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JULY-AUGUST 2021

ISSUE 97

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OUR FUTURE IS IN GOOD HANDS AFTER ALL

When folks come across *The Shed* magazine, I know they will have a preconceived idea of who this publication is designed for — you, as a regular reader, probably have too.

Many may reckon they know exactly the type and age of sheddie that we feature and who reads our magazine, but they would be wrong.

Sure, a lot of our content features males of a certain age wearing a fair bit of grey hair but, honestly, it's not exclusively so.

With our *The Shed* website traffic, for example, Mr Google tells us that the majority of our visitors are males aged 35–50. However,

female visitors account for over 25 per cent of our traffic. Does that surprise you?

When we think of a project to write about or a sheddie's work to feature, we are looking at the article not the age or gender of the sheddie. We like to think we are not ageist or sexist. Young and old and all sexes are welcome on our pages, as we try to cover a wide range of skills, pastimes, and interests.

A case in point is our article in this issue on a young Auckland sheddie, Nick Howard. Nick is an electronics wizard but, in time-honoured shed tradition, he will have a crack at anything — and I mean anything. He is a young man with not a speck of grey hair showing and will spend a morning welding a new floor in a car he is doing up before bottling some tomatoes in the afternoon. The next day he will make and smoke his own salami before building his own home security system then creating and fitting a home ventilation system. He is a true sheddie in every sense of the word.

Another thing that may surprise some is that he doesn't live in one of our smaller cities but in a built-up Auckland suburb closely surrounded by neighbouring houses.

After I voiced my fears on the future of our shed interests and skills in the previous issue's editorial, it is encouraging to see that there are, actually, some quite young sheddies out there and that the future of the Kiwi shed is safe. It looks as though the mantle will be carried on after all, phew. 📁

Greg Vincent
Publishing Editor



THE WHERE DREAMS ARE MADE REAL
Shed

the-shed.nz

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A sheddie restores some of the “most significant motorcycles in history”



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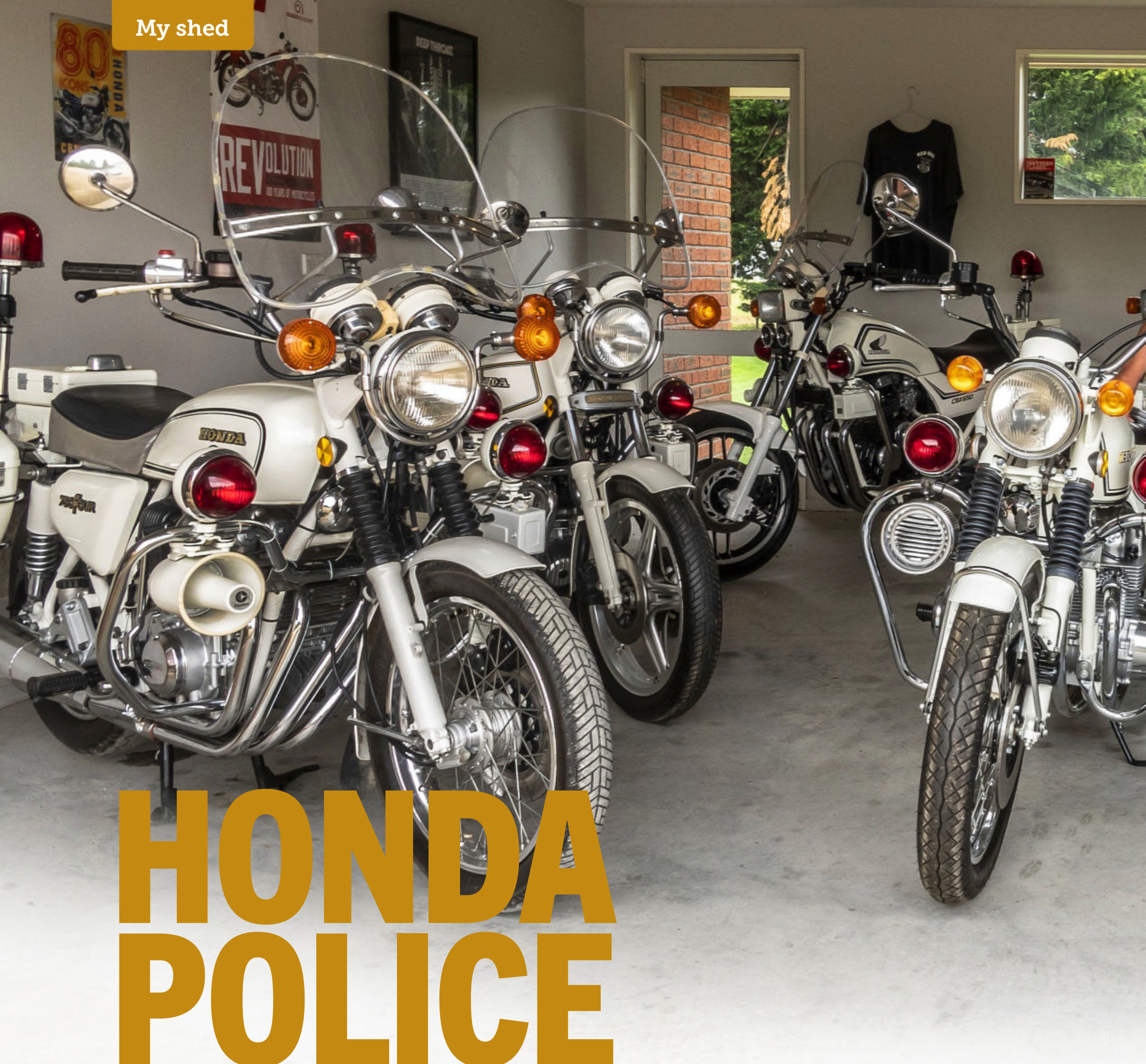
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HONDA POLICE SPECIALS

“One of the three most significant motorcycles in history” — that’s how Hayden Tasker describes the Honda CB750, considered by many to be the first superbike. He believes the bike changed motorcycling — so it’s no surprise to find three of them in his collection of police specials

By Ritchie Wilson

Photographs: Brian High



Hayden Tasker and his collection of Honda CB Police Special motorcycles from the 1970s and early 1980s.

Hayden Tasker works as an agricultural contractor in New Zealand's South Island because he strongly feels that there is nothing more important than food production and feeding the world's population. He points out that even scientists researching a cure for cancer can only do so because there is toast and Vegemite for them to eat for their breakfast.

If the weather is fine, agricultural contractors work all the hours of daylight, and Hayden often clocks up 80-hour weeks with a succession of 18-hour work days. When *The Shed* contacted him to arrange a visit, he said he expected a cold

front to pass through at 11am the next day and that he would be available then. He has studied his local weather for years and is often consulted by his neighbours on meteorological matters. Sure enough, as I made the long trek south, a towering band of cumulus cloud, gleaming white, stretched east to west across my route, from the mountains to far out at sea, as cold air from the Southern Ocean pushed northwards, complete with a southerly wind change and a band of rain.

Fitness for purpose

I arrive at Hayden's home rather before the arranged time and, shortly after, he



They are built for the job they
are going to do and, in his
experience, rarely fail to perform



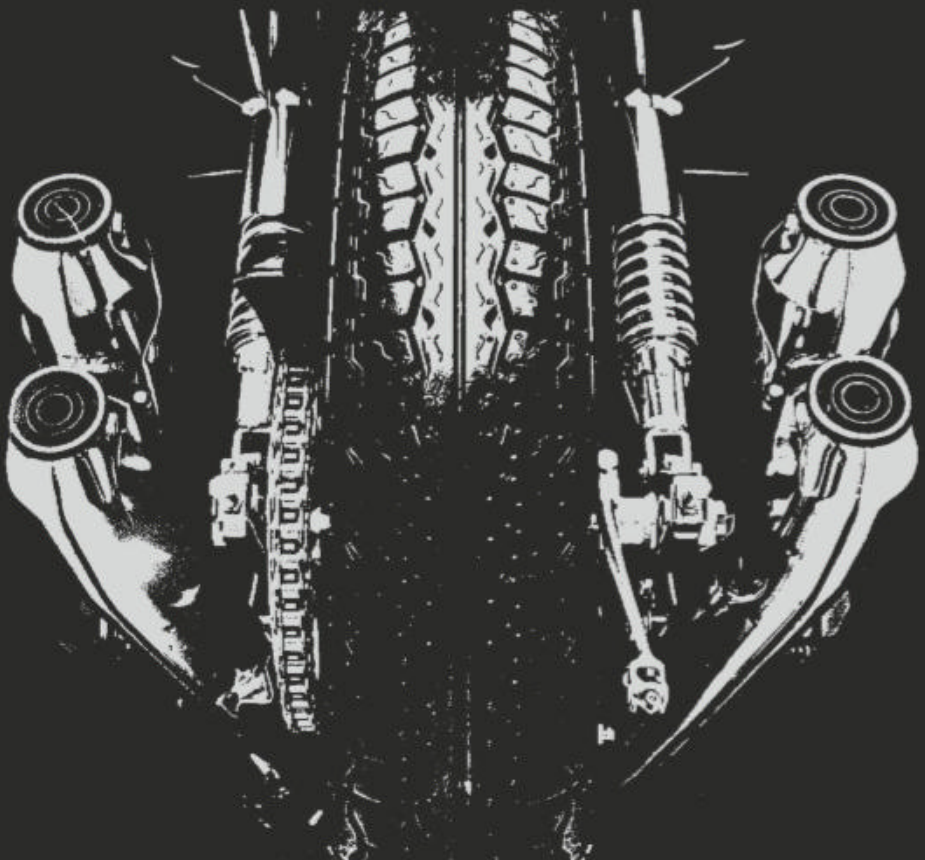
rides down his immaculate driveway on a 1958 Puch 150cc two-stroke scooter. We have a glance at his highly organised workshop, where everything is stored in under-bench cupboards; his road bikes, including a couple of Honda turbocharged V-twins; and his Japanese kei car — a Honda Beat two-seater sports; but what Hayden is interested in talking about is his collection of Honda CB Police Special motorcycles from the 1970s and early 1980s.

Hayden likes Hondas — even though they are not always the fastest motorcycles — because of their reliability and their “fitness for purpose”. They are built for the job they are going to do and, in his experience, rarely fail to perform. If they do have problems, it is usually because of some easily corrected, minor fault. They are “bulletproof”, with good, utilitarian engineering.

A tyrannical perfectionist

Hayden thinks the admirable qualities of Honda products are a reflection of the company’s creator, Soichiro Honda (1906–1991). Hayden tells a story of the great man’s early life that shows

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Next time you see a seven fifty Honda, stop. Listen to the message in the deep quadraphonic grumble of the pipes as it thunders down from that humming engine.

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four, and feel the smooth, vibrationless power that idles in the heart of those pipes.

One turn on the gas handle and that power burbles into life, and that's a life story well worth hearing. Have a test listen at your nearest Honda dealer soon.

This year go all the way get the Honda.



HONDA

Go all the way.

his concern for others. Although revered by his employees, Honda is popularly considered to have been a tyrannical perfectionist who drove his business partner, Takeo Fujisawa, with who he formed the Honda Motor Company in 1948, to distraction. Hayden's story, in contrast, shows Honda was respectful and considerate.

Hayden emphasises that the Honda CB750, commonly considered to be the first superbike, is one of the three most significant machines in the history of motorcycles.

His top three are:

1. the Honda C100 step-through of 1958, which "changed the world"
2. the 1927 Triumph Speed Twin, which eventually put 100mph within reach of the ordinary rider
3. the Honda CB750, which was much imitated.

"[The Honda CB750] looked right, it went right, and it was priced right," says Hayden, who admires the historical importance of the bike. "It changed motorcycling". ►



Smaller capacity bikes were used for parking enforcement



The Police Special motorcycles

Hayden has nine Honda CB Police Special motorcycles, previously owned by the New Zealand Ministry of Transport's (MOT) Traffic Safety Service (TSS) or associated agencies.

They are:

- Honda CB360 twin
- Honda CB500 four
- Honda CB550 four
- Honda CBX750 four
- Honda CBX650 four
- Honda CB650 four
- Two Honda CB750F fours
- Honda CB750K four.

Police specials are made by most of the world's motorcycle companies because police departments buy lots of bikes and can be loyal customers, with regular servicing and repeat purchases. The bikes come equipped from the factory with radios, lights, and sirens, and with robust electrical systems to power them.



The transverse four-cylinder engine layout of the Honda CB was very widely imitated

These accessories are additional sources of profit for the companies. The simple, usually white, colour schemes are also easy to apply.

Showroom condition

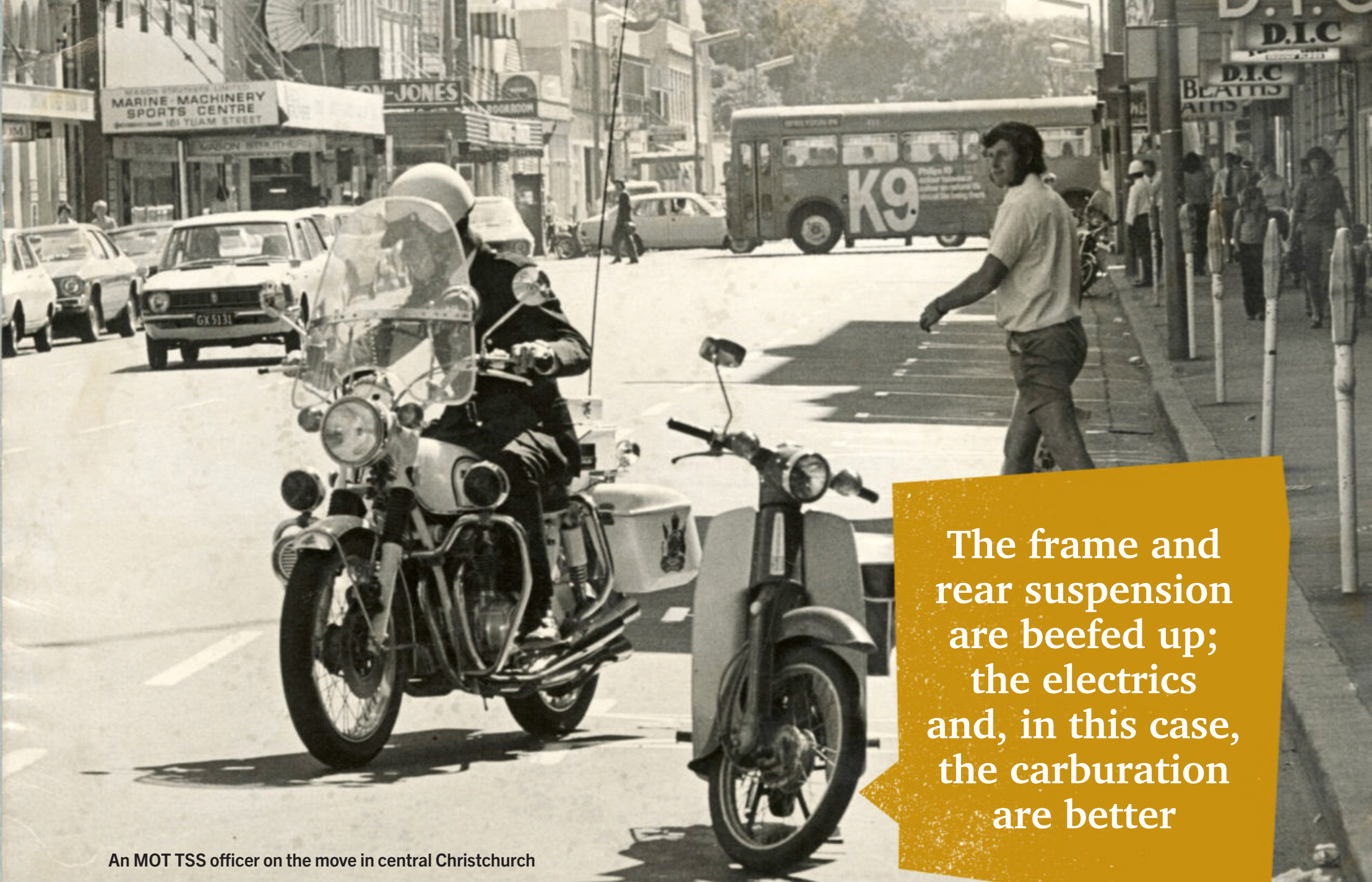
Hayden and his friend Stu Holdaway restored the bikes in Hayden's collection to showroom condition over a period of four years. They also restored several

other Honda CB Police Specials for other owners.

Hayden leaves me in no doubt that Stu was an essential part of the restoration story — besides having an encyclopedic knowledge of motorcycles. Stu strongly encouraged Hayden to restore the bikes. He would come over to Hayden's house after work and the two of them would work on the restorations until well after midnight, till perhaps just two or three hours before dawn and the start of a new working day. Hayden says that he doesn't need a lot of sleep. When it became known that a major motorcycle restoration effort was taking place, other friends got interested and wanted to become involved. For instance, the local truck and agricultural machinery painter offered to paint the bikes.

The two of them would work on the restorations until well after midnight, till perhaps just two or three hours before dawn





The frame and rear suspension are beefed up; the electrics and, in this case, the carburation are better

An MOT TSS officer on the move in central Christchurch



The distinctive twin speedos of a Police Special. The one on the left is able to have its needle frozen, recording the speed at the time

Twin speedos catch offenders

Originally, Hayden had bought just one police special, a CB550K, out of interest because it was a Honda CB, and then another for parts. His personal preference is to maintain his bikes to a good standard but leave them cosmetically as is.

As he worked on the bike, he was impressed by its good looks and by the

number of improvements in the police version to make them fit for purpose in their more demanding role. The frame and rear suspension are beefed up; the electrics and, in this case, the carburation are better. Distinctive purpose-built twin speedos are fitted at the factory.

The twin speedos are interesting. One is the normal speedo calibrated in 5kph increments; the other, with fine

2kph markings, has a meter stop, which freezes the needle when operated. When an officer was trailing a motorist breaking the speed limit, he would match speeds with the speedster and press the meter stop. Then, when the speeding motorist was pulled over and disputed the accusation of speeding, the officer could point to the frozen needle, which indicated the motorist's actual speed.

A slice of Kiwi history

A friend pointed out to Hayden that he had something special in the ex-MOT bike and that he should preserve it by restoring it to its original condition — as it was when it left the Honda factory. The friend emphasised that the MOT police specials were a rich slice of local history, of Kiwiana. The Honda CB Police Specials in their white livery, with their specialised patrol gear, were a memorable part of many motorists' younger years, important because of their provenance. Hayden says that he appreciates a beautiful old motorcycle, but that he loves an old bike with an interesting story, such as the police specials have. They have a history. ►



Sourcing parts difficult task

Restoring the bikes became more difficult over the four years as stocks of parts were exhausted and the condition of the bikes bought became worse. When the bikes were sold by the MOT, they were often stripped of their patrol gear, except for the twin speedos, and had the MOT stickers removed. Sourcing the lights, sirens, radios, panniers, and windshields to replace those that had been removed was a major problem. The mechanical sirens, driven by cables from the rear axle on some of the bikes, are obsolete and are especially rare and expensive. Hayden says that he didn't appreciate when they began how difficult obtaining parts would be. Some local-body bikes were sold with patrol gear, and this was one source of parts. Original suppliers in Japan were another, as were online auctions, but it became more difficult and would be, Hayden thinks, almost impossible today. Again, Hayden emphasises that Stu was the kingpin in the restorations, quoting him as saying, "You can't not do this."

A blast to ride

The MOT's relationship with Honda came to an end in the early 1980s after the MOT took delivery of the shaft-drive CBX version.

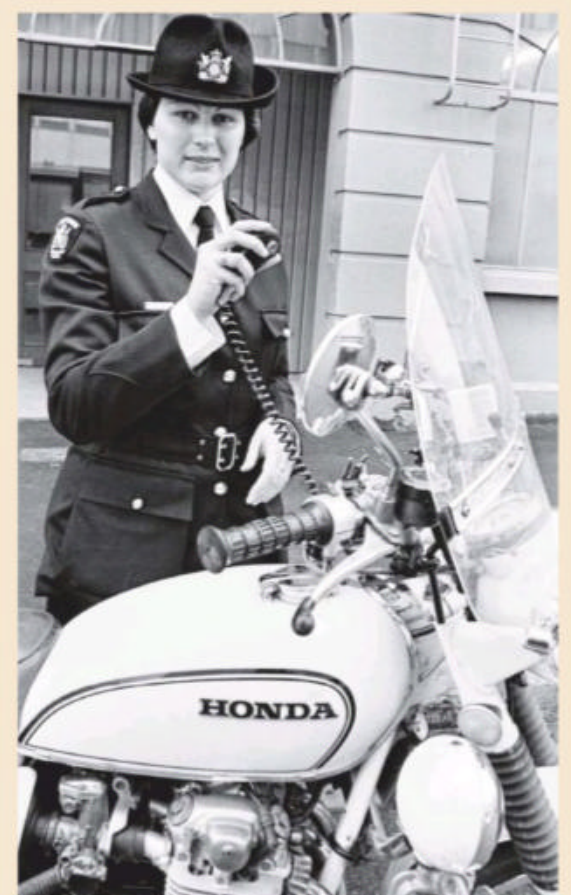
I've talked to the owner of a Honda dealership of the time, a well-known competition motorcyclist, and he says that he rode a CBX750 at, he thinks, the Manfeild raceway, when the bike was first introduced to New Zealand dealers and the press. He says that it was absolutely superb. It had huge amounts of power and he could get the heavy machine's front wheel to lift under acceleration. He recalls it being "a blast" to ride. He had to use his racing skills on the corners because of the bike's width, but he didn't experience any handling problems at very high speeds; the bike didn't have a windscreen or loaded panniers fitted. He had to be reluctantly flagged in to allow other dealers a chance to have a ride. ►

The policing of New Zealand's roads

The first traffic cop in New Zealand was hired by Auckland City in 1894, when virtually all vehicles were horse-drawn. From then on, many local bodies had officers with the authority to enforce traffic laws within their boundaries. The central government started policing some roads just before World War II, and gradually took over this task from local councils until, by the early 1990s, it was the sole traffic authority.

The MOT was formed in 1968 and, apart from officers employed by some local authorities, the policing of New Zealand roads was the responsibility of its TSS. The MOT was a very large government department responsible for everything from lighthouses, now unmanned, to air-traffic control — now the responsibility of Airways Corporation — to weather forecasts.

In 1992, the MOT's TSS was merged with the New Zealand Police. At first the TSS officers continued to police the roads but were, over time, given training in new skills such as firearms usage and drug enforcement. They were progressively absorbed into the police, thus greatly increasing the number of sworn police officers. In some quarters, at the time, it was said that the main motivation for the merger was to fulfil an election promise to increase police numbers. Many people think there is less emphasis on road safety than on revenue gathering in road policing





traffic snarls that would stop a patrol car and they can very quickly turn and pursue rule breakers speeding in the opposite direction. A police motorcyclist told me that motorcycle cops “always get their man”.

Another essential service that the police motorcyclist performs is escorting the vehicles of VIPs in the country for official visits. During the visit of Prince Charles and the Duchess of Cornwall to New Zealand, the bikes and riders of their escort were flown around the country as the tour progressed because there weren't enough bikes in any one place to make an appropriate show. Bill Clinton, of course, brought his own fleet of

escort vehicles when he visited in 1999. In 2020, officers and their machines were going to be borrowed from Australia to make up the numbers for an international conference in Auckland. However, because of the pandemic, the conference became virtual, so the bikes and riders weren't needed.

It is thought that habitual breakers of traffic laws are much more likely than the average law-abiding driver to engage in criminal behaviour in the rest of their lives, so it is hard to argue that traffic police aren't an important aspect of overall law enforcement and shouldn't be part of the regular police force.

today compared with the time of the MOT traffic cop.

Even in the days of the TSS, it was difficult to recruit motorcycle traffic officers from the dwindling population of riders of large-capacity motorcycles. Hayden Tasker has heard stories of senior traffic officers suggesting to young motorcyclists that they had pulled over for speeding that they become motorcycle cops; they would be paid to ride fast — and have a worthwhile career. The relative inexperience of some officers on fast two-wheelers could have contributed to some of the accidents that injured them.

The MOT traffic officers didn't only issue tickets to motorists who broke the rules of the road. They were also involved in, for example, traffic safety lessons in schools, safety checks on the bicycles of primary-school pupils, and conducting tests for driver licences. Ex-MOT traffic officers say that only about a fifth of their interactions with motorists resulted in the issuing of a ticket. The emphasis was on educating motorists in safe driving — perhaps a reflection of the grim death rates on New Zealand roads at the time.

Motorcycles are a valuable part of the road-policing mix. They can negotiate



An MOT officer pictured in 1981 on duty during the Springbok Rugby Tour





Honda warned that heavy panniers and the GN200 windshield, which had been fitted to previous models, shouldn't be used on the CBX because of potential handling problems

A few issues

The former dealer recalls that in service with the TSS there were niggling issues with the engine's timing chain. At one stage, his workshop was replacing the timing chain with every oil change — at his personal expense. The problem was eventually fixed by replacing the newly introduced automatic chain tensioner with the old manual one, but it was one of the reasons he gave up the Honda dealership.

Honda warned that heavy panniers and the GN200 windshield, which had been fitted to previous models, shouldn't be used on the CBX because of potential handling problems.

Hayden's CBX650 Police Special has a label warning of the potential dangers of riding with a windshield and heavily loaded panniers fitted. The label states, in part: "The cargo load must not exceed 27kg under any circumstances." This advice was reportedly ignored, and MOT officers started riding the CBX650s and 750s on the country's highways with the windshields fitted and the panniers fully loaded with heavy wet-weather gear.

Writer and CB650PZ owner Greg Price, who wrote about the issue in *Beaded Wheels* magazine in 2017, told me that the staunch TSS union apparently became concerned about the Hondas and they were withdrawn from service, to be



Honda Super Cub

The Super Cub was, at first anyway, a 50cc four-stroke motorcycle with a semi-automatic gearbox that was introduced in 1958. It had the factory designation 'C100' but is best known in New Zealand as the 'Honda step-through'.

The 'non-super' Cub was a two-stroke clip-on bicycle motor that Honda made in 1952 and '53. Soichiro Honda particularly disliked the noisy, inefficient clip-ons, which were popular in Japan at the time, and wasn't keen on two-strokes either, but he must have liked the name.

The Super Cub is still in production and, according to motorcycle.com, 50 million had been produced by 2006 — with about the same number having been made since then. It is easily the best-selling vehicle of any type ever made. It transformed transportation in Asia, replacing the donkey in local economies.

Even in the US of the 1960s, it was a cultural phenomenon, with its classic "You meet the nicest people on a Honda" advertising slogan. Iconic American rock group The Beach Boys had a minor hit with the song *Little Honda*, from their 1964 album *All Summer Long* written by band members Brian Wilson and Mike Love. The surviving members of The Beach Boys were still performing the song live in 2007.

Little Honda featured in the 1965 movie *The Girls on the Beach* and was covered by The Hondells — a group of Los Angeles session musicians that included Glen Campbell — with their version reaching number nine in the US charts. When they appeared on *The Andy Williams Show* in February 1964, they had to change the words from "Little Honda" to "Little cycle" because the television network wouldn't allow them to say 'Honda' on air.



The shaft-drive CBX650 with its windscreen and heavy patrol gear

replaced by the Yamaha XJ750 and then by the BMW R80 TIC. Hayden's CBX650 is one of the five that were kept by the Auckland City Council for parking-enforcement duties — which didn't usually involve high-speed chases.

By 2015, Honda was back in favour, and the New Zealand Police bought Honda ST1300s for traffic policing.

Right first time

Almost from the start of the four-year restoration project, Hayden Tasker and Stu

Holdaway followed the same sequence in returning the sometimes quite run-down two-wheelers to showroom condition.

All the bikes were New Zealand new and were purchased in New Zealand. Hayden says that a newly purchased bike would be returned to good running order before the restoration process began.

"I usually liked to put some miles on them before we pulled them down for restoration. The main reason is that then we knew when we reassembled the bikes that they were good runners. If we had ►

**The staunch
TSS union
apparently
became
concerned
about the
Hondas**

Prototypes

Working in agriculture, Hayden Tasker often gets to see new and innovational machinery up close. He says that New Zealand is used as a testing ground by international machinery manufacturers, mainly, he thinks, because of its remoteness, although it's hard to imagine agents of industrial espionage scouting local fields to scope out the opposition's latest device. The difference in our seasons from the Northern Hemisphere, where these manufacturers are based, may also be an attraction.

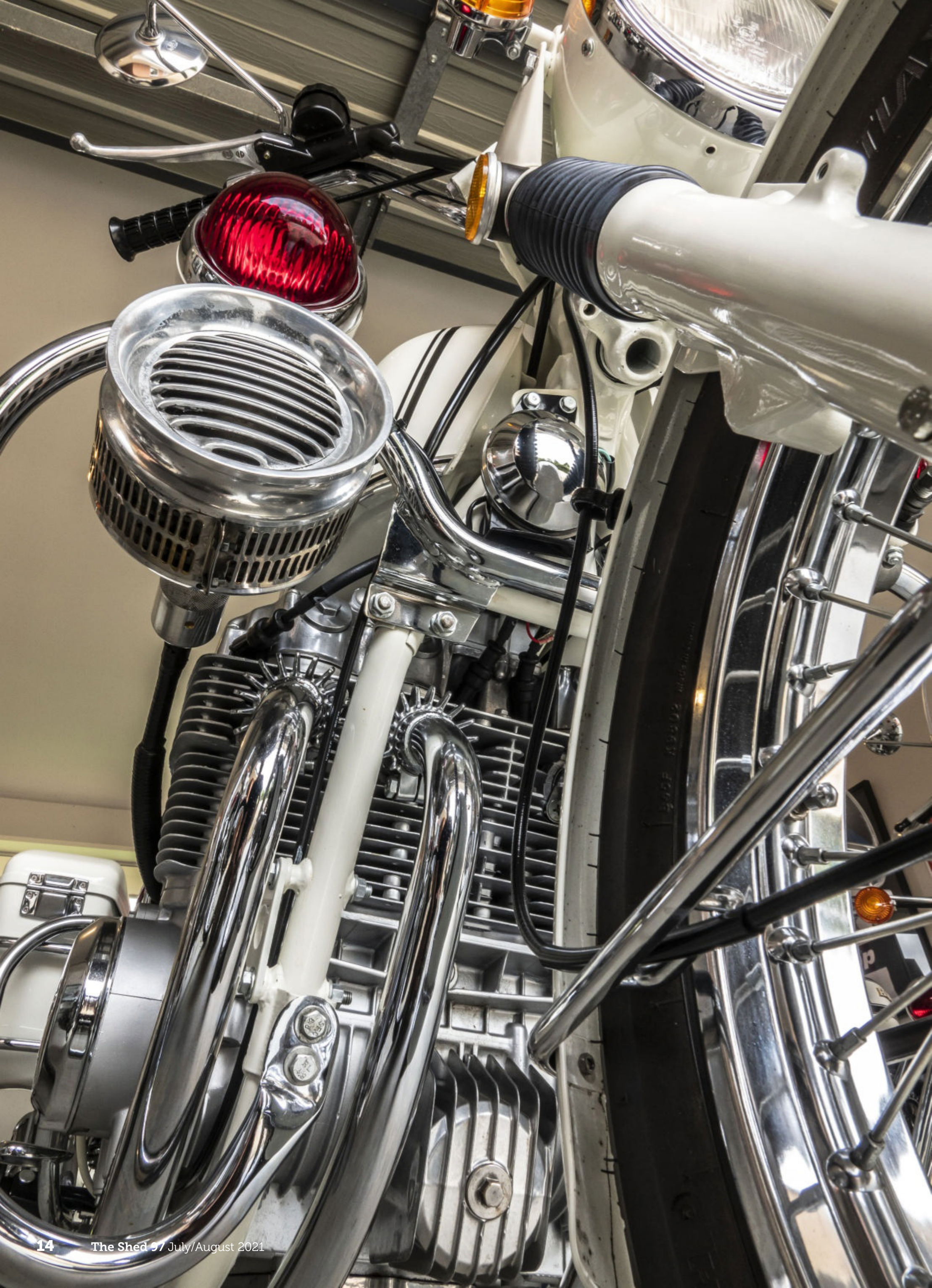
Hayden believes that it's the same with motorcycles. New models can be discreetly trialled on our relatively

deserted roads without attracting any great interest. The testers would enjoy better weather than during their winter at home too.

On one holiday — preseason, of course — at the popular resort of Kaiteriteri at the top of the South Island, I was relaxing on the really wonderfully pretty beach when a crew began setting up a scaffolding and tarpaulin structure on the adjacent grassy verge. Cameras on tripods were then set up in the structure's shade.

There was a short lull while a catered snack and coffee were consumed. Then a large car transporter, distinguished by tarpaulins fastened to its sides to hide the cars, swept down the hill at

the end of the road from Nelson. The two or three small sedans with German number plates — Munich, I think — were quickly unloaded and carefully positioned between the cameras and the golden sands, the clear ocean water, and the bush-covered islet in the centre of the bay. I had my camera with me and was going to take a photo of the proceedings when a crew member came onto the beach and asked me nicely not to — so I didn't. Pictures were shot and, as quickly as they had arrived, the cars were reloaded and departed — perhaps to return to Germany. I never discovered what the German sedans — about the size of a Suzuki Swift or Mazda2 — were; I'm pretty sure that they were never sold here.





The most challenging restoration for Hayden and Stu was the last, the CB750K



Hayden says that some nights they would sit with a coffee in his house and say, “What the hell are we doing wrong? This bike is growling at us!”

The bike had been crashed and it had also been highly ‘civilianised’: the mounts for all the patrol gear, such as lights and siren, had been cut off. There were other ill-considered modifications as well. It was the only bike where pulling it apart was almost more difficult than putting it back together.

Hayden says that the bike is proof of his theory that the things in life which are hardest are the most worthwhile. Stu says the bike almost killed him — and not because he was riding it, either.

The bike did, however, turn out very well. It has distinctive four-barrel exhaust pipes, two on each side, which Hayden particularly likes — he has a contemporary Honda advertising poster featuring a large image of the rear of a CB750K, exhausts prominent. ►

done our job properly they would be right first time and wouldn’t need pulling apart again.”

After the bike’s evaluation, it would be methodically stripped down and the parts classified according to what needed doing to them. As soon as the bike was disassembled, Hayden would take the parts to the appropriate folks to be blasted, powder-coated, painted, or plated. Any parts that were in too poor a condition to be reused were put on a ‘pray we find another one’ list.

In a number of cases, a second bike of the same type was purchased and was used as a source of parts. One good bike was made from two. The overall result

was that most of the bikes have 100 per cent original parts in them, with only a few nuts and bolts being new.

“We never at any stage mucked around timewise,” Hayden says. “Things happened fast, keeping up our enthusiasm for the project. Stu did the electrical work and I did the polishing and tidying up of parts. Everything else was a team effort. We used a wheel-building expert to lace the wire wheels.”

Saving the best till last

The most challenging restoration was the last, the CB750K. It was also the most satisfying, but it tested the resolve of the two friends.

After the bike’s evaluation, it would be methodically stripped down and the parts classified according to what needed doing to them

Military police bike

One of the CB750F bikes that Hayden and Stu restored is exceptionally interesting. The person who sold the bike to Hayden said that it had been part of an estate sale on the West Coast and had been a Military Police bike, first at a Royal New Zealand Air Force (RNZAF) airfield and then at the Burnham army base. It transpired that it was a well-known, very fast bike that had impressed in informal racing between engineering apprentices on the airfield. Apparently, airfield racing was a common occurrence at Air Force bases back in the day — perhaps it still is.

As the restoration progressed, a few unusual aspects of the bike became apparent; for instance, the engine mounts were welded to the frame rather than being bolted on to allow routine replacement. In an attempt to find out exactly what he had, Hayden contacted the Honda museum, called the Honda Collection Hall, which is in the small town of Motegi on the island of Honshu, Japan, near where the Japanese MotoGP is run.

Amazingly, it turned out that the English-speaking expert he spoke to at the museum was a friend, who had been a fellow pupil at Hayden’s local high school, where he played rugby for two years and generally had a good time. The

Hayden’s Police Specials					
Bike	Engine capacity	Number of cylinders	Single or double overhead camshaft	Chain/ Shaft drive	Comment
CB360	360cc	Two	Single	Chain	
CB500	500cc	Four	Single	Chain	
CB550K	550cc	Four	Single	Chain	First bike restored
CB750F	750cc	Four	Single	Chain	
CBX750	750cc	Four	Double	Shaft	First of type off the production line
CBX650	650cc	Four	Double	Shaft	Former Auckland City Council
CB650	650cc	Four	Single	Chain	
CB750F	750cc	Four	Single	Chain	Ex–Military Police; unusual engine
CB750K	750cc	Four	Single	Chain	Last bike restored — very rough

expert was excited when he was told the details of the CB750F and confirmed that it was a rare bike, with an experimental engine, which the museum was keen to buy. Hayden had no hesitation in rejecting this proposition.

“They sent it here, so here it stays” is his attitude.

A stunning collection

It is difficult to describe the impact of seeing these gleaming, fully restored bikes as a group. Each is of absorbing interest, with its perfect chrome and paint, its specialist patrol gear, and interesting history, but the whole is

greater than its nine separate parts. The overall effect is genuinely stunning.

Hayden wants the collection to stay together in New Zealand, perhaps in a museum where it would be able to be seen by the general public and would be well looked after. There is a police museum in Porirua, but these are MOT bikes not police bikes.

The front has passed; the rain hasn’t been as bad as feared. Hayden is ready to return to work. My time with the nine ex-MOT Honda CB Police Specials is at an end.

I can hear Hayden’s phones ringing as I drive away. 🚲

A symphony in chrome. Four cylinders, four exhausts



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Deputy principal Lisa Squire and Reid Walker of Hobsonville Point Primary School take delivery of their Tinker Cart

TINKERING WITH THE FUTURE

A innovative scheme to pass the baton on to the next generation

By Ian Sharpe

We have all heard it — or thought it at some point: the kids of today are so focused on their screens that they have no idea how things actually work. They don't muck about with tools and wood and wheels; they don't make things themselves any more. This, the theory goes, means that they are missing out on something really fundamental and valuable.

Some might argue this digital-only focus doesn't matter; kids are learning all the skills they need in the digital age, just as we learnt what we needed for the pre-digital age. More people, however, think that kids are missing out on vital hand-brain training and practical problem-solving that will make them more rounded people and more active agents in their own lives. This could be even more valuable than learning music or another language, which is already known to have proven brain benefits.

Kick-starting those grey cells

So — offering incontrovertible proof that handiness with tools makes people creative and proactive — the Warkworth Men's Shed has come up with a way to get tools into the hands of schoolchildren to kick-start their unused little grey cells.

