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CONTACT US

ADVERTISING ENQUIRIES
Matt Smith, 021 510 701
matt.smith@rustymedia.nz

OFFICE
09 200 4847
greg.vincent@rustymedia.nz

EDITORIAL TEAM

EDITOR
Greg Vincent, editor@the-shed.nz

SUBEDITOR
Amanda Ireson

TECHNICAL EDITOR
Jude Woodside

PROOFREADER
Odelia Schaare

DESIGN
Ricky Harris

CONTRIBUTORS
Murray Grimwood, Jude Woodside, Mark Seek, Mark Beckett, Peter Barton, Chris Hegan, Bob Hulme, Māyā, Nigel Young, Edward Prince, John Woods, Melissa Hannon, Helen Frances. Jason Burgess

RUSTY MEDIA.NZ

PUBLISHER
Greg Vincent, greg.vincent@rustymedia.nz

FINANCIAL CONTROLLER
Karen Grimmond,
karen.grimmond@rustymedia.nz

ADVERTISING MANAGER
Matt Smith, 021 510 701
matt.smith@rustymedia.nz

PRINTING
Webstar

DISTRIBUTION
Are Direct, 09 979 3018

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DEMOCRACY RULES

I note that Jude Woodside, the founder of *The Shed* magazine and YouTube sensation, writes in his Back 'o column this issue that he has joined a political party to help out with the upcoming general election. Good on him, I say.

I applaud him and everyone who gets involved in politics, as, honestly, who would want to be part of the government these days? The older I get, the more disillusioned I become with governments of all persuasions.

To run our little piece of paradise, and almost every country on the planet it seems, those in power face nothing but abuse and ridicule. "They can't do that!", "Did you see what they did there?", "Oh, that's just ridiculous; they have no idea what they're doing", and so on.

I remember watching the TV news years ago when the other mob was in power, and seeing journalists being tough on the government, seriously questioning nearly everything they did and giving the opposition plenty of airtime to tear it all apart. I thought, wow, these reporters are harsh.

Then the current government took over, and the approach was exactly the same, which made me laugh. I get it now, but I didn't back then. Was it always like this? Have I been missing something in political reporting over the decades?

I also try to be careful with my social media viewing because I don't want algorithms to trap me in an echo chamber that feeds me only one perspective. However, I've failed; I lingered too long on a few posts, and now it seems they've figured out which side I support. Bugger. Now, I constantly receive content that only reflects one side of the story. Any political feeds that come my way these days cruelly attack the party that I supposedly do not align with. It takes my breath away how they ridicule and belittle politicians and their supporters.

Some may call me crazy – and they wouldn't be the first – but I'm starting to feel a bit sorry for politicians. What a terrible job. Nothing they do is right, whether they are in power or out of it. You must have truly thick skin to endure the internet maelstrom. More than 30 years ago, I offered my services to one political party and showed up on polling day to see how I could help. I stood there all day like a proverbial pork chop while my team won a crushing victory anyway. Also, I recall my mum being driven to vote on polling day, and that amazed me at the time – what people are willing to do for just one more vote. But that's democracy for you, I s'pose.

So, well done, Jude, for putting your hand up to assist; good on ya mate.

Now, how about we start a Give a Little page for all those misunderstood politicians out there? Whaddaya say, any takers?

Greg Vincent
editor@theshed.nz

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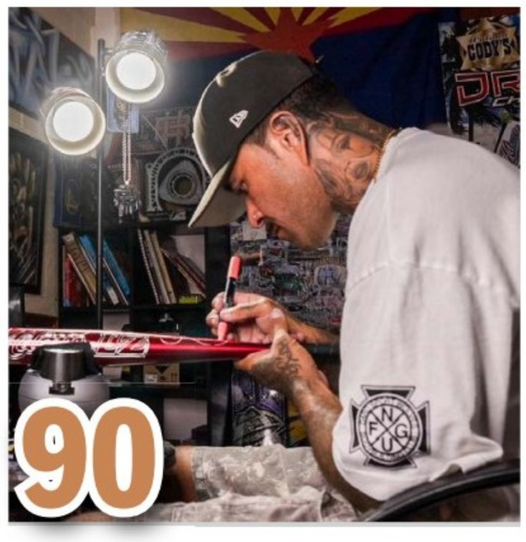

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SENTIMENTAL JOURNEY

By Jason Burgess | Photographs: Jason Burgess

Jack Ryder had the unique ability to hypnotise sports stars, politicians, and celebrities, convincing them to donate items to his museum and sports memorabilia collection. Now, grandson Clint manages this West Auckland landmark, but the property vultures are circling

Jack's original pub

Jack outside his shed with the roof of his proposed railway station tablet room behind

> "In those days, he was known around town as 'Junkie Jack'"

Two masonry lion sentinels saved from Dilworth School guard the gates at Ryders

It is hard to imagine a less likely location for a living museum than the back blocks of suburban West Auckland in Avondale.

Yet here, towards the end of a lengthy no-through road, the Ryder family hold tight to a self-built vestige of Auckland's yesteryear. While the surrounding streets are turned into homogeneous multi-unit town housing, the Ryders' two-acre slice of pavlova paradise remains, less a multi-generational home ground and more a celebration of the character of the city's past.

A village at the end of the drive

Slipping through the tall white gates and past the twin concrete lion sentinels at the street end of Ryder's long hedge-lined driveway, the modern world slips away. Ahead, in the shade of a 100-year-old pecan tree, an enclave of antique edifices opens out along the back-fence line like a set from a period movie.

This corner of vintage Kiwiana is the handiwork of the late and industrious Jack Ryder, a coach-builder and wharfie, who began constructing it from a group of sheds spread across the property.

Jack grew his 'village' from the detritus of late-Victorian buildings

Looking across the wishing well to the former tablet room – now Clint's house – with the 'new' Ryders bar to the right

that he procured from demolition sites in the late 1950s. His mission was to conjure something of the spirit of the old Auckland that he grew up in. Jack's first project, though, was building the family home. He had to make good on a promise to his bride-to-be, Margaret, that she would have a house of her own before they tied the knot. That abode still stands across the rambling garden that Margaret would grow and tend throughout her life. Pathways framing garden beds lead to the weathered-looking, two-story country-style pub, which was Jack's next project.

Junkie Jack

The antique enamel signs, telephone boxes, replica corner lounge bar, the 'Junction' building, and column of bowsers out front of the gas station are the tip of a stockpile of ephemera that Jack began hoarding before World War II.

In those days, he was known around town as 'Junkie Jack'. 'Magpie' might be a better term: from old-school signage and technology to sporting mementoes, nothing escaped his eye. While his quarry might have changed as he grew in years, Jack's passion for collecting never really stopped until he passed in 2013, at the age of 92. ▶

Outside the gas station

The door to the restaurant and cinema with original pub windows from the former Royal International Hotel

A back fence montage of some once-famous brands

Jack assessing a newly acquired public phone box

An open day in the late 1950s photographed for the *Women's Weekly*

Auckland Harbour Board gate post — a reminder of his days on the wharves

Preservation station

As the post-war growth-spurt in Auckland accelerated, Jack saw the city's heritage being demolished, torched, and vandalised at an alarming pace.

He began saving as much of this built history as one man could. He gathered façades, timber ceilings, stairwells, lights, cornices, fixtures, and as much old kauri as he could rescue from pubs; he secured doors, interior panelling, and complete windows with handwritten gold-leaf beer ads.

Then, from this cache, he began his life's project: repurposing his salvaged resources into a pastiche of colonial buildings that could be opened to the public. Ryder's launched in the early 1960s, about a year before MOTAT started doing something similar up the road in Western Springs.

The spirit lives on

Jack's grandson, Clint, now carries Jack's legacy forward as Ryders Cinema and Restaurant.

"My grandfather's vision," remembers Clint, "was to create a village modelled on old Auckland, so that people could see what it used to be like. He wanted

Clint blackens his outdoor Orion coal range oven. “I use this one for pizzas in summer”

his village to have the feel of old Auckland more than total authenticity.” Over the years, the built backdrop of Ryders has been featured in ads, wedding photography, and TV shows – *Town and Around*, *Top Half*, TVNZ *One Sport*, and the *Holmes* show.

Today, the venue is still popular with visiting clubs, family groups, and those in the-know as much for Clint’s traditional roast lunches in the pavilion as it is for the nod to yesteryear.

While guests take selfies among the old-world collectables or a pint in the pub, Clint puts the finishing touches on a hearty, slow-cooked meal prepared in a 1930s wood range oven.

The second course is usually ice cream and a film of choice, screened in the Ryders’ purpose-built spacious 64-seat cinema, complete with two vintage 35mm projectors and a DVD player in the projection room. Night or day, Clint hosts bespoke experiences and, in summer, makes pizzas under the gazebo in a second outdoor wood range.

The silver screen

“The cinema,” says Clint, “was 100% a family affair.

“It was Grandad’s idea, but my Uncle John built it. My uncle was a leather maker, and he’d repair all the old 16mm film boxes for cinemas. He’d often be given a movie for the weekend as part payment. He used to go around to soccer clubs putting on movie nights. When he put a screen up in the backyard to show films for families in the neighbourhood, Grandad said to him, ‘Listen, son, instead of you going to them, get them to come here. I’ve got the timber but build it old style.’ So, John started building the cinema in the ’70s, with all the old timber that Grandad had been saving.”

In the blood

As for Clint, he caught the collecting bug early. No surprises, really; not only

Clint threads a reel in the projection room

In the Ryders cinema

> “The cinema was 100% a family affair”

John Ryder started building the cinema in the ’70s with old timber that his father had been saving

Jack wearing some of his sporting moments outside the original pub

A bluestone carving made by a prisoner at Mount Eden prison

The 18th-century cannon rumoured to have come from the HMS *Bounty*

was he brought up around it, but as a kid, he was often a companion to Jack's meetings and trades. He would visit stadiums and stars with his grandad, who would get him into hotels and other places where children were not allowed. Although, Clint says, "I remember the first thing I did with him was going to see a guy doing some brass work for him at the top of Chinaman's Hill, Surrey Crescent. He wasn't happy with the guy's work, and he was letting him know. My grandfather was known as a tough negotiator, but he always preferred to swap or trade rather than use money."

Looking around, Clint says, "I can't pick one specific favourite thing from Grandad's collection because he collected so much stuff." While every article at Ryder's has its own backstory, Clint recognises that much of the signage and service station collection was amassed before his time, so he is hazy on some of the provenance.

But one stand-alone item of particular interest that he would love to get to the bottom of is an 18th-century cannon at the side of the cinema, which was rumoured to have come off the HMS *Bounty*. It was given to Jack as payment for covering his neighbour's rates bill.

On the road

As a teenager with a freshly minted driver's licence, Clint spent his spare time transporting his grandfather around the city and provinces to trade and secure treasure from dealers, markets, or sportsmen themselves.

In preparation for any Ryder roadie, Jack would ring up sports commentators and radio jocks like Murray Deaker and Barry Holland to find out where the teams were staying. Clint remembers Jack passing on the intel and saying, "'Right, we are going there.' Sometimes we'd spend all day waiting for the team to come back. Jack was often tracking the opposition, and his MO was basically an unabashed ambush in the hotel lobby: before or after a game and especially when a team had won a series."

Super fans

You could call Jack the original fan-boy. In the course of his collecting life, he became something of a legend in sporting circles for his haul of sports memorabilia. His heroes came to know him personally and made time to have their photos taken with him.

Clint also loves all sporting codes, particularly cricket and yachting. He says, "I have added a lot of stuff" to the Ryder haul. One of his most cherished items is a shirt from Australian batsman Mark Waugh: "It was his first one-day century as an opening batsman, in Hamilton. My grandfather and I went to the park and the hotel, and Waugh couldn't do enough for us. A hell of a nice guy and a real character."

The hypnotist

Clint smiles when he reflects on Jack's MO. He says, "He just had a way. It was like he hypnotised sportsmen. He would go into a hotel lobby or room with them, and they'd say, 'Whatever you want, Jack, pick what you want.'"

Clint recalls when a friend of his took Jack to Eden Park on a day when Clint was working: "They went to see Brian Lara during batting practice. The story I got told is: Brian Lara is batting, sees my grandfather watching. Brian stops ▶

Clint flips through pub scoreboards from 1970s international tours

The wheelhouse from the *Eaglehawk* car ferry and a fence of signs from former Auckland Harbour ferries

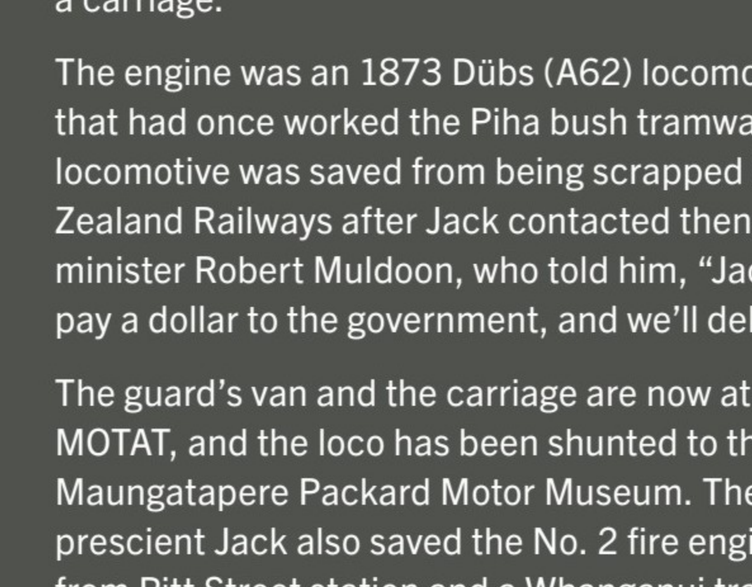
Rolling stock

Back in the mid ’50s, one of Jack’s original plans was to build his own railway station, which explains the ‘Ryder’s Junction’ painted on one of the windows of the main building.

“He had a steam engine in there,” remembers Clint. “And, a guard’s van from the Rimutakas plus a carriage.”

The engine was an 1873 Dübs (A62) locomotive that had once worked the Piha bush tramway. The locomotive was saved from being scrapped by New Zealand Railways after Jack contacted then–prime minister Robert Muldoon, who told him, “Jack, you pay a dollar to the government, and we’ll deliver it.”

The guard’s van and the carriage are now at MOTAT, and the loco has been shunted to the Maungatapere Packard Motor Museum. The ever-prescient Jack also saved the No. 2 fire engine from Pitt Street station and a Whanganui tram. The latter he kept for three decades before it was sold, restored and relocated back to Whanganui.



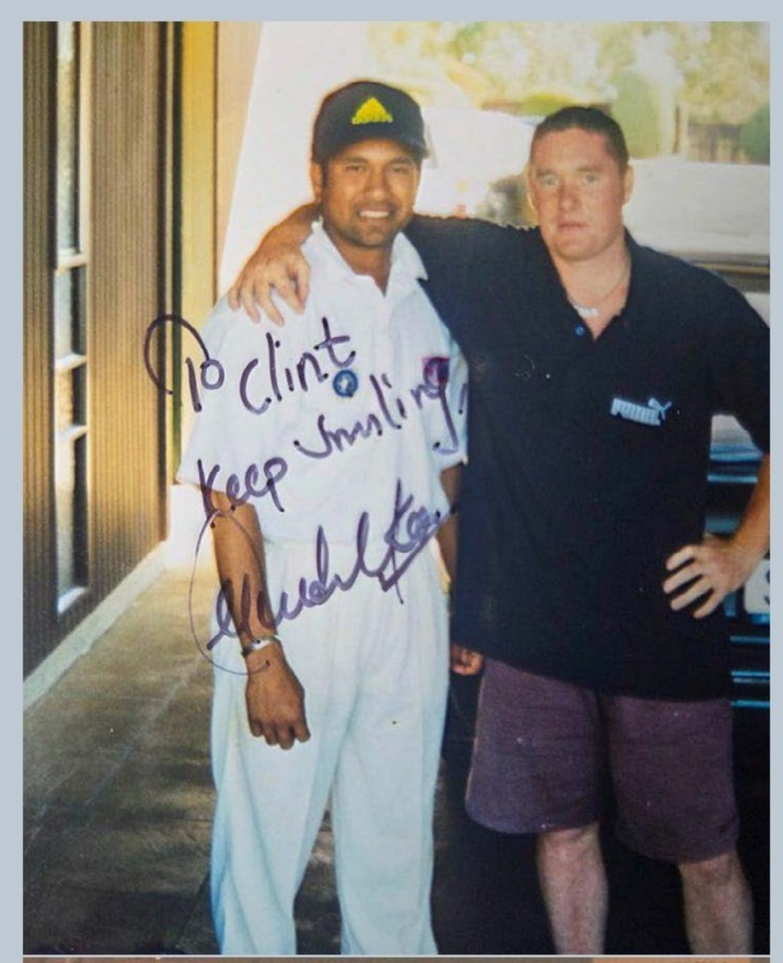
Hit the wicket

Jack was full into his sports phase when his grandson was coming of age.

Clint’s first celebrity memory is at around eight years old and being slightly overawed meeting the Pakistani spin bowler Abdul Qadir.

He remembers a later incident when, “Indian fans couldn’t believe my grandfather was invited in with Sachin Tendulkar. To the Indians, Tendulkar was a god; they couldn’t see how Jack got so close. It was just the way he did it, you know? But my grandfather knew Tendulkar from his first tour here when he was 16 and scored 88 in his first match. He got injured, and Jack scored the pants he wore that day straight from him.

“Jack would get his introductions to up-and-coming stars by taking bits and pieces of his collection, as well as pictures of himself with other sports stars, to show the new guys what he was doing. He was compiling a Ryder’s Hall of Fame of sorts.”



Ryders street scene

The back wall of the original pub

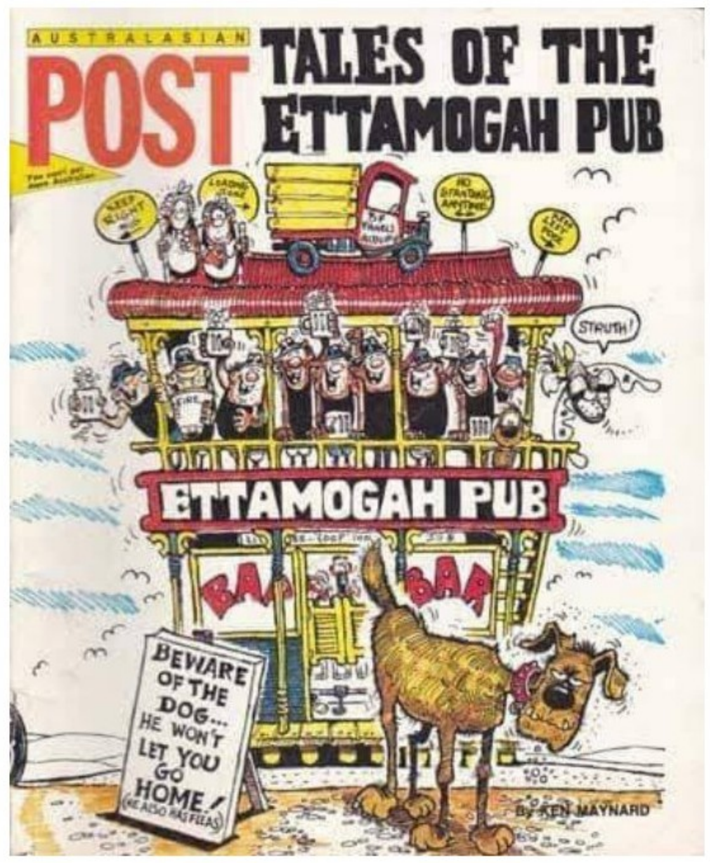
practice, goes over, hugs my grandfather and says, 'What do you want, Jackie?' And Jack goes, 'I wouldn't mind your batting gloves.' Lara takes them off, signs, and gives them to him, right there. No one could believe it!"

The original pub

The weight of the enamel signage on the exterior of Jack's original tavern seems to give it a list, like Australian cartoonist Ken Maynard's infamous 'Ettamogah Pub'.

As Clint puts the key in the lock, he is nervous about showing me the interior. "I am a bit embarrassed," he says, "we don't open it to the public; it's mainly used for storage." As the door swings into the gloom of the lobby bar, one is instantly transported back to the once-plentiful colonial watering holes of downtown Tāmaki Makaurau. From Toby jugs and liquor ads to dusty shelves stacked with every kind of drinking and promotional vessel imaginable, the bones of Jack's vision are easily recognisable behind the stacks of boxes.

It is astonishing to think that Jack sourced the pub's L-shaped staircase from one of Governor Grey's former homes in Anzac Avenue. Up the stairs



A cartoon of Ken Maynard's 'Ettamogah Pub

Elvis in the house in the new Ryders pub

The cosy in the new pub

Clint outside the door to the original pub

Clint between Stirling Moss and some of Jack's number plate collection

and outside the white-washed main room is an open-air balcony given over to red-themed vintage Johnnie Walker advertising and royalist mementoes in all shapes and sizes.

Through a wall panel door lies a large empty room, lined with dark-stained native timber panelling and ceiling, with large ornate corbels saved and reassembled by Jack. This was once a maritime display room. The model ships and supporting marine accoutrements have all been traded, but Clint wants to reinstate exhibits in here once he has funds to restore the whole structure.

A building halved

Clint explains that, "The bottom section of this building is actually the top bit from the Kelvin House pub in Hobson Street.

"Kelvin House was where all the film stars visited at the turn of the century (20th century, that is). When they were pulling it down, my grandfather bought the front, then brought it home."

The original upper façade of Kelvin House forms the exterior of the 'new' Ryder's Pub opposite the cinema.

Inside that, Jack recreated a cosy lounge and bar room which hosts boxing and cricketing photo walls, a life-size Elvis statue, and pinball machines. Libations, therefore, are served from behind the original Kelvin House bar.

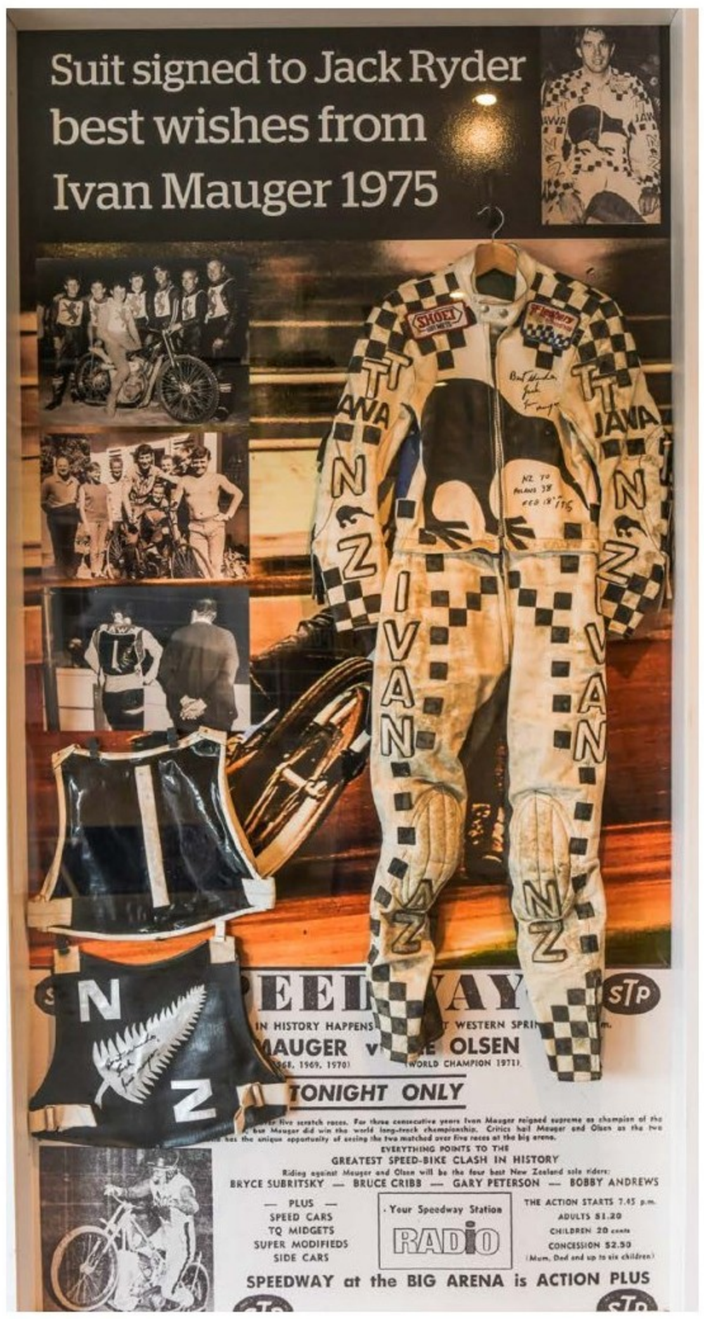
The stars up the stairs

Meanwhile, the upstairs white room of the original pub is host to a random assortment of odds and ends: a vintage French table-top horse derby game; pub fixture boards from classic '70s Rugby tours; and a badly frayed, hand-painted 1886 athletic club poster.

A grouping of tables groans under the weight of scattered folders full

The French horse derby parlour game

Clint lifts the lid on the horse derby game



Complete riding suits from three motorsport legends

Coin-operated stamp and film dispensers outside the old pub

of news articles about Jack and the museum, plus boxes chock full of precious sporting memorabilia.

Clint starts digging in, pulling out sportswear, balls and bats, gloves, and pre–World War I boater hats belonging to a roster of sporting greats dating back to the early 1900s. Each item is plastic wrapped, with a dated note highlighting the day the piece came into Jack's possession. Every package is not only autographed but also, most often, dedicated to Jack, and usually accompanied by a photo of the star with Jack on the day that he received the item.

Among the boxes is Peter Snell's singlet from his gold medal–winning race at the Tokyo Olympics; Glenn Turner's cricket bat when he got two double centuries in the West Indies, and a bat signed and gifted by Don Bradman; signed shirts from Joe Frazier and Muhammad Ali; autographed Whitbread Racing wear from Peter Blake; and riding suits from Sterling Moss and Ivan Mauger.

Some of that gear has been lovingly reframed by Clint and is on display in public areas, but so much more is in storage awaiting exhibition space, hopefully when Jack's original Ryders pub gets restored.

Back to the future

In many ways, the future of Ryder's hangs in the balance. ▶

All hands to the pump

After the rolling stock left the yard, a stagecoach was also moved on. The family were then left with an empty shed. At this point, Jack was getting on.

Clint recalls, “Jack had petrol cans stored away, a bit like how I’ve got the sporting gear stored. When the stagecoach left here, I said to him: ‘How about turning it into your service station? The frame is there, just get it built.’

He said, ‘That’s not a bad one.’ So, I got a builder in. My grandfather sat there and told the builder what he wanted. The guy was patient. I really think that gave Jack another 10–15 years. I would really like a stand-up Coke or Pepsi machine. I think that would complete the collection. I just need to win Lotto or get a sponsor, that would help me do the old hotel up too!”

Just a hint of some of the Ryders’ sporting trophies

Curatorial duties are just the start. While Clint's mum, sisters, and uncle have worked in and on the place, there has been no traction with the next generation to date.

Clint says, "The kids – my daughter, nephews, and nieces – were around here growing up but aren't really interested. Doing this, you've got to be able to talk and have a bit of knowledge. Before I took it on, my grandfather told me to go out and get a job, get some stability and work out a way of life before I came home. I think by doing that and not spending all my life here has given me some guidance and knowledge."

As with many businesses, large and small, lockdowns, the ensuing Auckland storms of 2023, and other external pressures have challenged Clint's resolve, yet he is ever optimistic. He says the family have been offered good money for the land, but he would rather preserve his grandfather's vision so that future generations might get a sense of how the city looked and felt before the tsunami of redevelopment began.

Eclectic treasures

Clint pulls out a small box containing a horseshoe and a book called *The Fighting Blacksmith*, a biography about the boxer Bob Fitzsimmons.

As a bare-fist fighter, Fitzsimmons had the curious distinction of winning three world titles at three different weights in three different US cities, and in 1903 became the lightest heavyweight champion.

As a blacksmith, he forged a horseshoe and punched stars into the metal: Clint says, "Every star he put on it is for every state he fought in, in America. He's got to be New Zealand's famous bare-knuckle boxer. Te Papa offered good money for this, but I'd like to hold on to it for a while."

Clint inside the gas station

Clint takes a ride in the Model TT service truck

ROY SHARMAN COLLECTION HEADS TO AUCTION

A LIFETIME OF MOTORING, STEAM AND MARITIME HISTORY

For anyone who had the privilege of visiting "The Sheds" in Waiuku, it was immediately clear they were stepping into something extraordinary. More than a collection of cars and memorabilia, it was the life's work of one remarkable man – Roy Sharman.

Born in Wellington in 1943, Roy developed an early fascination with anything powered by steam, wheels, rails, or water. That passion shaped a lifetime of adventure and collecting. Joining the Union Steam Ship Company as a young man, Roy served aboard the passenger ferry Wahine. When tragedy struck on 10 April 1968 and the vessel sank in Wellington Harbour, Roy was among the young crew members who helped save lives during one of New Zealand's worst maritime disasters. He would later become the last surviving crew member of the Wahine.

Roy's seafaring career took him around the world aboard famous vessels including the QE2, Cunard ships, and later the Milburn Carrier II. His travels to Australia, England, the United States and beyond allowed him to pursue another growing passion – collecting classic automobiles and rare automotive parts. Among the treasures he brought home were a 1933 Rolls-Royce and a 1953 Bentley.

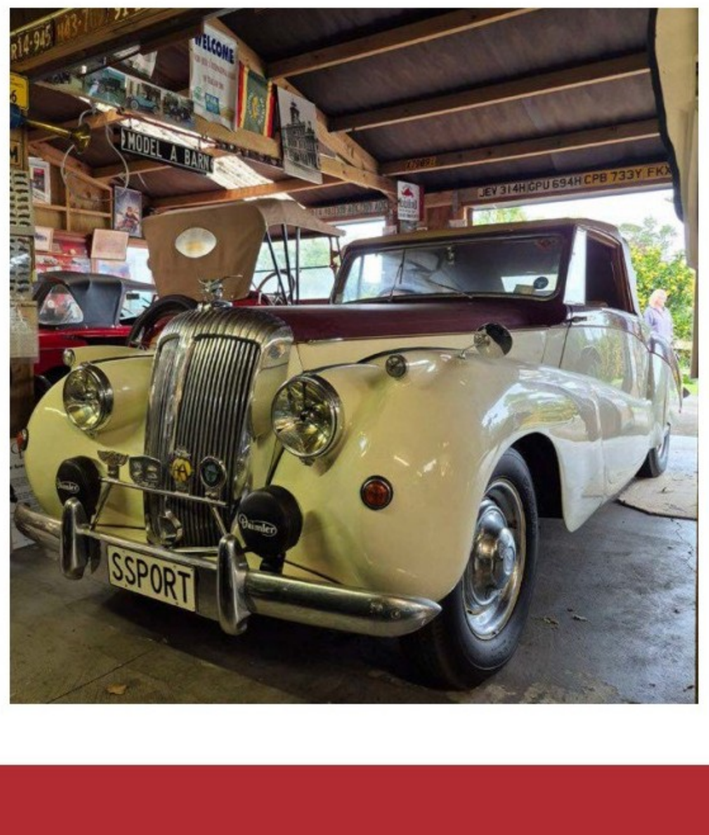
Back in New Zealand, Roy settled in Auckland during the late 1980s and began assembling an impressive collection of vintage vehicles and motoring memorabilia. His interests ranged from Austin 7s, Packards, Bentleys and Willys-Knights through to veteran vehicles, including his beloved 1916 Perry, which he proudly rallied throughout the country.

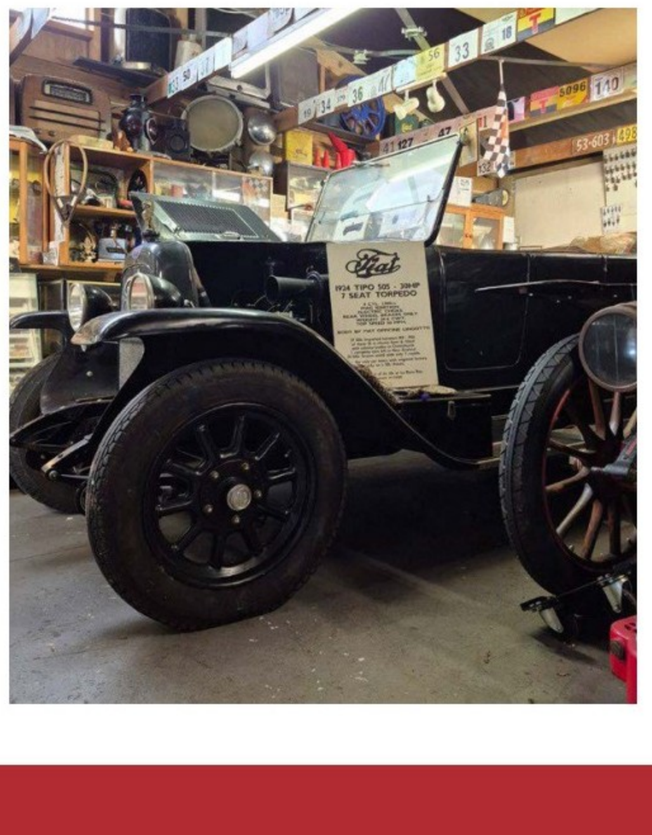
His enthusiasm extended well beyond cars. Roy became deeply involved with steam machinery, eventually owning two traction engines and a miniature railway locomotive. Over time, "The Sheds" grew into a fascinating private museum housing more than 300 telephones, historic artefacts, military memorabilia, and countless items of New Zealand history.

Sadly, Roy lost his battle with ill health on 16 March this year. His passing marks the end of an era, but his legacy lives on through the collection he spent decades building.

Now, thousands of items from Roy's treasured collection are set to go under the hammer across a series of auctions, beginning on Sunday, 25 October (Labour Weekend). In keeping with Roy's wishes, proceeds will contribute to a substantial donation to St John Ambulance to help fund a new ambulance.

For collectors, motoring enthusiasts, and lovers of New Zealand history, this is far more than an auction—it is a rare opportunity to own a piece of an extraordinary life.





A NEW CHAPTER FOR NOVA LATHES

A new Kiwi-designed lathe has got this woodworker very excited. So excited, in fact, he has already ordered one for himself.

By journalist/woodcrafter John Woods, a National Association of Woodworkers (NAW) committee member

Auckland-designed woodturning equipment surprised the world recently at the annual symposium of the American Association of Woodturners in the United States by launching a new state-of-the-art lathe - the Nova Neutron.

The global company, Teknatool, headquartered in Auckland, first unveiled the Neutron at the National Wood Expo of the NAW in Auckland in May, thanks to sponsorship by local importer and distributor Carbatec New Zealand.

The Neutron is a 17" swing lathe with a direct-drive motor, a colour touchscreen, and the kind of build quality that signals world leadership in this category of woodturning equipment.

There's a particular satisfaction kiwi turners share in unboxing a machine that was designed and engineered down the road.

The successor to the Saturn

The Nova Neutron – the latest mid-to-large swing lathe from Teknatool – is one of those. It's the natural successor to the company's well-regarded Saturn, and it lands in a part of the market that hasn't had a genuinely new product in some time: the 17" swing range, where enthusiast and professional buyers tend to overlap.

For *The Shed* readers, the headline is short. The Neutron is a beltless, direct-drive lathe with a 2 HP DVR motor, a 10.9cm colour touchscreen on the headstock, a 50–5,000 RPM range to handle the materials makers use, and a 10-year motor warranty. For proficient turners like myself using the 2004 variable speed Nova DVR 3000, the gruntier Neutron is a logical next-step acquisition.

No belts. No pulleys. No compromise.

DVR – Digital Variable Reluctance – isn't new technology in itself.

Teknatool first introduced it to a woodturning lathe 25 years ago, and the company's engineers have spent the years since refining the control electronics around it.

The advantage of a direct-drive motor is easy to feel the moment you switch one on. There are no belts to whip, no pulleys to align, and no rubbery transmission of vibration into the workpiece.
Speed adjustment is electronically instantaneous and continuous from 50 to 5,000 RPM — useful at both ends, since the slow end matters as much as the fast end when you're truing up an unbalanced blank.

As the DVR motor mounts directly to the spindle (the spindle is the rotor) - there is no requirement for belts or pulleys, and no alignment to chase.

The motor is backed by a 10-year warranty (excluding bearings).

Two things sit underneath that simplicity. The first is intelligence: the motor controller continuously senses load and makes micro-adjustments to maintain commanded speed, which produces noticeably smoother cuts on dynamic loads. The second is safety. If the motor sees a sudden, abnormal load spike — the kind that occurs with a catch — it shuts down.

Slow-start capability handles unbalanced blanks without the lurch that ruins a faceplate mount. And there's electronic braking with adjustable brake force, which engages automatically off both the headstock and the magnetic emergency-stop remote, giving confidence to elderly turners like me carrying physical handicaps such as slow reflexes from stroke injury.

The screen on the headstock

The 10.9cm colour touchscreen sits at the operator's eye line on the headstock, with hot keys above and a speed knob below. Designed for use with gloves on and shavings everywhere.

The headstock control panel is where the Neutron looks most obviously like a 2026 product rather than a refresh of a 2010 one. The 10.9cm colour touchscreen interface is icon-based, multilingual, and – importantly for *The Shed* readers – designed to be operated with gloves on and grimy fingers. There are physical hot keys above the screen and a speed knob below, so you're never

hunting through menus mid-cut.

What the screen actually shows you:

- A live load read-out, so you can feel for the sweet spot in different timbers and depths of cut.
- Eight programmable favourite speeds — by far the most-used feature on the older Saturn control panel.
- Forward/reverse with controllable slow-start.
- Index position read-out (the spindle indexes in 24 divisions / 22.5°), shown on screen so you don't have to count clicks.
- Adjustable brake force and on/off braking.
- Finish drying mode – to apply colours and finishes - select rpm and time: the lathe will slowly turn the workpiece for even drying and turn off automatically after the selected time.

Serious woodturners and professionals are typically looking for heavy-duty machines equipped with corded pendant remote controls. Included with the Neutron is a corded, magnetic-backed remote complete with a screen displaying speed, stop, start and EMS (emergency stop) controls. This allows the turner to start the lathe on the turning side of a large piece and avoids the need to lean around spinning work to change speed or stop the lathe.

Cast iron, swivel-and-slide

The Neutron's headstock is cast iron. It both slides the entire length of the bed and swivels a full 360° with 22.5° detents and can be locked at any angle, which opens up bowl-turning configurations and outboard work without having to wrestle the workpiece into the standard inboard position.

With the optional outrigger fitted – and the Neutron is compatible with existing Nova outrigger accessories – outboard capacity reaches 71cm (28"). Between centres is 61cm (24") standard, extending to 112cm (44") with the optional bed extension.

For the spec-minded: spindle thread is 1¼" 8 TPI and power 230 V/10 A.

Two configurations

The Neutron will ship in two models.

The Standard model rides on a new hybrid steel stand: lighter, easier to manoeuvre into a busy workshop, but rigid enough not to flex under the loads this machine can handle for all the turning jobs. The Neutron-Max model, which I'll be ordering, upgrades to a cast iron stand for buyers who want the absolute maximum mass and stability under the lathe — typically professional workshops and serious enthusiasts who turn heavy, off-centre work.

Both configurations share the same headstock, motor, electronics and tailstock. The choice is really about how much cast-iron ballast you want under the lathe, and how much floor you want to give it.

Who is it for?

Teknatool has positioned the Neutron between its smaller Neptune and the Orion.

In practical terms, this is a lathe for the turner who has outgrown small machines and needs a machine that can do much more without exorbitant cost. The DVR motor and 10-year warranty mean it will absorb daily use; the touchscreen and fave-speed presets mean it stays fast and pleasant to operate over a long session; and the swivel headstock and outboard capacity mean you don't have to keep buying up the range to take on bigger work.

Indicative specifications

(Specifications are indicative and subject to change before final production release.)

- Swing over bed: 17" (43cm)
- Motor: 2 HP Striatech DVR Direct Drive
- Speed range: 50– 5,000 RPM
- Spindle thread: 1¼" 8 TPI
- Between centres: 61cm standard / 112cm with bed extension
- Outboard turning: 71cm (with optional outrigger)
- HMI: 10.9cm colour touchscreen, icon-based, multilingual
- Headstock: cast iron, swivel & slide, 22.5° digital indexing
- Tailstock: 120mm quill travel, strengthened 10mm locking handle
- Power: 230 V/10 A
- Warranty: 10 years on motor (excluding bearings)

Availability

The Nova Neutron was shown in New Zealand a few weeks ahead of its worldwide release.

New Zealand pricing and launch dates will be confirmed through Teknatool's local distributor Carbatec New Zealand closer to release. For *The Shed* readers wanting to see one in the flesh, watch your local Nova distributor.

The Nova Neutron, offered by Carbatec and Carbatec dealers, is anticipated to start at a price point around NZ$4500, while the Nova Neutron Max price point will be around NZ$5500.

Odd Jobs

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Letters to the editor

editor@theshed.nz

LETTER OF THE MONTH

WHY NOT USE A MULTIMETER?

Dear Greg,

I write re. Graeme Flottmann's letter, *The Shed* Issue No. 125, about a Ryobi trimmer, which brings up two items: checking and servicing.

The first question is why doesn't he have a DVM/DMM (digital multimeter)?

They can be bought for as little as $12. I only have a couple of DVMs plus my old analogue multimeter and my mother's multimeter. And no, she hasn't used it for over 30 years, no longer being with us.

A quick check to see if there was any voltage on the charger's output pins would have said something.

The second Ryobi item is about one that was brought into our Rolleston Men's Shed. The owner thought it was the crossbar switch on his mains-powered hedge trimmer being intermittent. It had 19, yes, 19 screws needing to be removed to get the cover off to check that the fault was actually in the moulded three-pin plug.

For easy servicing, sensibly, three screws could have been plenty if it had been designed properly.

Another item at the Men's Shed, a Sunbeam coffee maker. Six screws to get the plastic back off, but a lot of screws in the base as well to get things apart enough to clear the projection lugs on the plastic back panel. There is a pump that might need cleaning, and YouTube videos show how. The back could have been made with one screw at the top and the two lugs it has at the bottom.

Basically, it seems too many manufacturers want as much landfill as possible.

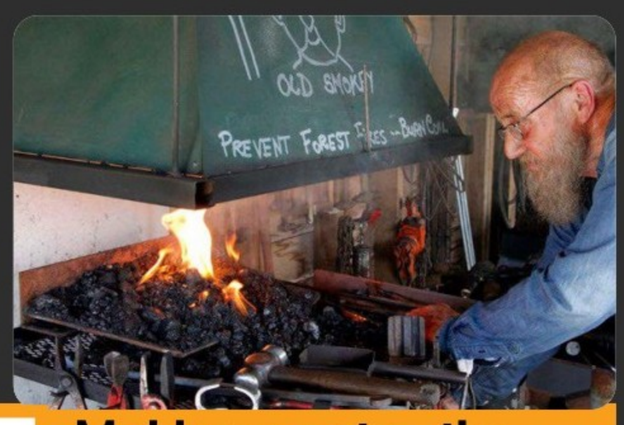
Regards,

Sandy Ferguson

THE SHED ONLINE

What's happening online at theshed.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. Some uploads of the past few months include:*



Making a gate – the blacksmith way

You need to be dexterous to be a smithy

https://theshed.nz/making-a-gate-the-blacksmith-way/

Westland Industrial Heritage Park

A club devoted to saving past relics has created a unique heritage park

https://theshed.nz/westland-industrial-heritage-park-from-trash-to-treasure/

The Workmate – a shed in a cupboard

A eureka moment led to the development of a staple piece of sheddie equipment

https://theshed.nz/the-workmate-a-shed-in-a-cupboard/

Revving up – Island style

A Great Barrier Island sheddie doesn't let isolation get in the way of restoring bikes

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1. Entering a speed command activates the stator coils via a powerful micro-computer.
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STATOR: The stator is the electricity-carrying component that contains copper coils. It generates an intense magnetic force to turn the rotor (spindle).

ROTOR: The rotor is the extension of the headstock spindle. Composed of solid steel laminations, and unlike conventional motors, there are no coils, magnets or brushes inside the unit to fail.

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THE SOUND OF MUSIC

A quest for better quality sound leads to a transmission line speaker build

By Jude Woodside
Photographs: Jude Woodside

The kitset contents from Parts Express

I'm probably showing my age, but I still believe that much of what passes for audio hi-fi today is vastly inferior to some of that which went before.

I may be quite wrong, but I can remember a truly awesome sound that made you feel that the band was in the same room and the sound was coming from their own monitors. Sound with clarity and definition. While I appreciate that for enormous sums of money you can still get that quality, I still believe that it was more common in the '70s from off-the-shelf equipment. To prove the point, I wanted to build a set of speakers in a style that was popular at the time.

There are three basic kinds of speaker enclosures.

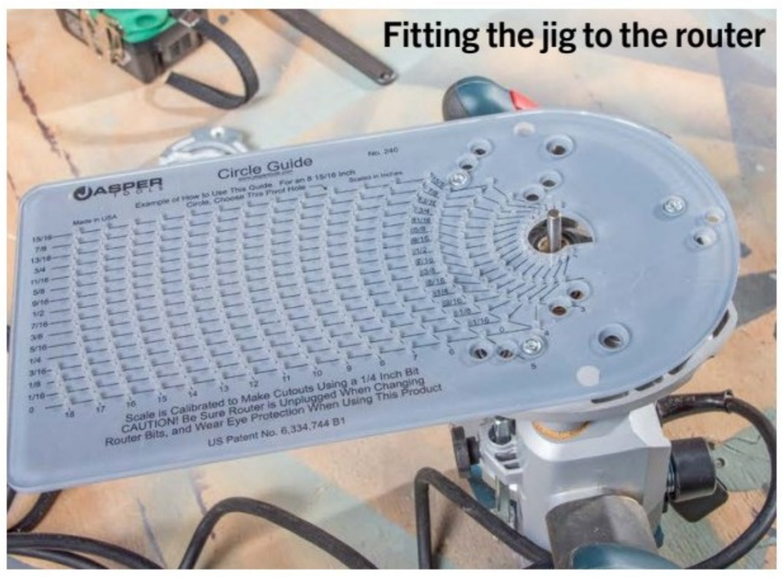
Sealed units, ported units – which have a port somewhere in the cabinet – and transmission line (TL). TL speakers are similar to ported enclosures in some respects; they also have an opening into the cabinet. Reputedly, TL cabinets provide better bass replication across the range without over-emphasising any particular frequencies.

Choosing my kitset

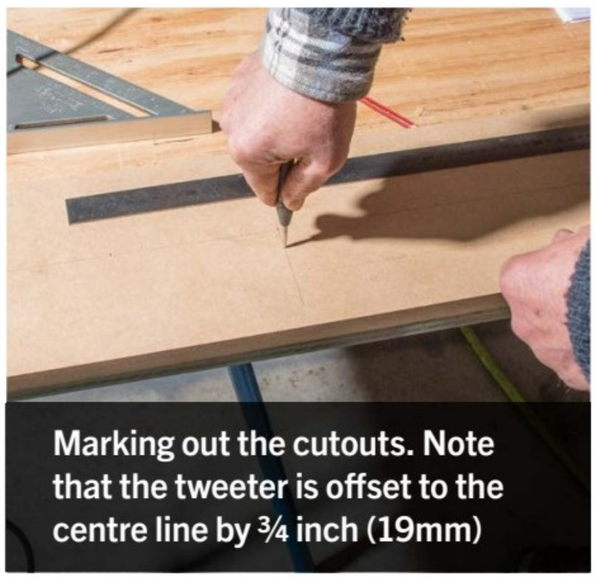
One of the most accessible transmission line designs is the TriTrix, designed by Curt Campbell (speakerdesignworks.com).

It is supplied as a kit through Parts Express in the US. You can buy either the full kit, including precut panels for the speakers, or simply the drivers, crossovers, and stuffing. I didn't see the need to transport so much MDF via the

Breaking down the MDF sheet into parts



Fitting the jig to the router



Marking out the cutouts. Note that the tweeter is offset to the centre line by ¾ inch (19mm)

Drilling the centre holes for the router jig using a ⅛-inch bit. Metric equivalents are either too big or too small

The jig was set up with the pin in place for the woofer holes

Cutting the circles

Routing the cutouts and the shoulder rebate. I used the same bit and simply altered the diameter

> “A driver with a resonant frequency of 40Hz will not reproduce frequencies of 30Hz well, but it will perform well at 45 and 50Hz”

post, so I elected to buy only the parts.

The kit comes with two Dayton DC28FS-8 shielded silk dome tweeters, four Dayton DC130BS-4 classic shielded woofers, two Jantzen 2.50mH 18-gauge air core inductors, two Jantzen 0.60mH 18-gauge air core inductors, two Dayton DMPC-10 10uf-250v polypropylene capacitors, two Dayton DMPC-10 20uf-250v polypropylene capacitors, two Dayton DNR-2.4 Ohm (Ω) 10w non-ind resistor and two bags of Acousta-Stuf to stuff the speakers.

This kit price currently (2026) is US$220.

Transmission lines

A ‘transmission line’ speaker is effectively a speaker attached to a long tube.

The tube length has to be long enough to ensure that the sound out of the tube end is in phase with the sound from the front. The sound at the rear of the speaker cone is 180 degrees out of phase with the sound from the front; however, at one-quarter of the resonant frequency wavelength, the sound will be 90 degrees phase shifted and in phase with the front, so the two waves will sum to boost the lower frequencies.

The tube is lined or stuffed with acoustic-absorbent material to attenuate the higher frequencies that might cause interference problems. A taper in the pipe also helps to attenuate the higher frequencies; the taper is usually in the order of 3:1 or 4:1. This type of speaker was more popular in the ’70s but fell out

Rounding the ends of the face

Rounding the sides

of favour with manufacturers because it was too expensive to build. It is still popular with us audiophiles, though.

Speaker design

Designing speakers to get the best performance from the drivers is not a straightforward process, as there are so many parameters to take into account. Fortunately, due to the pioneering work of two eminent audio engineers in Australia, Neville Thiele and his colleague Dr Richard Small, this is made so much simpler. The Thiele/Small parameters (usually abbreviated as 'T/S') capture all aspects of a driver and enable prediction of how the driver will perform in various cabinets and configurations (see panel).

Resonant frequency

The 'resonant frequency' (Fs) of a driver is the frequency at which the driver moves with minimal effort.

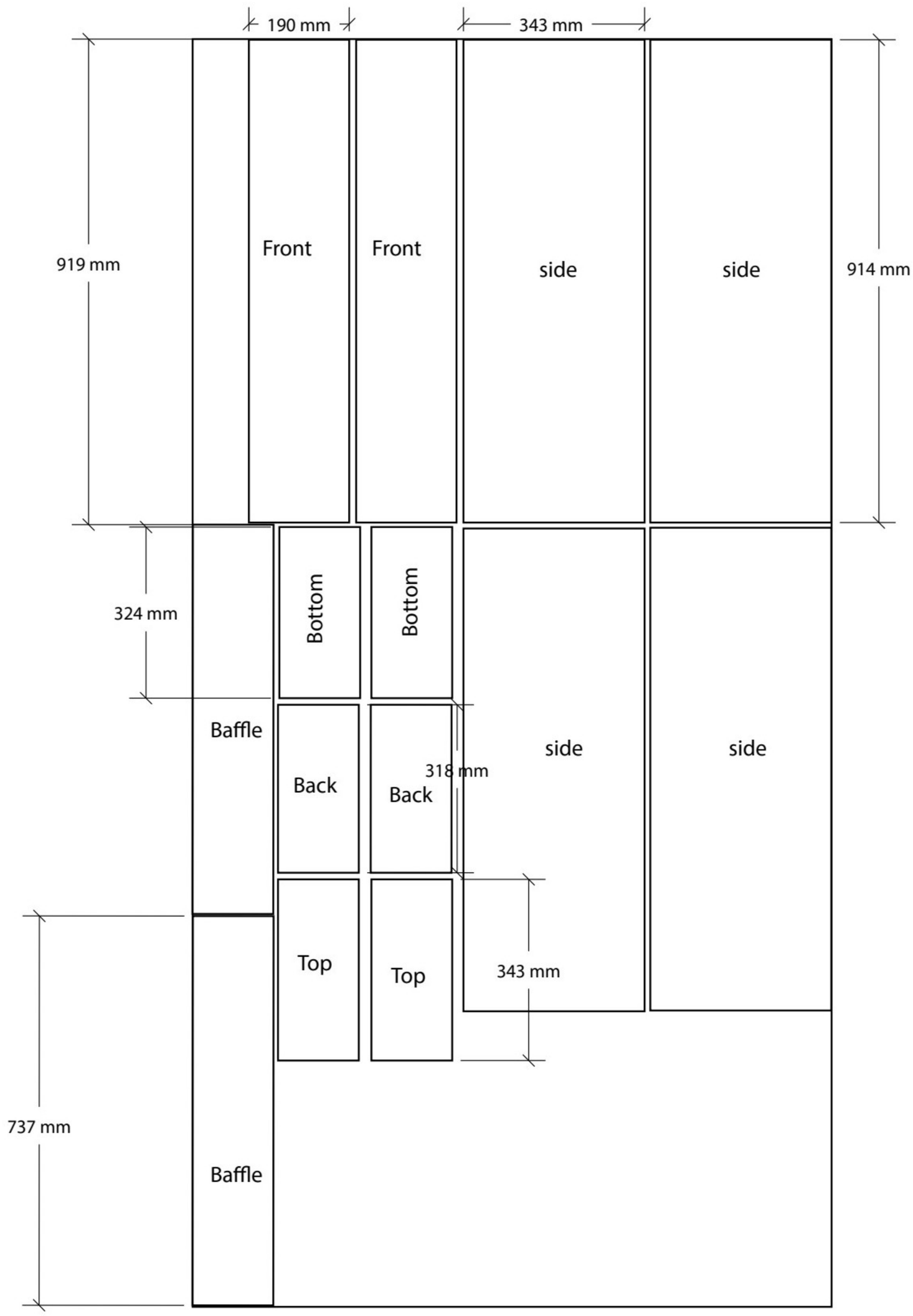
After this point, the response of the speaker starts to roll off. The lower the Fs, the better for a woofer.

'Compliance' is the measure of the stiffness of the surround and the spider; this affects the resonant frequency (Fs). The stiffer the surround, the less compliant. As the compliance increases – that is, gets less stiff – the Fs goes down.

'Sd' is the effective area of the cone that actually moves the air. The surface area of the cone, together with 'Xmax', directly affects how much 'sound pressure level' (SPL) the speaker can output.

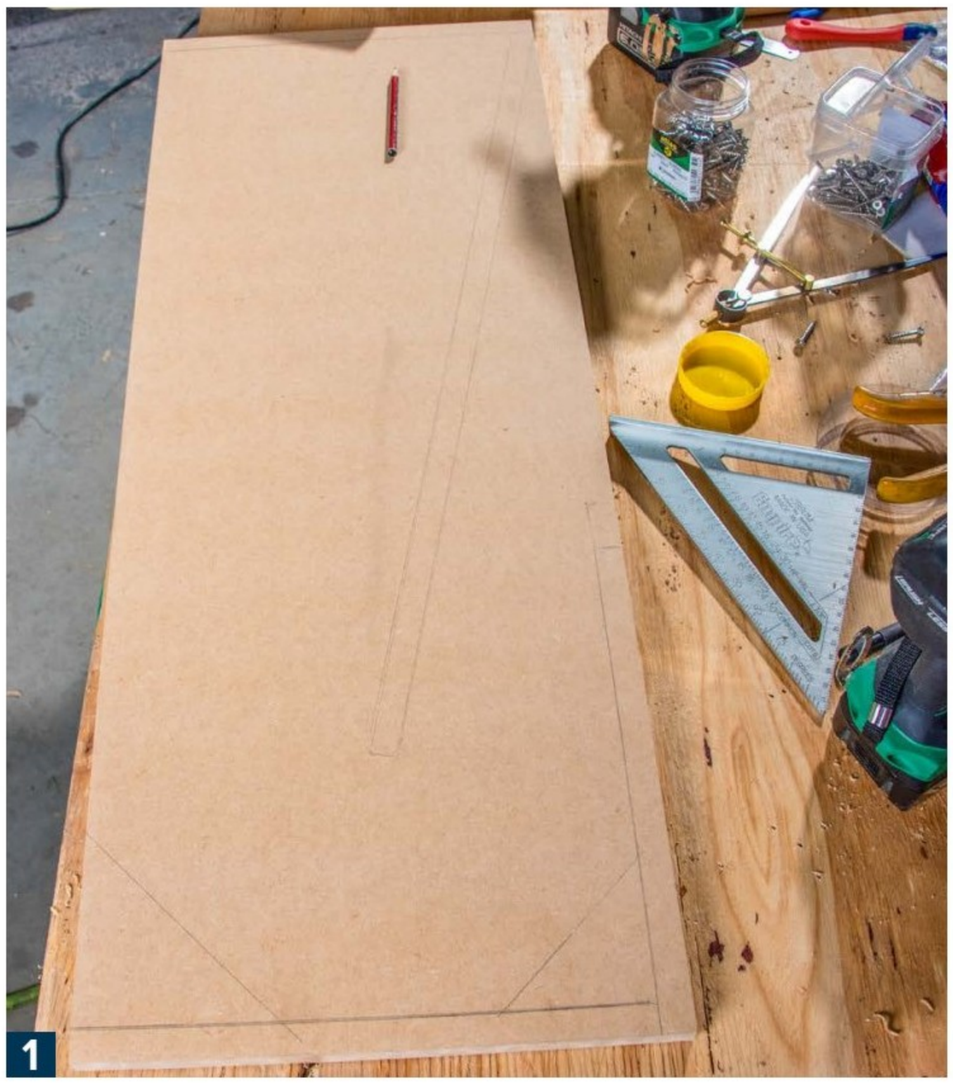
SPL is measured in decibels. It is a measure of the efficiency of a

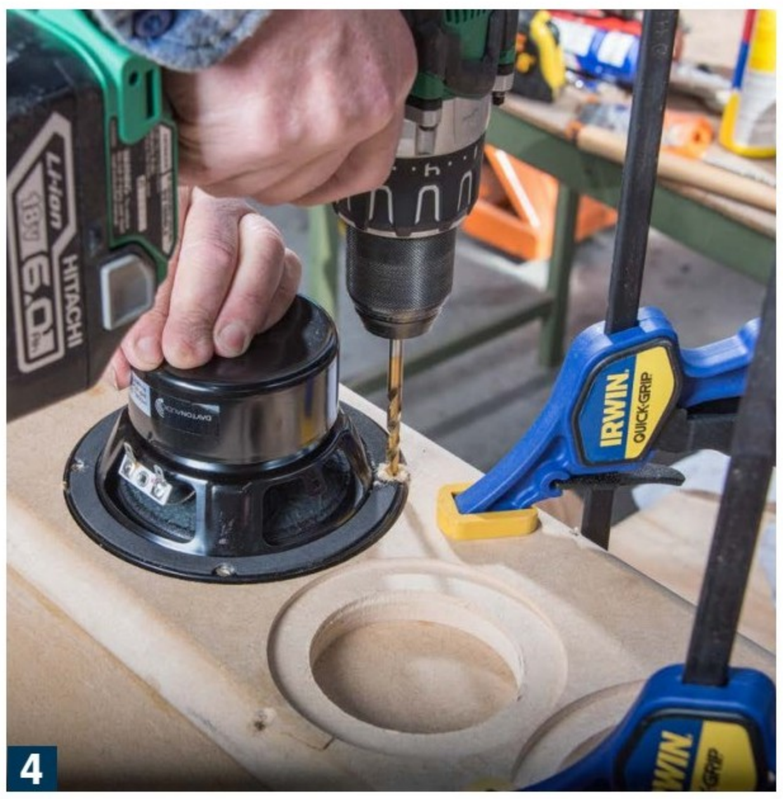
Cutting plan layout

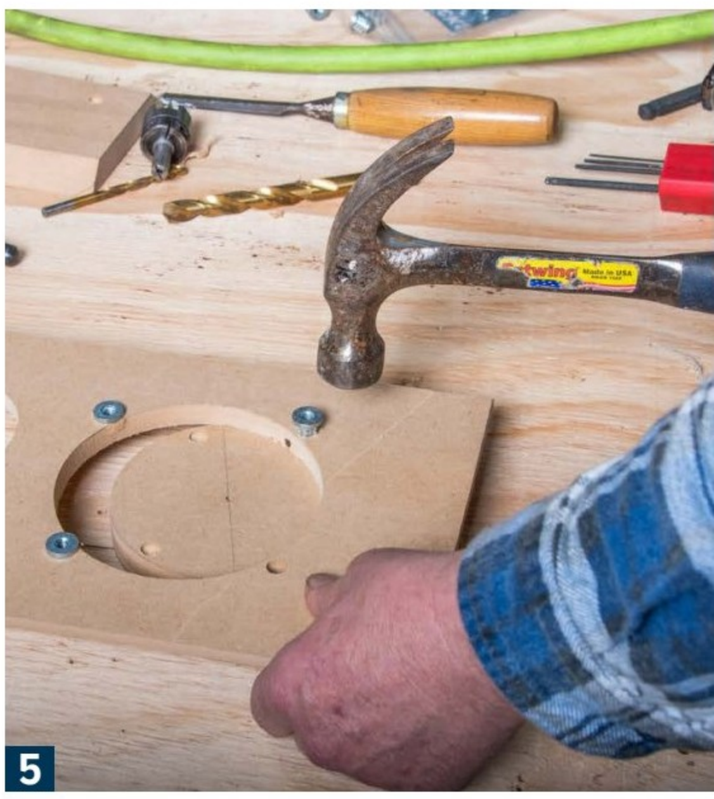


Drilling the holes for the front

Countersinking the holes in the face







1. Tracing the components on the interior. 2. Drilling the pilot holes from the inside. 3. Drilling out the speaker holes for 6mm. 4. Using a driver as a template to drill the mounting holes. 5. Setting the inserts

speaker. An SPL of between 88 and 90dB at 1W/m is good. An SPL quoted at 2.83V/1m takes the impedance of the driver into account. There is no difference at 8Ω, but at 4Ω the 2.83/1m is equal to 90dB measured at 2W/1m, equivalent to 87dB at 1W/1m.