One of the Warkworth members, Mike Izzard, who returned to New Zealand after many years in design education overseas, has developed the 'Tinker Cart'. It contains most of the things that kids would need to turn ideas

into some form of reality — stationery, hand tools, hot-glue guns, sewing machines, motors, wiring, soldering irons, electric drills, and even 3D printers. The idea is that the carts can be wheeled from classroom to classroom depending on where they are needed.

Some wealthier schools have 'maker spaces' but that often means dedicating a classroom to that use. The cart is obviously a great alternative for less well-funded schools that currently can't offer a technical curriculum — and the kids do not have to go to the maker space; it can come to them.

A nationwide push

The Warkworth Men's Shed committee decided that this was an idea that deserved a wholehearted push, so it is participating in a local project, soon to go national, called 'The Tinker Cart Project'.

The project involved finding sponsors to help pay for the construction of carts to be offered to local schools. One of the big-box hardware stores funded the supplies for one cart, and of course the local Menzshed built it.

Warkworth Men's Shed secretary Paul Maguiness says that Warkworth has now given three carts to local schools and a fourth cart is being developed.

Mike Izzard is coordinating feedback and refining the cart design, and the group is in discussions with Educated Furniture, one of the sponsors of the project, to have the Tinker Carts flat packed.

Paul says the Warkworth Men's Shed is in the process of making the plans and system available to other Menzsheds, with the idea that the scheme could be replicated through Menzsheds across the country.

Sheds and schools just need to



Snells Beach School has its cart loaded and ready



Warkworth Men's Shed secretary Paul Maguiness explains the Tinker Cart to Mahurangi College students

get a cart sponsored by a community organisation or business.

There's an app now too

So what do the students make? Digital technology has come in handy here. In collaboration with a company called Super Humanics, the carts now have their own app that contains projects and advice on how to make and do things. The app even has its own marketplace for reordering supplies.

Mike says the goal is to make the

carts 'self-reporting' as their computing capability increases. They could capture projects and report on the use of different tools, and also integrate new technology into projects, combining old-world logic and the lessons of prototyping in developing something entirely new.

For more information, contact Barry Thompson, chairman, at mensshedwarkworth@gmail.com or 09 425 5613; or Paul Maguiness, at maguinesspaul@gmail.com or 027 237 2015.



Point of correction

The 'Artful Bodger' is on the move

In The Artful Bodger story in *The Shed* Issue No. 96, we printed the wrong email contact for Jasper Murphy. His correct email address is murphy.jasperw@gmail.com.

Since publication, Jasper has made some life changes and is now working from a new shed at his new home in Wainui.

He says, "The next generation has taken over the orchard and we have moved to the beach for a slower lifestyle, with more time for woodwork."

He will keep his original shed for larger projects. With more time on his hands, Jasper plans to start running bodger workshops.

"I feel it's important to pass on the knowledge around this old craft and I enjoy teaching," he says.

In the interim, he is working on a new commission: a chair made from "a beautiful piece of ash".

You can see some of Jasper's work at [instagram.com/jasperbodger/](https://www.instagram.com/jasperbodger/).

PAINTING TIPS FROM THE RESENE EXPERTS

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

Always plan the order of painting, top down

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

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

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

Yes, you can paint over winter.

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

Did you know?

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





Bob Turnbull behind the steering wheel of his Sizaire et Naudin. Next to him is Kelvin Lewis, general manager of the Central Canterbury Power Board (photo: Jock Miller)

MORE ON THOSE BUGATTI BROTHERS

Dear Sir,

As a former member of the staff of CWF Hamilton & Co (CWFH) I may be able to add to Lindsay Vincent's absorbing article on the Turnbull twins in *The Shed* Issue No. 96.

I come from Timaru, where my late father was a well-respected member of the South Canterbury Model Engineers Society with a well-equipped workshop in which I gained considerable practical experience. (My father was self-taught.)

I had to do three Christmas holidays of practical work for my BE Mechanical

degree and worked at Hamilton's Christchurch works (up to 250 staff) on night shift and operated a large Mitchell lathe — approximately 10-inch centre height and six feet between centres. I was paid 13s 6p per hour plus 3s 4p tool money per week in recognition of my skills, while my fellow students were paid 5s 6p per hour.

While I didn't have a lot of contact with Bob Turnbull (a senior designer) during this period, I subsequently spent four months in the design office between graduating and taking up a

Graduate Apprenticeship with Hawker-Siddeley-Brush International (UK).

There I had daily contact with him. He had a very enquiring mind and was continually asking why a particular job was being done in a certain manner. He was a very shy person; a dedicated engineer involved with improvements to the Hamilton jets, the design of Hamilton's range of 1500/2000psi hydraulic pumps and motors, valves, etc. He did not invent the jet unit. This was done by CWF Hamilton himself, supported by his son Jon Hamilton (also a BE Mechanical) and by George Davison (another BE Mechanical), who started at Irishman Creek, in the rural Mackenzie Country, where, during WWII, an engineering workshop with about a dozen staff existed.

CWF gave George a bundle of pencils, a rubber, and a set-square and T-square, and told him to draw up the original prototype jet unit. George spent the whole of his career involved with the jets. The secret of the Hamilton jet was that the water jet exited the transom above the waterline so 'the full change of momentum of the water force' was available for propulsion. Bob Turnbull was involved in the expansion of the range of jet units from single-stage impellers to three-stage and latterly with the bigger units.

The Sheddies



LETTER OF THE MONTH PRIZE

Every issue, our Letter of the Month winner will receive a copy of *Best of The Shed 2*. More top projects from 15 great years of *The Shed* magazine

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



On my return after two years in the UK, I rejoined CWFH as a design engineer and worked for 18 months with Bob. I was then appointed Technical Sales Engineer and was away from the works every second week, being engaged in projects such as the first chairlift at Coronet Peak and the first Queenstown gondola, which required me to visit the Pomagalski company in Grenoble, France, to confirm details of the gondola.

I met Bill Turnbull before he left for the UK. He used to visit the CWFH works to see Bob and would wander around the shop floor to see what was going on. Regularly, works staff would approach him about some feature of a Bob Turnbull job! They were identical twins and practically indistinguishable.

As I have an extensive home workshop, Bob would sometimes ask for assistance with the making of some part. He drove a tiny Fiat Bambina car, which he could barely fit into. He would arrive at my back door after dark. My late wife, Diana, was an ex-nurse and was used to awkward people, and would insist that he stay for dinner. The table would have been set for four, but Diana would redistribute the food and produce a fifth plate for Bob. He and I would then adjourn to my workshop, perhaps until midnight, when he would set off for his house, 20 miles away on the other side of Christchurch, squashed into the Bambina, to be at work at 8.30 in the morning.

During this period, Bob was fully engaged in the restoration of the 1907 Sizaire et Naudin. Its single-cylinder engine was unserviceable, but he managed to obtain one that had been fitted to a waka on the Whanganui River. The flanges which attached the cylinder to the crankcase had fractured in use and a temporary repair was effected by winding No. 8 wire around the engine to keep the two components together. This was apparently successful enough to get the canoe back to Whanganui, where the engine was tipped into the river.

Bob obtained this engine with all its faults, and I well remember him being very upset when he got the connecting rod back from crack-testing by NAC. The rod had cracks at both ends and was sure to fail in use. Bob got an 80mm

diameter piece of three per cent NiCr machinery steel and converted it into a beautifully machined H-section rod with an approximately 50x60mm big end and 35x50mm little end. The section thickness was approximately 6mm.

While visiting the south of France, he tracked down Monsieur Sizaire and, in his typical fashion, wanted to know all the details of the design. There were language difficulties but, in the end, M. Sizaire threw up his hands and said, "I only architect!"

The photograph here is of Kelvin Lewis (BE Electrical), the ex-general manager of the Central Canterbury Power Board, with Bob and the Sizaire et Naudin, at Bob's workshop in Ophir. Kelvin and I were on our way to a model engineers' meeting in Gore.

I was in Bob's workshop on that visit 30 years ago, but I don't recall many details, except he had a round-bed Drummond lathe and a very good English toolroom centre lathe, probably a Holbrook.

Jock Miller
Christchurch

(Readers may recall that Jock featured in The Shed Issue No. 94 in an article called 'Hard As'. In that article, retired engineer Jock shared his knowledge on steel and its make-up and whether some manufacturers' claims are all that they're cracked up to be.)

CAN ANYONE HELP?

Dear Sir,
Does anyone have drawings for making a crox tool for making an internal swage on tubing? We need to make a $\frac{5}{8}$ -inch internal diameter tool for aluminium tubing for a static aircraft display. There are plenty of sizes available, but not $\frac{5}{8}$ inches.

I heard a rumour that making a crox tool was an exercise for toolmaking apprentices. If we had a drawing for a $\frac{1}{2}$ -inch version, it should be easy to upscale it for a $\frac{5}{8}$ -inch version.

Can anyone provide a drawing, or a tool?

Andy Wilson
Auckland
027 683 9947

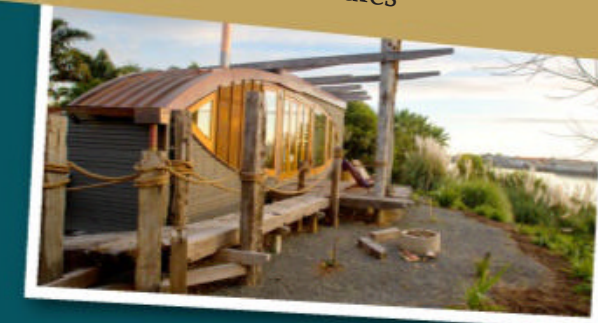
WHAT'S HAPPENING ONLINE AT THE-SHED.NZ?

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

Make your own telescope
An exciting and easy-to-follow project



Video of the Ioana Boathouse project
The architect praises the work of some skilled sheddies



Metal with pictures
Learn the art of engraving



A garden arch in a weekend
Add a touch of class to your garden with this project



BUILDING A ROCK TUMBLER

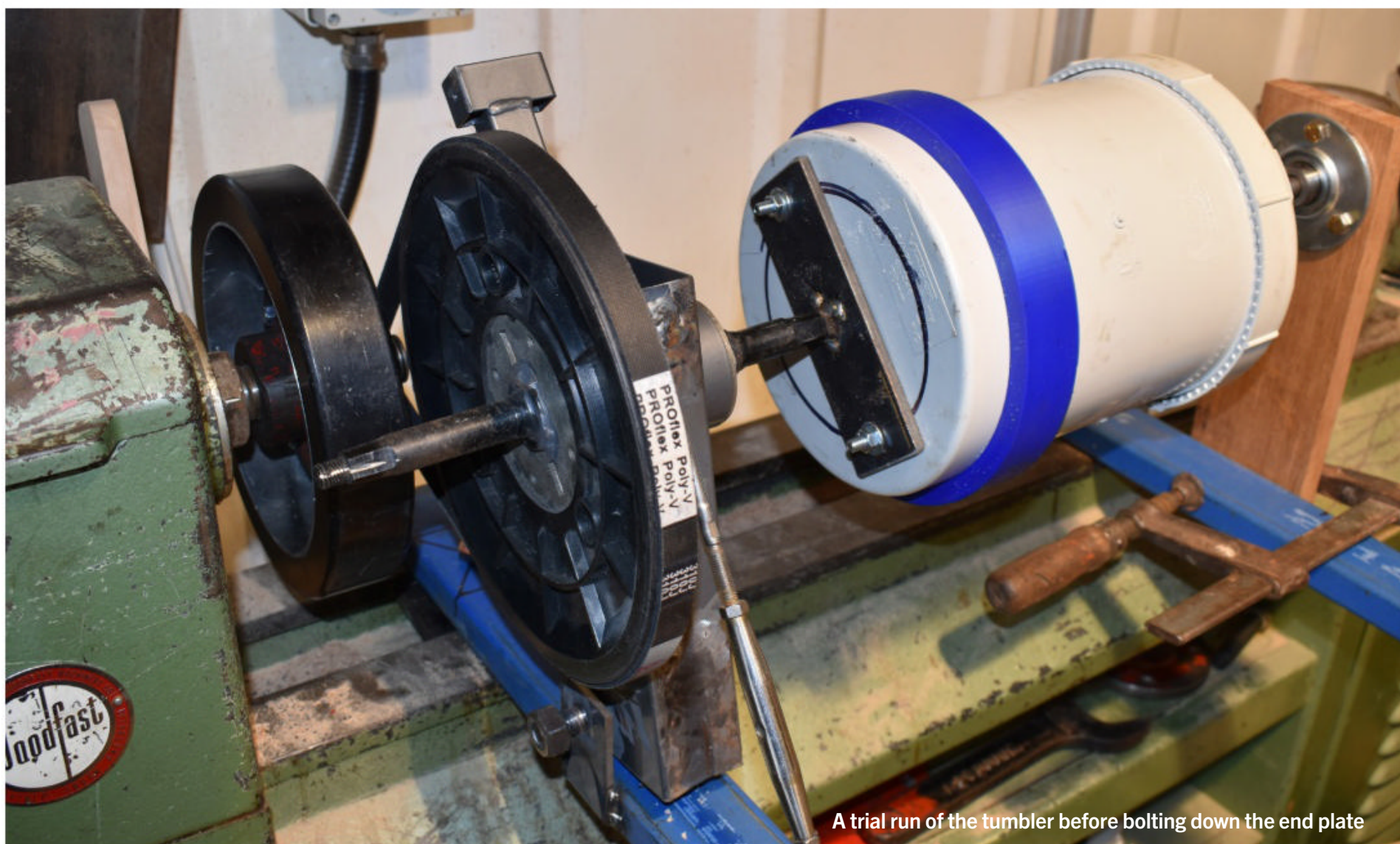
A wood lathe begins a new life polishing a rock collection

By Coen Smit

Photographs: Coen Smit



The stone that started it all



A trial run of the tumbler before bolting down the end plate

The main purpose of a rock tumbler is to remove the rough edges of specimens and bring out the patterns

At the tender age of six, my parents took the family on a camping holiday from Holland to post-war Germany, to a place where a jewellery shop had been bulldozed into a small creek sometime during World War II. Ostensibly, the creek could still contain stones that the previous owners did not have the opportunity to process into saleable items.

I suspect that it was more an attempt by my parents to distract my brother and I, rather than any thought of actually discovering gemstones in the creek. Imagine everyone's surprise then when I turned up a large agate covered in moss and algae in ankle-deep water. I still have it in my collection some 65 years later.

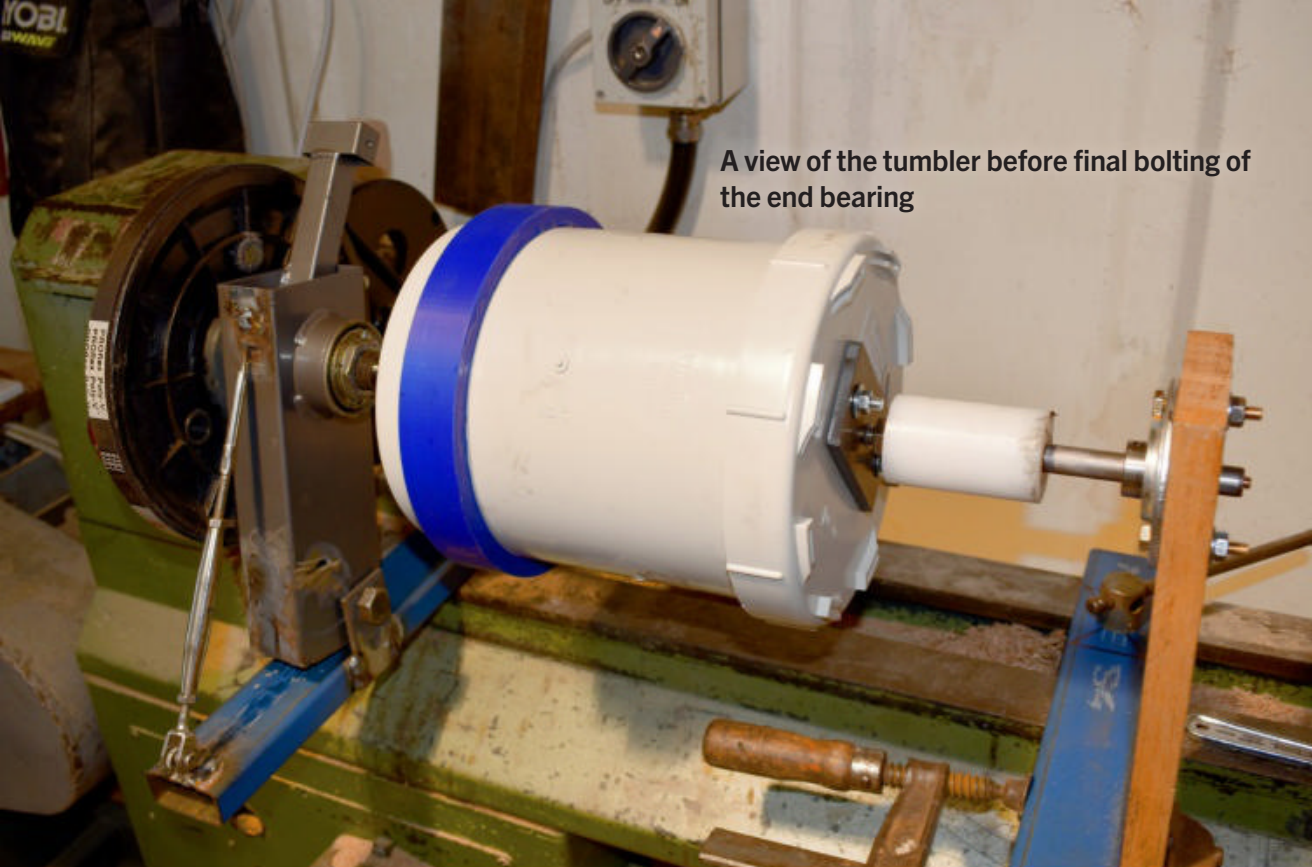
Youthful adventures

When we moved to Australia, we continued our explorations in western New South Wales looking for fossils and interesting rocks in general. These youthful adventures had a long-term influence on my life. I still look for different or unusual rocks whenever I'm out and about. Anything with an interesting colour, pattern, or shape seems to find its way into my pockets. Consequently, our house is replete with rock specimens of all sizes, scattered about doing duty as paperweights or just sitting around looking cool. It was somewhat inevitable I guess that sooner or later I would build a rock tumbler.

The main purpose of a rock tumbler is to remove the rough edges of specimens and bring out the patterns, striations, and colours contained within. This is achieved by putting a collection of them together with a grinding slurry and slowly rotating them in a drum over an extended period. The constant collisions between the rocks and grit and water slowly polish away the rough edges. A similar process occurs in the rivers and on the rocky beaches of the world's oceans where continuous wave action moves rocks around to achieve the same result. ►



A nice lump of amber (an honorary rock)



A view of the tumbler before final bolting of the end bearing



The black olive barrel

The mechanics of the tumbler

A tumbler must revolve slowly enough to pick up rocks and drop them within the container, yet not so slowly that the process takes an inordinate amount of time. Too fast and the stones are held to the container wall by centrifugal force.

If you have read some of my previous articles, you will know that I repurpose as much as possible in my projects — or, failing that, try to extend the uses for tools I already have. In this project, happily I was able to achieve both.

I recently 'acquired' an old wood lathe, which, although I don't expect to have a great deal of use for, was just too good to

pass up. Searching for a means to build a slow revolving mechanism for the tumbler, it occurred to me that the wood lathe would make an ideal starting point. It already has a set of belts and multiple pulleys that enable the speed of the output shaft to be adjusted. Using the wood lathe as my driving unit also meant better utilisation of limited shed space, as I wouldn't have to find room for a stand-alone unit. ►

Using the wood lathe as my driving unit also meant better utilisation of limited shed space



Front-on view of the mounted cross-trainer mechanism



Modifying the lathe

The lathe's headstock is threaded for faceplates, so I originally thought to weld a short section of shaft to it and fit a small pulley, which would then drive a larger one to reduce the final speed sufficiently for the tumbler. However, I happened across a discarded cross trainer that already had the pulley arrangement I was looking for. In the cross trainer, the large pulley drives the small one, which is equipped with a flywheel and magnets. A bit of butchering, turning, and bolting resulted in the faceplate sporting the small pulley ready to drive the larger one on the tumbler assembly. The large pulley already has a substantial bearing assembly that easily copes with the tumbler, requiring only a smaller bearing to support the other end of the tumbler.

I pivot-mounted the large pulley on a section of 50x25mm box steel and welded a turnbuckle to the pulley arm and the box section to act as a belt tensioner.

At this point, things started to become more complicated.

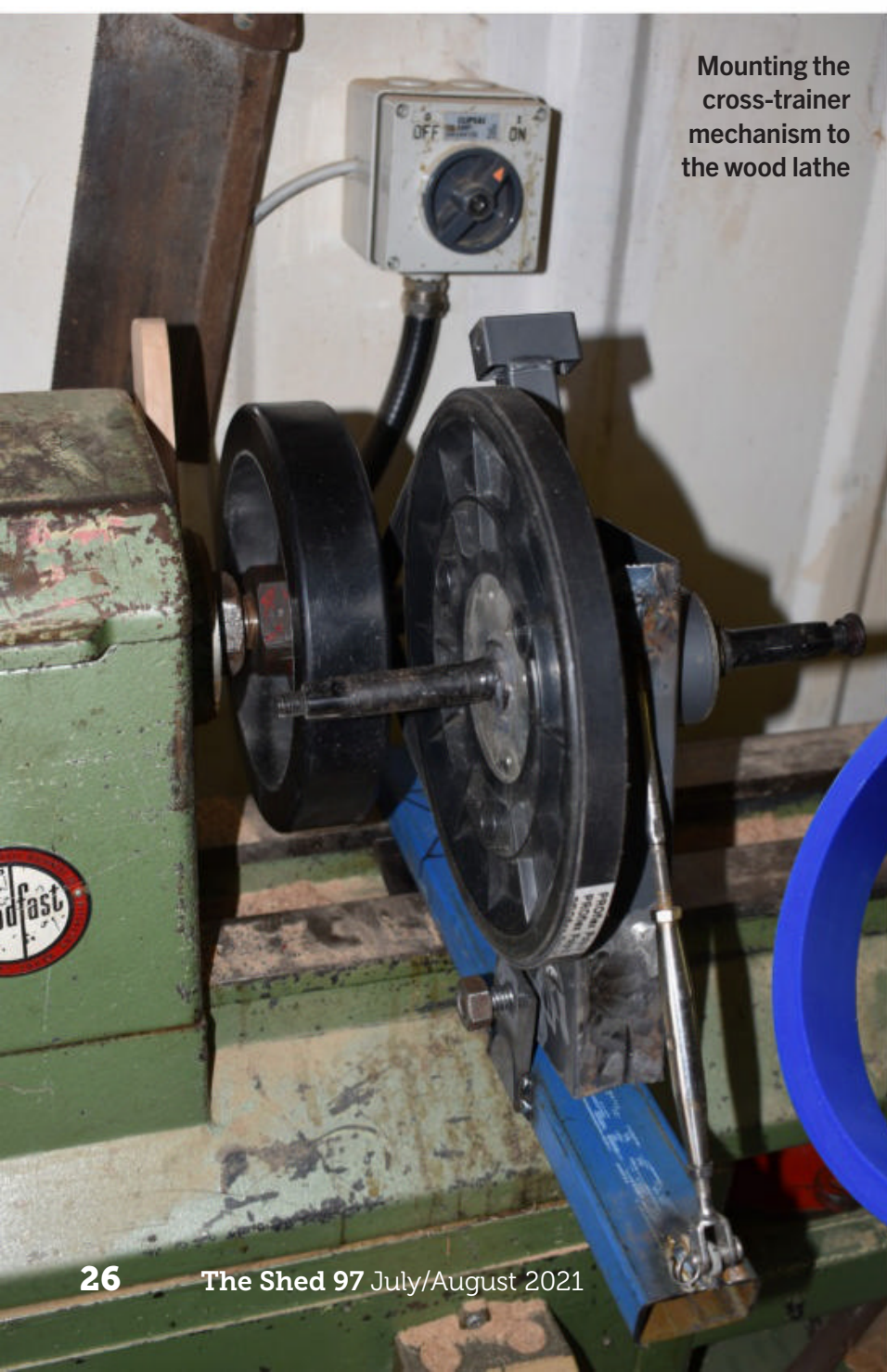


The gear mechanism rescued from a cross trainer

The barrel

Selecting the barrel itself was a bit of an issue at first. I originally thought that a short section of storm-water pipe with suitable end fittings was my best option. I then looked at the cost of larger plastic barrels with wide necks on the internet and they are rather expensive. Meanwhile, I came across a good compromise: the plastic barrels in which black olives are sold in supermarkets. I am rather partial to them anyway, and the barrel is easy to replace when they

Imagine everyone's surprise then when I turned up a large agate covered in moss and algae in ankle-deep water



Mounting the cross-trainer mechanism to the wood lathe



The components for the barrel

The final barrel made from an end cap and screw cap plus a 3D-printed joining ring



wear out. Happy days all round, or so I thought.

After a few sleepless nights wondering about the best way to proceed, I eventually rejected the olive barrels as probably being too weak in the wall to withstand prolonged pummelling from rocks. As I cannot be there to keep an eye on the unit 24 hours a day, I must be confident that the barrel won't break up when left unattended.

Therefore, I returned to my original plan and bought a 150mm threaded end cap and fitting, as well as an end cap.

Rather than buying a section of 150mm storm pipe that only came in minimum lengths of a metre, I constructed a ring on my 3D printer to glue the fixed end cap on to the threaded fitting, ending up with a nice-sized barrel with the added benefit that both have thicker walls than the pipe.

Of course, the tumbler can be built to suit any sort or size of barrel. It largely depends on the amount and size of rocks you want to tumble. I opted for a short barrel, as most of the rocks I collect are small and I am conscious of the available space. ►

After a few sleepless nights wondering about the best way to proceed, I eventually rejected the olive barrels



Fitting the barrel

The cross-trainer assembly has a threaded shaft protruding from either end, and it was a simple matter of welding a piece of 50mm flat to the

appropriate nut and bolting that to the fixed-end-cap side of the tumbler. As I had already purchased a face bearing as part of my earlier incarnation of this project, I decided to use that to support the other end of the tumbler barrel.

I drilled and threaded a bolt through the screw lid, locked it down with another small section of 50mm flat previously threaded to match, and two short bolts at either end as well as a locking nut on the main bolt. I threaded a short section of nylon bar at one end to match the main bolt and drilled the other end to take the bearing shaft.

Assuming, correctly as it turned out, that the barrel wouldn't run perfectly true, I fitted the face bearing into a short plank of timber and haven't locked the bearing to the shaft. I also need to be able to easily withdraw the end bearing to open the barrel — another reason for not fixing it rigidly at this end. In operation, the wooden plank, the face bearing housing, and bearing between them cope with the perturbations of the barrel as it spins.

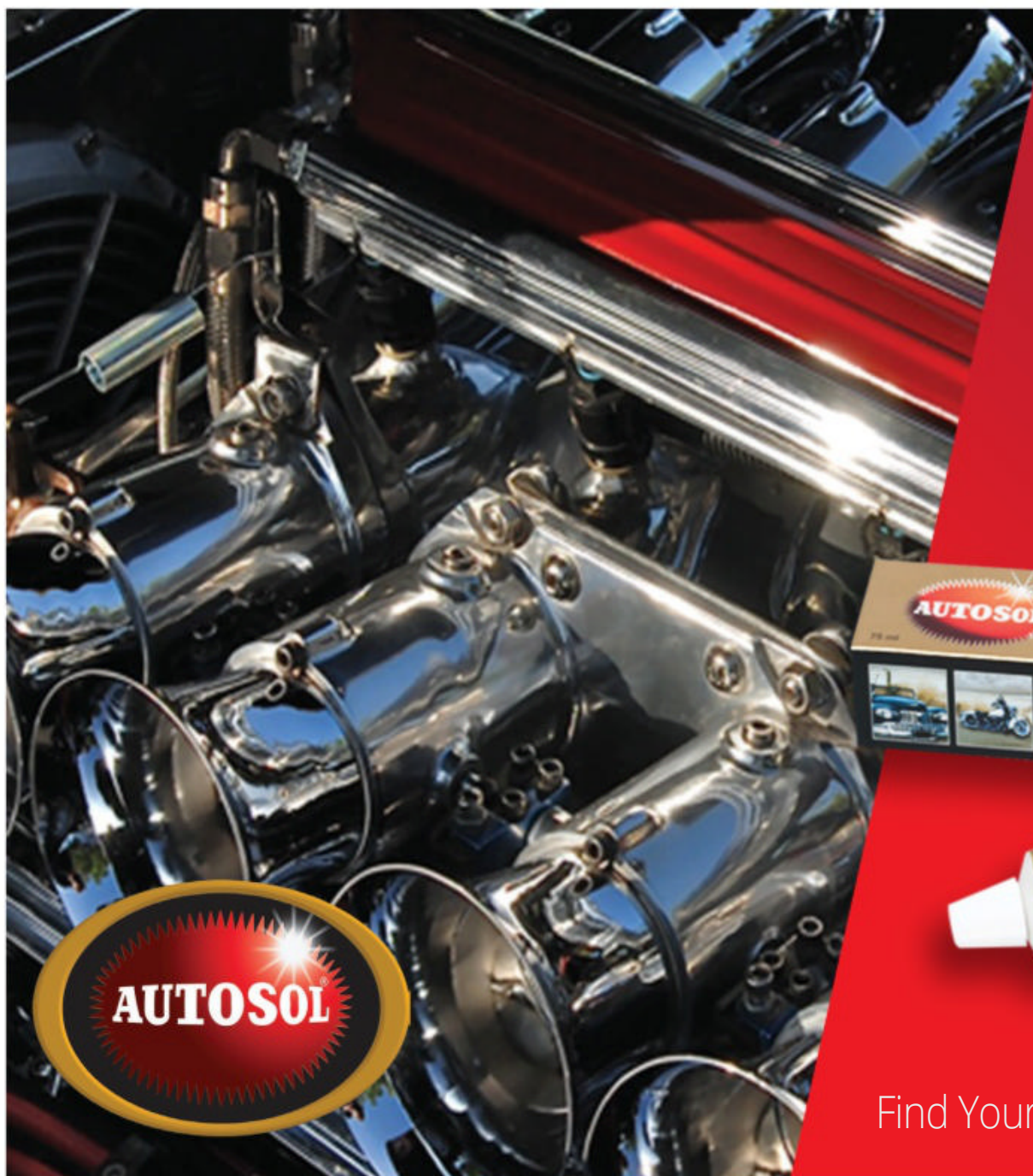
Now, the grinding paste

The whole rig is clamped to the lathe bed by two bolts, one for the driving pulley end and the other for the support bearing. A turnbuckle on the driving pulley allows the belt tension to be adjusted as needed. The lathe speed is set by two opposing pulleys allowing for four different ratios, thereby enabling the tumbler rotation speed to be varied as well.

Apart from unbolting the two sections of the tumbler and changing the faceplate, the wood lathe is unmodified and can still be used for its original purpose.

Building the tumbler was the straightforward part; searching the internet for suitable polishing and grinding pastes was a whole other story. Amazon, eBay, and others offer a plethora of grits, polishes, and pastes that will magically transform your rocks into gems. To keep my initial outlay to a minimum and trial my tumbler, I decided to follow nature's example first: sand, water, and rocks combined in a slurry. If I'm happy with the result, I can opt for finer grit such as silicon carbide to finish off the polishing process. 📦

The whole rig
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As a busy mother to three young children and with a business to run, Juliet was surprised to discover she had a talent and passion for jewellery making.



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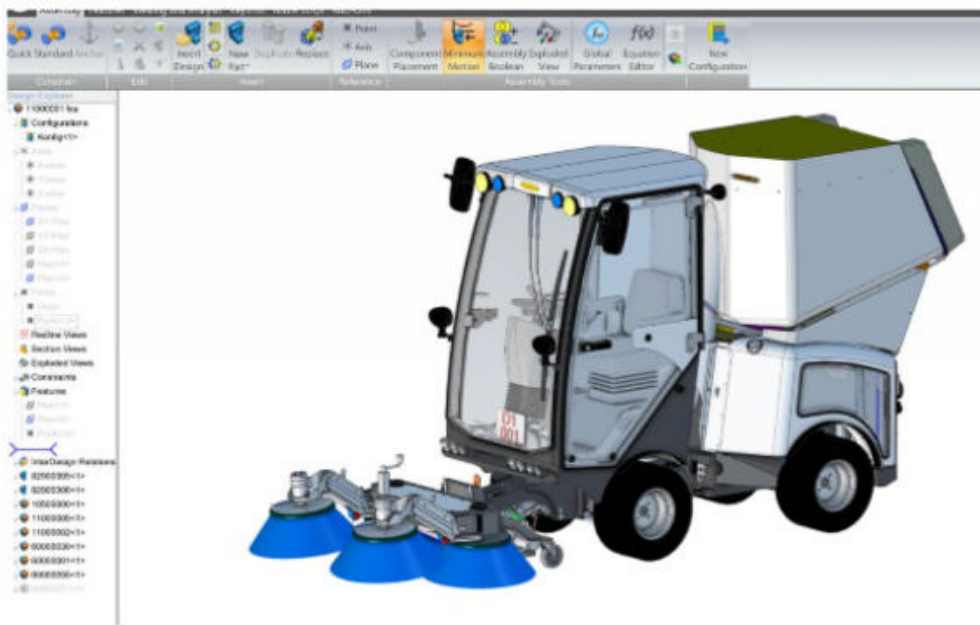
J Coles of Auckland
G Duffy of Palmerston North

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Workspace previews with Alibre

Enjoy the benefits of real-time 3D previews of part workspaces before you commit to the real result with the recently released Alibre Design Version 23.

The new version from Alibre also features a simplified and more intuitive tool ribbon with a tool search feature — a real bonus for all users, and especially for newbies. Add to that you don't use the cloud — so it doesn't require ultra-high-speed internet to run. Simply buy it and own it, install it on your computer with no hassles.

New licence prices start from NZ\$323 for Atom3D, NZ\$1535 for Professional, and NZ\$2952 for Expert. To find out more, visit baycad.biz. You can also email enquiries@baycad.biz or call 027 484 7464 (New Zealand) and +64 27 484 7464 (Australia).

Get a grip

Hi-Q Components' range of hand grips delivers unique contours and patterns tailored to a range of uses. The grips are manufactured by an injection-moulding process that produces specialised grips that are difficult to achieve with other processing technologies. Perfect for everything from outdoor power equipment, garden tools, and recreation equipment to medical and healthcare equipment and sporting goods; there's a grip to suit every purpose. The range of seven styles of black injection-moulded FPVC grips covers everything, with ribbed, contoured, honeycomb, and contoured options available. The grips fit a range of standard bar sizes/diameters, including: 1/2, 3/4, 7/8, 1, and 1 1/4 inch. For further information, please contact Hi-Q components: sales@hiq.co.nz, or visit hiq.co.nz.



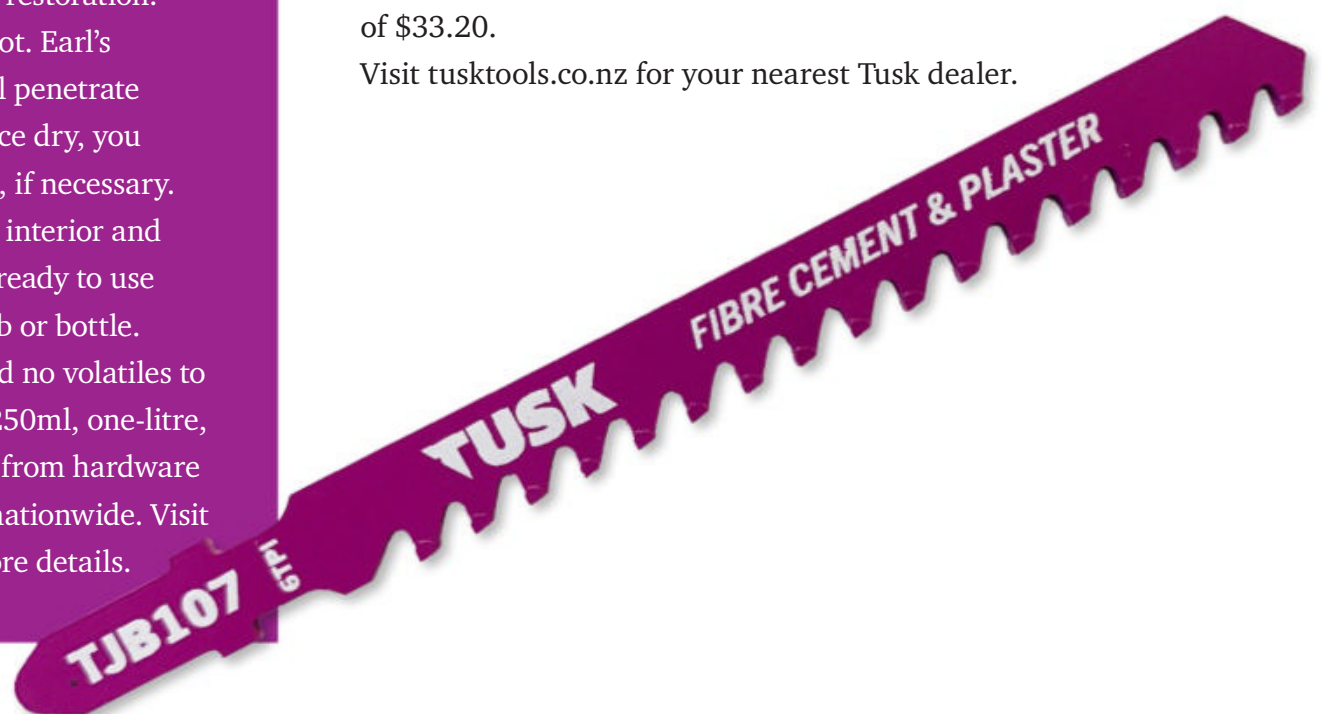
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Cutting edge

The new TJB107 fibre cement and plaster jigsaw blade harnesses carbide technology to provide increased durability and reduced breakage. This new offering from the Tusk jigsaw blade range is made to cut through the toughest abrasive materials. This blade doesn't only cut fibre-cement board and plasterboard but also makes quick work of aerated concrete and glass-fibre-reinforced plastics from 5mm to 50mm thickness. The TJB107's overall length is 100mm with 6TPI, and a pack of two blades has an RRP of \$33.20.

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MASTERING THE LATHE—PART 5

A newly cut cap screw thread

Learn the ins and out of screw cutting on the lathe

By Bob Hulme

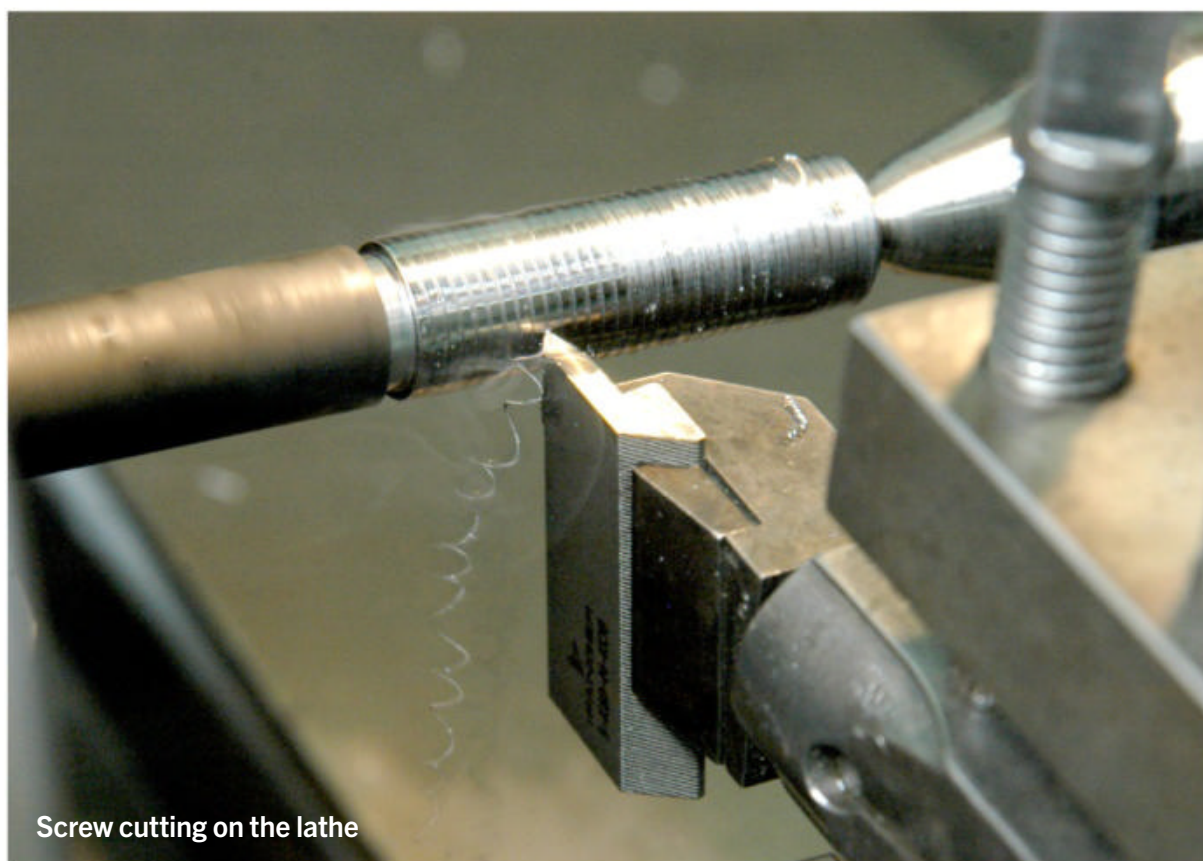
Photographs: Gerald Shacklock

Screw cutting is one of those tasks that is very satisfying to do on the centre lathe. It can be a lifesaver in many situations, particularly when you need an item with a certain type of thread but can't buy one. Screw

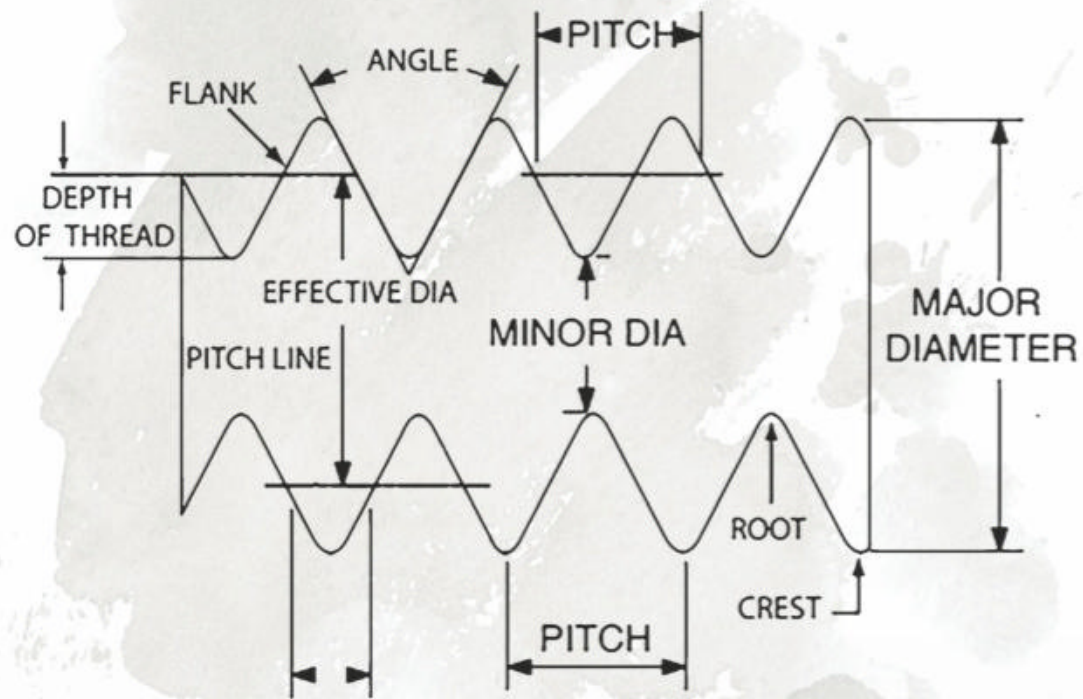
threads are basically specified by their major diameter, pitch, and thread form. Vee form is the most usual shape for everyday nuts and bolts and is the form of threads in this article.

The project in this issue addresses

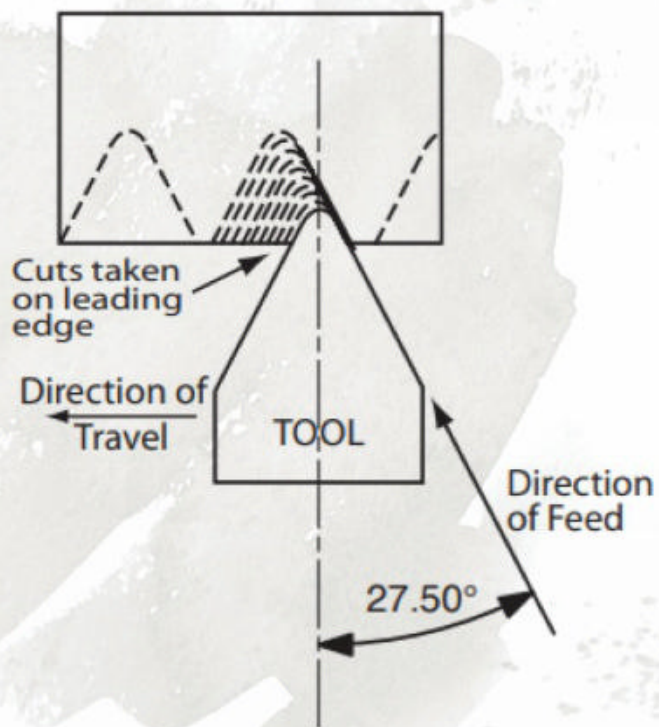
the problem of replacing a fastener with a fine pitch thread that is not available as a stock item off the shelf. Let's say we need a socket head cap screw with a fine-pitch metric thread M16 x 1.5mm (standard M16 thread has 2.0mm pitch). A cap screw is one of those fasteners that are particularly difficult to make from scratch, so the answer is to purchase one that is the right diameter with a plain shank long enough for the screw length you need. The threaded end can be cut off and discarded, leaving a cap screw blank. This means that we have the advantage of the forged head and material that are up to the desired tensile specification. The downside is that cap screws are made from quite tough steel, which makes it hard going when cutting the thread. Being cut instead of rolled, our new thread will not be quite as strong as a production item. Don't be discouraged though, as the altered screw will still be very strong. ►



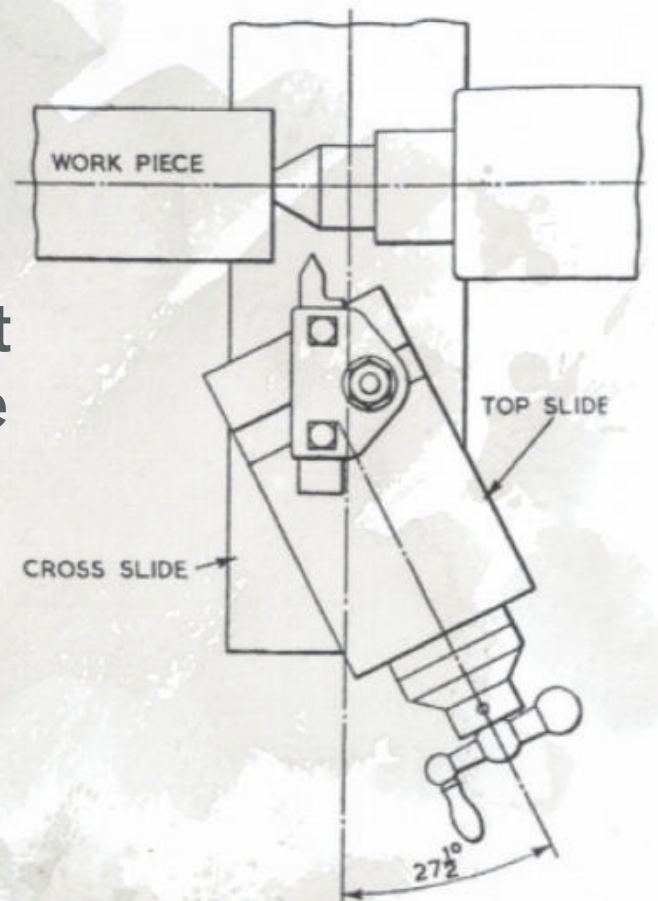
Screw cutting on the lathe



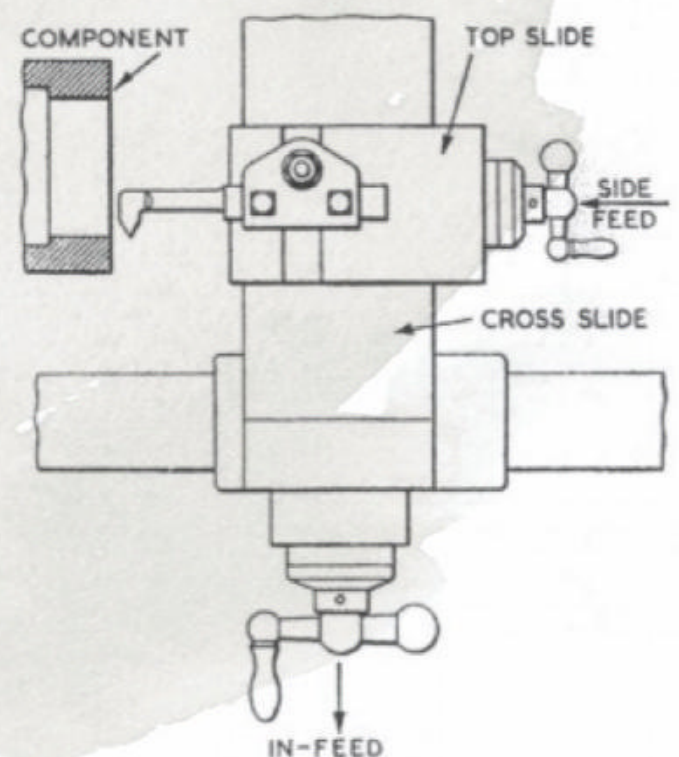
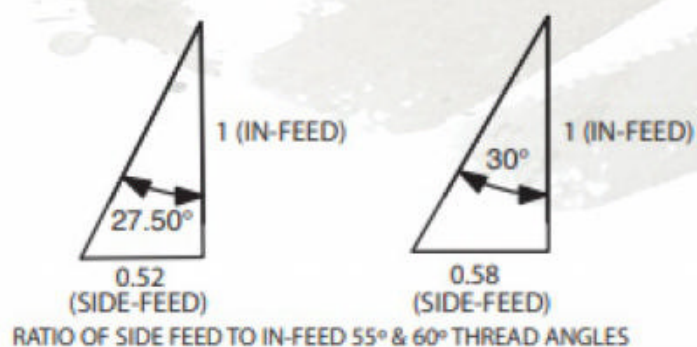
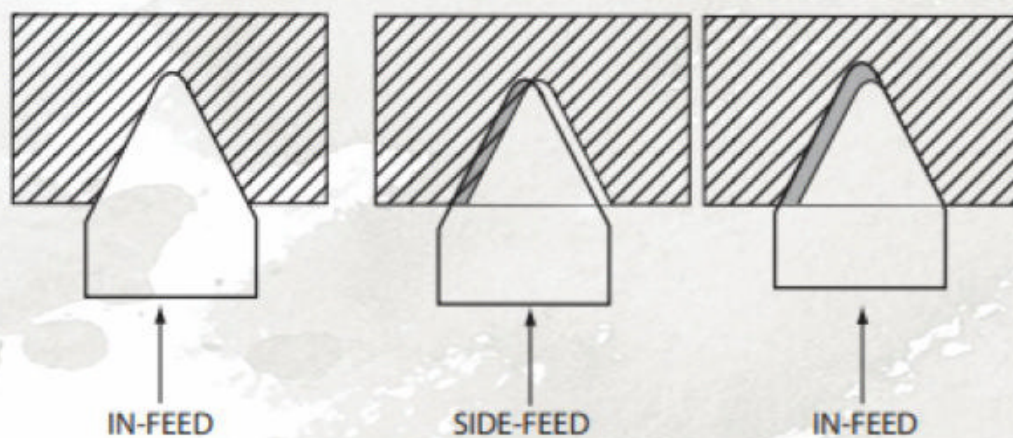
Angular feed

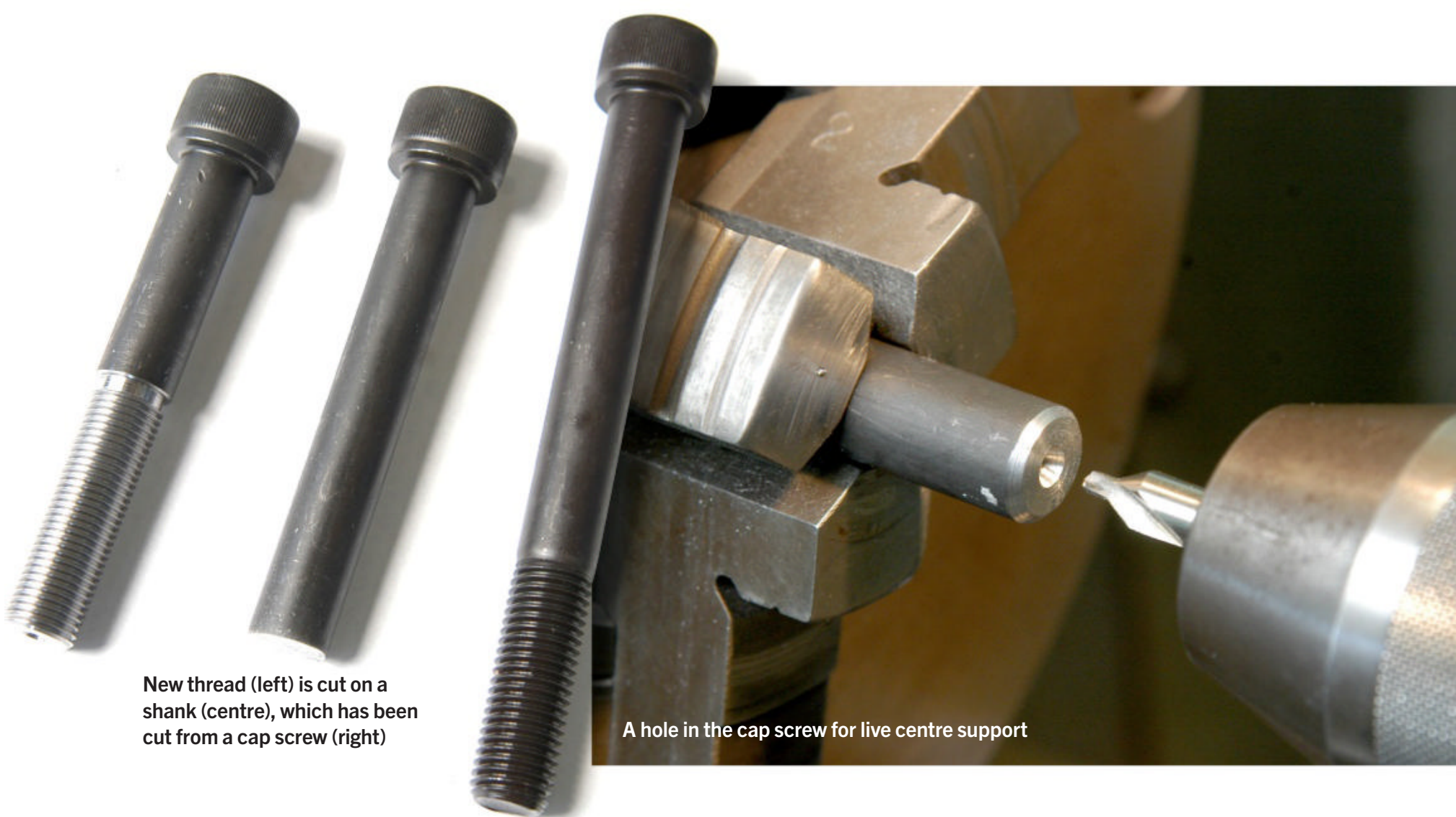


27½-degree setting is right for 55-degree threads such as BSW



Combined feed





New thread (left) is cut on a shank (centre), which has been cut from a cap screw (right)

A hole in the cap screw for live centre support

Thinking it through

Again, it is important to plan what you are going to do in sequence before starting. Time spent thinking the job through properly is the most important determinant of success.

First, decide which screw-cutting method to use. To keep the cap screw running true in the lathe chuck while you are machining it, make a centre hole at its end so that the live centre can be used for support. Hold the cap screw in a three-jaw chuck on its plain shank to ensure that it is running reasonably

true, as positioning of the centre hole must be as central as possible. Re-grip the cap screw in the chuck on its head using the live centre for support as you tighten the chuck. Now wind the tailstock hand wheel to press the live centre firmly into the centre hole and lock it.

Before you actually cut the thread, it may be necessary to skim the plain shank diameter if it is above the size wanted. What we want in fact is just below our theoretical major diameter of 16mm. Around 0.1mm under should be

OK. It will also be advantageous to cut a groove at the end of where the thread will be cut to act as a 'run-off' area.

When screw cutting, the required depth of thread is achieved in several passes (or cuts) of the tool. If no groove (or recess) is provided, particular care must be taken in running out the tool, as you may damage it if it cuts beyond the point where it was withdrawn on the previous pass. The groove should be as deep as the threads will be. A parting-off tool is handy for cutting such grooves.

British threads

British threads are becoming less common nowadays because of metrification. They are found on older equipment and could be needed if you have a restoration project. The most common British threads are:

- **British Standard Whitworth (BSW)** The thread angle is 55 degrees. A coarse-pitch thread, it was one of the most common before metric threads. Coarse-thread screws are good general-purpose screws and are also best in soft materials such as aluminium.
- **British Standard Fine (BSF)** The thread angle is 55 degrees. With these finer threads, the pitch is smaller, so they are less likely to come loose when there is vibration. Veteran and vintage cars are riddled with BSF nuts and bolts.
- **British Standard Cycle (BSC)** The thread angle is 60 degrees. This

durable thread is still used in the bicycle industry, although the motorcycle industry is dominated by metric threads because of Japanese influence.

- **British Association (BA)** These have a thread angle of 47.5 degrees and, unlike the previous threads, do not have regular sizes for their outer diameters. They are stated as being 2BA, 3BA, 4BA, etc. Where other threads are $\frac{1}{4}$ BSW, $\frac{5}{16}$ BSW, $\frac{1}{4}$ BSF, $\frac{5}{16}$ BSF, etc. with the $\frac{1}{4}$ or $\frac{5}{16}$ being the outer diameter. In the case of BA threads, the outer diameter of 4BA for example is 0.14 inches. While it may seem an oddball size, the BA threads filled gaps between the conventional sizes. They were commonly used in electrical equipment. BA threads offer a range of sizes under $\frac{1}{4}$ inches.

- **British Standard Pipe (BSP)** The thread angle is 55 degrees — commonly called a 'gas' thread because it is used on gas pipes and water pipes. Sizing can be confusing because it is designated by the bore of the pipe. For example, a $\frac{1}{2}$ -inch BSP thread is found on the outside of a pipe with a $\frac{1}{2}$ -inch bore size. The actual diameter of $\frac{1}{2}$ -inch BSP is 0.825 inches.

BSW threads

American threads

American threads are not disappearing as fast as British threads because the US is still clinging staunchly to imperial measurements. As the US dominates the aeronautical industry, these threads are likely to be in use for many years to come. The most common American threads are:

- **Unified National Coarse (UNC)** Apart from its 60-degree thread angle, it is very similar to BSW threads. In fact, UNC nuts will fit on BSW bolts quite easily, with the exception of $\frac{1}{2}$ inch where the pitch is different.
- **Unified National Fine (UNF)** A 60-degree thread angle. Like BSF, it tends to be used to ensure that there is less chance of the fastening coming

loose or when a fine adjustment is needed. UNF threads are generally the same sizing as UNC. While UNC and UNF are broadly accepted as US threads, they were a result of a series of conferences in 1945 between Britain, the US, and Canada. When under a $\frac{1}{4}$ of an inch, both UNC and UNF change to being specified by a number and the pitch is expressed as a number of teeth per inch (tpi). For example "8-36" is a UNF thread that has a 0.164-inch major diameter and 36 teeth per inch.

- **National Pipe (NP)** Similar to BSP, but not interchangeable, as most sizes have a different pitch. Thread angle is 60 degrees.

American UNC threads



Angular feed / Combined feed

Now we are at the stage of actually cutting the screw head. The two main methods are angular feed and combined infeed and side feed (see diagram on page 35).

'Angular feed' involves adjusting the compound or top slide so that it is at an angle equal to half the thread angle. This is the preferred method when using a single vee-shaped cutting tool.

'Combined feed' is when the cross slide and compound (top slide) are at right angles to each other. The feed for the first few cuts is straight in on the cross slide. Then side feed is given by moving the compound slide hand wheel. The cut now taken will be on the leading edge of the tool.

For a 60-degree thread angle, the side feeds should be $0.58 \times$ infeeds; that is, an infeed cut of 0.10mm should be followed by a side-feed cut of 0.58 mm.

For a 55-degree thread angle, the ratio is 0.52. The angular feed method is more straightforward but the combined-feed method is best suited for cutting internal threads. This is because it is not often possible to accommodate the space needed to incline the compound slide towards the chuck.

Cutting tools

As with many other consumer choices today, when it comes to tools for screw cutting, your choice is probably essentially made according to the depth of your pockets. High-speed steel tool bits are the cheapest.

These square-section pieces need to be ground to the thread angle with the sides tapering inwards towards the bottom of the tool bit to give clearance at the sides and prevent rubbing. The top face needs to be ground so that it is angled back slightly away from the leading edge. ►

The two main methods are angular feed and combined infeed and side feed



Cutting tools: tungsten carbide and high-speed steel (right)



The live centre locked in place



The cut groove marks the end of the thread



Skim the plain shank diameter to fit the nut

The point of the tool has to be ground carefully to a small radius. Obviously, it takes some work and some trial and error to perfect the angles on the top face.

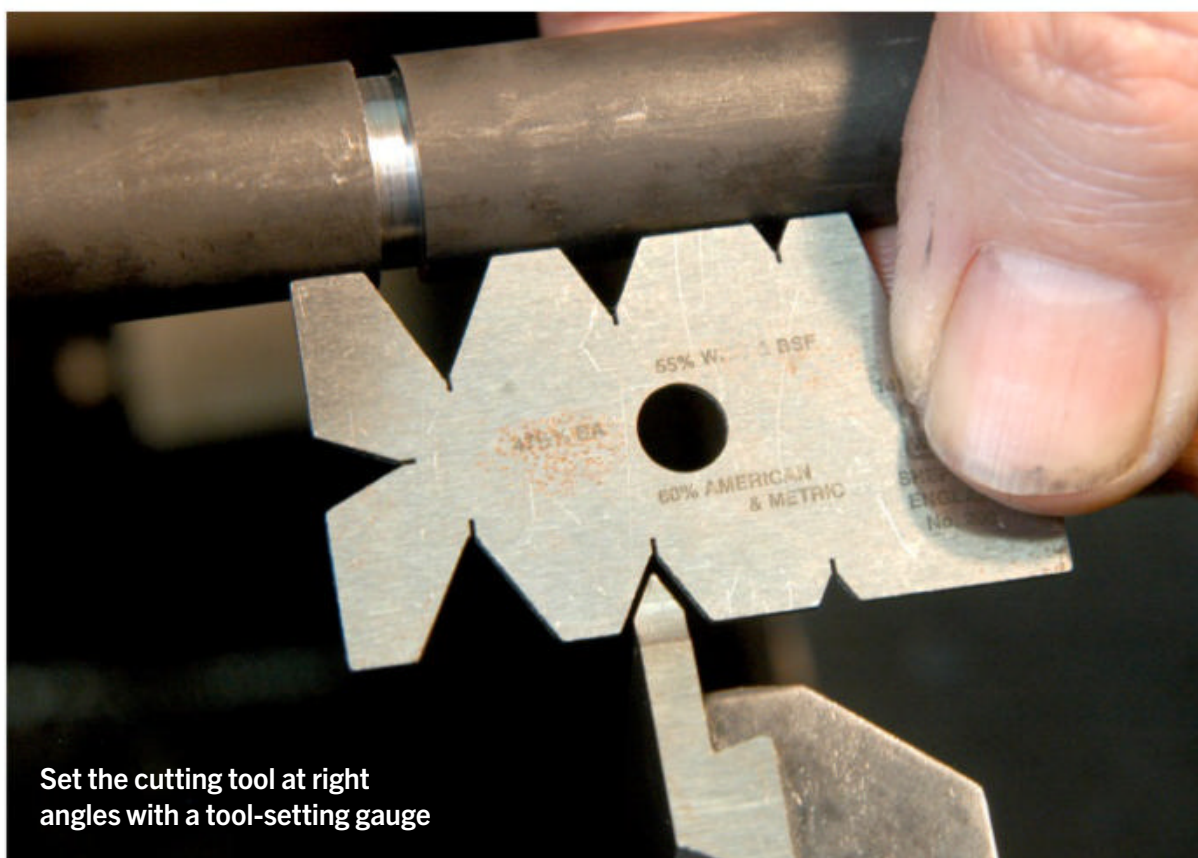
Ifanger pre-shaped tool bits are available pre-ground to the thread angle. All you do is grind the top face. These tools are quite a step up in price and you need the special tool holder as well, but they do last for a long time. Trade Tools stocks them.

Tungsten carbide inserts make life really easy. These have not only the angle of the thread and the right radius at the end but also part of the shape of the next thread, so that the radius is formed on both the top and bottom of the thread. This produces a close to perfect thread form. Here, I am using an Ifanger tool and the angular-feed method.

Before cutting, select the correct gearing to give the 1.5 pitch needed for this job. On my lathe, this is just a matter of reading the table on the side

of the headstock and following the lever settings. If you have an older lathe, you may need to rearrange the actual gears at the end of the headstock. The calculations

for this are beyond the scope of this article. Next, use a tool-setting gauge to set the cutting tool at right angles to the side of the job.



Set the cutting tool at right angles with a tool-setting gauge

Metric threads

ISO metric threads, which have a 60-degree thread angle, are the international standard and official for many countries, including New Zealand and Australia.

- **ISO coarse** These are common for

general nuts and bolts, and are ideal for soft materials such as aluminium.

- **ISO fine** These are more suited to applications where fine adjustment is required or where vibration tends to loosen coarse-threaded items.

The pitch of a metric thread is quite plainly stated in millimetres whereas British and American thread pitches are expressed as a number of teeth per inch (tpi).

Patience

Screw cutting is as much about patience as anything, and taking many passes with a small depth of cut will give good results. With the lathe running and job rotating, wind the cross slide across until the tool just touches the diameter of the job.

Set the dial to zero on the cross-slide hand wheel. Position the tool at the right-hand end of the job just clear of the end. Set the revolutions per minute (rpm) of the spindle to a speed that you are comfortable with for withdrawing the tool quickly in the run-off groove. Screw cutting can be done at quite fast speeds, but the faster you go, the worse the consequences if you have a crash. Start slowly (I suggest 150rpm). You can always step it up for subsequent passes. The first cut depth can be approximately 0.2mm in diameter, but as successive passes are made, the engagement of the cutting tool increases

so the depth of the feed you set should be reduced.

With the lathe spindle rotating at around 150rpm and the tool waiting at the end of the job, engage the leadscrew feed. Off it goes, cutting that first spiral groove along the job. Keep your wits about you and be ready to hit the brake as soon as the tool enters the run-off groove. Wind the tool out on the cross slide to clear the job, then reverse the spindle. The tool will traverse back to the right-hand end of the job where it started. Hit the brake when it is in the starting place again. Do not disengage the leadscrew until the thread is finished. Keep making successive passes, winding on a little more depth of cut each time, but less than the increment of the previous time. Step the spindle speed up as you become more confident. The surface finish will improve with more speed and with the use of cutting oil. ►

Screw cutting can be done at quite fast speeds, but the faster you go, the worse the consequences if you have a crash

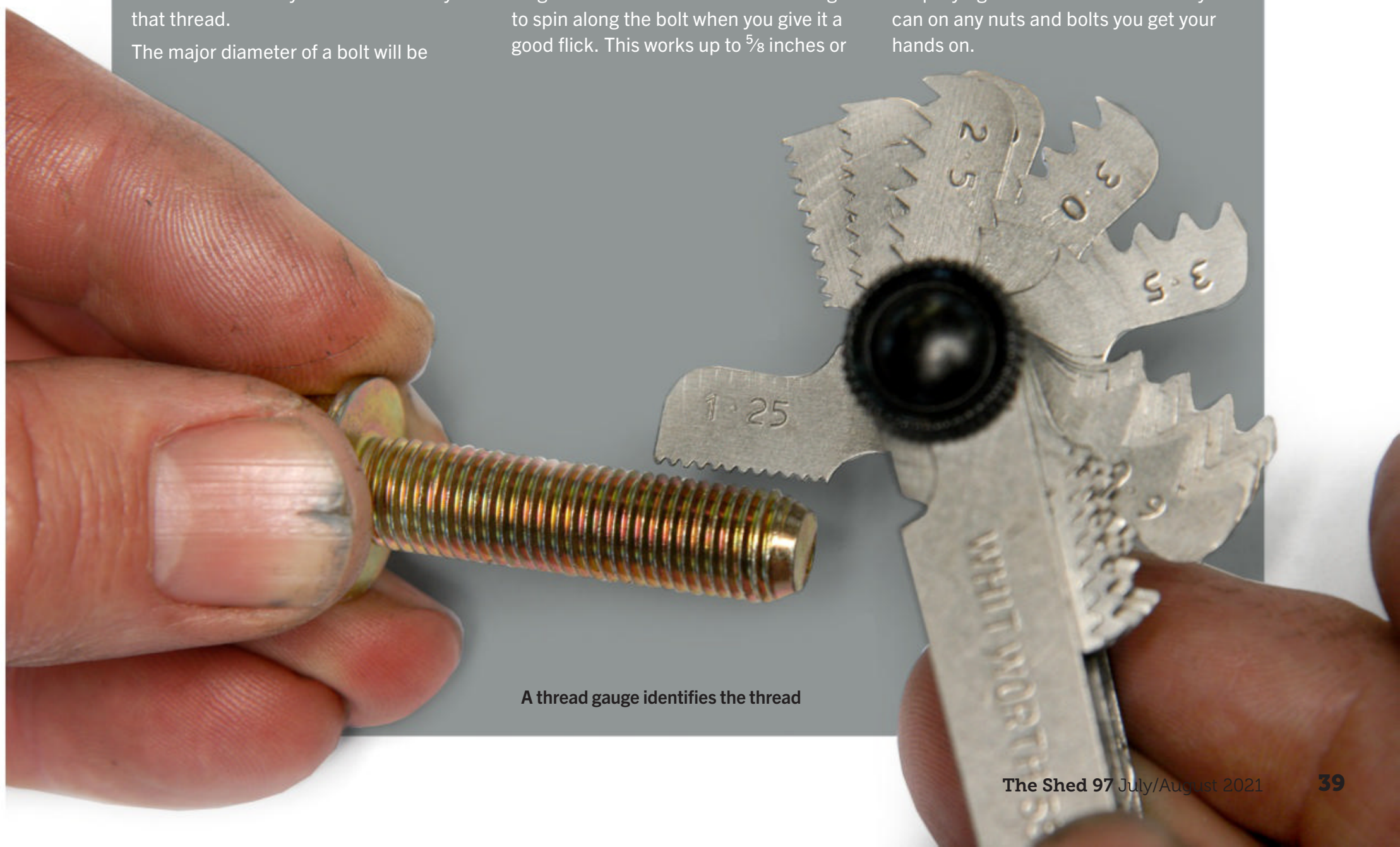
What thread?

To identify the thread on a bolt, simply measure the major diameter and the thread pitch using a thread gauge. Armed with this information, consult your *Engineers Black Book* or a website such as nutsnbolts.co.nz. When you have a match for the diameter and pitch, you will have most likely found the identity of that thread.

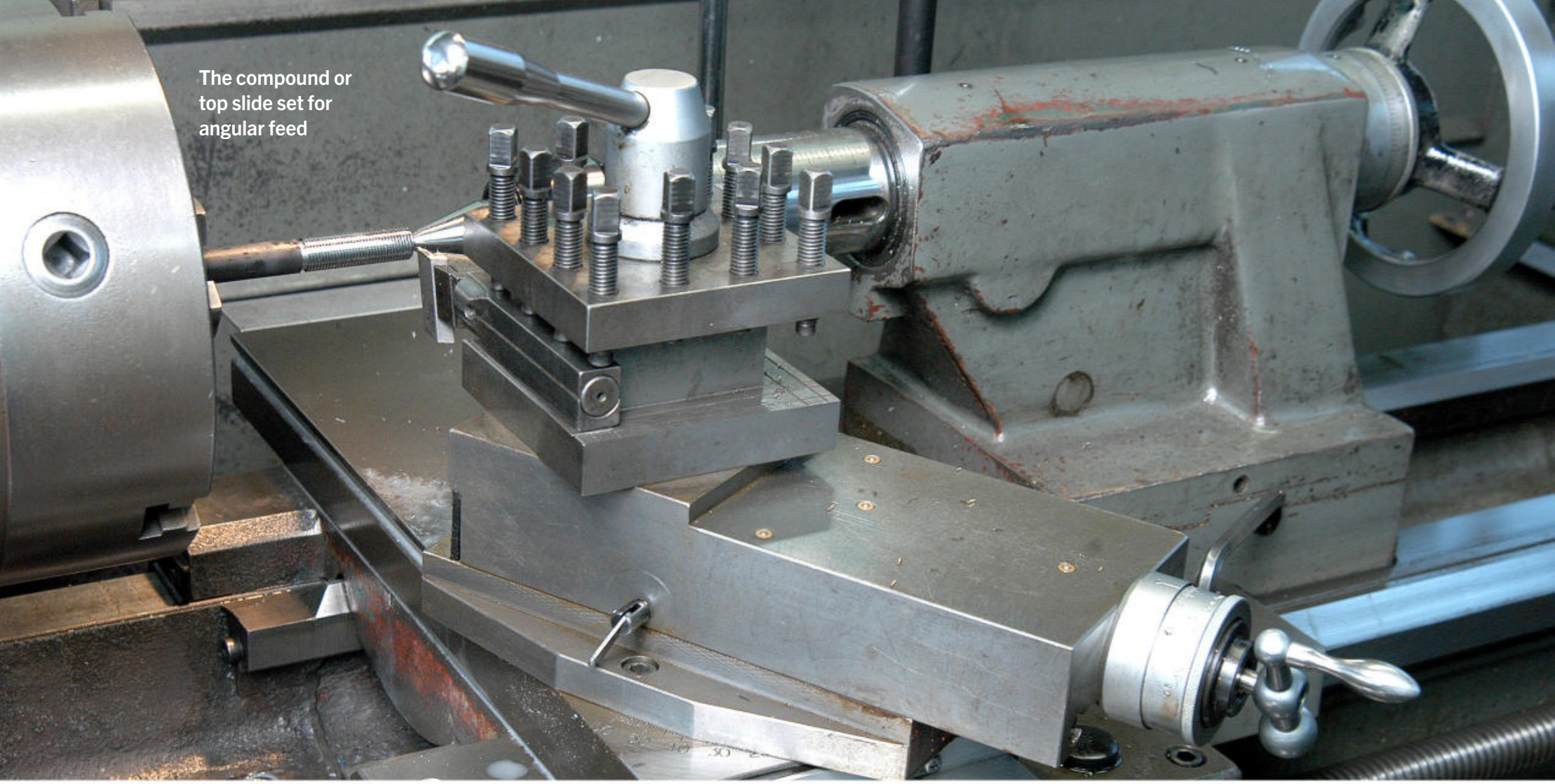
The major diameter of a bolt will be

slightly less than is stated in the tables. The exact size-for-size fit with the nut would be too tight, so some clearance is essential. The clearance will vary with the quality of the bolt. It is simple enough to get an idea of how well made a bolt is by screwing on a nut that you know to be good. The nut should be free enough to spin along the bolt when you give it a good flick. This works up to $\frac{5}{8}$ inches or

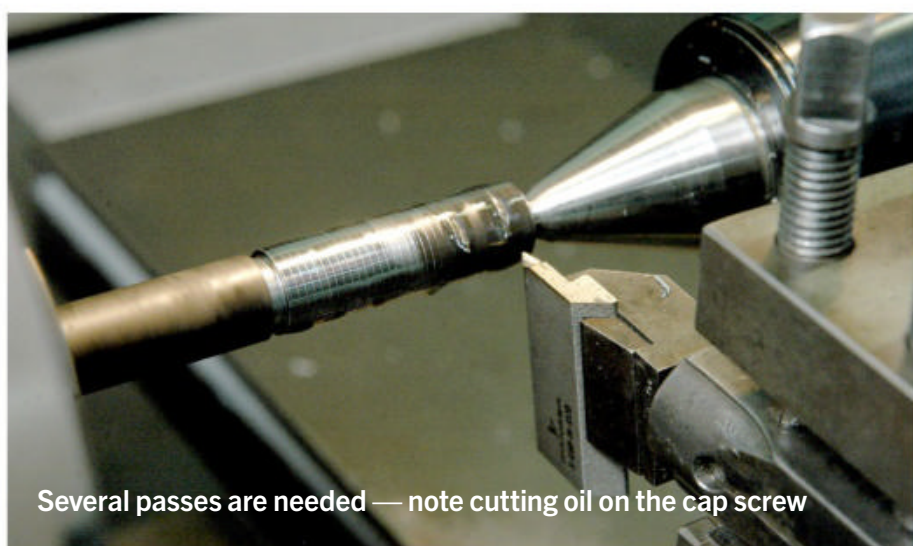
16mm size — above this, the weight of the nut itself shows more influence. Now rock the nut from side to side on the bolt and try to tip it at an angle to the bolt. Too much movement shows that the bolt is poor quality and undersized and will have inferior strength. To get a feel for this, keep trying this wee test as often as you can on any nuts and bolts you get your hands on.