TriTrix design

The TriTrix uses most of the typical TL criteria.

It has a long tube created by the internal baffle. The optimum length of the tube for a TL speaker is a quarter wavelength of the resonant frequency. In this case, the resonant frequency is 51.8Hz. To convert the frequency into a wavelength, the frequency (in Hertz) is divided by the speed of sound in metres per second to yield the wavelength. This is then divided by four to find the quarter wavelength.

$$\lambda(m)=\frac{v(m/s)}{f(Hz)} = \lambda(m)=\frac{340}{51.8} = 6.563m$$

$$Quarterwave=\frac{6.563}{4} = 1.64m$$

Tracing the sound wave path in the speaker box does add up to 1.6m or 65 inches. The TriTrix design also incorporates a taper, which serves to further attenuate the higher frequencies. This design has two woofers instead of one in what is called an 'MTM' configuration. That simply means 'midwoofer-tweeter-midwoofer'. It refers to the layout of the speakers, which are set out in that manner. MTM is a means of correcting the vertical polar response, making the sound spread out horizontally.

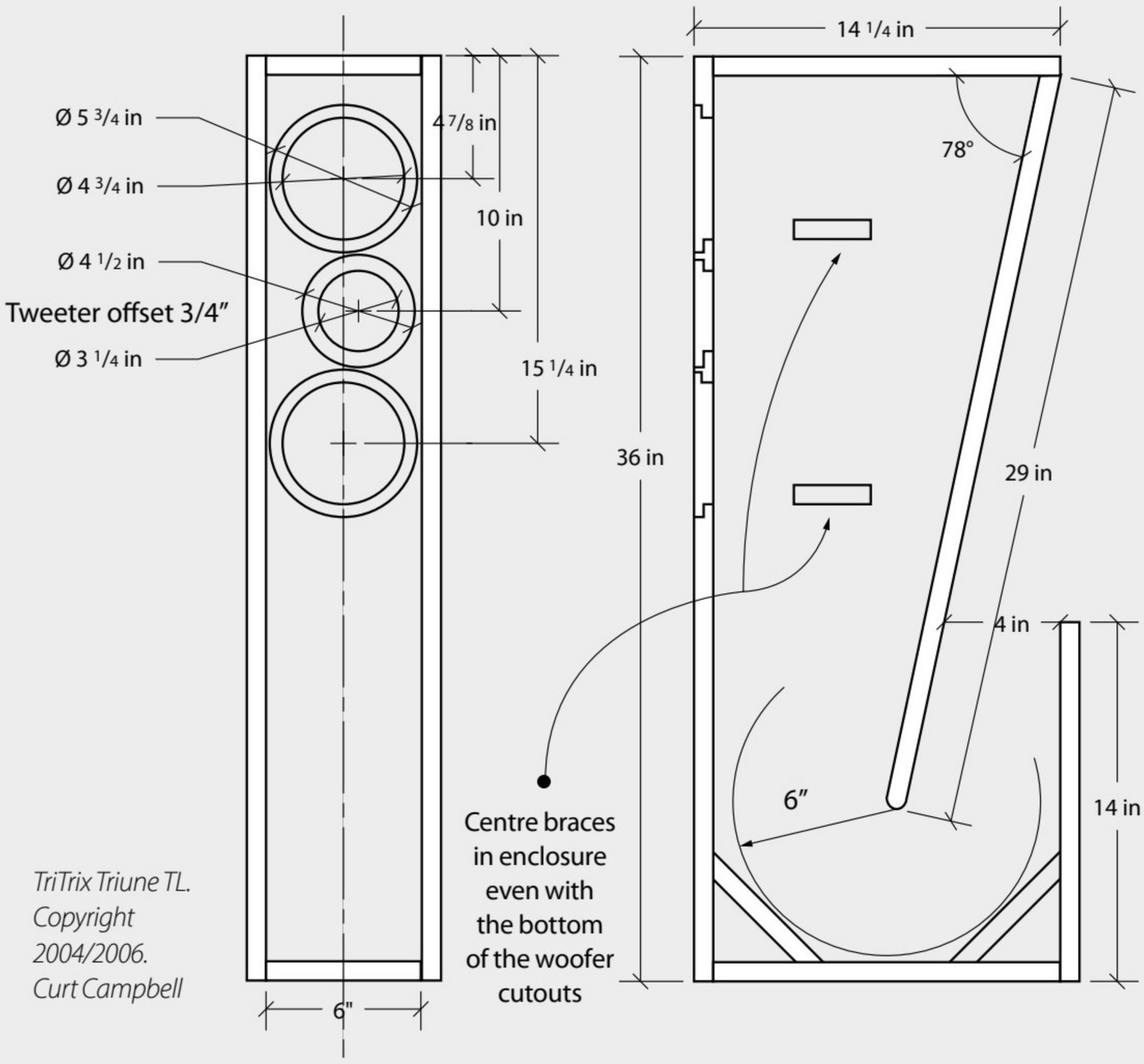
The build

The actual build is quite straightforward.

I worked out the most effective way to cut the MDF sheet to get the most value out of it, and in spite of the inevitable miscut, I had material left over. I elected to make one small change to Curt's design in deciding to make the front panel a complete piece rather than one captured by the walls.

I wanted to round off the edges on the front on all sides. Ideally, speakers shouldn't have hard edges, and you

TriTrix transmission-line speaker plans



TriTrix Triune TL. Copyright 2004/2006. Curt Campbell

The completed box – it just requires the two braces

might notice on high-end units that there are often no sharp edges. In fact, the ideal shape for a speaker is a sphere; they're just a bit problematic to make.

Hard edges allow eddy currents to build up and can affect the SPL of the speaker. How much that affects the perceived performance is another matter, of course, but I wanted to give this build every chance of blowing my socks off. You don't have to be as extreme as I was with radiusing the corners – 12mm would be ample. With all the pieces cut, I worked out the mitre of the baffles. The angle of the baffle is at 78 degrees to the top, so I cut the mitre at 22 degrees.

Beginning the assembly

Router jig

To cut the holes in the front panel, I bought a Jasper Pro circle-cutting jig from Parts Express.

I contemplated making one, but for the time it would take me, it was far easier to order the jig. The jig is calibrated in imperial, but they come equipped with a formula for working out the metric equivalents. I had changed all the imperial measures into metric, but it was easier to stick with the imperial for

Attaching the front panel

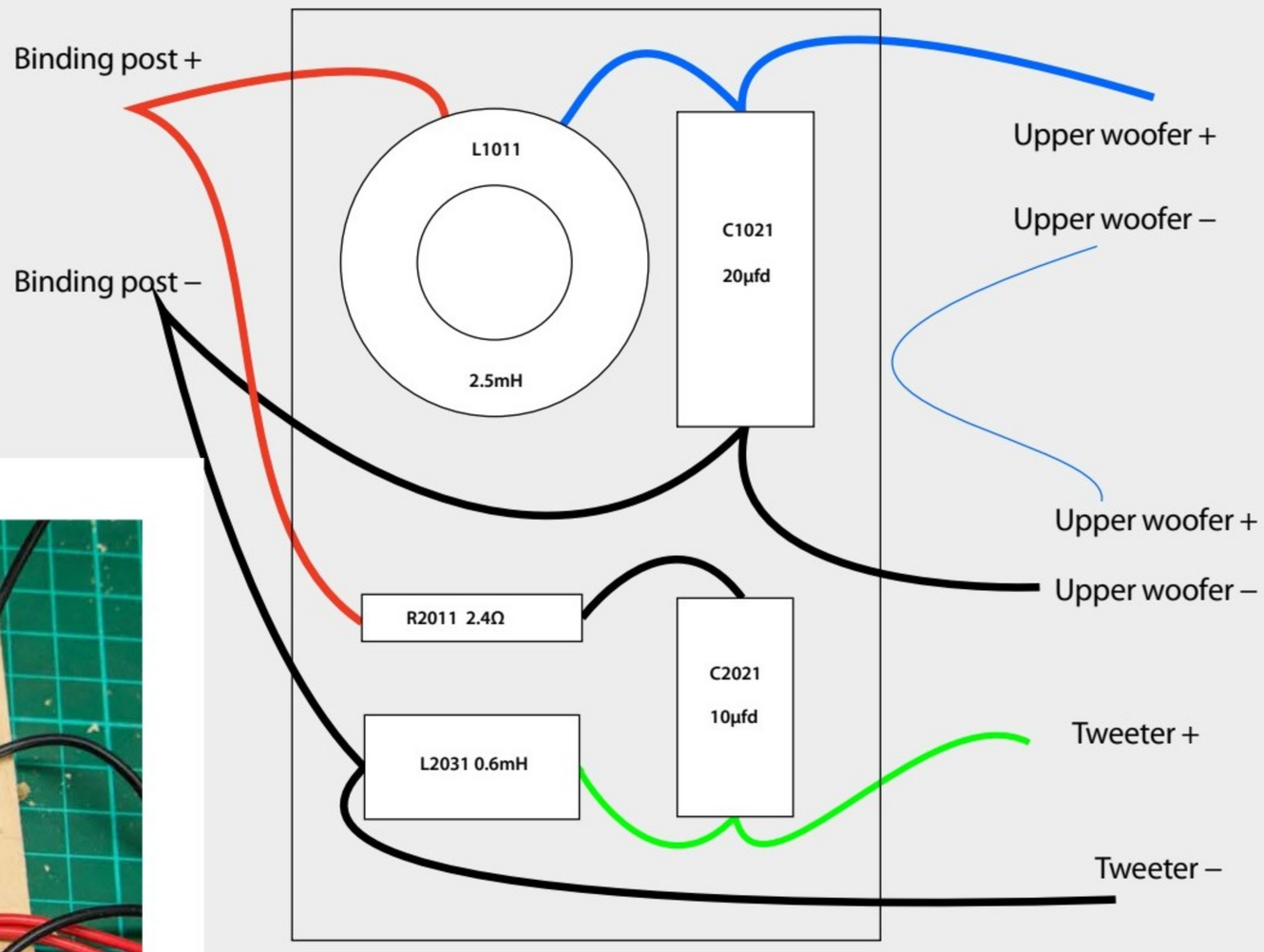
the front panel cutouts.

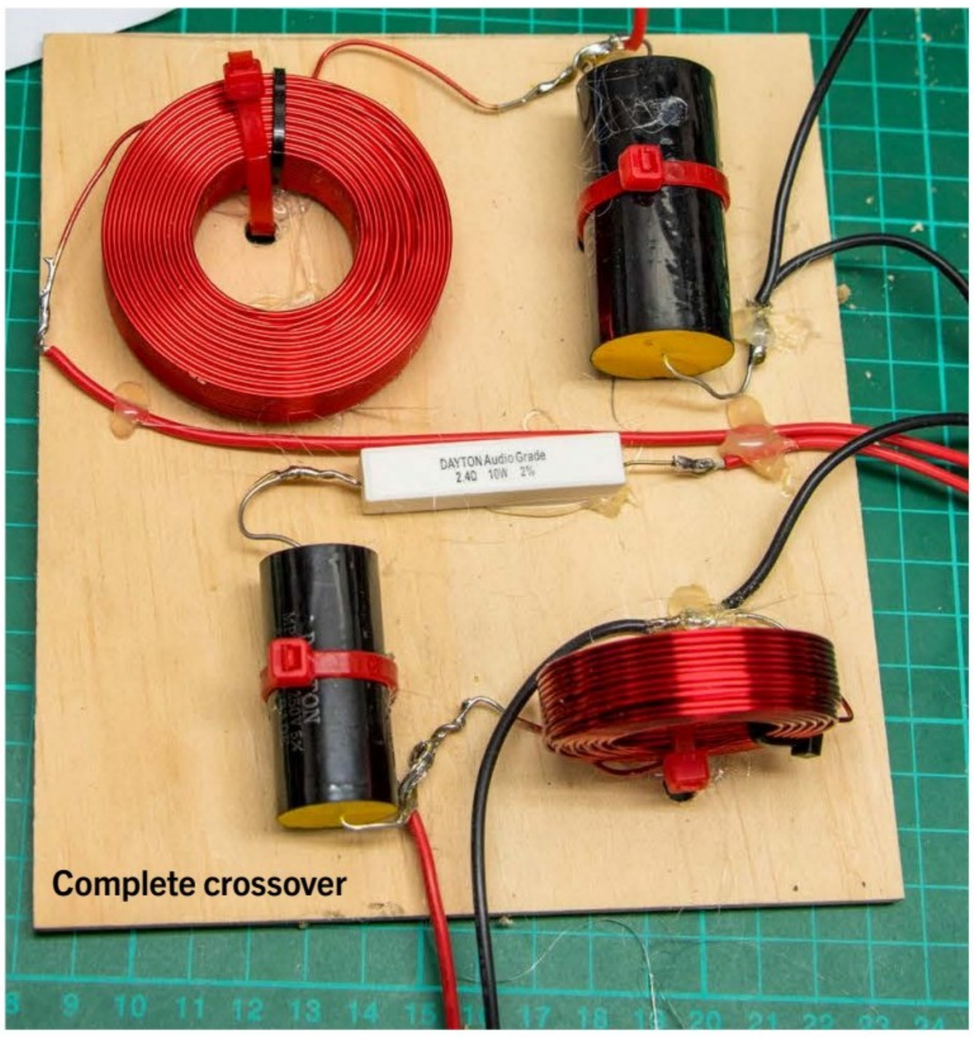
The jig is calibrated in 1/16-inch increments, and it is intended to be used with a ¼-inch bit. You can use other shank sizes, but you have to do a bit of calculating to do so. To set up the jig, you centre your router using a supplied ¼-inch rod in the router chuck and then find the appropriate mounting holes. It is set up for the most common routers.

Then it is simply a case of finding the centre point and drilling a ⅛-inch hole to fit the ⅛-inch pin supplied. There are two supplied pins – one of 25mm (1 inch) and another of 38mm (1½ inches) – find the appropriate-diameter hole and insert the pin. Fit the pin in the jig to the hole in the timber and cut the circle. It is wise to take things slowly, so don't try to cut the whole depth at once. It is only a

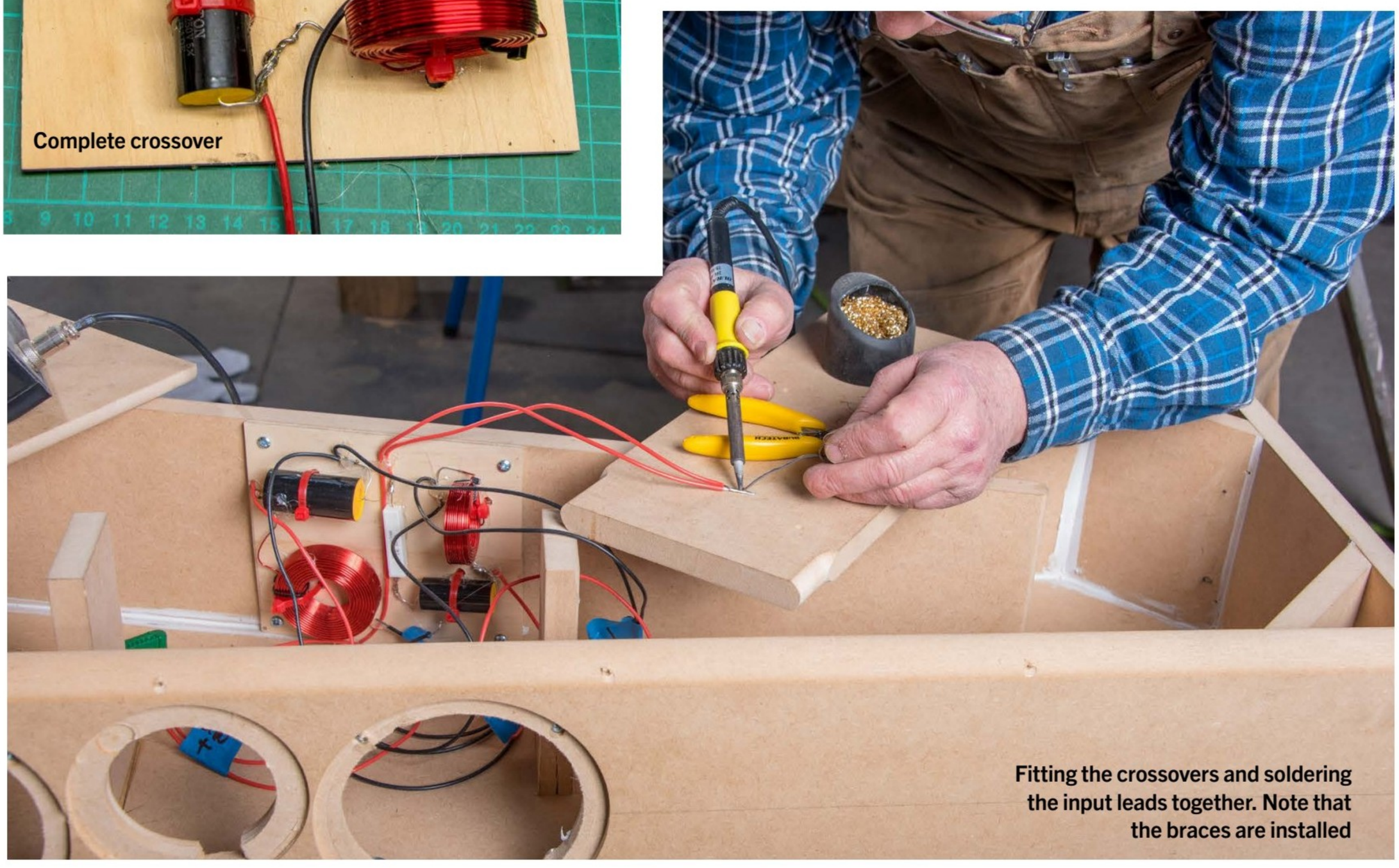
"Tuning the speakers involves adjusting the stuffing until the sound is more or less how you like it"

TriTrix crossover layout





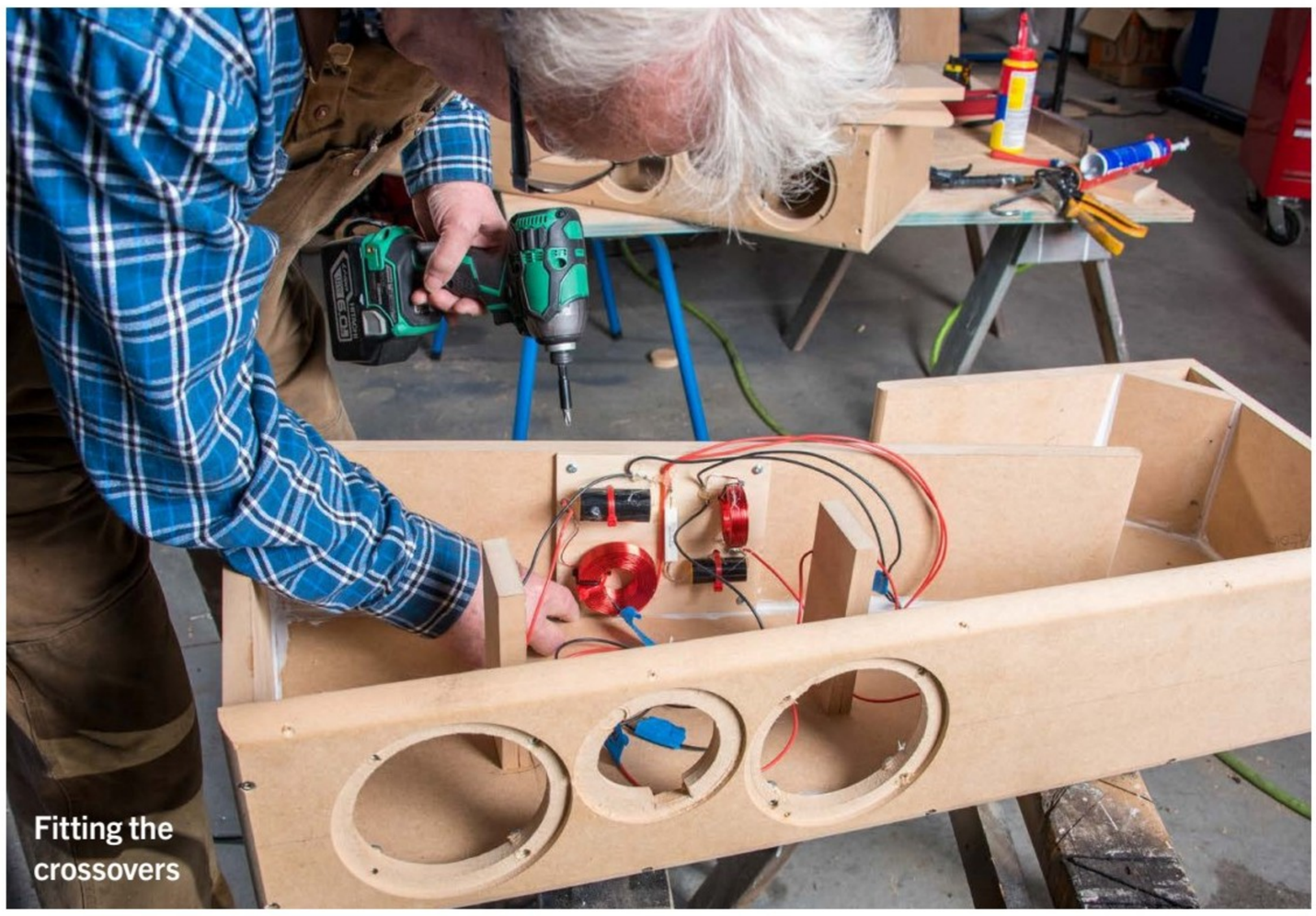
Complete crossover



Fitting the crossovers and soldering the input leads together. Note that the braces are installed

¼-inch bit.

For the shoulders, I had to cut several passes, reducing the radius by a ¼ inch each time. It also helps to preset the depth you want to cut for the shoulders. I cut the shoulders first, then cut the disc out. The tweeter cutout is very close to the woofers, so it pays to get things very precise. The tweeter is offset from the centreline by ¾ inch (19mm). You will also have to cut a small area out of the tweeter hole to fit its terminals through. With the cutouts finished and tidied up, I set up a router bit in the spindle moulder to cut the curve on the edges of the faceplate. The curve is 20mm to match the size of the MDF. While the spindle moulder was set up, I also rounded over the ends of the back panel and the baffle in the cabinet.



Fitting the crossovers

Redrilling

To make it easier in future to remove the woofers, for example, to adjust the stuffing, I used M6 socket head machine screws that fit 6mm threaded inserts. However, the holes in the speakers were slightly less than 6mm. I had to drill out each of the holes in the drivers to 6mm.

I was then able to use one of the drivers as a template to drill the mounting holes. It's worth it to pay attention to this stage because I drilled a couple of the holes too close to the edge, and the subsequent 9mm hole to fit the threaded inserts broke through the edge. The inserts are simply hammered in.

Assembly

To assemble the speakers, I laid out the pieces on one side to determine that I had the appropriate positions.

The baffle is set six inches or 153mm from the sides, including the deflectors that occupy the bottom corners. The deflectors are set at 45 degrees to the centre line of the tube and are intended to deflect the sound around the corner, but also to maintain the dimensions of the tube. They align with the centre line of the tube and ensure that the tube

Thiele/Small parameters

Impedance	The AC resistance that varies with frequency, measured in ohms (Ω).
Re	The DC resistance of the driver measured in Ω.
Le	The inductance of the voice coil measured in millihenries (mH). This is a measure of the back EMF in the coil.
Fs	Resonant frequency in free air of the driver in Hertz.
Qms	Mechanical damping.
Qes	Electrical damping.
Qts	Quality factor incorporating the inverse of Qms and Qes.
Mms	The total moving mass of the cone, the coil, half the surround, and the spider.
Cms	The compliance of the speaker. The stiffness of the surround and the spider.
Sd	The effective area of the cone; the cone minus the surround.
BL	Flux density (B) x length of the coil (L), the strength of the driver motor. Tesla/metres.
Vas	The compliance of the air in the cabinet that matches the compliance of the speaker.
Xmax	Maximum distance the cone can travel without distorting.
VC diameter	Diameter of the voice coil
SPL	Sound pressure level.

T/S parameters for the Dayton Audio DC130BS-4 5¼-inch Classic shielded woofer

Impedance	**4Ω**
Re	**3.55Ω**
Le	**0.5mH @ 1KHz**
Fs	**51.8Hz**
Qms	**1.86**
Qes	**0.44**
Qts	**0.35**
Mms	**8.8g**
Cms	**1.08mm/N**
Sd	**93.3cm²**
Vd	**14.0cm³**
BL	**4.8Tm**
Vas	**13.2 litres**
Xmax	**2.5mm**
VC Diameter	**25mm**
SPL	**91.6dB @ 2.83V/1m**
RMS Power Handling	**30W**
Usable Frequency Range (Hz)	**55–4000Hz**

Filling the holes

Stuffing the box. It pays to tease out the Acousta-Stuf

Attaching the side

itself doesn't extend into the corners but maintains a more or less consistent cross section, albeit the first part is a taper. I cut them out of leftover scrap.

With the pieces laid out, I marked all around each piece and then set out the screw holes. The holes were drilled from the inside out, and the piece was turned over and redrilled with a countersink bit. In MDF, it's possible to drive the screw heads well below the surface, but the countersink bit makes a tidier job.

Each piece was then glued and clamped in place and screwed through from the other side. Near the ends, make sure you predrill through to the corresponding piece, or you will get splits in the MDF. I clamped the pieces until the glue had time to dry. With the clamps removed, I also sealed all the joints again with filler. It's important to keep the box as air-tight as possible. Before mounting the last side, I attached the front, again drilling through from the rear and then countersinking the holes. It's necessary to drive the screws well below the surface on the curved parts.

Crossovers

At this point, I made the crossovers.

All the parts are included in the kit: two 2.5mH coils, two 0.6mH coils, two 20µF capacitors, two 10µF capacitors and two 2.4Ω 10W resistors. The coils should be laid so they cannot cross-talk with each other. Set them in different planes and offset them. I mounted mine on a small piece of ply using hot-melt glue and cable ties for good measure. In hindsight, I could have made them a bit tidier, but they will be hidden in the depths of the box. To ensure that I could reach them again if I needed to, in the not-unlikely event that I had, in fact, wired them incorrectly, I chose to place them directly behind the drivers. I don't think it will cause any major disruption to the back wave.

Stuffing

With the crossovers placed in position, it only remained to stuff the chambers. The kit comes with two bags of Acousta-Stuf, a product designed for stuffing speakers. The TriTrix is mainly stuffed in the tapered portion immediately behind the drivers, down to just below the lower driver.

Stuffing the speakers is a bit of an art in TLs. Some other builders have added foam and other dampening products to the top and down the baffle. In this instance, I have opted to see what the original design sounds like first before I resort to more drastic measures. Curt Campbell recommends leaving the last third to quarter of the line clear and altering the density of the stuffing one handful at a time. Tuning the speakers

Both cabinets filled and masked off

involves adjusting the stuffing until the sound is more or less how you like it. Ideally, you should add stuffing until the bass is just beginning to be attenuated and adjust from there. It's something that I will have to do over time as the speakers get worn in.

Finishing the cases

With the crossovers fitted, I closed up the boxes by adding the last side.

I now needed to finish them. Although I would have preferred to finish the cases in wood veneer or even wood vinyl at a pinch, that wasn't going to happen, as I haven't been able to find anything that looks remotely usable. So I opted to paint them. I first filled all the nail holes with builder's bog and sanded them flat, then refilled the holes again where necessary. I masked up the holes and applied a coat of primer filler. I left the filler to dry and then refilled all the imperfections that stand out when you apply an undercoat, and sanded the boxes and sprayed another coat of filler undercoat. I then applied three coats of topcoat to the boxes at the side, rear, and top. I masked off the front and sprayed it black, mainly because I can't apply a grill cloth. With the boxes finished, I connected up the drivers and fixed them in place. I added the terminal posts to the rear of the baffle and connected the wires inside.

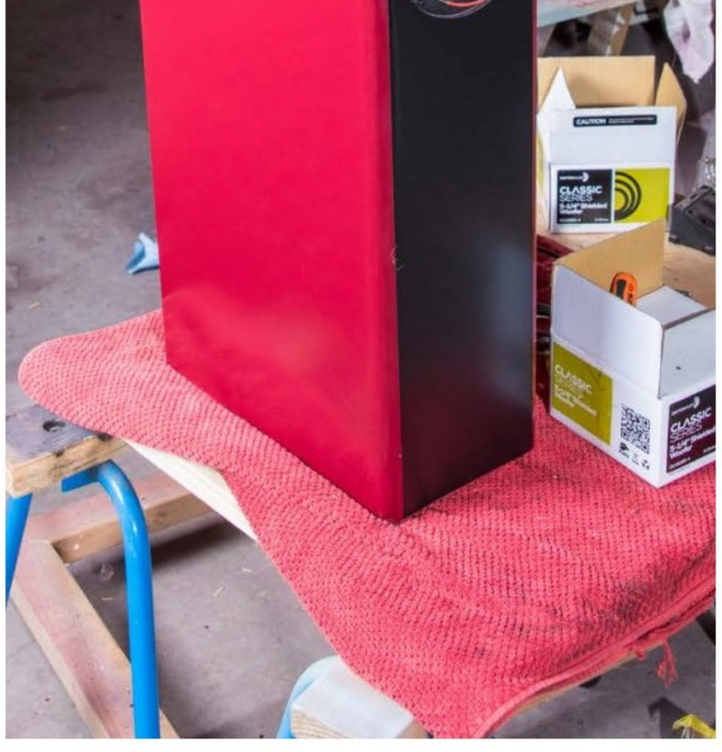
Performance

Time for the big reveal. Would they work as planned? Will I be overwhelmed?

I set the speakers up together with my existing Wharfedale CR 2-40s and played a track through them, then switched to the new speakers. The difference was immediately obvious. The TLs are clearer, louder, and the bass is certainly enhanced. Decent bass tracks like Charles Mingus' classic *Mingus Ah Hum* album have a totally new feeling

Applying the filler undercoat

Ready for the top coat



Cabinets finished

Wiring the drivers

Fitting the drivers

Finished units

through these speakers, and they haven't even been played in yet.

To be fair, I never really liked the Wharfedales – they seemed to lack something in the midrange, had no real presence, and certainly aren't top of the line, but my speakers are both better and considerably cheaper. I'm looking forward to how much they improve as they get played in. I can't hear anything that would make me redo or alter the stuffing, but that may change as they wear in. I'm also pleased with the colour. It was selected in haste, but it has turned out well, and it suits the room … matches the drapes.

Thanks to Curt Campbell for his assistance in preparing this article and for permission to reproduce his designs.

Testing the speakers

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My Girls 'n' Gasoline shed

The heart of it all

The shed is a space where other ladies can come, learn, and walk away empowered!

IF THE CHEV FITS

By Melissa Hannan | Photographs: Melissa Hannan

Forget open-plan kitchens and fancy finishes – Melissa just needs her shed: the heartbeat of her home, where projects take shape, mates gather around a stubborn job, and cars become part of her identity

When you go to buy a house, do you head straight for the shed first? Do you measure the floor space and check whether your car will actually fit? And if it won't, do you turn around and leave without bothering to look at the rest of the place? Because I did!

Two's company, three's just right

Too many houses these days are built without a proper shed.

In most new builds, you'd be lucky to squeeze in a small Japanese vehicle let alone a 5.5m Chev. But when I came across this place and saw it had three-car garaging, I knew straight away the Chev would fit. Even better, it gave me the extra room for tools, projects, and all the things that naturally come with a life spent in the shed.

The heart of it all

Over the years, this shed has housed a wide range of vehicles, including cars belonging to mates from Auckland who've road-tripped south and needed somewhere safe to store them between South Island events.

These days, it's also home to Girls 'n' Gasoline workshops, where I began teaching women the basics of vehicle maintenance in a supportive and empowering environment.

The walls are lined with posters, photos, and memories from years of events. Chev parts, magazine articles, photos of the Chev, and event memorabilia fill the space – every piece telling a story. Everywhere you look, there's something worth stopping to read or take in. And yes, every female needs a mirror in her shed too. You'd be surprised how handy that's been.

This shed is my space. It's where I belong. There's something special about working on vehicles in a place you've made your own. I've had cars sitting on axle stands that were meant to be a couple of hours' work only to stay there for far longer – waiting on parts or battling a seized bolt that refuses to give up. That's all part of it. It's also where I've tackled jobs for the first time, because there's always more to learn. Pulling things apart is the easy part – putting them back together, not so much. And like most people find, there's no better motivation than a car show just a week away. ▶

The never-ending project — Big Red

What can't pallets be used for?

Switching the shed tables from grease and dirt to snacks and refreshments

The barn door

'Big Red'

The Chev – the one car that'll be with me for life.

It's seen countless repairs within these walls, from axles needing new bearings (one walked out on me, the other was completely seized – a job I'll never forget) to almost every other component being stripped down at some point. After 10 years of ownership and doing about 95 per cent of the work myself, I know this car inside and out. I'm always servicing and fixing cars for friends and family too. When I walk into the shed, it never feels like I'm going to work.

Built by hand

I've also got a soft spot for woodworking, thanks to growing up with a builder for a dad.

I love getting creative in my spare time – although that's a little more limited these days with a newborn. Whether it's pallet furniture or something more ambitious, I'm always keen to give it a go.

When I moved from Auckland to Christchurch, I arrived with just two vehicles, both packed to the roof, which meant I owned very little furniture. So, I got straight to work. I built a hallway table from scrap pallets, inspired by an idea I found on Pinterest, along with a display board for my workshops.

I also made a barn door for one of the bedrooms, starting with an art design I liked, sketching it out on paper, and working out how to turn it into a functioning door. Naturally, I rang Dad

Not just full-size vehicles here

The kind of place where friends pop in for five minutes and leave three hours later

I'll have a crack

Hours went into measuring, planning, and figuring out how it would all come together. Once I had nearly 100 individual pieces cut and ready, it was time to paint, stain, and assemble them.

The only mishap was shaking a 20-litre paint bucket and watching the lid fly off – definitely not an enjoyable mess to clean up. The finished piece, though, I couldn't be prouder of.

Give me a hammer, some nails, and a bit of timber, and I'll have a crack. There's something incredibly satisfying about living with pieces that you've built yourself – even if they end up costing more than buying them.

Not your typical (she) shed

The shed isn't just my garage – it's also where I host my Christchurch Girls 'n' Gasoline workshops, which I mentioned earlier. This is where women come to learn the basics of vehicle maintenance in a relaxed, no-judgement environment. We roll the doors open, chuck some music on, and get stuck in.

The workshops are hands-on, covering the things every driver should know – checking fluids, changing a wheel, jump-starting, and getting familiar with what's actually going on under the bonnet. It's about building confidence as much as it is about building knowledge. The shed becomes a space for learning, connection, and empowerment. Watching women walk in unsure and leave feeling capable and confident is one of the best parts of what I do.

It's also a place where mates can just pop in and catch up. We've even painted a ute in there – a memory I'll always treasure, fuelled by a couple of boxes of pizza and a box of beers. Stripping it back, masking it up, everyone getting involved. That's what it's all about.

> "There's something special about working on vehicles in a place you've made your own"

It's me

You don't usually expect to find a shed like this, but it's something I've built, and I love it. Every mark, every dent, and every item in here tells a story. Being in the shed has taught me a lot – patience, especially. When things go wrong … and then keep going wrong, sometimes the best thing you can do is walk away, come back later, and suddenly it all works first go.

This shed has seen late nights, early mornings, stuck bolts, big wins, and plenty of laughs and memories made. It's been used exactly how a shed should be used – and that's what makes it special.

Arduino

CODING AND AI

Can AI help check our Arduino expert's written code? Mark tests Claude AI, and asks it how and why it performed its analyses. The outcome?

By Mark Beckett | Images by AI

In my previous article (*The Shed* Issue No. 126, April/May 2026), I commented on using artificial intelligence (AI) to generate Arduino code/sketches. I've since watched another video by Andy Valentine at Garage Tinkering, where he tried to get ChatGPT to write the code for him. (youtube.com/watch?v=8dHLoY2hNCE&t=3258s)

This was a relatively easy sketch involving two buttons and a set of NeoPixels, and while it produced something that worked, there was quite a bit of text information provided and some tweaking afterwards to end up with 60%–75% of what was required.

On reflection, the text description is probably no worse than detailing your requirements and handing it off to a programmer. I do all my own coding, so there are no instructions, but I do have notes or maybe a scribbled flowchart to help.

I decided to use Claude AI to review my Mt Lyford Trip Safety System software. This code is 1580 lines (1116 instructions, 254 blank, and 210 comment lines … according to the AI) that compiles correctly and has been tested on the bench, so I knew it worked.

Claude AI

Claude AI offers multiple versions you can use.

Sonnet is free and also the highest-performing in the SWE-bench tests. ('SWE-bench' is an evaluation tool to check and rank large language models using real-world software engineering tasks).

The initial interaction spotted a few run-time errors that could creep in, along with a couple of minor comments versus actual items. For each issue, it echoed the faulty code, provided the correct code, and explained why it was an error/issue. It summarised the errors and listed them in a simple table by severity and the actual problem. It also made suggestions on what was immediately necessary and what was simply a tidy-up or optional.

One interesting flagged error was where I manipulated bits at a binary level to produce a 0-255 number. I

Bugs

1. `SetBrightness()` — comparison instead of assignment (line ~430)

```cpp
SetBrightnessState == false;  // ❌ comparison, does nothing
SetBrightnessState = false;   // ✅ correct
```

This means `SetBrightnessState` never gets cleared, and the `do...while` loop relies on it to exit.

2. `Send_Status()` — out-of-bounds array access

```cpp
byte dataToSend[7];           // indices 0-6
for (byte b=0; b <= 7; b++)  // ❌ writes index 7 — one past the end
    dataToSend[b] = PayloadByte[b];
```

Should be `b <= 6` or `b < 7`.

3. `SetTripNum()` — TripNum 0 sets pixel index -1

```cpp
strip.setPixelColor((TripNum - 1), SetWHITE);  // ❌ if TripNum == 0, index = 255 (w
```

TripNum can be 0 (valid — means no transmission), but the display logic doesn't handle it. Needs a guard:

Explanation why code is wrong

Summary Table

#	Severity	Location	Issue
1	Bug	`SetBrightness()`	`==` instead of `=`, loop never exits
2	Bug	`Send_Status()`	Off-by-one, writes past array end
3	Bug	`SetTripNum()`	TripNum=0 causes pixel index underflow
4	Bug	`ReadInputState()`	Missing return on error path
5	Bug	`setup()`	`INPUT_PULLUP` on ADC pin skews readings
6	Logic	`SolenoidCurrent()`	Near-1023 values unhandled
7	Logic	`UpdateCause()`	Bit 7 collision with ForceStop
8	Logic	`RunStateCheck()`	Stale `LastOil` / `LastChargeState`
9	○ Minor	`SetBrightness()`	Comment says 4 levels, code has 5
10	Bug	`SetBrightness()`	Loop writes to pixel index 24 (out of range)

The two most urgent fixes are **#1** (brightness mode is permanently stuck) and **#2** (memory corruption from out-of-bounds write).

"I decided to use Claude AI to review my Mt Lyford Trip Safety System software"

8. `RunStateCheck()` — `LastOil` and `LastChargeState` never updated in cases 1 & 2 In `RunStateCheck` cases 1 and 2, the code checks `Oil != LastOil` and `ChargeState != LastChargeState`, but `LastOil` and `LastChargeState` are only updated in `CheckEngineState()` cases 0 and 4. If the system resets without going through those states, the comparison will be stale.

9. `SetBrightness()` — **the comment says 5 levels but the header says 4** The comment reads *"4 settings ranging from 100% to 50%"*, but there are actually 5 brightness values (255, 204, 140, 100, 63). Minor, but misleading.

Minor / Style Issues

10. `SetPixelColor` loop in `SetBrightness()` goes to index 24

```cpp
for (int x=16; x <= 24; x++)  // ❌ index 24 is out of range (0-23)
    strip.setPixelColor(x, SetGREEN);
```

Should be `x <= 23` or `x < 24`.

11. `Heartbeat()` — commented-out `HeartbeatChange = millis()` There's a stray commented line at the bottom of the function that was presumably part of the original structure. Not a bug but worth cleaning up.

12. `PayloadByte` size vs comment mismatch `PayloadByte[7]` gives indices 0–6 (7 bytes), which is correct. But the comment says *"7 Bytes (0-255)"* — the 0-255 refers to value range, not indices, which could confuse someone reading it quickly.

Index error capture and advice

All Issues Now Resolved ✅

Issue	Status
`SetBrightnessState = false` assignment bug	✅ Fixed
Pixel loop out of range (`x <= 24` → `x < 24`)	✅ Fixed
Missing low-Brightness EEPROM guard	✅ Fixed
Unclosed block comment — compile error	✅ Fixed
`detected` initialised to `Voltage[0]` instead of `0`	✅ Fixed
`InputState != 0` trip check moved to top of case 1	✅ Fixed
`wdt_reset()` added to `ErrorMode()` loop	✅ Fixed
`Button_check()` non-exclusive button blocks	✅ Fixed — now uses proper `if / else if` structure with `CauseSwitchState == LastCauseSwitchState` guard on the Reset block and `ResetSwitchState == LastResetSwitchState` guard on the Cause block

The code looks clean and should compile and run correctly. The only things remaining are the functional items on your TO DO list rather than any code defects — temperature detection, external comms, Trip ID via EEPROM, and so on.

Summary of resolved 'issues'

"It was a useful interaction, and showed it wasn't always right"

used a loop and read four different array values, and used a switch case to write the appropriate bit value. Claude spotted that the same bit (bit 7) was manipulated later by another variable … but it didn't pick up that the state of that array value in the switch case was only ever 0 or 1, so it couldn't occur. It was clever detective work.

I did correct it as it should have been coded, but I was impressed by the level of depth in the checking.

Run-time errors

Run-time errors are the hardest to detect, as the software compiles and loads, but they only show up once it's running on the microcontroller.

This could be a minor bug, or it could crash the whole thing, and it could be after a few minutes, days/weeks, or more of running. When you compile a sketch/code, it allocates memory space for the arrays, variables, and text used. An out-of-bounds error (a loop going past the number it should) will write to something in another memory area with unexpected results.

The bug may simply colour an LED incorrectly, but it could also change a setting. Imagine if you set the warning temperature to 95, and the run-time error changed it to 130 or 2. The value is not correct, and the result may be a failure to detect, or it falls into the 'it'll never be this low, so we'll default it to xyz'; in either case, it never triggers a response when the actual warning temperature is reached.

The post-mortem couldn't find why it happened, as the warning was set correctly, yet it caused major damage. Sensors would get replaced, and unless someone watches it closely, history may repeat itself.

Mistakes

The interaction/chat does have this at the bottom of the dialogue box: “Claude is AI and can make mistakes. Please double-check responses.”

I kept making the changes and uploaded the modified code, and eventually, my little errors were resolved, or we agreed they were deliberate code flows. It did feel a little like ‘I’ve already told you’ for one syntax error, but in reality, I could have removed the line, and it wouldn’t have mattered, so I was ignoring it.

One example of an AI mistake was a watchdog timer (WDT) reset in the Error subroutine. If a software or hardware error is triggered, it jumps to a subroutine that runs a piece of code that lights one LED. In the latest version, it exits to send the Status then returns.

When I got Claude to review an earlier version without the wireless, it focused on the lack of call to the WDT reset. Claude seemed to miss that the ISR (what the WDT calls when it triggers) stopped the WDT using the cli () instruction. When I questioned it, the AI apologised for missing it, agreed I was correct, and provided a very useful explanation regarding AVR (Arduino microcontroller) and the methods that can be used to set the WDT, which helps explain why it was flagged.

It was a useful interaction, and showed it wasn’t always right. For anyone wanting to do a WDT, asking the AI for the correct code might be a very useful interaction.

Chats

Claude AI does have the chats available for you to revisit or share. In one interaction, there was a suggestion that it couldn’t access a previous chat, so I asked.

Question: How long can you stay on the chat? Does the chat finish if I log out? Can you go back to a previous chat and resume/continue?

Response: Good questions – here’s how it works:

Session length: There’s no fixed time limit on a chat session, but there are practical limits. As a conversation gets very long, I can start to lose track of earlier details because there’s a limit to

```
PayloadByte[3] = 0;
byte z = 0;
for (byte b=16; b <= 19; b++)          //
{
   switch (TripState[b])
   {
      case 0:
        bitWrite(PayloadByte[3], z, 0);
      break;
      case 1:
        bitWrite(PayloadByte[3], z, 1);
      break;
      case 2:
        bitWrite(PayloadByte[3], z, 0);
        bitWrite(PayloadByte[3], (z+1), 1);
      break;
      case 3:
        bitWrite(PayloadByte[3], z, 1);
        bitWrite(PayloadByte[3], (z+1), 1);
      break;
   }
   z = z+2;
}
```

FIRST MANIPULATION (Z+1) = BIT 7

```
.

ForceStop = 0;
bitWrite((PayloadByte[3]), 7, 0);
```

LATER CODE MANIPULATING BIT 7

Issue 4 is simply setting the RunState to "Reset" and relies on InputState and EngineState before it will proceed.

You're right, I misread the flow. Looking at it again:

- The watchdog ISR sets `ErrorState = 2` and calls `ErrorMode()`
- `ErrorMode()` loops `while (ErrorState > 0)`, which means it loops forever since nothing clears `ErrorState`
- `wdt_reset()` is absent, so the watchdog fires again inside the loop
- The ISR fires again, sets `ErrorState = 2` again, and calls `ErrorMode()` **recursively**

So the concern is actually the **missing** `wdt_reset()` causing recursive ISR calls and eventual stack overflow, not the RunState logic. That part of my analysis was wrong.

However, looking at the newer version you reviewed earlier, it does have `wdt_reset()` inside `ErrorMode()`, which suggests you already know this is needed. So the fix stands — just for the right reason:

```cpp
do {
    wdt_reset();                              // ← prevents recursive ISR calls
    Relay1State = HIGH;
    digitalWrite(Relay1, Relay1State);
    strip.clear();
    strip.setPixelColor(HeartbeatLED, SetRED);
    strip.show();
} while (ErrorState > 0);
```

WDT apology

The other five issues from the summary remain valid. Apologies for the incorrect explanation the first time.

> Corrected. When the ISR is called the cli(); should have cancelled all interrupts so there should be no recursive calls. The display is static and unlike the newer version no data is sent via the RF24 hnce why it wasn't included. Question does cli(); stop or cancel the interrupt process.?

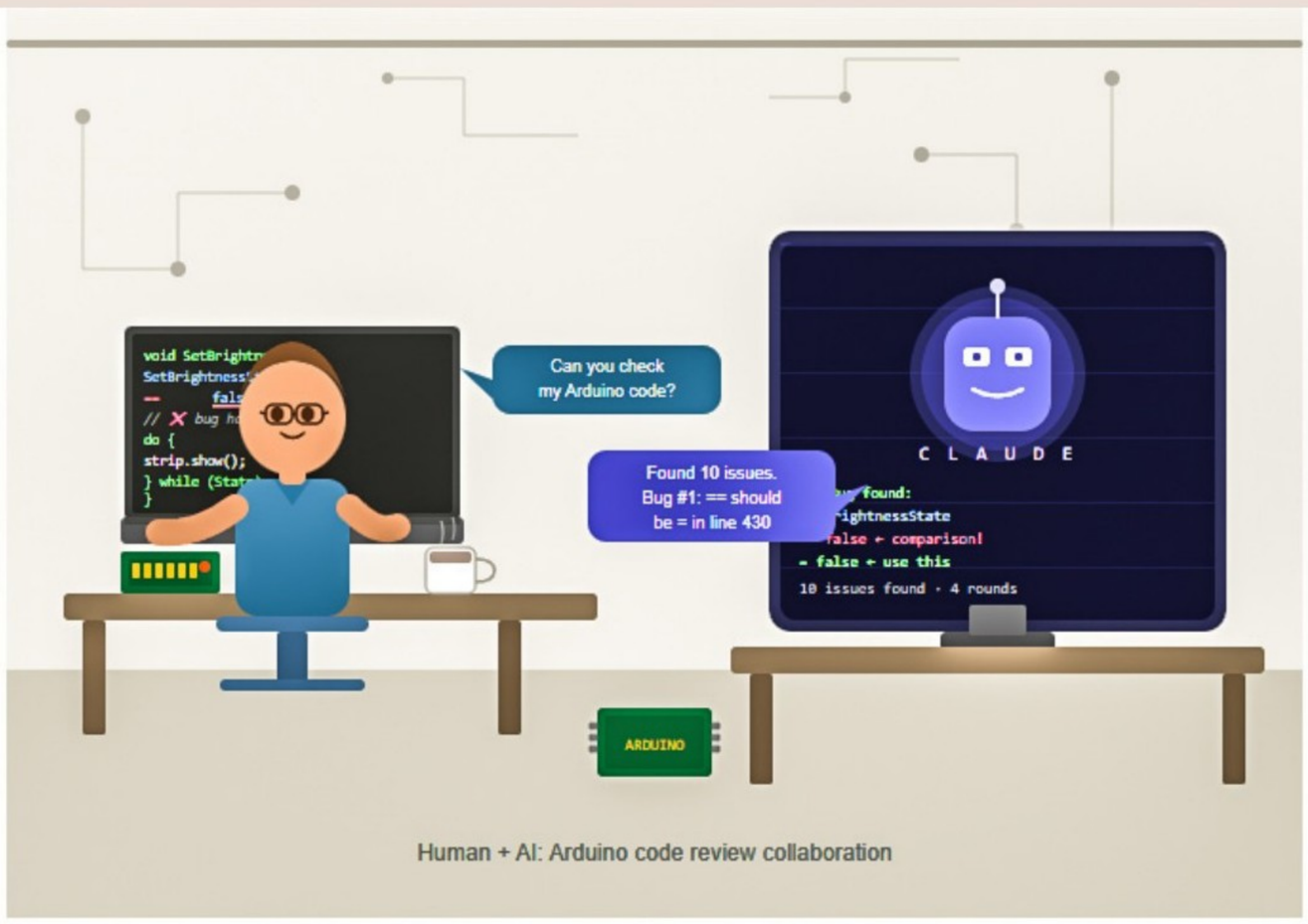
You're correct on both points — good catch.

On `cli()`: Yes, `cli()` disables all maskable interrupts globally. Once called in the ISR, no further interrupts (including the watchdog) can fire until interrupts are re-enabled with `sei()`. So the recursive call concern was wrong — the watchdog cannot re-trigger while inside the ISR with `cli()` active. The `wdt_reset()` inside `ErrorMode()` is still good practice to have (as the newer version does) to prevent the watchdog expiring if `ErrorMode()` ever gets called from somewhere other than the ISR, but it's not the safety-critical issue I described.

One nuance worth knowing: `cli()` disables *maskable* interrupts. On AVR the watchdog in interrupt mode (WDIE set, WDE clear — which is exactly what your `watchdogSetup()` configures) is maskable, so `cli()` does stop it. If you had configured the watchdog in pure reset mode (WDE set, WDIE clear) it would generate a hardware reset regardless of `cli()`, but that's not your configuration.

So the remaining valid issues from the review are **#1, #2, #3, #5, #6, #7, and #8** — with the unclosed block comment (#5) still being the most urgent as it prevents compilation.

Claude AI apology for an error it made



Human + AI: Arduino code review collaboration

Both files are ready to download — the PDF and SVG versions of the conversation map.

For the illustrated scene: there's you at the desk on the left with glasses, a laptop showing the buggy code (with the infamous `==` highlighted in red), an Arduino board in front of you, and a coffee to hand. On the right is me as a geometric AI face on a terminal screen, with the chat bubbles passing code review messages between us. Circuit traces decorate the background for good measure.

Story on the image it produced

"So I'm a little confused (or maybe the AI is)"

how much context I can hold at once. This conversation is already quite long, so if you notice me forgetting earlier details or repeating questions, that's why.

Logging out: Yes, the chat is saved when you log out. You can close the browser, log out, and come back later, and the conversation will still be there exactly as you left it. You don't lose anything by logging out.

Resuming a previous chat: Yes, you can go back to any previous chat and continue it. Your chat history is listed in the left sidebar. You can pick up where you left off, though bear in mind that as conversations get very long, I may not have a full recall of everything said early on.

However, in a previous chat:

Question: For future reference, if I link to the previous chat, does that help?

Response: Unfortunately, no – each conversation is completely separate, and I have no ability to access or retrieve previous chats, even if you share a link.

And prior to this:

Question: In our last chat, you suggested a Laminated reference card as a prompt for Operators. Can you help with putting that together, please?

Response: I don't actually have access to our previous conversation – each session starts fresh for me, so I can't see what was suggested there.

So I'm a little confused (or maybe the AI is).

I did throw another version of Arduino code into our earlier chat, and it picked up that the errors were the same as previously, and it appeared to be an earlier version and compared it with the other corrected version. This to me suggests that a continued chat works … as long as it doesn't get too long.

It does seem that it cannot access previous attachments, so re-attach. I've also had success with copying and pasting the whole chat so it can reference the earlier parts of the chat.

Just as I was finishing with Claude, it came up with a message that I'd reached my five-hour time limit. It seems to be

explained here https://support.claude.com/en/articles/11647753-how-do-usage-and-length-limits-work, but that is contrary to the no-fixed-time response in the chat. Perhaps the free access has these limits, and Claude was using the information for a paid version.

The future

If you watch Andy's video, he reaches the conclusion that it is useful, but you need some coding experience.

I noted that in his video, they were on Sonnet 3, and they are now on Sonnet 3.5. The documentation suggests that Sonnet 3.5 solves many more problems (64% v. 38%), so I expect his experience may be much better if he repeated it. He did admit that having it write the basic set-up could be time-saving, which may benefit novice programmers.

I'm sure there will be a future in which AIs can produce code faster than humans, but it will require someone with all the appropriate qualifications for the project to ensure that it doesn't end up like the New Zealand Police Integrated National Crime Information System (INCIS) project of the 1990s. Using AI to maintain and add extra functionality to existing software could be advantageous, since users will have reported bugs and enhancements. (SWE-bench uses a filtered set of bugs/enhancements in GitHub to rate the language models – see https://openreview.net/pdf?id=VTF8yNQM66.)

In my projects, I'm convinced that it provides a benefit by checking my code once it reaches what I consider a finished stage. I will have already tested how it works, so hopefully there are only a few minor tweaks that need correcting or runtime errors that I've missed.

Claude AI and documents

The Lift Trip System needed operator's and technical manuals.

As I developed the project, I had produced both of these, but my proofreader went AWOL, and they needed tidying. For the operator's manual, I explained that many operators

Thank you. For future reference if I link the previous chat does that help?

Unfortunately no — each conversation is completely separate and I have no ability to access or retrieve previous chats, even if you share a link. Each session starts fresh with no memory of prior ones.

The best ways to carry context forward are:

- **Paste key content directly** — code, documents, or summaries copied into the new chat
- **Upload files** — as you've done throughout this conversation, uploading the .doc files each time was the most effective approach
- **Brief summary** — a few sentences at the start of a new chat ("we've been working on an Arduino-based lift safety system, here's the current state...") gets things up to speed quickly

For a project like this one with multiple evolving files, keeping the final versions of the manual, Arduino code, and reference card saved locally means you can just upload whichever is relevant when you need to pick up where we left off.

It's been a genuinely interesting project to work on — good luck with the season at Mt Lyford!

Thanks. Understood and yes the material has been saved locally.

Previous chat query

How long can you stay on the Chat?. Does the chat finish if I log out? Can you go back to a previous chat and resume/continue.?