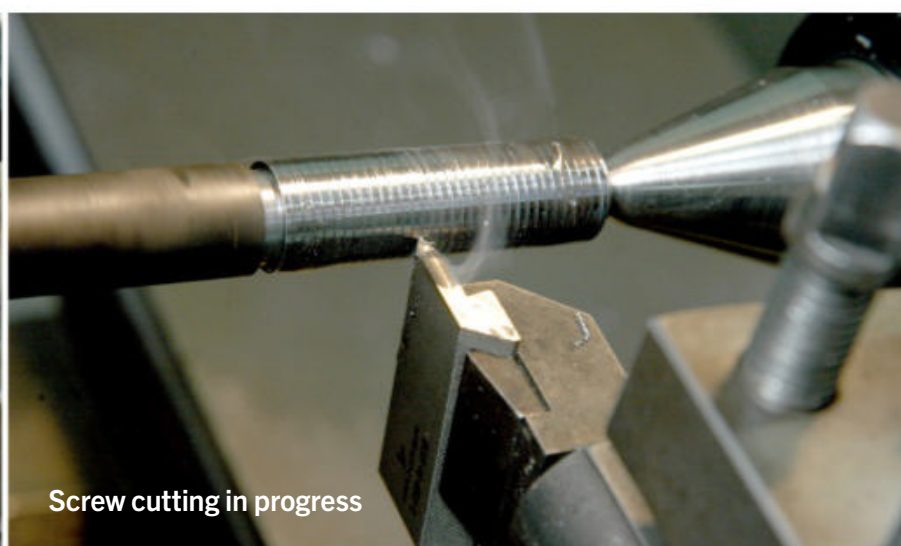
A thread gauge identifies the thread



The compound or top slide set for angular feed



Several passes are needed — note cutting oil on the cap screw



Screw cutting in progress

Minor diameter

Thread tables will tell you the minor diameter of the thread and therefore how deep you need to go to achieve the full thread profile, but the ultimate test is if the nut fits and winds along it freely. Don't disengage the leadscrew or stop making cut passes until the nut fits nicely. If you have a die nut for the thread being cut, use it to finish the thread, as it will form the radius on the outer tips. This is not cheating — it's common sense. Die nuts are not designed to cut much material away. They are intended for tidying up dinged or dirty threads, so screw cut the thread as close as you can first.

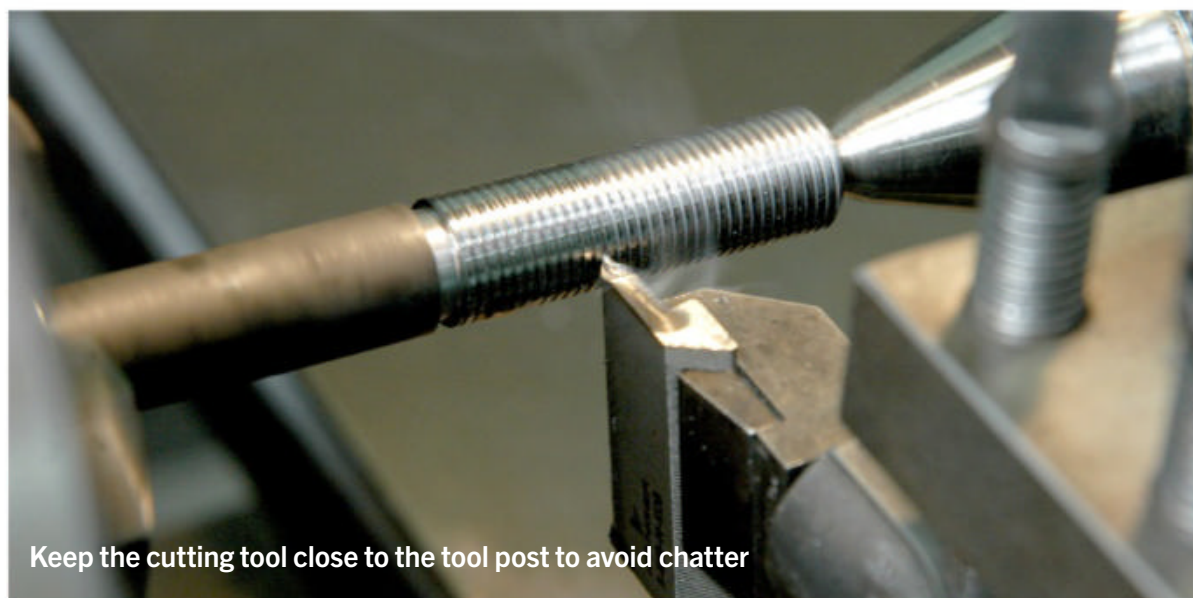
The method described assumes your lathe has a foot-operated brake, as is common on many lathes. If not, the technique changes just a little. As the cutting tool arrives at the run-off groove, wind the cross-slide handle quickly to withdraw the tool from the job, then

switch off the spindle. Reverse the rotation and let the tool traverse back to the start position. You may have to stick with slower speeds with this technique.

Chasing dial

Another way to stop the tool at the end of the thread is to disengage the leadscrew feed. The cutting tool will then stop traversing even though the spindle is still

rotating. The trick then is to get the tool in the right relationship to the job for the next cut. It does not follow that simply by engaging the leadscrew again, the cutting tool will cut in the same place. It will cut the same pitch but the groove could be half a pitch out of step with what has already been cut. You can use the chasing dial to find the same relationship. On the first cut, engage the leadscrew ►



Keep the cutting tool close to the tool post to avoid chatter



Screw cutting needs patience

when a particular number on the chasing dial lines up with the pointer. As soon as the leadscrew feed is engaged, the chasing dial stops rotating. If you have to disengage at the end of the pass and traverse the saddle back by hand ready for the next pass, engage the leadscrew feed only when the same number on the chasing dial lines up with the pointer again. Check the manual of your lathe, as this will not be true for every machine.

Left-hand threads

To cut left-hand threads, the procedure is the same apart from the essential difference that the leadscrew rotates in the opposite direction so that cutting passes are made from left to right. In this case, the cutting tool's leading edge is on the right-hand side.

Possible problems

After the basics, it is up to you to learn the finer points from the university of experience and, not least, the limitations and characteristics of your own lathe. Here is a checklist of items to help get as many factors as possible on your side.

- Recheck the diameter of the work. If it is oversize, you will end up with a very sharp tip to the threads.
- Ensure that the cutting edge of the tool is set so that it is the same height as the spindle centre line.
- Look at the gearing to be sure that it is set for the pitch of the thread that you want.
- Set the spindle speed as fast as you can cope with, for withdrawing the tool at the end of the thread, without taking too much risk of pranging the tool into another part of the job or, heaven forbid, the chuck.
- Cutting oil is important when screw cutting. A straight oil is best, rather than a soluble type mixed with water. The latter is good for keeping a job cool, but as we are running at slow speeds this is less important.

Chatter

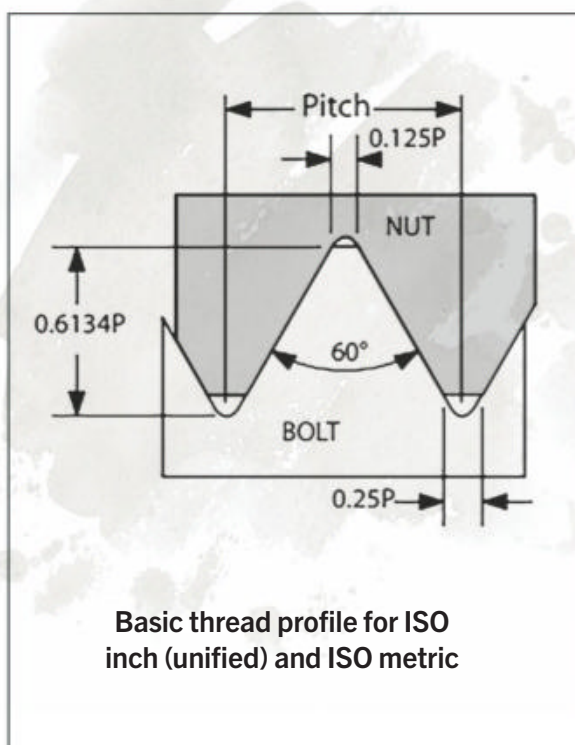
Because the tool is loaded for a significant length along its cutting edge, particularly when the thread is closer to full depth, it is prone to chatter. A vibrating tool leaves a bad finish to the job. To combat this, use lighter cut depths and ensure that

the tool is as rigid as possible. Keep the tool holder as close in to the tool post as possible. If the cutting tool or its holder protrudes too far, they have insufficient support and flexing can occur. Practise on a piece of aluminium bar first to get the basics right, then try steel. The aluminium will cut much more easily and will highlight errors in settings or techniques before you need to deal with factors affecting the finish on steel.

When using a high-speed steel tool bit or Ifanger tool, the angles that you grind on the top face have a huge influence on how well the tool cuts and the surface finish on the job. Trial and error will determine what is best for the type of material you are cutting. Start with just slight angles to the horizontal at first. Remember to readjust the tool to spindle centre height after each regrind. 📁



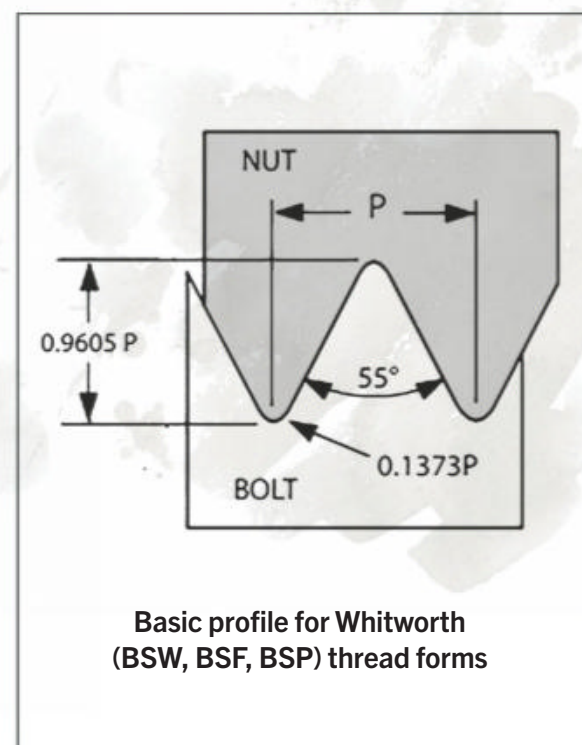
Use the chasing dial to line up the pointer again



Basic thread profile for ISO inch (unified) and ISO metric

Basic metric thread form

The basic form is derived from an equilateral triangle, which is truncated by $\frac{1}{8}$ of the height at the major diameter and $\frac{1}{4}$ of the height at the minor diameter. The corresponding flats have a width of $p/8$ ($P \times 0.125$) and $p/4$ ($P \times 0.25$) respectively. In practice, clearance is provided beyond the $p/8$ flat on internal threads and beyond $p/4$ on external threads. These clearances are usually rounded.



Basic profile for Whitworth (BSW, BSF, BSP) thread forms

BSW form

The sides of the thread form an angle of 55 degrees combined. The top and bottom of the full triangle are truncated $\frac{1}{6}$ the height. The actual depth of the thread is equal to $\frac{2}{3}$ of the height of the generating triangle and equal to $0.6403 \times \text{pitch}$. The crests and the roots are rounded to a radius of $0.137 \times \text{pitch}$.



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A woodturning newbie learns some secrets from a master

By Jason Burgess

Photographs: Jason Burgess and Chris Hooton

Woody and his fence of timber-working memorabilia



Beautiful finishes with respect for the grain are the hallmarks of Woody's creative process



Starting blanks



For sheddies who have been around the woodturning circuit for a while, the name Chris 'Woody' Hooton will probably be familiar.

Woody's passion for end grains, side grains, shakes, shrinkage, twists, and galls, 'beautiful scratchings and ugly shavings' is contagious. For the past 16 years, he has been sharing his knowledge and perfecting a recipe for teaching the fundamentals of woodturning to curious tourists and serious woodworking beginners from his shed at Woody's Place in Kinloch. He believes that turning a bowl is a great introduction to all forms of woodworking, as many of the basics cross over to flat woodwork.

Woodturning for beginners

As a complete newbie to woodturning myself, I felt it only right to get the basics from an expert, so I booked in for a night in Woody's bunkroom and settled in to his two-day introductory course.

Now, when I hear words like 'peeling', 'slicing', and 'scraping' in the same sentence I start imagining kitchens and chefs, not woodworkers in their sheds. After a weekend with Woody, this novice-of-the-lathe quickly comes to realise that whether making a plate ►

“I have had grown men crying on the lathe when they see what they have achieved”



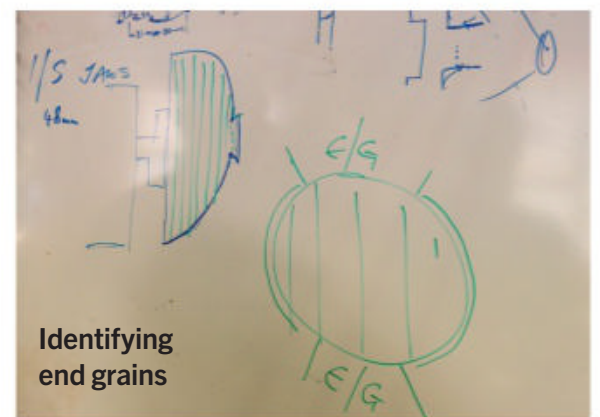
Woody's stockpile with sawmill to the left

of food or a vessel to serve it from, the language is interchangeable and that finishing my bowl to Woody's standards is ultimately satisfying.

“People think woodturning is round and brown, that it is boring,” he says. “But it is a journey. I have had grown men crying on the lathe when they see what they have achieved.”

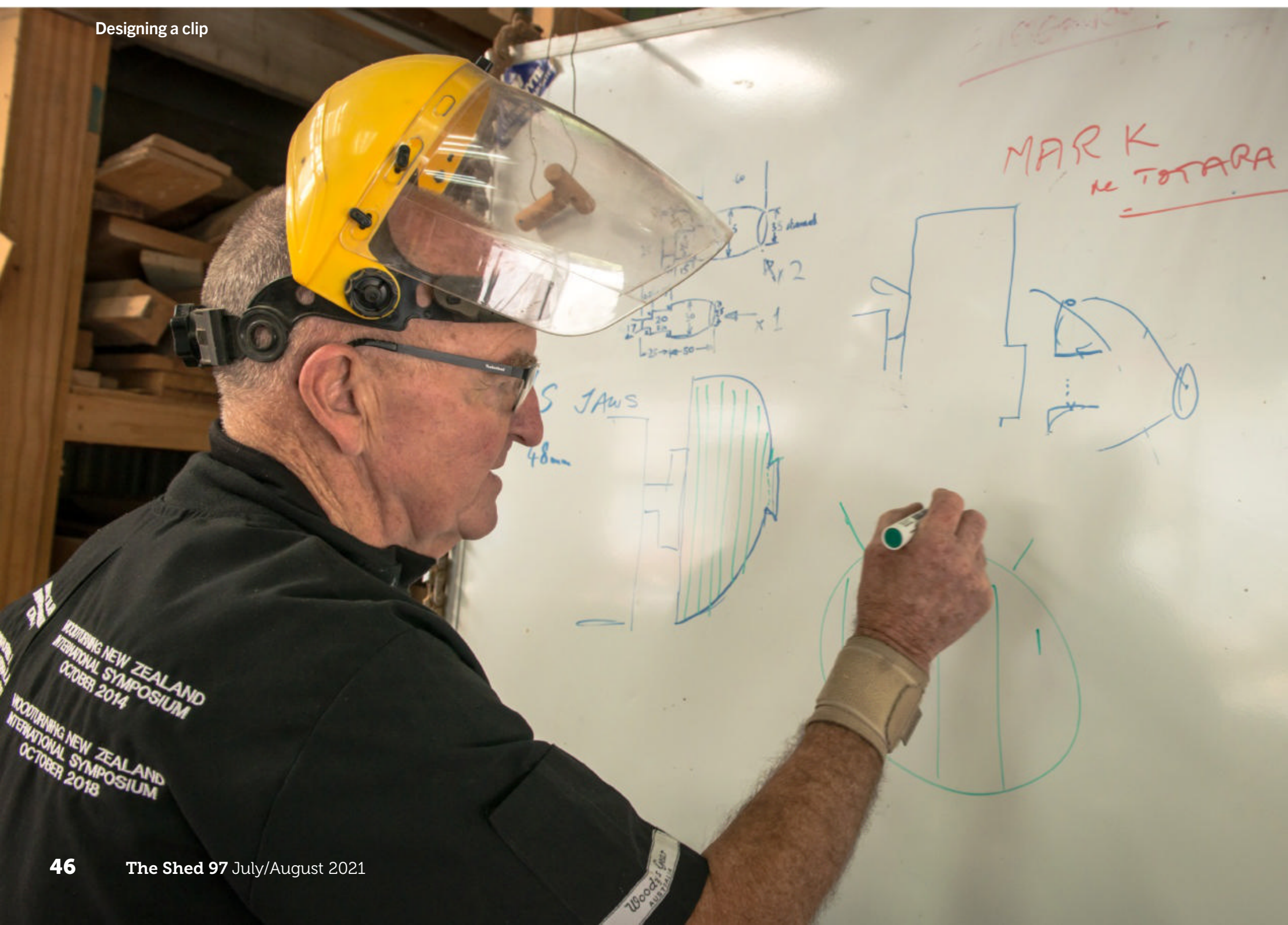
Country boy

Timber has been a prevailing theme in Woody's life. Both his grandfathers in Lincolnshire, England, were men of the countryside. They were skilled in traditional country crafts and working with wood was their main medium. But it was the gift of a pocket knife from his aunty at age seven that really



Identifying end grains

Designing a clip



Woody's tips

Starting out

- Visit a local club. They will have loan lathes and chisels to get beginners started and they may assign you a guardian angel for a day.
- Check out the National Association of Woodworkers (NAW) website: naw.org.nz. NAW has links to all the clubs nationwide and you can stay current with what is going on.
- Attend a woodworking jamboree like the three-day Taupo Jamboree. This is held every April and is very much a hands-on affair that has launched many novices to great heights.
- Go to a club night or a woodworker's home workshop. Watch somebody with experience going through the procedures.
- Learn about pull cuts, push cuts, and negative rake scraper work, keeping the tool rest moving, following the profile that the woodturner is creating.
- Get a good, second-hand variable-speed lathe.

Boring depth measured, taped off, and ready to drill



You can never have too many clamps



Creating catch grooves for hollowing the bowl

fuelled Woody's passion for creating with timber.

"I used to sit on the back step whittling hazel and willow walking sticks," he says. "I basically went to school to eat my lunch and play with wood. I must have got quite good at whittling because my maternal grandfather, who barely spoke a word, came past one day and said, 'Boy, if you get good at anything, make sure you share it before you move on from it.'" Those words more or less became Woody's credo.

A lot of shed time

Woody first tried turning in the woolshed on the family farm: "I bought a lathe, turned it on, stuck a chisel in, and started. But it just didn't sound right. So I bought a book by Brian Massey [*Woodturning in New Zealand: The Complete Guide to Timbers, Materials and Processes*] and attended demos by Rolly Munro, Graham Priddle, Terry Scott, and Guilio Marcolongo from Australia. This helped me to create artistic shavings. Following their teachings was very productive."

Still, he reckons it took at least two years of practice before he had anything decent to show. At one stage, he was spending more time out in the shed than in the family home.

Latterly, it is Irish turner Glen Lucas and one of Woody's former students, Troy Grimwood, who have been providing him with fresh inspiration.

"It is important to find the right teachers and get alongside people who give an honest critique without being overly critical," Woody says. ►



Woody in his element



Chalking to identify the grains



Preparing to turn the bowl around to carve out the interior

Teaching methods

Woody started teaching because he felt that there should be no secrets in woodturning. He teaches anyone from 13 years old onwards (his oldest so far was 83) and each student walks away with a handsome wooden bowl of their own creation (with a bit of help from the master's chisels).

As well as running classes from his shed, he is busy with commissions — everything from designing and building furniture to constructing domed yurt canopies and creating one-off art pieces. Adjacent to his shed is a purpose-built exhibition space known as '3ART Gallery', where he shows his work alongside invited local woodturners and artisans. The '3' refers to the gallery's modus operandi of using only natural, sustainable, and/or recycled materials.

Tree secrets

Woody credits his peripatetic career with providing him with the skill sets that he brings to his woodturning. He has worked all over the North Island as a sheep and beef farmer, a farrier, and an arborist. He also had stints as a specialist joiner, a construction coordinator, and berry grower, not to mention sawmill worker.

"My only real training for woodturning was training to become an active arborist while woodworking in my spare time," he says. "It taught me to read what trees were hiding inside — the secrets that are useful to woodturners — rather than seeing them as just firewood. I can read trees like book covers. It's an adventure finding out what is in a piece of wood. Every woodturning project is like a voyage of discovery." The more complex the grain the more compelling the project. ▶

Chisel sharpening on the grinder



Woody's tips

Chisels

How many do I need? A total of eight is the maximum you need until you advance into hollow forms.

The following will get you started:

- 10mm bowl gouge with a 45-degree grind
- 13mm bowl gouge with a 45-degree grind (good on the outside of the bowl)
- 13mm bowl gouge with a 35-degree grind (good for hollowing out the bowl)
- parting tool
- skew chisel
- spindle roughing gouge
- spindle fingernail gouge
- negative rake scraper

Buy new chisels and gouges, about \$130 each. Get high-speed steel — they keep their edge.

"Every woodturning project is like a voyage of discovery"

Pull cutting to shape the outside of the bowl





Sizing up with skidding tongs to find the right grip for moving log to mill



Sanding the exterior form

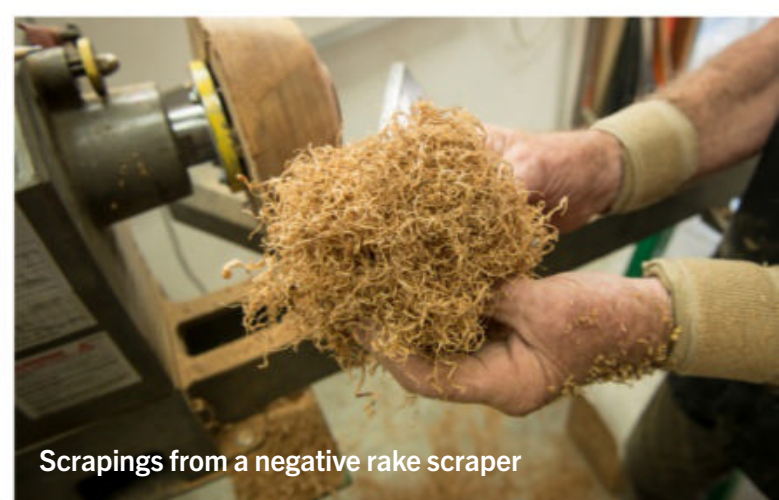
“Head logs and stumps are the best because you have no idea which way the grain is going,” he says.

The rotting stump bowl

The back paddock at Woody’s Place is strewn with growing stockpiles of seasoning timber salvaged from across the Taupō region. Some are earmarked for large projects, others will be milled on his portable sawmill and cut into blanks for teaching or for his own creations. “Locating the piece of wood is often my favourite part,” he says. It could be a newly cut tree or a trunk salvaged from someone’s dump. Recently, one donor of a rotting stump visited 3Art Gallery and ended up buying a finished bowl made from that same piece of



Shear scraping with a negative rake tool



Scrapings from a negative rake scraper



Using a vacuum chuck to remove the base



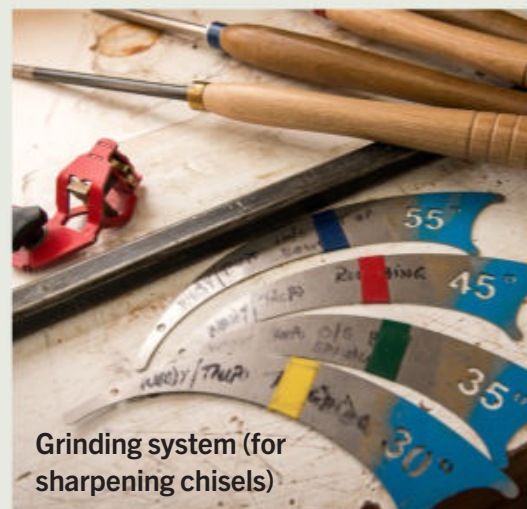
Woody holding a bundle of kahikatea walking sticks

“When you are working with wood, your body should perform a subtle dance”

Woody's tips

Stay sharp

- Use a CBN (cubic boron nitride) sharpening wheel for sharpening gouges and an aluminium-oxide wheel for shaping.
- Colour-code the gouge bevels to match the cutting angle presets.
- With a felt pen, colour the gouge bevels before sharpening to highlight the required angle.
- Dirty wings mean that the chisel is blunt.
- In woodturning, the blank is attached to a screw-chuck faceplate. People have a lot of issues with their wood coming off the lathe because they use inferior screws. Use Tech screws — they are strong and reusable. Revolve the wood manually before starting to check for a clear revolution, then bring up the tail stock and happy turning.
- When centring, speed check the lathe.



Grinding system (for sharpening chisels)

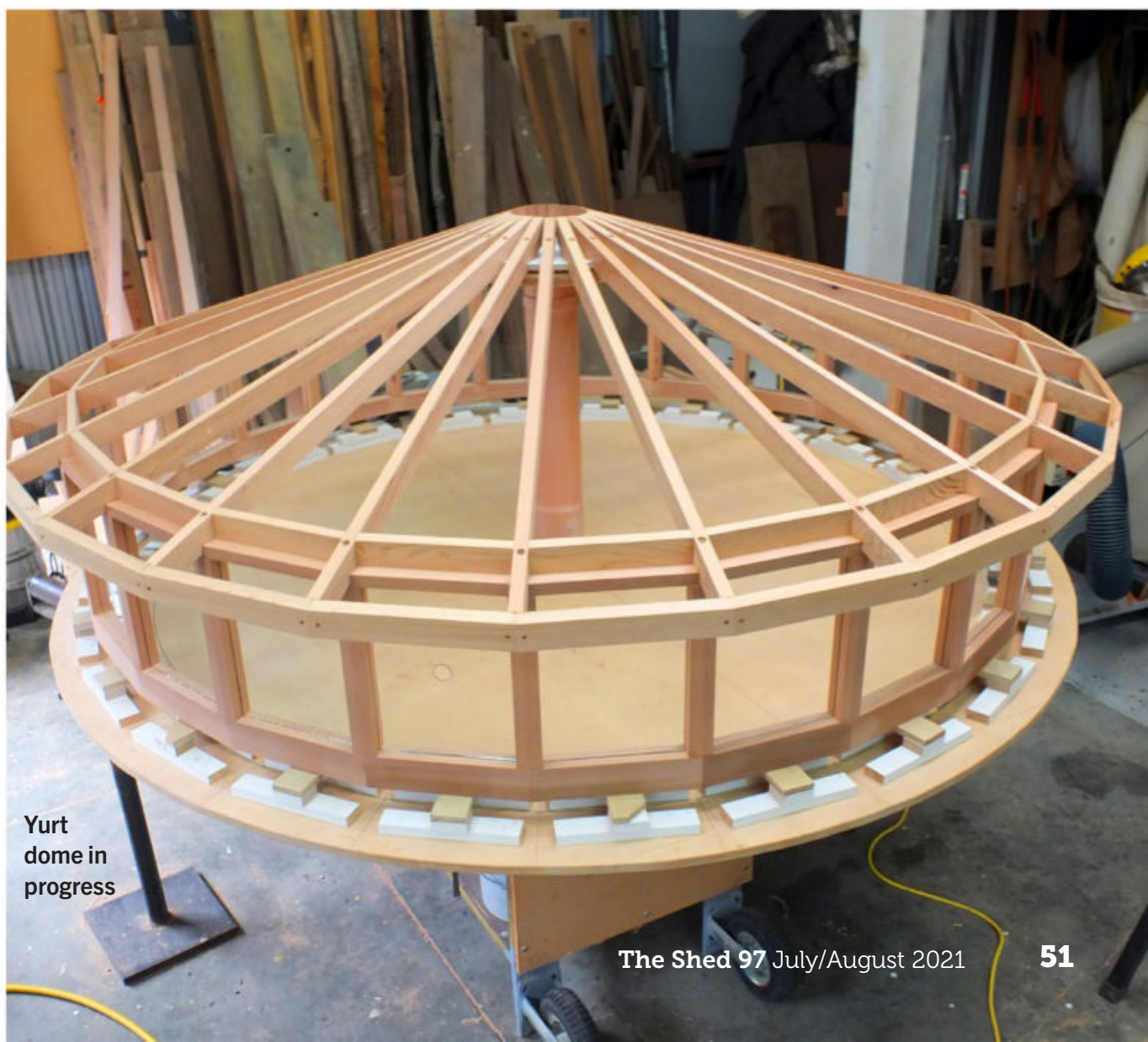
wood. “She wouldn’t believe that it was made from her timber,” says Woody.

After health and safety, a session with Woody begins with chisel/gouge choices and the importance of regular tool sharpening. A dull tool is the enemy of a clean cut — it will tear the grain. The ABCs then follow:

- A. The angle of the chisel presented.
- B. The rubbing of the bevel.
- C. Altering the chisel angle to achieve a good cut — not scraping.

From tool-sharpening angles and body stance to the way the tool is held and where and how to apply pressure, the nuances are many. Wood is constantly moving.

“When you are working with wood, your body should perform a subtle dance. A light touch with sweeps of the chisel and a relaxed tool stance. Force and muscle are not necessary. It comes down to balance and the way you hold the tools — a bit like sheep shearing,” Woody explains. ►



Yurt dome in progress



Woody's tips

The final touches

- When you are finishing, put in an extra five minutes because a bowl will be around for years.
- Re-sharpen your chisel before you get to your final cuts. This will save you a lot of sandpaper. Sandpaper is the most expensive item in the shed. If you can, use a chisel to create a finer cut; you will save in the long run.
- Make your bowl gouge do the final cut. The negative rake scraper will remove any anomalies that you might feel as you get the timber smooth.
- Before sanding, use chalk to massage into the wood to identify the end grains — this will make it easier to blend with the side grains.
- Speed is not vital; let the wood direct. By travelling slowly, you can start sanding with a 240-grit paper to smooth out the end grains, then up to 320 and 400 grit. Use wire wool (600 grit approx.) to finish before polishing and burnishing.
- You can clean clogged sandpaper with acetone and a bronze brush, but rubbing it with crepe is a cheaper and simpler option.

Beginner gets rhythm

Even for this humble beginner, I occasionally find myself swept up in the rhythm, at one with the tools and the material, ribbons of shavings effortlessly peeling off the wing of my gouge gently guided by my right hand, flute open for aggressive cuts. That is, until I catch myself thinking, *This is it. I've got it*, while simultaneously catching the gouge in the timber! Fortunately, Woody is there to read the shavings and listen to the cuts. "I heard that," he calls as he comes to inspect the damage. "You weren't rubbing the bevel."

"Every angle which," is a Woodyism that he often employs to describe particularly knotty pieces of timber, like the one I am working with. After a bit of instruction from the master's hand, I'm off again. He says, "This will come up beautifully. Remember, trees are living things — by finishing a piece of wood well you can make it look alive again."

Visit: woodysplace.co.nz. 📄



A few more of Woody's timber treasures on show in the 3ART Gallery



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TO SERVER OR NOT TO SERVER WHAT WAS I THINKING?

In part two of this project, Nigel calls on an expert to interpret 'computer-speak'

By Nigel Young

Photographs: Nigel Young, Lance Hastie

There was one joy, however: I got to attack the one I bought for parts with a grinder

The home-spun die-cast box with the RPi controller and the 1TB SSD drive inside, next to the 6TB HDD storage drive. Note the HDMI connector if you want to add a screen

In these days of sustainability and cradle-to-cradle production processes, recycling old tech has got to at least be examined. Well, I did — and it was interesting to say the least. In the end, I couldn't get the G5 to restart. I took it to several repair places, bought an old G5 for potential parts — \$20, so current expenditure is \$65.21 — but still no joy. There was one joy, however: I got to attack the one I bought for parts with a grinder; it was very satisfying. I'd like to get the old G5 going again — if anyone has any ideas I'd love to hear them.

A chapter ends

So for now, the chapter has closed on the G5 and four of the older hard drives. The other four — some hardly used 500GB LaCie drives — are of such a quality that they should last for a while yet. I have, however, since bought a 13-inch MacBook Pro laptop, so I want that to be included in the mix. I've allocated one of the four LaCies to it as a backup via Apple's Time Machine, which I also use on my 27-inch iMac — my main computer — using a small 2TB WD drive. Both of these are backed up regularly, but usually only once a week so potentially I can lose up to a week's work.

Until recently, they were also backed up to iCloud, so there were systems in place. However, I wanted more than just backup; I wanted a server that could be accessed from either Mac or from an iPad or iPhone. It's fair to say this is where iCloud wins hands

down — its seamlessness between hardware items is flawless. If I stick to Apple's own apps — Pages instead of Word, Keynote instead of PowerPoint, and Numbers instead of Excel, then there is no contest.

That flawlessness became part of the solution in the end, in that we made the decision that everything Apple was simply saved there first, and then that in turn was saved back to our new server. So we're staying with iCloud, but at a much reduced level. By cutting back to its 200GB plan at \$4.99 a month, we save \$144 annually while still maintaining the best of the service. It became a 'best of both worlds' solution, given budget restraints.

Boring tech names

I met Lance Hastie of Com Technology through a business networking group that I'm a part of, and through him learned of a whole new world: that of mini-computing — in this case using a Linux 'lite' system on a platform known as 'Raspberry Pi'. Where do they get these names from? (Having said that, I once read that 'TWIN' — which is the name for the driver software used with some scanners — stands for 'technology without an interesting name'. That's a bit like the sign that says "This sign has sharp edges").

Probably the best way to continue is to go straight to the 'final' — I use that word guardedly — configuration, and then explain how we arrived there. The hardware list is shown below. ►

Raspberry Pi SC0193 4 Model B — 2GB of DDR RAM	\$54.44
Raspberry Pi AC adapter with USB-C Type C	\$13.42
USB3 2.5 SATA HDD adapter cable	\$25.95
Dynamic HDMI — Micro HDMI female to male adapter	\$9.95
Dynamix 1200 Defender UPS	\$185.00
Samsung SSD 1TB hard drive	\$159.00
Seagate Expansion 6TB external hard drive	\$278.99
Kingston 16GB micro SD card	\$7.78
TOTAL (incl. GST)	\$870.72
To this was added:	
Software:	
SyncFolders Pro+ by GreenWorldSoft	\$15.00
Get Backup Pro 3 by BeLight	\$27.54 ¹
Coffee	\$ — Who knows?
Add to this our existing costs of \$65.21	\$935.35
Lance Hastie's time	

¹ Lance is an above-and-beyond guy who put far more hours into this than he ever billed me for, justifying it on the basis that the research involved was useful to him elsewhere. Integrity, diligence, and ethics par excellence.

If you can keep track of networked attached storage (NAS), which is what the project is about, there is a chance you will survive this

Meet Lance

At this point I'm going to hand over to Lance, as from here on the geek speak is terrifying — and that's not too strong a word.

If you can keep track of networked attached storage (NAS), which is what the project is about, there is a chance you will survive this. I have put a list of abbreviations and terms at the end of this instalment. What doesn't help are Lance's opening comments: "There would be 50 ways to achieve this — didn't Paul Simon write a song about that? — depending on your proficiency with microcontrollers, computers, and in particular the Raspberry Pi (RPi) unit.

"As mentioned earlier, the RPi is a minicomputer that runs Linux — the world's most popular operating system — in a cut-down form. Nigel has described this earlier as Linux 'lite', but don't be fooled by its small size, price, and the 'lite' configuration — latest models compete in performance with most desktop computers when it comes to the basics.

"Between web browsing, email, and LibreOffice,* you've got a start-up home-office package. In this guise, the RPi is being used to back up working files over

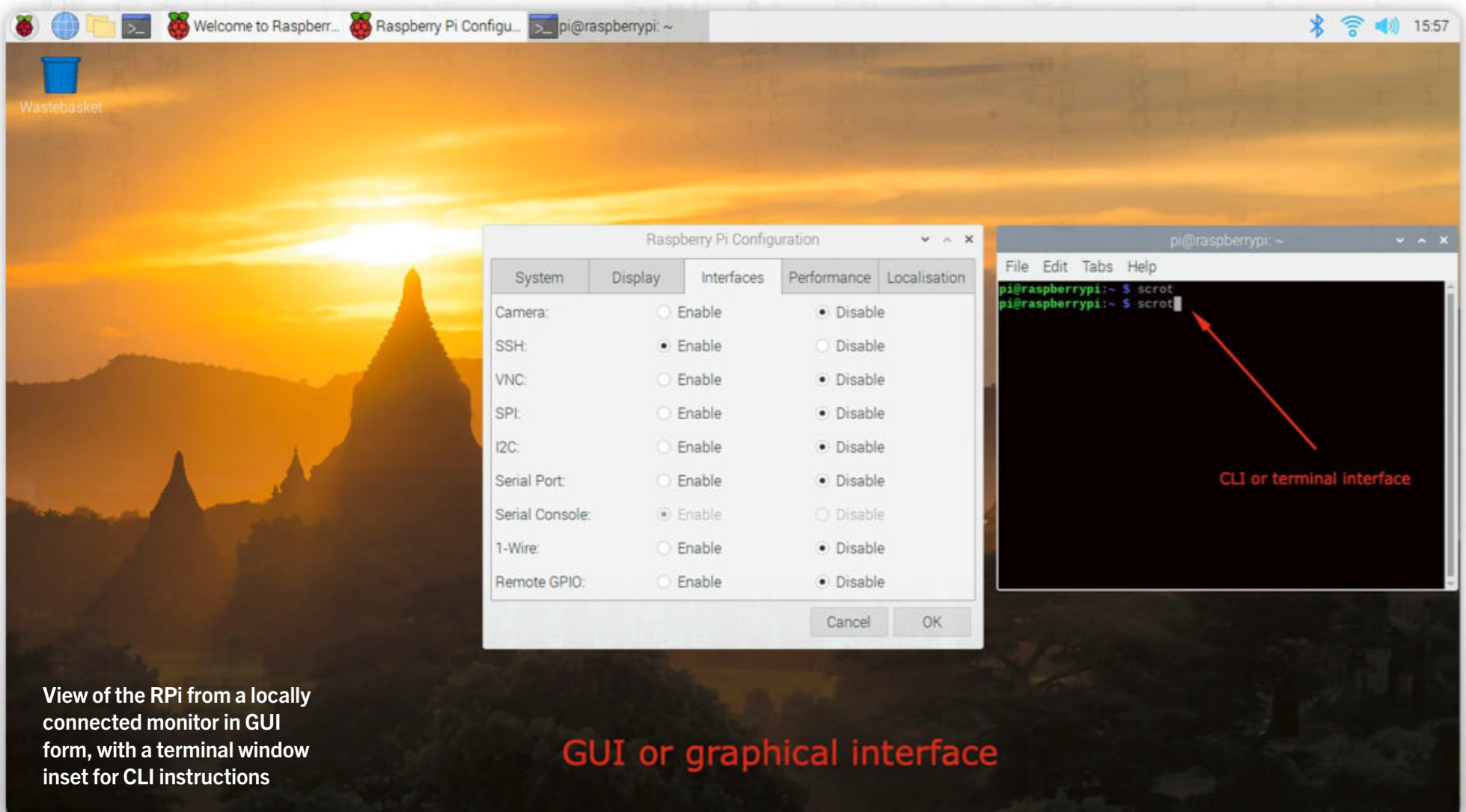
the local network — typically a mixture of cable and Wi-Fi — to a primary drive, which in turn is backed up once a week to a secondary drive."