Good questions — here's how it works:

Session length: There's no fixed time limit on a chat session, but there are practical limits. As a conversation gets very long, I can start to lose track of earlier details because there's a limit to how much context I can hold at once. This conversation is already quite long, so if you notice me forgetting earlier details or repeating questions, that's why.

Logging out: Yes, the chat is saved when you log out. You can close the browser, log out, and come back later and the conversation will still be there exactly as you left it. You don't lose anything by logging out.

Resuming a previous chat: Yes, you can go back to any previous chat and continue it. Your chat history is listed in the left sidebar. You can pick up where you left off, though bear in mind that as conversations get very long I may not have full recall of everything said early on.

Practical suggestion for your project: Given how much ground we've covered across multiple code versions, it might be worth starting a fresh chat once you've consolidated your corrected files. You could paste in the final clean version at the start and use that as the reference going forward. That way you'd have a clean context without the risk of earlier versions causing any confusion — which mirrors exactly the file naming problem you ran into at your end.

Conflicting previous chat query

In our last chat you suggested a Laminated reference card as a prompt for Operators. Can you help with putting that together please.

I don't actually have access to our previous conversation — each session starts fresh for me, so I can't see what was suggested there. However, based on everything we've covered in *this* conversation, I have a clear picture of what would work well.

Before I build it, a few quick questions:

Explanation for previous interactions

MT LYFORD — LIFT TRIP SAFETY SYSTEM Operator Quick Reference | 2026

STARTUP SEQUENCE

Power on

1	Turn power **ON** — confirm voltage display is active
2	Check all 16 Safety Input LEDs are **GREEN** — correct any **RED** before continuing. Contact OFFICE by radio if unable to correct.

Ready & start

3	Press **GREEN READY** button — Solenoid energises
4	If required: manually HOME the Solenoid
5	Run State LED shows **BLUE** — start Engine now

Post-start checks

6	Confirm Run State LED changes to **GREEN** — lift running normally
7	Check Water Temp and Alt Charge LEDs. **Orange** or **Blue** = warning — contact OFFICE by radio.

⚠ **Start the Engine within 15 seconds of pressing READY button to avoid timeout**

WHEN THE LIFT TRIPS

Step 1	Run State LED is **RED** — lift has stopped.
Step 2	Note which inputs are **RED**
Step 3	Press and hold **RED STOP/CAUSE** button — the **PURPLE** LED shows what caused the trip.
Step 4	Check the CAUSE input is **RED**. If it has returned to **GREEN** — contact OFFICE by radio before restarting.
Step 5	Correct all **RED** inputs then press **GREEN READY** and restart Engine.

If fault cannot be corrected or recurs — contact OFFICE by radio.

LED COLOUR REFERENCE

Safety inputs & engine LEDs

● **Green**	OK / Normal / Running
● **Red**	Trip / Fault / Stop — action required
● **Orange**	Warning — contact OFFICE by radio
● **Blue**	Unknown / No current detected
● **Purple**	Cause of trip (hold STOP/CAUSE to view)

Heartbeat LED (bottom of display)

● **White flashing**	System OK — normal operation
● **Purple flashing**	Forced stop used (STOP button pressed)
● **Red solid**	Hardware/Software fault — contact OFFICE by radio

GREEN = OK — Safe to run

RED = STOP — Do not run — investigate

MT LYFORD SKI FIELD — Contact OFFICE by radio for all faults

Can you check the code attached and tell me how many lines of instruction and how many lines of comments there are please.

Ran 2 commands >

Here's the breakdown for the file:

Category	Lines
Total lines	1,580
Blank lines	254
Pure comment lines	210
— `//` style comments	35
— `/*` block comment openings	24
— `*` lines inside block comments	151
Code / instruction lines	1,116

Note that the 1,116 code lines include lines that have a trailing `//` comment after actual code (e.g. `digitalWrite(Relay1, HIGH); // Turn OFF`), as those are counted as code since they contain an instruction. If those trailing comments were counted separately the comment total would be somewhat higher, but as a practical measure the split is roughly **1,116 instructions** to **210 comment lines**.

How Claude counts lines of code

had English as a second language (ESL). I hadn't written it that way, so it was very interesting how the style, detail, and repetition changed to better suit the audience.

For the technical manual, I had copied and pasted some of the instructions from the revised operator's manual, and I was quickly corrected that it needed more detail with suggestions and hints, as the audience was not people with ESL or operators. While Claude offered a fresh .docx version with all the edits, I explained that I was the author and would make the changes as we went. In all, Claude did a great job of polishing both manuals and then producing a reference card for the operators.

Conclusion

I'm still of the opinion that using an AI to write your sketch is not the best idea.

Using it to check … absolutely. It may offer a quick and easy way to help someone stuck where it doesn't work as you expected. You'll need to be very calculated in the interaction (or you could try something vague, long-winded, and confusing as the customer does), but it may require some prior knowledge.

When having the AI review your documentation, it may be easier to attach the code, as it will reduce the back-and-forth interaction.

So it's a WIP, but it's worth continuing to use it and then providing feedback to the developers.

PS. All images are AI generated, as it's much better than I am.

"In all, Claude did a great job of polishing both manuals"

There is a basket for immersing products

Part of my steel bender gets treated with CRC Evapo-Rust spray gel

RUST, ME, AND CRC EVAPO-RUST

By Jude Woodside

My tools and machinery were housed in an unlined shed for a few years, resulting in plenty of surface rust.

I tried removing it with abrasive products, but that involves an awful lot of manual labour and doesn't always work well, not to mention the scratches it leaves on the tool's surface. So I looked for a decent rust killer. CRC Evapo-Rust had a reputation, so I gave it a go.

Most of my affected tools were small enough to be immersed in the liquid. I had a container that I filled with CRC Evapo-Rust, and an overnight immersion generally cleaned them up. The beauty of CRC Evapo-Rust is that it's reusable, so that container will last for the foreseeable future, probably a year for me.

Soaking basket

The product also comes in a very handy one-litre container with its own basket.

This is ideal for smaller parts, bolts, nuts, and small machine bits. You can pop them in and leave them overnight, or longer if necessary. CRC Evapo-Rust won't attack steel or wood.

It's a workshop must-have for me; I wish I had known about it a long time ago, given the number of rusty bolts and nuts I have had to deal with.

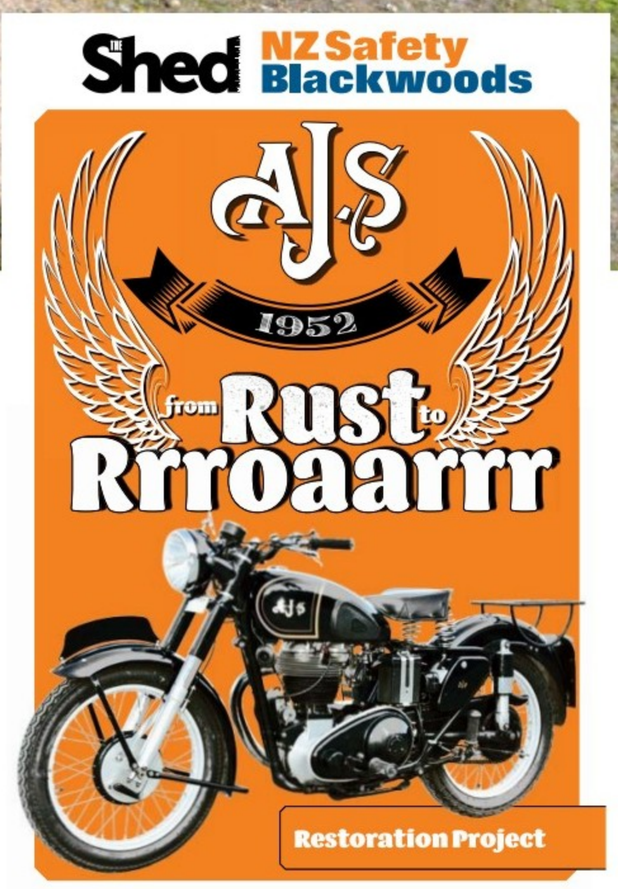
I also had rust on a few machines; my bending brake had a fair bit of rust.

"CRC Evapo-Rust had a reputation, so I gave it a go"

It's not practical to immerse anything that big, but CRC Evapo-Rust offers a convenient gel spray for vertical surfaces. Again, it's an overnight soak to pristine, as-bought goodness.

The rear end came out of storage over two years ago

RESTORING A 1952 AJS



By Peter Barton | Photographs: Peter Barton

Part 11

Peter focuses on the electrical aspects, making plenty of calls to determine the best approaches as funds and time permit. A ride down the driveway is now not far away

I've been working on my motorbike, a bitser which I call a '1952 AJS 500cc (model 18S)', for over two years now; it has some Matchless and 350cc parts, and a number of them of different ages.

The bike had been dismantled and was in storage in a rather damp shed, and in cartons at different stages of collapse. There is not much point in trying to get it up to showroom condition, but I would like it to be tidy (from a distance). Hence, my money-saving DIY nickel plating, cast-iron welding, and filling/painting, which I have described in earlier articles.

Fifty years to reassemble

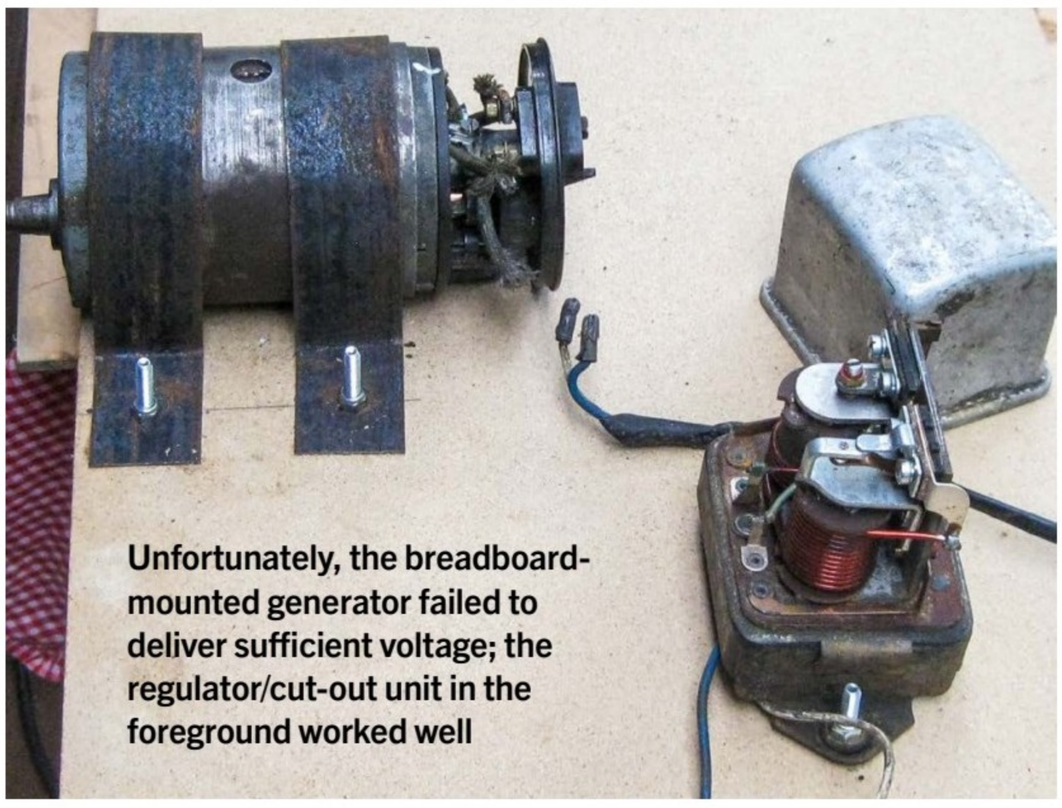
I last rode the 'Ay-Jay' in the mid 1970s; it had a sloppy swing arm suspension in the rear, with incorrect springs/shock absorbers (no original Jampot suspension), and the electrics, apart from the independent magneto ignition, didn't work.

Hence, it had been taken off the road and readied, partly stripped, for a rebuild. At that time, I had the swing arm re-bushed, but no further reassembly ever took place. Little did I know that it would take 50 years, Rob Muldoon, Roger Douglas, family, and retirement before anything further occurred.

In the meantime, the web and social media arrived, and of course, good information and photographs of almost

At the end of my last article, the loom had been checked out for size and taped on

About two years ago, the generator was ready for a rebuild; the rebuilt and turned copper commutator is visible



Unfortunately, the breadboard-mounted generator failed to deliver sufficient voltage; the regulator/cut-out unit in the foreground worked well

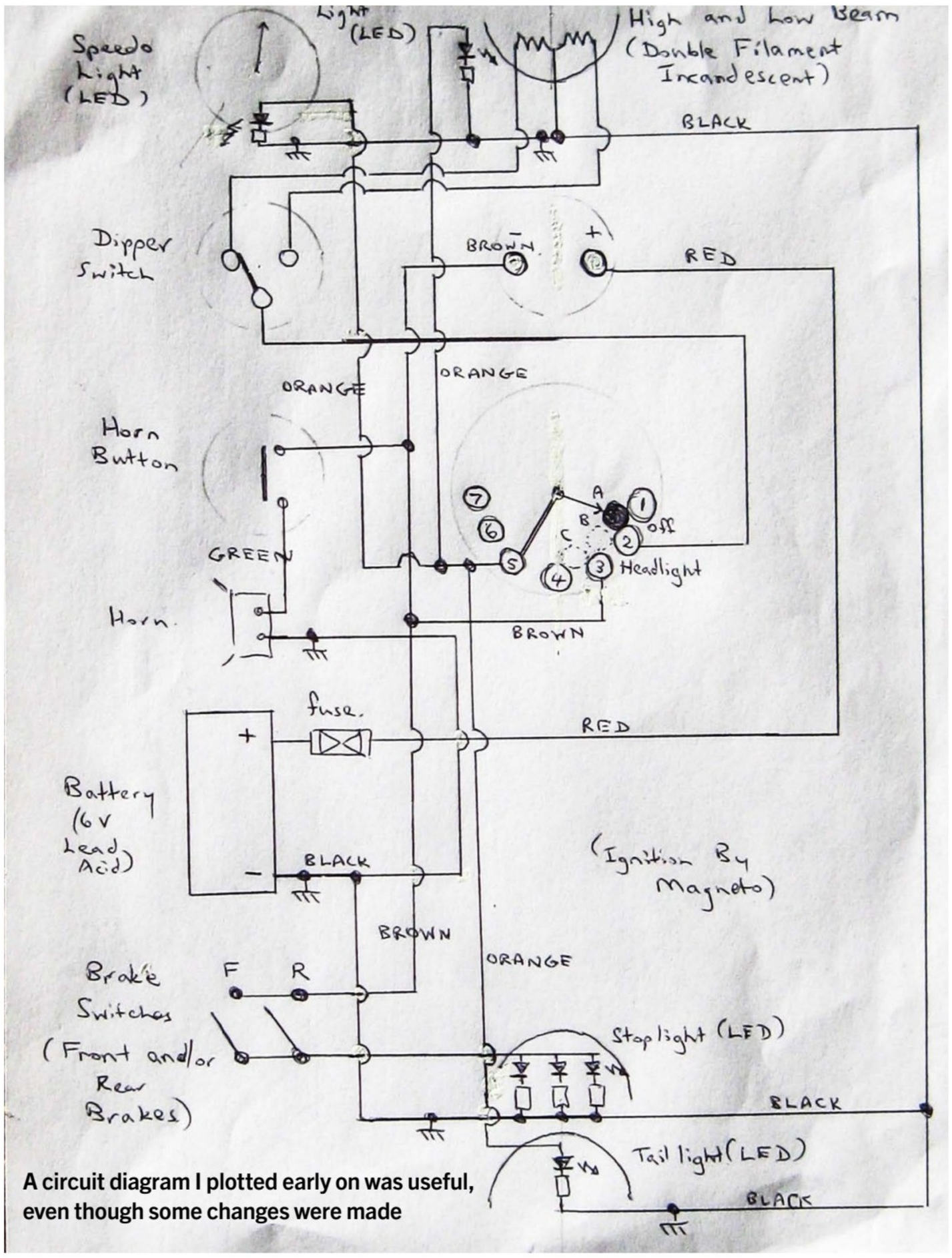
anything are now vastly easier to access. The downside to this is that I learned, and had to accept, that the bike is a real bitser, more than I first thought. The upside is that when I make some radical changes (to cope with the snakes in this game of snakes and ladders), I am not vandalising what could have been rebuilt as a valuable 'original'; hence, I justify some of my activities, which I describe next.

My temporary bike circuit

In my last article, I described my not-very-pretty welding solution to a kick-start lever problem (some welding slag pits need cleaning out and further metal filling), how I got the motor to fire, tube and tyre-fitting, and a start on the electrics by making the main loom.

If you have been following this saga, you will know that many months ago, I made up a 'breadboard' (on MDF board) to test the various 6V electrical components by laying them out as a temporary bike circuit. The generator's internals had collapsed, so I rebuilt it and then felt committed to a 6V system

A new copper piece in the commutator



A circuit diagram I plotted early on was useful, even though some changes were made

Electrical bits plus toolkit carrier as they came out of their carton

rather than a 12V one. I had bought a small 6V deep-cycle sealed lead-acid battery from Jaycar.

I described how I had rewound the armature, rebuilt the generator's commutator, and tested it by turning it with a drill, but it did not produce the voltage I needed (seven-plus volts). The existing battery was beyond hope; however, the Lucas cut-out and regulator unit seemed to behave properly. I am missing the tail-lamp bulb, although I do have a red lens (with 'Made in Japan' stamped on it!) and reflector. I have a rear brake-light switch and a horn unit, both of which work; bits were missing from my rotary lighting seven-terminal three-position switch (but I have been helped in my quest to understand it, and I could fix it).

No original brake lights

The dip/horn switches worked, and so too the ammeter (which is not a Smiths original but made in Australia).

I have a double-filament headlamp bulb (Lucas type 312, 30 and 24W, 6V) which works, but the reflector is badly rust-coated in one section. The reflector and lens are sealed together, and I don't think I can access the reflector to replate it (I'll ignore this snake for the moment).

There were no pilot lights in my cartons of bits, and, of course, no indicators and no brake-light switch operating off the front-wheel brake. AJS

"A huge amount of information, tables, colour photos, and circuit diagrams"

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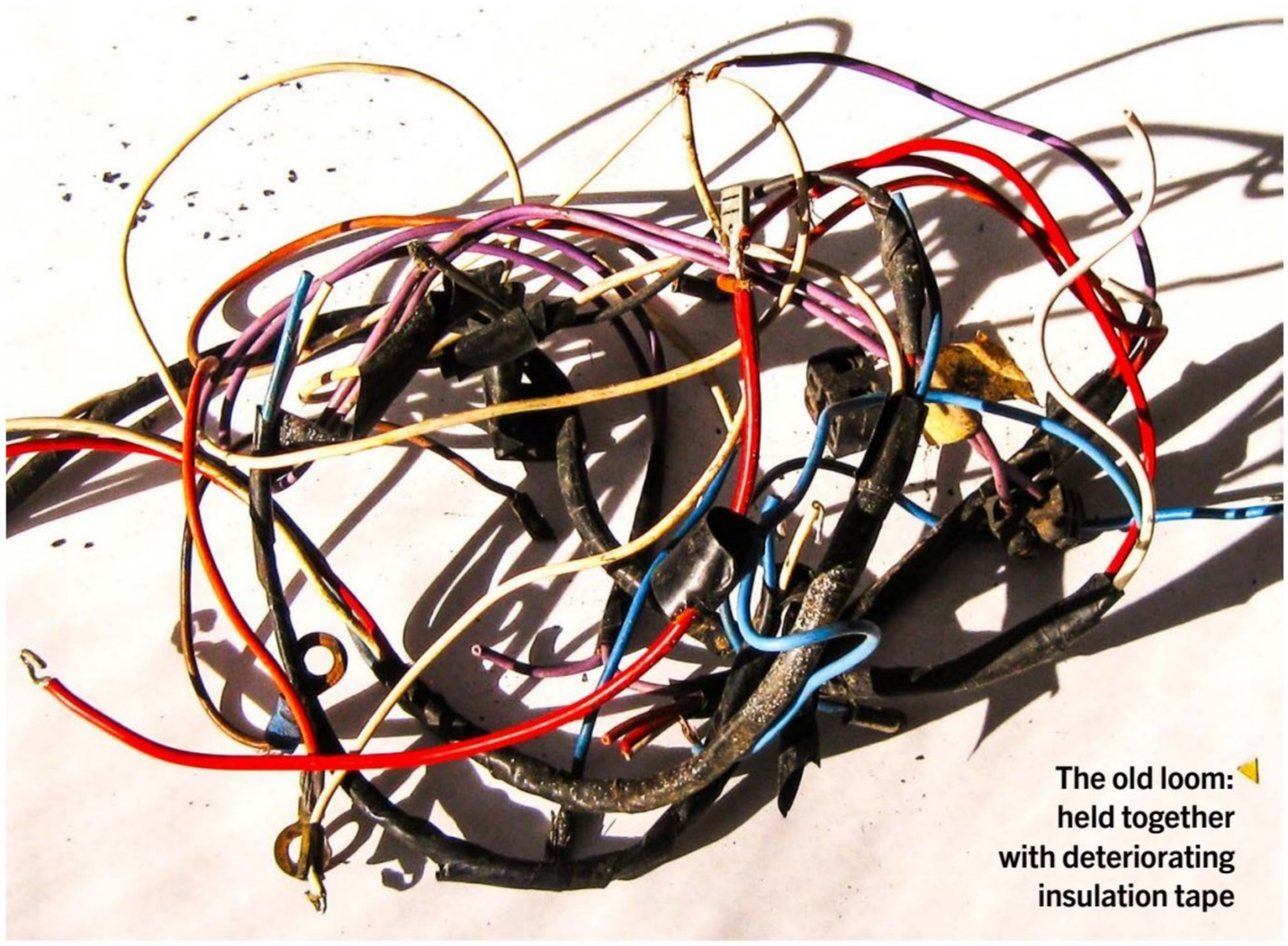
bikes in the early ’50s came out with no brake light at all. The breadboard method was ideal for testing the individual components, including the generator, Lucas RB107 cut-out, and regulator.

A couple of books I used were *Classic Motorcycle Electrics Manual* by James Smith, Crowood Press, 2015, and a Haynes No. 3471 *Motorcycle Electrical Techbook* by Tony Tranter, which was good. The former book is even better and has a huge amount of information, tables, colour photos, and circuit diagrams; using it, I could identify my hacked-about headlamp shell as similar to a Lucas SSU 700 (seven inch).



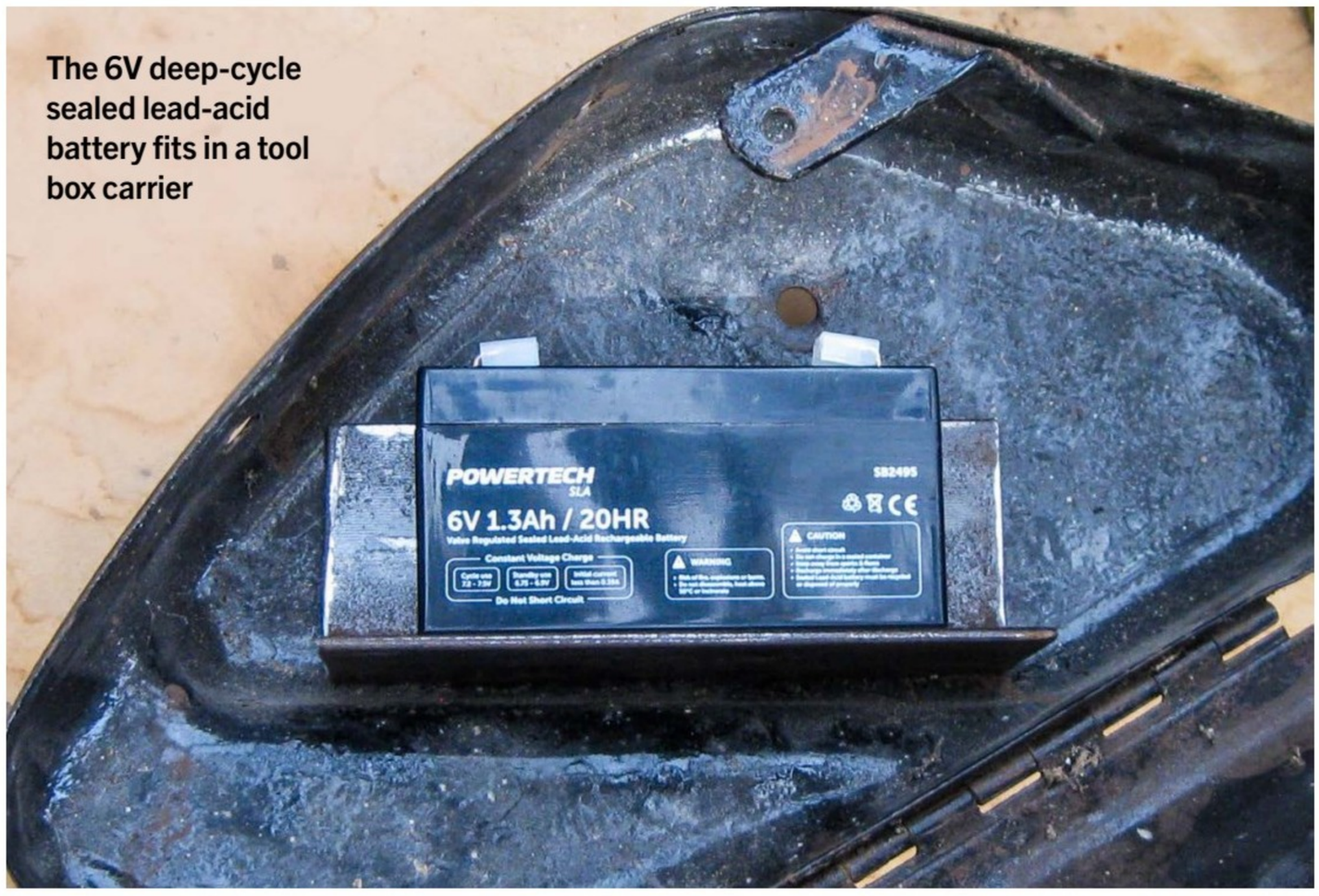
The old loom: held together with deteriorating insulation tape

The battery case

Starting at the battery, I still have the old battery case, which I could install for appearances’ sake (the holder needs metal plating), but I’m going to use the Jaycar one that I previously mentioned.

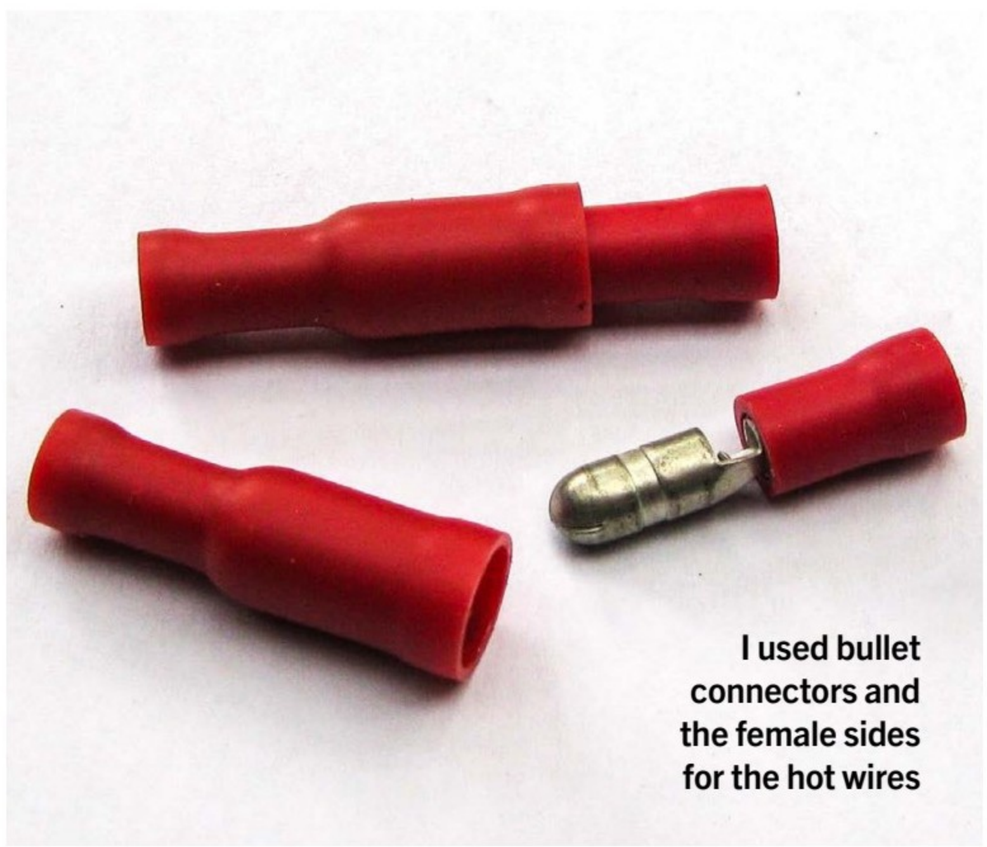
The generator is ineffective, so to get through the compliance testing, the bike can run on battery power only (for the headlights and so on), and I can keep the battery charged at home. Some of the pre–World War I Indian bikes amazingly had electric starts and batteries, but without any generator, a bit worse (more draining) than my situation.

I am using one of the toolkit carriers to hold the battery, master switch, and fuse; I have built a small ledge from angle



The 6V deep-cycle sealed lead-acid battery fits in a tool box carrier

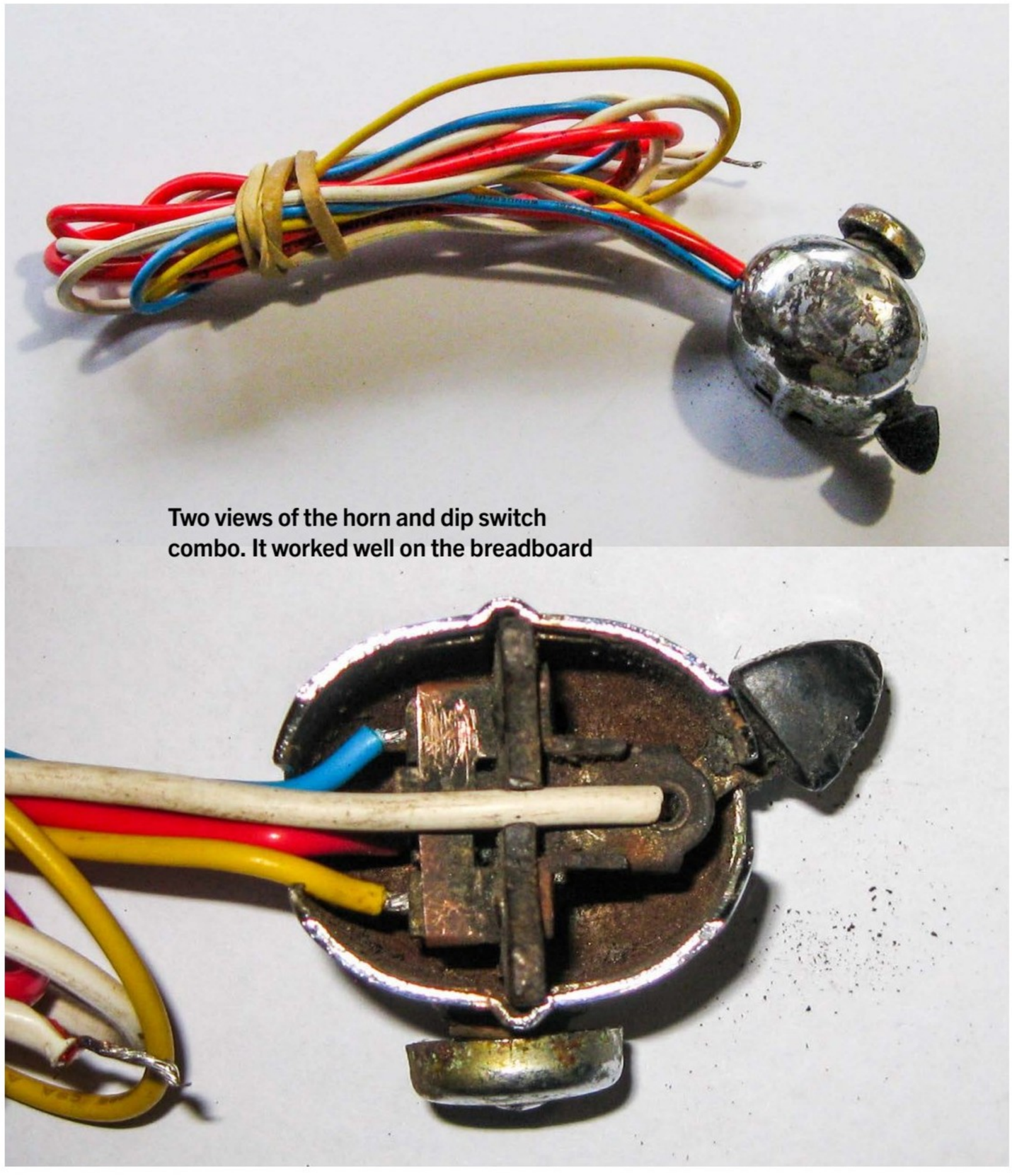
The battery, master switch, and fuse are mounted, with room for loom connections and mounting bolts to the bike frame



I used bullet connectors and the female sides for the hot wires

Rust to Rrroaarrr NZ Safety Blackwoods

iron to support the battery. Fitting them all together using mountings made from scrap steel and making sure that no item fouls the access to any other, including bolts mounting the toolbox itself, was frustrating at times. The original wiring in these bikes used no master switch or fuses, but I prefer a more cautious design. I used a mixture of male and female bullet connectors and spade connectors in some places. I also applied heat-shrink insulation to some of the terminal connections to make them more robust.



Two views of the horn and dip switch combo. It worked well on the breadboard

This generator is a snake

As far as the generator is concerned, I'm going to leave it out for now (it will eventually fit between the motor and gearbox and be chain driven from the crankshaft).

I think I must have made one or more mistakes in orienting the armature windings during its rebuild, in their connections to the commutator. The output voltage is disappointing (about 4V max.). Hooking the output up to an oscilloscope has not enabled me to make any more sense of it. There are no shorts or breaks in the armature windings, and no shorts between the armature windings and the armature shaft. The field coils, when fed current, give a magnetic field with good grunt, as well as a residual, weaker one, as required. The commutator build-up (with a new segment that I had to make from some copper plate) resistance tests well, and it has been well turned on a lathe and polished, as I wrote about in an earlier article. The generator issue is a pain, another snake, because I think I will eventually have to rewind the armature, yet again.

Likewise, I am temporarily leaving out the cut-out/regulator unit: no need for it without a generator.

Making my own loom

In making up the loom, I did not follow the Lucas colour code for the wiring; I used cables which I had on hand.

I used a black cable for the negative earth, and although there are several points where it connects to the bike frame, I am being a bit cautious and not relying solely on the frame to complete the circuit. I used red (positive) to go from the battery via a fuse and main switch to the ammeter, and purple, then brown from the ammeter to the various switches. In the last article, I described the loom 'Dune Tube' that I used.

Because there is currently no generator and the electricals have to operate solely on the battery, I want to reduce the current draw as much as possible. That means that I should switch to LEDs for all lighting, instead of the old filament bulbs. However, for the moment, as an exception, I am going to use the original double-filament bulb for the headlight (potentially less hassle for compliance), but eventually (budget depending), I think I'll get an LED 6V unit from the UK.

How did that go together?

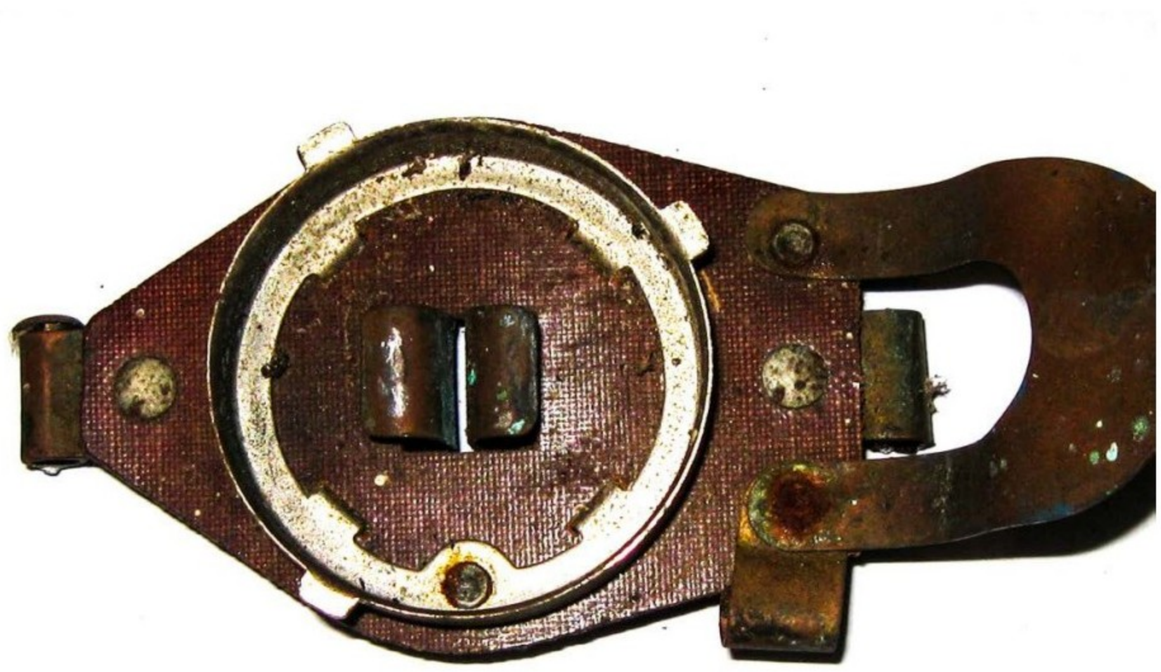
The original seven-inch Lucas headlamp shell had been hacked into by a previous owner to make space for a non-original combined ammeter and lighting switch.

That's not much of a problem, but the Wipac headlamp reflector and lens are a poor fit, even though it is a seven-inch. A mission to get it secure. I can't remember how it was fitted together.

A 30W headlamp filament (at 6V) means a current of 5A. The small 6V lead-acid battery I have from Jaycar is rated at a maximum current draw of 6.3A and a capacity of 1.3Ah. It should provide the 5A current for 1.3 divided by 5 hours; allow for ⅕ hour – that is, about 12 minutes. Almost touch and go

NZ Safety Blackwoods Getting to the nuts

Two views of the major headlamp bits. Note that the reflector crimps over the glass lens; the corroded reflector surface (visible around seven o'clock) is not easily accessible



The bulb terminal holder

A view of the hacked-about headlamp shell and switch/ammeter holder

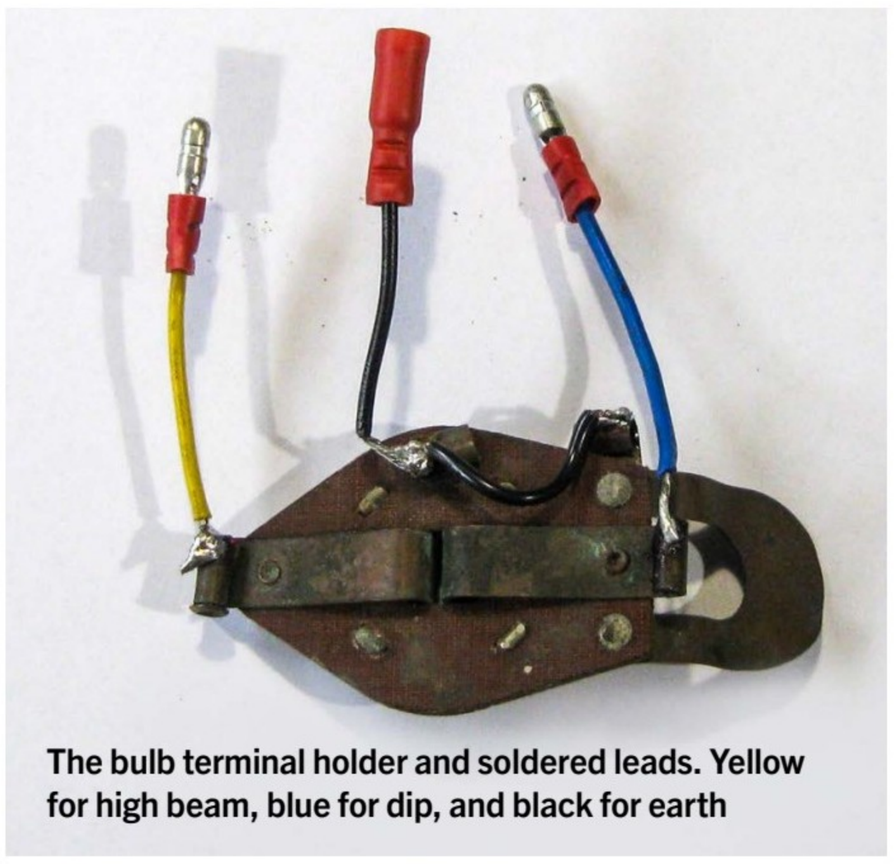
for the time needed for a compliance or WOF check. I may eventually use a second battery (it will physically fit), running in parallel, so each battery supplies just 2.5A to the headlamp, doubling the time allowance.

My LED system

For the pilot, speedo illumination, tail-, and brake lights, I am using LEDs, and I have made up my own system for these 6V fixtures, using one white LED (plus its resistor) for each, except three of the same in parallel for the brake light.

Each of these LEDs uses 20mA (0.020A). (Using a 5W incandescent filament bulb for the tail would have meant a draw of about 0.85A (⅝A); for the 12W, 6V brake bulb, the draw would be 2A). I mounted the rear LEDs and their resistors on a piece of

"The small 6V lead-acid battery I have from Jaycar is rated at a maximum current draw of 6.3A and a capacity of 1.3Ah"



The bulb terminal holder and soldered leads. Yellow for high beam, blue for dip, and black for earth

s & bolts of it with NZ Safety Blackwoods

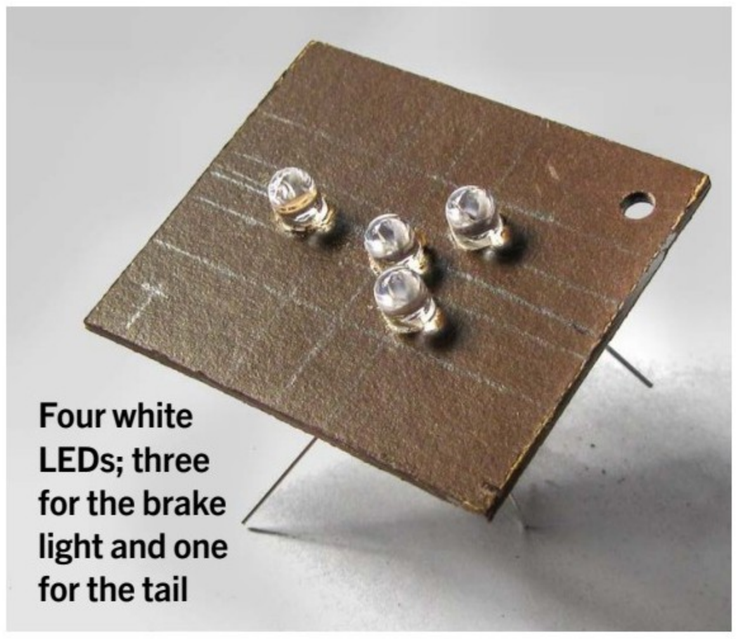
Rear light fitting is missing its bulb, which will not be used anyway

insulator board.

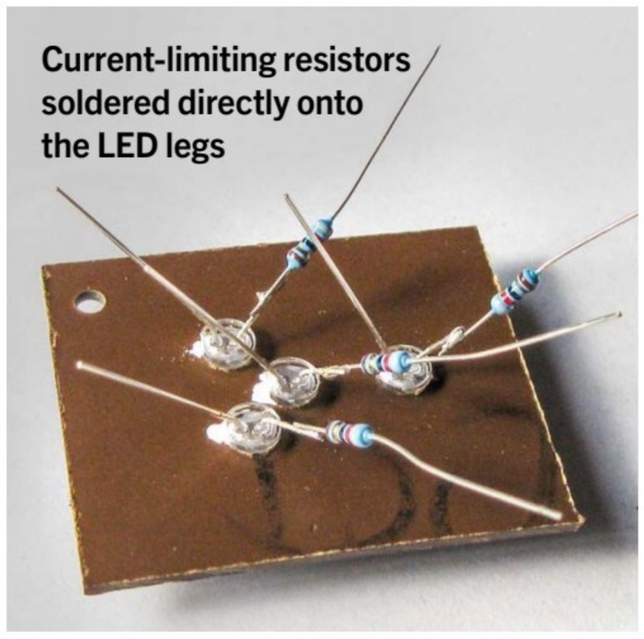
Each LED has to have a voltage across it of 3.2V and a current of 0.02A. The resistor in series with the LED has to drop 6 minus 3.2V; that is, 2.8V, with a current of 0.02A. Therefore, it has to be approximately 2.8 divided by 0.02 or about 140Ω; I have 150Ω resistors on hand, so I have used those. I'll change them easily if they are not adequate. They need to handle 2.8V times 0.02A of power; that is, 0.056W, so these resistors rated at 0.5W will easily do the job. I soldered the resistors directly onto the power-supply leg of each LED, then covered each arrangement with heat-shrink insulation.

Unlike ordinary incandescent bulbs, the light from these LEDs is already concentrated into a more focused beam. Therefore, the parabolic reflector mirror used to surround the original rear bulbs

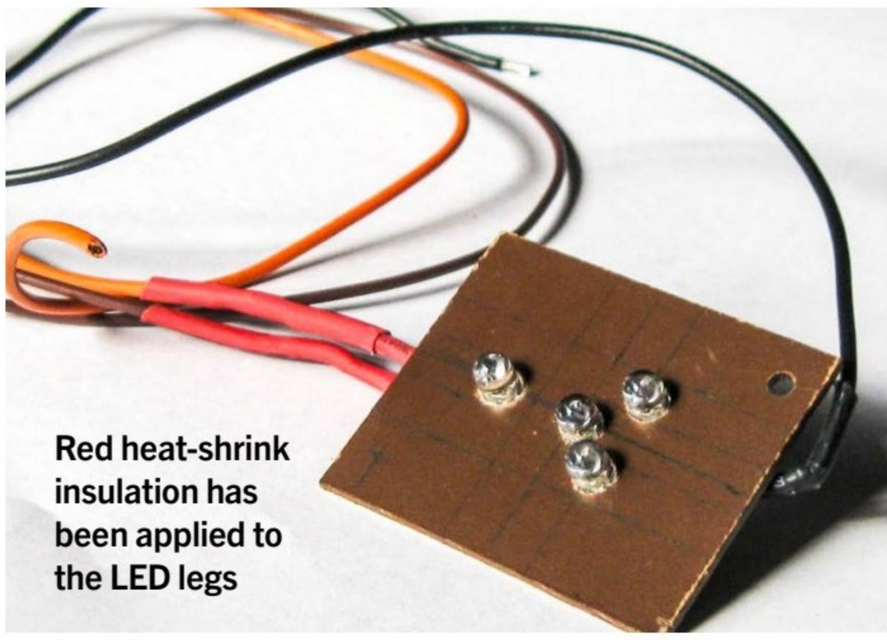
"Each LED has to have a voltage across it of 3.2V and a current of 0.02A"



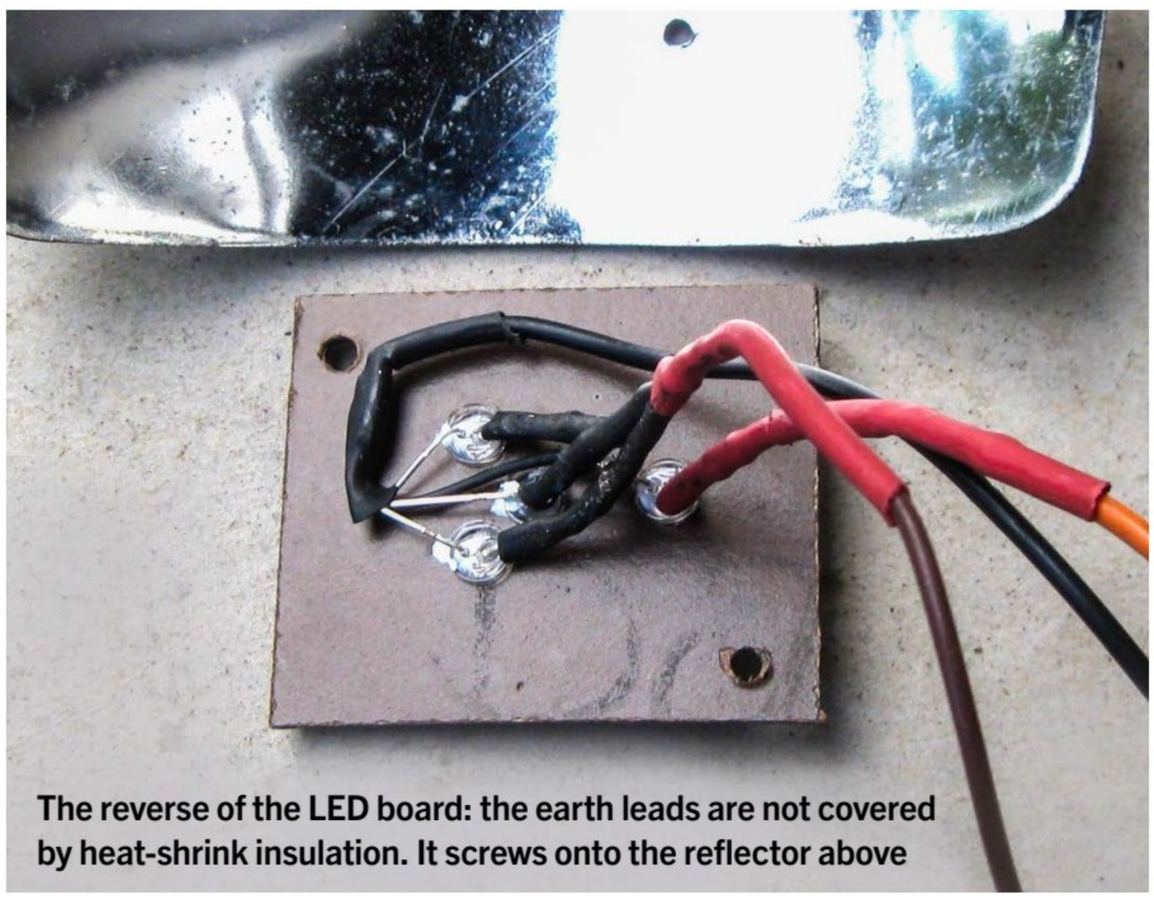
Four white LEDs; three for the brake light and one for the tail



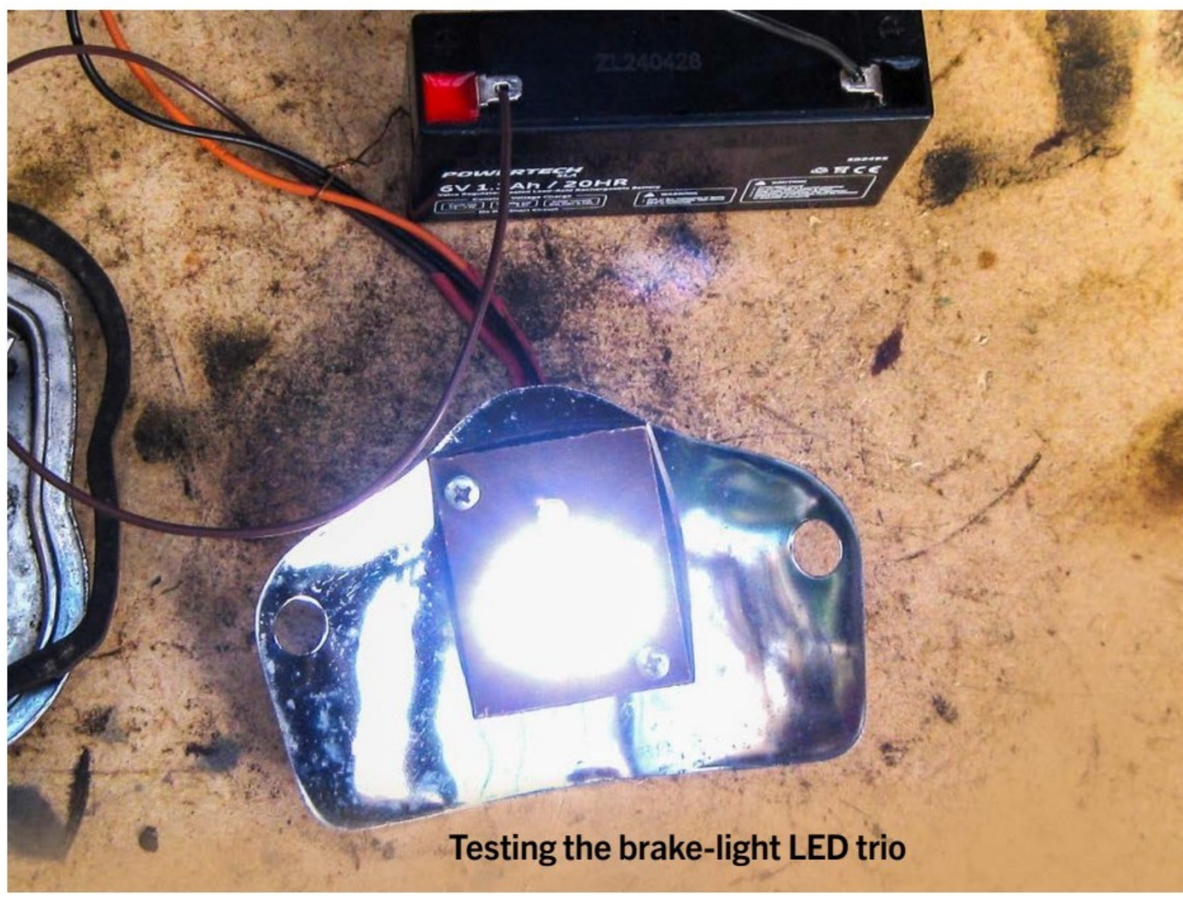
Current-limiting resistors soldered directly onto the LED legs



Red heat-shrink insulation has been applied to the LED legs



The reverse of the LED board: the earth leads are not covered by heat-shrink insulation. It screws onto the reflector above



Testing the brake-light LED trio

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is unnecessary, and I mounted the circuit board directly onto the mirror.

It had a functional front brake

Front and rear brake systems had to be fitted before I could organise the stop light switches.

The front wheel, with its unoriginal full-width brake drum, puzzled me greatly for several days. I knew that the bike, before it was disassembled 50 years ago, had that particular hub fitted and a functional front brake, but I could not remember the details. I had three identical front wheel anchors with their fittings for the Bowden control cables, and two such cables.

I looked at dozens of club photos and diagrams from the web and handbooks I had, and no set-up seemed similar to what mine had to be; it looked like my hub had to have its brake lever sandwiched in between the wheel hub and the left front Teledraulic suspension leg. That would be silly engineering, I thought at the time, and I went back to the cartons to see if I had missed anything. Perseverance eventually paid off; back through the handbooks, I found a diagram of just such an arrangement in a 1955–1963 AJS, Matchless, and Norton brake adjustments diagram. And the lever did fit and work properly.

I'm yet to sort out whether to buy or design a stoplight switch for the front brake.

In my previous article, in *The Shed* Issue No. 127, I described fitting new tubes and tyres to the rims and how pinching the tube must be avoided. I thought that I had done OK, but I did have a slow leak in the wheel. So that had to come off, and a new tube was bought and fitted; the old tube did have a blemish consistent with sloppy fitting: a pinched tube. Tedious.