Primary and secondary drives

The primary drive is a 1TB solid state drive (SSD). While well known for its speed, in this configuration — as it has no moving parts to wear down over time — it can stay on and powered 24/7 with minimal degradation. The weekly secondary drive is a 6TB USB hard disk drive (HDD) — powered by a script and controller board — for backing up the 1TB SSD. Both drives connect via USB interface, with the 1TB SSD using one of the RPi USB3.0 ports while the 6TB HDD drive uses another, via a USB2.0 software controlled switchable hub. The RPi has four USB3.0 ports, with 2GB of RAM assisting the process.

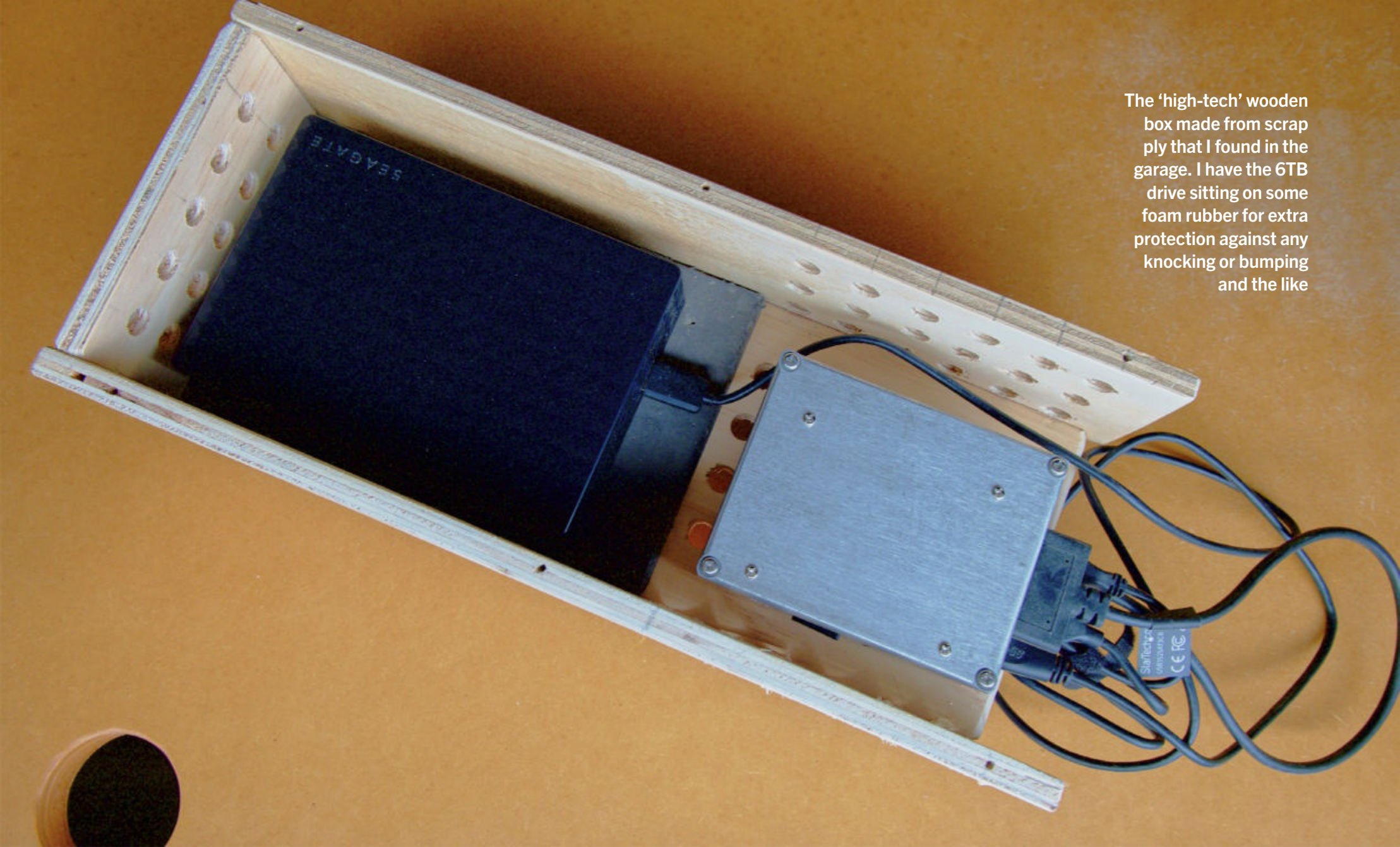
You've probably figured that there are two physically separated backup drives. Why mix the types? As mentioned, the main 1TB drive is solid state. There are no moving parts and it is silent. It's not that large in terms of storage space, due mainly to price. On the other side, the 6TB spinning disk drive is as cheap

* The free and open-source version of Microsoft Office.



View of the RPi from a locally connected monitor in GUI form, with a terminal window inset for CLI instructions

GUI or graphical interface



The 'high-tech' wooden box made from scrap ply that I found in the garage. I have the 6TB drive sitting on some foam rubber for extra protection against any knocking or bumping and the like

as chips. To lengthen its life, we only turn it on when it's needed — in this case weekly. It is also easily unplugged if required.

Regarding performance, both drives are faster than the network connection that is handling the backup, so any old drive will do. The RPi, 1TB SSD, and USB hub board are encased in a home-spun die-cast box, with the 6TB HDD — or any secondary drive larger than 1TB — sitting next to it. Nigel built a wooden box from some scrap ply to house it, boring holes primarily around the die-cast box to allow cooling. While it doesn't heat up enough to require fans, airflow is still essential.

Some specifics about this project

While this describes the process for a Mac platform network, the OpenMediaVault (OMV) software on the RPi is cross-platform so will work equally — and in some cases more simply — for Windows users. OMV is the software that turns the RPi into a network storage device. Being open-source software, it is free and highly configurable.

Originally it was intended that the OMV — running on the RPi — would synchronise the files between devices.

Regarding performance, both drives are faster than the network connection that is handling the backup

Obviously, it didn't end up being that way. Why? Permissions. A recent security update by the Mac operating system (OS) made this cumbersome, as the changes to the way the files were allowed to be read and written — the permissions — were prone to be later changed. While it worked from the outset, pulling the files from the Mac and onto the RPi would likely fail in time, as the set-up was very device specific and would probably require ongoing maintenance to keep it working.

Synchronising files

The next step was to run software on the Mac to do the synchronising of files to the RPi — that is, push them from the Mac to the RPi. Using a simple computer script — written in bash format — plus the rsync (file synchronise) and a cron (chronological task scheduler) seemed obvious. For all the reasons given, it fell into the same

'permissions' hole and result. The end result was to pick an app that would run in the background, quietly transferring files — pushed from the Mac to the RPi.

From the many options available in the Apple app store, SyncFolders Pro+ by GreenWorldSoft was settled on. After a few false starts, where it seemed not to run reliably, it has proven to deliver. It is easy to configure. Simply create a new task, select the source folder, the destination folder — being the folder configured by OMV on the RPi — and go. Synchronise to a routine or when a file has been updated.

The flexibility of OMV allows backup synchronising of files or mirror options, where any changes on the local computer were updated on the RPi. Any other sharing computers would also see that updated file — in this case Nigel's laptop and iPad. ►

One of the key points of this project was file security, so that any cyberattack wouldn't be able to access them. The end result was to keep this as a local network solution only.

Another learning opportunity — more relevant to Mac — is that the file handling and versioning it uses is unique. If you want to share Mac files between devices, use iCloud Drive and back that up to the RPi. More on that later.

A point here is to use iCloud Drive only for files that you essentially need shared between Mac devices or need access to outside your local network. This was one of our primary goals, due to Apple's price structure. For the rest keep/use your existing file/folder structure.

Pros and cons of local storage

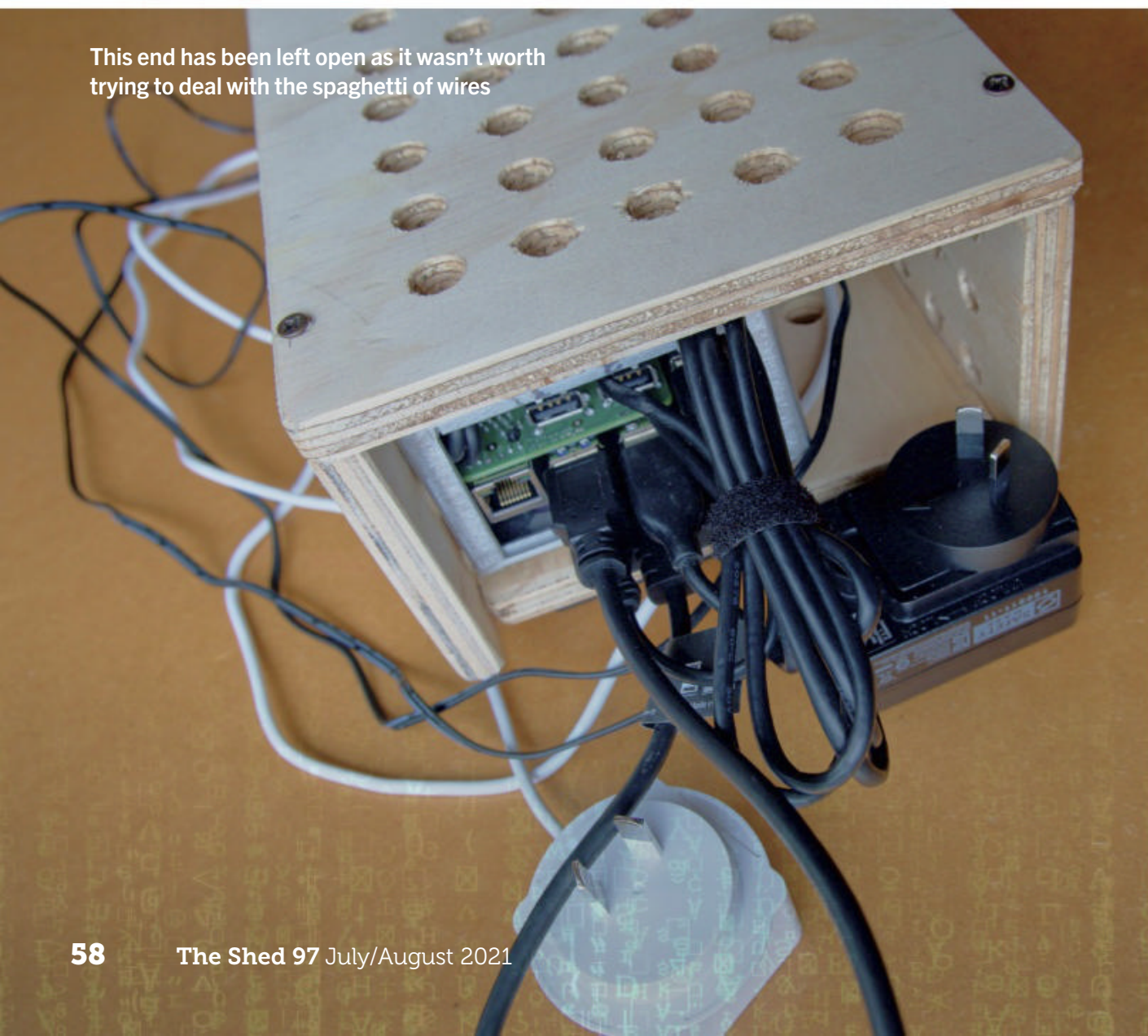
Pros

- You physically know where your files are stored.
- Your files are not sitting prone to cyberattack — deletion or retrieval — from a remote location; neither are your access credentials.
- There are no ongoing subscription fees/charges.
- If you lose internet access, you've still got your files.



The wooden box and lid drilled for air movement. Lance comments that while it doesn't need a fan, it is still important to allow for air movement around it

This end has been left open as it wasn't worth trying to deal with the spaghetti of wires



Cons

- If you're out and about you don't have access to your files.
- If your home is ransacked, all your files could go with it.
- If your home is damaged by earthquake, fire, or flood, you may lose access to your files.

Software

This is where the project, through many iterations, is presented in an out-of-the-box style. Each person will have their own take on refining it to suit their own specific needs, plus the software is ever changing.

Equally, why isn't this a 1, 2, 3, paint-by-numbers style guide?

By the time you try this, something will have changed in the way it is done and the method will fail. Keeping it generic points towards the steps rather than the actual painting of them. ►

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but we would rather use yours.

For more information and to enter your shed shots visit

 /theshedmag

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

THE WHERE DREAMS ARE MADE REAL
Shed

Another key point is sticking to the main road when it comes to software, as future updates will often leave custom configurations behind and you'll be left debugging something that used to work but is no longer supported.

The RPi (Model 4) was loaded with the NOOBS ('new out of the box') Linux OS. It is stored and run from a microSD card that forms part of the board. This hugely community-supported OS is very simple to navigate and has a feel of Mac/Windows hybrid to the interface. It's easily downloadable from the internet.

It is at this point that the reality of Linux being a stand-alone OS can create complexity if you're used to Windows or Mac, as it is another OS that can be too different for some to comfortably navigate.

The SD card (often used in digital cameras) holds the OS that needs to be 'imaged' in the correct Linux format. Depending on whether you're using a Mac or a Windows PC, there are free utilities that allow you to write the software to the SD card in the correct format that is a true image copy of its source — imaging is a true system level copy. It may even be easier to purchase the software preloaded onto the SD card when buying a new RPi.

Powering it up

Along with connecting a keyboard, mouse, and monitor — via HDMI — the RPi requires a beefy 5V supply. Best suggestion is to purchase a power supply with the RPi — the plug will fit and it will just work.

Preference is to cable connect the RPi to your local network using an Ethernet cable. If this really isn't practical, you can connect via Wi-Fi — dealt with in a later step. Ensure that the SD card is also inserted, everything is securely connected, and then apply the power.

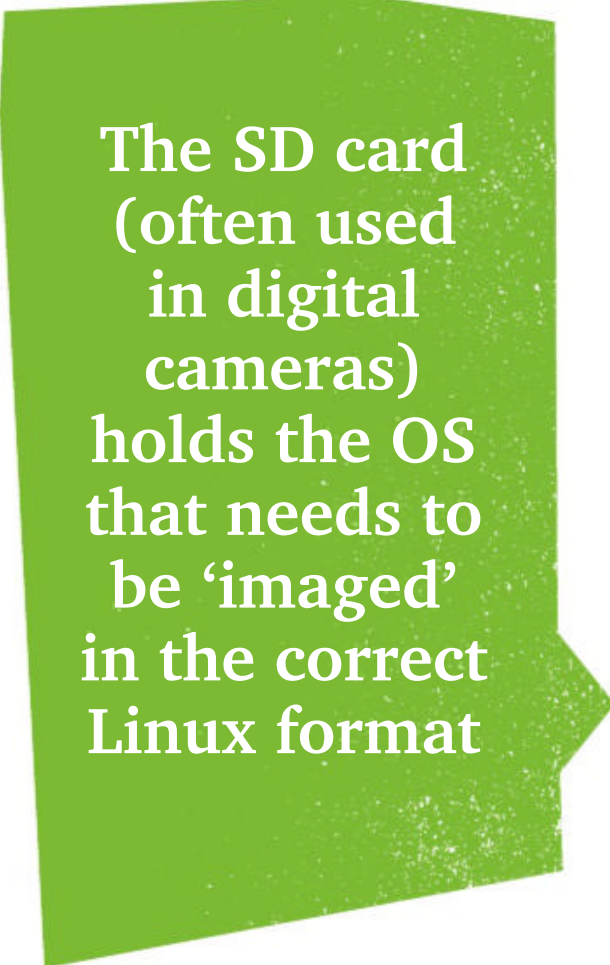
A word of wisdom

Treat power to the RPi as being as precious as oxygen. Disconnect the power only after software-shutting the RPi down. Due to the way it reads/writes files, if you cut power during one of these cycles, it will corrupt the OS — not

maybe; it will! You will have to start all over again. That is why, when you have it all set up and running, it is good practice to take an image copy of the SD card and store it, preferably on a clone SD card, in case you should ever need to reinstate it.

Enjoy the show

The desktop that will eventually load will look strangely familiar and probably easy to navigate — you've probably already figured out how to connect it to your local network and/or Wi-Fi. You can do all the set-up via keyboard and command line interface (CLI). However, I detoured and set this up using the graphical user interface (GUI).



The SD card
(often used
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holds the OS
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in the correct
Linux format

It also makes connecting to a network significantly easier. The prompts to do this appear during the initial boot sequence and set-up.

After you've got yourself a nice desktop, there are a few housekeeping steps. If you have an Ethernet cable connected to your local network, chances are your RPi is able to browse the internet. If not, look for the Wi-Fi network icon at the top right of the screen and follow the prompt to search and connect to your local network.

Next:

From the top left (RPi icon) > Click > Raspberry Pi > Preferences > Configuration

Interfaces tab > SSH > Enable

Then: RPi icon > Logout > Reboot (This enables SSH access for network access to the Pi.)

Then: RPi icon > internet > Chromium Browser.

This will open a browser where you can test your internet connection.

Next

A bit of updating to catch up with any latest changes:

From the top left — black 'Terminal' icon— click to open a terminal window. Then type these commands, one after the other — let one complete before running the next:

```
sudo apt update
sudo apt upgrade
sudo -i
```

(This enables the following commands to be issued as the root user.)

```
wget -O - https://github.com/
OpenMediaVault-Plugin-Developers/
installScript/raw/master/install | sudo
bash
```

When that is finished, reboot — it may reboot automatically.

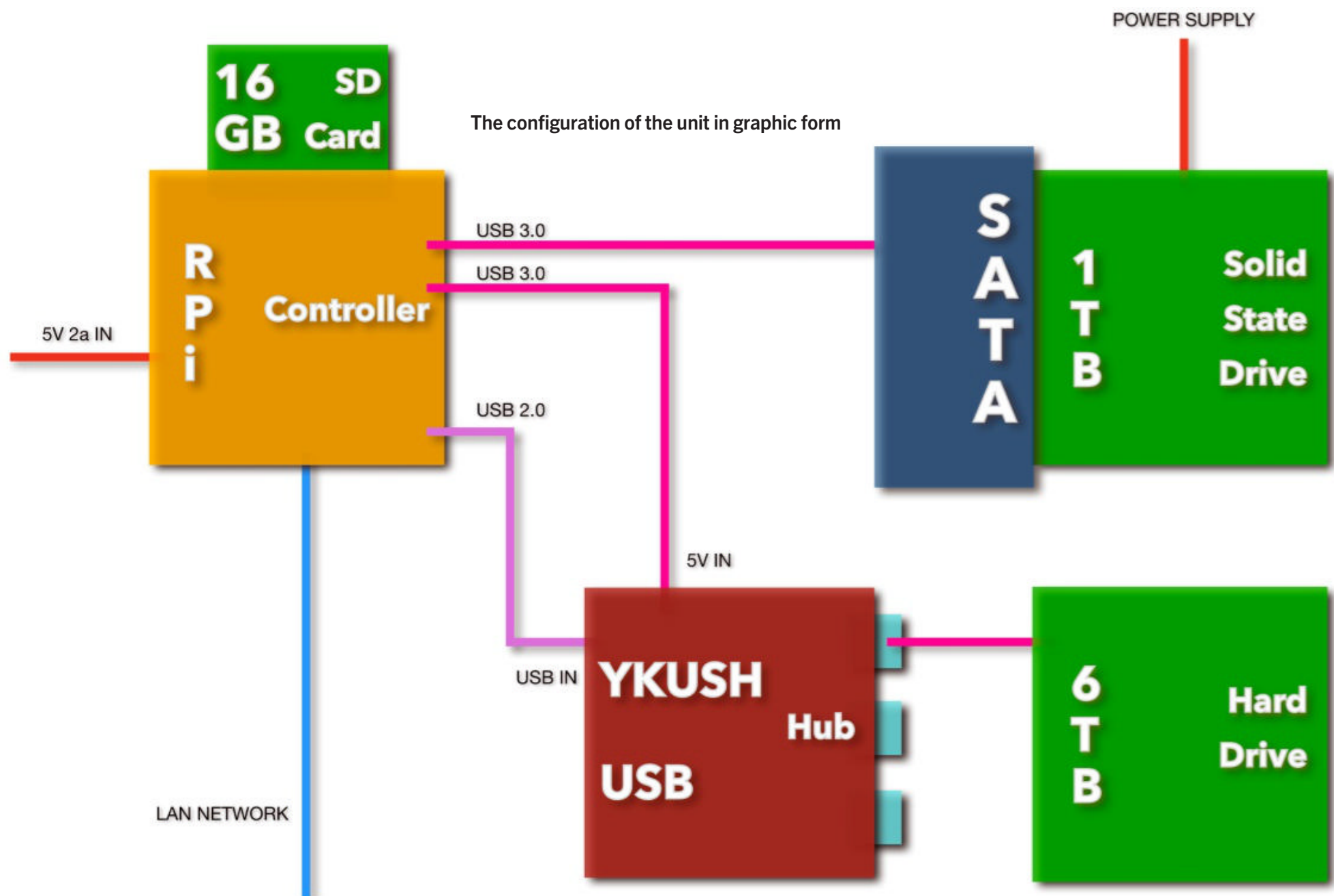
Once this is done, open a new terminal window and type:

```
sudo -i
Ifconfig
```

This displays the network address of the RPi on the local network. If you are cable connected, look for eth0, or wlan0 for wireless. The inet value is your RPi local address. Enter that address into your nearest computer browser to access the OMV now running on your RPi. If you want to run the backup, backup drive set-up — let me know if you need one of these boards as I have a few in stock locally — there is the software to install to use it.

Mounting to the 1TB SSD drive

The obvious question is: how do I connect to the SSD drive? First, it needs configuring. There are two methods, one using command line (CLI) or the desktop (GUI). Both methods are covered well in the following article



Treat power to the RPi as being as precious as oxygen

and will get your drive usable in the correct format: zdnet.com/article/raspberry-pi-adding-an-ssd-drive-to-the-pi-desktop-kit/.

Installing the Ykush USB hub

Hardware

Start by connecting the 'Upstream' port — as labelled on the board — to one of the RPi USB ports. The USB backup drive you want to control will plug into one of the 'Downstream' ports. The supplied script is configured to use Port 1. This board also requires a 5V power source.

Easiest option is to use one of the RPi ports, using a USB lead to connect to the 5V on the top edge of the board. Both the RPi port and RPi-branded power supply are sufficiently rated to run an HDD drive via this method.

Software

Open a terminal window from the desktop and start to install the dependent libraries — type each command and press 'enter' to run. Once complete, move to the next:

```
sudo dpkg -l | grep libudev
sudo apt install libudev-dev
```

Then, from your local computer — you can use the RPi if you're proficient at handling files and unzipping — go to yepkit.com/products/ykush, and download the package from yepkit.com/uploads/documents/68548_ykushcmd_master_20171130.zip.

Unzip the files to a local directory.

The next step requires copying these to the RPi. You could copy them to a thumb USB drive and drag/drop via the RPi File Manager. Or you could use SSH via your local computer or sFTP: connect using the IP address given

with username 'pi password raspberry'. Navigate to `/home/pi` and create the directory 'ykushcmd' — without the quote marks. Place all the files in there. Next right click on the new directory and set its permissions to 774 — or do this via sFTP or CLI.

Next

Follow the instructions at yepkit.com/learn/setup-guide-ykush.

From a terminal window, navigate to `cd /home/pi/ykushcmd`.

Then type and run each line below:

```
sudo apt-get install libusb-1.0-0-dev
sudo apt-get install libusb-1.0-0
```

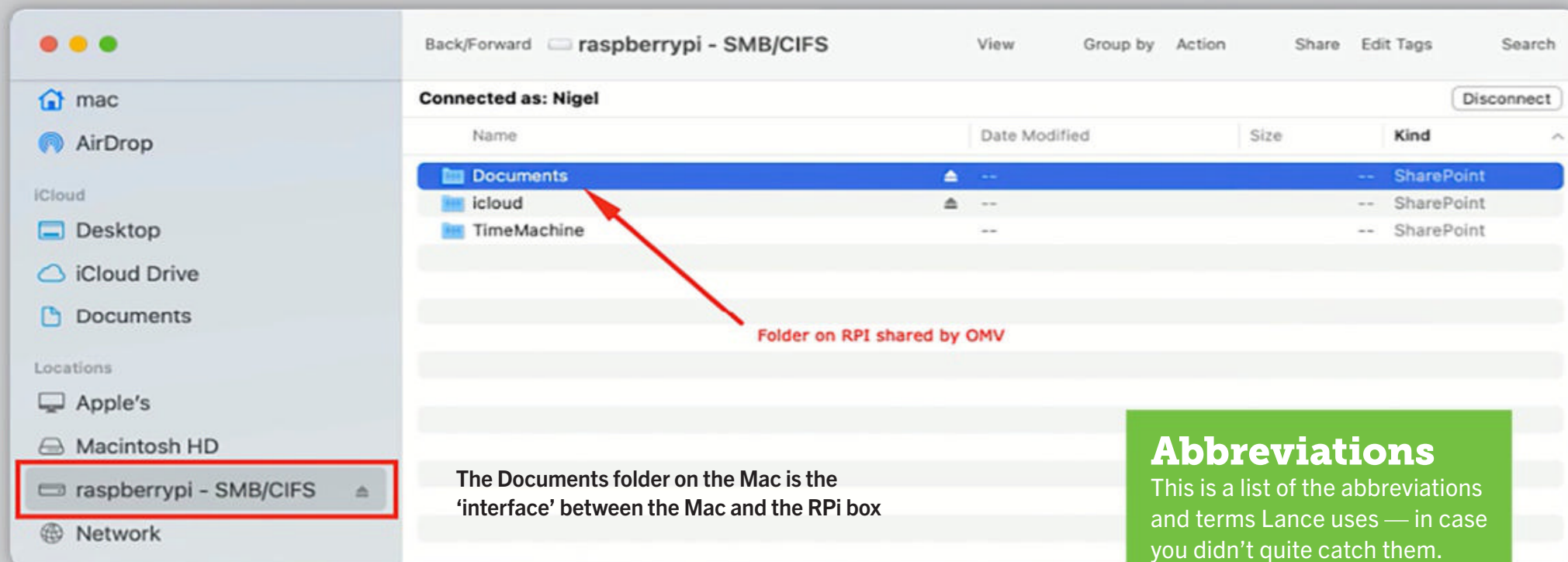
To build the application run:

```
sudo ./build.sh
sudo ./install.sh
```

Other backup measures

In this instance, Nigel is using Time Machine. This is an Apple software package that backs up the entire computer and any changes to an attached drive.

A hard lesson learned this year: Time Machine is great but if it's on your ►



A hard lesson learned this year: Time Machine is great but if it's on your network drive and you lose access to your Mac, you'll lose access to your network and/or access to your backup

network drive and you lose access to your Mac, you'll lose access to your network and/or access to your backup. Time Machine works best when saved to a USB drive — or series of drives.

Originally, this project included backing up Time Machine to the NAS drive. The hard fork has simplified the end result. The RPi is now a NAS device with some evolution, mainly that it backs itself up to a USB attached storage drive, on a weekly basis.

How that works

On the RPi is a simple bash script (attached) that is called by a scheduler function from within Linux (crontab).

Its simple instructions are:

1. Turn on USB port 1 — this also powers up the USB drive.
2. Mount the drive.
3. Copy new/modified files from the source to the destination — using the rsync command.
4. Close off any open files.
5. Unmount the USB device.
6. Power down the USB port — this removes the power and puts the drive to sleep.

More detail

The switching of the USB port requires a little bit more hardware, in the form of a software-controllable hub. In this case we used the Ykush USB hub — of which I have

a stock. It simply extends one of the RPi USB ports to add additional ports, which can be turned on/off via installable software.

Backing up of iCloud Drive

Again, the way files are handled on a Mac is unique. Simply backing up a folder location won't deliver what you expect. You have to copy iCloud Drive files to a physical location on your Mac and then back that up — another reason to keep your iCloud Drive light in terms of file size and use. The flip side is that iCloud Drive works superbly at sharing files between Mac OS devices.

Are we there yet?

So what was the outcome of all this? You'll have to wait for the next instalment, but it involves a rethink of how I work, the beginning of a new blogging idea, more coffee, a few beers — and perhaps even the grinder again!

Resources worth reviewing

Christopher Barnatt has a recent YouTube video on the installation and use of OMV and its latest edition: youtube.com/watch?v=LOg4xfDQafc.

au.pcmag.com/news/65070/how-to-turn-a-raspberry-pi-into-a-nas-for-whole-home-file-sharing <https://pcmac.biz/openmediavault-5-on-raspberry-pi/>

Abbreviations

This is a list of the abbreviations and terms Lance uses — in case you didn't quite catch them.

CLI

Command line interface — think green blinking dot in *The Matrix*

Downstream

As in the outlet

GUI

Graphical user interface — think mouse, monitor, and thousand-hour stare

Hard fork

Hard fork in the road — pick a road; decision time

HDD

Hard disk drive

NAS

Network attached storage

NOOBS

New out of the box — just as well it isn't 'Bought out of the box'!

OMV

OpenMediaVault — nothing to do with censorship

Pull

Pull file from remote to local

Push

Push a file from local to remote

RPi

Raspberry Pi

sFTP

Secure (s) file transfer protocol

SSD

Solid state drive

SSH

Secure SHell³

UPS

Uninterrupted power supply

Upstream

As in the source

USB

Universal serial bus — nothing to do with public transport

³. "Secure shell — an encrypted network protocol. For the purposes of the article, if you know you know; if you don't, move to Plan B." Plan B? I'm still trying to get my head around Plan A. At this point, check out Lance's website: comtechnology.co.nz/.

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TWO WINTER PROJECTS

The arrival of the “season of mists and mellow fruitfulness” reminds our writer to set to work on a special project

*By Murray Grimwood
Photographs: Murray Grimwood*

Thirty-nine times, so far, I’ve observed a particular phenomenon: namely, that my partner’s birthday and autumn coincide. Never varies. Thus, as the first leaves fell, two projects coincided. One was building something for her as a birthday present. The other — driven by visitors tending to stay for longer periods these post-Covid days — was building something to facilitate

winter clothes drying. While neither was groundbreaking, both were satisfying. Projects always are.

The prezzie

Pretty much the rule of thumb is that I make, rather than buy, presents, and readers of this column will know that a certain pride is taken in not having to leave the property when I’m

‘making’. Of course, the longer in the tooth one gets, the fewer untapped inspirations remain — and more cannot be remembered, anyway. So I found myself looking around with two weeks to go, not quite desperate but sensing its imminent arrival. The roughest thing in view was our outdoor seating; old hunks of decaying macrocarpa on stacks of concrete blocks. Just one of those

Remembering to have three lefts and three rights

With a full-sized drawing, cutting commenced



Better than slabs of macro perched on concrete blocks ...

temporary lash-ups that somehow linger on. Some seats, then?

Now, there is a stack of sawn macrocarpa, some of it 50mm thick, under the trees. It's been picked over many times, but I approached it with a tape measure and eternal optimism. I departed with some passable 2m lengths and memories of a talk I sometimes give, which explains how we always use the best first, which makes every following option 'worse'. Politely, you'd call this stuff 'downgrade', but it's still too good for firewood. The pieces had started life as 125x50mm (5x2 inches) and 250x50mm (10x2 inches); all I gave them was a rough planing to get rid of the grey.

Doing it my way

Design-wise, I like to do my own thing. Often someone has already been there, however I enjoy the thought process, and every once in a while they haven't. So I stacked some blocks and planks, until a comfortable sitting height was

achieved. The stack was shifted out from a vertical wall — of a shipping container, as it happened — until back and bum felt relatively sited. With those heights and offsets drawn on the inside of the container door, I could play; a straight line from the backboard through the front of the seat looked about right to go all the way down as the front legs. A reciprocal short one looked to be enough to stop us from falling backwards. A cleat as long as the seat is wide just designed itself.

With a full-sized drawing, cutting commenced. Just me and the aged Border collie, soaking up the sun, selecting the least knotty timber in the least wasteful way, and having the odd scratch; life can be good sometimes. Assembling the six ends — remembering to have three facing left and three facing right — went surprisingly quickly, just using 8mm Tek screws. I use a socket in an old-school brace for this stuff; you get good control of how far to tighten when you're turning at hand speed. ►



The fun stage



Drying rack revolution from me, where I use drop lines instead of pulleys

However, they
... gave me
an excuse to
stand in my
favourite place
— in front of my
workbench

Bugger, a design flaw

Very quickly, the design flaw showed up: the backrest board wasn't comfortable when vertical; it dug into the shoulder blades. So it had to be sloped. This drove the seat plank forward a little. Then I played around with variations. If I set the seat plank back until it was all carried on the cleat, the backrest only just notched into the upright. If I cantilevered the seat forward, the back looked better — recessed into the upright — but the seat and cleat not so. All three ended up slightly different variations on the theme; nobody seems to notice, as is so often the case.

With a couple of coats of the palest Sikkens (we're yachties, and we've learned what lasts the hard way) they sure look better than what they replaced.

"We're out of jail for another year, Zeb," I told my offsider. An understanding tail wag said that he agreed.

The drying rack

Drying racks were nearly universal 100 years ago; we had built one for our previous house, but for some reason we've gotten by without one hereabouts. Till now. I went for practicality, opting for light weight rather than wooden quirkiness — my usual default position. Some powder-coated 25x50mm aluminium box section had come our way with a second-hand set of solar panels; it looked ideal. Given that the cross pieces at each end are pulled inwards by the weight of the washing, I laid them flat and slotted them into the longitudinals, winging the cut-outs out at right angles to serve as riveting flanges.

It was the same Border collie but a very different sun from the one we'd soaked up with the seat build; wintry, lifeless, and

bleak, with a cold southerly eddying into my open-fronted workspace. The low rays paralleled the 6mm nylon as I threaded it back and forth, tightened it, and tied it off. Things were a little warmer in the conservatory, where I hung it temporarily to check out a wee idea that I'd had. You see, everyone has this idea that you hang these things on pulleys. So passé! *How about hanging it on four drop lines, then swinging it sideways so it rises on the arc?* thinks Mr Clever.

It don't mean a thing if ...

Well, hanging it on four drop lines is easy. It certainly does what it has to, drying-wise. But, as I write this, the swinging-it-sideways bit is, dare I say it, up in the air. It appears that the four droppers have to be exactly parallel and exactly on the same plane. I'm figuring on using one pulley to give a 2:1 on the sideways pull, and will report back as to whether it worked in practice. If not, it'll be back to a couple of overhead pulleys in the time-honoured manner and this will be just another of those 'often someone has already been there' times.