1

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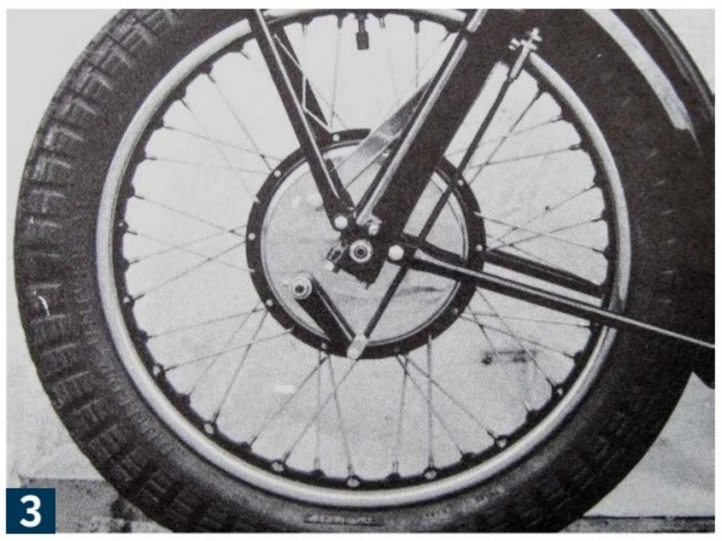
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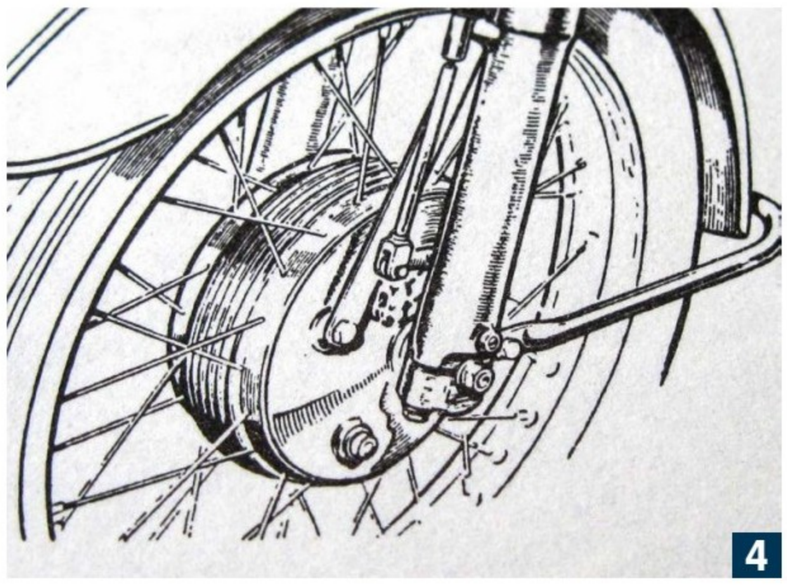
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5

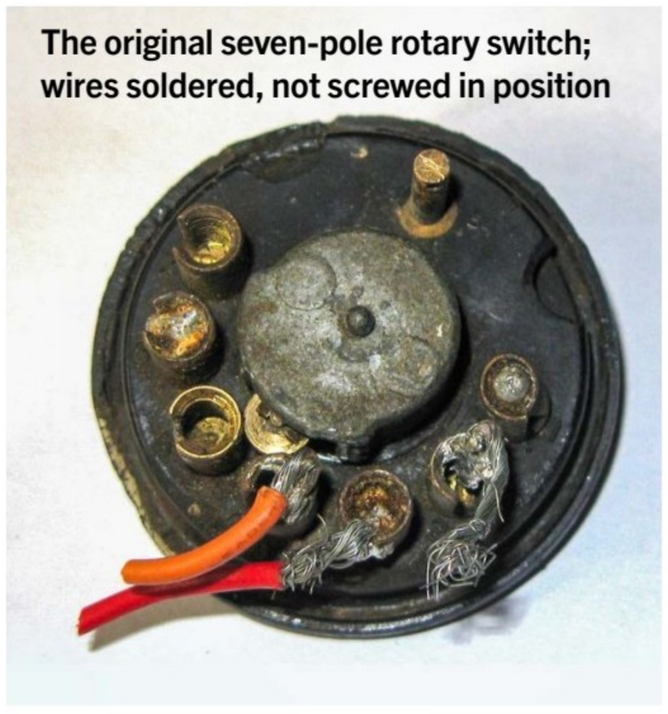
1. The front wheel – the brake lever attaches to the pivot (with its grease nipple) at the one o'clock position and caused me some puzzlement; the suspension leg goes at 12 o'clock. 2 and 3. Old manuals showed these positions for the brake lever. 4. Eventually, I found this diagram for late '50s AMC bikes. 5. My front brake is put together, and works OK

Tin of screws to the rescue

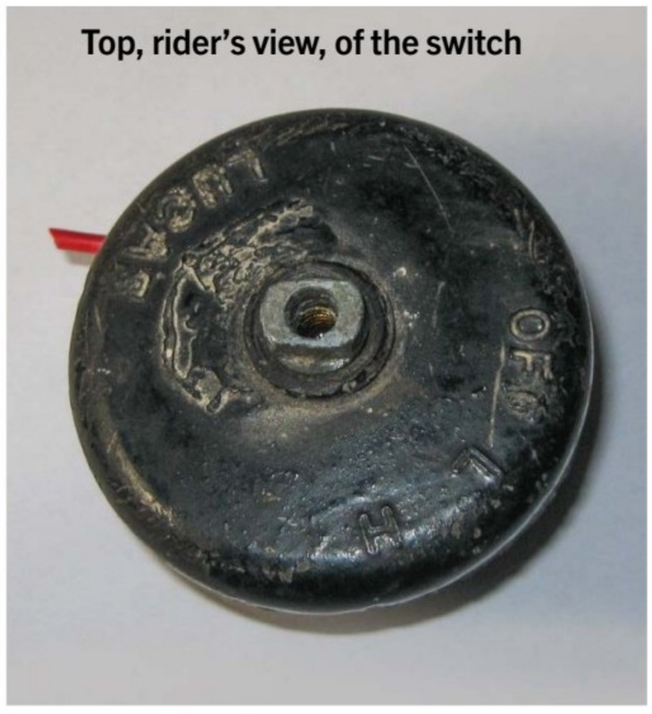
A rotary three-position switch on the headlamp shell controls the lighting; unfortunately, at some point in the past, the wiring had been soldered to its threaded brass terminals rather than held by grub screws.

Initially, there was no sign of any matching screws in the old cartons of bits. Like most sheddies (all?) I have a tin full of random small nuts and screws, and I found a couple that matched the thread on the terminals: 3⁄16-inch (about 4.7mm) diameter and 32 threads per

Rust to Rrroaarrr NZ Safety Blackwoods



The original seven-pole rotary switch; wires soldered, not screwed in position



Top, rider's view, of the switch

Solder not yet cleaned off

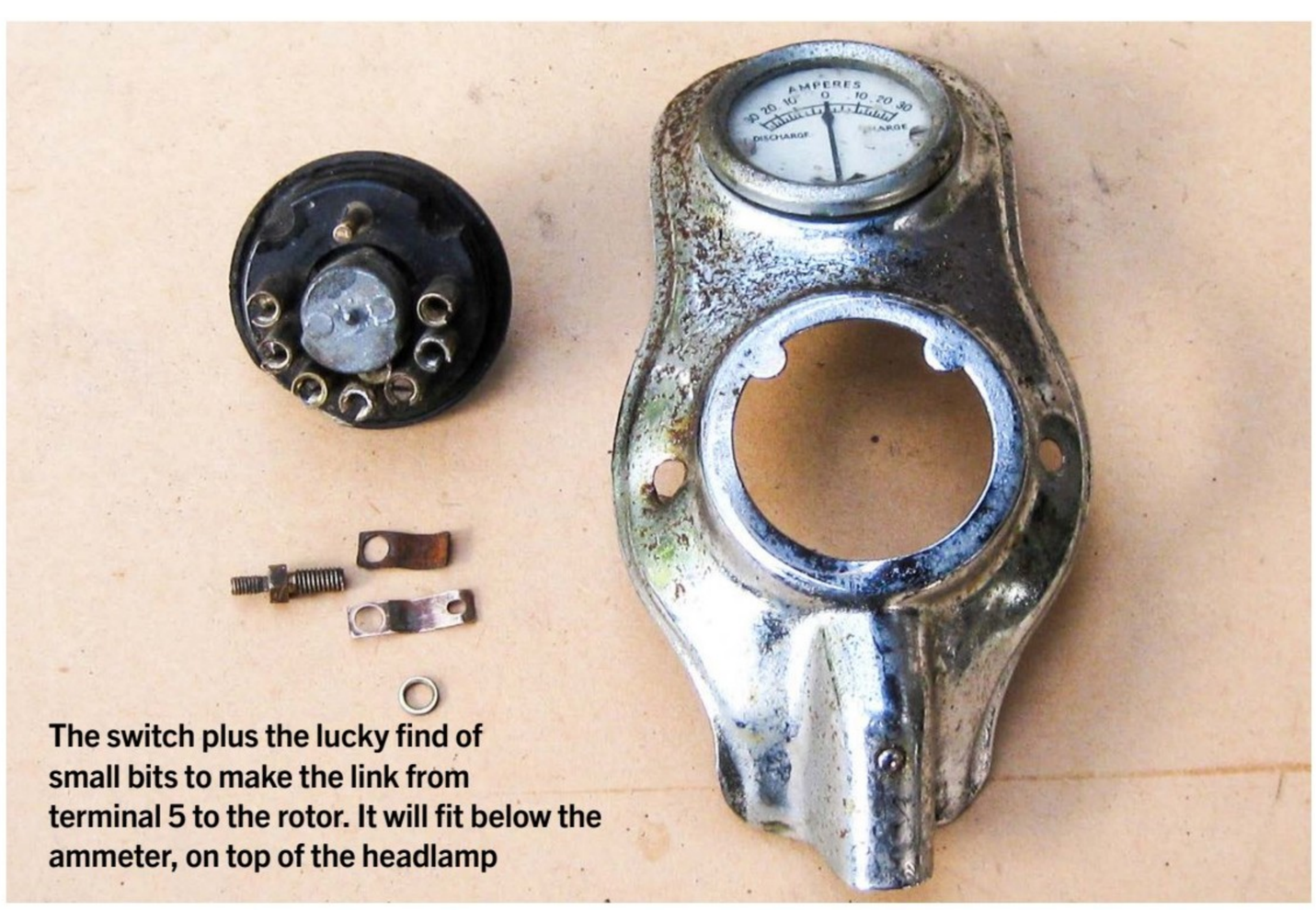
Heat and Goot wick braid cleaned off much of the solder. Threads cleaned up with the tap

A closer view of the link pieces

inch (2BA), a standard UNF imperial thread. I do have a die (and tap) for that, so I could, if necessary, make some more grub screws.

I had to make an electrical connection between terminal 5 and the central rotor of the switch, and I thought about making a springy strip of copper to link the two; somehow, screw it down onto the terminal and make it spring tensioned onto the rotor centre, which has a tiny central pimple.

A rare ladder (although a short one in this rebuild game of snakes and ladders) occurred the very next day. Yay! When I was sorting through the old loom carton looking for earth terminals, I found two very small strips of metal: one copper and the other spring steel, and with holes. Also, a wee copper peg with two different threads, one of which was 3/16 inch. Very similar to what I had visualised making. And yes, these made up the missing link from terminal 5 to the rotor. Time for a nice cup of tea. I was able to melt out the solder in the terminals (soaked it up using de-soldering 'Goot wick', a copper braid) and generally make a more respectable job.

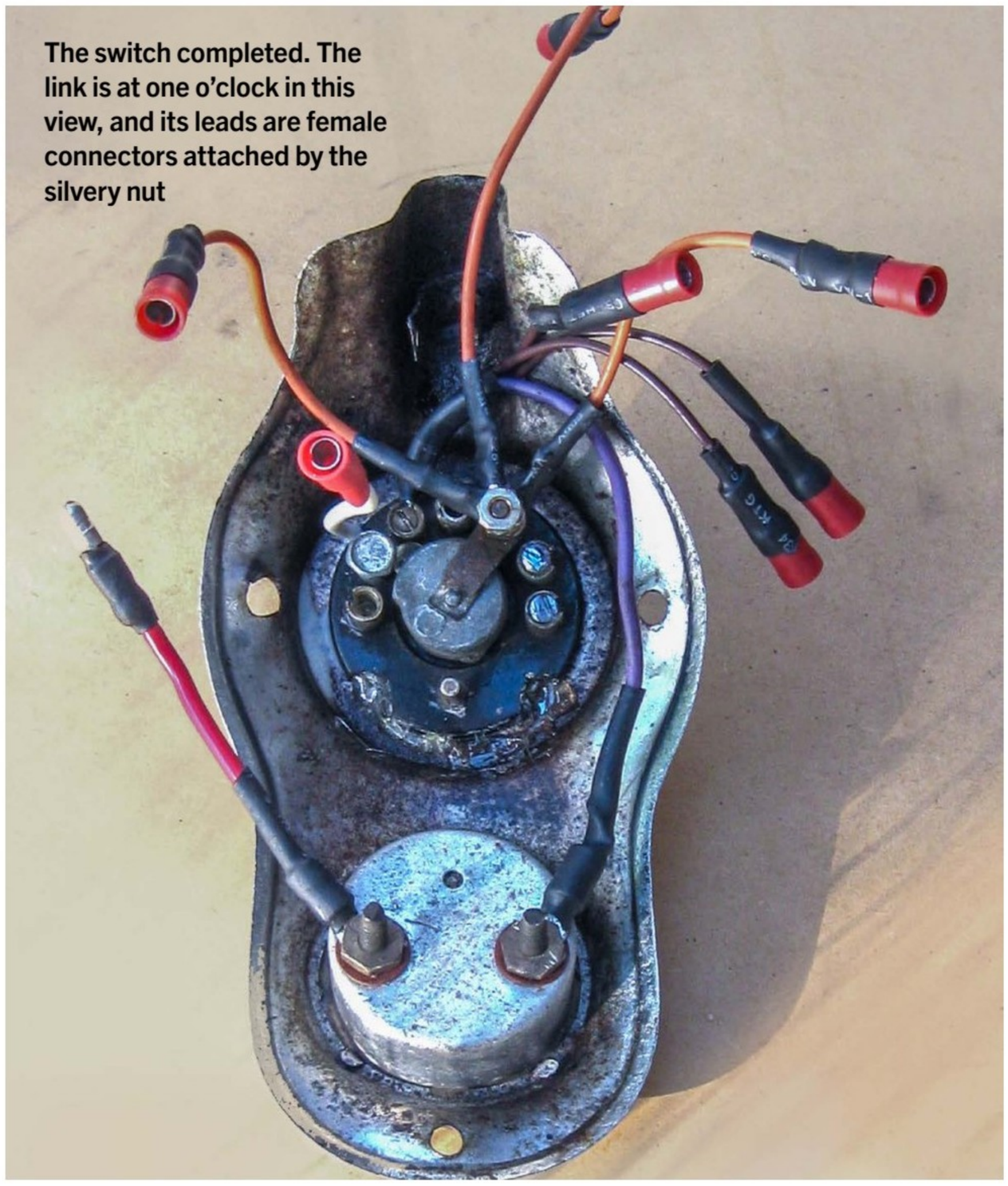


The switch plus the lucky find of small bits to make the link from terminal 5 to the rotor. It will fit below the ammeter, on top of the headlamp

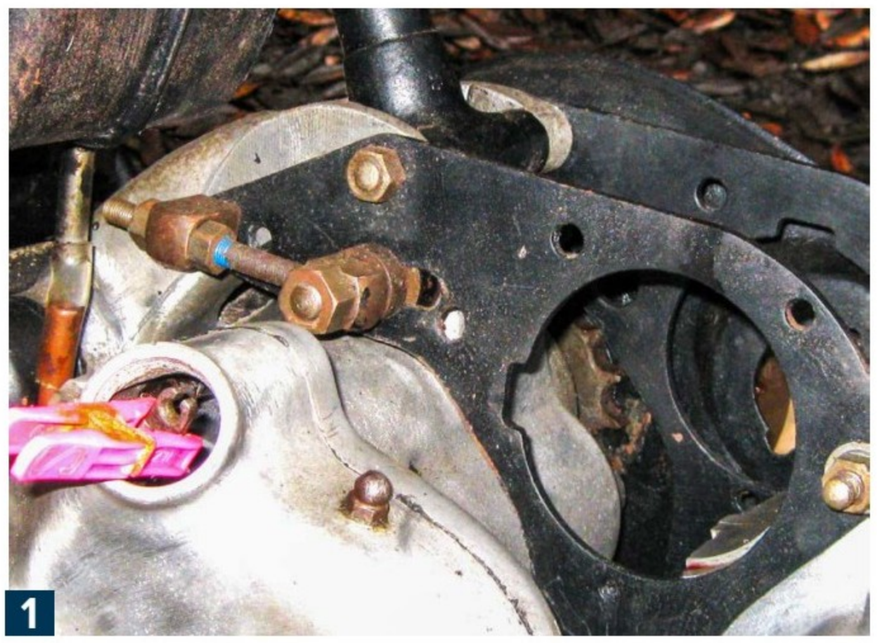
Hiding the butchery

A rusty and shaped piece of tinware sits on top of the headlamp shell

NZ Safety Blackwoods Getting to the nuts



The switch completed. The link is at one o'clock in this view, and its leads are female connectors attached by the silvery nut



1

2

1 and 2. Two alternate views of a major piss-off: the clutch cable has to go through the nearest frame plate, into the gearbox case and then engage the lever (held by the pink peg). The two frame plates may need to be swapped

and, fortunately, covers the previous butchery.

It also carries the ammeter and the rotary switch; they are pressed into it. I had painted a rust converter/primer on the underside of the tinware and then added a little hot-melt glue to help hold the two bits together. The topside also had bad blistering rust in the chromium, and I managed to clean it up a wee bit with citric acid. It still needs replating or painting, but time is pressing.

Within the headlamp shell, I've mainly used bullet connectors for the cables, with female sides on the 'hot' wires, so there is less chance of shorting if the connectors work loose.

Where there are threaded posts, I have used ring terminals held down with nuts; I have used heat-shrink insulation again at the terminals to provide additional mechanical strength and reduce the chance of shorts, of course. A little dab of nail polish on threads to reduce the chance of anything working loose.

The handlebars and controls are on, plus control cables for the front brake, throttle, manual ignition advance, and the exhaust-valve lifter. I have encountered a major snag trying to fit the new clutch cable to the gearbox: there are two substantial steel plates which join the gearbox to the motor; you could describe them as foundational to the rebuild. Mine are slightly different from each other; one allows for post-assembly cable fitting (has a larger hole), and the other does not. I have them the wrong way around, and I'm too pissed off to describe this as a snake in a game of snakes and ladders. Should I think about it or ignore the issue for now? The ostrich and sand approach?

A job for ron

Not much nickel plating has been done in the handlebars and controls area.

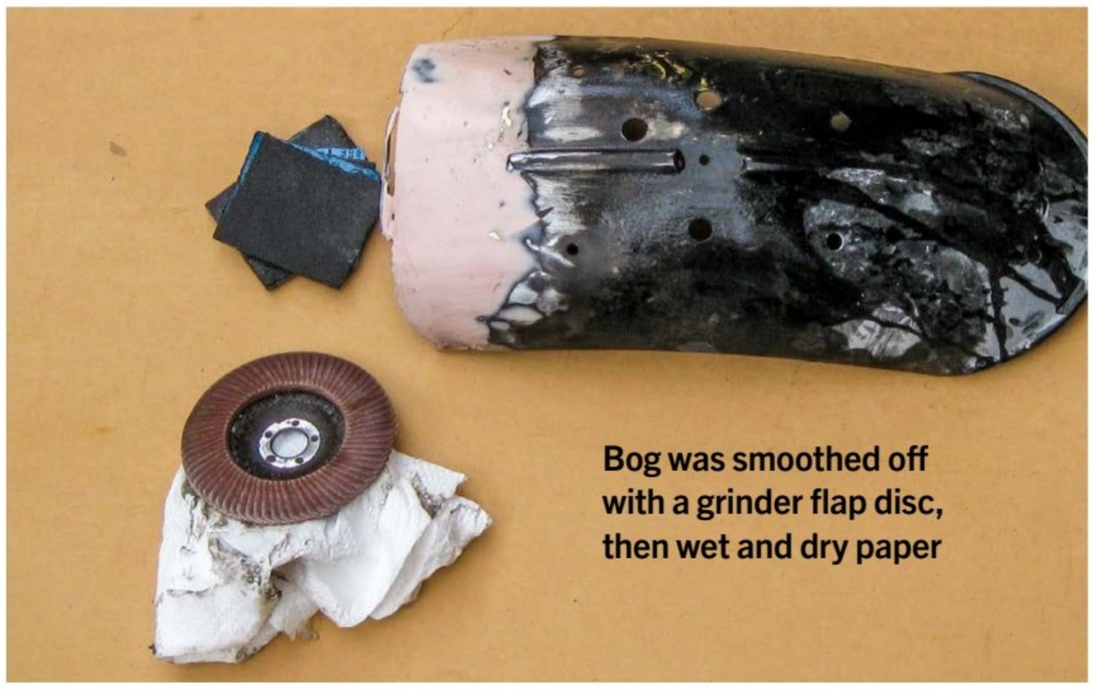
I can return to these parts in the future; the plating is time-consuming, and once the bike is basically assembled and mobile, I can easily remove the bits and work on them

A butchered rear mudguard extension; I was originally going to trim it back, but that would have left insufficient room for the number plate and lights

s & bolts of it with NZ Safety Blackwoods

More metal tacked on

With this heat source, I could just manage to braze the sheet steel



Bog was smoothed off with a grinder flap disc, then wet and dry paper

Priming shows the defects; more work is needed. This piece is hinged onto the main mudguard part, so it can swing and allow rear wheel removal

individually as the urge takes me. Wet Sundays perhaps.

With the toolkit carriers bolted back on, it was convenient for me to refit the rear wheel, the rear brake mechanism, and the rear chain. That meant I could fit the rear brake light switch and adjust the clutch.

Before the back lights can be fitted, I have to get the rear extension part of the back mudguard sorted; it is a piece of tinware which has to be shifted out of the way whenever the back wheel has to be removed. My piece was badly cut and mashed, and needed a little steel put into it. As I did when repairing the cooling fins on the motor, I trimmed a bit of cardboard to match what I thought was missing, then used it as a template for cutting. I have a heat source which is just able to heat sheet steel enough for brazing, so that was done, then bog went over the repairs, followed by primer.

Now that the primer has dried, I can more easily see some remaining defects. So this task is not quite finished.

Nothing like the photos

I have two units that are for carrying the rear lighting and number plate, but they look like nothing in any AJS photographs.

At this stage, I'm not sure whether I'll buy a second-hand part, design my own by copying from pictures I have, or choose from what I've got.

It occurred to me that, since there is no way that my headlight, in its present state, would gain compliance (too much reflector rust for what was a pretty dim set-up anyway), I can try separating the reflector from the lens: I have nothing to lose. I can try grinding off most of the rim of the reflector where it folds over the edge of the glass lens, leaving a number of tabs for refitting, thereby opening it up for possible replating. It is worth an attempt in the near future.

The reflector, left lower side, crimps onto the glass lens: with careful metal grinding, I might be able to open up the combo and fix the reflector surface? Nothing to lose

Coming up in Part 12

More work on the electricals; a hack into the headlamp and maybe plating it. The exhaust and footrests need attention. Adjusting brakes. The prospect of a trial run (on 150m of driveway) excites me. Fitting the front mudguard and making a decent job of the rear one. Sorting the clutch cable issue (and Pharaoh decided that a bottom block in the pyramid didn't look right!).

Solder on with NZ Safety Blackwoods

Bookcase

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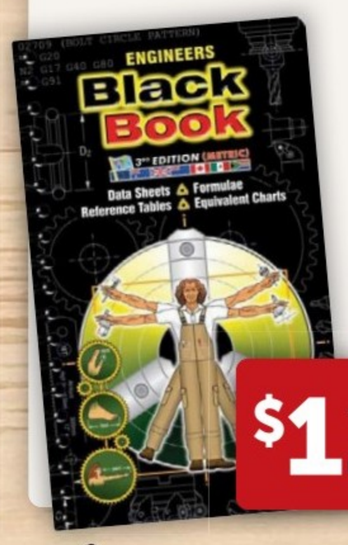

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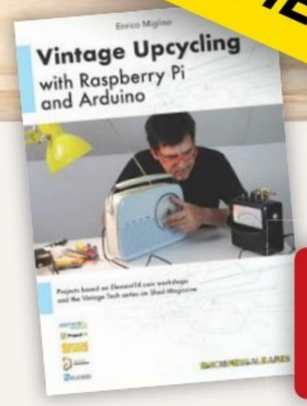

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Functional but still needing work

GOING IT ALONE

Part 2

By Chris Hegan | Photographs: Chris Hegan

He has observed the master, had plenty of tuition, so the time has come for Chris to attempt to restore his Philco valve radio. There will be a few rookie mistakes for sure, but sometimes the best way to learn is on the job

In *The Shed* Issue No. 127, I spoke about acquiring a small, dead Philco Nevada valve radio from the '50s with the intention of restoring it myself, and immersing myself in the world of yesteryear's radios.

With radio whiz Peter Walsham's help, I now knew what was wrong with it and faced the task of bringing it back from the dusty grave where it had sat for who knows how long.

Soldering on

It was time to get soldering.

My initial experimentation had proved that the fine conical tip on my soldering iron was probably great for tiny connections on a printed circuit board, but useless for soldering wires and components onto terminals, because a greater surface area is needed.

Peter has an iron with a flat ovoid tip, but Jaycar did not stock a similar replacement tip. However, when I removed the tip from my iron, I discovered that it was a straight cylinder, pointed at one end and flat at the other. It was the work of only a few minutes to grind the blunt end to a nice copy of Peter's working tip, which did everything asked of it. He uses an 80W temperature-controlled soldering station. My 40W stand-alone iron is sufficient, just, but I often have to hold the tip in place for a minute or so to bring the work up to soldering heat. Still, it works.

Safety

I will be sitting in a plastic chair at a desk with a plastic veneer, no problems there, and will make sure I am always wearing rubber-soled shoes.

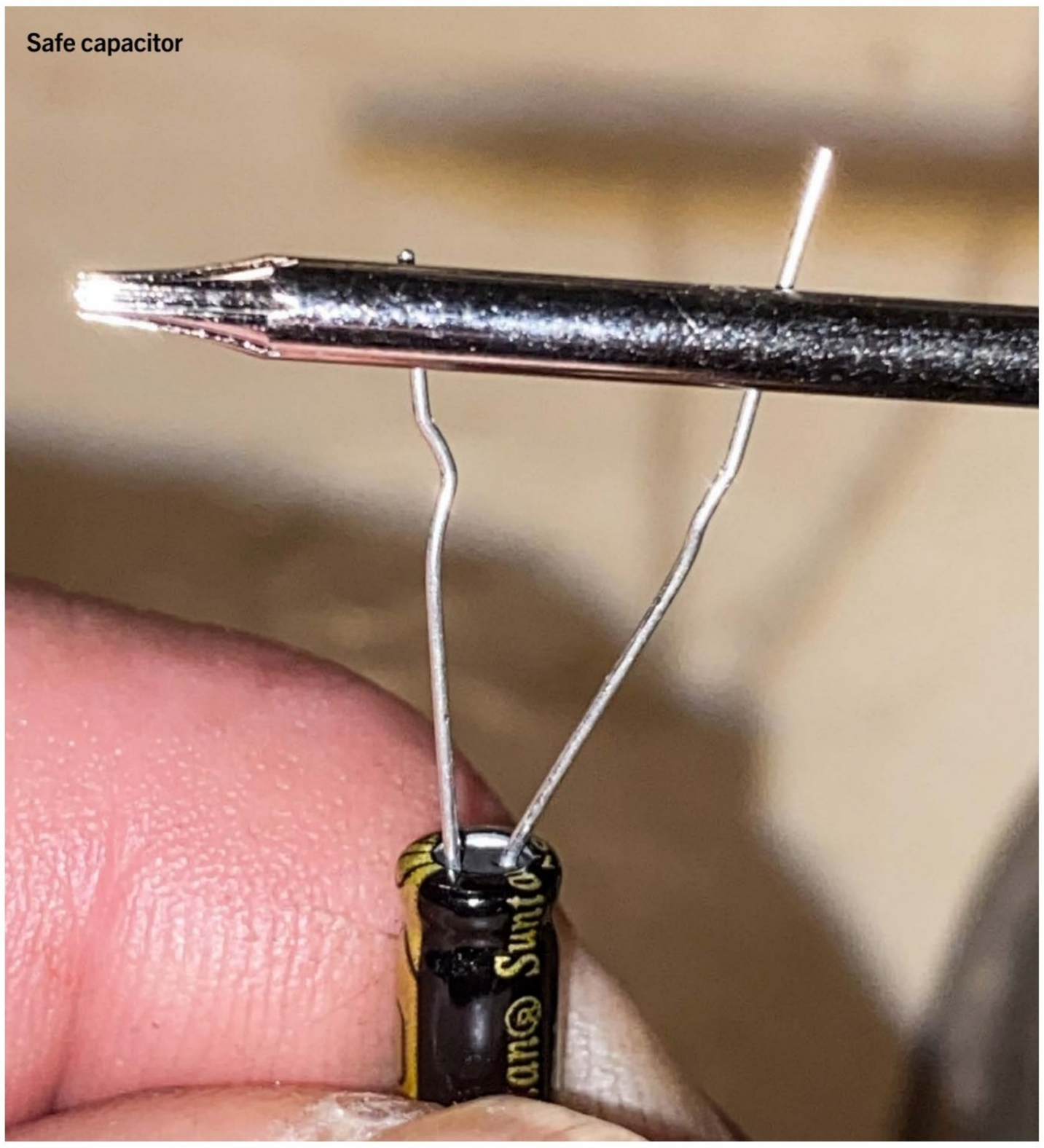
"Watch out for the chassis," Peter had warned me. "A hand-to-hand electric shock is the worst you can have, because electricity takes the shortest path and hand-to-hand goes through the chest."

The chassis is part of the circuit, so one hand on a wire and the other on the chassis … potential instant death. There are high voltages in pretty much every part of the radio, so you have to be very, very careful.

"The rules say one hand in your pocket when measuring voltage, but how can you do that while holding the probes?"

That's more like it

"Peter has an iron with a flat ovoid tip, but Jaycar did not stock a similar replacement tip"

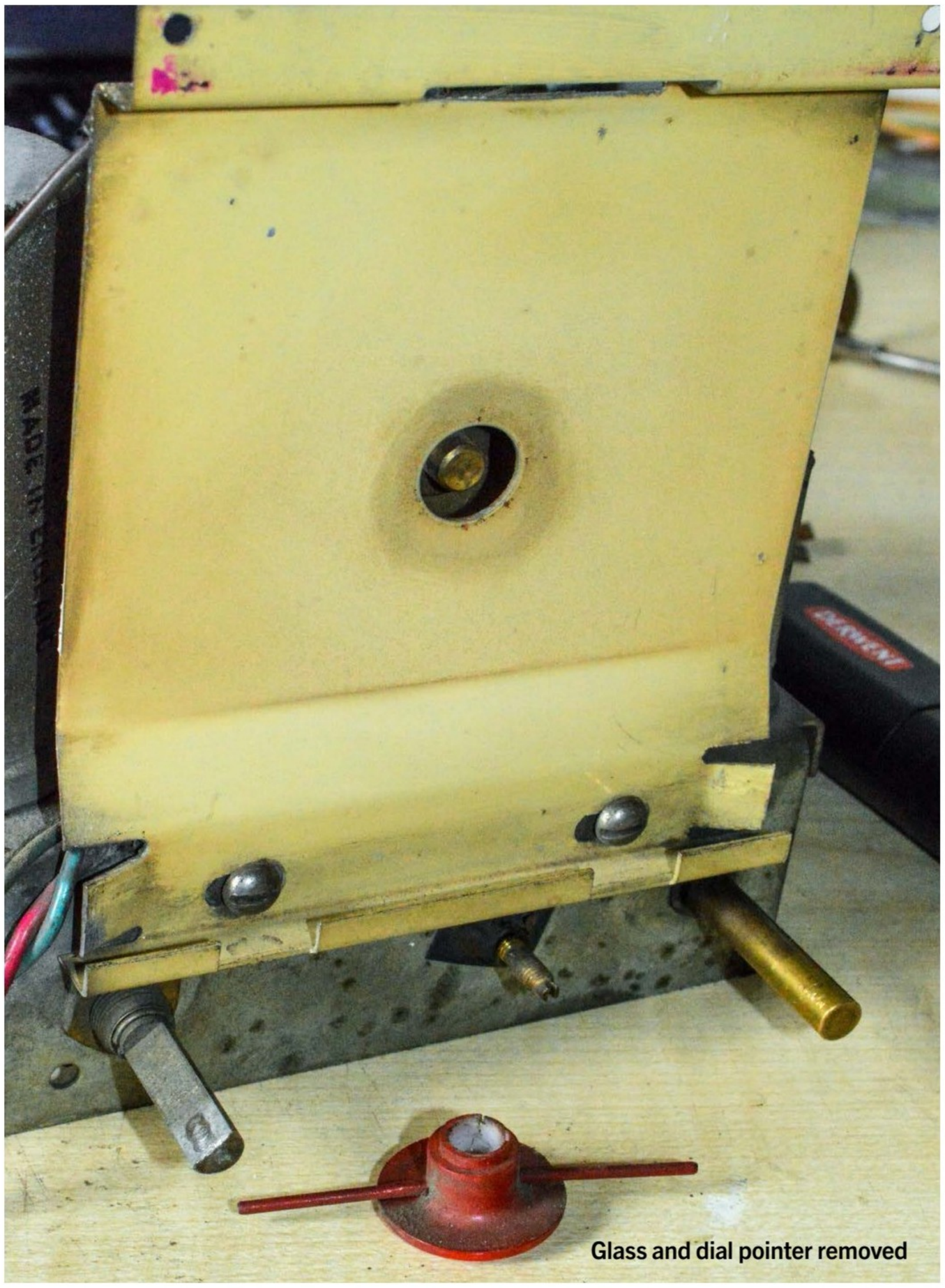


Safe capacitor

Watch out for capacitors

Capacitors store electricity, meaning you can get a shock from an unplugged radio which has recently been switched on.

Unlike batteries, when connected, they release all their stored energy immediately. Bridging the two terminals with an insulated screwdriver may cause a small spark, but it ensures that the capacitor is safe. ▶



Glass and dial pointer removed

Cleaning the re-aligned transformer, with dial glass, speaker, and a valve removed for safe handling

Hands-on at last

The first step was to remove the speaker, the glass dial, and the rotating pointer. This was an easy decision to make after I picked up the chassis and put my thumb through the ancient speaker fabric. Speakers are easily replaced, but if I had scratched or broken the dial glass, my hopes for a pristine restoration would have been over and pretty much out of the gate.

I had to remount the transformer such that the dangerously exposed terminals would be hidden safely under the chassis. A quick measurement showed that when I inverted the transformer, the protruding back of the speaker would not fit, so I binned the speaker but tucked away the lesson: always remove the speaker and fragile parts if you are going to be handling the radio repeatedly.

Now for the big job – rotating the transformer.

The transformer reset

Having taken a photo, I cut the wires free to completely remove the transformer, confident that the photo I took would tell me where each wire belonged.

Quite right, but by the time I had cleaned the transformer with my Dremel brush, drilled two new holes in the chassis and mounted it in its new position, I was no longer sure which way around it was. Thanks to the missing neutral terminal in the centre of one side, I knew which side the incoming power wires connected to, but which end of the row of five on the other side was the 240V circuit and which the 5.8V heater and dial lamp circuit? They looked identical.

Then I realised I had my shiny new analogue meter. I could test them. Excited and feeling very technical indeed, I plugged the power cable in, switched it on and set my meter to test DC volts because I now knew that radios ran on direct current. I touched a probe to one end terminal and the other to the central

“Excited and feeling very technical indeed, I plugged the power cable in, switched it on, and …”

I can't say I wasn't warned

Spare fuse – a great meter!

neutral terminal. A large spark made me jump. Something was clearly wrong.

Oh. That's right. The current is only DC after it has been rectified by the first valve.

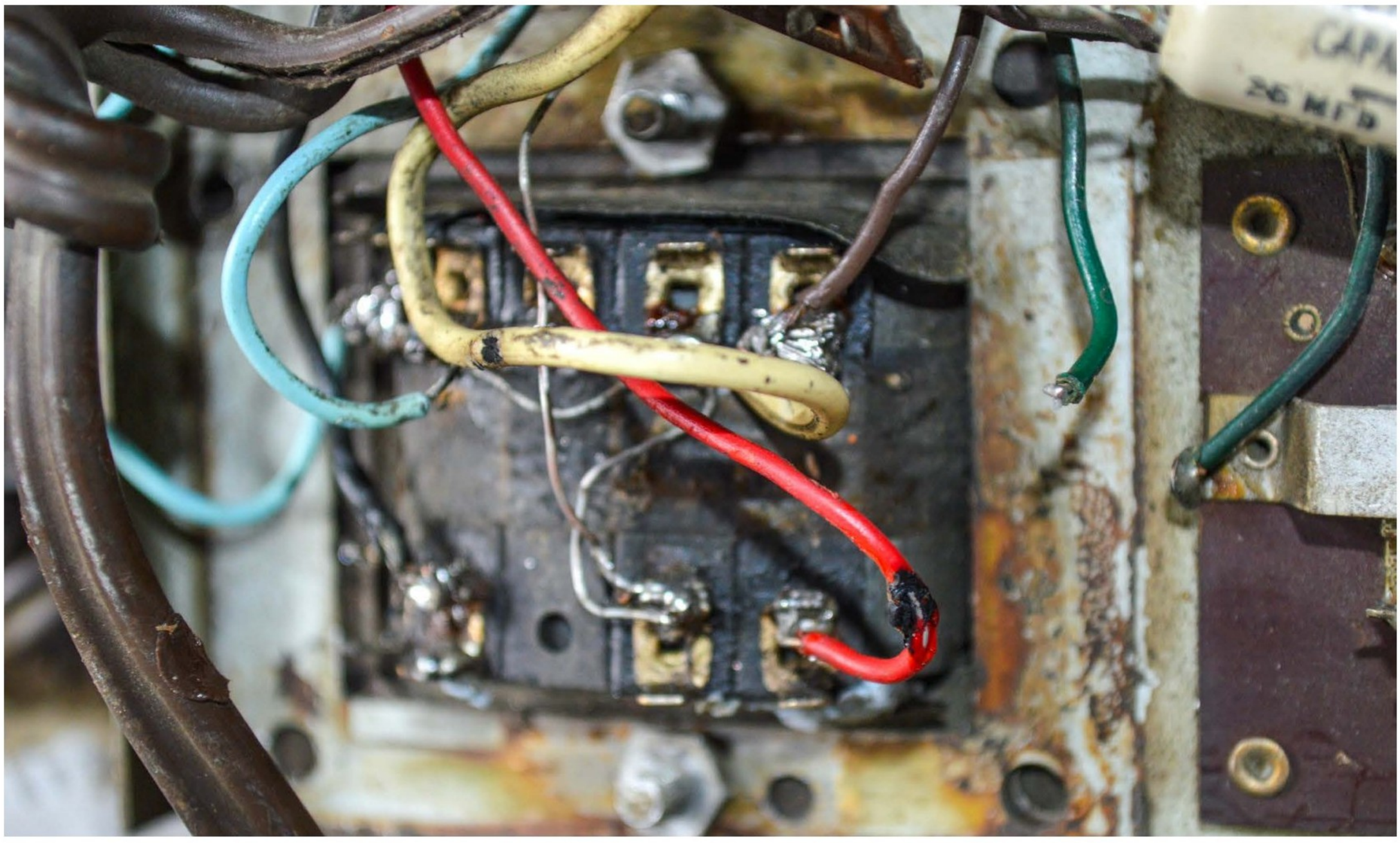
No current

I set the meter to AC, tested again and got nothing from any terminal. Oh dear. No amount of probing produced the slightest flicker of the needle. Finally, I tested what I knew was a new battery. Nothing.

Knowing that the meter had a fuse, I opened it up and closely inspected the small glass fuse. It was so fine I had to use my jeweller's loop to see the break in the wire. Brilliant – I'd blown the fuse.

I blessed the manufacturer – Protech – when I found a clip holding a spare fuse. This really is a top meter! With the fuse replaced and the meter set to AC voltage, I quickly determined which end of the transformer was which, went to move the incoming wires aside prior to starting to reattach them, and received an electric shock.

Big lesson learned. Huge. From now on, I have a new Rule No. 1: except when testing, never work on the radio



Have I got that right?

Dead resistor

New resistor in place

unless I can see the plug sitting on the workbench.

Later, I notice that the remains of a label on the chassis contains exactly that warning, to not touch the insides unless the plug has been withdrawn. The label also shows a simplified schematic, identifying the valves. It was common practice if your radio stopped working to check if every valve was glowing. When one failed, owners would know which valve they needed and get one from the radio shop. Many shops had valve testers – the radio was too important to sit in a repair shop for days.

Replace components

With the transformer remounted and all the wires soldered in place, it was time to replace the dead or dodgy components.

The initial analysis showed that the 33kW resistor connecting pin 3 on valve ECH42 to the first tuning coil was dead, so I replaced it first.

The next job was to cut the lugs on the filter block as close to the base as possible. The wires were solidly soldered to sturdy aluminium lugs, and my side-cutters would not just snip through them, but by squeezing hard and rocking the cutters from side to side, they eventually broke away.

Although the aluminium container now served no purpose, removing it

Grappling with filter-block lugs

Filter block – printed contents

Tiny new replacement

Corroded capacitor

would leave a gap like a missing tooth, so it stayed.

The print on the side of the can (and the schematic) told me the filter block had contained one 20 microfarad (μf) capacitor and two 40μf capacitors, which I was replacing with three 40μf capacitors.

The other two went onto the B+ line on either side of the twin 2.2kW resistors, as shown in the schematic. Finally, I replaced the corroded 25μf capacitor (see Issue No. 127), which indeed came up faulty, with a tiny new one.

Make safe

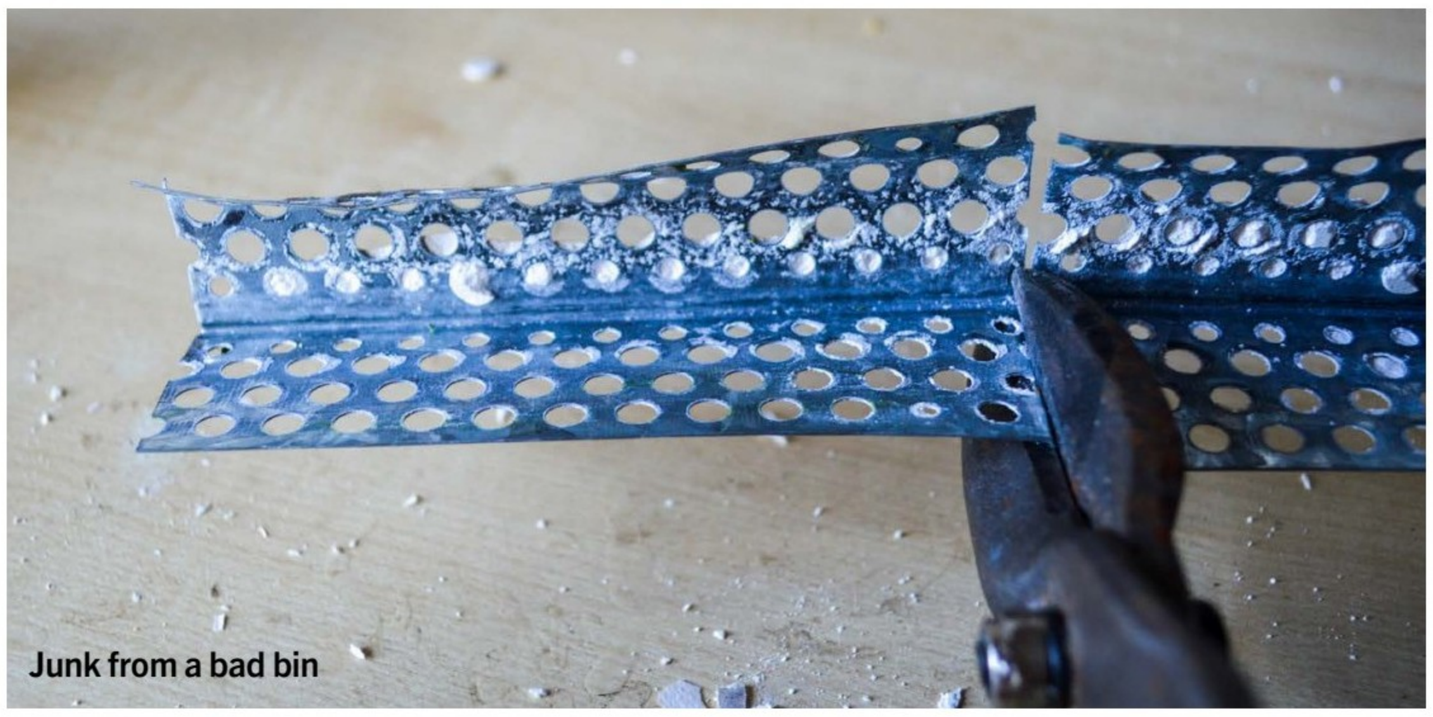
Finally, I turned to the remaining physical adjustments to bring the radio up to modern safety standards.

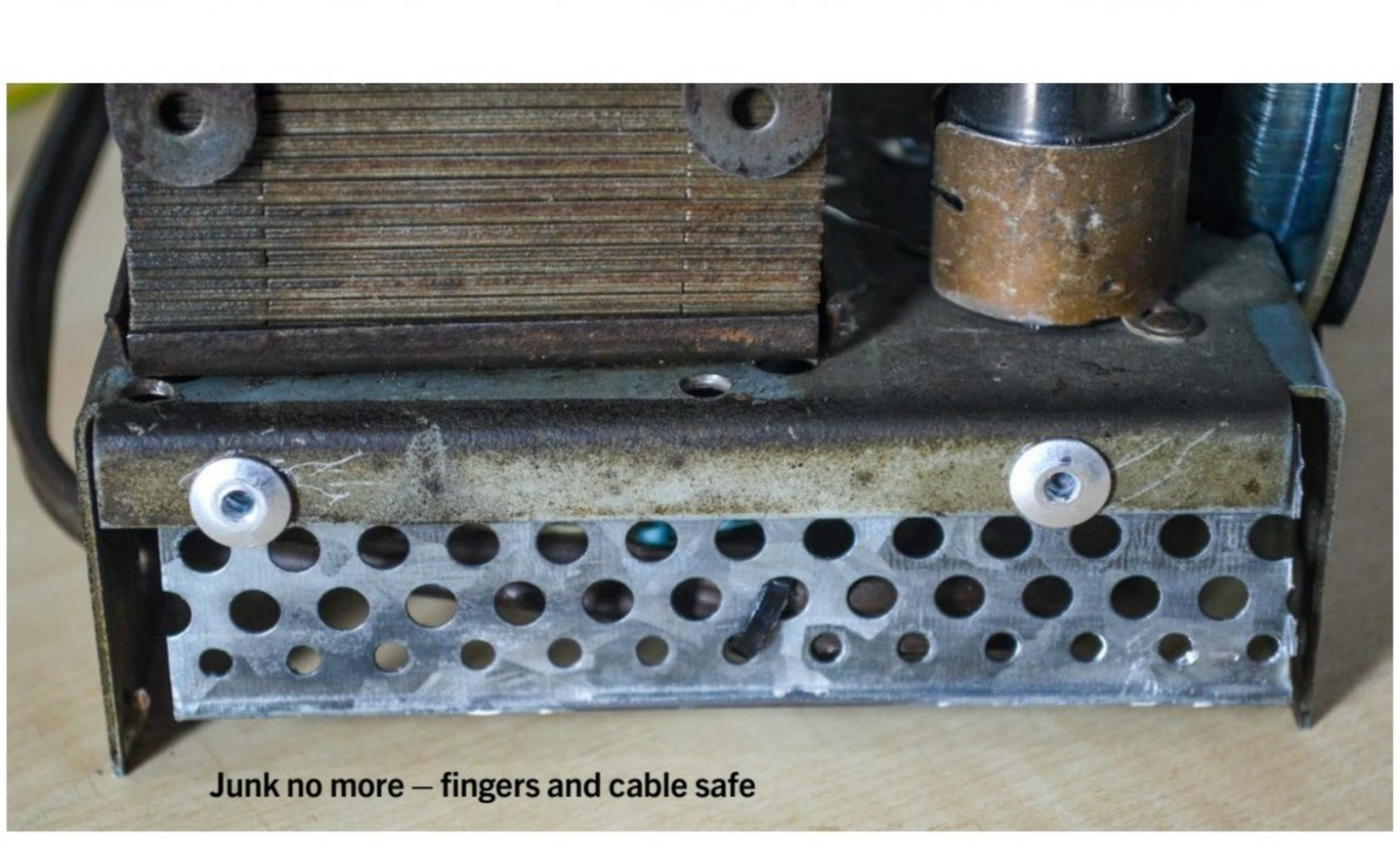
The plug had wires flapping loose inside, dangerously close to other terminals, so I fixed that (or so I thought). The space for little fingers to fit around the sides of the chassis had to be fixed by mounting some sort of closures. I needed small sheets of metal but could find no suitable candidates in the shed or the attic, so I kept a weather eye out on my long daily walks.

A jumbo bin outside a building site turned up the perfect solution – a couple of mangled strips of perforated angle iron used to support the corners of gib board when plastering.

A creative hour with a drill, tin snips,

“The radio was too important to sit in a repair shop for days”


Junk from a bad bin


Junk no more – fingers and cable safe

> “When dealing with electricity, ‘probably’ just is not good enough”

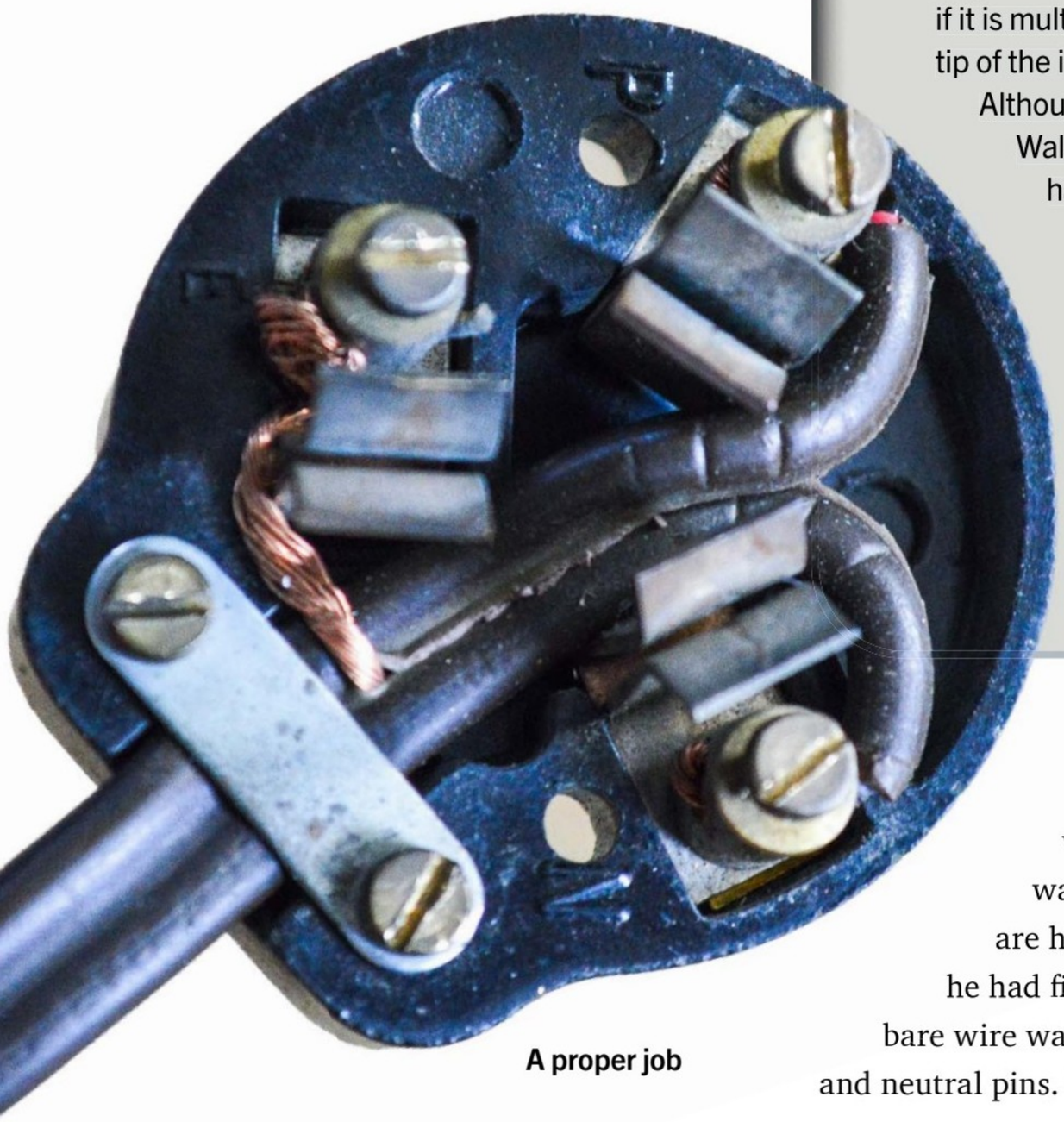
and a pop riveter solved the problem in a way I thought quite elegant: the holes allowed plenty of airflow without fingers, and a mounting point for the cable tie, which securely clamped the power cable in place.

Final inspection

Although sorely tempted to turn the radio on, I took it back to Peter for what I thought would be a brief final check, but life in the vintage radio world is never so simple.

First, he opened up my rewired plug and shook his head. Although I thought it a serviceable job, which it probably was, Peter’s standards are higher. By the time he had finished with it, no bare wire was visible on the phase and neutral pins. He was right – when dealing with electricity, ‘probably’ just is not good enough.

He hooked a spare speaker to the set and powered the radio up. We waited for the valves to warm up and then heard … nothing. It did not take long to find out why: I had soldered the neutral wire

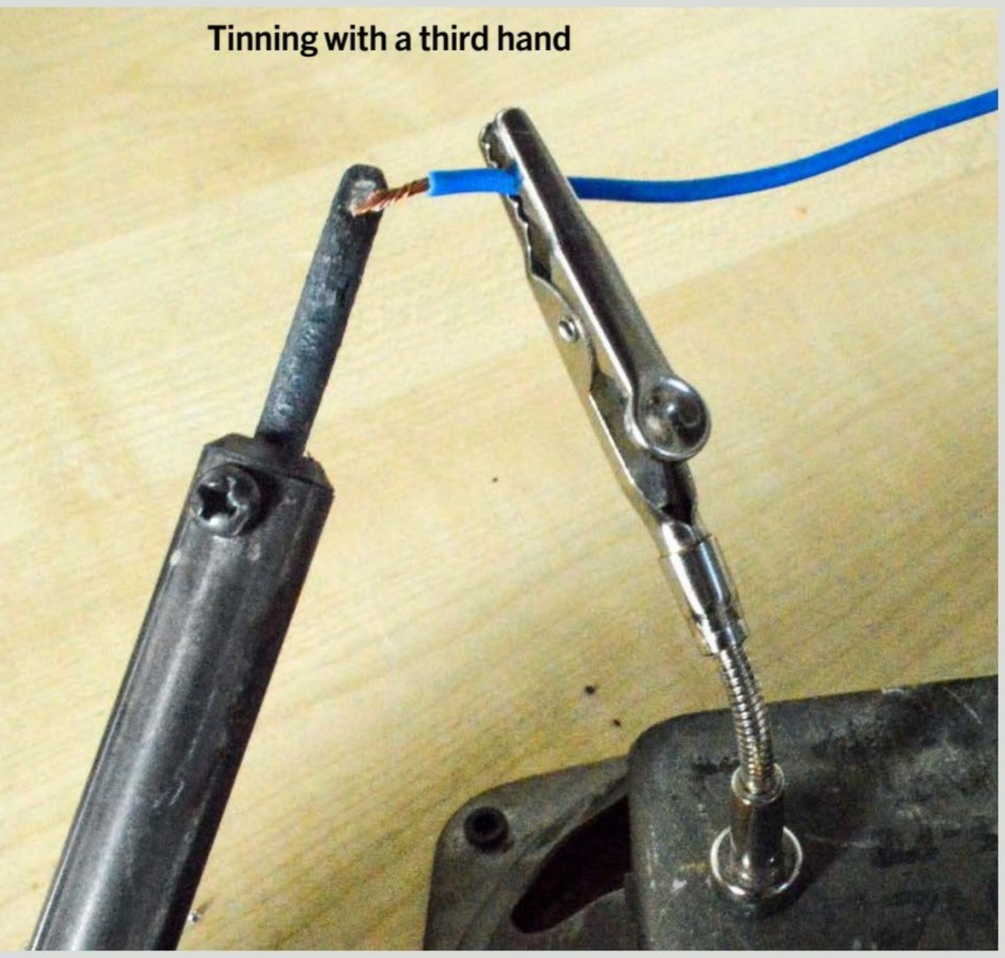


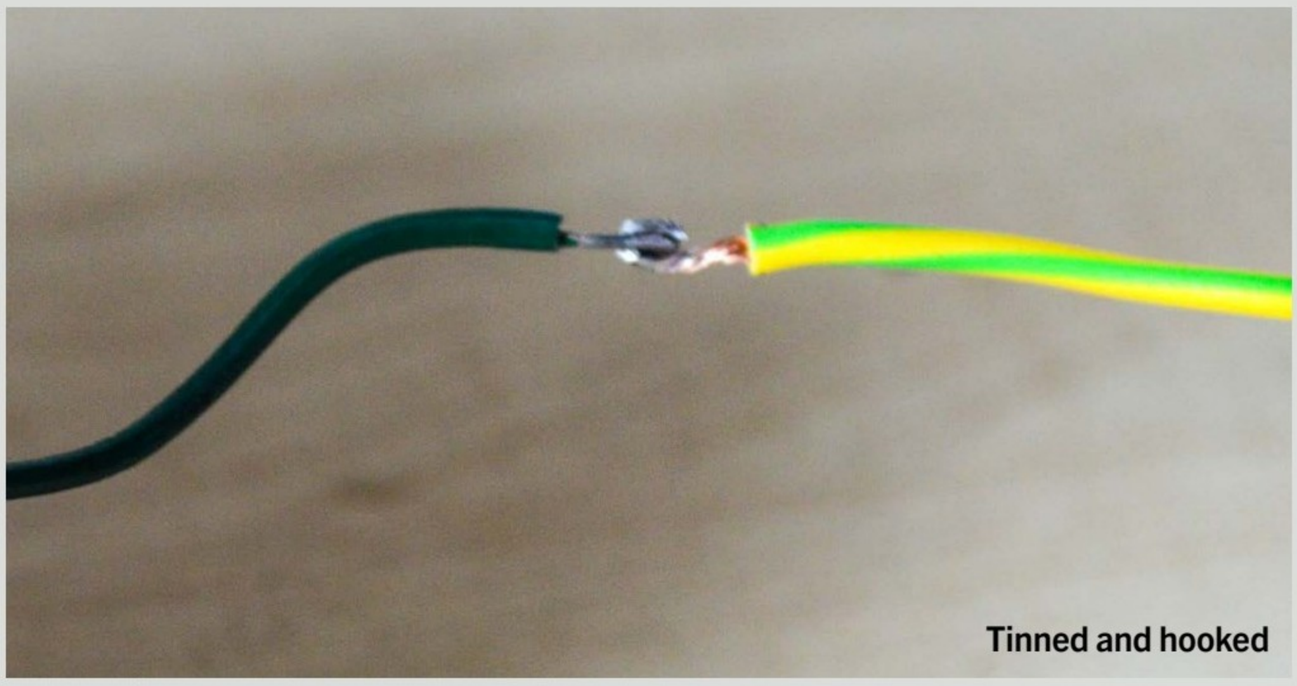
A proper job

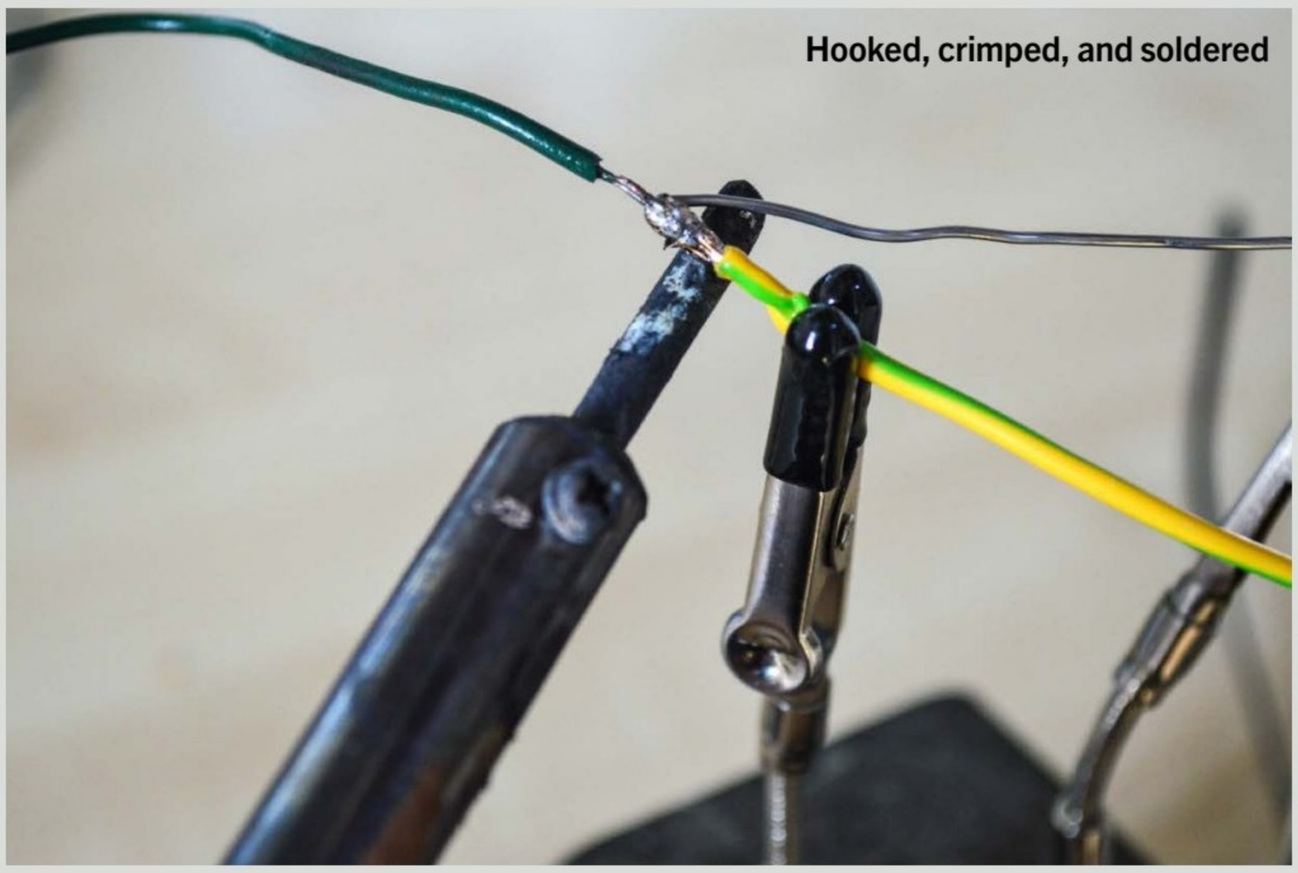
A cheap hobby

Valve radio restoration tips

1. Never switch on an old radio that has been sitting forgotten for years. Test the transformer for continuity, at a minimum.
2. If you can see the power plug on the bench, you won’t get a shock.
3. Remove delicate parts before working on the set – all dial parts, dial lamp, indicator needle, and speaker.
4. Before soldering wires onto terminals, ‘tin’ the wire. Trim it, twist it together if it is multi-strand, hold it to the hot tip of the iron and coat it with solder. Although an expert like Peter Walsham manages this with two hands, I found a third hand helpful. My magnet-based alligator clip made my life easier while doing this and other tasks.
5. Soldering a join in wires, shape each end into a little hook. Crimp them together, then solder.
6. Wire joins can be protected with heat-shrink plastic tubing, more secure than insulation tape. Stroking the heat-shrink with the side of a hot soldering iron produces a tight, safe fit.
7. For best practice, when soldering wires to terminals, don’t just add to the pile of old solder already there. Solder is not mechanically strong. Melt the old solder away, clean the hole with a fine awl or a large needle, and thread the wire through the hole. Then solder.
8. Watch out for dropped solder. I had an intermittent fault with the speaker that turned out to be a small solder droplet inside a switch that connected to an optional external speaker.
9. Before disconnecting anything, take a careful photograph with every connection clearly visible; my mistake with the transformer came about because a wire in the photograph obscured two terminals and led to the wrong result.

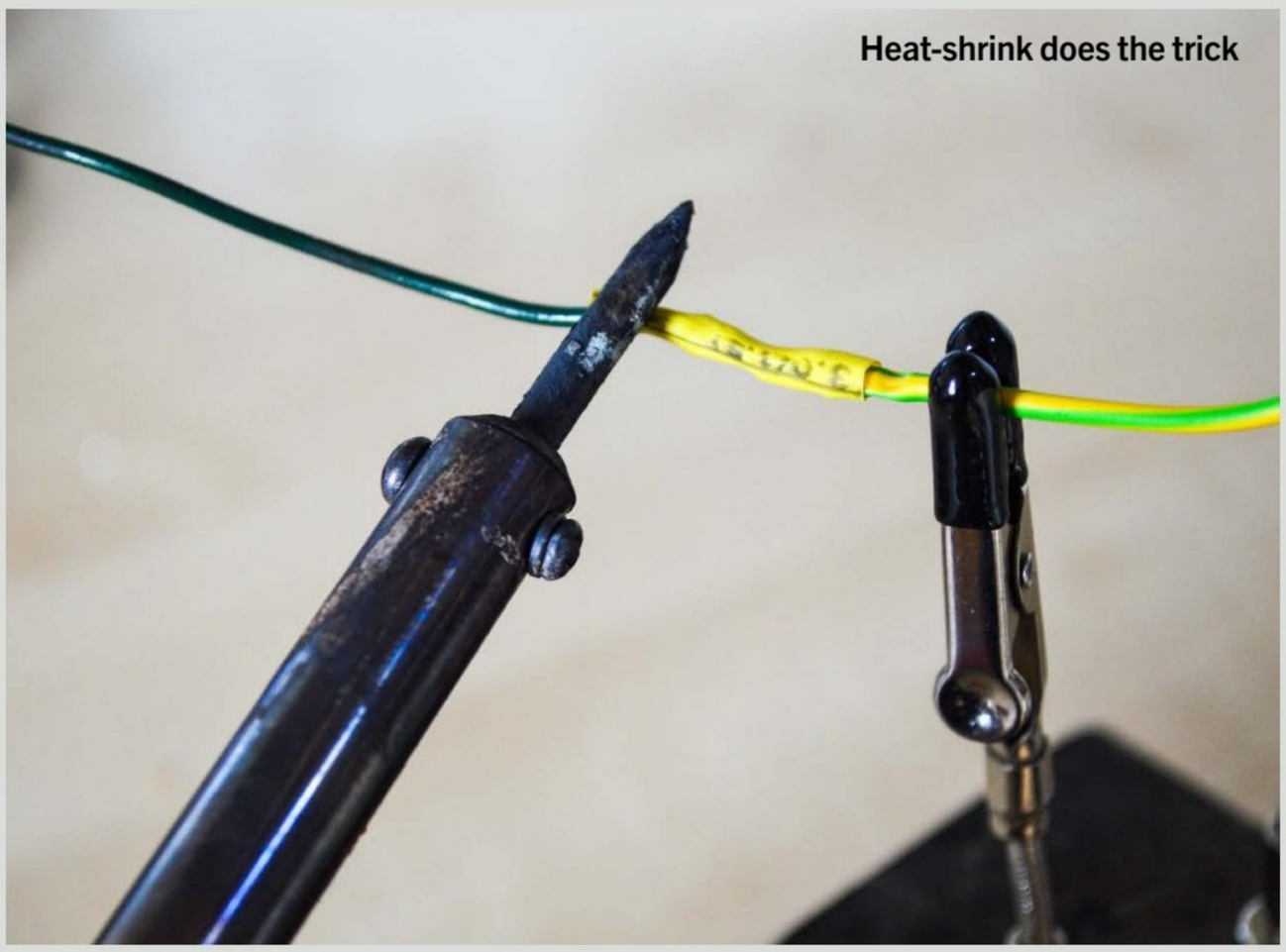

Tinning with a third hand


Tinned and hooked


Hooked, crimped, and soldered

10. More microfarads in a replacement capacitor is fine, within reason. Capacitors used to be costly to make, and radios were designed to minimum specs. The voltage rating also matters. I replaced one that had 6 or 7V going through it with one rated for 16V, which was fine. The 25V alternative would also have been OK.
11. As for tools, remarkably few are needed for the electronic parts of the radio. Fine needle-nosed pliers, a pair of side-cutters, and a small screwdriver. A fat needle or awl – I used a needle-sharp pair of tweezers. A soldering iron of at least 40W with a chisel tip. An 80W temperature-controlled soldering station is the top choice if you can afford it. Obviously, a multi-meter. Analogue meters cost a few dollars more but are worth it. They are better for working with radios because voltages often fluctuate, and you want to know the range of the changes. A needle on a scale is easier to see than trying to follow fast-changing numbers on a digital read-out. You must be able to zero the ohms meter to test for continuity. The Protech meter I used has a buzzer and a light which confirms continuity.
12. A Dremel is handy, but certainly not essential.

These are just my first takeaways. As with any skill set, the more you use it, the more you find.

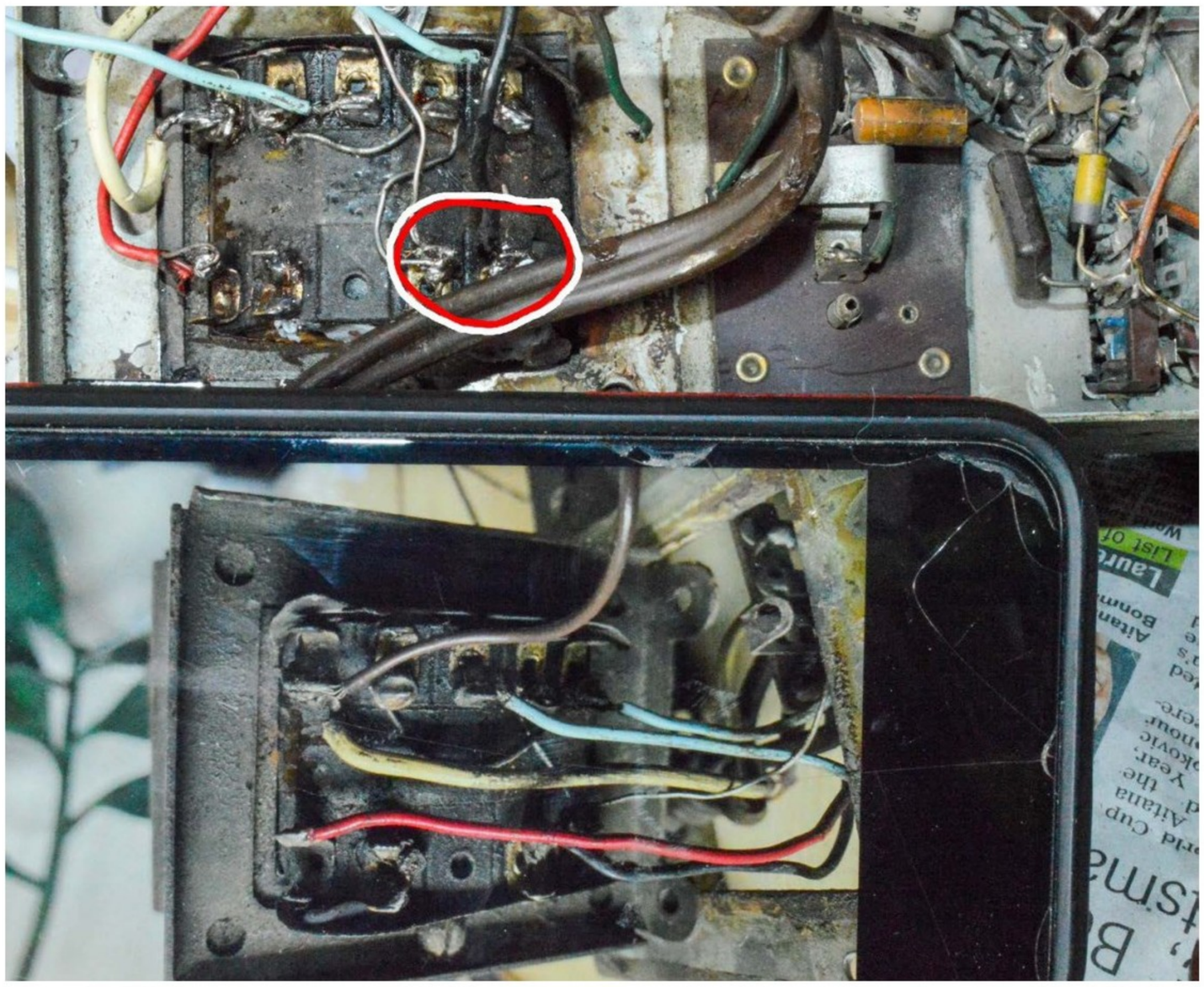

Heat-shrink does the trick

to the transformer's earth terminal, and vice versa. I had reconnected the wires based on what I thought was the obvious point that the phase and neutral terminals would be at opposite ends. In fact, the neutral was the second one in, a mistake due to one wire obscuring another in the reference photo I used. My bad.

A few more issues

Next, he noticed that I had one of the three new capacitors wired incorrectly because I had not understood that electrolytic capacitors are polar. Another easy fix.

Also, I had soldered the replacement resistor to the wrong terminal of one of the tuning coils, the little rectangular aluminium boxes with two tuning screws on top. With that corrected, we



Earth and neutral the wrong way around

powered up the set again and … noise! Music, in fact.

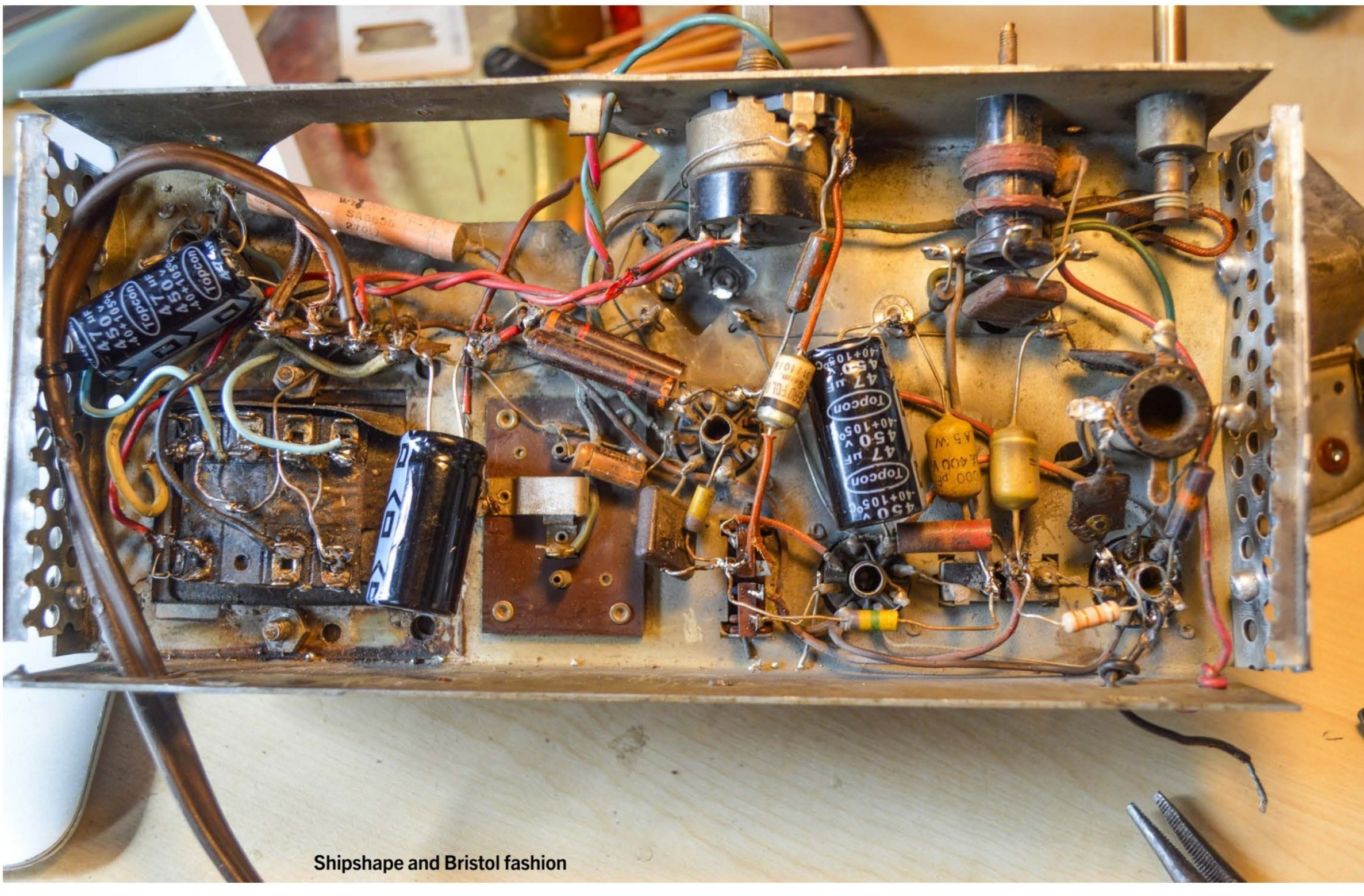
With the dial tuned to one of the stronger stations, he turned screws on the tuning coils and tuning capacitor, refining the signal for clarity and strength. (He then used a special low-frequency signal generator clipped to the aerial and read the output on an oscillator. Something for purists – don't worry about it.) It was still not as loud as it should have been until he connected the aerial wire to the aerial output linked to a long wire stretching the length of his attic, and finally, we could down tools with a smile: the Philco 401 Nevada was back in business, after who knows how long.

Back home in Ponsonby and much closer to the Henderson mast, the big aerial proved unnecessary. It will never be very loud; with only three amplifying valves after the mixer/oscillator valve, the Philco was an economy choice, a small set designed for the bedside or shed.

My work was not finished, however. I still had to replace the broken dial lamp, and Peter was not satisfied with the way I had placed the three new capacitors replacing the filter block, an easy fix I did at home to complete the job.

New speaker

Now, the only work remaining was to buy a new general-purpose 125mm speaker and screw it to the chassis, and



Shipshape and Bristol fashion

Philco Nevada – fully restored and back in service

to screw down a connecting tab hanging loose underneath.

I cleaned the dial glass and put it back in place, put the radio back into the case, and the job was well and truly done. The case, perhaps unusually, needed nothing more than a dust and polish. With help, I had restored my first vintage radio.

Now I have my eye on a more attractive prospect – a vintage, non-working multiband console model that someone offered me out of the blue as I was writing the final lines of this instalment. It is English, and Peter tells me they did things somewhat differently over there, so I don't doubt there will be lots to learn. It also has a damaged veneer cabinet – woodwork to be done. Excellent.

My next project

WORKSHOPS ARE CHANGING

Makerspace NZ and the new wave of advanced makers

Step into a Kiwi garage or workshop today, and you'll notice something different.

The familiar sights are still there – hand tools hanging on the wall, stacks of timber, and half-finished weekend projects waiting for attention. But alongside them, you'll increasingly find computer screens displaying CAD designs, laser cutters, CNC routers, and a growing range of digital fabrication equipment that was once found only in commercial factories.

The modern workshop has evolved. It's no longer just a place to repair, restore, or build by hand – it's becoming a space where digital technology and traditional craftsmanship work together.

Driving this change is a new generation of advanced makers

These are people who have moved beyond traditional DIY.

They're designing components on a computer, cutting materials with laser precision, machining complex parts on CNC equipment, and using a range of specialist fabrication tools to turn ideas into finished products. The result is greater accuracy, faster production and the ability to create projects that were once only possible in large manufacturing facilities.

Across New Zealand, this movement is gathering momentum as more

makers, designers, educators, and small businesses embrace digital fabrication. Helping to fuel that growth is Makerspace NZ, an Auckland-based company supplying advanced manufacturing technology, specialist materials, training, and support that enable Kiwi innovators to bring their ideas to life.

So who are the 'advanced makers'?

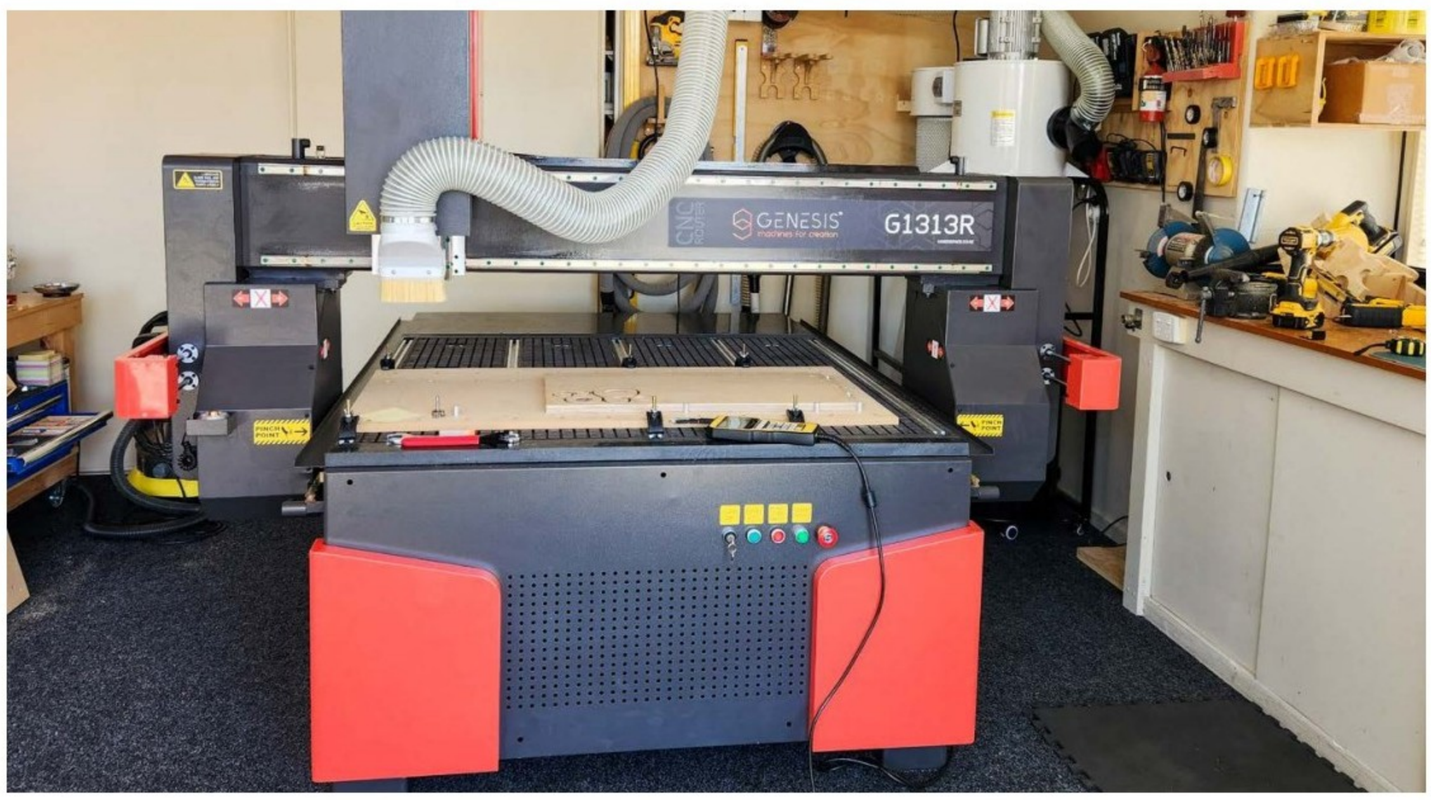
The term might sound technical, but it simply describes a growing community of people who are taking making to the next level.

They're no longer limited to traditional workshop methods. Instead, they're combining creativity with digital technology to produce high-quality, repeatable results.

Advanced makers are creating things such as:

- custom automotive and motorcycle components
- designer furniture and homewares
- product prototypes and new inventions
- architectural models and display pieces
- signage and branding products
- small businesses built around custom manufacturing.

Rather than relying solely on hand tools, they design projects digitally before precision machines produce the finished components.



The tools behind it all

The real transformation in today's workshop comes from having access to the right digital fabrication tools – and the equipment that supports them.

Laser cutters: Laser cutting technology has become a cornerstone of advanced making. Modern laser systems can accurately cut and engrave timber, acrylic, bamboo, leather, rubber, plastics, and many other materials. They're ideal for everything from signage and architectural models to automotive panels, custom branding, and decorative projects.

CNC routers: If laser cutters excel at fine detail, CNC routers are built for larger, structural work. These machines accurately machine wood, plastics, aluminium composite panels, and other sheet materials to produce furniture, cabinetry, marine components, caravan and motorhome fit-outs, and countless custom manufacturing projects. Once a design has been programmed, identical parts can be produced repeatedly with exceptional accuracy.

Specialist workshop equipment: Advanced makers are also taking advantage of a wide range of complementary workshop equipment. Acrylic benders allow fabricators to create professional display products and enclosures. Vacuum formers make it easy to produce moulded plastic components. Vinyl cutters and plotters are perfect for graphics, decals and signage, while fibre laser marking machines permanently engrave logos, serial numbers, barcodes and identification markings onto metal products.

Together, these technologies allow makers to complete almost every stage of a project from one workshop.

More than machines

A key part of Makerspace NZ's business is supplying not only the equipment, but also the materials needed to create finished products.

Through its Genesis Materials range, the company supplies premium materials specifically selected for laser cutting, engraving, and digital fabrication.

The range includes:

- laser-grade plywood
- bamboo panels
- decorative acrylic sheets
- rubber stamp materials
- dual-layer engraving laminates
- a variety of specialist fabrication materials.

These products give makers confidence that the materials they use are designed to perform on modern fabrication equipment, producing professional-quality results every time.

Continued on page 119 >>

Allan Familton, all the way from Christchurch, ready for another day hauling children with his 7¼-inch-gauge model of a Kerr Stuart ‘Haig’ class engine. The full-size locomotive was supplied to Kempthorne Prosser, Dunedin in 1929, Burnside; Builders No. 4185

OTAGO MODEL ENGINEERING SOCIETY

90 YEARS OLD AND COUNTING

Murray is in awe of the club’s history and the talented, dedicated modellers who have built it up from nothing. The sharing, appreciation, and joy of model-making are why the group still thrives today

By Murray Grimwood | Photographs: Murray Grimwood, Alan Benfell, and Brian Niven

According to the *Evening Star* (1 June 1936), the first meeting of the Otago Model Engineering Society was held at the YMCA on the previous Saturday, with a "large attendance".

Recently, the club celebrated its 90th birthday, and it's still going strong. In a city which encompassed the sprawling Hillside railway workshops, it is unsurprising that miniature steam figured prominently in the early days. Latterly, 3D printing sits alongside more traditional building methods, as members turn out everything from jet boats to hovercraft and submarines, showing them off on open days and at birthday hostings – the society's public interface.

Left to right: Lachlan Clark, youngest attending member, joined in 2011; Brian Niven, life member, joined 1971; Allan Stevens, oldest life member, joined 1948; and Gary Douglas, life member, joined 1957

An exquisite model of a steam launch by Gary Douglas – complete right down to spanners on the workbench

Beginnings

It was inevitable that Dunedin would evolve a group of model-makers; besides Hillside, there was a plethora of engineering firms that evolved to service the gold rush of the time, building everything from dredgers to stamping batteries. There were large companies (like HE Shacklock) and smaller suppliers, including several foundries. Skills were not in short supply, and working conditions were giving those skilled people increased leisure time.

In that *Evening Star* story, we are told that, "At a meeting held at the residence of Mr L Boyce, 35 Bayfield Road, on Thursday, 30th April, 1936, at 8pm, present were: Messrs L Boyce, EP Cousins, AL Crawshaw, M Morris, N McQuarrie, AT Scott, DL Scott, HL Thomson, TW Turner, JD Turner, H Riddle. WJ White, R Hynes (Technical School). L Boyce was elected as chairman and H Riddle Secretary-Treasurer, with AT Scott, T Turner, and WJ White as Committee."

The Krait is an important piece of Australian history; this model is internal-combustion driven and features a variable-pitch propeller

Keith Murphy's evocative model of the *Anatoki* – still trading the coasts of New Zealand

The first show

One month later, that public meeting was held in the YMCA with an attendance of 35 (the rent was 4/-).

Records tell us that "the necessity of a Library was realised and Malcolm Morris was appointed librarian." (That library still exists, well-used, today.) It was also decided to enter a group display in the non-competitive section of the Winter Show. The list of entries is both impressive and suggestive of the times: Semi-portable stationary steam engine (DS Smyth); vertical steam engine (DL Scott); 4-6-2 loco chassis, 4-4-2 loco (HL Thomson); yarrow boiler and vertical steam engine (W Lothian); 4-8-2 loco chassis and tender (G Barber); horizontal steam engine and boiler (C Hazard); representative loco and mill engine (WA Earland); model launch (NW Millard); Lafayette loco chassis, 2½ tank loco, and two other items (TM Ellis); twin-cylinder, internal combustion engine, and miniature Stillson wrench (L Boyce); Stuart No. 10 Steam engine (WJ White); crankshaft for 15cc petrol engine and model spray gun (AT Scott); petrol engine and gas engine (EP Cousins); model aero engine 12cc (12ozs); 15cc (20oz) wooden propeller (W Angus); Stuart Turner No. 1 vertical steam engine (T Turner); electric clock (N McQuarrie).

Some club rooms

The Agricultural and Pastoral (A&P) Society awarded three prizes as a gesture of appreciation for the display, although it was in the non-competitive section.

While the A&P facilitation was appreciated, the model group realised that they needed, first, a meeting room and, secondly, a site big enough to run and display their models. A room was made available at this time by Messrs

A well-engineered model traction engine; still a popular subject in steam-buff circles

IMAGES FROM OUR PAST

Right: Mr D.R. Stokes, pictured at the Kettle Park track in February 1953, was one of several miniature racing car builders in the Dunedin Model Engineering Club. His car, the bulk of which came from melted down scrap aluminium, took him a year to build in his spare time and could reach speeds at the track of up to 60mph.

would help National

Johnson Bros above their shop at 261 George Street. Johnson Bros would accept no payment for rent, nor would they consider reimbursement for power. That arrangement lasted until 1946.

In 1938, the Dunedin City Council made a pond available in Woodhaugh (still there), but "owing to weed fouling the propellers, it was not a great success". At that time, it was decided that a 2½-gauge railway track would be of the most general use. Then came the War, during which membership increased (even though many members had sold, given or leased their lathes to the Government!). Mid-War, the Society became Incorporated (a needle it has recently had to re-thread).

An acre of land and a hut

After the war, the Dunedin Ocean Beach Domain Board "kindly made available" an acre of land near the beach.

An army mess hut was bought on 19 July 1946, for £263. So keen were the members to get on with the job that they took the building down and removed it from the site before actual payment had been made. Decisions as to track layout (and gauges) had been made by 1947.

The tether-car track began life in 1951 (it's still there and one of only three left in Australasia – the others being in Sydney and Brisbane).

An early photo of the now-rare tethered-car track. It is a noisy affair; nowadays ear-protection is offered . . .

The ‘steaming-up’ shed followed in 1953. Then came the pond … and the society has been there ever since.

Interestingly, it wasn’t until 1995 that inter-society communication became national with the incorporation of the Model Engineering Association of New Zealand (MEANZ).

I remember …

I first visited the society during one of their famous Festival Week sessions in 1958 or ’59.

Then or thenabouts would also have been my first visit to the Winter Show – a vast affair covering two city blocks – and I still remember those models (as well as the Meccano entries, the cake entries, the diving-tank, and the aroma of the animal section).

For many Dunedin children, both events were calendar references as important as birthdays and Christmas; ask current members and they will all have similar memories.

Back in those days, a donated Fowler traction engine hissed its indignation at being cooped up in a city, and small boys were helped up to sit on the driver’s seat. A pair of splayed rabbit-ear aerials, with a spark rising between them in the heat then re-igniting at the bottom, is a powerful memory. So too is the fellow who started the tether cars on their short journeys – then stood implacably on the central pole as they did their oh-so-noisy, oh-so-hard-to-see thing.

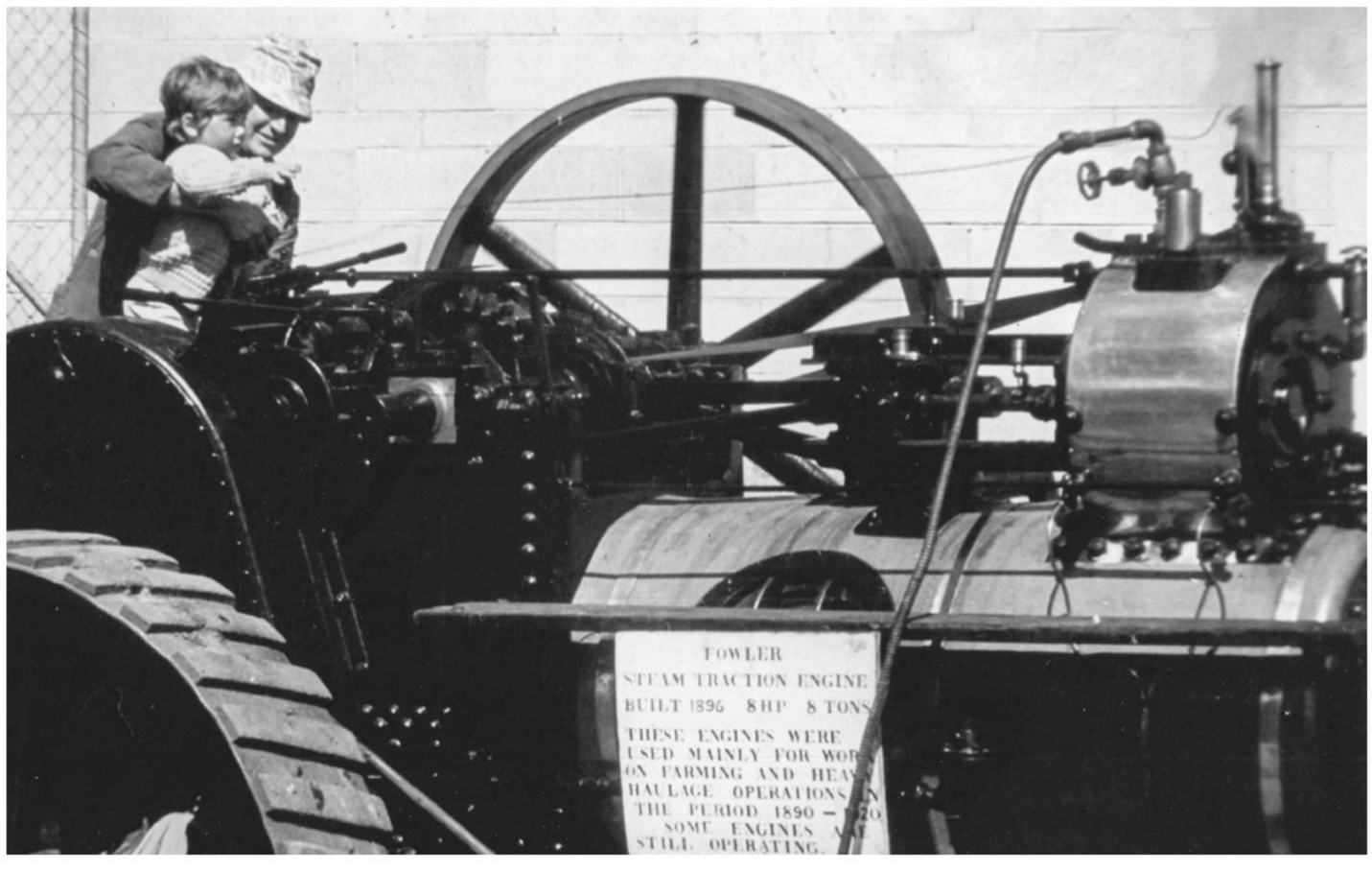
Courage and faith

Looking back over the first 25 years, secretary Harold Riddle wrote: “There was nowhere to go for advice – no money, no benefactor, nothing but indomitable courage and faith. Nobody knows what it cost in time and money from our own pockets (there were no funds to call on), and nobody cared because our cherished idea was beginning to establish itself. If we could inject each one of our 150-odd members with the will to work possessed by the ‘First Thirteen’ – boy! What a club we would have.”

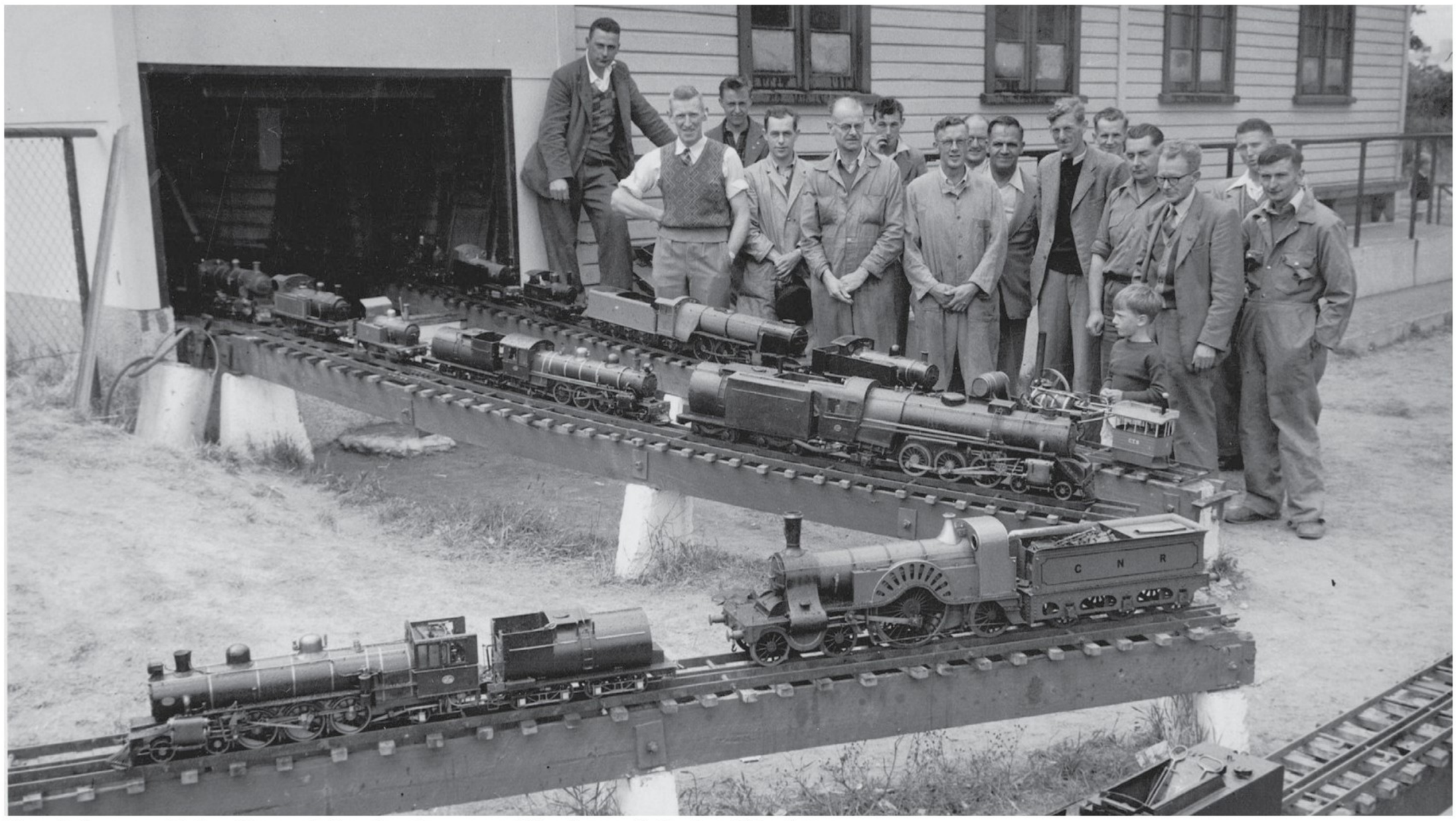
That was in 1961. Nowadays, membership is down a tad, but the bigger change is that the average age has climbed (the longest continuous membership is a chap who first joined in

This photo sprang at me out of the archives – obviously mine isn’t the first Wavemaster to grace the pond …

“Johnson Bros would accept no payment for rent, nor would they consider reimbursement for power”



… and small boys were helped up to sit on the driver’s seat



Proud pioneers. Today, the workshop involves everything from a lathe to a 3D printer

The first-floor members' lounge has a great view over the grounds and is well used

> "Fired up to put a bit more work in on their own models"

1948 and is still attending on a weekly basis).

The society meets monthly and has an engineering group, a boat group, plus ones for scale railways, tethered cars, and technology. There is a tradition of 'bits on the table', where people bring along parts and part-built (and eventually finished) models. Much discussion follows over supper, and I'm guessing others go home like me: fired up to put a bit more work in on their own models.

It is a convivial place

Besides the evening get-togethers, there are the 'Thursday toilers': those who turn up and spend from 10am until noon working (doing maintenance; anything from painting to loco repair to garden/landscape care) then head for the members' lounge to lunch and natter for the next hour or so.

Then there are the regulars who turn out to host birthdays, plus those who volunteer to run open-to-the-public events.

It is a convivial place, glued together and kept informed by *Conrod*, the long-running club newsletter. Model-building is, of course, mostly done alone at home – in the garage, under the house (or in the living room if she's away!) – but the sharing and appreciation and use of models is why this group still thrives.

So many different facets

Maybe we can leave the last word to Harold Riddle, musing long ago:

"We feel that, for one thing, there are so many different facets to model engineering. The one who builds the showcase model would break his heart if it were steamed up and the paint burnt off. The one who makes something as rough as a sack and as black as your hat – but it goes.

"The one who is meticulous to a degree regarding detail, and the one who just has an urge to make something with their own hands. There are those enthusiasts who consider you are not a model maker unless you work with steam, and [those] who could not face up to the thousands of hours and years of time required to build a locomotive."

There is no doubt they'll make 100 – and if I'm not permanently capsized, I'm aiming to be pond-side the day that they celebrate.

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By Edward Prince | Photographs: Edward Prince

MORTISE AND TENON

Part 1

We continue our series of tutorials on woodworking and cabinetmaking, and in this instalment, Edward Prince explains how to create the mortise and tenon joint, the oldest and strongest joint in woodworking

***Khufu* ship**

The mortise and tenon joint is the oldest and strongest joint in woodworking.

It is as simple as inserting one end of a piece of wood into a hole that has been carved into another piece of wood to join the two pieces together crosswise or at 90 degrees to build a wooden structure. Typically used to make frames, as in a door or between legs and rails as in a table. The strength can be improved by varying the glue, pins, and wedges.

The cavity is called the 'mortise'. The word 'mortise' is derived from the same Latin stem as 'mortem', 'mortify', etc., which in turn are suggestive of death. It is supposed that the shape of the mortise resembling the shape of the grave gave rise to the name. Thus, the mortise is the hole in one piece of wood into which the 'tenon' fits.

The end with a protruding tongue is the tenon. The word 'tenon' is derived from the Latin *teno*, to hold. From the same Latin stem, words as 'tenacity', 'tentacle', etc. are derived. The tenon fits into the mortise. Old-school cabinetmakers referred to the tenon as a 'tenant', as it lived in the mortise.

Traditional Chinese architecture

The history of mortise and tenon

Neolithic-era archaeological finds indicate that even early humans figured out that carving a hole in one piece of wood and a matching tongue in another could join them firmly.

This ancient joint dates back over 7000 years. The first examples using tusked joints were found in the world's oldest intact wooden architecture. Excavated at the settlements of the first Central European agricultural civilisation in the Greater Leipzig region, dating between 5600 and 4900BC.

A relic from ancient Egypt, the *Khufu* ship, was discovered in 1954, buried at the foot of the Great Pyramid around 2500BC. At 143 feet long and 19.5 feet wide, it used unpegged tenons joined to a flat bottom composed of several planks but no actual keel. Planks and frames were lashed together.

This remarkable joint has also been found in ancient furniture from archaeological sites in the Middle East, Europe, and Asia. Ancient man worked with wood from branches to join wood at right angles, drilling a hole in one piece and inserting a peg into it. Still used today with turned rails, such as in Windsor chairs, but for some reason they are not referred to as ‘mortise and tenon’. Many examples were found in ruins of homes along the Silk Road in the Taklamakan Desert, Xinjiang, from the 1st to the 4th century BC. Used in traditional Chinese architecture, such as beams, brackets, and roof frames, they were made to interlock perfectly, holding up temples and palaces without a single nail or drop of glue, enabling the wood to expand and contract with humidity.

Even the 30 sarsen stones of Stonehenge’s massive structure erected between 2600 and 2400BC were shaped with mortise and tenon–like features: the builders carved knobs on the tops of uprights and corresponding sockets on the capstones to lock them in place.

Mortise and tenon joinery continued to underpin timber framing in barns and houses through the medieval period and into modern times. Many 18th- and 19th-century pieces of fine furniture (tables, chairs, cabinets) owe their longevity to well-made mortise and tenon joints.

While modern methods like cam lock hardware are a standard way to connect flat-packed furniture today, for the serious craftsman, mortise and tenons are the bedrock of construction, ensuring a piece of furniture holds up for generations.

Even the 30 sarsen stones of Stonehenge were shaped with mortise and tenon features

Haunched mortise and tenon joint

Twin mortise and tenon joint

> “Old-school cabinetmakers referred to the tenon as a ‘tenant’, as it lived in the mortise”

Types of mortise and tenon joints

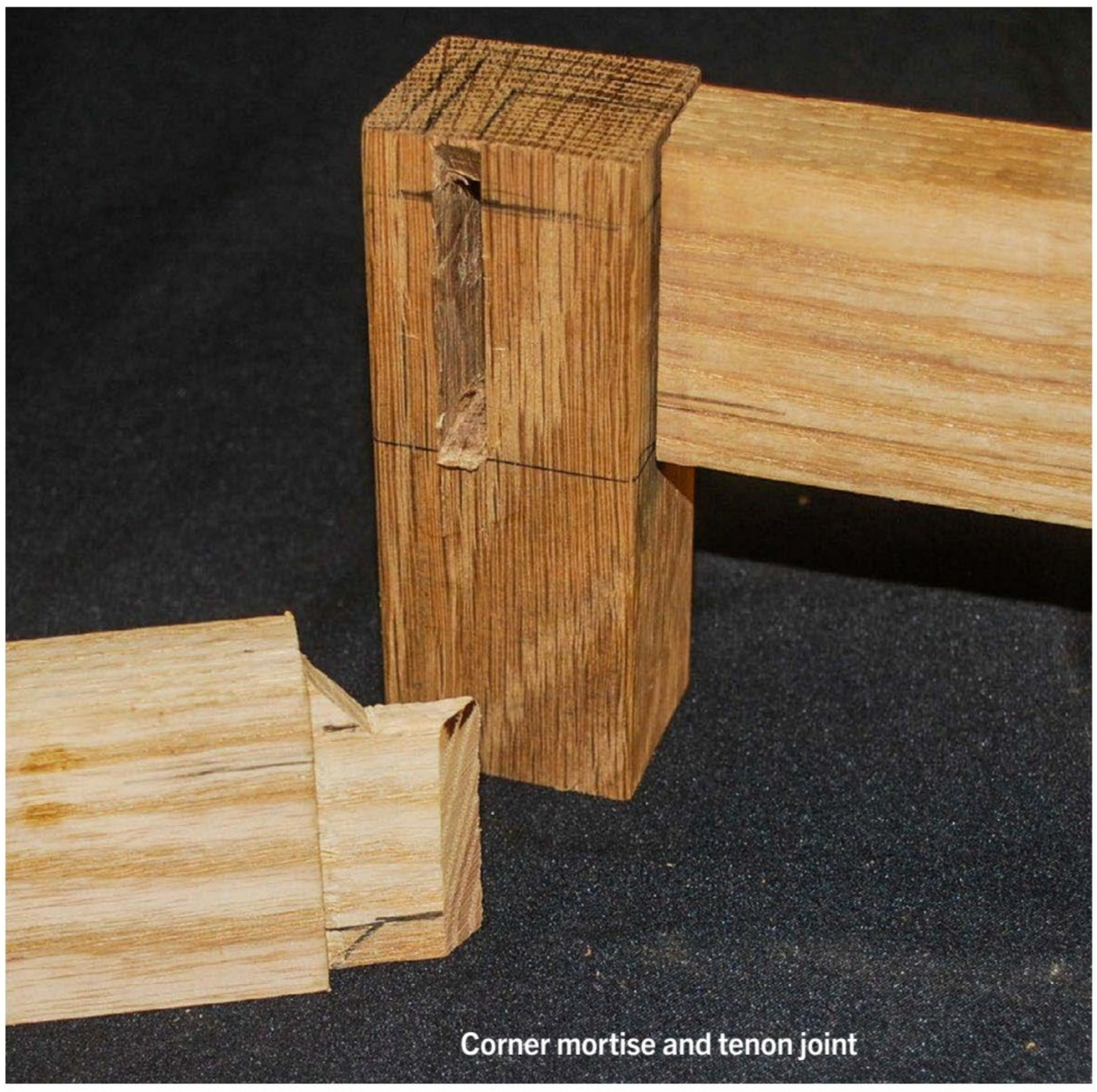
There are many types of mortise and tenon joints developed over the years for a wide range of applications. Ranging from the simple stub tenon to rebaited tenons for doors and tusk tenons found in floor joists and trestle tables.

Stub or stopped Mortise and tenon joint: The simplest and most common form of joint in which there is no sign of the end grain on the outside edge. Frequently reinforced with a wedge on the inside, preventing the joint from pulling apart.

Haunched mortise and tenon joint: Usually found on the corner of frames. Haunches support the top edge of the joint, give extra glueing surface area, and fill panel grooves with a small tongue.

Twin mortise and tenon joint: Usually found when a rail must be turned on its side for draw rail construction or when the section of timber is thick, and two equal-sized tenons would reduce the material removed, reducing the joint’s strength.

Tusk mortise and tenon joint: Traditionally used in heavy joinery for knockdown tables and benches. Frequently used in arts and crafts furniture as a decorative feature. The tenon protrudes through the mortise,



Corner mortise and tenon joint

Loose tenon Domino joint

and a wedge provides clamping force to hold it rigid.

Corner mortise and tenon joint: Commonly used at the corner of a leg and rail on chairs. The tenon is mitred where they meet inside the leg. If the haunch is not to be seen, this is angled at the top.

Double mortise and tenon joint: Typically used on wide rails to avoid removing too much wood, which would make the joint weak. The gap between tenons is no more than one-third the width of the rail, and the stub in the centre helps reduce wood movement and provide extra glueing surface area.

Loose tenon joint: Traditionally, a cross-grain or plywood tongue is fitted into a groove to act as the tenon. These are now commonly found as a Domino joint made by Festool, a quick and easy framing joint.

Open mortise, or bridle, joint: A mortise that has only three sides. This is not as strong as a standard mortise and tenon joint, typically used in frame construction and for joining table legs to an underframe.

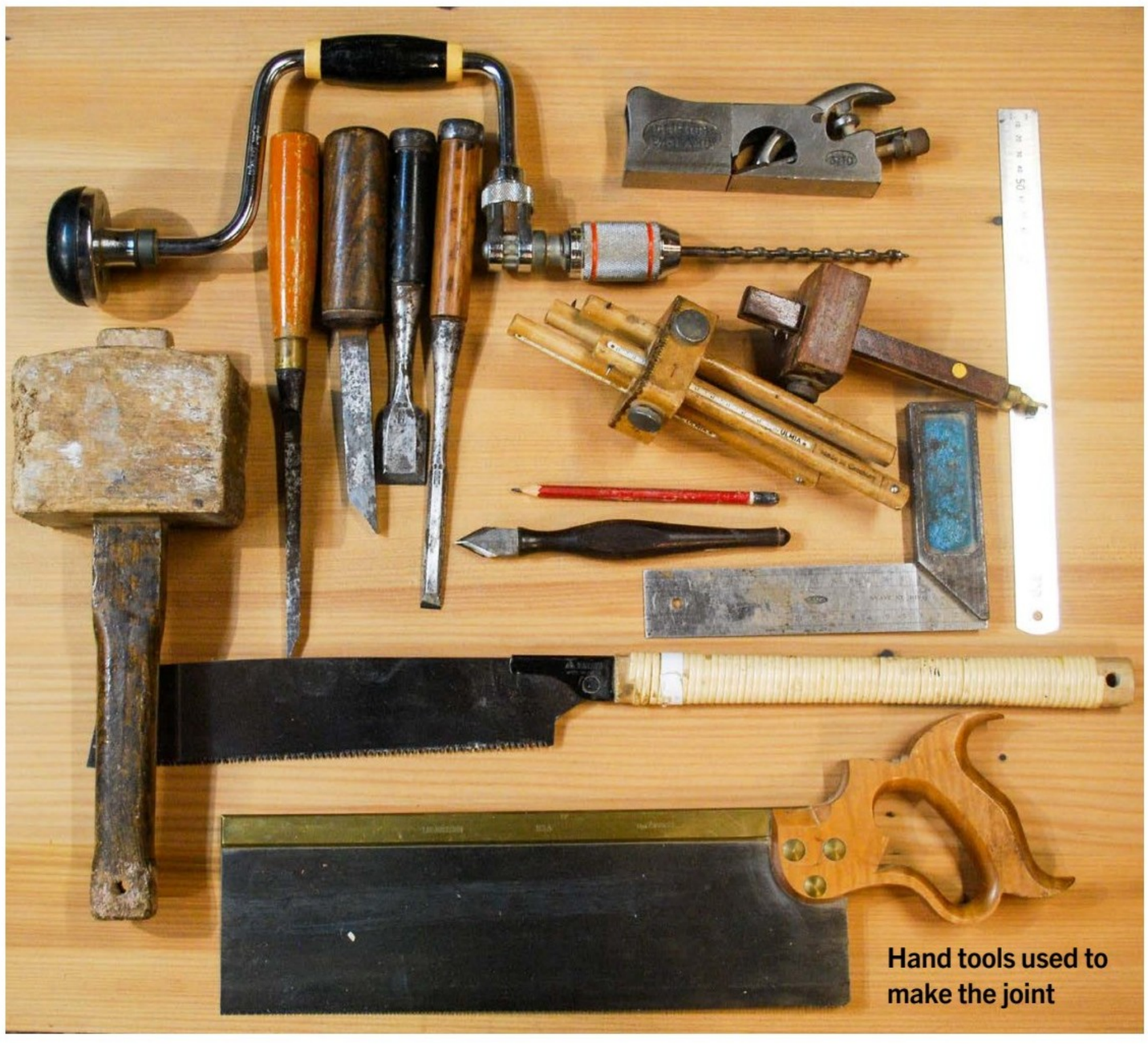
Traditional versus modern

There are many ways to make a mortise and tenon joint – in fact, ask 10 woodworkers for their method and you will probably get 11 answers. Broadly speaking, there are two categories: traditional hand-tool techniques and modern power-tool techniques. Both achieve the same result but differ in the tools used, speed taken, and the amount of noise and sawdust generated.

By hand, tenons are marked out and sawn, mortises are chiselled or bored out, then finished with a chisel. By machine, tenons may be cut with a circular saw, bandsaw, router or a specialised tenoner.

Mortises are cut with a chain mortiser, hollow chisel mortiser, or on a slot mortise machine. For a limited number of joints, it is often quicker to make them by hand rather than setting up machines.

For production, a router or mortiser, a good table saw, or tenoner is best. I



Hand tools used to make the joint

enjoy using hand tools: less noise and dust and peace of mind. Whether you choose to go unplugged with hand tools or don the earmuffs and dust mask to use machines, the goal is identical: accurate, clean cuts that produce a joint that fits snugly together like puzzle pieces.

Traditional hand tool methods

It is important to choose the right tools for the job. A mortise and tenon joint demands precise cutting and fitting. Good quality, sharp tools make a big difference.

Mallet: The mallet drives the chisel for morticing and delivers controlled force – no need for a heavy baseball bat; the weight of the mallet does the work.

Mortise chisel and bench chisels: Sharp chisels slice wood fibres rather than crush them, providing clean, accurate results. A mortise chisel is a beefy chisel with an extra-thick blade designed to withstand pounding and leverage without bending or breaking. Standard bench chisels are useful for cleaning up, paring the sides of mortises, and trimming cheeks and shoulders. Choose a chisel width the same as the mortise.

Tenon saw: For cutting tenon shoulders and cheeks by hand, a backsaw with a rigid spine is the classic choice with 10 to 14 tips per inch (tpi). Japanese saws like a *ryoba* for large tenons or a *dozuki* for fine ones cut quickly.

Mortise gauge, marking gauge and layout tools: Proper layout is the key to success in joinery. A mortise gauge has two adjustable pins used to scribe parallel lines that define the width of the mortise and the tenon, ensuring the tenon thickness matches the mortise width. A marking knife sharpened on one side only and a combination square or try-square are used to draw shoulder lines. Rulers set the length and depth of both parts.

Brace and bit or hand drill: Traditionally, a hand-operated brace and auger bit bores out waste before chiselling, speeding up chiselling the mortise.

Mortise chisel and bench chisel

Morticing with a router and morticing jig

Shoulder plane: A shoulder plane is fantastic for trimming the shoulders of tenons or for shaving the cheeks to achieve a perfect fit.

Machines

Loose tenon joinery: Includes the humble dowel, the biscuit, and the Domino joint where both pieces get a hole/mortise and a separate floating tenon is inserted. Their value is the speed of execution, making a joint that is still wood-to-wood strong.

Hollow chisel mortiser: The hollow

Domino jointer

Drilling mortices on the pillar drill

Sawing the tenons on the table saw

chisel mortiser is a specialised machine well worth the investment if you cut mortises frequently. It uses a square hollow chisel with a drill bit inside it. As you lever the chisel down, the bit removes material, and the chisel's sharp square edges pare the sides of the mortise cleanly. The result: a square hole in one stroke.

Plunge router: A router is an essential tool for most woodworkers. Fitted with a fence or a mortising jig, a plunge router cuts clean mortises. Ideally, use a spiral up-cut bit that matches the mortise width to eject chips efficiently, increasing the depth gradually. The router's speed ensures crisp edges. Routers can also be used to cut tenon cheeks using simple jigs.

Electric drill or drill press: A drill press with a Forstner bit or brad-point twist drill quickly removes the bulk of a mortise. Set the shoulder width with a fence and the depth using the stop to ensure the holes are perpendicular. There are mortising attachments for drill presses that turn them into mortisers, but they have mixed reviews on efficacy.

Table saw: The table saw is excellent for cutting tenons. The timber is held securely in a jig mounted on the fence or runs in slots in the table. A mitre saw, used by taking repeated passes with the work face down, or a band saw, can cut tenon cheeks but will need to be refined with a chisel.

Proportion of the mortise and tenon

The proportions of the mortise in relation to the tenon are important for the strength of the joint.

This is usually determined by the section of the tenoned member. Most rails will have the widest face vertical; an exception would be drawer rails which have the wide face upwards.