Neither project was earth-shattering or life-changing; not every single one can be. However, they kept the grey matter churning, and gave me an excuse to stand in my favourite place — in front of my workbench — and not tackle the more mundane things on the list. Now, what's next? 📁



Slotted in and clamped for riveting



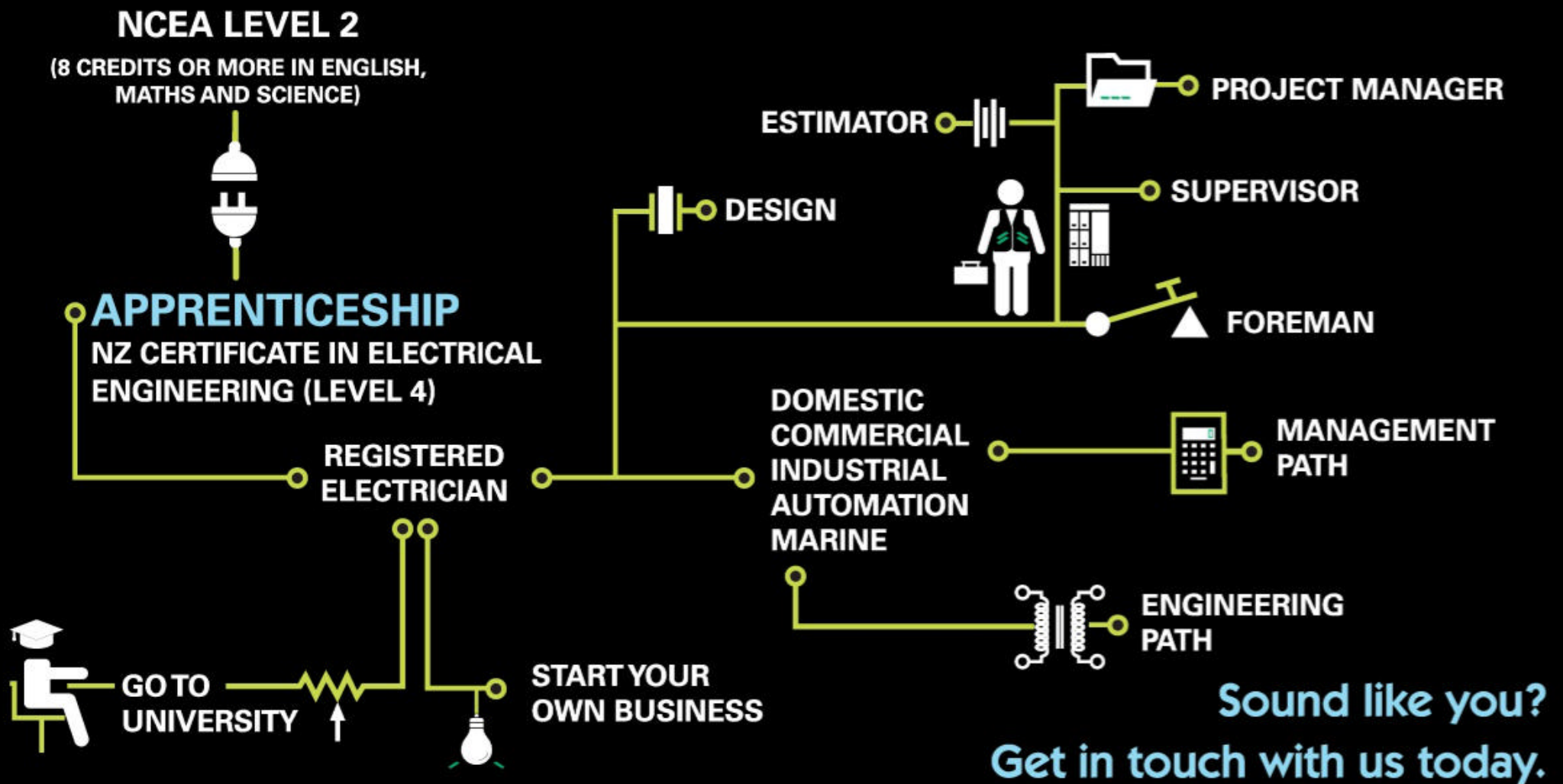
Six-millimetre nylon ... threaded back and forth



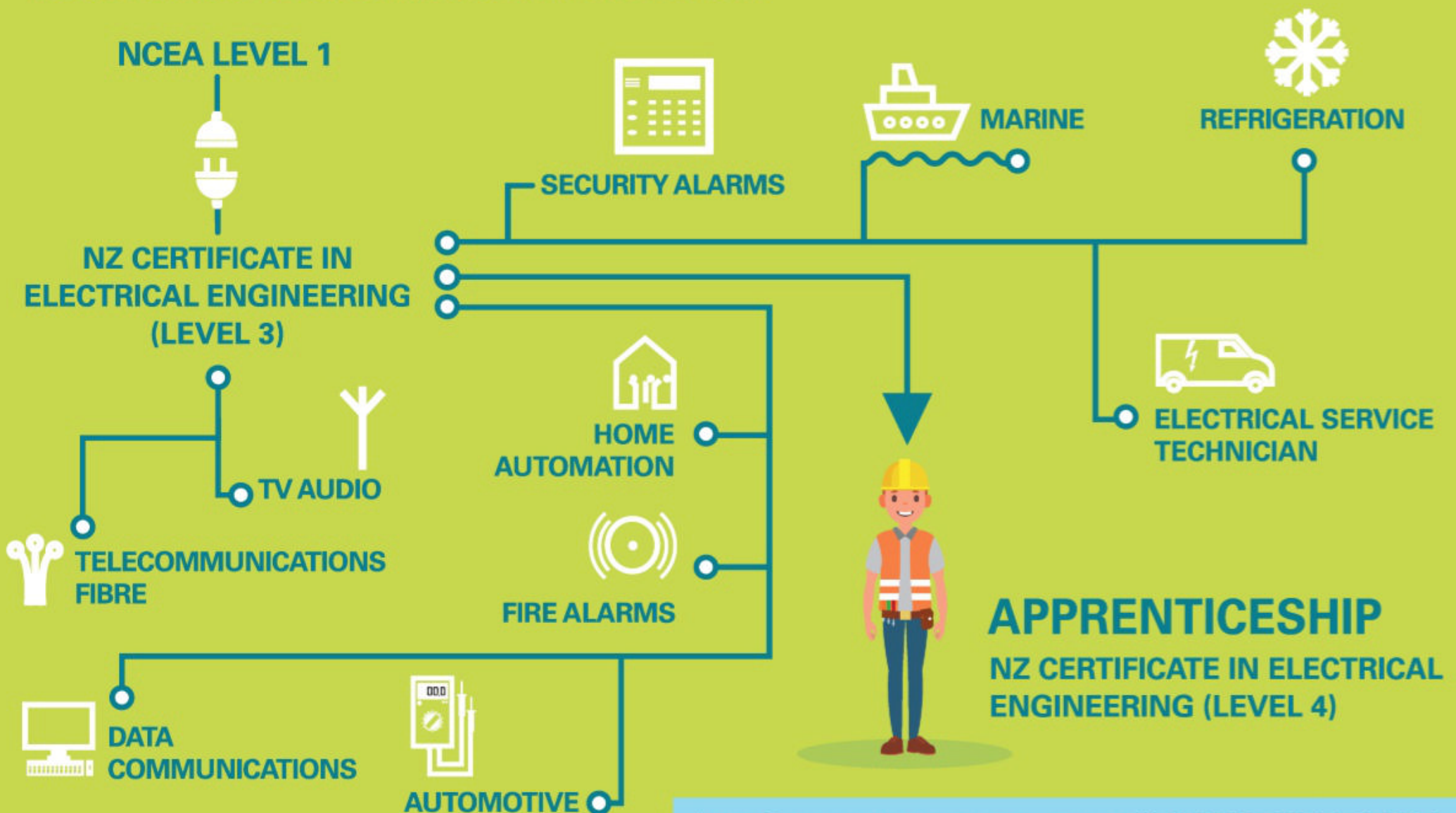
Winger cut-outs



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NATURAL MAGIC

The romance of a pinhole camera survives into our world of advanced technology

By Jason Burgess

Photographs: Jason Burgess and Jenny Tomlin

Strange Fruit.
Jenny Tomlin pinhole
photograph made with
a Speights-can camera

In the less-is-more world of pinhole photography, fine art can be created from the simplest of cameras — often made from everyday items we discard.

Jenny Tomlin is a photographer and darkroom printer who much prefers analogue to digital. Her passion for pinhole photography began in the late 1990s after seeing an international exhibition of pinhole photography.

“Until then, I was shooting with a large-format camera; I was getting stale. Pinhole reignited the sense of surprise that I first loved about photography. Pinhole is never really what you see in front of you. There is always something else. It can raise as many questions as it answers,” she says.

Pinhole cameras are a celebration of

photography at its purest. They bridge the gap between camera obscuras and the analogue cameras universally made popular by Kodak’s Box Brownie. The ‘camera obscura’ — the term is Latin for ‘dark chamber’ — can be any darkened chamber, from shoebox to living room. A tiny aperture in the camera obscura projects the outside world, albeit upside down, from one wall onto a facing wall.

An ancient concept

The concept is more than 2000 years old. During Leonardo da Vinci's time, camera obscuras had become portable aids for drawing, the image being projected onto a piece of drawing paper for the artist to trace. These working processes were recorded in 1558 by Giovanni Battista della Porta, in a book called *Magia Naturalis* ('Natural Magic'). Over time, ground-glass lenses were added and, with the introduction of photographic emulsion processes in the early 1800s, they essentially morphed into rudimentary cameras.

A pinhole camera is basically a camera obscura with a sheet of film or photographic paper inside. There is neither lens nor

viewfinder. Light passes through an aperture/'pinhole' to expose the contained film and a shutter starts and halts in-camera exposure. The resulting image will always be a negative. A pinhole camera boils photography down to its key elements: light and

composition. Serendipity and patience play a big part too. Using a pinhole camera demands that the photographer slow down and engage with a subject, as exposures can vary from 10s of seconds to a number of days. The soft, mysterious qualities of the resulting images will be affected by the shape of the camera, the size of the aperture, and the number of apertures — yes, you can have more than one.)

"A pinhole camera could be made of anything really," says Jenny. "It is really basic. Make it dark and light-tight, make a clean pinhole, make the lid secure, and then make a shutter that can be moved without shaking the camera."

Jenny favours the wide-angle effects of concave cameras and constructs the following from a drinking-chocolate container.

For more info about Jenny Tomlin, her practice, and pinhole workshops, visit <http://jennytomlin.co.nz/>. ►



Houheria Falls, Waitakere Ranges.
Jenny Tomlin pinhole photograph
made with a coffee-container
camera

How to make a pinhole camera

01

Tools

- A body — in this case, a hot-chocolate container; a shoebox is a common option
- Black paper or card — the darker the better; use a thicker card on the lid
- A black marker or Sharpie
- Matte black tape and glue
- Aluminium drink can
- Push pin — a needle is best
- Scissors or sharp knife
- Cardboard cutter
- Ruler
- Finishing sandpaper — approx. 800 grit
- Photographic paper





02

02: Trace the container onto the black card for blacking out the interior, including base and lids. Paint could be used but may wear off on to the camera negative. Measure the interior 'walls' so they are longer than the container to allow for cutting and folding into light baffles (see Step 06).

03

03: Glue the base card.



04

04: Locate centre of the container for the aperture position. Use an awl to start the opening, and tin snips to cut a hole of about a centimetre in the container.

05: Insert the interior card to locate the aperture. Trace and cut a hole in the card. Do not glue the card in yet.

06: The surplus length of interior card is cut into curtains that are folded over under the lid to form a light-tight baffle.



06



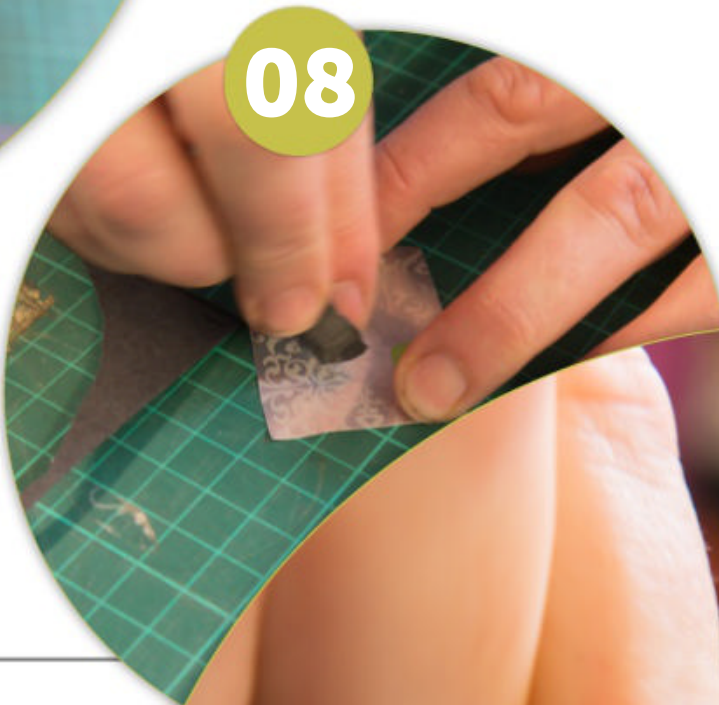
05



07

07: Make a pinhole plate from an aluminium drink can. The thinner the better for achieving a sharp pinhole. Tinfoil is too thin and will probably get damaged very quickly. Cut a piece larger than the centimetre-sized container hole.

08: Food-grade aluminium is usually coated with a plasticiser, so needs to be sanded back with 800 polishing-grade sandpaper.



08



09

09: Narrow the depth of the aluminium as much as possible. Use the end of a ballpoint pen to make a 'bump' then sand from the protruding (bump) side. This helps make a cleaner or sharper hole and thus a sharper image.



10

10: Drill the aperture. A size 10 needle is better than an actual pin, as a pin has an obelisk shape whereas a needle is straighter. Tape the end to make a drill handle to spin and drill with rather than poking it through. Put your finger on the other side to feel the needle head coming through. Test it by holding it to the light to make sure you have not punctured the surface elsewhere. Sand off to remove any burrs from the hole. Press the needle back into the hole to clear out any debris from the sandpaper.

11: An aperture of 0.5mm is an ideal size. A larger hole will make it 'faster' but not sharper. It's never as sharp as a lens but a smaller aperture is preferable.



11



12

12: With a black permanent marker or Sharpie, locate the pinhole and circle around the aperture on the outward face. Black out the interior of the plate as close to the hole as possible.

13: Tape the aperture plate to the inside of the camera. Use matte black, electrical, cloth, or masking tape. Keep the tape clear of the aperture. An extra layer of tape above the hole will help in identifying its position when loading the photo paper in the dark.



13



14

14: Use cloth tape for a simple shutter. On a cardboard surface, first place clear adhesive tape around the aperture to protect the surface and so that the cloth tape can easily be opened and closed without losing its stick. Stick a red dot on the outside of the tape to locate the position of the pinhole. This helps identify when the aperture is open or closed.



15

15: The interior lid card should be cut generously so that the lid fits tightly over the folded baffles. For added light-tightness, Jenny also fixes the card to the exterior of the lid.



17

17: The speed of the camera is determined by the size of the aperture and the distance between it and the film plane — at the back of the camera. The larger the distance, the longer the exposure times will be. This drinking-chocolate camera is 95mm from pinhole to film plane. Divide that by the size of the pinhole — in this case 0.5mm, which gives an aperture of 190.



16

16: Cut a template of the required paper to size. Use that to cut photographic paper in a darkroom. If you don't have a darkroom, load photographic paper at night and ensure that there are no light leaks under the doors.

approximately 6 EI.

Light condition	Camera focal length 40mm	Focal length 75mm	Focal length 135mm
Bright sunshine	15s **	40s **	150mm
Hazy bright	40s	40s **	3m **
Overcast/open shadow	3m	3m	8m
Deep shadow, early/late daylight	8m	8m	18m
Home interior - bright lights (tungsten)	6h	18m	40m
Home interior - average lighting	12h	20h	18h
			>24h

** Make sure pinhole plate has no sun shining directly on it. This creates solar flare from light and the edges of the pinhole.
(tungsten lighting) not practical. Low light and paper is not.

18

18: Jenny's notes on exposure times.

19

19: On location with a camera preloaded with photographic paper — the first images are tests for light-tightness and speed. Jenny usually does this close to home, making images until she gets a good negative. This ensures that she knows how fast the camera is and how long the exposure should be.

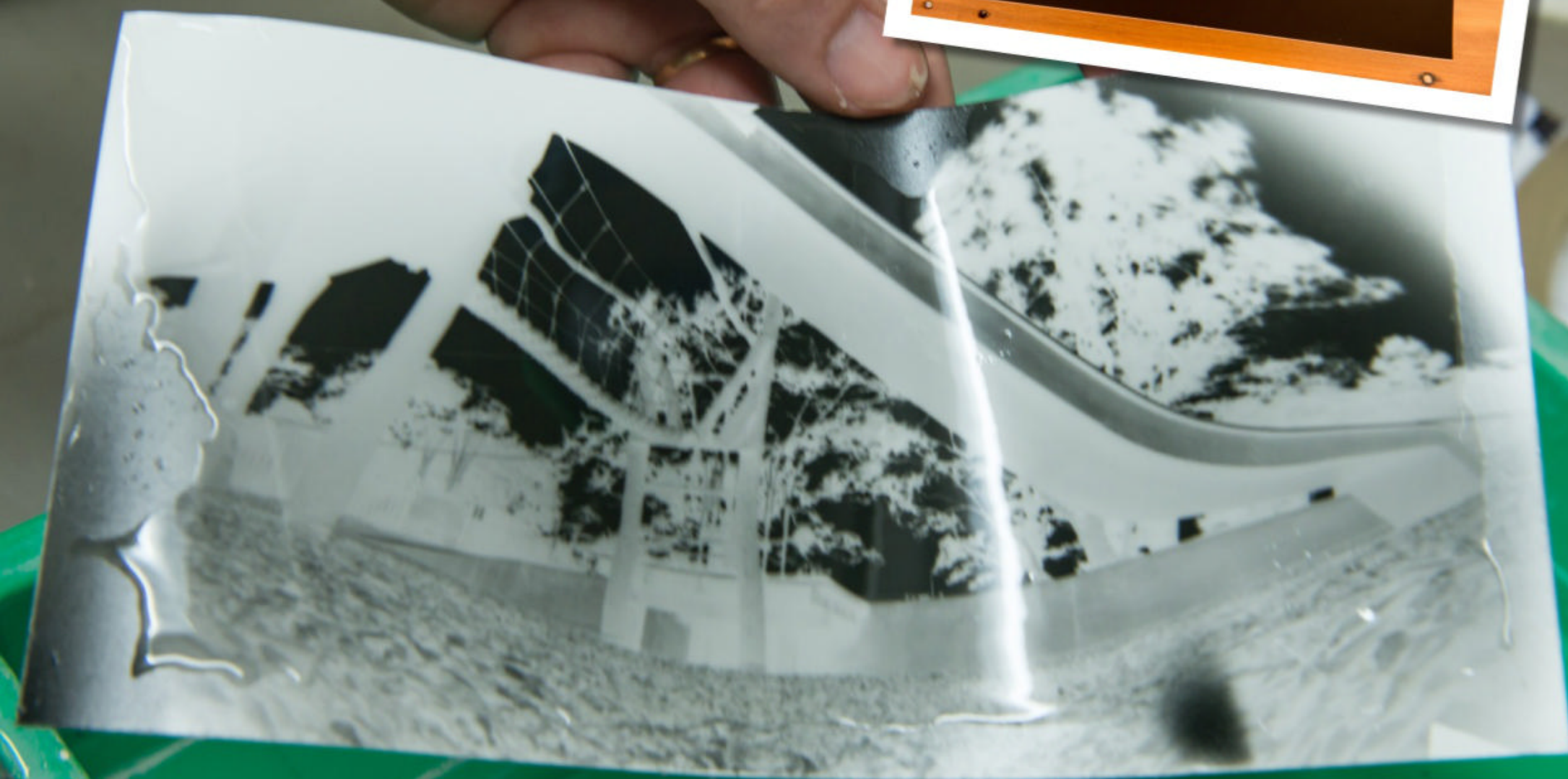
20: Jenny's subject matter: a slide in a playground.

20



21

21: The first exposed paper negative.



22

22: The first positive printed image.





A 'dark-change' bag for working on location, upcycled from an old, lined parka stitched closed at the neck and waist

Hacks

Pinhole cameras usually require long exposure times, so cameras should be secured to stop any movement during the exposure — this includes camera shake from sliding the shutter. Magnets can secure the side or bottoms of metal cameras or fasten them to other stationary steel objects. Tripod connectors can be taped on cameras. No tripod? Try taping the camera to a garden stake or, for low angles, to weed-mat pins. Some cameras can fit a phone mount for a tripod. Using a container with a flat bottom makes it easy to stand it upright.

The shutter, lens cap, or exposure controller is the thing most likely to give out.

A shutter can be as simple as a piece of tape with card around the pinhole to keep the aperture free of stickiness or a card that slides back and forth across the pinhole wrapped with the bottom of a plastic shopping bag for ease of sliding.

Note: Black ice cream containers and milk bottles are not light-tight enough for making photographs; they will need blacking out. ►

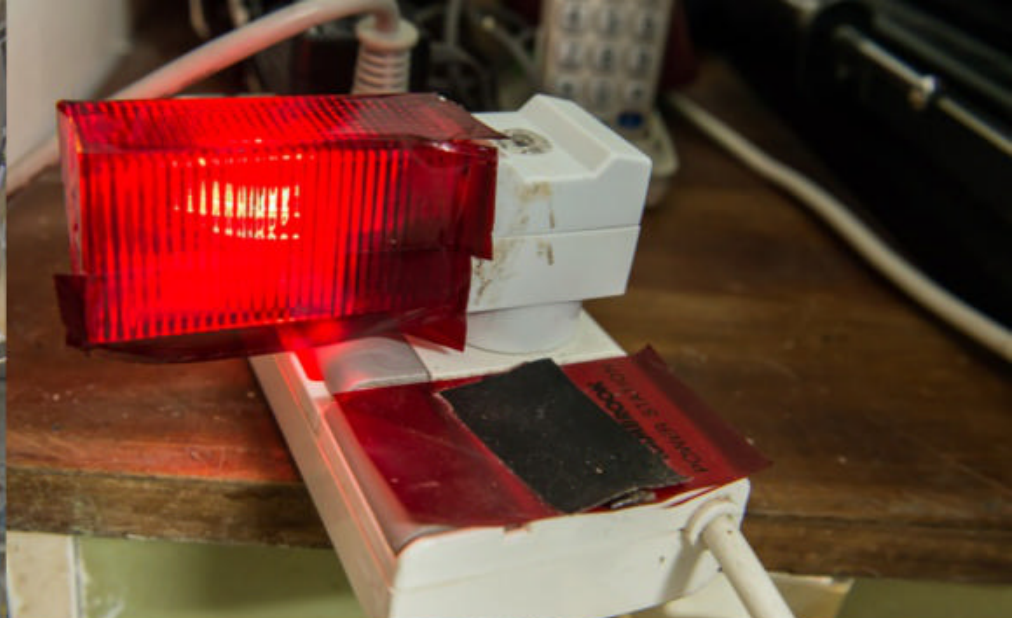


Jenny fine-tuning a multiaperture biscuit-tin camera

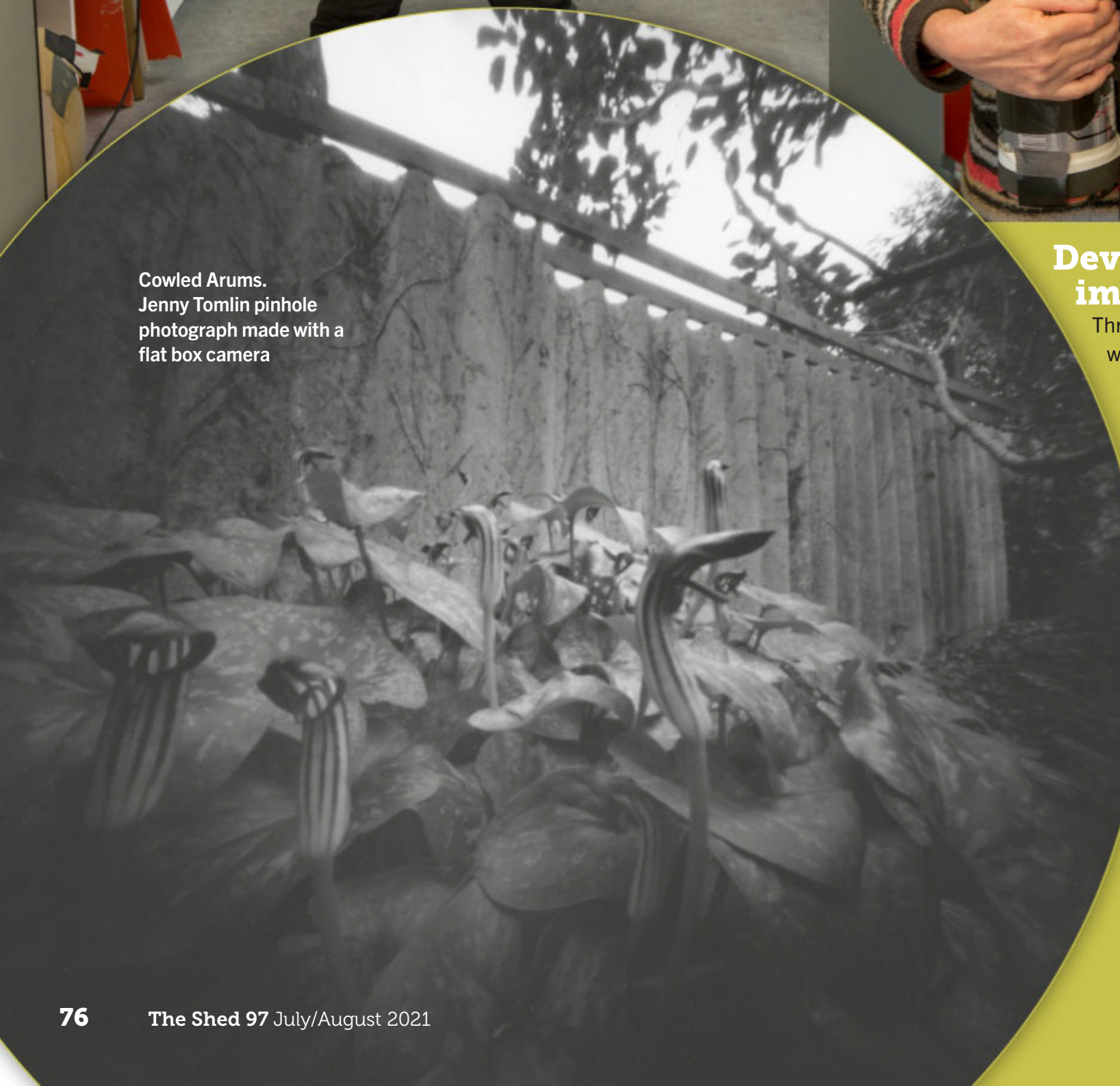


A multiaperture pinhole camera producing a kaleidoscopic print effect

Clockwise: Jenny holds a finished print taken at a local beach; low-tech red light made from a 15W night light wrapped in cellophane; Jenny modelling a range of pinhole cameras, including a mini beer flagon camera, lens box camera, and tomato-sauce-bottle camera, among others



Cowled Arums.
Jenny Tomlin pinhole
photograph made with a
flat box camera



Developing the image

Three trays of chemistry will be needed for developing the image. A developer makes the image visible in the paper; a wash or stop bath will halt the development process; and then a fix will stabilise or 'fix' the image. Chemicals are available online — try:

<https://aucklandcamera.co.nz/>

photowarehouse.co.nz

photo.co.nz/

<http://southerncameras.co.nz/> 

NOT just your...

Sizes: 1.0, 1.5, 2, 2.5, 3, 3.5, 4, 4.5, 5, 5.5, 6, 6.5, 7, 7.5, 8, 8.5, 9, 9.5, 10, 10.5, 11, 11.5, 12, 12.5, 13mm • Metric)

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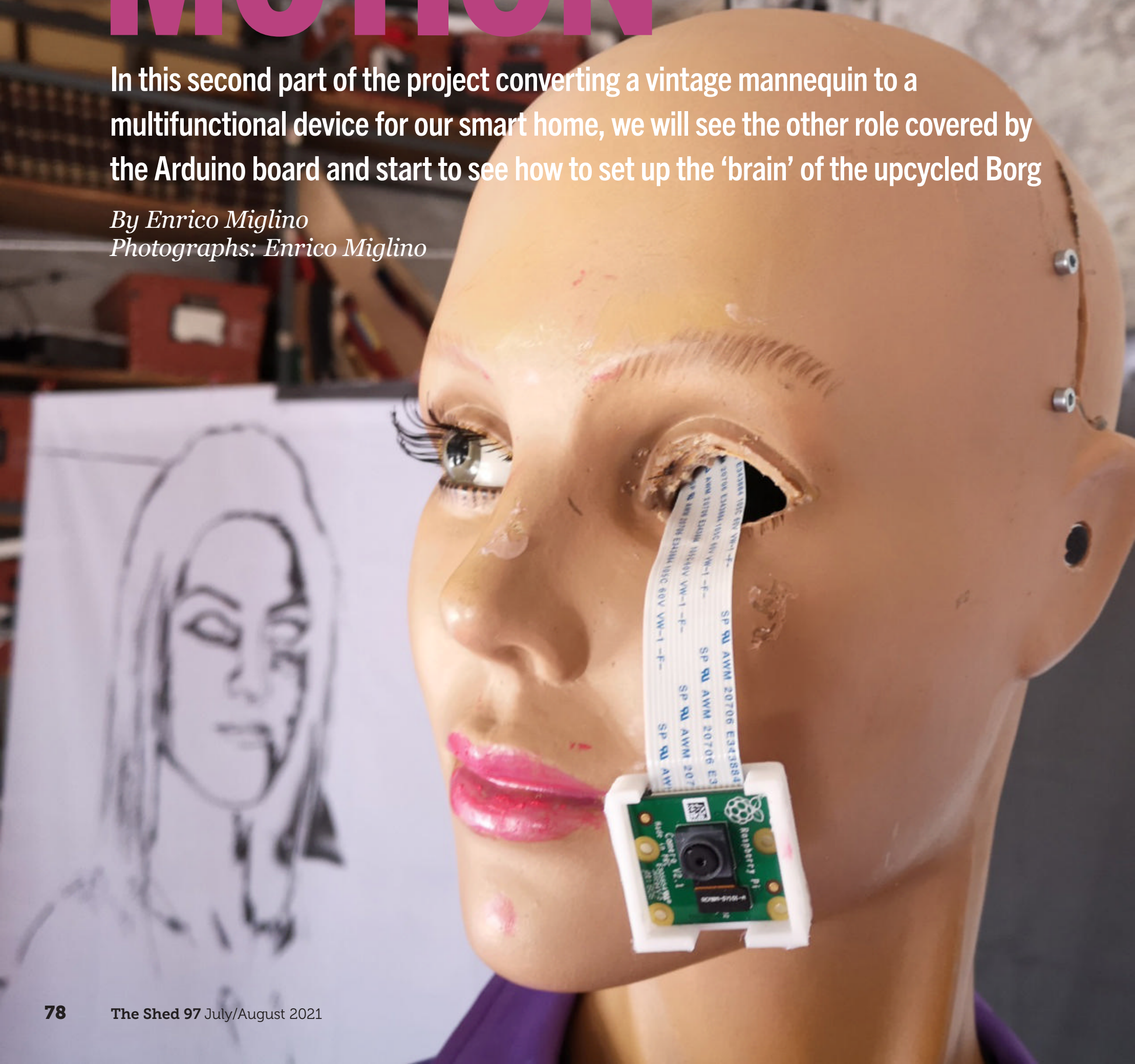
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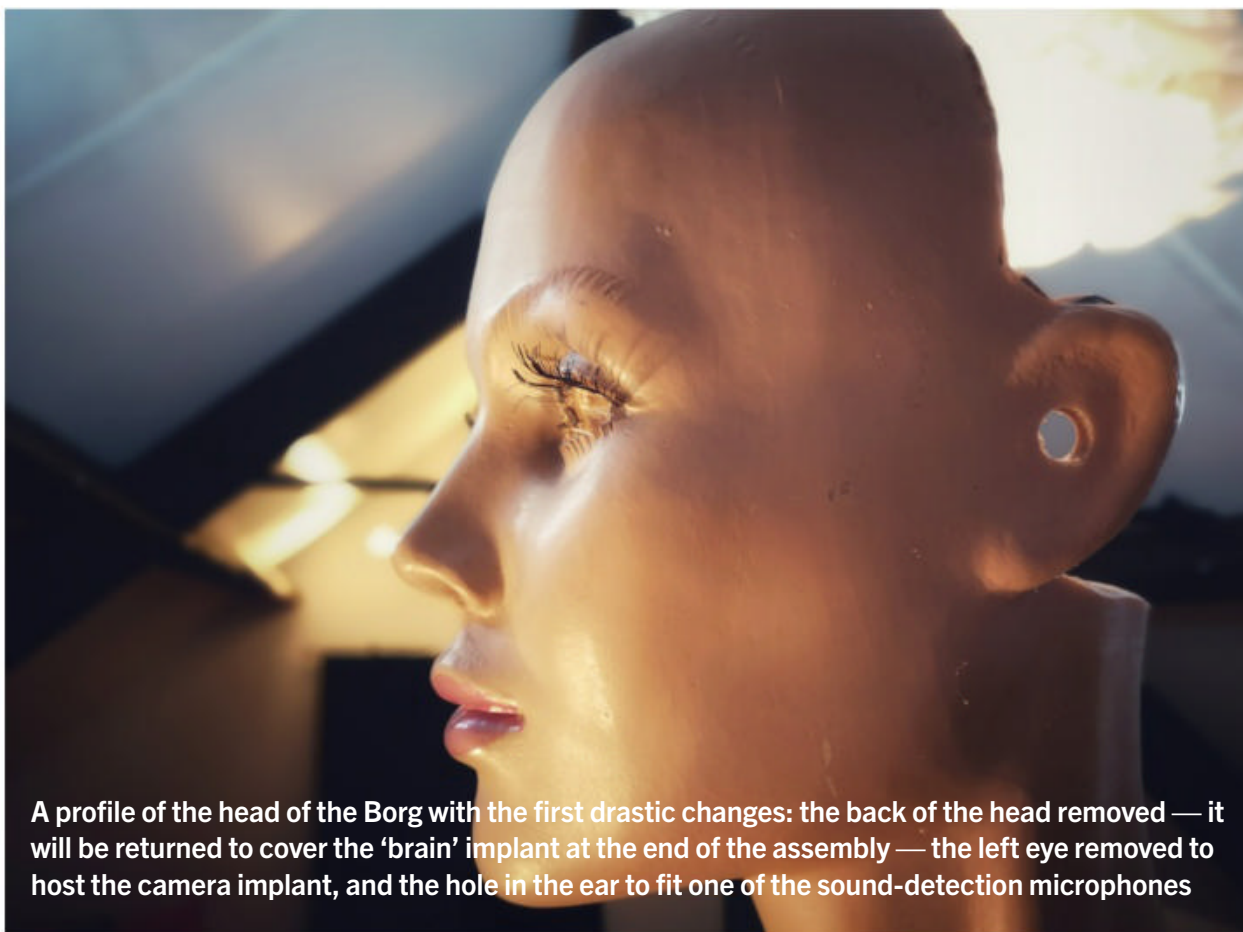
CREATING A 'HUMANLIKE' MOTION

In this second part of the project converting a vintage mannequin to a multifunctional device for our smart home, we will see the other role covered by the Arduino board and start to see how to set up the 'brain' of the upcycled Borg

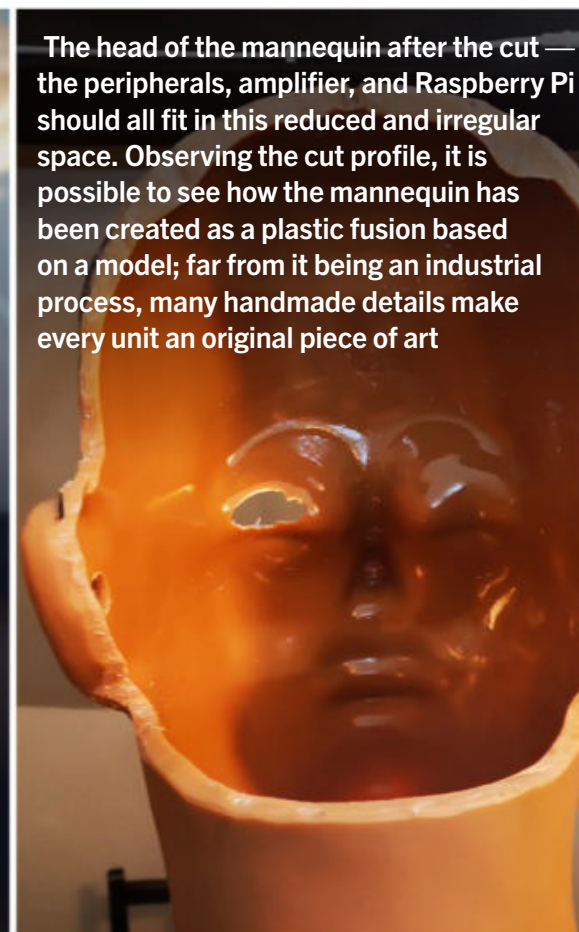
By Enrico Miglino

Photographs: Enrico Miglino





A profile of the head of the Borg with the first drastic changes: the back of the head removed — it will be returned to cover the 'brain' implant at the end of the assembly — the left eye removed to host the camera implant, and the hole in the ear to fit one of the sound-detection microphones



The head of the mannequin after the cut — the peripherals, amplifier, and Raspberry Pi should all fit in this reduced and irregular space. Observing the cut profile, it is possible to see how the mannequin has been created as a plastic fusion based on a model; far from it being an industrial process, many handmade details make every unit an original piece of art

The ability to turn in a certain direction when a sound catches our attention is a type of reaction that should not necessarily be mediated by our brain. Often, when someone calls us, we spontaneously tend to turn in the direction the sound is coming from without thinking and making a conscious decision. Similarly, the Borg has the ability to rotate the torso — within the limits of its range of actions — to direct its 'gaze'; indeed, the camera pointing at the subject from which the sound source comes must be an automatic reaction, not requiring any processing by the Raspberry Pi.

To keep the technological parallel: if the Raspberry Pi performs some functions to manage the sentient part of the Borg, so the Arduino board manages the automatic reactions.

Automatic reactions

Having the Borg capable of pointing in the direction whence a sound comes when the sound reaches a predetermined level is just what we need to make the home guardian reactive to sound-driven events.

Both sound detection and movement feedback are connected to, and automatically managed by, the Arduino board.

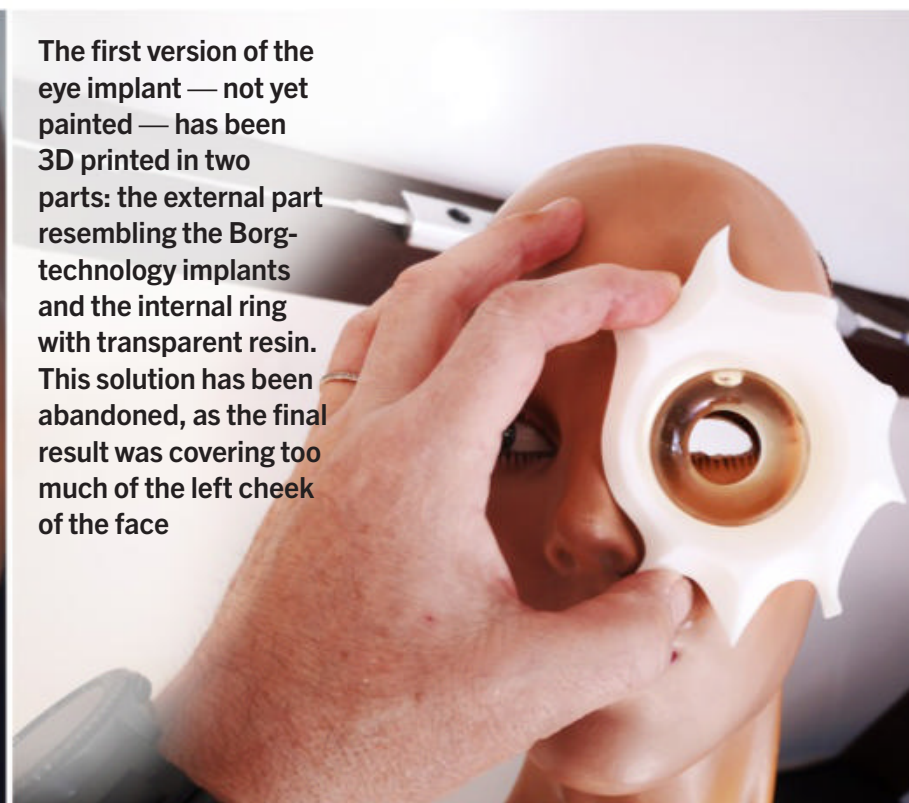
If a sound louder than the predefined level is detected, it is possible to send back a notification to the Raspberry Pi — connected to the Arduino Uno via the USB cable.