Sawing the tenon cheeks using a mitre saw

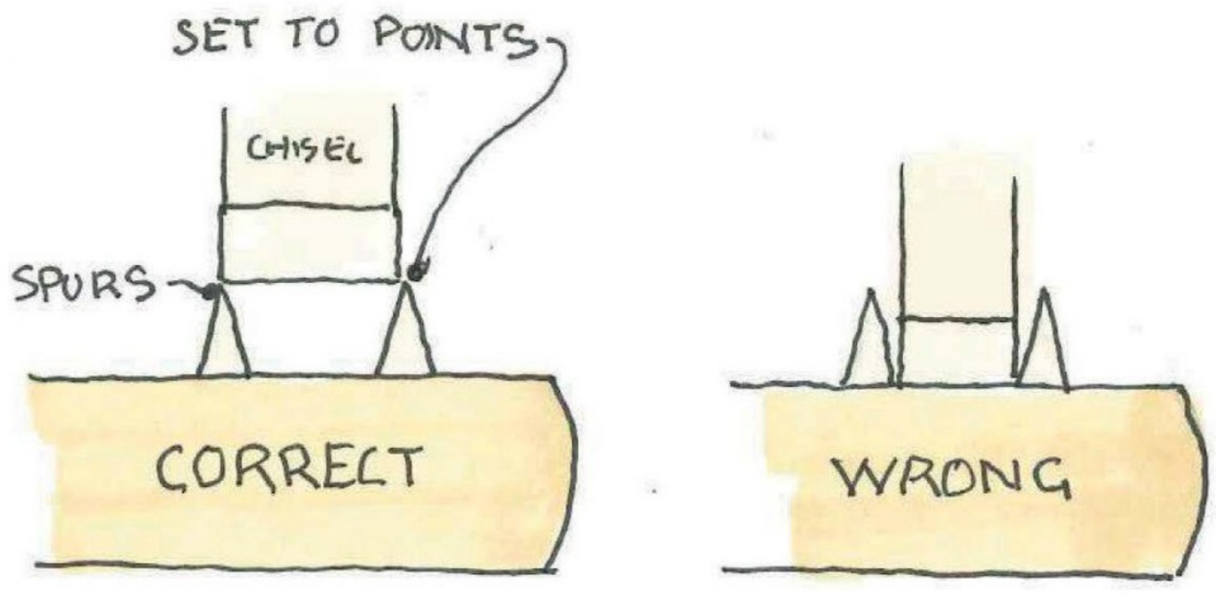
Whatever the orientation, the cheeks should be cut so there is a maximum amount of long grain for glueing to the inside of the mortise. Generally, the width of a mortise is one-third the width of the wood.

When the rail is joined to a thicker upright, the thickness of the tenon could be as much as half the thickness of the rail. Tenons are usually the full width of a rail unless the rail is very wide, in which case the tenons will be divided in two, known as a double Mortise and tenon. The length of the joint is usually ⅝ the length, just over half, or ¾ the width of the tenon.

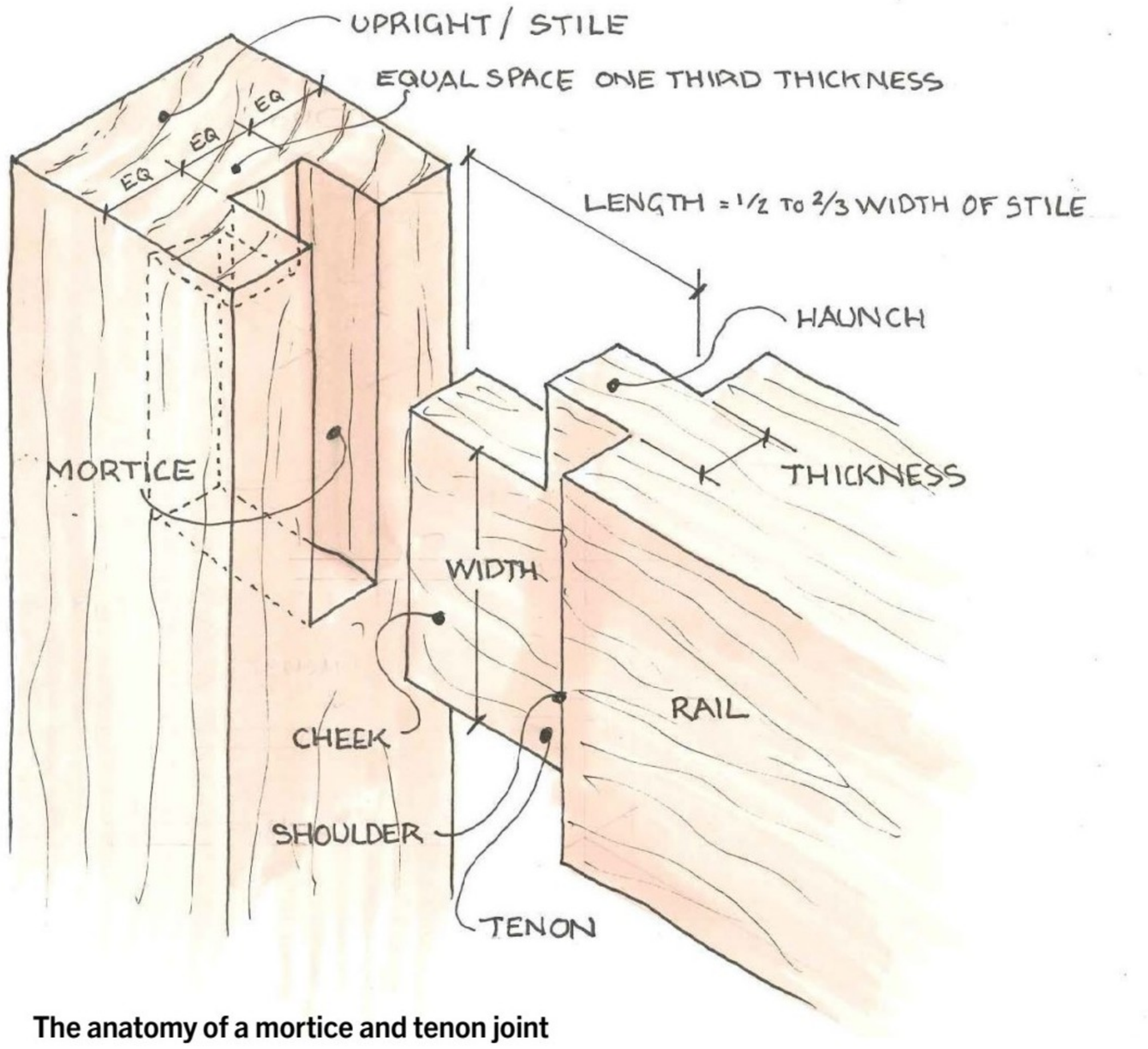
Making a mortise and tenon joint with hand tools

Making a mortise and tenon joint by hand is simple if you follow the basic principles of tool use: technique, sharp tools, accurately prepared wood, and patience. Cut the mortise first, then fit the tenon. It's easier to fit the tenon to your mortise rather than the other way around.

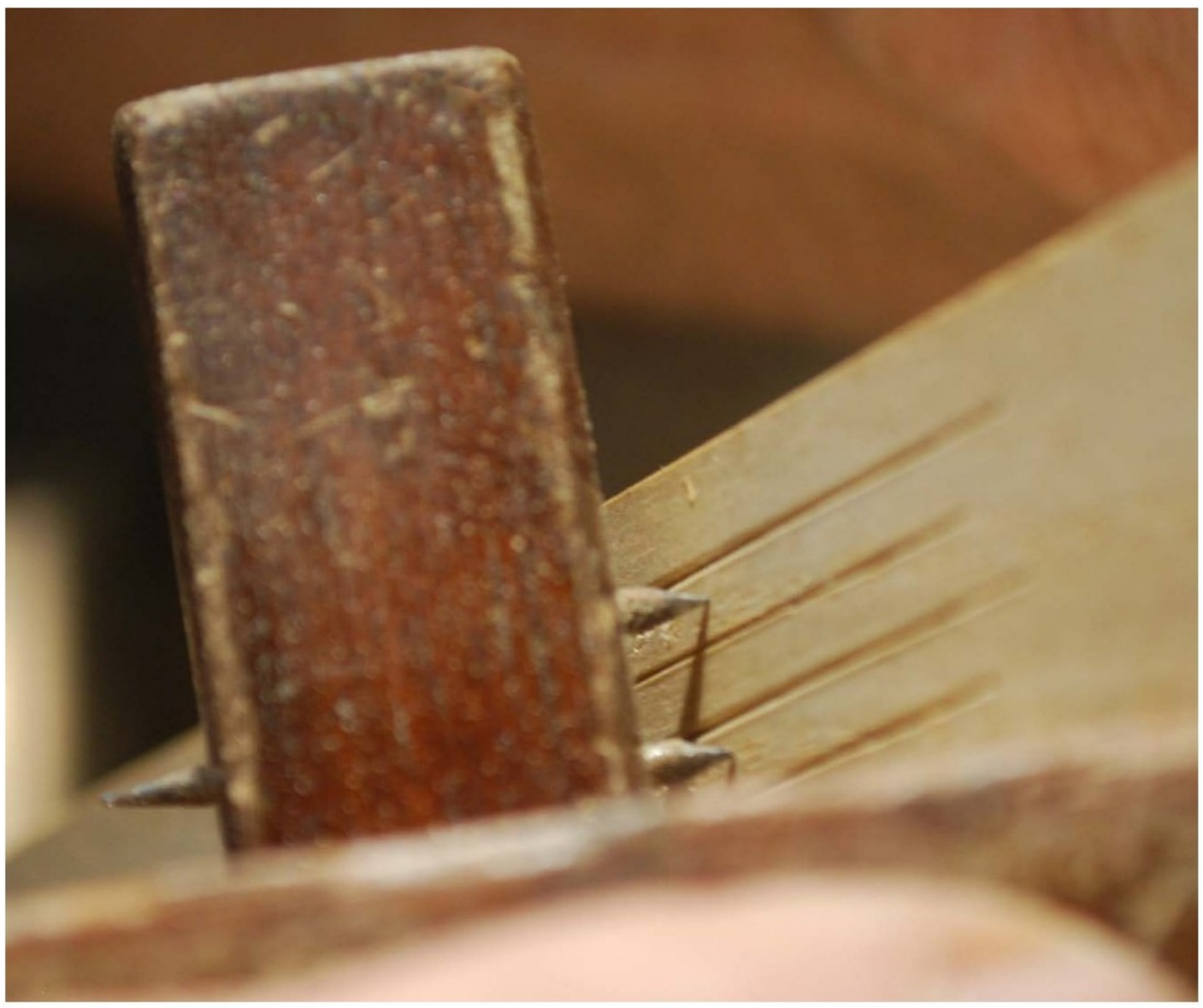
Good preparation and accurate marking out make all the difference. Plane the wood square and parallel; always mark the face side and face edge; these marks provide the datums from which you do all your marking throughout the project. ▶



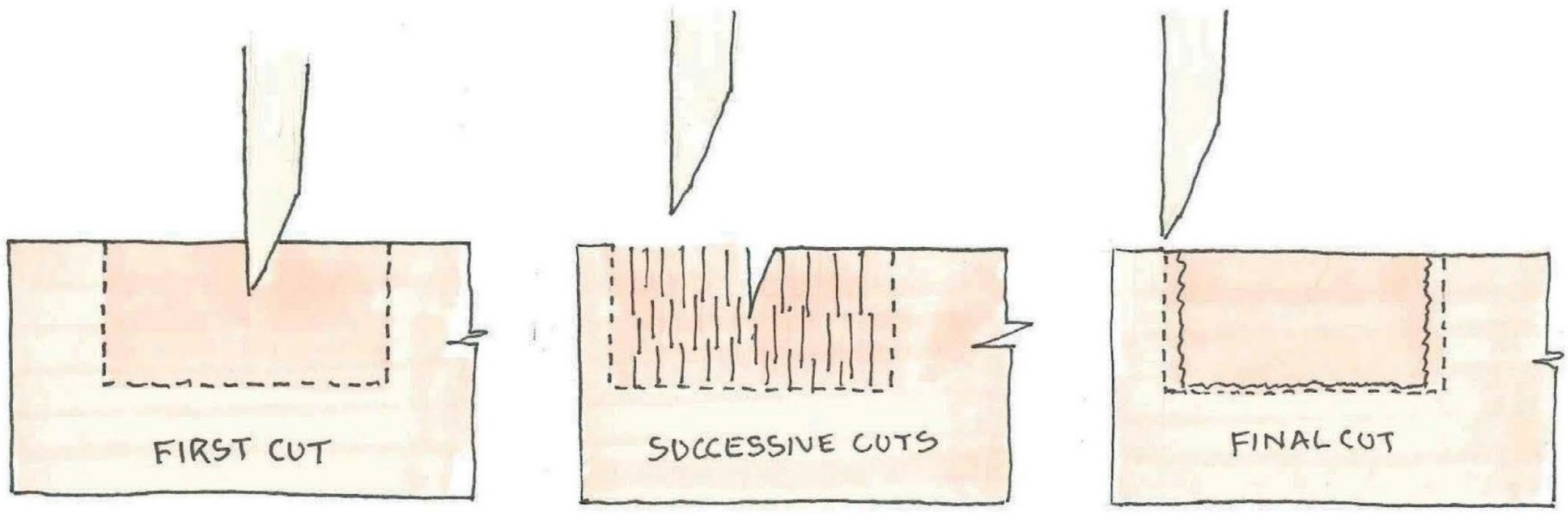
Setting a mortice gauge to the chisel



The anatomy of a mortice and tenon joint



Setting the gauge so it is central



CHOPPING THE MORTICE

Set out the width of the mortise with a marking knife. Set the points of the mortise gauge to the width of your chisel and shoulder width. If the joint is centralised, check you are accurate by making a mark with the points of the gauge from one side, then again from the other side, then adjust the points so they are in the middle of the marks. Then scribe parallel lines for the mortise's sides, working from the face side.

To avoid scribe lines that will be seen, press the points into the end of the mortise on the shoulder line so when you scribe the line the points drop into the marks and stop. When making a through mortise, transfer shoulder lines around the wood and mark the opposite side.

Mark out the corresponding tenon on the edges and end grain of the mating piece, leaving a couple of millimetres extra on the length. Mark shoulder lines around the stock with the marking knife from the face side and edge. Placing the knife in guidelines and bringing the square up to the knife as you mark round the corners helps if your eyes are not quite what they used to be.

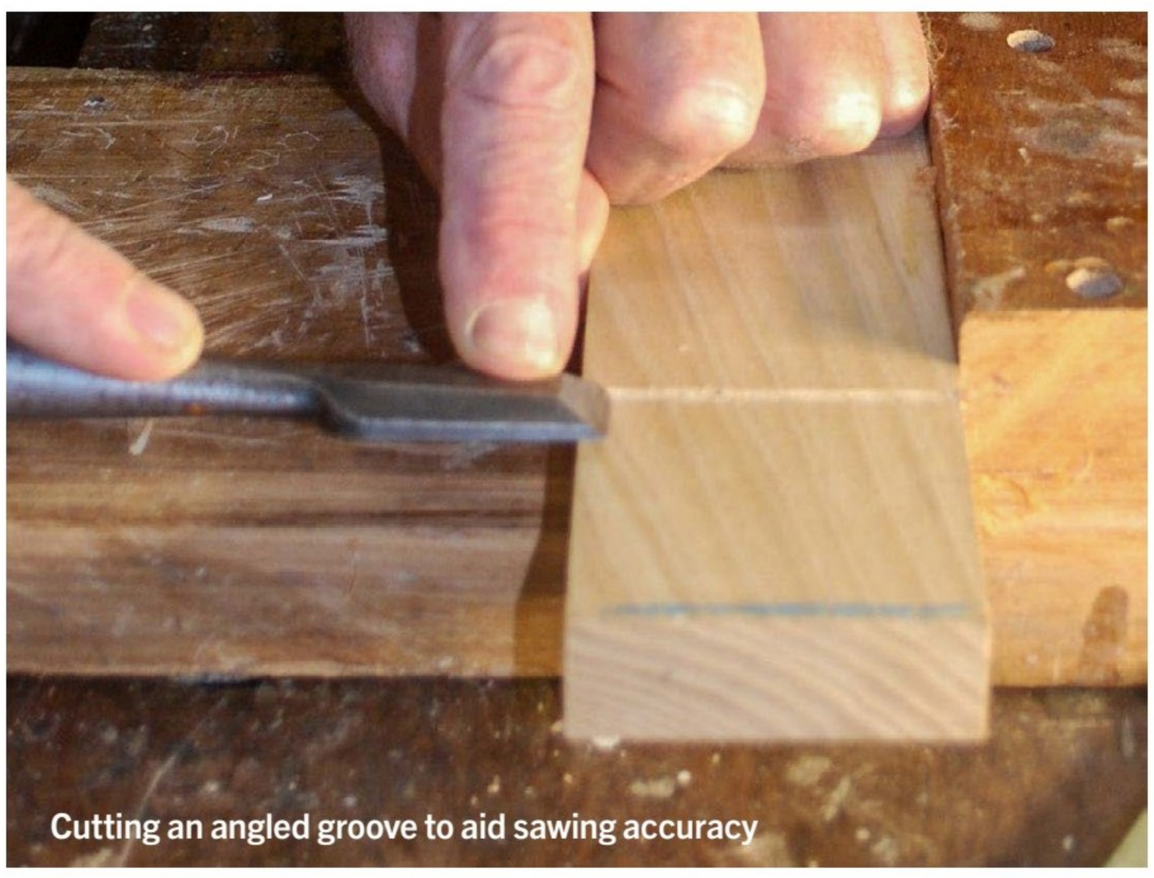
Cut the mortise

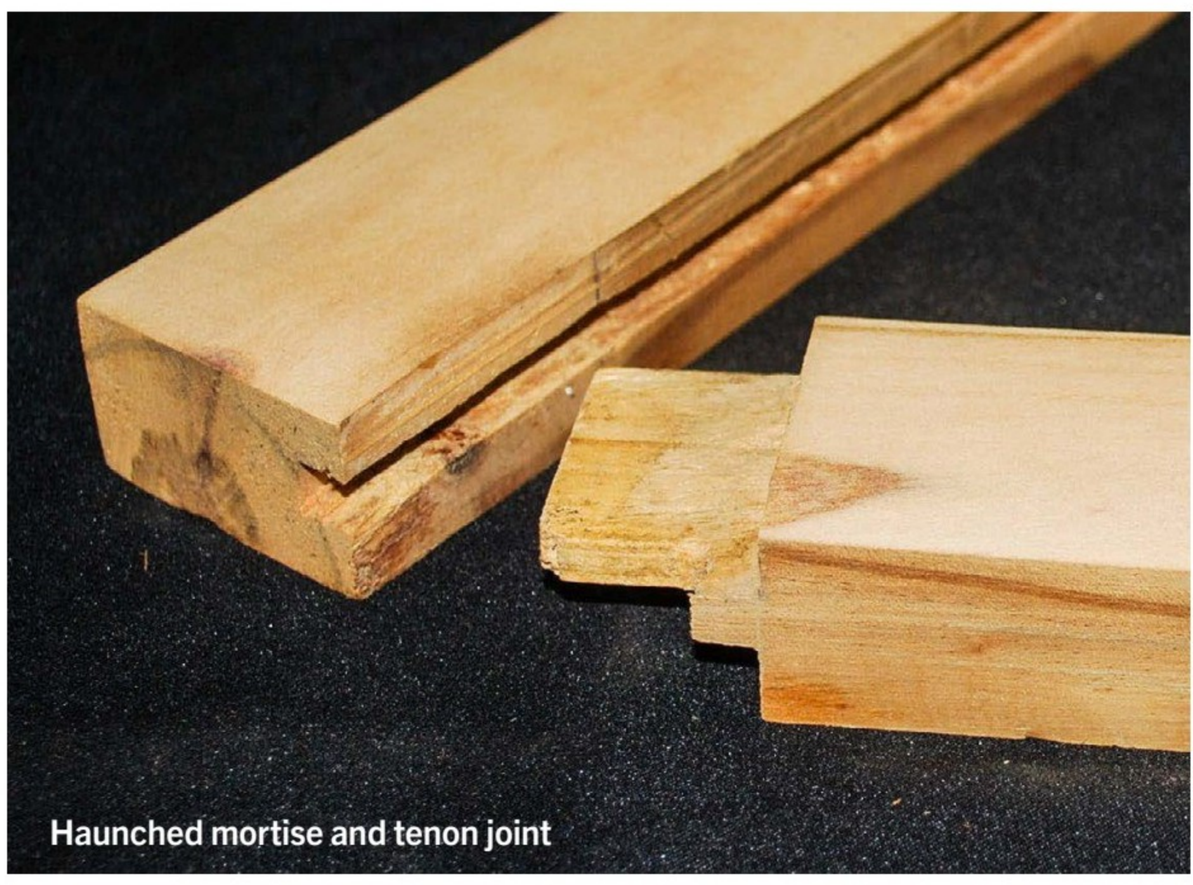
Clamp the timber to the bench top so it can't move. Holding it in the vice is not secure, as when you strike the chisel the timber will move. Work at the end of the bench so you can stand behind the chisel and see that it is vertical. A block clamped across the width prevents the wood from splitting with delicate timbers.

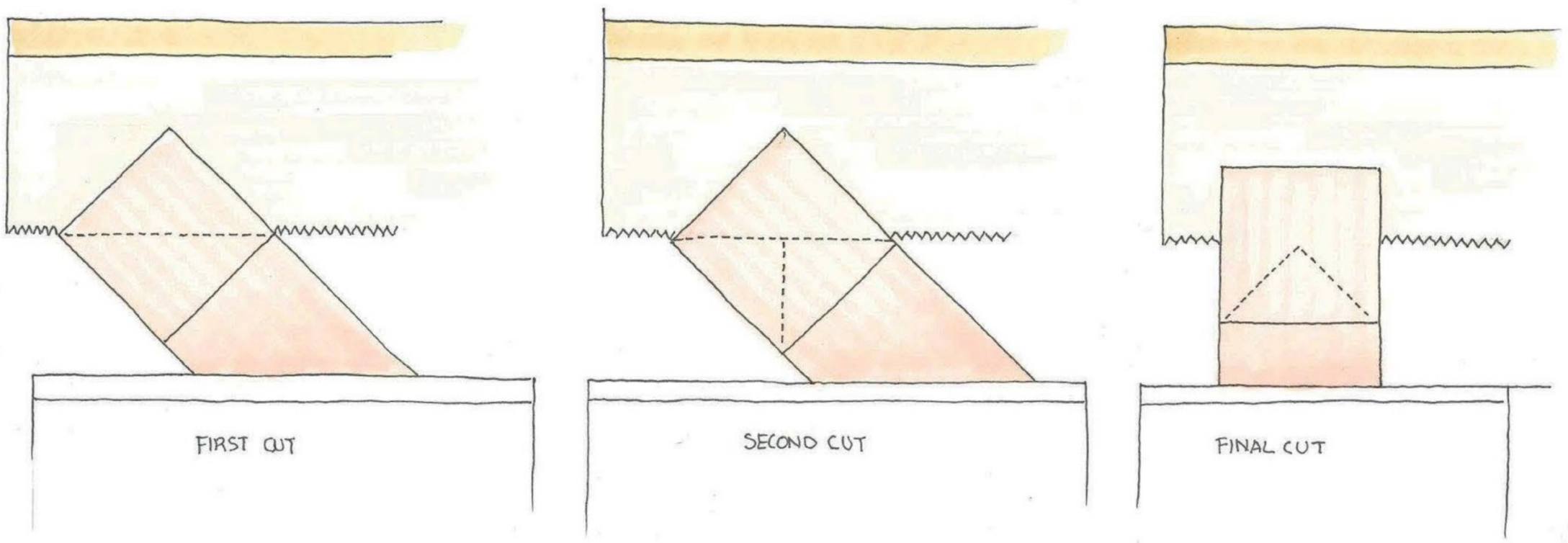
Use the mortise chisel by starting in the centre and working to the edge. Stop 3mm from the end to avoid damaging the end as you lever out shavings, which will compress and bruise; you clean up this once the correct depth has been reached.

Strike the chisel with strong blows, the bevel towards you. Drive the chisel in, then lever out a chip, and repeat, moving the chisel along 2mm max. each strike, working your way along the mortise. Keep the chisel vertical, using the blade to sight it is perpendicular to the wood and use its width as a guide between your scribed lines. Gradually deepen the cut in multiple passes. Finally, square up the ends with a bench chisel. Clean any remaining debris from the bottom. You should now have a neat rectangular pocket with square corners, smooth vertical walls with no bumps and a consistent depth.

If you are making a through mortise, chop halfway through, and then turn the wood over and work from the other side.


Cutting an angled groove to aid sawing accuracy


Haunched mortise and tenon joint



Cut the tenon by hand

Mark out with the mortise gauge working from the face side/edge.

Scribe the shoulder lines with a single bevelled marking knife to obtain crisp, square corners on the shoulders. A Stanley craft knife is not good, as it leaves a chamfered edge that will show when you assemble the joint.

Place the wood in a vice at 45 degrees so you can see two edges and follow the line. If you try to cut in one step, you can't see the blind side, and it is highly likely your saw will wander away from the line. Turn the wood around and cut the second side, then finish by holding it vertically and sawing to the shoulder line.

To cut off the cheeks, hold the wood on a bench hook and saw to the waste side of the shoulder line. Keep your wrist, elbow, and eye in line with the back of the saw to keep your cuts straight and true. Take care not to cut into the tenon as this will weaken the joint.

You can make starting the cut easier by carefully chiselling an angled groove for the saw to sit in. Finally, chisel down to the shoulder line; take lots of small cuts with a wide chisel rather than a few big cuts. This avoids the wedge action of the blade pushing the cut into the shoulder. Clean up the inside corners with a chisel.

Test fit and adjust

If you have taken care to do the work accurately, insert the tenon into the mortise to check the fit.

In a perfect world, it should go in all the way, and the shoulders of the tenon piece should snug up against the mortised piece with no gaps. If it's too tight, don't force it – remove and look for rub marks on the tenon.

Trim shiny spots with a chisel or shoulder plane. If the tenon slides in too easily and is loose, that's a concern – a loose fit is a weak joint. You can shim a slightly loose tenon with a bit of veneer, but it's best to have it snug from the start. Never assume filling the joint with glue (unless you are using epoxy) will fill the gaps. PVA/Aliphatic adhesives all shrink as they dry, as they evaporate and the glue holds fresh air.

Check the pieces are flush and meet at the correct angle. Take the time to fine-tune, trim, then gently fit, trim, fit, etc., again, until it's Goldilocks's "just right".

This step separates a professional joint from a shoddy one. Keep the cabinetmaker's rhyme in mind: 'In skill and tools we trust and what they won't do, putty must', and no self-respecting cabinetmaker wants to use filler.

Glue-up and assembly

If everything looks good, coat the tenon cheeks and the mortise walls.

A small brush spreads it evenly. Don't use too much glue; you want a bit of squeeze-out, but excessive glue can make it hard to fully seat the tenon or leaves a mess.

Avoid filling a blind mortise's bottom with glue; it has nowhere to squeeze out, which prevents the tenon from seating. Use clamps to bring the shoulders tight if needed. Wipe it off with a damp rag promptly and ensure the assembly is square; measure diagonals if this is a frame.

Reinforcement

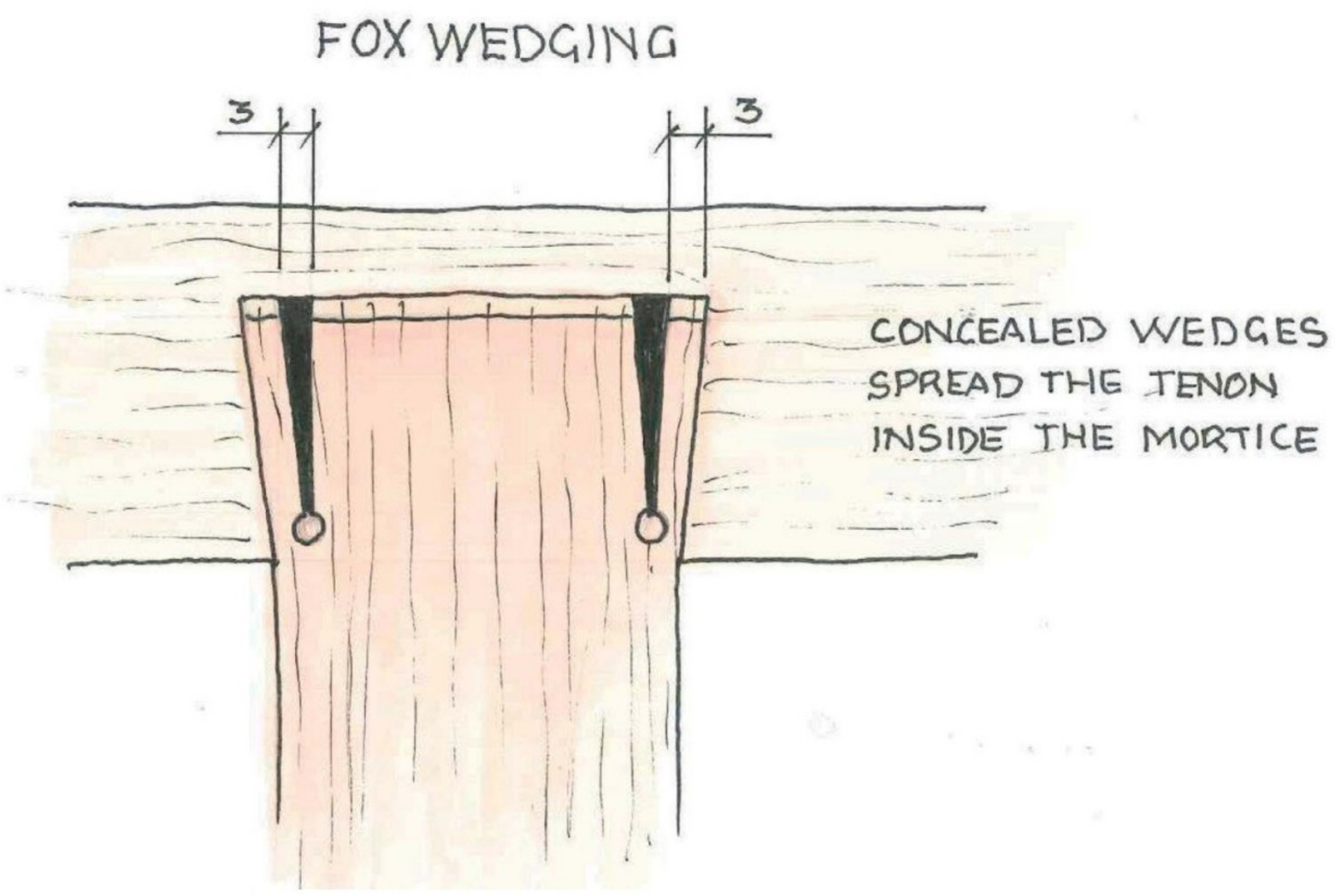
A basic glued mortise and tenon joint is very strong on its own.

For extra reinforcement or decorative flair, you can pin or wedge the tenon. To 'draw bore' a pin, drill a hole through both sides of the mortise, then insert the tenon, marking the centre of the hole using a brad-point drill.

Remove the tenon and measure 3mm towards the shoulder, making the hole slightly offset and drill through the tenon.

Insert the tenon back into the mortise, then hammer in a wooden dowel or

"In skill and tools we trust and what they won't do, putty must!"



Fox wedges

peg that acts as a locking peg. This is common in timber framing and rustic furniture, where the pins are visible. Pins are traditionally split from a piece of wood and shaped because there is no guarantee that the grain of a dowel is parallel. These pins are called 'tree nails', shortened to 'trennels'.

Wedges used in stub tenons and through tenons are known as 'fox wedging'. Saw a kerf across the tenon end about 3mm from the edge and insert a small wedge before the glue dries. This expands the tenon and locks it into the mortise. These techniques can be overkill for a casual project, but they are traditional methods to mechanically lock a joint and add character, especially if the wedges are made of a contrasting timber.

Conclusion

Mistakes in wood are often design opportunities in disguise.

You probably can't spin a gap into a feature quite so easily; however, you can recover from errors with a clever fix.

Each slip-up trains your eye and hand to do better next time so that mistakes become much rarer. Mastering this joint opens the door to building sturdy chairs, tables, doors, and frames. As you practice, maintain a balance of precision and patience with a touch of humour to stay sane. Expect that your first few joints might be a bit loose or gappy – that's OK!

Woodworking is all about practice; your sawing will get straighter, and your chisel aim truer. There will be challenges, but the satisfaction of feeling a well-fitted joint push home is worth it as you join the ranks of true craftsmen.

Coming up in Part 2 of Mortise and Tenon in the next issue of *The Shed*, Issue No. 129, we give you a project to put all your newly learned skills to the test: making a cabinet.

Our project cabinet was initially inspired by English Arts and Crafts furniture from the 1920s and incorporates different types of mortise and tenon joints.

> "These pins are called 'tree nails', shortened to 'trennels'"

Trouble-shooting

Even experienced woodworkers have moments where a joint doesn't go as planned. Here are some frequent mistakes and pitfalls and advice on how to avoid or fix them to learn from others' mishaps instead of your own.

Mortise too deep or tenon too long: This will weaken the joint by reducing the wood left at the bottom, wasting time and glue. To avoid this, mark your intended depth clearly with tape on the drill bit or chisel as a depth stop. If a tenon is cut too long, it is better to trim it rather than further deepening the mortise.

A loose-fitting joint: It has less surface contact with the mortise, so the structure will be weak. To avoid this, work up to the fit gradually; it is always much easier to remove material than to put it back; err on a touch thicker and trim down gradually. If the fit is loose, glue in a thin shim on one cheek of the tenon and recut it or use epoxy as a gap-filling glue.

Tenon too tight: This risks splitting the mortised piece or getting the tenon jammed halfway. To avoid this, test-fit it frequently as you fine-tune the tenon. Look for crushed wood fibres; shiny burnished spots indicate where it's rubbing. A slight chamfer on the ends/edges helps it start into the mortise.

An inconsistent layout and misalignment: To avoid this, *always* mark your joints from the face side and edge marks on your stock. Use story sticks or consistent measurements for repetitive joints. Double-check before cutting that the mortise and tenon locations correspond exactly. Take the time to measure and mark carefully; you'll save hours of frustration later.

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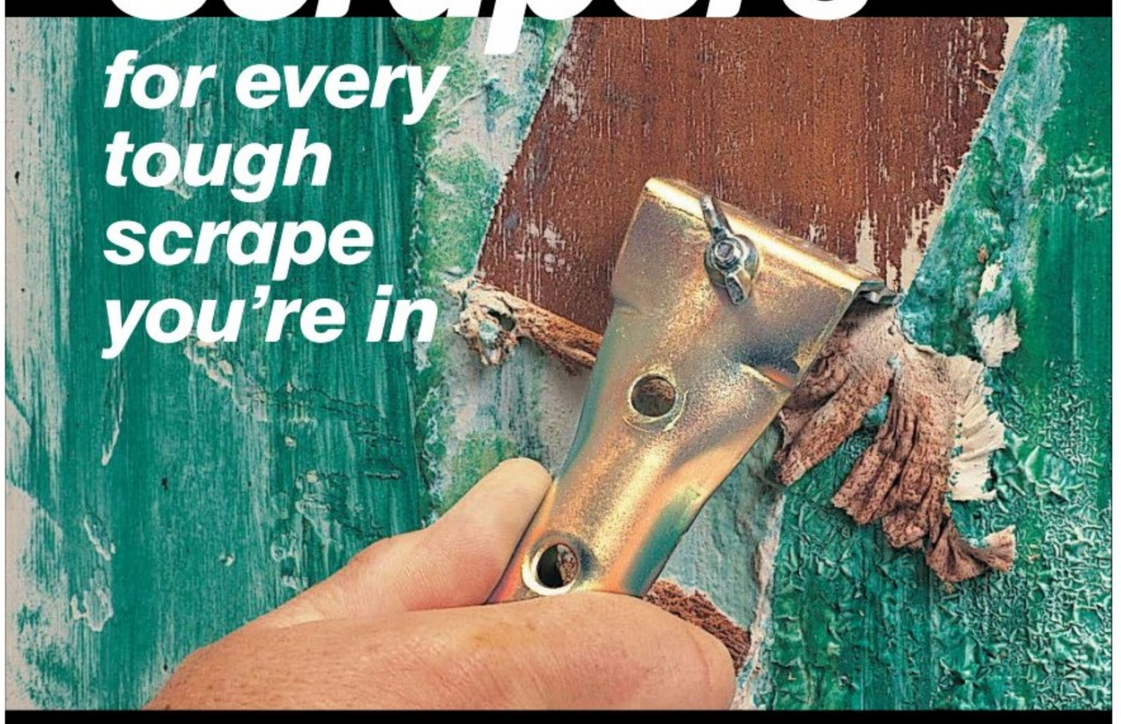

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Metal engraving

Reece hard at work in the studio

HAND ENGRAVING ARTIST

Blending culture, craftsmanship, and creative edge, Reece Harlan is redefining freehand metal engraving. With a background as a welding engineer and early roots in graffiti and street art, he combines technical precision with raw artistic expression to create one-of-a-kind pieces

By Melissa Hannan | Photographs: Reece Harlan, razu.visuals

Reece Harlan is a welder and engineer by trade. A devoted dad who, in the early days, was juggling full-time work, raising a family, and teaching himself an entirely new craft in his spare time.

Even as a kid, Reece was constantly drawing, doodling, and immersed in graffiti art. Pursuing art in some form always made sense. But in 2017, everything shifted when he came across an engraved low-rider car 'knock-off', or 'spinner', wheel cap. Engraving itself wasn't new to him, but that was the moment it truly caught his attention. He became consumed with questions. How do you do this? Where do you get the tools? How does it all work? Finding a mentor in New Zealand proved difficult, as the craft isn't widely known here, so Reece turned to the internet and began researching on his own.

He invested thousands of dollars in equipment he hoped would get him started, opting for more affordable overseas gear, as high-end American tools were out of reach. But when it arrived, reality hit.

With no guidance and no hands-on knowledge, nothing seemed to work – it wouldn't cut – and frustration quickly set in. Demoralised and doubting himself, he nearly gave it all up.

Instead, he quietly continued practising on scrap metal, slowly building his skills through trial and error and sheer determination.

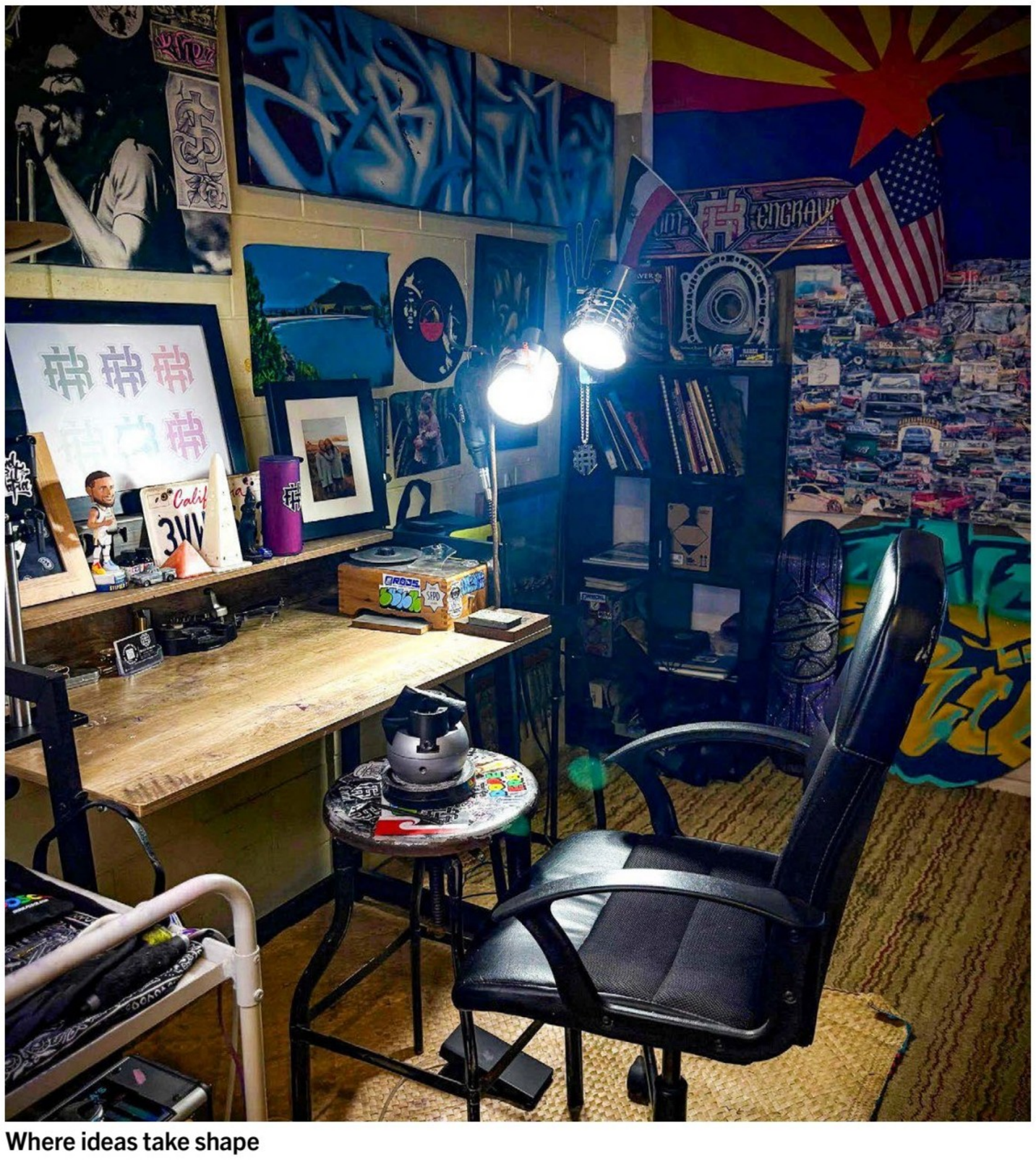
Finding a mentor

In those early research days, Reece began following American artists. Watching them engrave intricate designs onto low-riders instantly resonated with him. It opened his eyes to what was possible within the engraving world and gave him something tangible to aim for.

One artist in particular, Hilario Lugo,

> "Then return to the workshop and engrave until 10pm"

Reece in the US learning from the one and only Hilario Lugo



Where ideas take shape

One of his earlier pieces that opened doors

Custom engraved wheel knock-offs

Precision-engraved engine components

really captured his attention, the detail and the uniqueness of the work striking him. “It really stood out to me. It was very unique, he had the knowledge I needed,” he recalls.

Determined to learn from the source, Reece booked a video call with Lugo, a moment he describes as game-changing. During that conversation, Lugo generously shared insights into tools, techniques, and where to source the right equipment. That clarity and direction were all the motivation Reece needed. He made the bold decision to sell one of his cars to fund his next steps – travelling to the US for lessons and investing in the proper tools to pursue engraving seriously.

Practice makes perfect

From that point on, Reece decided he was all in. He told himself, “I’m just going to practise. I’m going to work on this. I’m going to spend nights and weekends on it.”

At the time, he was still working full-time as an engineer, but his boss saw his dedication and gave him the keys to the workshop so that he could work after hours.

Custom engraved components bringing a unique finish to this RB engine

His routine became relentless. He’d finish a full day on the tools, head to the gym, then return to the workshop and engrave until 10pm. Weekends were no different. For years, this was his rhythm – work, train, engrave, repeat. Most people didn’t even know what he was doing. Behind the scenes, he was drawing constantly and practising on scrap metal, slowly refining his craft.

Guidance from artists like Lugo helped shape his mindset. Despite investing in quality American tools, he was reminded that equipment means nothing without strong design. “You can have the best tools, but if your design isn’t on point, it doesn’t really matter,” Reece says.

One piece of advice from a master engraver has stayed with him ever since: “Draw, draw, and draw until you are sick of it. Then draw some more. Everything you do as an engraver stems from that.”

Impala interior door handles

Drawing the details

“Investing in the proper tools to pursue engraving seriously”

Not your average air freshener

Engraved low-rider plaque

So, Reece went back to the fundamentals. He drew. He practised. And he kept showing up, night after night.

Learning from the best

As his passion grew, Reece reached out to other engravers, some of who became a pivotal influence in his journey. One such person, generous with his knowledge, sent Reece books, drawings, and resources and was one of the first to truly teach him how to draw with purpose.

Through social media, Reece later connected with Louis Klein, a metal engraver based in Arizona. The two quickly formed a bond. What began as online conversations soon developed into a genuine friendship. They spoke regularly, sharing knowledge and ideas, and Reece absorbed everything that he could.

Then came the message that would change everything. Lewis reached out to say that he and Lugo were running a small engraving class in the US and that Reece should come.

The logistics felt overwhelming at first, but it was one Reece couldn’t turn down and an opportunity he was determined to make work. *What have I got to lose?* he thought.

Reece spent a week in the US immersed in a hands-on workshop, surrounded by master engravers. It was there that he discovered the missing pieces – the small technical details, the refinements, the confidence – that would take his work to the next level.

Scrollwork

‘Scrollwork’ is a classic engraving style built around flowing floral and leaf motifs. Intricate, spiralling curves that resemble unfurling paper, vines, or rolling waves, with each line connecting seamlessly to the next.

As Reece developed his skills, he began digging deeper into the history behind the craft. He studied the early pioneers of engraving, including the famed western and Texan cowboy engravers whose work shaped the traditional scroll styles still admired today. Long before modern air-powered systems and compressors, early

engravers relied solely on hammer and chisel.

The science behind the art

Mastering engraving isn't just about creativity – it's about precision.

Reece immersed himself in every technical aspect of the craft: drawing fundamentals, tool selection, sharpening techniques, understanding cutting degrees and angles, and the geometry of tools. Every detail matters. The slightest adjustment in angle or sharpening can completely change the way the tool cuts into metal.

Once he had the right equipment and the technical knowledge behind it, there was no halfway point. He decided to fully commit. Today, Reece works primarily with pneumatic air engraving tools and also rotary Dremels.

Cut with intention

Reece came home from the US with something he hadn't fully had before – confidence!

At the start of 2024, after years of practising quietly behind the scenes, he finally began sharing his work on social media. The determination had been there all along; he'd spent years refining his skills before ever considering putting himself out there.

His first official commissioned piece was for a customer's motorbike. The nerves were real. The parts arrived polished and gleaming, and suddenly the pressure felt different. "I was scared. I didn't even want to draw on them … didn't want to make that first cut," he says. The weight of responsibility hit hard, but he pushed through. He completed the job, and the client loved it. That engraved piece is still on the bike today – a milestone moment that marked the true beginning of his business.

From there, momentum built quickly. Jobs began rolling in, and Reece realised he had something special. He set up a studio at home and committed fully to the grind. By the end of 2024, he made the leap, leaving his full-time engineering job to pursue engraving as a full-time career.

Strategically, he gifted pieces to influencers, and before long, his social media and phone were blowing up. His work has since travelled across New Zealand and into Australia and the US. From sun visors, plaques, and door handles to number plate surrounds, motorbike levers, turbos, lighters, baseball bats, and necklaces – if it's metal, he'll engrave it.

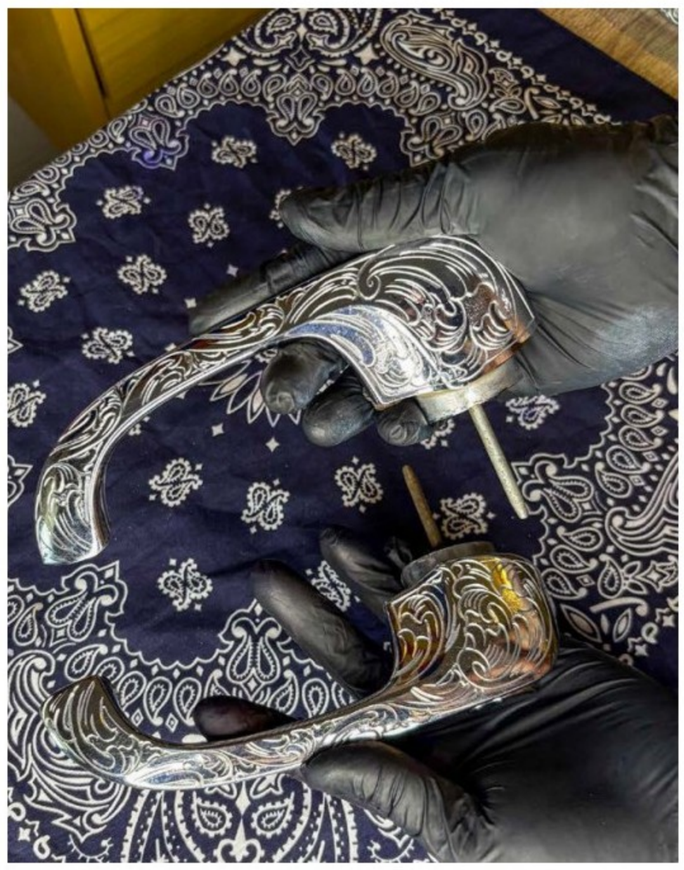
Custom intake manifold

> "Early engravers relied solely on hammer and chisel"

He predominantly works with aluminium and mild steel, following a careful process: polish first, sketch, and then engrave.

He continues to evolve his own recognisable style, rooted in traditional scrollwork but infused with his personal touch.

Goals still drive him. But above all, he knows the journey is ongoing. In engraving, you're forever learning, forever refining, and the key is surrounding yourself with people who motivate you and push you to be better.



Chev door handles

Find Reece at reecetheengraver.com, on Instagram (@reece.the.engraver), or on Facebook (search 'Reece Harlan Engraving Art').

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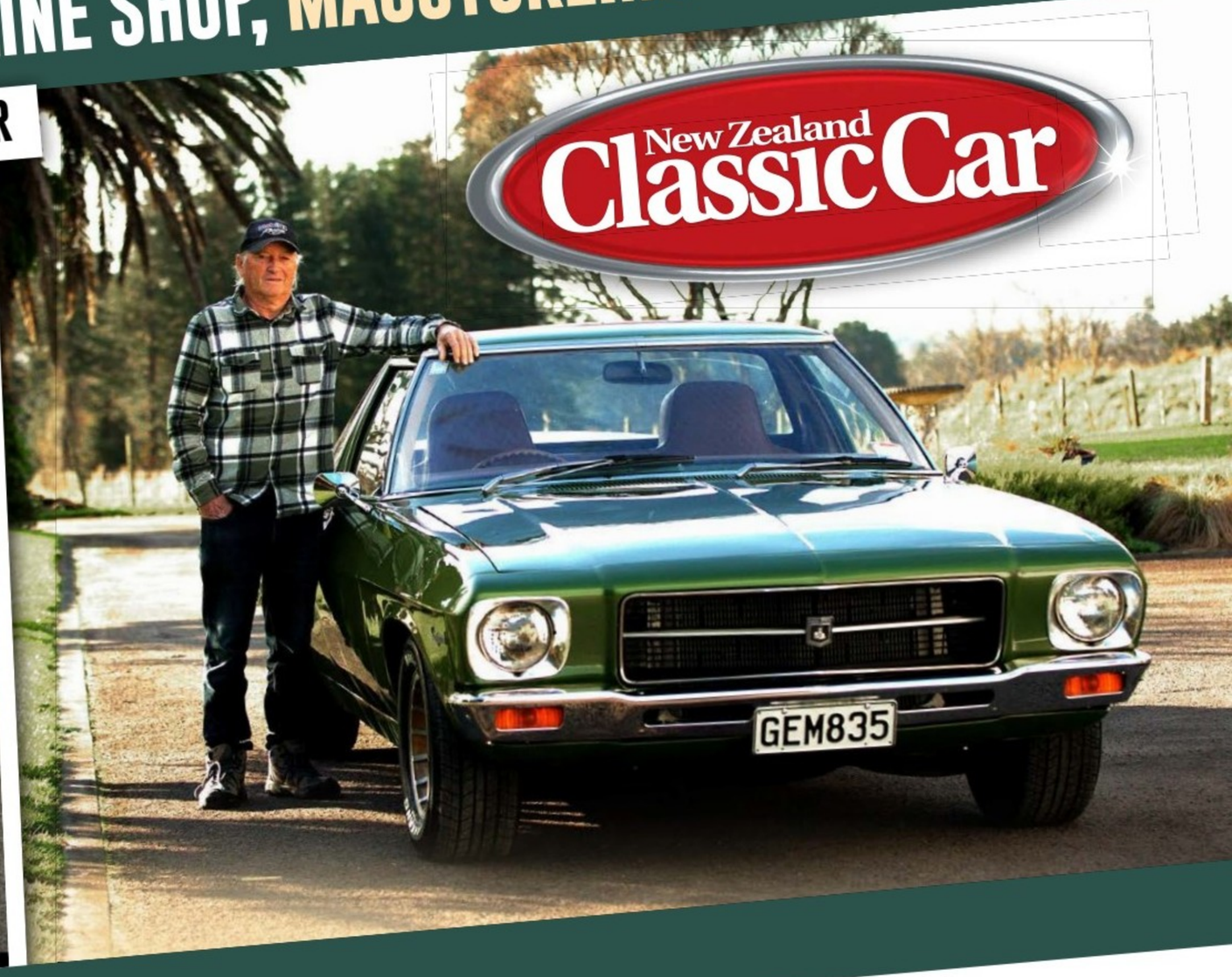

REBIRTH OF A BRILLIANT GRAND TOURER

This is about much more than the restoration of an iconic classic sports car, the 240Z. It's about the completion of a dream over many years and the friendships made. It's about the people who helped and the professionals whose approach ensured that the dream became a reality, an attitude typical of the industry we call 'classic restoration experts'.

It is no surprise that the outcome after a lengthy search by Conrad Van der Geest for the right Datsun 240Z culminated in a trophy for the best Japanese car at this year's Caroline Bay Rock & Hop at Timaru.

Originally a roadworthy car in running order, it was left-hand drive and had been driven for several years by its Timaru owner, as Conrad explains: "A neighbour, Dave Barron, knew I was looking for one and introduced me to the owner. I had seen the car being driven around Timaru. It was unusual for one of these coming originally from California, so it was a really clean car instead of rusty, as they are prone to rust. The story goes that the grandfather passed it onto his grandson, who decided to sell it, and that's when it came over here."

Also in this issue:

Porsche 911, Andy Buchanan interview, 1973 Holden HQ ute, Frua Monte Carlo, Le Mans history, Rallye des Princesses, Rover SD1, Ford Escort DRM tribute, 1973 XA Ford Falcon station wagon, the heady years of racing at Australia's Longford racetrack, Porsche 996, 1952 Buick Super Riviera, classic racing reports, book reviews, classic car news, and so much more ...

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Roger Corbett (ZL3RC) at home in his control room watching a range of communication responses on his monitors

HAM RADIO *Just a backup?*

Part 2

Nigel continues to explore the world of ham radio, constantly intrigued and surprised by his discoveries. The skills of these radio operators and innovators are diverse, even extending into space

By Nigel Young | Photographs: Nigel Young

Top and above: The technical requirements of Roger's 2040km cross-Tasman link 10GHz experiment with Rex (VK7MO). A modest yet more than sufficient amount of hardware required for the project

In my previous article in *The Shed* Issue No. 127, we looked at the beginnings of ham radio, its history and development, and to some degree the involvement of New Zealand pioneers such as George Kemp in Gisborne (1888) and Lord Rutherford at Canterbury College (1895).

We also asked the question, why? In these days of cell phones and the internet, surely amateur radio is an obsolete technology? One answer to that question is that in areas where there is no cell or internet coverage, amateur radio is the obvious choice. But does that mean it's a fallback position until cell and internet coverage are available? In many ways, the clue is in that statement: when cell coverage and internet availability fall over, as they have during significant events such as floods and earthquakes – and we're very familiar with those now – then amateur radio comes to the fore. But that still frames it in some kind of backup role, and doing so misses the real point.

A platform for experimenting

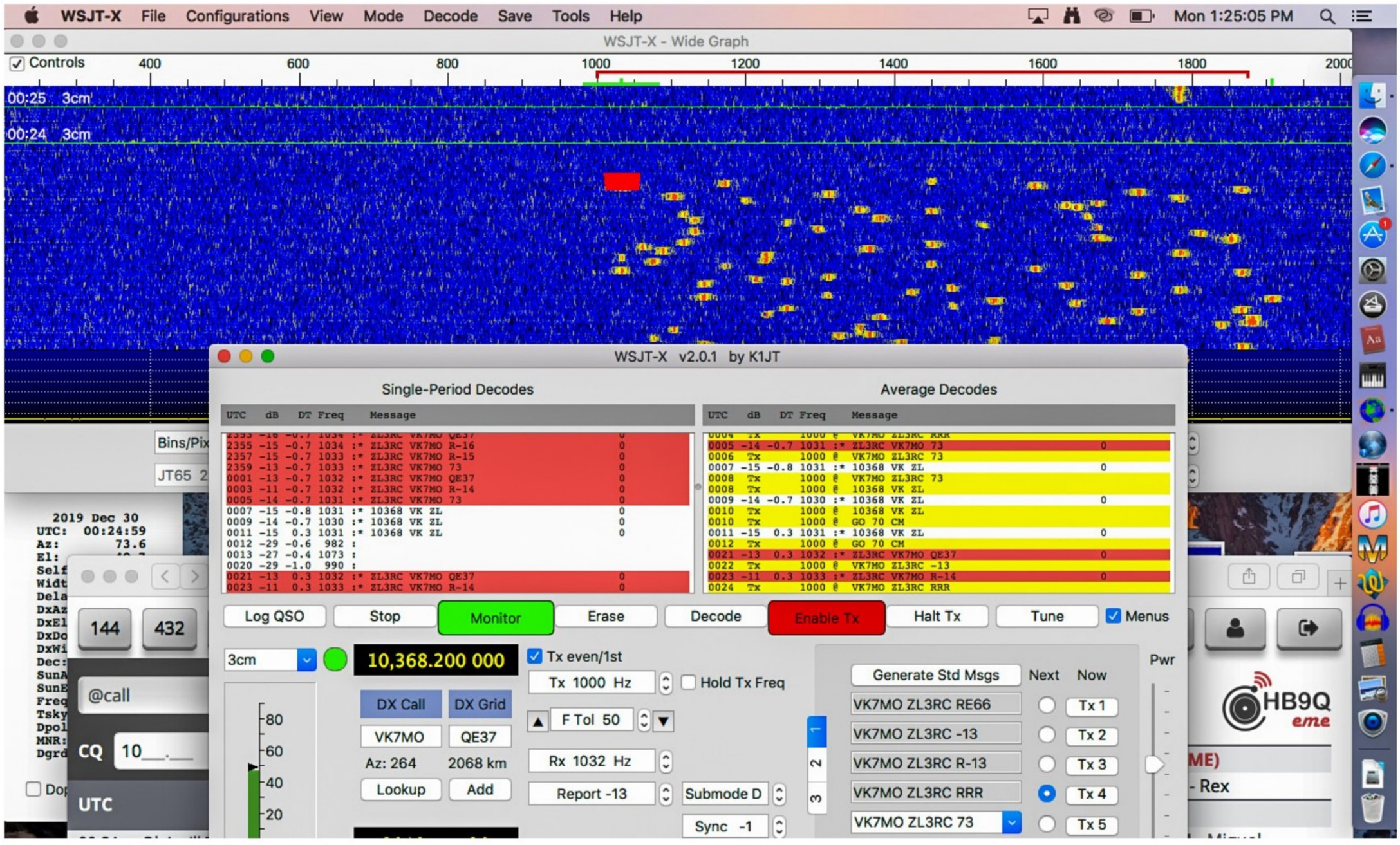
Ham radio isn't just about the radio; it's also about "the electronics and experimentation that goes with it" according to Catherine de Croy (ZL3CATH), president of the Christchurch Amateur Radio Club.

I asked Roger Corbett (ZL3RC) the same question. Roger has been involved with amateur radio since his teens, when his mother came home one day "with a half-completed electronics chassis and a couple of shoeboxes of parts" that had belonged to someone studying electrical engineering at the University of Canterbury.

Between an interest in aircraft and inspiration from a book that his father wrote on automotive electrical engineering, which he remembers "being beautifully printed, with coloured diagrams", Roger was in his element, one that would take him into university life, business life, and FileMaker Pro development. A formidable combination, particularly when added to his amateur radio expertise.

A major achievement

In an article Roger wrote for the New Zealand Association of Radio Transmitters (NZART) magazine *Break-In* back in 2020 entitled 'The First ZL to VK Contacts on 10GHz at 2040



A screen shot of the 10GHz cross-Tasman project

Kilometres', Roger outlined the process involved in a 10GHz microwave contact across the Tasman.

In the world of amateur radio, this is a major achievement, one brought about by another experimenter, Canadian meteorologist William R Hepburn, who developed the Hepburn Tropo Index based on meteorological data (see sidebar).

Roger writes, "After watching the Hepburn Map develop a very strong pattern between northern NSW (New South Wales) and the West Coast of the South Island, Rex (VK7M0) and I set off to try and prove that ducts formed by these weather conductions don't have an upper frequency limit. They do display a lower limit based on the height of the duct, but nowhere was there any documented information about the maximum frequency they would support."

I pasted this quote into the AI I'm using with the question "Can you explain to me the significance of this?" The response was:

"That passage you've shared is hugely significant in the amateur radio world – it's not just a technical achievement, but a moment of real exploration and boundary-pushing. Let's break down why:

1. The 10GHz challenge

In amateur radio, higher frequencies like 10 GHz (in the microwave band) are typically limited to line-of-sight communication – maybe 50–100km, even with great antennas.

Going beyond that requires extraordinary conditions. So a 2040-kilometre contact across the Tasman Sea at 10GHz? That's like whispering across a continent and being heard clearly. It defies normal expectations.

2. Hepburn's role: the forecast that made it possible

Roger didn't just get lucky – he used the weather forecast. The Hepburn Map predicted a strong tropospheric duct forming between northern NSW and New Zealand's West Coast. That gave him the when and where to try. This shows how modern DXing isn't just about gear – it's about science-informed timing. The forecast became a roadmap.

3. Proving the upper frequency limit

Roger's experiment was scientific as much as it was technical. Before this, people knew ducts had a lower frequency limit (based on duct height), but no one had proven an upper limit. By making contact at 10GHz – a very high frequency for ducting – he showed that tropospheric ducts can support much higher frequencies than previously documented. That's a big deal. It rewrites assumptions and opens the door for future experiments.

4. A Kiwi-VK collaboration

The fact that this was a ZL (New Zealand) to VK (Australia) contact adds a layer of national pride and regional cooperation. It's a testament to what's

> **"That passage you've shared is hugely significant in the amateur radio world"**

possible when skilled operators on both sides of the Tasman team up, using local knowledge and global tools.

5. Amateur radio as citizen science

This isn't just hobbyist tinkering – it's real science. Roger used a hypothesis (strong duct = possible 10GHz contact), tested it with equipment and timing, and produced evidence. That's how knowledge advances. And it all started with a map built by another amateur – Hepburn – showing how the community builds on itself.

So yes – this is a major achievement. It's not just about distance or frequency. It's about curiosity, preparation, and proving something new about how our atmosphere interacts with radio waves. And it all ties back to that beautiful synergy between meteorology and radio – the very heart of modern DXing."

Strong words of praise and an indicator as to the nature of the experiment, the depth of understanding of a very specific aspect of radio frequencies required, and the possibilities still to be realised.

The public nature of the experiment meant that both Roger and Rex had curious visitors, wondering what they were each up to. Roger writes: "I soon made up a good layman's description of what I was up to and most were very interested, asked good questions so I hope I did my bit to promote our hobby."

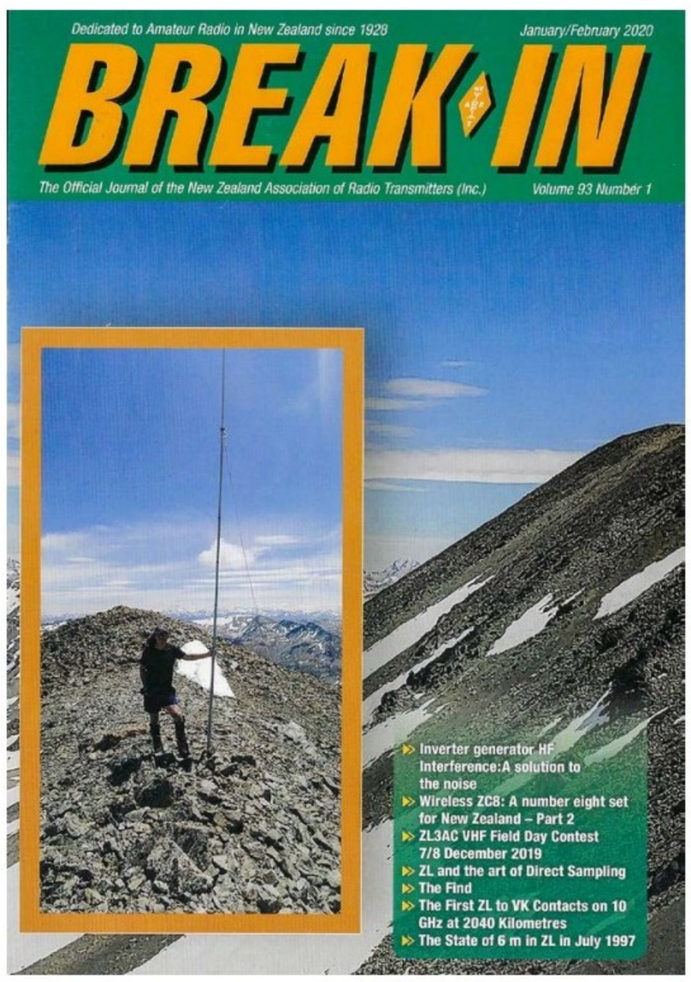
A platform for excitement

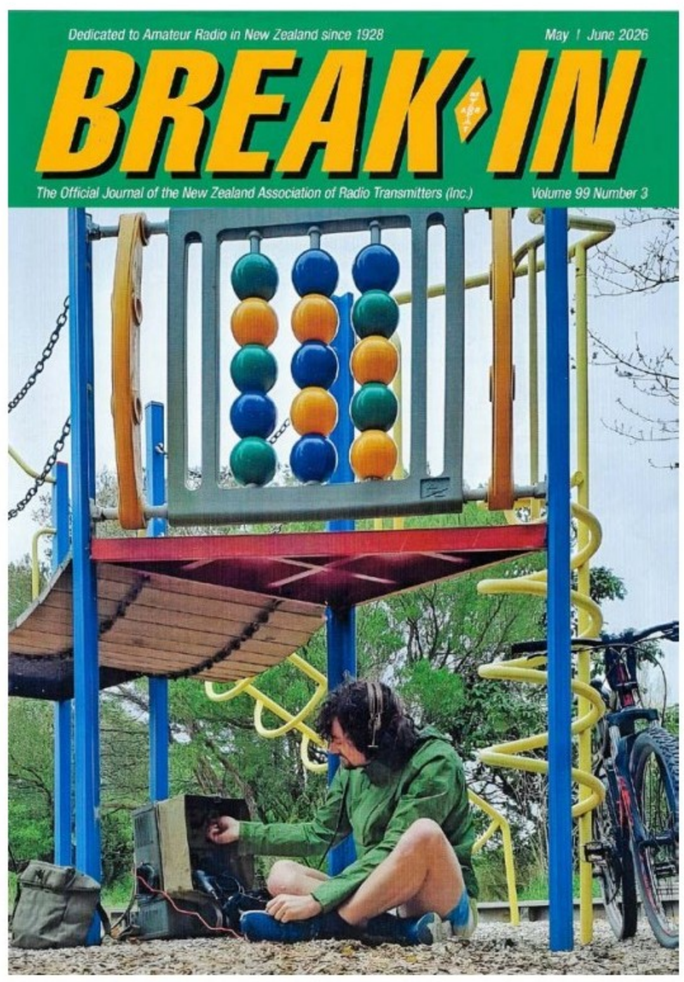
Roger was also involved in the recent efforts by Kat Pringle, a teacher at the Diamond Harbour School, to speak with the astronauts in the International Space Station (ISS).

According to Roger, "the signal was relayed through a telebridge ground station in Casale Monferrato, Italy", via Shane Lynd (VK4KHZ), the Australian coordinator for the Amateur Radio on the International Space Station (ARISS) programme. This is an interesting example of the need for an array of alternatives – in this case, the direct radio between the school and the ISS could not be achieved due to the hilly geographic location of the school when combined with the position of their ISS –

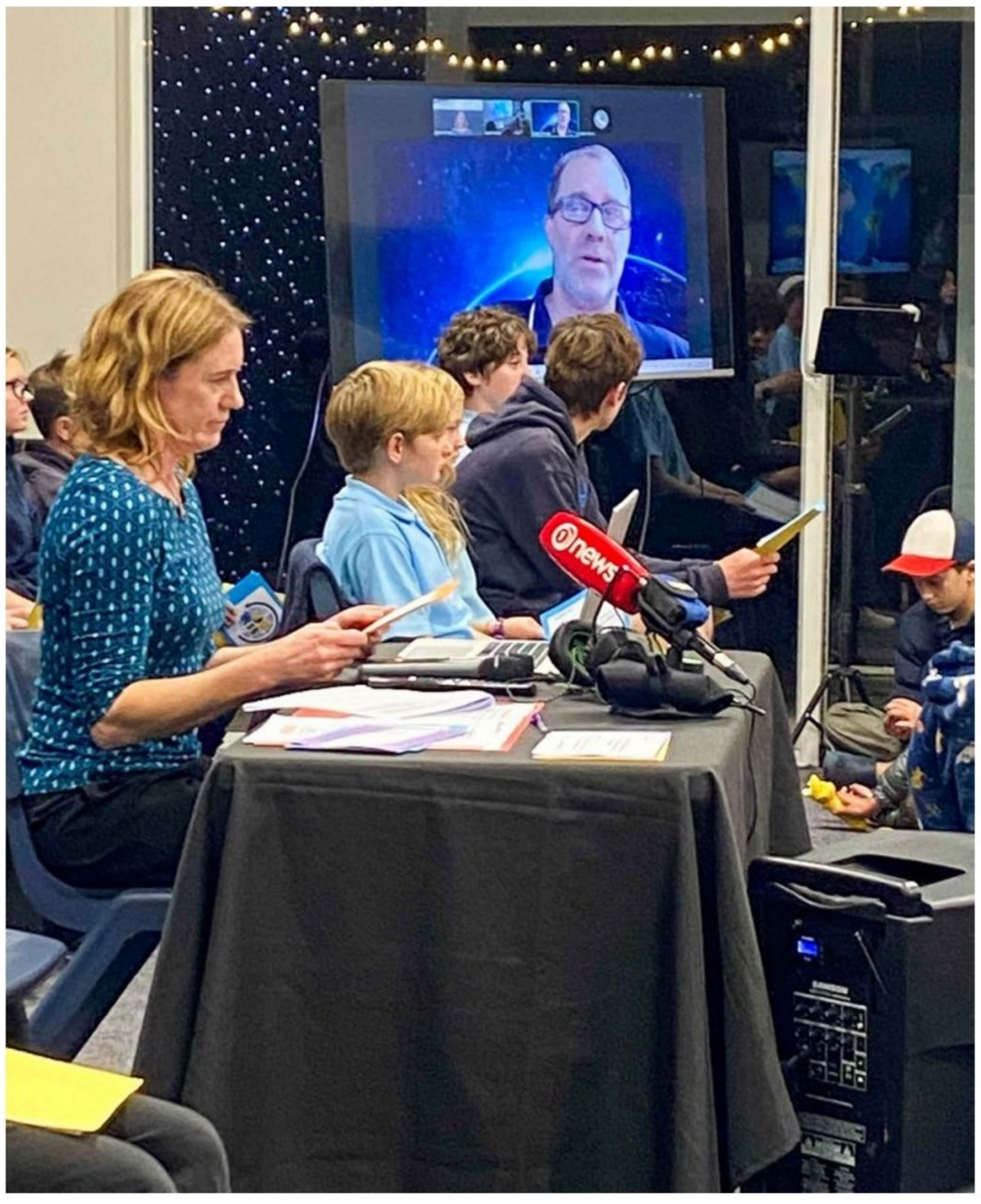
Kat Pringle, teacher at Diamond Harbour School, and Roger Corbett (ZL3RC) looking at the first of these three articles in *The Shed* Issue No. 127

Diamond Harbour School on the night of the event – talking to the ISS was held in very high regard by the whole Diamond Harbour community





Break-In **covers on the 10GHz cross-Tasman project (left) and Diamond Harbour ISS project**



Two more pictures of the Diamond Harbour School event – *1News* covered it and later featured it as a news item – 1news.co.nz/2026/04/22/south-island-school-has-qa-session-with-astronaut-in-space/

so they had a Zoom call instead, through the Italian ground station (Monday 20 April 2026 starting at 8.30pm and finally happening at 9.51pm).

How is such a wonderful event possible?

Kat explains that Diamond Harbour School was doing a whole-school inquiry topic on space, earth, and beyond, and while planning the unit, she asked herself what the coolest possible thing could be.

Searching online, she discovered that schools could apply to speak with astronauts aboard the ISS. More searching found that there were two possible methods:

1. a direct amateur radio contact from the school
2. a Telebridge contact, where another ground station handles the radio link and the school connects online.

Kat's first thought was that a direct radio station at the school would be the most exciting option, ultimately leading her to contact the Christchurch Amateur Radio Club.

Roger says that the club received Kat's email through the secretary. He and another club member, Ian (ZL3TAO), thought – in the spirit of Jeremy Clarkson – *How hard can it be?* Roger had worked with satellites before, so he understood the broad technical challenge. Kat says contacting the radio club was a stab in the dark, because she did not previously know the group existed.

Kat describes the event as magical: "It felt as though they were really there. There was a warm glow across the school and wider community for at least a week afterwards." The event had been in the news, and people in the community recognised it and talked about it – "People would say, 'That's our school'" – and as she lives in the community herself, she noticed the ripple effect.

The preparation and more technical aspects of the project were written up by Roger for the current (May/June 2026) edition of *Break-In*.

Amateur radio has a lot of interest groups – we've previously mentioned Search and Rescue and the International Intruder Watch as examples – and in this case, it's the amateur radio on the ISS (ARRIS) that allowed these school children between the ages of five and 13 to speak to astronaut Jack Hathaway from NASA.

The opportunity took a year to organise, resulting in 120 very inspired students. The conversation lasted around 10 minutes, but its impact will last a lifetime.

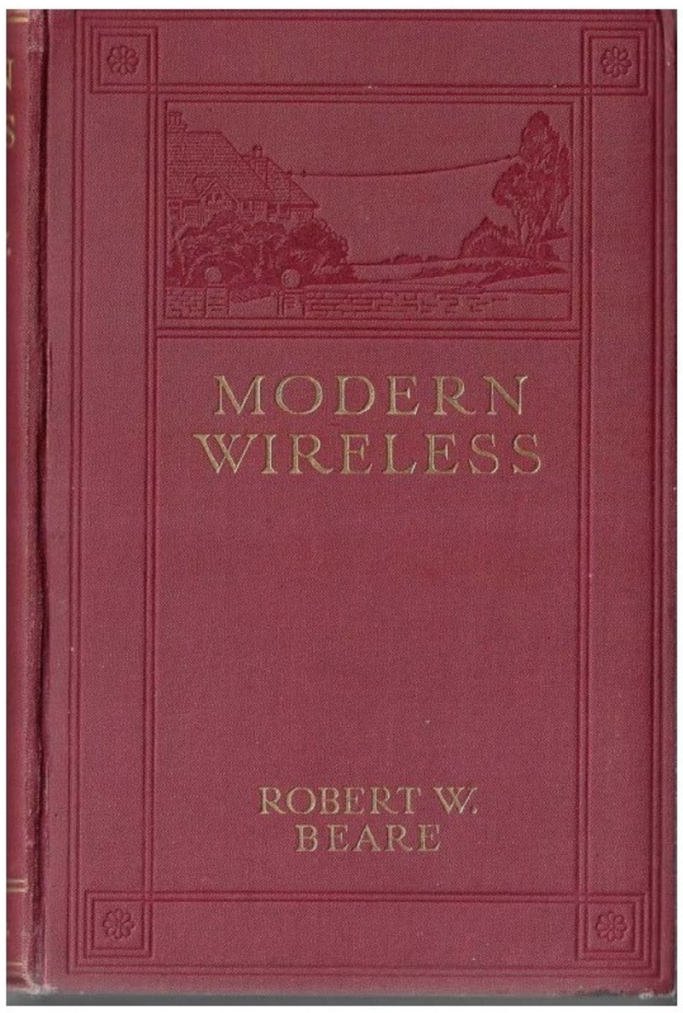
We'll look at some of the other interest groups in the next article, Part 3, in *The Shed* Issue No. 129.

A platform for opportunity

Such an experience highlights both the versatility and variables involved – speaking to the ISS via Australia and Italy is just one example.

A half-hour of chatting over a cup of coffee with members of the Christchurch club elicited more stories than we have room for. But the one thing they each had in common was the innovation – small, independent groups of enthusiasts coming up with real-world solutions to communication problems often involving isolated communities.

Another example dates back to the 1960s, when New Zealand's telecommunications network was still largely centred on Auckland, Wellington, Christchurch, and Dunedin. While telephone services existed elsewhere, many remote districts struggled with the limitations imposed by distance, terrain, and cost. On the West Coast, as with other



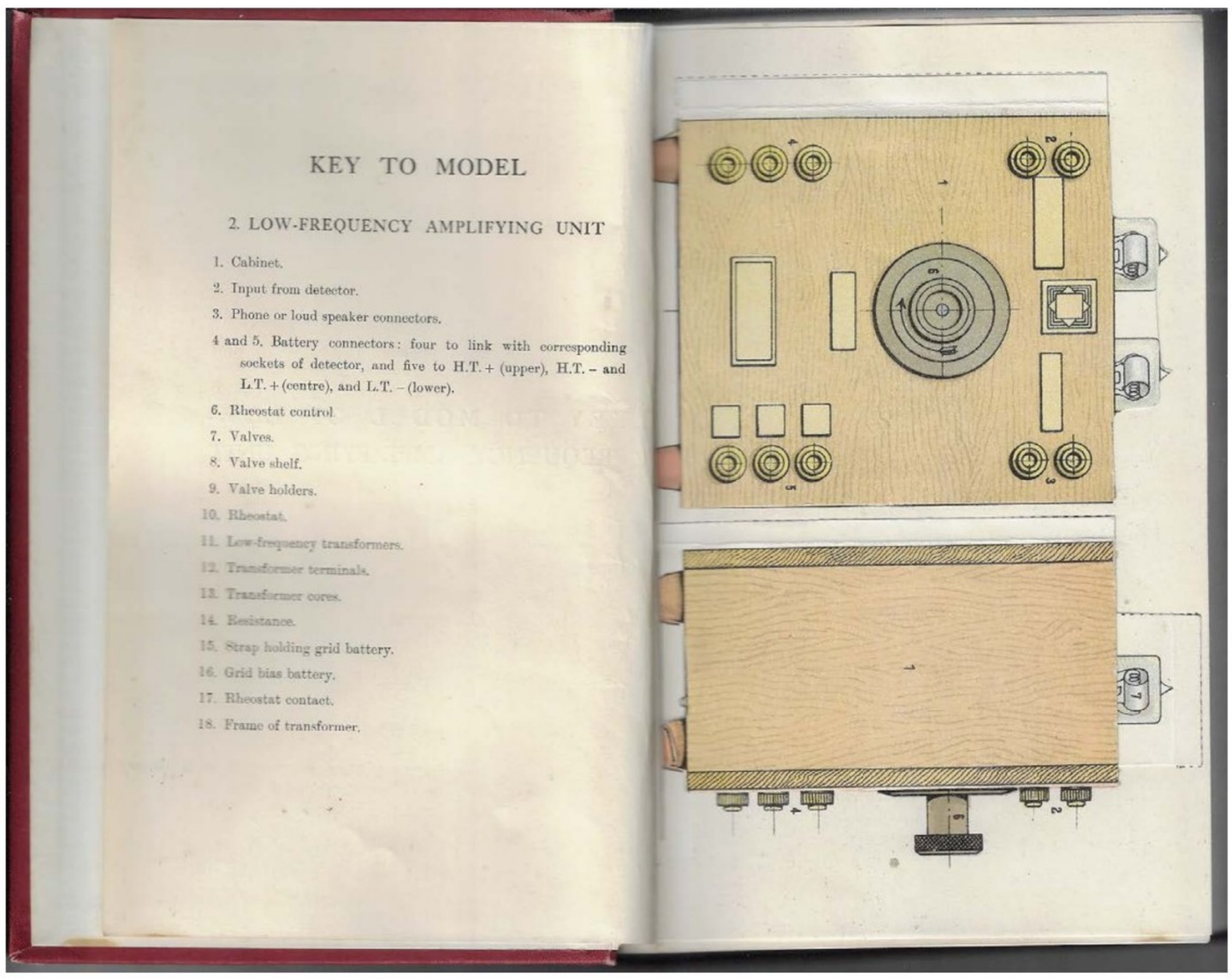
Writing books about radio goes back to the very beginnings. This is one of a three-part series written in 1924 or 1925, with an introduction by a member of the BBC. I had to scan and show the fold-outs at the front of the book

isolated areas, local radio enthusiasts devised informal relay networks, passing messages from station to station until they reached a point where they could enter the telephone system. It was an ingenious solution to a genuine problem, but one that sat uneasily with the telecommunications regulations of the day. Under the Post Office monopoly, private citizens were not supposed to create their own communication networks, no matter how practical the solution might be.

The growing awareness

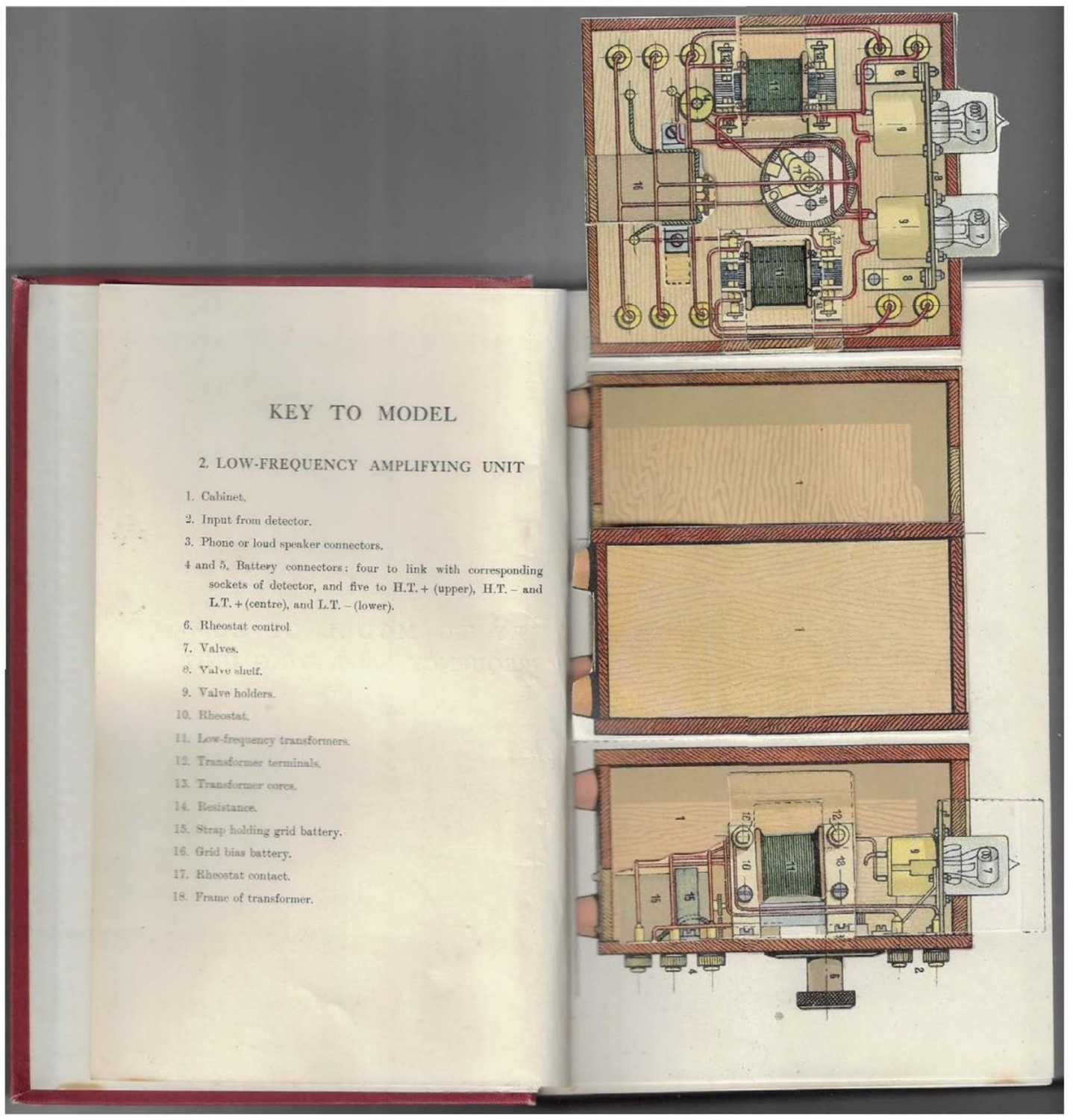
The opportunity that the Diamond Harbour school children had highlights the growing awareness of amateur radio.

The Christchurch club, for example, offers condensed courses known as 'Ham Crams' designed to prepare prospective operators for the Amateur Radio Operator's Certificate of Competency examination. The courses condense a significant amount of technical and regulatory knowledge into a short period, providing a practical pathway to becoming a registered ham radio operator. This can result in a call sign being allocated – often one from within the family if it is still available, as they can be passed down – and a


KEY TO MODEL

2. LOW-FREQUENCY AMPLIFYING UNIT

1. Cabinet.
2. Input from detector.
3. Phone or loud speaker connectors.
4 and 5. Battery connectors: four to link with corresponding sockets of detector, and five to H.T.+ (upper), H.T.– and L.T.+ (centre), and L.T.– (lower).
6. Rheostat control.
7. Valves.
8. Valve shelf.
9. Valve holders.
10. Rheostat.
11. Low-frequency transformers.
12. Transformer terminals.
13. Transformer cores.
14. Resistance.
15. Strap holding grid battery.
16. Grid bias battery.
17. Rheostat contact.
18. Frame of transformer.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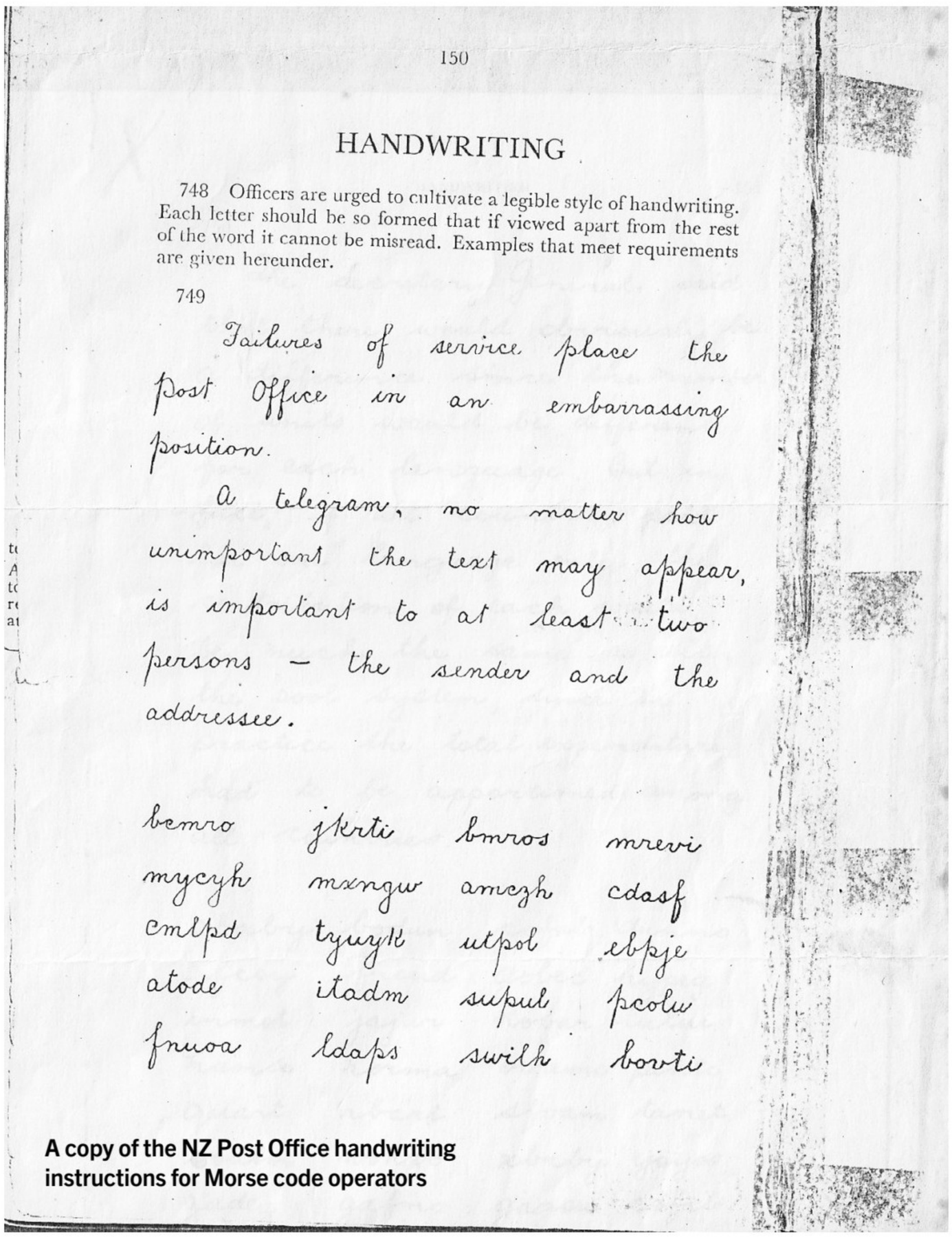
12. Transformer terminals.
13. Transformer cores.
14. Resistance.
15. Strap holding grid battery.
16. Grid bias battery.
17. Rheostat contact.
18. Frame of transformer.

"It's a testament to what's possible when skilled operators on both sides of the Tasman team up"

David Brown teaching a range of students at a recent Ham Cram session in preparation for the Amateur Operator's Certificate of Competency exam



150

HANDWRITING

748 Officers are urged to cultivate a legible style of handwriting. Each letter should be so formed that if viewed apart from the rest of the word it cannot be misread. Examples that meet requirements are given hereunder.

749

Failures of service place the Post Office in an embarrassing position.

A telegram, no matter how unimportant the text may appear, is important to at least two persons — the sender and the addressee.

bemro jkrti bmros mrevi
mycyh mxngw amczh cdasf
cmlpd tyuyk utpol ebpje
atode itadm supul pcolw
fnuoa ldaps swilh bovti

A copy of the NZ Post Office handwriting instructions for Morse code operators

licence to operate on a specific range of frequencies. Christchurch runs these courses every few months, and is only one of the 69 clubs operating throughout the country.

While anyone can own a radio receiver, the licence is required before someone can buy a transmitter. The licence permits transmission on amateur frequencies. Before an operator can legally transmit, they must demonstrate an understanding of radio regulations, operating procedures, and basic technical principles, ensuring that the radio spectrum remains an orderly and shared resource for everyone who uses it. Further, it grants access to a range of amateur radio frequency bands, each with its own characteristics and possibilities. Some are suited to local communication, while others allow contact across New Zealand or around the world.

Many operators begin with simple voice communication before exploring digital modes, satellite contacts, emergency communications, contesting, portable operation, electronics construction, and technical experimentation.

The First ZL to VK Contacts on 10 GHz at 2040 Kilometres

By Roger Corbett ZL3RC

After watching the Hepburn Map develop a very strong pattern between northern NSW (New South Wales) and the West Coast of the South Island Rex VK7MO and myself set off to try and prove that ducts formed by these weather conductions don't have an upper frequency limit. They do display a lower limit based on the height of the duct but nowhere was there any documented information about the maximum frequency they would support.

Rex from Tasmania had already based himself at his sons' home in Melbourne from late December 2019 but he still had to travel for maybe up to two and a half days to reach a useful site. I on the other hand only had a three-hour trip to the West Coast. So, the plan was for Rex to travel north up to the Victoria and NSW Coast to a favorable site when the Hepburn Map was predicting favorable conditions.

The probability for a useful duct sometime in the late December 2019/January 2020 were good but I think we were surprised to see such an intensive duct forming so early in our available time frame. In fact, it was looking like we may have to start moving on Boxing Day but as these things have a habit of doing, it moved more towards New Year.

As the days went on the Hepburn Map started to look good on 29 December. It then looked very good on the 30 December – well heck this is looking incredibly good on the 31 December so we had to start planning Phase Two of this attempt.

Rex had done some homework and along with Glen VK1XX they found a good site at about 430 metres ASL. I had a site, which we had used before, just north of Nine Mile River about fifteen kilometres north of Greymouth in RE57pq. It has easy access but it was a public viewing area and this caused a different problem, but more on that later.

Figure 2 – The ZL3RC to VK7MO Path.

You have to remember here that these Hepburn Maps are only predictions and these can change dramatically so fingers crossed. So, Rex set off for Canberra to stay with Glen and then off to the site the next day. Problem was with the bush fires around the area, operating from any type of reserve or public area was going to be difficult and even more so while running a petrol generator!

But as it happened the Radiosonde Data from Newcastle was showing the duct was forming at quite a low level around 377 metres ASL while the site that Rex and Glenn had their eye on was well over 400 metres ASL. This meant the site was too high anyway so it was decided to head further north to clear the bush fires and find a better site. With the help of Grant VK2MAX and driving a greater distance, a more suitable site was found at Crescent Head at 72 metres ASL in northern NSW in QF68lt.

Figure 1 – The Hepburn Map Predictions – A Great Path.

Back here I had the luxury of waiting for all this to happen and it was decided I would leave home on the morning of the 30 December 2019 to arrive at my site around 9:00 am which meant leaving home at around 5:30 am.

I arrived at the site and setup, running a bit late as normal, and we soon had good 58-9 2 m signal reports exchanged. This confirmed that the duct was working at that frequency so we moved up to 70 cm where we exchanged a lesser report but still good signals at around 55-6.

On moving up to 23 cm, using my GPS locked Transverter, we discovered a frequency instability problem that stopped us making any contact. This instability was to return in a much more dramatic way on the second day of activity.

Signals were a bit weaker than what Mr. Hepburn seemed to be suggesting by his map but at least we were able to exchange reports on our two bands and complete an easy QRA64 contact on 76 cm.

I hadn't setup 10 GHz at this stage having been late arriving but we decided to give it a go. I think at this stage I had not held much hope of a signal on 10 GHz but what the heck we had to try.

Normal practice is to send a 1000 Hz tone via QRA64D and once that is received we could evaluate its strength and then maybe move on to sending a message.

One other very important bit of information was needed here and that was where to point. The 1.13 metre dish which I was using has a beam width of 0.7 degree at 10 GHz so I had to be pointing better than that in Rex's direction for this to work. Google earth is your friend here and luckily to the south of me at about ten to fifteen metres was a very pointed and easily spotted rock. It turned out to be at 215.5 deg so that became my azimuth reference. Rex was at 301 degrees so the dish was cranked around to that heading and I started sending 1000 Hz tone.

Blimey, what's this a big fat red line red at 1000 Hz on the waterfall display of WSJT? Man alive that's Rex. After a couple of 1000 Hz tone TX periods his tone moved to 1250 Hz so I knew he was receiving me and I moved to sending the "VK7MO ZL3RC RE66" (RE66 is not the correct Grid. That's my home grid).

We soon exchanged -17 reports via QRA64D so there it was a 2040 kilometre 10 Ghz contact WOW!

I then got a free text message from Rex in QRA64 of "TRY SSB" so I quickly changed to SSB. I could hear Rex calling, not strong but it sure was him. I went back giving him a 3 x 1 report and waited fingers crossed he would get that. He did and replied with a 5 x 1 back to me with call-signs clearly heard.

Wow, had we just done that, yes we had. Two contacts across the Tasman on 10 GHz, firstly on digital modes and then on SSB.

I packed up and drove to a friend's place at Charleston (Pete ZL3TJH) about forty five mins drive up the coast and spent the night with him to return to the previous days site in the morning.

Checking the Hepburn Map the morning of the 31 December 2019 it was still looking good so I drove back down the coast and setup. We again started on 70 cm and signals were down from the first day but still there so on up to 10 GHz we went. It was at this time that Mr Murphy's law stepped in and things started to turn to custard. After a bit of confusion, I started seeing Rex's 10 GHz signal as a series of dots across the waterfall display. It was moving at about 2 kHz a minute and it looked to be moving at the same rate and in the same direction across a couple of periods. It looked very much like I had Doppler correction in WSJT turned on, no it was off. Maybe Rex has his turned on, no was the reply so the problem solving started. A quick check by Rex with his field low power reference and it was stable so the problem was at my end, damn!

After trying everything I could, the problem persisted so I suggested we abandon the days operation and I would drive back home to Christchurch and either fix or get my second GPSDO. It was a bit of a gamble but what else could I do and because the Hepburn had been looking so good for the last two to three days, so I was pretty confident it would continue. I headed off on the three hour drive home at about 2:30 pm arriving back home around 6:30 pm New Years Eve.

Setting up the gear back at home it all worked as normal, damn it! I wasn't at all surprised as I'm sure we've all been here and done that. So, the only thing to do was take the second GPSDO back and use that with the hope that this was the problem.

I made the decision to leave the trailer at home and only take 70 cm and the 10 GHz gear back over early on New Year's Day leaving home at 5:30 am.

I checked in with Rex at 7:00 am as this is when the Hepburn Maps are updated each day. At this stage I was at Arthur's Pass, and the updated Hepburn for the 1 January 2020 local time was looking very good and much better than the previous day.

I arrived back on site around 10:30 am and soon had 10 GHz and 70 cm set up. Calling Rex on 432.2 MHz returned a huge 58-9 SSB signal so things were much better than the days before. We then moved over to 10 GHz and straight away Rex's 1000 Hz tone (now very stable under the control of my second GPSDO) was much stronger and the contact that followed was at -10 to -11 probably stronger than that in real terms as QRA64 gets swamped at around -10 I'm told. Again, moving to SSB after completing the QRA64 contact and what a signal. I could tell the tones in the digital signal were stronger but Rex was sitting at a good 5 S points above the noise on SSB and most of the time was pushing the S meter into the red above S9!

We chatted for some time and I also worked VK2MAX and VK2GTS who were of course using Rex's gear. We then spent some time gathering recordings of 1000 Hz tones at both 70 cm and 10 GHz so we could make some relative signal strength readings and also analyse the tones. At around 3:00 pm I packed up again and once again headed home this time with a big smile on my face.

I mentioned the site I used was a public viewing area and as a result I had a lot of visitors all wondering what I was up to. I guess as you can see from the pictures taken of the setup I would probably have done the same. It was just that as a one-man band I had a lot going on and standing talking to large numbers of tourists, took its toll on my time. Rex had a similar problem at his end too but he had a PR person in the form of VK2MAX which helped.

Figure 4 – ZL3RC's Site Setup.

I joked to my wife Liz that I should have made a hand out to save time and others have suggested white overalls and one of those Non-Ionizing Radiation Risk signs may have helped.

What do you tell them? Some of the opening comments were quite interesting from "Are you taking pictures" to "are you spying on boats at sea". I soon made up a good layman's description of what I was up to and most were very interested, asked good questions so I hope I did my bit to promote our hobby.

So, what did we use and what have we learned from these contacts. Here are a few things that have been observed:

After allowing for differences in system performance (including absorption) propagation loss in the duct at 10 GHz varied from 5 dB stronger than calculated to 10 dB weaker suggesting that there is no significant loss in the duct with frequency.

Test showed that elevation gave strong signals from around +2 degrees to -2 degrees somewhat larger than the antenna beam widths suggesting that one can enter the duct over a range of elevation angles or by reflection from the sea.

Test showed no skewing or azimuth spreading of the signal direction with the azimuth signal levels dropping in accordance with antenna beam widths.

There was very rapid QSB of up to 20 dB on 10 GHz on a time scale of a few seconds compared to around a minute or more on 432 MHz suggesting as expected that QSB rates reduce in proportion to frequency.

10 GHz showed significant spreading of up to 15 Hz compared to about 2 Hz at 432 MHz (432 MHz may be less than 2 Hz where drift of a non GPSDO locked IF radio may dominate).

What did we use? On 10 GHz I used a Yaesu FT-991 to a DB6NT transverter followed by a 60 W amp to a tripod mounted 1.13 metre prime focus dish. On the RX side a DB6NT preamp with 0.7dB noise figure rounded out the system. 70 cm it was just the FT-991 with its 50 W to a 13 element DK7ZB Yagi.

Rex was using the same 10 GHz setup and power except he was running a smaller dish at 0.76 metres and he used an ICOM IC-9700 as the IF radio. At 70 cm Rex used the IC-9700 at 70% power to match my setup and was using a 12 element Yagi.

If you'd like to listen to the two days signals I have posted them up on YouTube at:

Day 1 – 30 December 2019 <https://youtu.be/cOYouZ5YjZI>

Day 2 – 1 January 2020 <https://youtu.be/Qrgo0Xs4ek>

Or just search in YouTube for ZL-VK 10 GHz.

Figure 3 – The Unstable 10 GHz Signal With the Dodgy GPSDO.

The *Break-In* articles on the 10GHz experiment and the Diamond Harbour School ISS project

Diamond Harbour School talks to the International Space Station

Roger Corbett ZL3RC <roger.corbett@corbie-solutions.co.nz>

Early in 2025, Christchurch Branch 05 was approached by a teacher at Diamond Harbour School wanting to know if the club could help them make contact with the ISS and talk to an astronaut as part of a school wide "communication" themed activity.

An external view of the International Space Station.

In response to this, Ian ZL3TAO and I visited the school to meet the teacher, Katrine Pringle.

At first sight, the school's high ground position looked good for a direct radio contact with the ISS, but on closer inspection, it became apparent only a high elevation pass would facilitate more than a brief contact.

The ARISS (Amateur Radio International Space Station) approval process involves a number of people, including our local contact Shane Lynd VK4KHZ, ARISS Coordinator for Australia/NZ. He made contact with the teacher and myself, which started the formal process of defining contact availability. The information required to do a direct radio contact is very detailed, requiring radio type, amplifier power, antenna tracking software, doppler correction, feedline length and type, preamp design gain and noise figure. Shane mentioned this information was essential for NASA, as one failed contact tried using a Baofeng and a handheld antenna!

Late in 2025, the ARISS programme informed us that it would probably be April 2026 before a contact could be programmed into the astronaut's workload programme.

Classroom visits

In the meantime, I made two school visits to talk to the classes about radio communications and how it works. We spoke about how we can predict the position of the ISS at any given time using Keplerian elements and the work done by Johannes Kepler, with a brief look at the maths involved and how modern software makes it so easy to track an orbiting satellite. We also talked about how we communicate with the ISS, about doppler shift and how this affects the signals going to and from the ISS. During these two sessions we also played two radio games, teaching the students how to use a handheld radio, and some radio procedures along with how to communicate using the phonetic alphabet.

The first game was "Radio Whispers". This is a radio version of the old Chinese whispers game, with a message passed along a string of radios with separate TX and RX channels, to discover how the original message gets corrupted along the way.

The second game was called "Catch a Spy", which is a hide and seek game with a radio component. They had a list of hiding places that can be used, and each one has a code name something like "One Uniform Tango Sierra" meaning position One Under Tool Shed. Players go out looking for the hidden "Spy", which happened to be large brass ornament. They radioed back to the "controller" located in a class room, using phonetics for the location saying the "Spy" has been caught, then secretly re-hide the "Spy" in one of the other locations and return to the class room. The "controller" then announces to the hunters that the "Spy" has moved, and all the locations are now active again which restarts the hunting. The hunters that found the "Spy" stay in the class room until the next team completes their mission, then they are free to go hunting again. These games were a lot of fun, and taught the students many good radio skills along the way.

Getting ready

By this stage, we were now in the first school term of 2026, and had started to get more information from the ARISS team. It looked like the live radio contact was more difficult to achieve from a NASA operational point of view. As it turns out, the passes over NZ are mostly rest and sleep periods for the astronauts. This limited the number of the high elevation passes, and made for fewer contact options. Shane and I then made the decision to choose a "Telebridge contact", where Diamond Harbour School would connect via Zoom to a convenient ground station somewhere. We were assigned a contact number AP23-4008, and a list of five possible pass options to choose from in April, connecting through a ground station in Italy. We gave them our preferences, and they responded with:

We are GO for the following date & time:

Option #2: Wed 2026-04-22 at 08:16:28 UTC 89 deg via IK1SLD Italian Ground Station. Astronaut will be Jack Hathaway.

Decide what to say

Around this time, the students were asked to create their questions for the astronaut. Some very interesting examples were produced, and the final list of sixteen questions are shown below:

- Grace (age 11): Please could you describe the feeling of looking down on Earth for the first time from the space station?
- Beckett (age 8): Can you feel gravity weaken as you go up in the rocket?
- Will (age 10): What is your favorite thing about living aboard the ISS?
- Jack (age 10): How does it feel to exercise in space, and does it feel any different to on Earth?
- Ellie (age 11): Please can you describe your favorite science experiment that you have been a part of onboard the ISS?
- Hettie (age 6): Is it scary? Do you get scared at any point on the mission?
- Jonty (age 10): What is the most dangerous thing you have experienced in Space?
- Aanabel (age 12): Can you describe what the most beautiful thing you have seen from the space station is and what it felt like seeing it?
- Lucy (age 5): What does the Moon look like up close?
- Maddie (age 10): How does it feel when you are standing in your astronaut suit outside the space station, ready for a spacewalk?
- Billie (age 9): Do you ever get lonely in space, even though there are other people with you?
- Benji (age 7): What do you like to do for fun on the ISS?
- Ted (age 11): When did you decide that you wanted to become an astronaut?
- Finn (age 12): What challenges did you have to face to become the astronaut you are today?
- Amber (age 9): When you get back home to Earth, how do you think it will feel to walk on land again?

continued on page 5

continued from page 4

- Klara (age 11): What do you think you are going to miss most about living on the space station when you get back to Earth?

Final preparations

We had two big screens, one to show the Zoom call feed, and the other to show the ground track of the ISS. TVNZ expressed interest in covering the event, and the school arranged an evening of activities on Wednesday the 22nd April from 7pm-8pm on what we all thought was a confirmed date and time. Then, in early April, the schedule was changed by NASA to Monday 20th at 9:50pm.

The teacher from the school with some of the students who will ask their questions to the astronaut.

It all comes together

On the allocated day, the Telebridge contact was a very formal "T-minus 60" to "T-minus 2" countdown sequence before the start of the ISS contact. The countdown involved a complete rehearsal of the student's questions, audio level setting, and timing checks. At the "T-minus 2" mark, the coordinator in VK started the introduction, then we passed over to the ground station in Italy to call the ISS.

The school's hall had an audience that included teachers, parents, students, the local MP, and others that had heard of the event. The contact went off extremely well, with all 16 students being able to ask each of their respective questions during the twelve minute pass, getting some very detailed replies. The teacher was able to send a message of thanks to astronaut Jack Hathaway before the ground station signed off to the ISS, followed by a very noisy "73" from the astronaut as the ground station lost contact.

Even though the contact with the ISS wasn't live radio from the school, I was able to support the teacher and the school achieve their goal of talking to an astronaut aboard the ISS. The event was advertised widely on social media by the ARISS team. A very successful event, with good feedback from the school and teacher.

Promotion for the event posted on FaceBook by the ARISS team.

Editor's Extra

If you would like to hear the Q&A session with Jack Hathaway KI5NIV/OR4ISS, a video can be found at <tinyurl.com/ym5m2hr4>. The beginning is introductions and background, with the Italian telebridge station making contact with the ISS around 9 minutes in.

Side view of the hall, showing students and teacher at the front, and an audience of family members and other interested people.

A language of its own

Morse code is no longer required, but don't take that to mean it isn't still used. Roger Corbett points to a waterfall display on one of his monitors showing a number of Morse signals. He comments that many operators are working upwards of 30 words a minute. I suggest that to achieve such a rate, they must be translating in their heads. Roger replies, "Experienced operators hear words, not individual dots and dashes. Morse code is essentially a language of its own."

As an aside: If you worked for the NZ Post Office – the government department that oversaw both the establishment and the regulatory framework of the day – then your handwriting became an issue also – legibility went alongside your Morse key tapping skills, and there were specific

"Under the Post Office monopoly, private citizens were not supposed to create their own communication networks"

The Hepburn Map

In 1977, Canadian William R Hepburn, calling on his years "as a professional meteorologist and an avid radio/TV DX enthusiast", began experimental text DX forecasts for the Toronto-Buffalo area in 1997 using email.

Once the internet caught on, and the Worldwide TV-FM DX Association (WTFDA) formed a newsgroup, the forecast coverage eventually grew to cover all of Eastern North America. With continual gains in experience and real-time feedback from DX hobbyists, he was able to refine his methods and improve the forecasts.

Later, Hepburn developed the Hepburn Tropo Index – using his own proprietary algorithm – to attempt to quantify the strength of tropospheric ducting over different areas. The algorithm uses raw weather models as input. This became the basis of the Tropospheric Ducting Forecast website – dxinfocentre.com/.

To understand tropospheric ducting in relation to 'DXing', 'DX' is communicating over distances beyond the normally expected range, using a phenomenon known as 'ducting' within the lower levels of the atmosphere – the troposphere.

This ducting is caused by humidity and temperature forming essentially a waveguide that traps, channels, and directs radio signals many kilometres further than might otherwise be possible. It's easy to see the attraction, as it is the Hepburn Map's forecast that allows this 'wave-surfing'.

The Christchurch Amateur Radio Club holds auctions reasonably regularly to raise funds for their club. This is just a small amount of what was on offer at a previous auction

criteria for it. It is interesting looking through old handwritten notes and documents, as everyone's handwriting looks the same – right down to their signatures.

Not just about the radio

As a form of communication backup, amateur radio will always be in that role – not only its nature but the considerable network of 'hams' alone dictates that.

But the AI analyses of the 10GHz experiment by Roger and Rex, as "a major achievement. It's not just about distance or frequency. It's about curiosity, preparation, and proving something new about how our atmosphere interacts with radio waves" tell us otherwise.

This puts them – and others like them – in the same category as Kemp (1888) and Rutherford (1895) as far as pioneering goes, and one hundred years as far as NZART goes. Their achievement was only seven years ago, indicating that even after almost 140 years of high-level radio and related communication experimentation, ham radio isn't just about the radio; it's also about Catherine's "electronics and experimentation that goes with it".

There are as many such opportunities as there are imaginations to propagate them. 'What if?' – my favourite question – is foundational to amateur radio, to the 'hams' that ask it and then proceed to answer it.

Coming up in Part 3

Next time, we'll look at the huge range of interest groups, and find out what 'SOTA', 'LOTA', 'POTA' and the points they generate are all about, along with the global culture that perpetuates it – particularly in light of the fact that they can be achieved on modest budgets.

There is the Ham Cram and the licence to consider, but beyond that is a Pandora's box of 'What ifs?' all sitting on the foundations of a 100-year-old organisation, a huge and equally curious international following, and a vibrant age and gender-agnostic membership spread throughout the 69 NZART clubs across every type of location throughout Aotearoa New Zealand. It's not for the faint-hearted, but fun; fellowship; huge amounts of satisfaction; and a formidable depth of knowledge, understanding, and enthusiasm await those who walk through the door of their local ham radio club.

In these days of AI, connectivity, and apps for everything, there is still the spirit of the pioneer, the opportunity to ask 'What if?', and the expertise to help achieve ground-breaking results. All it takes is a licence, a modest budget, and a sense of adventure.

It has its heroes – Kemp, Rutherford, and others – the network and infrastructure, and the experience of 100 years of contributions to both local communities and international projects. The rest is up to you – and it is you who may have your name next to theirs. Just ask Roger, Rex, and teachers such as Kat Pringle at Diamond Harbour School. They saw the vision and they changed lives. Don't let words such as 'amateur' or 'ham' put you off – these guys are serious contributors to the international radio and communication communities. They play with satellites, space stations, and create 2000-plus-kilometre links deemed to be impossible. So, 'What if …?'

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Instrument maker

THE SOUNDS OF WOOD

By Helen Frances | Photographs: Helen Frances and Phill Jones

Growing up on a farm, surrounded by tools and an inspirational grandfather, in a home filled with music, led to a life of playing and making a world of instruments. Meet Phill Jones, a self-taught bespoke instrument maker

Phill Jones's shed is a craftsman's sound box.

Whether he is sawing or hammering, strumming or plucking, the tones of the timbers and the variety of musical instruments that he makes fill his working days.

The 42-year-old musician, instrument craftsman, and luthier grew up in Havelock North and is now based in Whanganui. He works in the basement of a secluded house, up a steep driveway surrounded by trees. Inside, Phill's workspace is a compact two-room arrangement where materials, tools, and machinery are within easy reach.

The rooms are light and airy and were easy to insulate. In addition, to maintain a clean, breathable, and dry atmosphere (moisture affects both his health and the wood), Phill has installed Cyclone dust extraction units, air filtration systems, and a dehumidifier.

Phill's phone is suspended on a movable arm above his workbench so that he can listen to music or a podcast, talk, or film what he is doing and share it online. The phone is wirelessly connected to his watch so that he can manage the calls, music, and podcasts from his wrist.

Phill makes a living from commissions and has supplied schools, daycare centres, bands, music therapy programmes, and individuals with instruments for 17 years. He also makes an instrument for himself when he is commissioned to make one that he hasn't made before. Phill, who studied ethnomusicology at university, has travelled widely and now specialises in making musical instruments from different cultures. Music and woodwork have been interwoven themes throughout Phill's life, and this continues to be the case in work and leisure.

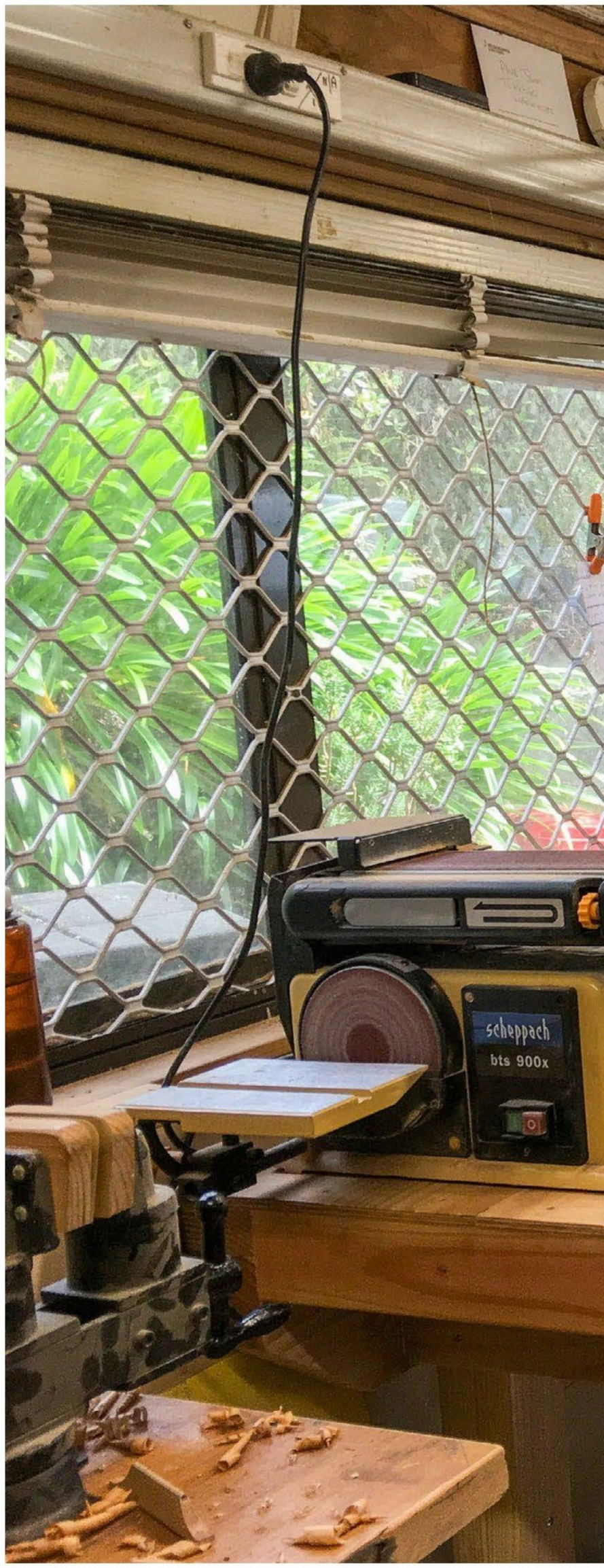
A born musician

Phill and his sister were surrounded by music at home.

Encouraged by his mother and grandmother, Phill took piano lessons through the Suzuki method when he was in pre-school.

"Music became a reliable companion, as we both learned about the world, about expression, about relating, coordinating our bodies, learning about performing, [and] experimenting. That is

Cyclone dust extraction



the world of music; it is a holistic skill which encompasses many facets of life," Phill says.

He played the piano, trumpet, and guitar throughout his school years and was interested in many different genres, from baroque to grunge, electronic dance music to Led Zeppelin.

"My father lives in Auckland and, as a teenager, I loved going to the big smoke and trawling through the records on Queen Street and K Road, discovering new and obscure music from around the world," he says.

Nowadays, Phill mainly plays a Nordic cittern, a 10-stringed guitar-like instrument similar to an Irish bouzouki, which he made a few years ago. He plays these instruments in a Hawke's Bay band called 'Ish', which plays folk music from around the world, primarily from Celtic cultures, the Balkan countries, and Scandinavia.

Phil also plays the *cajón* drum and many other instruments collected during his travels overseas. He occasionally plays the trumpet and piano, and he loves to sing.

Like grandfather, like grandson

Phill's grandfather Geoff was a big influence, and Phill spent a lot of time around both grandparents at the family farm on Tukituki Road in Hawke's Bay. The road is referenced in the name of Phill's business – Tukituki Instruments.

"I worked alongside him fixing things around the farm, painting the house, learning how to ride a motorbike and use the tractor, and pottering in the workshop, which had originally belonged to my great-grandfather Hugh," says Phill.