It is not possible to implement the audio process directly on the Raspberry Pi because two analogue inputs are required to detect the signals from the two condenser microphones, and the Raspberry Pi general-purpose input/output (GPIO) has no analogue-to-digital (AD) converters. ►

Having the Borg capable of pointing in the direction whence a sound comes ... is just what we need



Front view of the face with the left eye already removed; working with this material to remodel some parts — it is a plastic fusion of nylon — has been complex, as the structure is very strong but cutting and hand milling can cause the material to melt very easily



The first version of the eye implant — not yet painted — has been 3D printed in two parts: the external part resembling the Borg-technology implants and the internal ring with transparent resin. This solution has been abandoned, as the final result was covering too much of the left cheek of the face

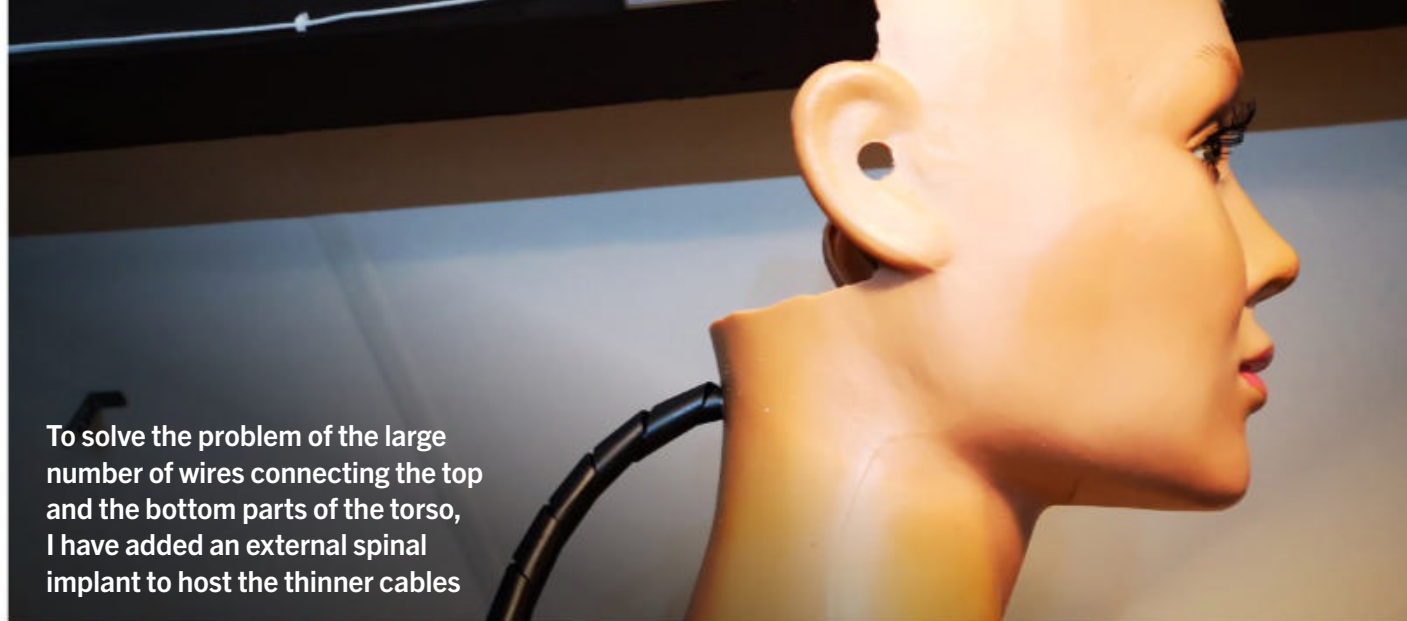
Direction of sound algorithms

The algorithm that I developed on Arduino for the identification of the sound sources in the space — direction and distance estimated by the intensity — is an approach based on what is called ‘sound location’.

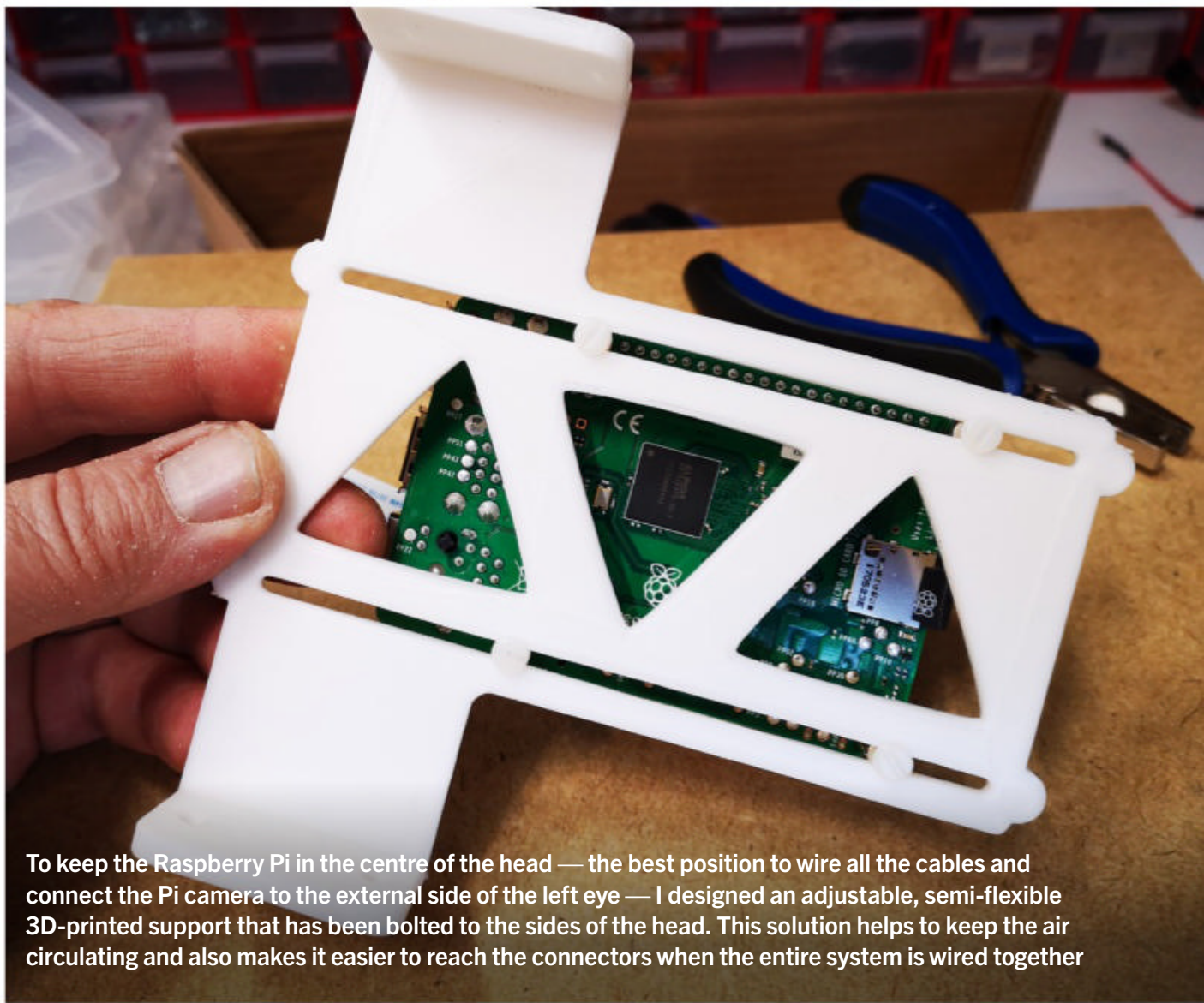
Sound localisation methods are part of the science that deals with determining the direction and distance of a sound source with the sole help of the sound itself. By acquiring the sound intensity from several microphones installed in different directions, it is possible to achieve accurate detection of the sound sources, fundamental in a large number of industrial and multimedia applications. For example, the ability of a videoconferencing device to detect the origin of the sound from one of the interlocutors makes it possible to activate only that interlocutor’s microphone.

Sophisticated systems can be found in many robotics applications in which a large group of microphones arranged circularly is used to obtain maximum accuracy in identifying the direction and origin of the sound source.

Even using only two microphones, as in this case, a few simple mathematical formulas can be applied to acquire valuable data that are sufficiently precise for the scope.



To solve the problem of the large number of wires connecting the top and the bottom parts of the torso, I have added an external spinal implant to host the thinner cables



To keep the Raspberry Pi in the centre of the head — the best position to wire all the cables and connect the Pi camera to the external side of the left eye — I designed an adjustable, semi-flexible 3D-printed support that has been bolted to the sides of the head. This solution helps to keep the air circulating and also makes it easier to reach the connectors when the entire system is wired together

```
peakToPeak[0] = 0;
peakToPeak[1] = 0;
signalMax[0] = 0;
signalMax[1] = 0;
signalMin[0] = MAX_SIGNAL;
signalMin[1] = MAX_SIGNAL;

// collect data for 50 mS from both ears
while ( ( millis() - startMillis ) < sampleWindow ) {
  // Check left sample
  sample[EAR_LEFT] = analogRead(A0);
  if ( sample[EAR_LEFT] < MAX_SIGNAL ) {
    if ( sample[EAR_LEFT] > signalMax[EAR_LEFT] ) {
      signalMax[EAR_LEFT] = sample[EAR_LEFT];
    } else if ( sample[EAR_LEFT] < signalMin[EAR_LEFT] ) {
      signalMin[EAR_LEFT] = sample[EAR_LEFT];
    }
  }
}

delay(50);
while ( ( millis() - startMillis ) < sampleWindow ) {
  // Check right sample
  sample[EAR_RIGHT] = analogRead(A1);
  if ( sample[EAR_RIGHT] < MAX_SIGNAL ) {
    if ( sample[EAR_RIGHT] > signalMax[EAR_RIGHT] ) {
```

```
signalMax[EAR_RIGHT] = sample[EAR_RIGHT];
} else if ( sample[EAR_RIGHT] < signalMin[EAR_RIGHT] ) {
  signalMin[EAR_RIGHT] = sample[EAR_RIGHT];
}
}

// max - min = peak-peak amplitude
peakToPeak[EAR_LEFT] = signalMax[EAR_LEFT] -
signalMin[EAR_LEFT];
peakToPeak[EAR_RIGHT] = signalMax[EAR_RIGHT] -
signalMin[EAR_RIGHT];
volts[EAR_LEFT] = double(peakToPeak[EAR_LEFT] * 5.0) /
MAX_SIGNAL;
volts[EAR_RIGHT] = double(peakToPeak[EAR_RIGHT] * 5.0) /
MAX_SIGNAL;
double diff = abs(volts[EAR_LEFT] - volts[EAR_RIGHT]);
Serial << "Max left " << signalMax[EAR_LEFT] << " Min left " <<
signalMin[EAR_LEFT] << endl;
Serial << "Max right " << signalMax[EAR_RIGHT] << " Min right "
<< signalMin[EAR_RIGHT] << endl;
Serial << "peakToPeak left " << peakToPeak[EAR_LEFT] << "
peakToPeak right " << peakToPeak[EAR_RIGHT] << endl;
Serial << "V left " << volts[EAR_LEFT] << " V right " <<
volts[EAR_RIGHT] << endl;
Serial << " V diff " << diff << endl;
```

The position of the incoming sound

The code source (left) shows how I approximated the sampling process to obtain information sufficient to understand the position of the sound thanks to the diametrically opposite position of the two condenser microphones.

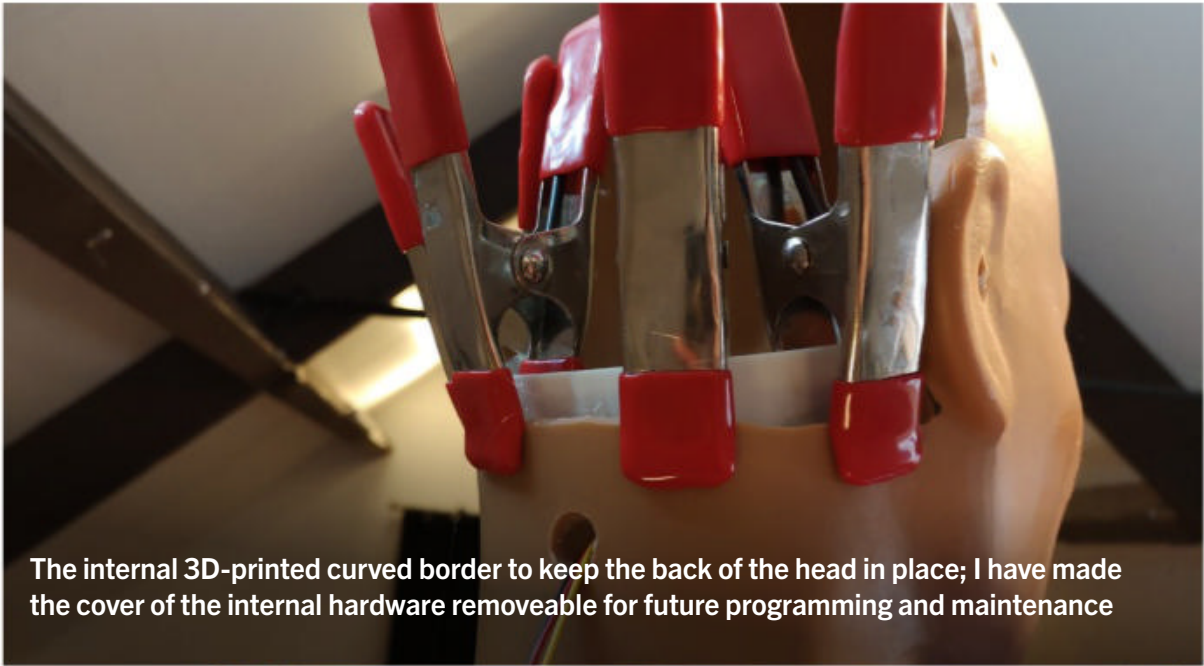
Each time this code block is called, two series of measurements are made in sequence through the analogue inputs connected to the microphones; the sound from each microphone is continuously sampled, with a pause of 50ms between every sample. In practice, fairly reliable values can be obtained from both sources in about half a second.

The difference between the levels of frequencies sampled by the two

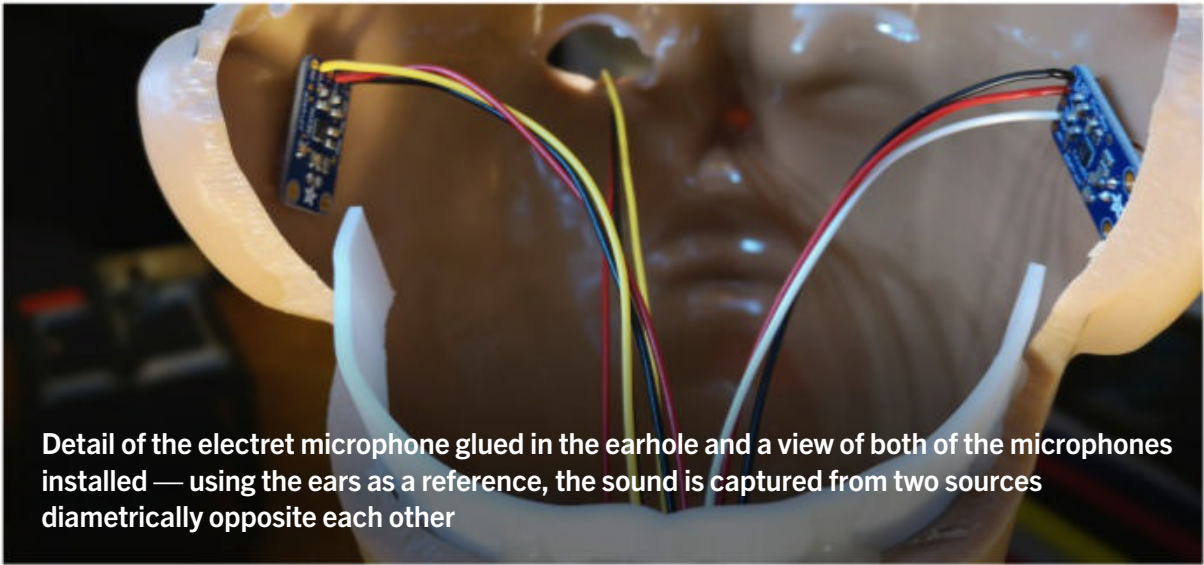
microphones indicates how much the sound source comes from one side rather than the other.

At this point, the motor rotates the torso slightly in the direction identified and then sampling is carried out again if the source has not been identified accurately enough. At this point, the Arduino board can notify the information to the Raspberry Pi, which can, for example, activate the ocular implant of the Borg, containing the Pi camera.

I had to set some limits on the maximum and minimum values to keep the calculation of the position within acceptable values, eliminating disturbances at the same time due to excessive peaks. The detection process is executed concurrently with the torso rotation to avoid capturing the motor-generated noise amplified by the moving body.

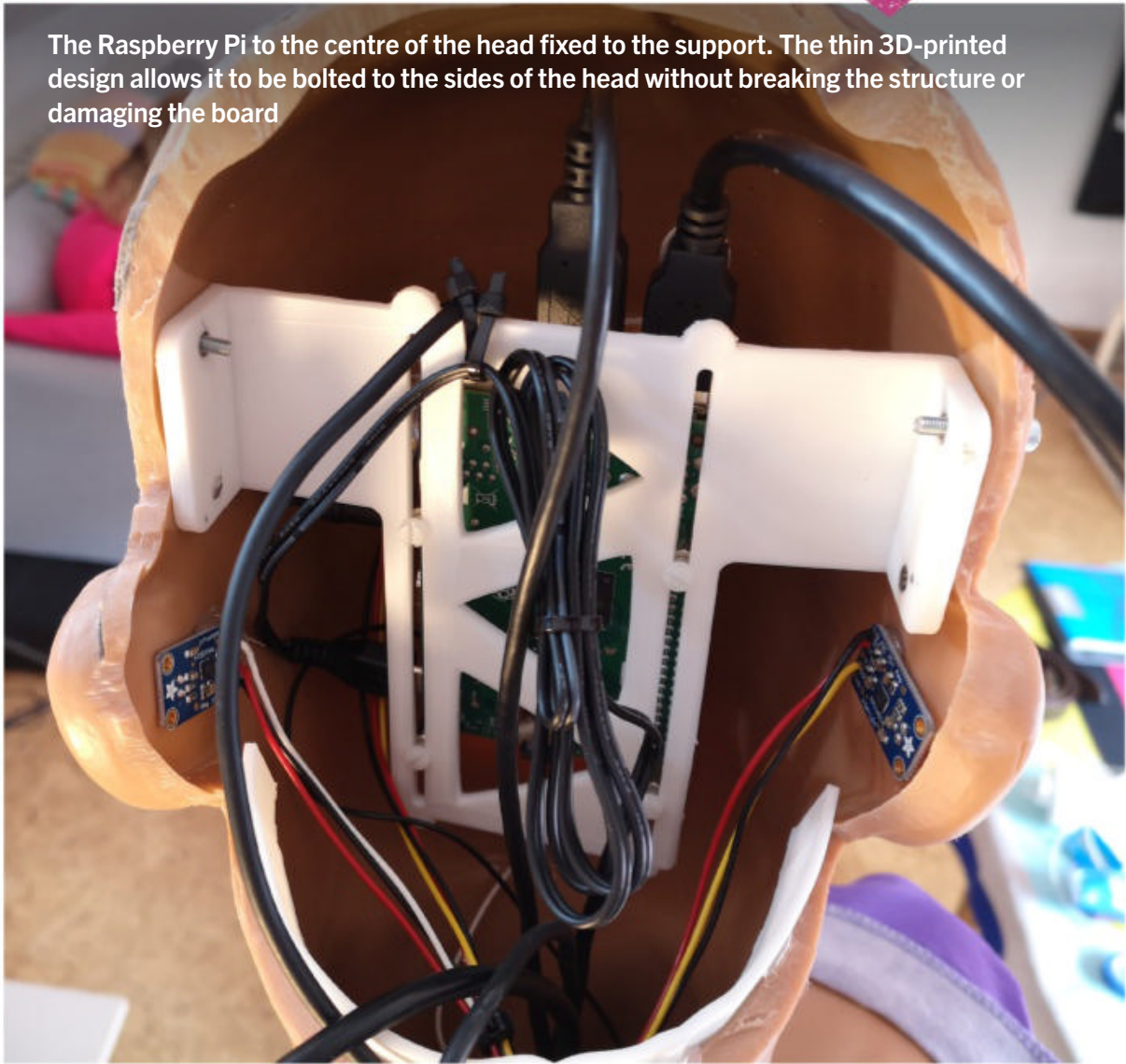


The internal 3D-printed curved border to keep the back of the head in place; I have made the cover of the internal hardware removeable for future programming and maintenance



Detail of the electret microphone glued in the earhole and a view of both of the microphones installed — using the ears as a reference, the sound is captured from two sources diametrically opposite each other

The detection process is executed concurrently with the torso rotation to avoid capturing the motor-generated noise amplified by the moving body



The Raspberry Pi to the centre of the head fixed to the support. The thin 3D-printed design allows it to be bolted to the sides of the head without breaking the structure or damaging the board

Predefined constants

Detections in which the value is too low to be meaningful are ignored. The predefined constants of the formula are defined in a header file extension — .h — included in the programme, as shown below.

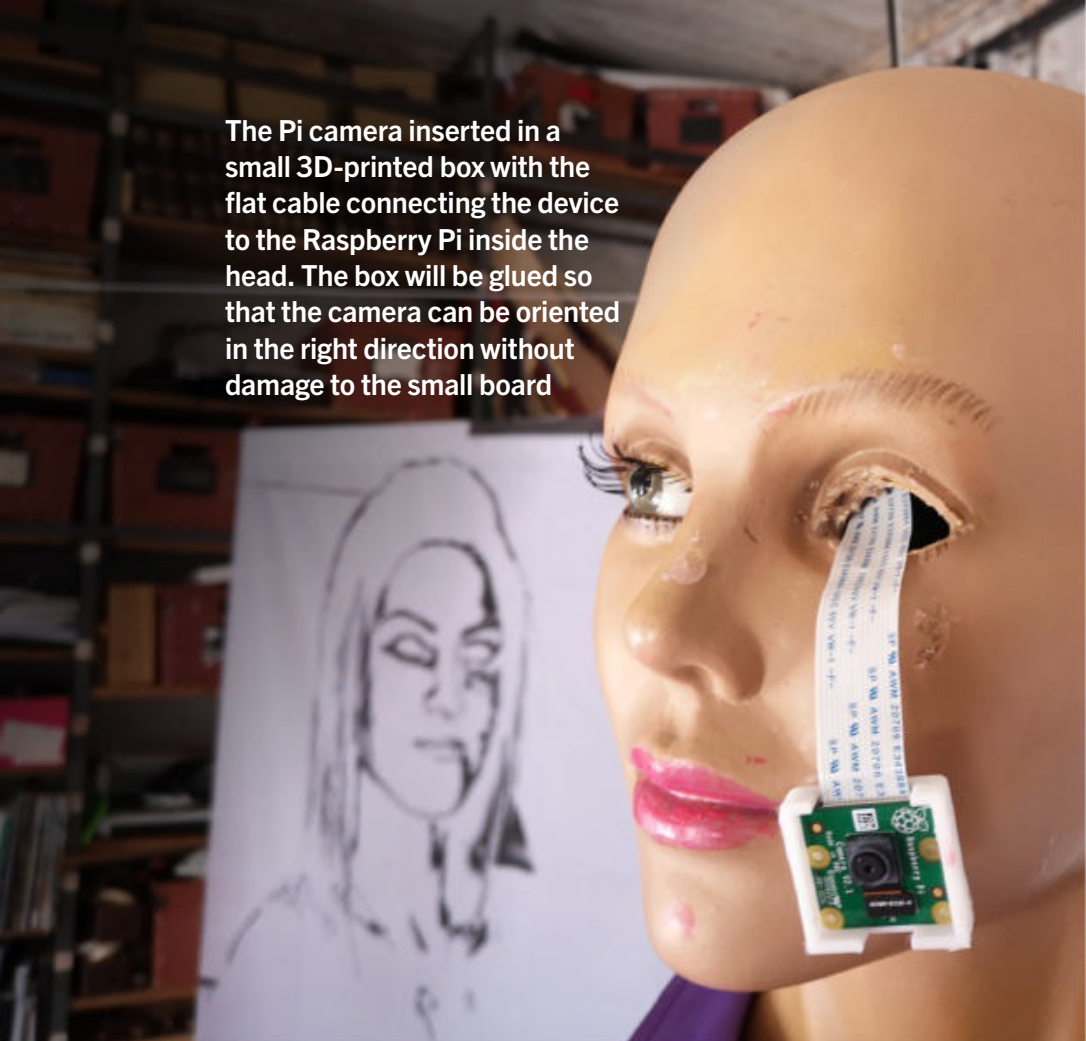
```
/**
 * @file microphone.h
 * @brief Electret microphone acquisition
 * global parameters and constants
 */

#define EAR_LEFT 0 ///< Left microphone
sample value
#define EAR_RIGHT 1 ///< Right
microphone sample value

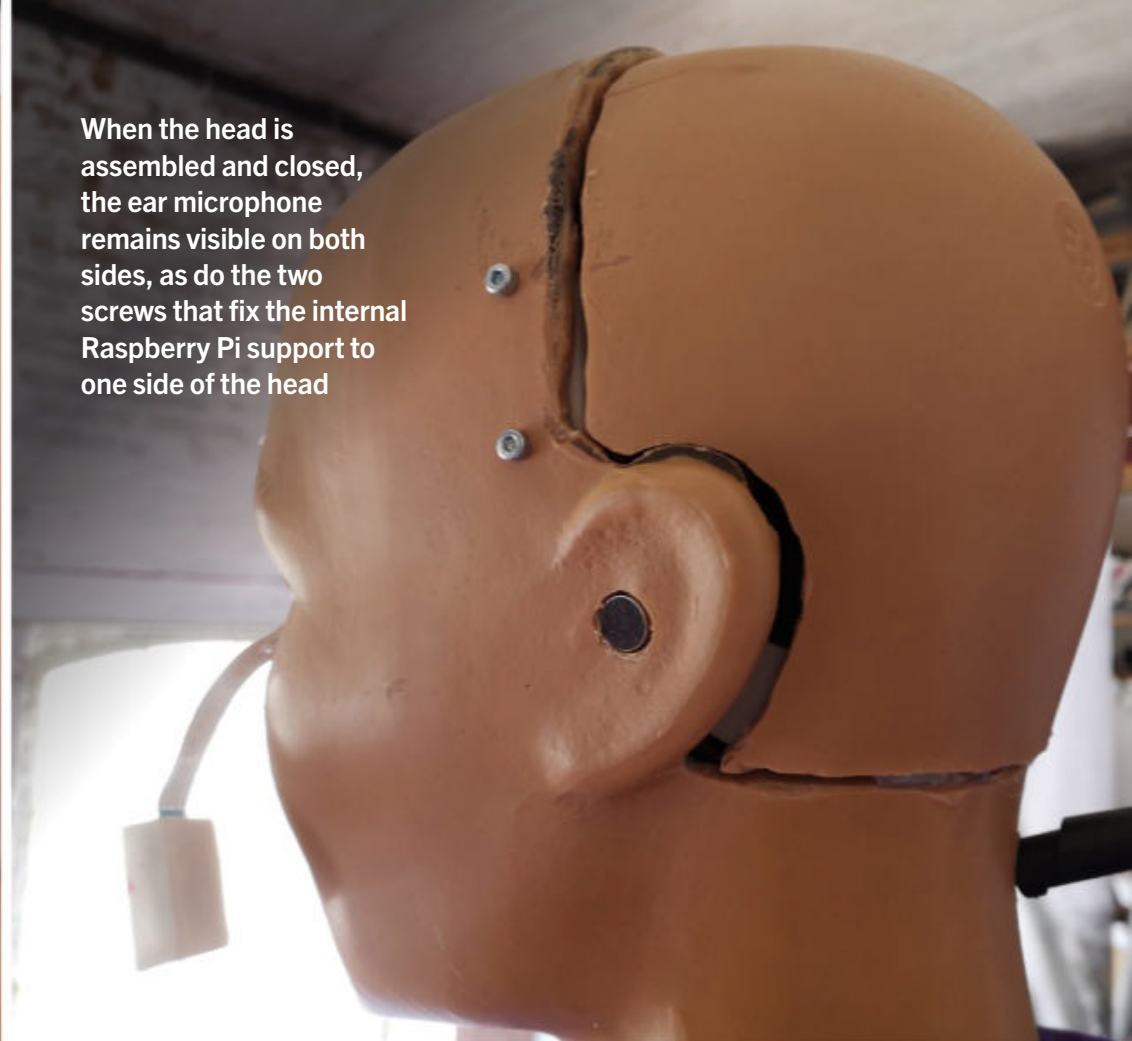
#define MAX_SIGNAL 1024 ///< Absolute
higher value of the analogue input

/**
 The sample window amplitude of 50 ms
 corresponding to a frequency of 20 Hz
 */
#define SAMPLE_FREQ 50
```

According to the level of environmental sound in which you are operating, these parameters can be modified and set as required. The best way to determine the right value of the control parameters is to experiment. ►



The Pi camera inserted in a small 3D-printed box with the flat cable connecting the device to the Raspberry Pi inside the head. The box will be glued so that the camera can be oriented in the right direction without damage to the small board



When the head is assembled and closed, the ear microphone remains visible on both sides, as do the two screws that fix the internal Raspberry Pi support to one side of the head

At the height of the heart, is the yellow lamp lighting the breathing and the emotions of the Borg

Preparing the 'brain' of the Borg

The Raspberry Pi (the brain of the Borg) hosts the programmes that simulate the intelligence and human reactions, but not exclusively.

The Pi camera and the speaker — the eyes and the voice of the Borg — are both directly controlled by the Raspberry Pi and must be installed in the head of the mannequin, exactly on the opposite side from where the Arduino and motion mechanism lie.

One of the main problems I encountered when I started assembling the parts inside the torso of the Borg was not the narrow space but the connections between the top and bottom. At the base of the torso are the Arduino Uno and the controller for the stepper motor, while the Raspberry Pi is housed in the upper part inside the head; in the middle, at the height

of the heart, is the yellow lamp lighting the breathing and the emotions of the Borg. These and other components made this a complex and time-consuming job.

To install the Raspberry Pi inside the head, while allowing access for the cables to the left eye of the mannequin, I designed and 3D printed a PLA support, then bolted it to the sides of the head.

On the opposite side of the Raspberry Pi, I kept space for a small amplifier connected to a smartphone speaker fixed to the outside of the neck and hidden with a scarf.

In the next issue, we will complete the making of this home-security Borg — the home guardian — focusing our attention on the making of the Raspberry Pi, hardware and software. I will also show a preview of the head's components assembly. 📁



To make the Borg speak as realistically as possible, a small, powerful speaker has been fixed outside the neck. The realism is impressive



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LOVE YOUR YEAST

The craft of beer making involves a knowledge of science as well as a bit of magic

*By Bryan Livingstone
Photographs: Robyn Livingstone*

Hydrating dried yeast before pitching

As a Beer Judge Certification Program (BJCP) certified beer judge, I get to judge a range of beer competitions each year. Apart from the joy of tasting some amazing beers, I also get a good feel for the issues that are challenging brewers.

In past years, cleanliness issues were one of the more common beer faults. More recently, I'm glad to say, the growth of craft beers and the growth of home brewing has seen brewers lift their game and poor sanitation issues are becoming less common.

However, one concern still evident in brewing competitions is that of yeast

health and pitch rates. So, this issue I wanted to shed some light on brewing yeast.

How important is yeast?

As far as ingredients go, yeast is the third-biggest flavour contributor to your brew. Malt and hops make up the first two largest flavour contributions. Sometimes you can make the same beer with identical ingredients but the result is different — sometimes better and sometimes not. Yeast selection, yeast health, and pitch rates could be the reason for this.

Yeast largely can be divided into two

As far as ingredients go, yeast is the third-biggest flavour contributor to your brew

groups: fresh living yeast and dried yeast. Dried is more common for kit brewers and all grain brewers here in New Zealand. One of the questions we are often asked at Brewers Coop is whether to sprinkle the dried yeast into the beer or to hydrate first. My preference is to hydrate first in fresh, cooled, boiled water.

Yeast osmosis

A yeast cell needs to hydrate before it can start working. To do this, osmosis needs to occur whereby water needs to be drawn into the cell to hydrate. Put simply, water will travel from a low sugar concentration to a high concentration in an attempt to balance the concentrations. In this case, water will cross the cell wall to hydrate the contents of the cell because water has a low concentration of sugars and the dried cell contains a higher concentration. So, pitching your yeast into water to hydrate before pitching it into the beer/wort is a very efficient process and gives the yeast cells the best chance of survival and growth.

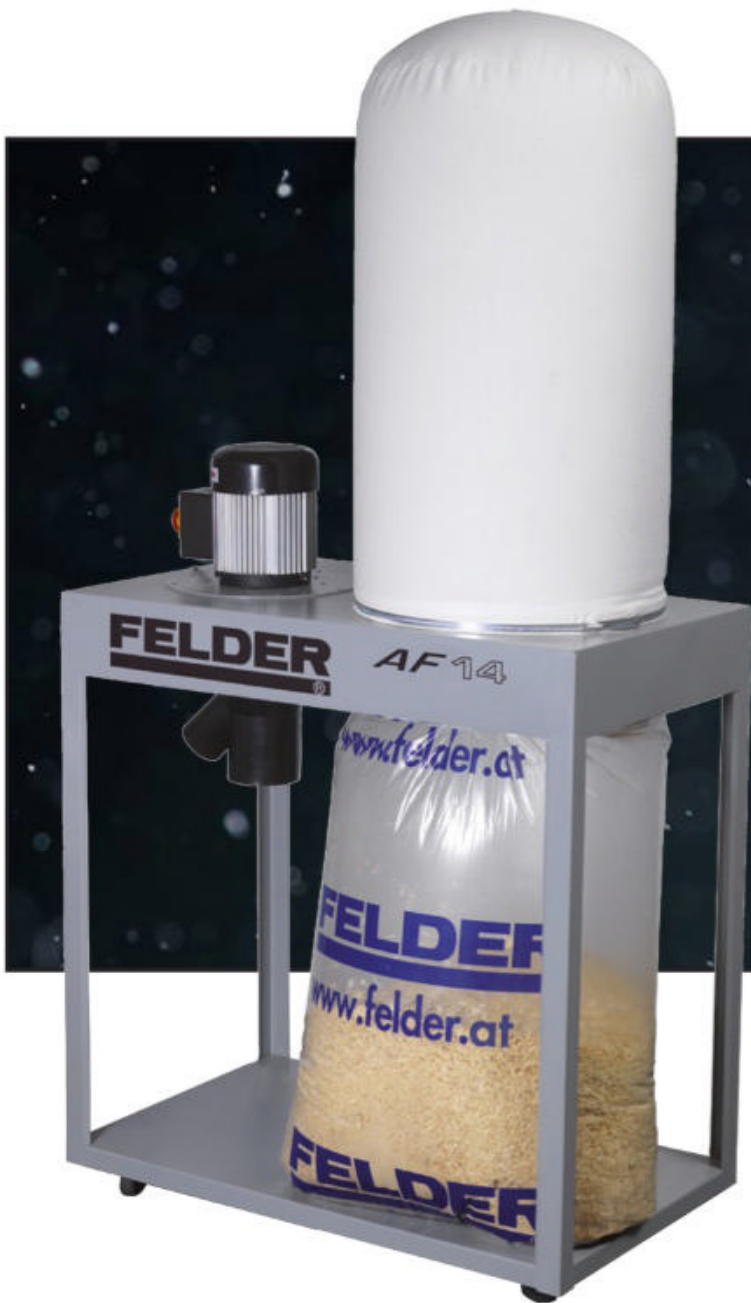
Pitching the dried yeast directly into fresh wort/beer isn't as efficient because fresh wort has a high sugar concentration and therefore osmosis doesn't occur to the same degree. Water does not travel across the cell wall very effectively because the sugar concentrations of the wort and the dried cells are too similar. Therefore, the yeast cells do not hydrate as well and there is consequently some yeast attrition, leaving you with a lower yeast count with which to start your brewing.

I find that hydrating in water always works the most efficiently and therefore my yeast count is nice and high, meaning my brews start bubbling a lot sooner than the brews where the yeast is sprinkled directly onto the wort. ►

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Pitch rates

An 11g yeast sachet and a home brew-sized pack of Wyeast or White Labs liquid yeast contains enough dried yeast cells to ferment five US gallons of beer with a specific gravity under 1.050.

The problem is that we Kiwi brewers brew 23-litre batches — or five New Zealand gallons, as we follow the British gallon being 4.5 litres — so we are already at the very extreme of the pitch rate for our yeasts.

When yeast is under-pitched it struggles to finish its job, and we start to notice the fruity esters in the resulting beer. Strawberry and pear aromas and flavours are often detected and sometimes the beer finishes sweet as the yeast doesn't ferment out all the potential sugars. Having a large, healthy yeast count at the start of the fermentation process leads to a clean and complete ferment. Here are some ways to achieve this.



Yeast selection is key

Matching the correct yeast to the style of the beer you are making will give you a better-tasting beer

Remove the 5g yeast from the beer kit and replace it with an 11g sachet. This should be enough yeast, as most beer kits have an ABV of 4.2–4.5 per cent.

If your beer is likely to be more than five per cent then pitch two packs of yeast. This will double your yeast count.

Build a starter. If you take a single pack of yeast and add it to one litre of cooled boiled water and 100g of dried malt extract, then after 24 hours the yeast count should have doubled. You are making a simple weak beer and letting the yeast cells multiply before they are added to your main beer.

Never use old yeast. If your yeast is past the 'best before' date, you are better to spend a few extra dollars and buy new healthy yeast than risk your brew with a poor-quality yeast.

Yeast health during fermentation

In previous articles, we have talked about consistent temperature while brewing. Temperature swing during fermentation can also give 'off' flavours in the beer. Getting too warm or brewing too cold for that strain of yeast will lead to beers tasting different from when brewed previous times.

Think of a running race. If you start off running a marathon but every 2km you are forced to run a 400m sprint before continuing with the marathon, your body is probably not going to be happy and the race result probably won't be your best. Same with yeast; the more you change while the yeast is doing its job, the more odd flavours you are likely

to get. Keep the brewing temperatures consistent within the recommended brewing range and your beer will taste better for it.

Choose the right yeast

There is nothing more disappointing when judging than tasting a beer that has missed the mark. Your beer can be clear, well carbonated, and have a lovely white head, but if the wrong strain of yeast has been used, it isn't going to score well for that style.

Imagine a German wheat beer. You expect to have banana aroma from the German yeast strain and a clean spicy finish to the beer. The generic ale yeast supplied with the beer kit won't usually achieve this and the beer is more likely to finish clean tasting without the German wheat beer character.