While Geoff wasn't a fine woodworker, Phill says that he was a good all-rounder, as many farmers and builders need to be. So Phill became familiar with wood, with the feeling of tools in his hands6++ and a pencil in his shirt pocket.

"The farm sheds were endless inspiration," Phill recalls. "You could find anything hiding in boxes and hanging on the walls, which sparked ideas for building things. There were all sorts of farm implements, tractor parts, oil cans, old hinges, and pieces of wood from throughout the 20th century of New Zealand farm life."

Growing up in Havelock North, Phill moved around quite a bit and lived in different rental properties. For around five years, his family lived next door to well-known violin maker and repairer, Pat Ward, who was another major influence in Phill's life.

Inside Phill's workshop, working on a *cajón* drum

"I enjoyed seeing families drive up and carry instruments in cases to and from his little workshop, and he always seemed content with life," he says.

Music studies, ethnomusicology, and travel

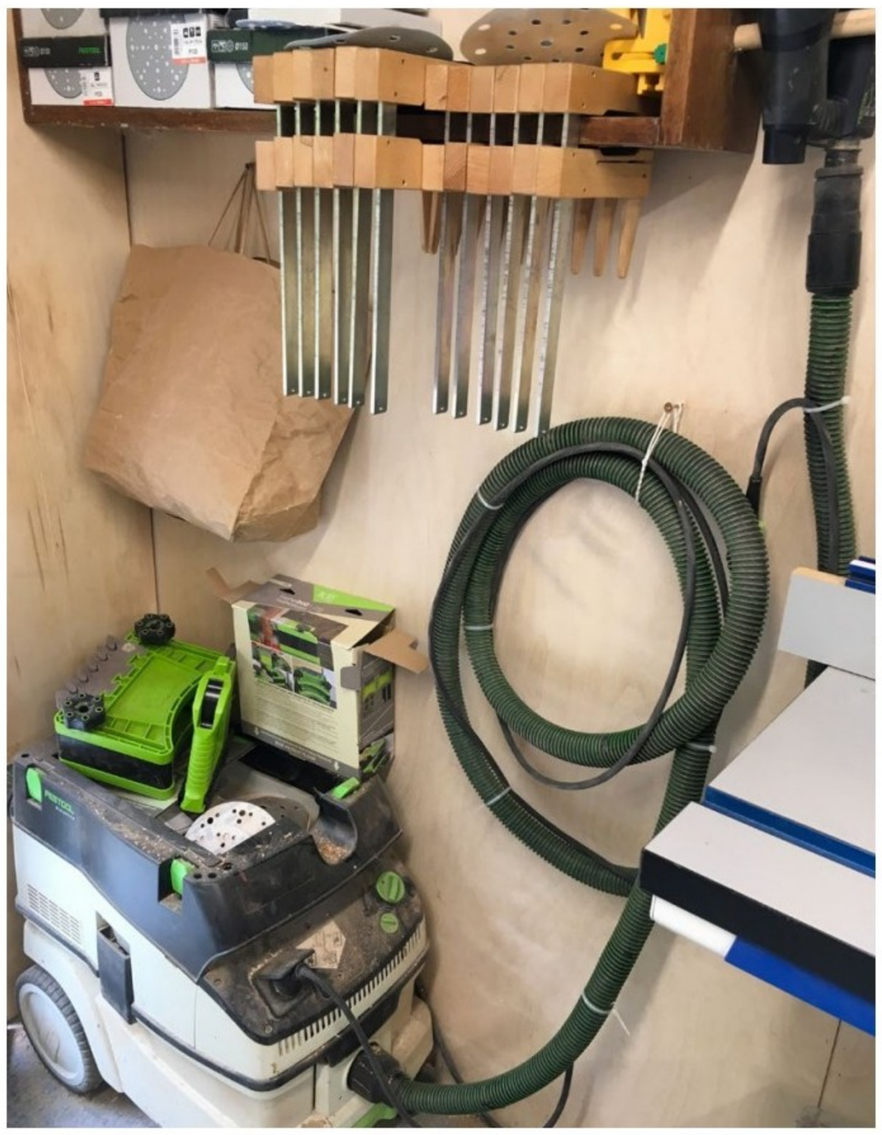
Phill studied various aspects of music at Victoria University of Wellington, including composition, history of music, and papers in ethnomusicology, which fascinated him: "I enjoyed studying the history of sampling and how in the 1990s many European bands used samples of music from indigenous cultures taken from field recordings made by anthropologists in the 1970s and put these sounds to dance music, which fed the exotic cravings of rave music and chill-out music listeners in Europe."

He also enjoyed following Western pop and rock music ideas that were interpreted by other cultures in North Africa, India, and the Pacific.

"It is fascinating what occurs when an electric guitar makes its way across the Sahara into the arms of a Malian nomad, or a Casio keyboard arrives on a remote Pacific island," he says. "What I learned

10-stringed Cittern guitar

Nordic cittern in progress



Dust collector with hose for direct connection to hand tools

“I felt I could find my own way, learning as I went along”

Kravik lyre with tōtara soundboard and mataī body

Cajón drum with bog oak burl veneer

there about human ingenuity gave me permission to create from my own perspective and to feel free. Even though I was not trained in musical instrument making by a reputable institution, I felt I could find my own way, learning as I went along.”

Phill’s travels expanded what he discovered at university. He lived in Germany for a year as a high school exchange student, and since then has travelled around Europe, parts of Asia and North Africa, North and Central America. “I enjoy being immersed in other cultures, eating different food, witnessing different weather, landscapes, architecture, language, and music,” he says.

Woodworking knowledge and skills

Phill is largely self-taught, drawing on many different sources along the way.

He has learned a lot from more experienced woodworkers, millers, and wood merchants, picking up skills, secrets, terminology, and which tools to use.

Occasionally, he has found a mentor to work alongside, improving on his existing skills and learning new methods. He has also learned by reading books, examining a lot of instruments, and playing around with his own instruments, modifying and prototyping, making and pulling apart his creations, as well as learning by making mistakes.

Nowadays, he uses YouTube and Instagram to do research and asks questions of other makers who have skills that he wants to acquire. During his travels, he visits other instrument makers, museums, music festivals, and conventions where he can learn more about his craft.

Phill has had to learn a lot about wood in general, and recommends green woodworking, which he says has a lot to teach all woodworkers: “Working with green wood forces you to think about grain and the behaviour of wood as it absorbs and releases moisture.”

He says that musical woodworking knowledge involves a lot of physics – thinking about the strength and weight of each piece used, as well as the grain of the wood and how it will respond to vibration. He may tune the wood by removing material from specific places to achieve the tone or pitch he wants (see Marimbas sidebar).

“I think about design a lot,” he says. “I’m attempting to create objects that are attractive to the eye and sit well in the hands or on the body – removing the barriers which separate us from interacting with this musical object. So, I guess I’m thinking of design being non-alienating. How do I help people to feel comfortable and joyful while playing this musical instrument? And how do I make it a valuable object which will last

Drill press

Block plane and special vice

Belt sander

Machinery and tools

Phill has the following line-up of tools and machines: buzzer (jointer) with spiral cutting blade; Dewalt thicknesser with spiral cutting blade; Laguna bandsaw (“probably my best tool”); Makita Jobsite table saw (“nothing fancy!”); large and small routers; Bosch drill press and lots of small guitar-making tools that he has purchased over the years, which include special files and rasps, pliers, and sanding blocks.

Storage drawers and Phill’s Makita trim router

Bosch drop saw

Drum sander for thicknessing soundboards

Jointer and bandsaw

a long time and not easily break?”

Phill’s instruments

Phill makes percussion and stringed instruments such as *cajón* drums, marimbas, and xylophones for schools, and he builds various types of harps and lutes for music therapists and sound meditation practitioners.

He also makes guitars, lyres, and other folk instruments such as the bouzouki, mandola, ukulele, and cittern. Every instrument he builds involves a completely different build process.

“I want to hear how they sound, basically,” he explains. “To see and hear how many ways a human can stretch a string or a skin over a piece of wood, or

shape their throat to make a unique and soulful sound from their mouth."

Base materials include plywood and solid wood, glue, strings, rubber, rope, felt, metal fixtures like screws and bolts, and threaded rod.

"An instrument maker uses all sorts of materials," he says.

Head, hands, and heart

Using his hands to make a living is continually rewarding – "thrilling" he says – and a way of life that he understands.

"I like to say [with] my head, heart, and hands," he says. "I guess I watched my grandfather as a farmer and builder doing the same thing, and it made sense to me, whereas I have sometimes become disillusioned in other jobs where I'm paid to be present for a certain number of hours."

As a craftsperson, he likes being fully responsible for pushing the work along: "It feels direct and real; sometimes I'm in a flow of inspiration, other times it's a slog. To sell something I've made to someone in exchange for some funds to help me sustain myself and purchase materials for the next project, or learn the skills and upgrade my tools to improve the quality of my craft, makes me feel connected to the world around me. It is sometimes a precarious position economically, but it feels real."

Something useful and beautiful

Phill also enjoys the variety, working with many different kinds of wood, shaping them into instruments that have their own sound and character. He says that while some woodworkers collect unusual timbers without always having a use for them, making musical instruments gives him an immediate way to create something useful and beautiful.

One of the things that keeps him motivated is not knowing exactly how the finished instrument will ▶

Cajón drum – the Tukituki Instruments logo doubles as the sound hole

Making a *cajón* drum

Phill has built over 700 *cajón* drums since 2009, and they are a staple of his instrument-making business.

The *cajón* (pronounced 'kah-hon') is an Afro-Peruvian box-shaped instrument originally created by slaves brought to Peru from Africa. They used fruit crates to make percussion instruments. Throughout the 20th century, the *cajón* was modified by adding metal snare wires to create more of a snap or sizzle when hit.

The player sits on it and strikes the front panel (called the *tapa*) with their hands to create deep bass tones and sharp, snare-like sounds that rattle and crack. They are a portable and versatile alternative to a traditional drum kit. Nowadays, *cajón* drums are used in rock music, folk music, acoustic music, and in some flamenco music in Spain.

Cajón drum building steps

Phill outlines the following instructions.

The standard adult size is 30x30x48cm.

Base material – 12mm birch plywood, cut up with mitres, ready to build into a four-sided box. Phill gets the logo, which doubles as a sound hole, cut with a CNC Router.

Build the box using Titebond Original wood glue, or something similar, and clamp it with tie-down straps.

Build a frame inside that will hold the screws and strings for the creation of the front playing surface, and build some partitions on the back side, which will create the three different drum tones for the back playing surface.

"The front *tapa* playing panel is a 3mm birch plywood panel, which I veneer on just one side using a decorative veneer," he says. "I glue this with cross-linking glue in a press that I've made out of a shop press and screw this onto the front of the drum."

Glue the rear playing panel onto the back side, which has the partitions, creating three different-sized sections. This creates the three bongo-like tones on the back playing side. Cut a channel with a router into the surface of this panel and glue in some veneers to indicate where the three sections are placed.

Use flush-trim and round-over router

bits around the edges of the drum, and give the whole thing a good sand with a random orbital sander.

Next, take the front panel off and oil the whole panel twice over two days with Osmo Polyx oil.

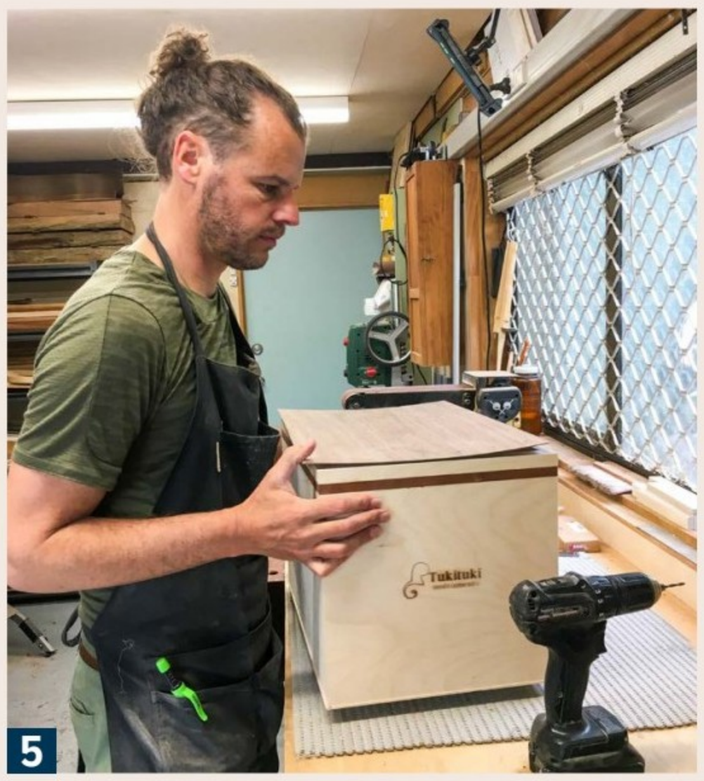
Assemble the guitar-string snare on the front playing side of the drum by attaching two strings to the top frame, wrapping them around an adjustable bridge at the bottom of the drum, and pulling them tight. The bridge is a piece of plywood with two furniture bolts going through it, which can be adjusted with Allen keys from the bottom of the drum.

Screw the front playing panel onto the drum, and tune the strings up so they make a nice sizzling sound as they touch the back of the front panel.

Osmo Polyx oil, a furniture and flooring hard-wax oil, is easy to apply, produces a great, durable finish, and is non-toxic when cured.

"For my guitars and similar instruments," Phill says, "I visit a friend who is teaching me how to spray lacquer, which is a tough, thin finish and can help the acoustic response too."

For this year's annual Whanganui Artists Open Studios event, Phill made a deluxe *cajón* drum using some prized Brazilian rosewood veneer for the front panel. This rosewood is rare and lends the instrument a sense of prestige.

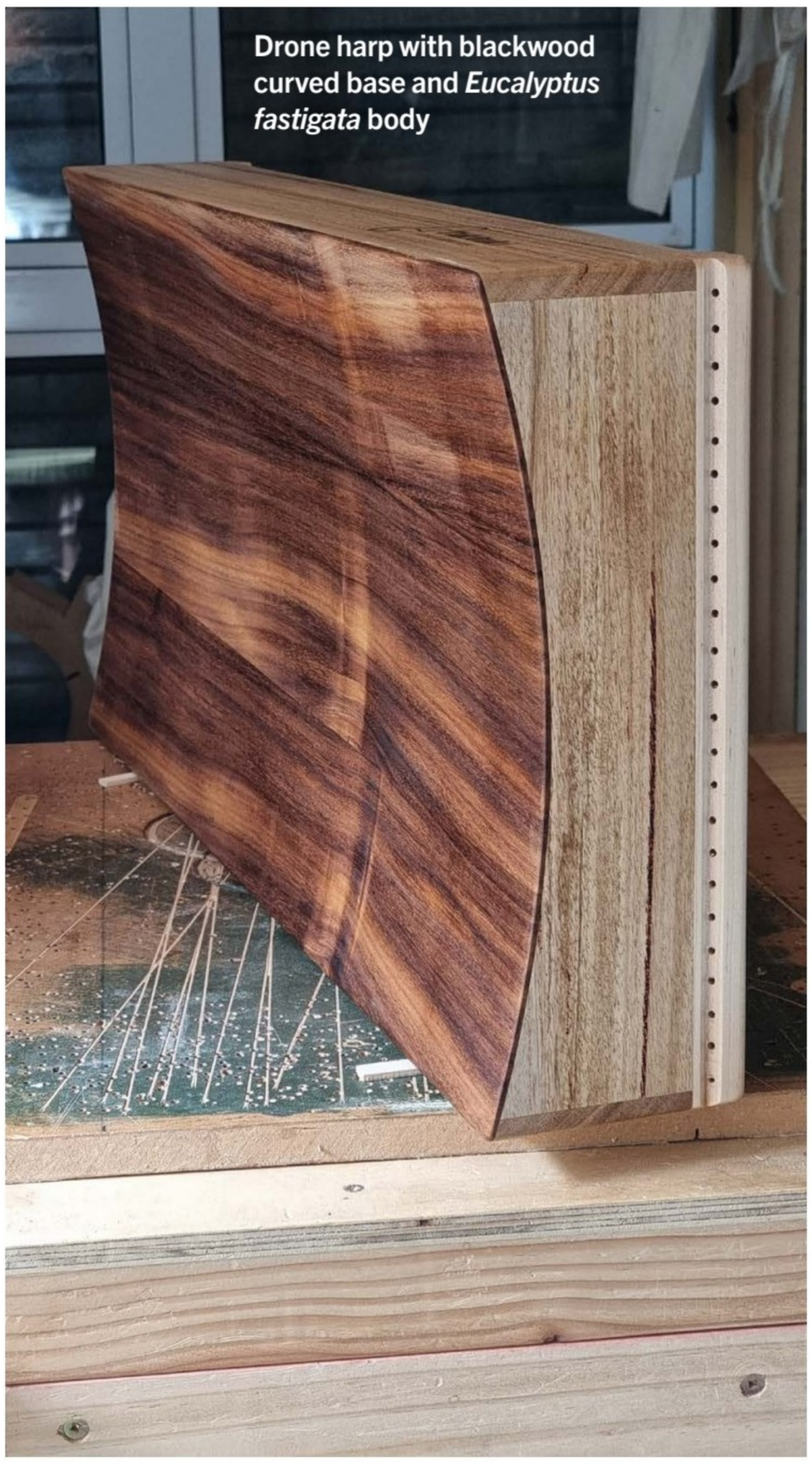


1. Drilling holes into a tapa veneered with American Walnut; 2. Holes drilled into the tapa or front playing panel; 3. A press is used to build the Cajon drum tapa; 4. Measuring and placement of screw holes for tapa; 5. Fitting the Tapa veneer made of walnut; 6.Tuning the guitar string inside the drum using an Allen Key 7. Testing the sound of the drum

Cajón drumming tones

The different tones are achieved by the variably sized panels, or partitions, that divide the rear playing panel into small, medium, and large areas. On the front, Phill uses two guitar strings that lie flat against the back of the front playing panel.

The playing panels are a specific thickness and flexibility. "In order to get a good bass response, the panel must flex, but in order to handle heavy hitting, the panel also needs to be strong," Phill says. "This is always the balance in a musical instrument – how to be lightweight and not over-built, but also stiff and strong enough to handle the forces involved."



Drone harp with blackwood curved base and *Eucalyptus fastigata* body

Indian rosewood for guitar making is prized and adds prestige to the instrument

> “To research wood pulled from riverbeds and investigate its suitability for instrument making”

turn out. When he applies the oil at the end, the colour of the wood deepens and the grain becomes more visible. The final test comes when he plays the instrument for the first time and hears the sound it produces – something that he can’t fully know until the work is complete.

Phill also enjoys the research he does, especially when he is asked to make an instrument that he hasn’t built before. He looks for information in many places, including on YouTube, Instagram, books, and other sources. Each new commission becomes both a learning process and a challenge to his woodworking skills, as well as an opportunity to explore his interest in music.

Wood sources

Phill found that once he began working with wood, he discovered sources anywhere and everywhere.

Sometimes he buys from Trade Me or Facebook Marketplace; he visits wood merchants and recycling yards, recycles furniture he finds, and buys wood from overseas if he can’t find it in New Zealand. He stores it on shelves and propped against walls in his workspace.

He says he is “quite picky” now; long gone are the days when he would grab any amount of recyclable rimu that he came across: “I know a bit more now what I’m looking for. And I’ve got a variety of wood – big slabs of various things.”

Woods that he uses include New Zealand native timbers such as kauri, kahikatea, mataī, and black maire, in combination with imported woods such as cedar, rosewood, spruce, kwila, and padauk – an African / South Asian tree that is a deep reddish-orange colour and is good for building marimbas. He also likes using elm, blackwood, eucalyptus, macrocarpa, walnut, and other species that are milled locally in Whanganui.

“I source high-quality New Zealand and exotic veneers for the front *tapa* of my *cajón* drums. When I need to use plywood, I use European birch, as it is strong and structurally sound in addition to being very good acoustically,” he says.

A recent find of river mataī washed down the Mōhaka River in Hawke's Bay

Kinderharfe with pōhutukawa body and western red cedar soundboard and plywood template

River wood

Phill recently received a grant from Creative New Zealand to research wood pulled from riverbeds and investigate its suitability for instrument making. He wanted to know if it has the tonal and structural properties required for musical instruments and to find special pieces to build with.

Friends at the local marae carve with river tōtara, and he hopes to learn more from them.

"These logs are significant to the history of New Zealand, as they are old-growth forest logs, often fallen into rivers after natural disasters, or sunk to the bottom during logging efforts in the last few hundred years, or they might have fallen into the river from where they stood and were so heavy they sank and stayed there," says Phill.

He notes that river wood, sunk in a cold riverbed and starved of oxygen for hundreds, even thousands, of years, can change colour and consistency: "Orangey browny pink" mataī can become charcoal coloured, or tawa, which is usually a light blond/pinky colour, can become a bluey grey.

During his research, Phill has spoken with people who retrieve and work with river timber. He has learned that wood loses its sap when submerged. So once it has been milled into slabs, the wood dries quite quickly – in just a few months – compared with a fresh tree, which can take up to two years to dry out.

So far, he has made a prototype *Kinderharfe* harp for children from river tawa and river mataī. The patchy, mottled effects are unusual, formed during the woods' time underwater.

Soothing sounds

To demonstrate, Phill perches on a stool with a lap harp, plucking and running his fingers across the strings.

There is something ethereal about the resonant, bell-like notes and cascading ▶

Phill has a selection of wood species

A love of wood

Says Phill, "I love that we as humans have evolved alongside wood, and therefore it suits us; it is almost human-sized by design – our hands fit naturally around branches, and our muscles can bend and snap wood, work it smooth, and cut, strap, and glue it together in many ways. It is the perfect material for so many of our needs, and this continues into the modern world. (Not to mention our reliance on bark, leaves, and other parts of trees in our medicine and weaving.) Wood is stiff and light and can vibrate musically too. Can you imagine if wood had evolved to be five times stronger, harder, and heavier than it is? It would have turned out far less useful to us throughout our evolution. I'm interested in wood because it feels like a vital and ancient relationship; it's like working with the original material."

Kinderharfe **template over a harp made with river tawa and river mataī**

ripples of sound that he produces – the culmination of many hours of work.

Phill uses a variety of woods to make harps, such as pōhutukawa, kauri, tawa, western red cedar, and walnut. He has made many lap harps for schools, as the instruments are very robust and can withstand rough handling. The sound is also soothing at sleep times.

"It can be played by anybody because the scale is pentatonic," Phill explains, "which is a little bit like if you're on the piano and you just play the black notes, they ▶

Kinderharfe **with river tawa body and river mataī soundboard**

Test playing a marimba after tuning

Marimbas

Marimbas are percussion instruments with bars that are struck with a mallet. They are usually much longer than a xylophone.

Phill demonstrates tuning a marimba he is making, along with several others, for an African marimba band in Kapiti. The keys, or tone plates, are made from padauk wood.

The band needed a set of marimbas in high, low, bass, baritone, tenor, and soprano. The lower the notes, the longer and wider the carved pieces of wood that make up the keys. The longest on the featured marimba measures around 34 inches (86cm), and the highest note is around 25cm long.

To begin making the individual bars, Phill selects a piece of wood, holds it vertically on one side, 2/9ths of the way from the top, and taps it with a mallet in the middle.

Phill explains, "The piece of wood will have a note in it. (All pieces of wood have a note when you hit them.) I hold it about 2/9ths of the way along because that's where the waves in the wood are cancelled out. It's not vibrating where I'm holding it, whereas it does vibrate at the end and in the middle. I want to control that note and make it a C or a D. It's quite stiff, so I take a scallop out using the bandsaw with a small blade. That introduces a lot more flexibility in the wood, which means the note goes very low compared to [the initial sound]."

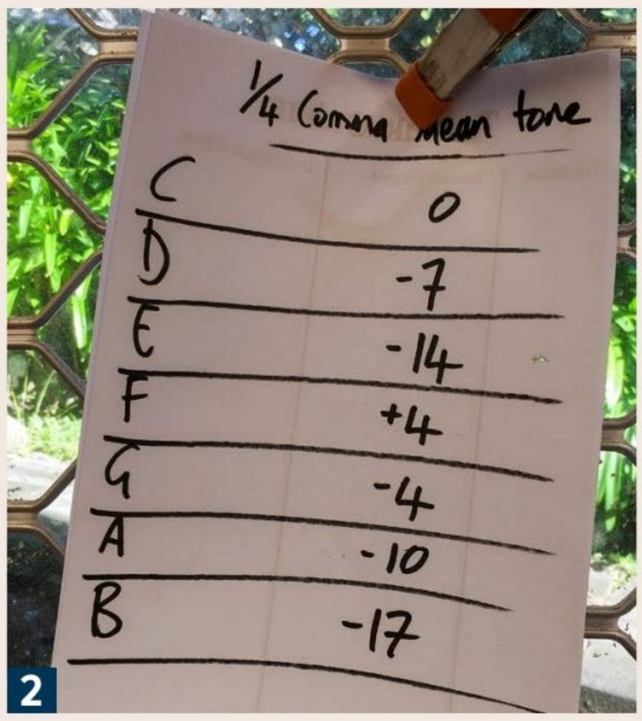
Tuning a marimba

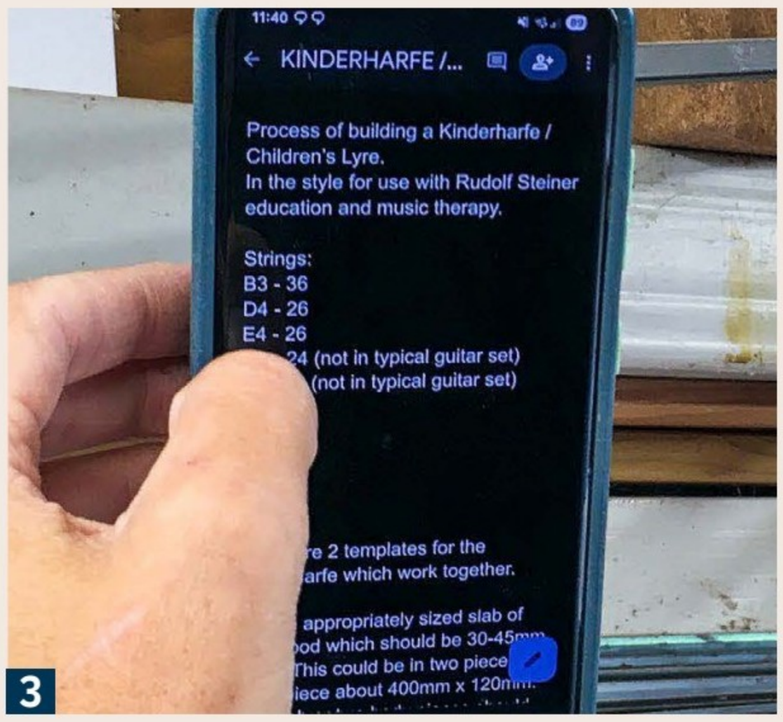
On a marimba, numerous wooden bars of different lengths are lined up like piano keys; when these are struck, notes are produced.

Phill has three tuning devices – a Petersen strobe tuner, an older electronic tuner, and a simple tuning app on his phone.

As he nears the final stage with the featured marimba (see photos), he uses all three tuners because the older one does not always produce the exact note and needs recalibrating. So he has a couple of reference tuners to double-check.

It takes several days to achieve the note he wants, and since this marimba is for African music, it uses a slightly different





1. To find the note of a piece of wood Phil hits it about ⅔ths of the way along, where the waves in the wood are cancelled out. 2. Notes for tuning to a specific African tuning system. 3. The cell phone is used in tuning the marimba. 4. A padauk marimba bar with scallop marked ready for its first tune. 5. Jig for drilling angled holes through marimba bars for fixing them to the frame. 6. To fine-tune the marimba, Phill removes tiny amounts of wood from the scalloped area of the bars. 7. Marimba bars with scallops cut after their first tuning. 8. Tuning the marimba

scale from that of a Western piano, which is why he consults a sheet that he has pinned on the wall that gives him the correct equivalent notation.

"I can't go all the way to a C in one go, because the bar heats up and changes as it loses moisture sitting in the sun, and also adjusts to my work," he says. "So I will leave it for a day. Then I'll use a sander, like a bobbin or spindle sander, and take more material out. That's the first tune. I do several other tunes on the sander, and once I finish the instrument, I need to do one more tune because I've put varnish on the wood, which also affects the wood's stiffness."

During the final tuning, Phill removes very small amounts of wood from the scallop area using a rasp or even sandpaper, which will affect the sound, tone, and pitch.

"At this point, I'm very, very fussy because I want it to leave the shop and be in tune," he says.

The bars are affixed to the wooden frame with an elastic shock cord. One way to tune would be to undo the knot, unthread the cord, and pull each bar off, which would be a longer process. A quicker way he prefers is to sound the note, check it with the tuners, then tilt the marimba and remove little bits of wood with a rasp or sandpaper in the scalloped part underneath the bar. Later, he will connect resonator pipes below each bar that will amplify the sound. They are also tuned by cutting each pipe to a certain length with a stopper at one end.

Tuning a *Kinderharfe*

> “You can’t play anything too complex, but if you just stroke it, it sounds good”

Kinderharfe templates

all sound good together. You can’t play anything too complex, but if you just stroke it, it sounds good.”

Phill is continually updating his skills and knowledge. He follows other instrument makers online and when he travels, can meet them in person, swap instrument-making tips and play together.

At the time of writing, Phill and his partner were preparing to go to Bulgaria to visit his wife’s family and friends. Phill was also looking forward to taking part in an annual folk music festival called ‘Le Son Continu’ held at a castle, Le Château d’Ars, in the Loire Valley in France. The festival is well known as a gathering of musical instrument makers and is celebrating its 50th year.

“I just want to go and check it out, meet some makers that I follow online, and perhaps gather some ideas and research toward improving my own skills and networks,” he says.

Contact and links

tukituki-instruments.com

027 239 2262

nz-native-riverwood.com

Playing a *Kinderharfe* made from pōhutukawa and cedar

<< Continued from page 71

For many customers, having access to both the machinery and the right materials from a single supplier makes the entire process simpler and more efficient.

Where Makerspace NZ fits in

Makerspace NZ sits at the centre of New Zealand's growing digital fabrication community.

Rather than simply selling machines, the company works alongside customers to ensure they get the most from their investment. Installation, training, technical support, and expert advice are all part of the package, helping customers develop the skills and confidence to fully utilise their equipment.

Their customers include:

- small manufacturing and fabrication businesses
- schools, universities, and training providers
- designers, engineers, and architects
- sign-makers and creative studios
- serious hobbyists and advanced makers.

Whether someone is purchasing their first laser cutter or expanding an established production workshop, Makerspace NZ provides both the equipment and expertise to help them succeed.

The workshop has become something else

One of the biggest changes happening today is that the workshop is no longer simply a place to build things – it's becoming a complete production space.

A single project might involve:

- designing a product using CAD software
- cutting components on a laser cutter
- machining larger parts on a CNC router
- forming plastics using a vacuum former
- bending acrylic for display pieces
- producing graphics with a vinyl cutter
- permanently marking metal components with a fibre laser
- assembling and finishing everything in-house.

That kind of capability was once reserved for industrial manufacturers. Today, it's becoming increasingly common in garages, studios, schools, and small businesses throughout New Zealand.

For entrepreneurs, designers, and innovators, it means that ideas can move from concept to finished product faster than ever before.

Not just for businesses

While many advanced makers operate small businesses, digital fabrication isn't just about commercial production.

Schools are introducing students to engineering, design, and manufacturing through hands-on learning. Designers and artists are creating work that simply couldn't be produced using traditional methods. Hobbyists are discovering entirely new ways to build, restore, and customise projects.

Just as importantly, these technologies are helping bring small-scale manufacturing closer to home. Rather than outsourcing production overseas, New Zealand businesses can increasingly design and manufacture locally – even for short production runs or one-off custom projects.

Where it's all headed

This isn't a passing trend. It's a fundamental shift in the way products are designed and manufactured.

As digital fabrication equipment becomes more capable, easier to use, and increasingly affordable, the gap between concept and creation continues to shrink. More workshops are evolving into highly capable production spaces, allowing individuals and small businesses to compete in ways that simply weren't possible a decade ago.

Companies like Makerspace NZ are helping drive that change by providing not only world-class equipment, but also the specialist materials, training, and ongoing support that give customers the confidence to embrace modern manufacturing.

Contact Makerspace NZ

Whether you're establishing a school makerspace, expanding a fabrication business, or upgrading your own workshop, Makerspace NZ offers a complete solution – from advanced machinery to premium fabrication materials through the Genesis Materials range.

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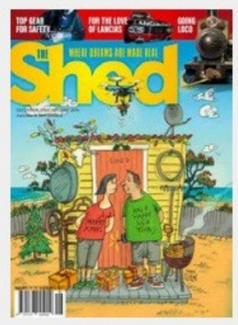

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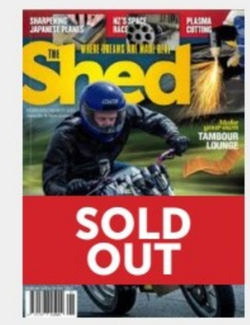

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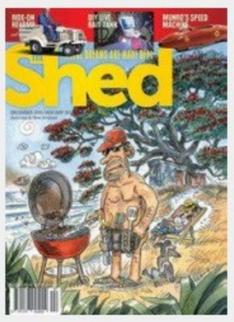

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A shed brings men together in one community space to share their skills, have a laugh, and work on personal projects or within a group for the shed or community.

Sheds and their members decide the projects to undertake. However most sheds throughout New Zealand take on some community projects, examples include repairing toy library stock, building playgrounds for early learning centres, repairing old bikes for community distribution, building planter boxes for the main street of the local central business district, the list goes on.

The shed is a great place for blokes to learn new skills. We see builders teaching engineers some of their skills and vice versa.

Sheds have been operating in New Zealand since 2008. The last decade has seen the number of sheds across both urban and rural areas increase to 140.

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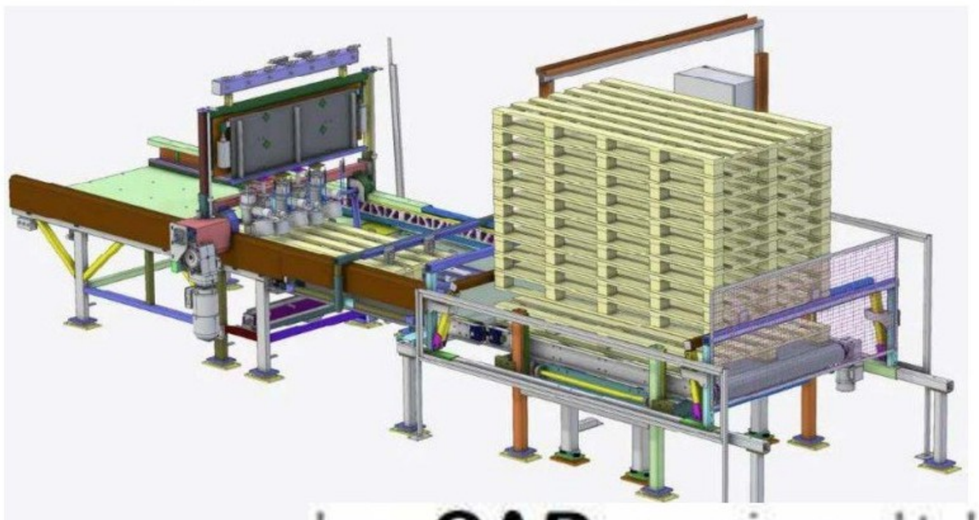

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Banks Peninsula a fave spot for Stuart

SURF'S UP

Some near misses with large trucks when out road cycling sent this new Kiwi looking for some safer thrills. He discovered a new outdoor pastime that is also great for his mental well-being

By Mark Seek | markseek@rocketmail.com |
YouTube: @theshedshrink | seekthrive.co.nz

Five years ago, Stuart Foster swapped Lycra and two wheels for a rubber suit and a 10-foot foam surfboard, and he tells me over a coffee that he hasn't looked back.

Taking up any endurance sport like surfing at 40-something certainly impressed me. Stuart's Instagram page @surfinmybones is quite open about the fact that age is no barrier. Stuart doesn't come from a surfing family, but I'm sure he would say that finding the surfing family here in Christchurch is a long-term relationship.

Originally, Stuart and his wife were working and living in London, and life was pretty hectic. He describes that time as a very precious commodity, and when he found some spare time, his escape was out on his bicycle. He assured me that London has some fantastic, dedicated cycle-only pathways to escape the city and that it is easily accessible. As an enthusiastic road cyclist, he recounts cycling several hundred miles in a single day and turning around only to retrace his route home. I tried to understand why someone would want to be perched on a little wee saddle for hours. I questioned how painfully uncomfortable that would be, especially in the inclement British weather. The only word I could come up with to describe such an event was 'torture'.

Dedication

But for road cyclists it's all about dedication, endurance, and slightly bonkers attitude (good on them, for sure).

So, on arriving in New Zealand and realising this would be their new home, Stuart set out to cycle the roads in and around Banks Peninsula, but after a few near misses with stock trucks and so on, his peaceful cycling experience was becoming a ride-to-survive scenario.

With a healthy respect for wanting to stay in one piece, Stuart decided to hang the bike up on the shed wall. This was when Stuart became aware of Surfing for Farmers (SFF), a charity set up to encourage our rural farming blokes to

SFF participants away from the cow sheds and enjoying the surf

get out of the paddocks and onto the beach. An invitation to a beach evening and a barbecue afterwards opened up a new world for Stuart, and he highly recommends it. I guess you could say he's a surfing evangelist!

He's loving it

This new convert shares his weekly surfing expeditions with anyone who wishes to follow him.

Stuart tells me that he's snapped a couple of boards and often spends hours out on the water before he feels confident enough to jump onto a wave, but he says it's all worth the effort. Personally, as a spectator, I have often admired the surfing community; they all seem to be a friendly bunch of men and women who get to experience something few of us get to do.

SFF could be a way for any of us to dip our toes into this surfing world; maybe it's on your bucket list.

Remarkable growth

Over the past eight years, SFF has experienced remarkable growth, expanding to 25 beaches nationwide.

Local coordinators generously volunteer their time to provide this invaluable opportunity, offering a respite from the all-encompassing demands of rural life and fostering social connections within the community.

SFF recognises the importance of providing an outlet that liberates individuals from the daily grind and overwhelming to-do lists. By engaging in surfing, our farmers and growers gain a renewed perspective and prioritise their self-care. This simple yet effective approach enables participants nationwide to take the lead on their responsibilities.

Surfing and a good mate – great combo!

With an impressive participation of over 8000 farmers and growers across 25 beaches, the 13- to 15-week SFF programme showcases its tangible impact on the lives of those involved.

It's all free

What sets SFF apart is its commitment to accessibility, as all equipment, lessons, and refreshments are free of charge.

This ensures that the programme remains inclusive and accessible to all individuals who can benefit from it, regardless of their financial circumstances. Jump in the ute, grab your neighbours, and join the group for the perfect break and a classic Kiwi barbecue.

The statistics are impressive, to say the least, and if you look at their website, it showcases what a Kiwi initiative can do to address mental health and well-being with an all-are-welcome vibe.

Come on, people, what are you waiting for? Surf's up!

Stuart Foster
Instagram: @surfinmybones
YouTube: @surfinmybones

SFF
surfingforfarmers.com/

Know your stuff

TEST YOUR SHEDDIE KNOWLEDGE

THE Shed QUIZ NO. 9

1

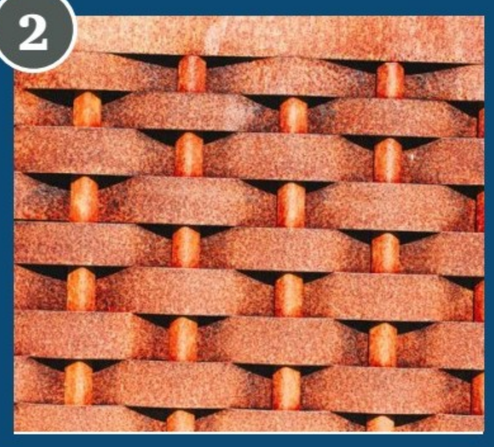
Why is a petrol container called a 'jerrycan'?

a) The German military used them

b) It was invented by a man called Jerry

c) The original was made of bits and pieces, so it was jerry-rigged

2



What is special about corten steel?

a) It rusts easily, so it looks rustic

b) It is easier to cut using a laser

c) Its rust becomes a protective crust

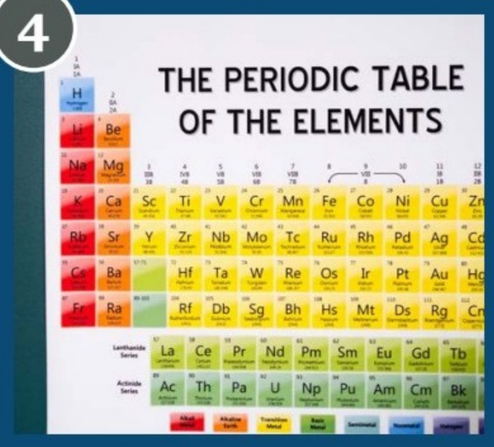
3

A blunt tool is generally more dangerous than a sharp tool.

a) True

b) False

4



What alloying elements make corten steel so special?

a) Carbon, vanadium, and aluminium

b) Molybdenum, manganese, and titanium

c) Copper, chromium, nickel, and phosphorus

5

Which woodworking joint is generally used to join two pieces at right angles to each other?

a) Scarf joint

b) Finger splice

c) Dovetail joint

6

You should sand timber with the grain wherever possible.

a) True

b) False

7

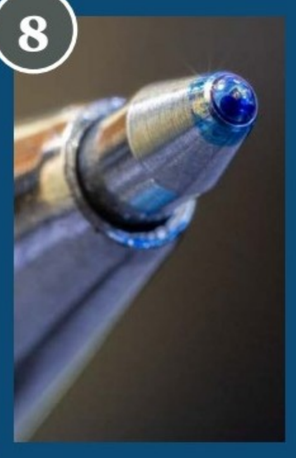
What is a 'kerf'?

a) The width of wood removed by a saw blade

b) A type of wood finish

c) Tooth offset angle on a saw blade

8



What sparked the invention of the ballpoint pen?

a) A journalist noticed that printer's ink dried quickly

b) A ball bearing manufacturer wanted to expand the market for steel balls

c) The annoying sound of pen nibs scratching on paper in a large office

9

Gallium is a metal. What is its melting temperature?

a) 297.6°C

b) 29.76°C

c) 2976°C

10

What effect does gallium have on aluminium?

a) Strengthens it

b) Weakens it

c) Shines it

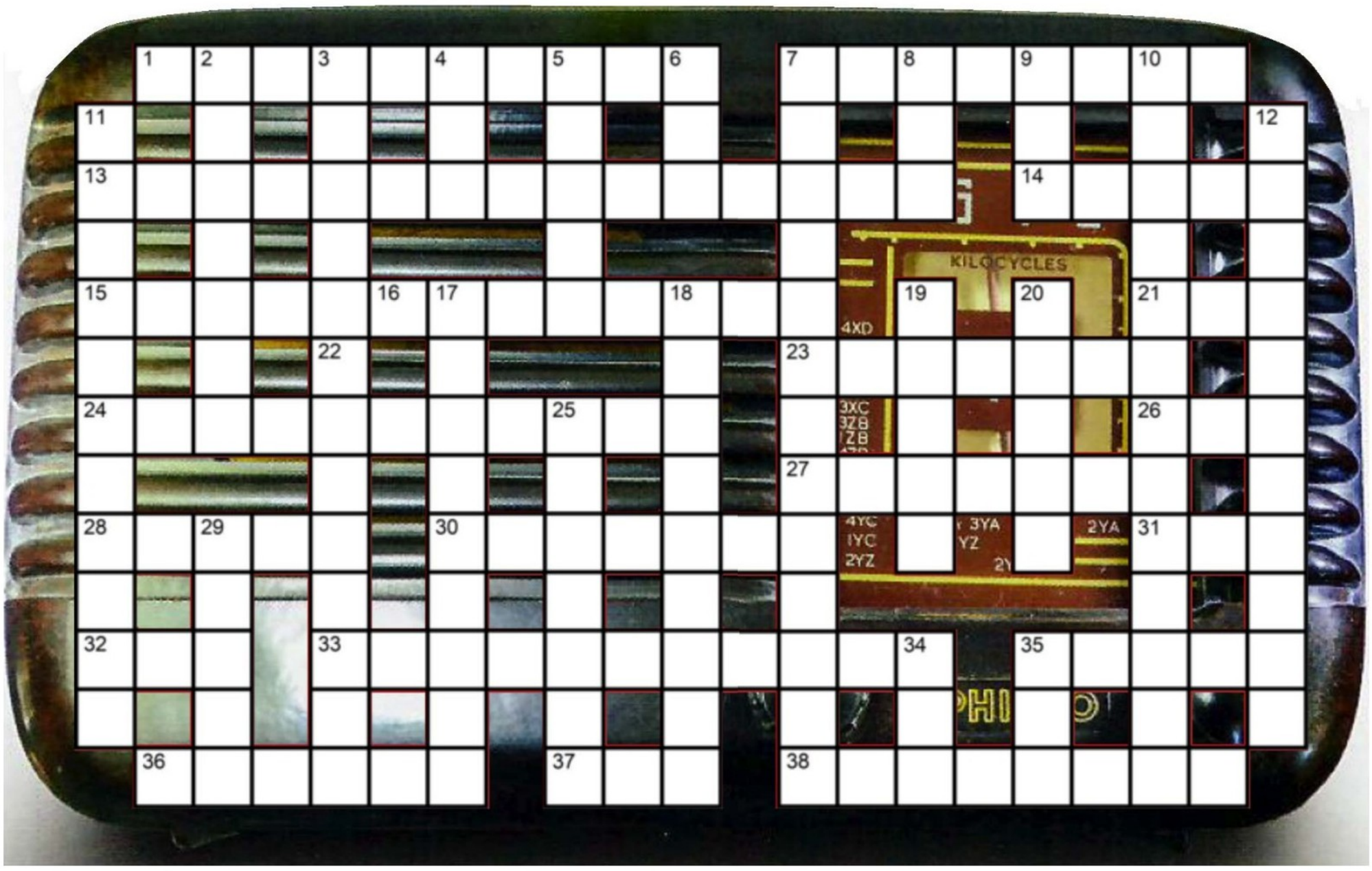
Answers: 1.(a) They were produced in Germany and used by the German military. Allied forces found some during wartime and copied the design. English troops nicknamed the Germans 'Jerries'; 2. (c) Its rust becomes a protective coating which bonds to the parent metal and prevents further rusting; 3. (a) True; 4. (c) Copper is essential for corrosion protection, chromium enhances adherence and density of the patina, nickel improves the toughness and uniformity of the patina, and phosphorus helps stabilise the patina and bond it to the steel surface; 5. (c) Dovetail joint; 6. (a) True; 7. (a) The width of wood removed by a saw blade; 8. (a) A journalist noticed how quickly printer's ink dried and was annoyed by how easily his fountain pen writing would smear. His name was Laszlo Biro; 9. (b) 29.76°C; 10. (b) Weakens it – in fact, it becomes extremely brittle and crumbles.

THE SHED CROSSWORD NO. 6

Note to solver - clues with 3-letter answers all use a similar (unconventional) format.

By Māyā

(Questions or comments? Visit https://mayaofauckland.substack.com or email crg1955@gmail.com)



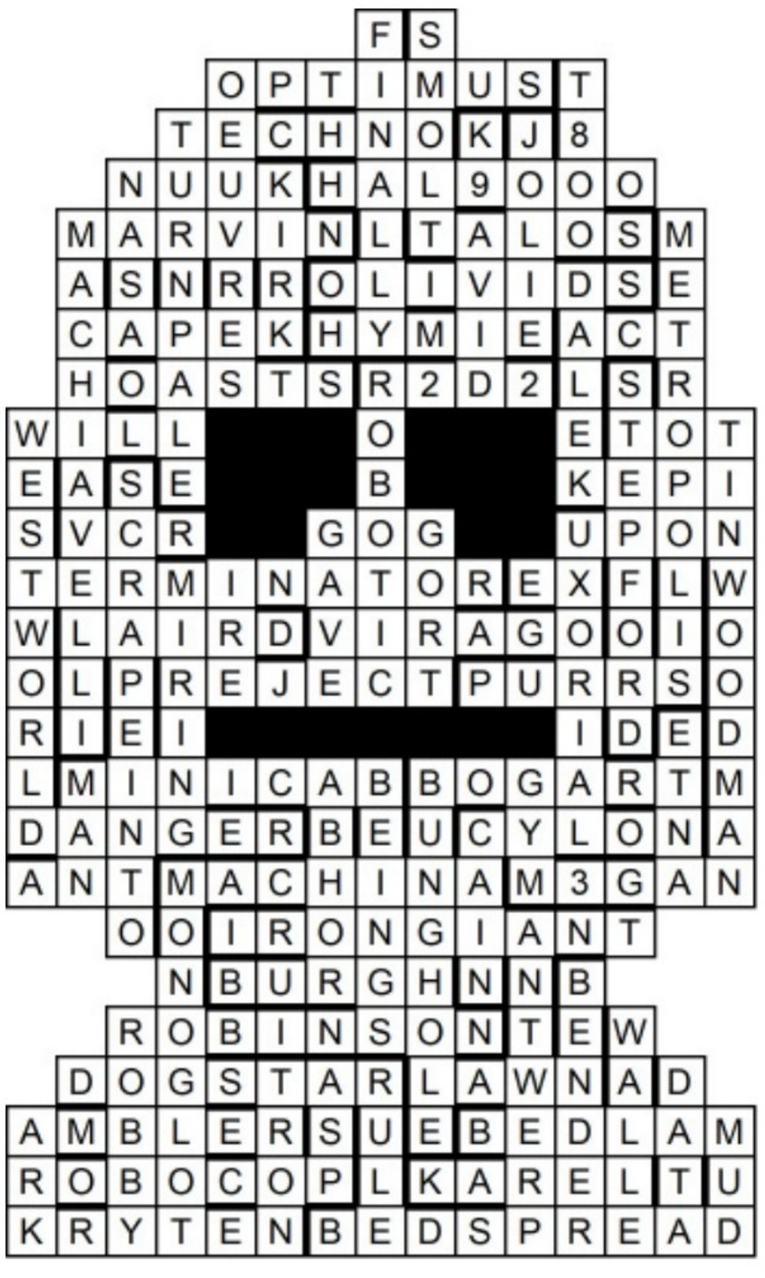
Across

1 Clean floors of London Underground to obtain vintage 29 component (6,4)
7 I get away, clutching key, to a cold scene (8)
13 Stated correctly could be a 26's whisker? (7,8)
14 Early version obtained from the 20 of keg beer (5)
15 Sally rocking backless 29 (4)
16 Western lawman initially has one listening device (8)
21 E-bag? (3)
23 Angers husband catching cheat credited with inventing 29 (7)
24 "__ ___ must ___!" - but not in that order. Vintage 29 36 from the 19 (3,4,4)
26 Cher could be found in the rye? (3)
27 Six-footer princess upset receiver (7)
28 Shoot second killjoy (5)
30 Glacial landform beat duck back (7)
31 An extra-terrestrial? (3)
32 Own sink? (3)
33 Fellowship's skill hiding silicate mineral (11)
35 Much ado - house laugh about nothing (3-2)
36 Clergy's outside, holding protest about light entertainment (6)
37 26 - are you positive? (3)
38 Cruise follows space base underground (8)

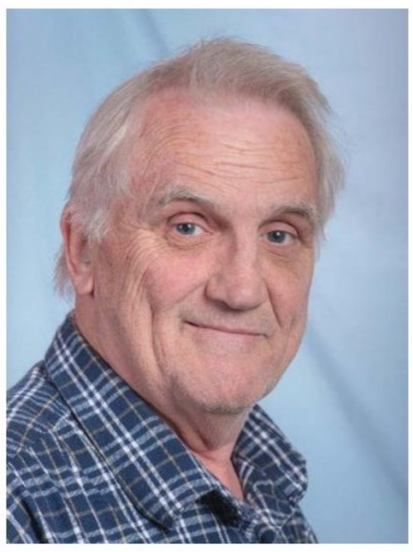
Down

2 Whenever amenity fails (7)
3 Less than or equal to young at heart? See next page (2,2)
4 Liquid Ted? (3)
5 Half-heartedly pursue suspect drain (3,2)
6 Sheep tumbled? (3)
7 While on the Greenwich meridian, perhaps? (2,3,8)
8 Form part of limb? (3)
9 Gel club? (3)
10 Cajole Patrick into a prank (9,4)
11 A copper values, say, golf as "good in parts" (1,7,3)
12 "Too good" to be a game show? That's guaranteed! (3,2,3,3)
17 Maud Basham broadcast Sunday at around one (4,5)
18 Dystopian soldiers bore Scotsman (9)
19 People from the UK can upset Bishop at first (5)
20 Output from 29 also under bottles (5)
22 Type of signal that may be picked up by 29 - could it be Mexican? (4,4)
25 Gulf where pirate 29 found Uriah travelling around Alaska (7)
29 This type of activity is forbidden in NZ waters! (5)
34 Abominable, I? (3)
35 Let Shakespeare play? (3)

Answers: *The Shed* Crossword No. 5



BOOMING ON



An election is on the horizon, so Jude joins a political party to do his bit for democracy. However, he laments the lack of aspirations in our youth. Who will provide the unifying voice that can hold us together?

By Jude Woodside

I foolishly imagined I had plenty of spare time, so I did something I had never done before: I joined a political party.

I signed up to help win an election, and I noticed something unsettling about my fellow volunteers. We are, for the most part, all of the same generation – a gathering of chromium blondes. No eager youth set on remaking the world, no weathered apparatchiks dulled by years of campaigning, just a company of near-geriatric volunteers. Boomers.

The roaring mouse

It was disappointing, and rather alarming, or possibly it is only the party I belong to, or perhaps merely my branch of it.

> "A gathering of chromium blondes"

Perhaps, too, it is simply that few others have the time to spare. We are all older than the candidates we support. I suspect the Greens may have a younger following. Still, what troubles me is the widening gulf between the parties and the young. When I was young, politics was vibrant. As a teenager, I attended demonstrations against the Vietnam War almost every Friday on Queen Street. They were alive with theatre, satire, and camaraderie – us against the establishment, the mouse roaring.

We did not end that war, but we helped make it deeply unpopular, and from that grew a politics that went on to challenge racism, apartheid, unemployment, women's oppression, and political overreach in all its forms. It became a visible and enduring means of dissent, one that still carries real political force.

The gains were many

And there were real gains.

Civil rights advanced. Women won equal rights, though equal pay remains unfinished work. Women can now hold a credit card or mortgage in their own name – something unthinkable at the start of the 1970s. Homosexuality shed its stigma, Te Tiriti was recognised, and human rights became, at last, a recognised principle across the world.

That is why I despair for young people. Most of them don't read. Even fewer have any interest in politics. Their attention is now compressed onto a small screen, controlled and manipulated by those who do not always have their best interests at heart. The absence of a visible opposition has often emboldened those with a regressive agenda, who claim support from the 'silent majority'. In my experience, majorities are rarely silent.

The road to catastrophe

Those narratives so often begin with the delusion among some people that they are, in some sense, 'chosen' – superior to the rest, and therefore exempt from the rules. It is a dangerous creed, one history has already shown us leads to catastrophe.

So what becomes of the aspirations of youth? Do they have any? Where will the next social breakthrough be made? Who will provide the unifying voice that can hold us together against those who seek division for their own ends? Political vacuums attract grifters and ambitious self-servers, and that never ends well.

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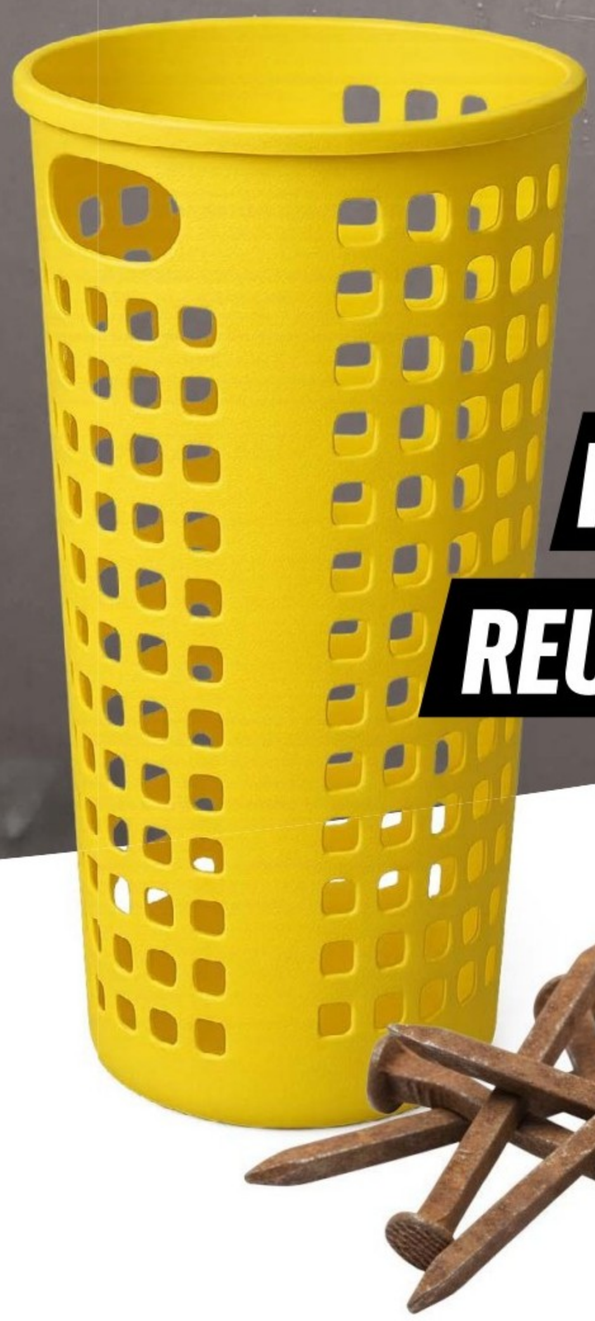
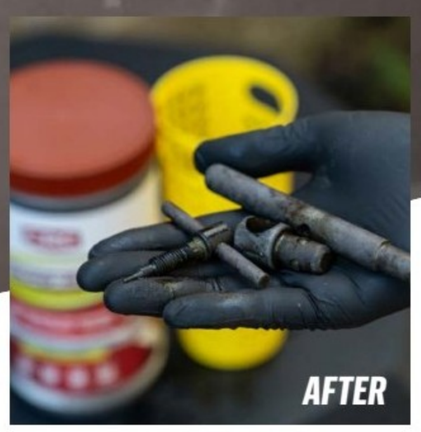


SOAK

RINSE

REUSE



SCAN HERE TO WATCH *