Matching the correct yeast to the style of the beer you are making will give you a better-tasting beer. Even if you aren't entering into a competition, choosing the correct yeast strain could have your friends liken your beer to one they tasted when they lived in Germany or England or Belgium — and wouldn't that be great feedback for the brewer?! 🍺



Yeast starter doubles yeast count every 24 hours

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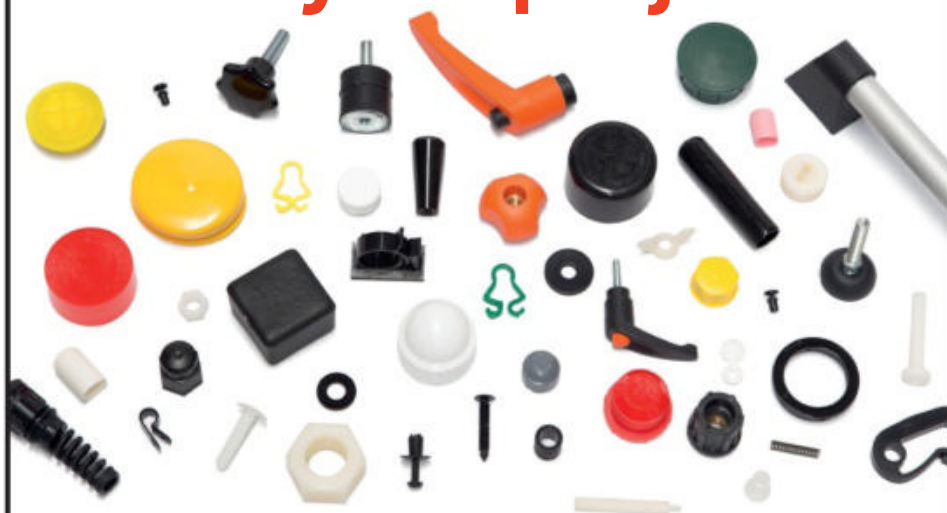


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WHEN A SHED IS NOT A SHED

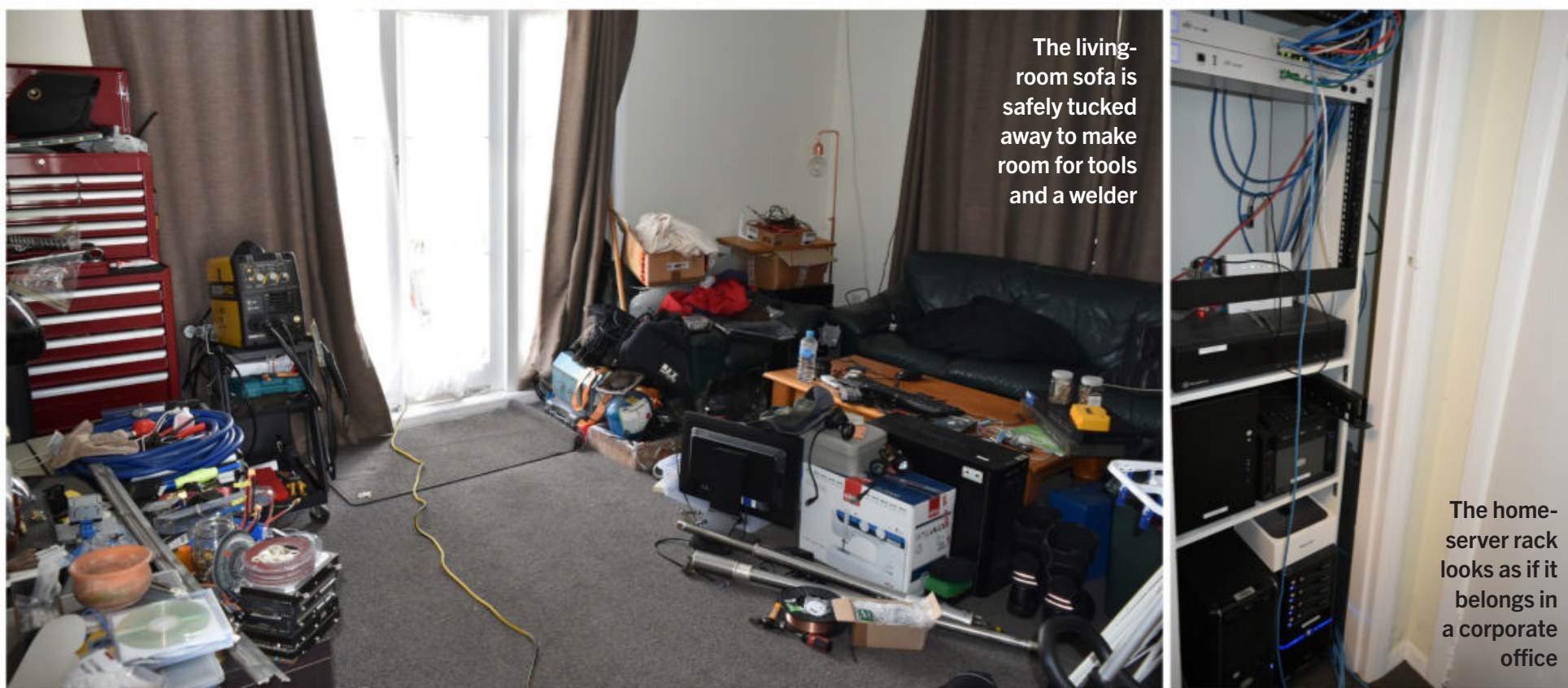
This resourceful sheddie takes do-it-yourself to a whole new level

By Sarah Beresford

Photographs: The Shed



A man's home is his ... shed?



The living-room sofa is safely tucked away to make room for tools and a welder

The home-server rack looks as if it belongs in a corporate office

When is a shed not a shed? When it's a house. Nick Howard has achieved that most elusive of sheddie dreams by getting rid of the boundaries between shed and house and combining the two.

There's a welder in the living room, car parts and gas cylinders colonise other spaces, a gas burner is stashed on the kitchen bench, a bedroom wardrobe houses a server that looks as if it belongs in a corporate office, and then there's the hub of a lot of his projects: a former bedroom that is now a workroom full of his electronic kit and gear for loading ammunition casings.

Nick is an electronics whizz and his job at Youtap, a global fintech software company, involves building complex communication platforms from scratch, among other techie things, but in his spare time he indulges his curiosity for just about everything.

Give it a go

Although Nick has a Diploma in IT and a Bachelor of Computer Science, he says that a lot of what he does has been self-taught.

"I've always enjoyed getting stuff that is broken and learning how to fix it. It's a mixture of exploding stuff on

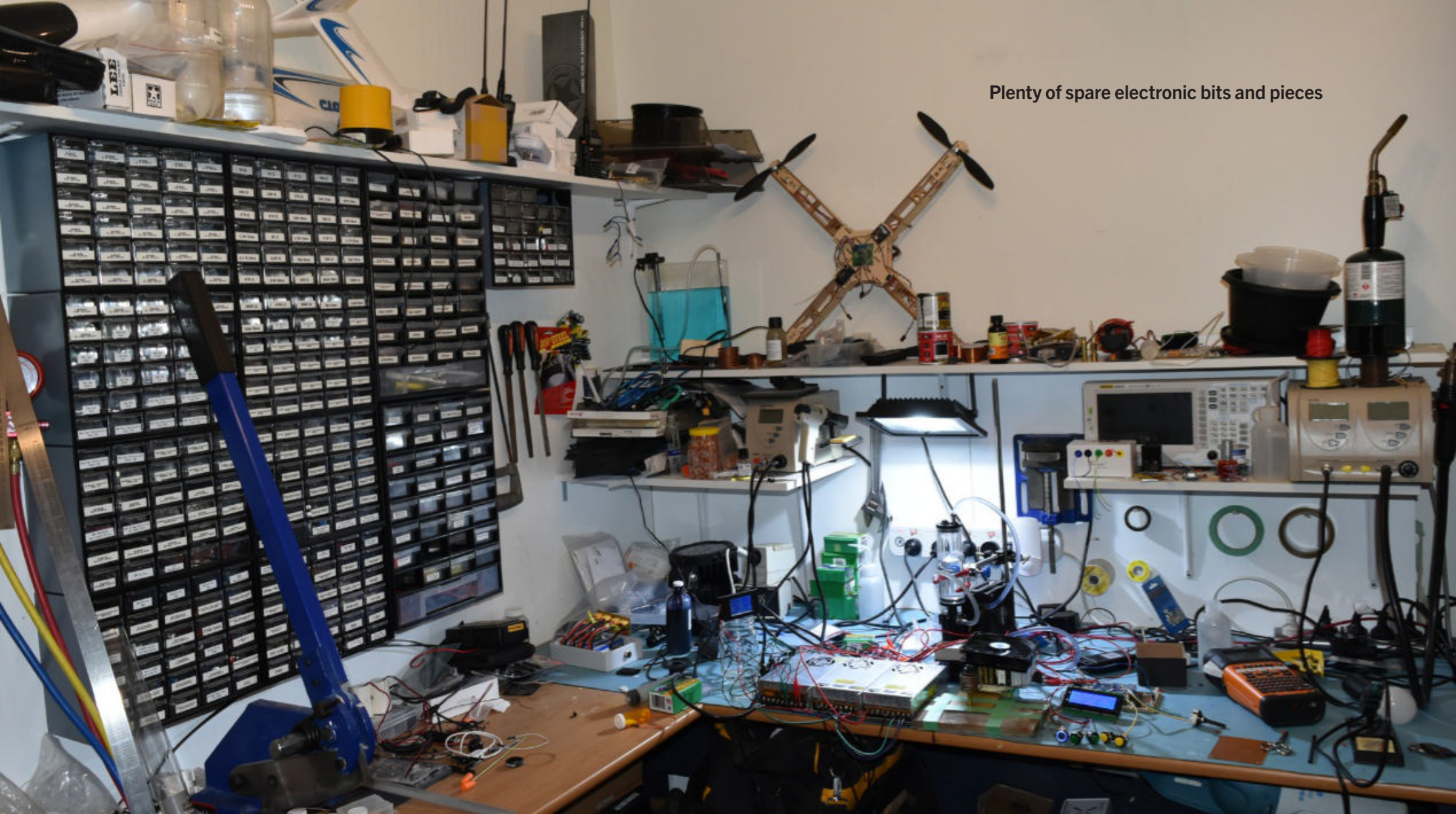
the workbench and Google," he says with a wry smile. "There's a lot of videos on YouTube and it's all along the lines of: 'If it's already f*cked you can't f*ck it further, and you might just fix it and learn something along the way.'"

That's why there's an industrial stage fan and a Dyson handheld vacuum in a corner of one room: Nick's been tasked with fixing them by friends.

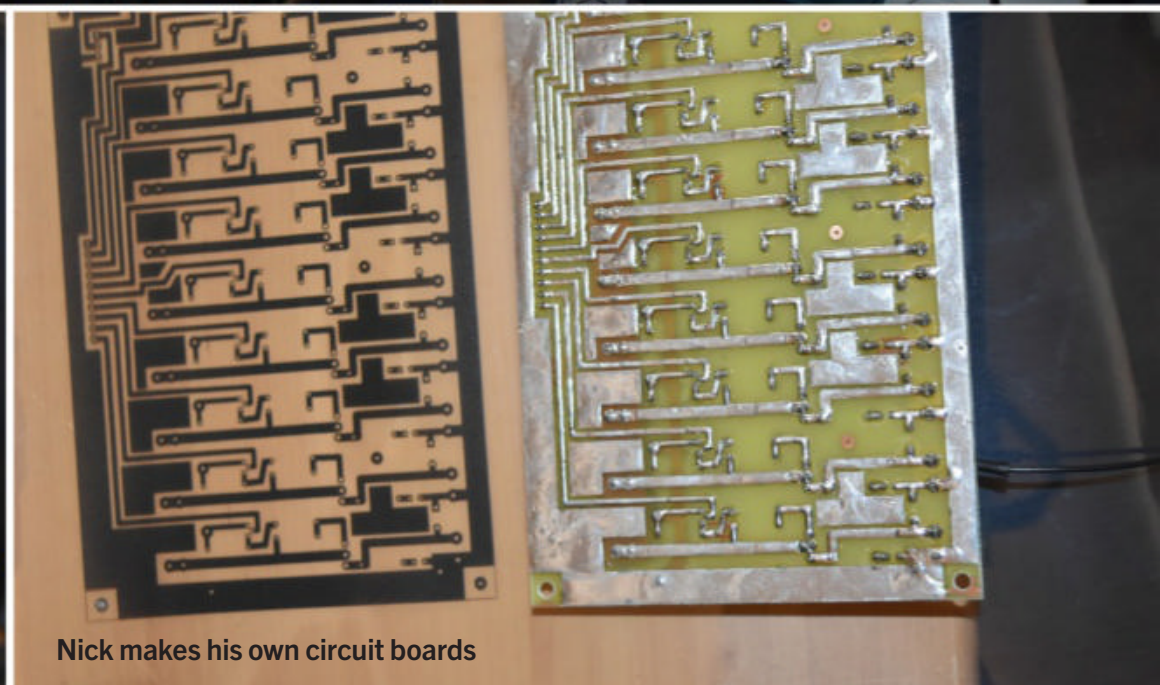
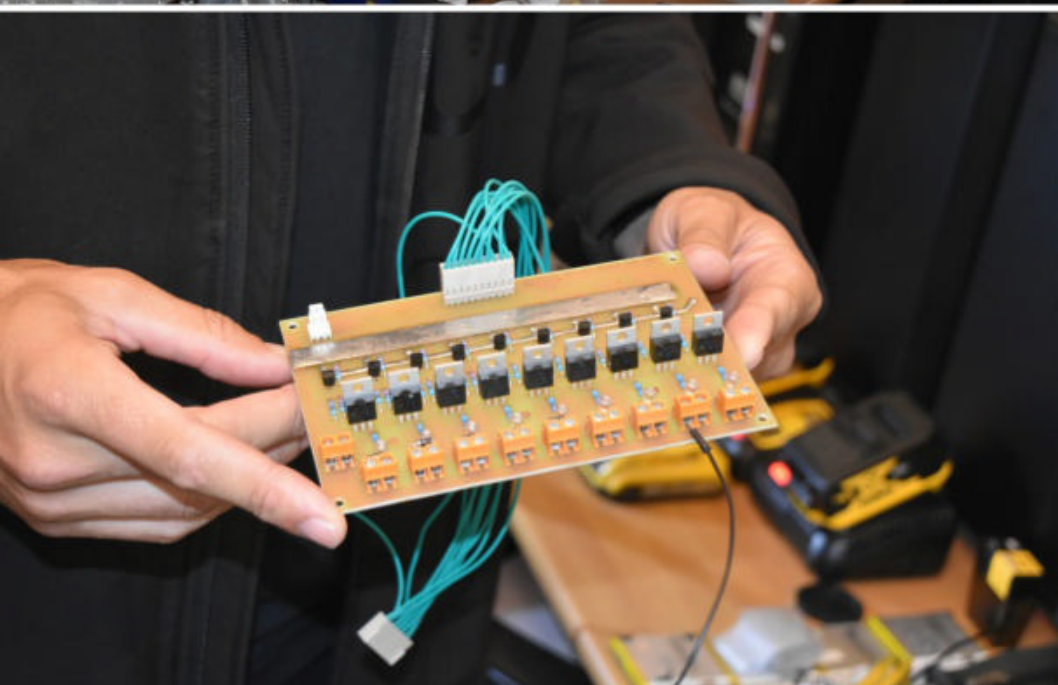
"If I can't fix them, there'll still be the parts — the vacuum has an electrical motor, a speed controller, and a powerful battery that could all be useful for other projects," he says. ►



The spare bedroom, which is now the main workroom in Nick's shed



Plenty of spare electronic bits and pieces



Nick makes his own circuit boards

Nick has designed and installed an electronic system on his phone so that he can turn lights on and off, control remote cameras

Ready for anything

One wall of the main workroom is devoted to a cabinet that houses Nick's collection of spare electronic components, which he has sourced from eBay and Trade Me: "I've got lots of bits and pieces. It means if something's cooked I'll probably already have the part on hand."

Nick is Mr Fixit electronically, and manufactures his own circuit boards from scratch. "I design things like circuit boards and timers on the computer and then build them using first principles," he explains. Hence there's a desk that is home to three computers and a work station with soldering irons, a spectrum analyser, and a radio RF/MFC, which he uses to redesign antennas.

There's no need for anything as pedestrian as Alexa here — Nick has designed and installed an electronic system on his phone so that he can turn lights on and off, control remote cameras ... you get the picture.

Passion for target shooting

Another part of the main workroom has all the gear that Nick uses to load ammunition: cases, dies to reshape the cases, smokeless powder and electronic scales to measure it, and a safe to store the ammunition when he has finished the process.

He participates in both short-range (25–300 yards) and long-range (300–1000 yards) events and has a swag of service rifle medals that he has won for short range hanging on a door handle in the workroom.

“A lot of serious competitors load their ammunition themselves,” he says. “It’s for cost — it offers a substantial reduction in the cost of long-range ammunition— but it’s also for precision and accuracy. Rather than a machine churning out thousands of rounds, you get consistency doing it by hand. You can load the precise amount of smokeless powder that you measure on

an electronic scale and you can tailor the ammunition for specific rifles.”
He points to a stack of books he has on the subject as an indication of how specific the whole process can be.

Fireworks, too

Nick is familiar with handling gunpowder, as he is also involved in pyrotechnics, ▶

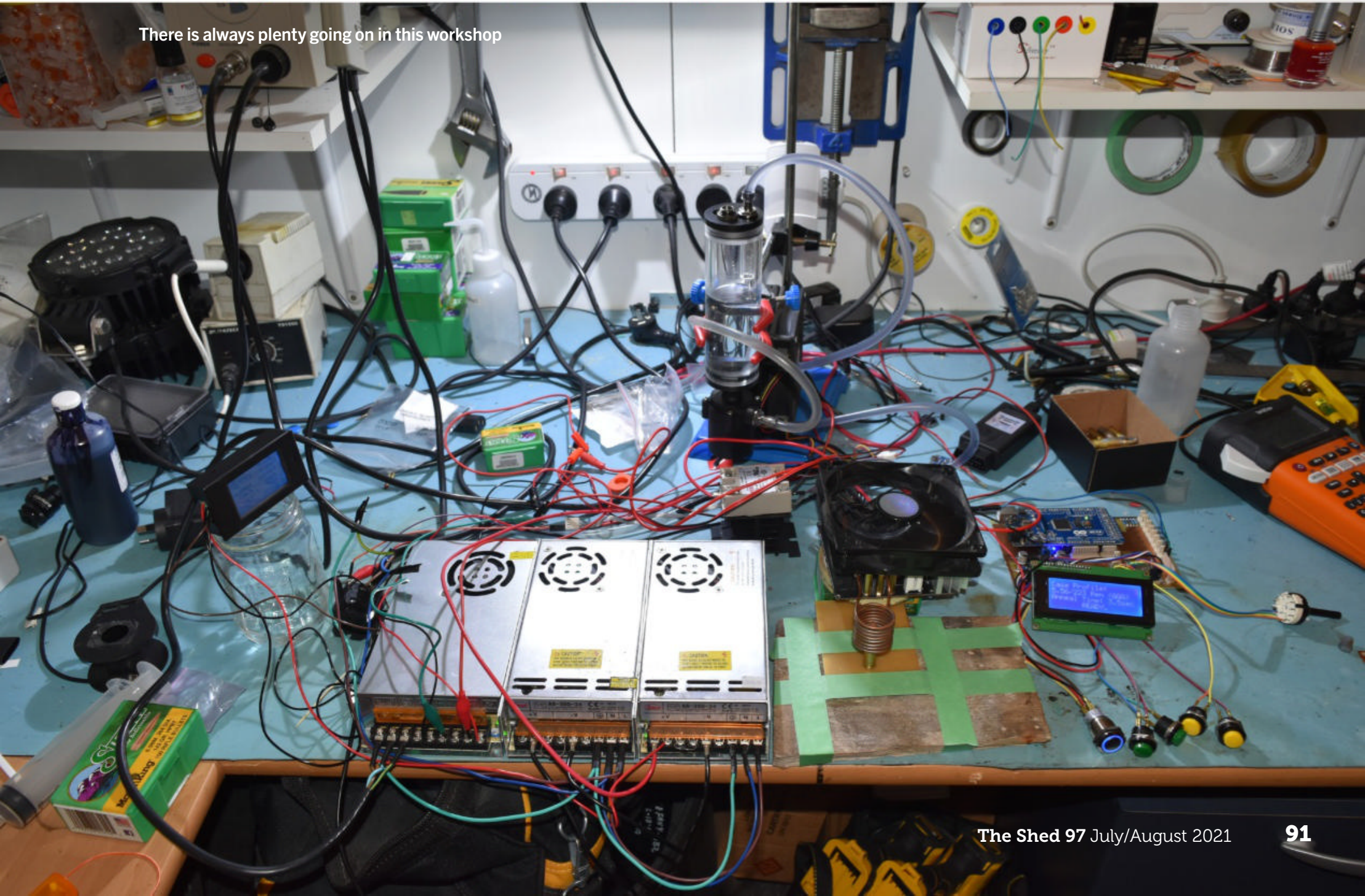
“A lot of serious competitors load their ammunition themselves”

Heaps of ammunition supplies



Nick loads his own gunpowder into reused shells

There is always plenty going on in this workshop



In true sheddie style, Nick bottles his own tomatoes and cures his own bacon and salami



If you cure your own bacon, well then, you need to slice it just the way you like it, right?

and was asked to help out with the fireworks at the Waitakere show in 2019.

“It started as a personal interest at uni and then I got my pyro licence. That involved a one-week physical training course, then some exams. At various events, I help with loading the fireworks, stacking them in the field, wiring up the electronics, and then making sure nothing burns down,” he says, laughing.

There’s a stack of walkie-talkies in one room that he uses to communicate with others in the field when setting up fireworks displays.

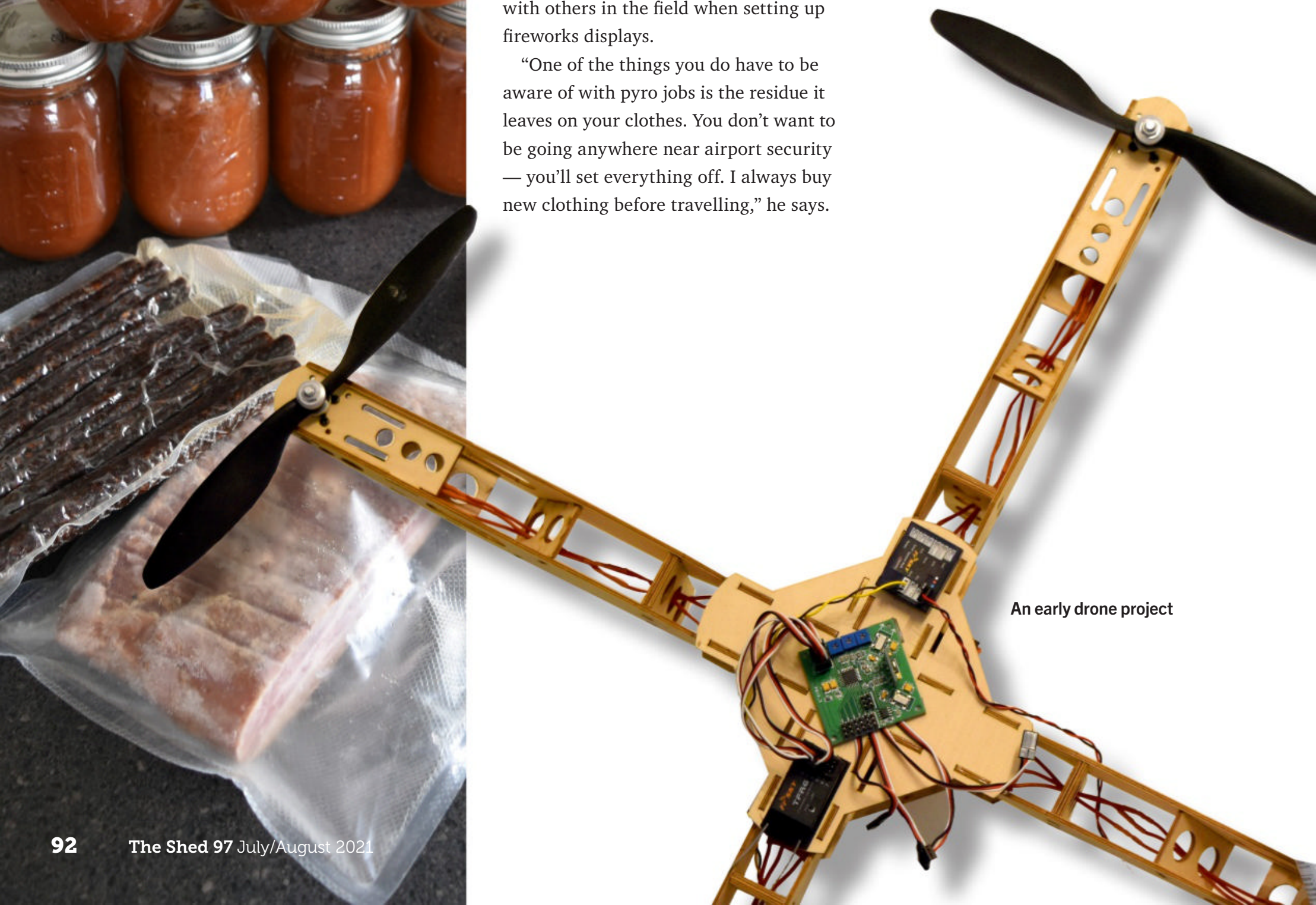
“One of the things you do have to be aware of with pyro jobs is the residue it leaves on your clothes. You don’t want to be going anywhere near airport security — you’ll set everything off. I always buy new clothing before travelling,” he says.

A good source of steel

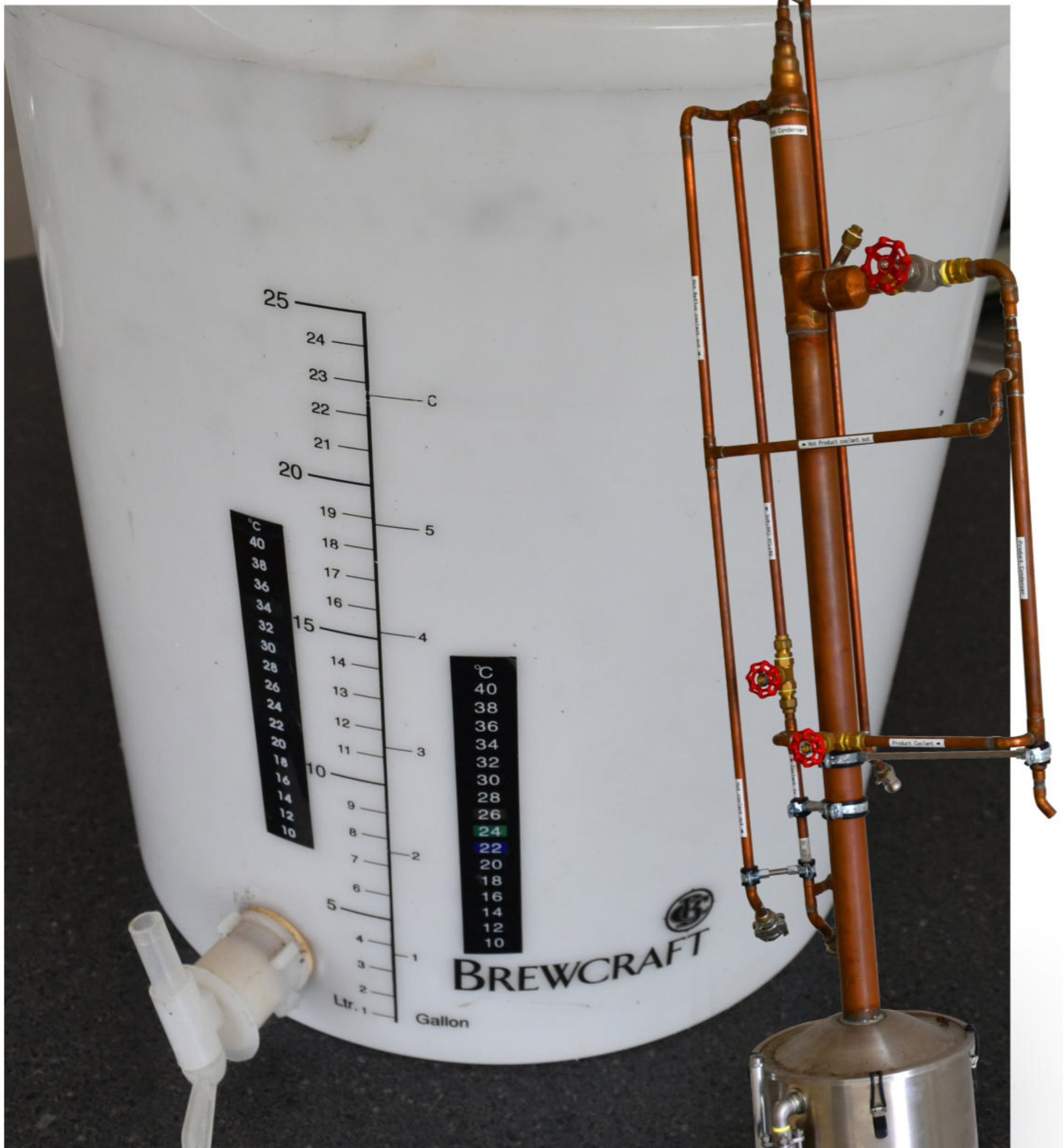
Talking about travelling, Nick is also a dab hand at repairing cars and has a few bargains to show for it. He’s just finished working on a Nissan 4WD.

“A percentage of it is now Fisher & Paykel actually,” he says, referring to the fact that he uses the sides of washing machines as a source of sheet metal for repair work.

His daily use car is something he got free and restored to working condition. ►



An early drone project



Office brew

Nick has given a twist to the time-honoured tradition of office drinks on a Friday night. He has installed a fermenter in the kitchen at his office and at one stage, when the staff numbers were larger — the head office is now based in Singapore — he was producing about 40 litres of beer a week.

“I bought a fermenter for \$3K and I filed expense claims for my costs and soon it will be paid off. I can make a litre of beer for about \$1.80. I use a combination of kits and my own hops,” he says.

After his boss made a crack about why he didn’t make some vodka for work drinks, Nick installed a still in the kitchen.

“I made some pretty good vodka, too — just to show him that I could,” he says, laughing.



A self-built security system controlled from an iPhone really looks the part



If you need a home-ventilation system, how hard can that be to create?



“A woman at work had it in her garage but it wasn’t going and she needed to free up space so she said I could have it free if I took it away. So I got a new battery, managed to fire it up, and drove off. I spent \$800 on parts and now I commute to work in it every day,” he says.

There’s also a pretty flash-looking BMW in the driveway that Nick worked his magic on.

True sheddie style

Nick points to some solar panels on the roof.

“I made them myself,” he says. “I was interested to see how they worked.”

Nick’s skills are wide-ranging. In the kitchen there is a stack of bottled tomatoes that he preserved himself after a bumper summer harvest. There’s also a meat smoker on the outside porch.

“I dry-cure my own bacon and salami,” he says matter-of-factly.

In fact, in true sheddie style, there doesn’t seem to be too much that Nick can’t turn his hand to.

“It’s just stuff I do,” he says. “I’m always looking at things to see how they work.” 📁

There’s a fair bit of Fisher & Paykel in the rust repairs of this 4WD

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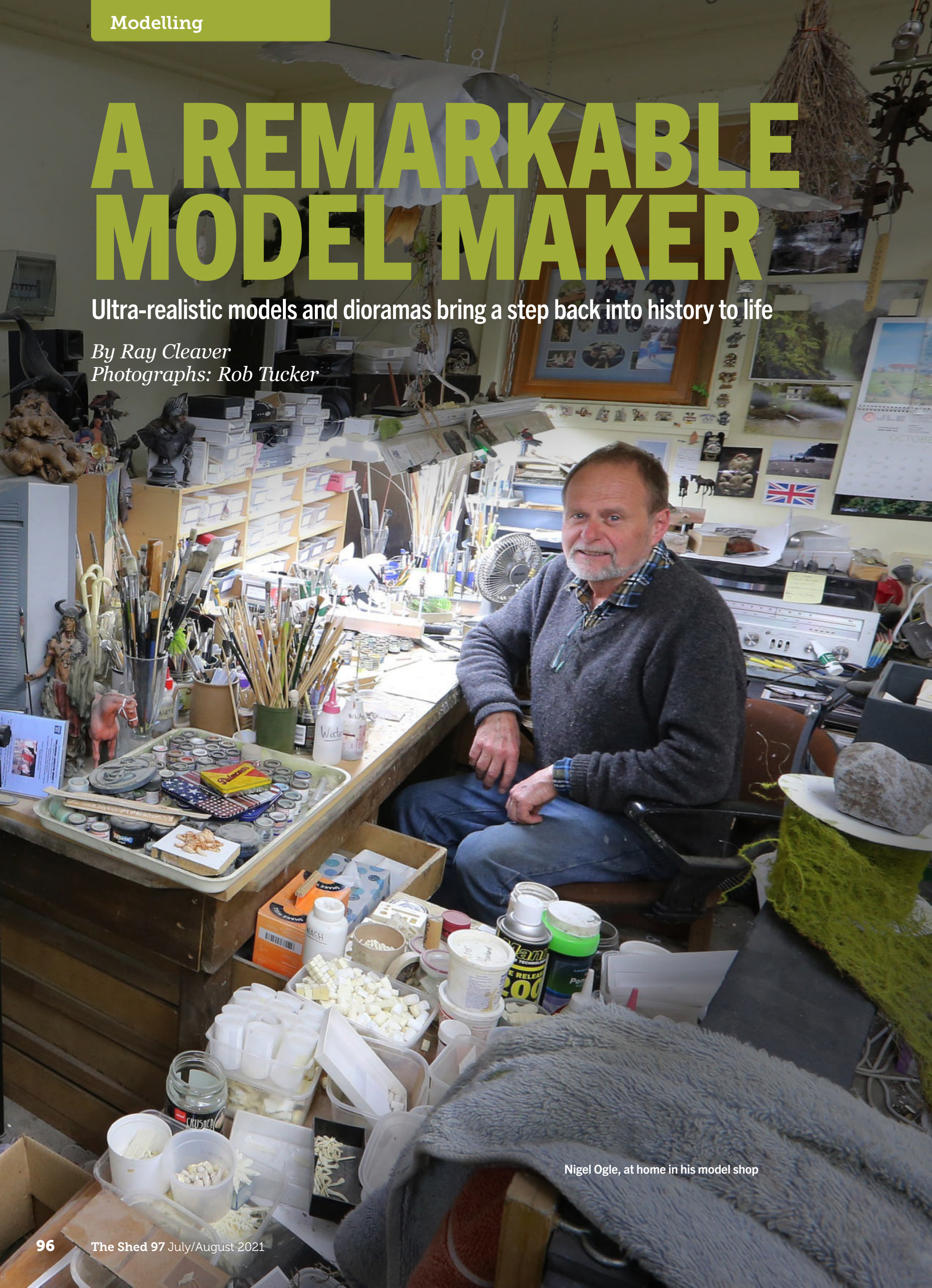
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A REMARKABLE MODEL MAKER

Ultra-realistic models and dioramas bring a step back into history to life

By Ray Cleaver

Photographs: Rob Tucker



Nigel Ogle, at home in his model shop



Extreme detail of Hawera's main street, 1902. There are even horse droppings on the road

Nigel Ogle of Tawhiti Museum has taken the art of model making to an extreme level. The South Taranaki artist has transformed a massive shed — it used to be a dairy factory — into an extraordinary early New Zealand history museum.

The acclaimed museum draws many visitors, its varied display areas even including a full-sized working bush railway.

One of Nigel's specialties is the models he creates in his workshop — everything from full-sized human models to dioramas featuring hundreds of miniature figures. An art teacher turned potter turned museum creator turned model maker, over the past 30 years he has, mostly single-handedly, created something very special. Nigel sees the museum as one big art project and his extremely prolific model making is an integral part of the museum. ►

Over
the past
30 years, he
has, mostly
single-
handedly,
created
something
very special



The passed-out lady confuses a visitor

The world in miniature

His model making workshop/studio is like something else indeed and there are many jobs in progress. Hanging on a wall there is even a bison head wearing a hat on its horns. Nigel makes his life-sized models from fibreglass and his little figures the traditional way from silicone moulds and resin. He has perfected the art over decades and his workshop/studio houses thousands of moulds, all catalogued alphabetically.

Making models is not a simple process. It involves sculpting or obtaining an original master figure, putting it in a cardboard frame, and pouring silicone around it to create a two-piece mould.



Original images are referenced for scale to replicate the real thing



Nigel's first car

Nigel was delighted with the offer to buy back his first car — a 1937 Morris 8 Sports — and it quickly became an exhibit. The owner of the car saw Nigel's name on the ownership papers from the 1970s, with flashbacks to his student days and fun with Nigel. Nigel accepted the offer to own the car again and it now has its own display shed ... of course!

Militia building road





Humbrol matte oil paint is used on models

These master figures are often shaped with Magic Sculpt, a two-part epoxy product he imports from the US that Nigel says is brilliant. These are called 'patterns' and Nigel has thousands of them. "Pattern making is most of my work," he says.

Time-consuming model making

He showed us a mother and baby pattern that took three hours to sculpt.

To make each figure, the mould is then filled with Easycast, a urethane resin, and the figure is hand painted. He uses Humbrol matte oil paint, a product made for modelling.

Painting a miniature figure $\frac{1}{32}$ of life size is a job for a steady hand and he has hundreds of brushes. "They wear out really quickly," he says. "I was using sable brushes but that got too expensive. I now use synthetic brushes and some of these are really fine." It's a job requiring a lot of patience and one Nigel has perfected over three decades. ►



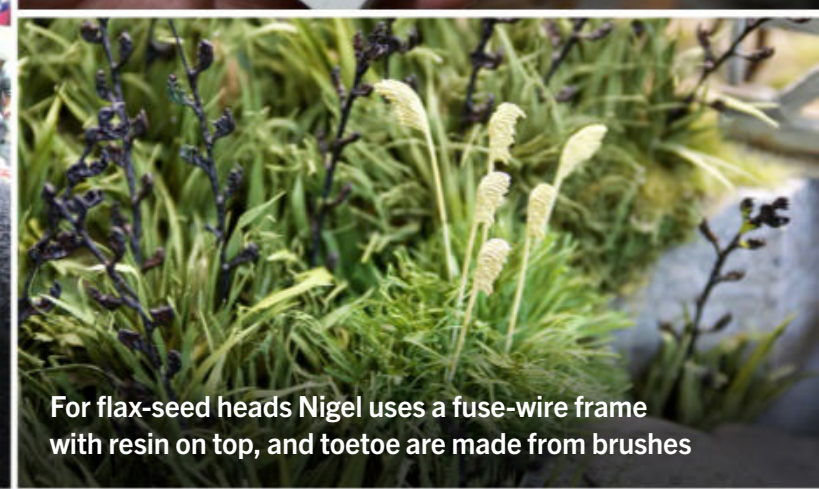
Making a fence using fuse wire



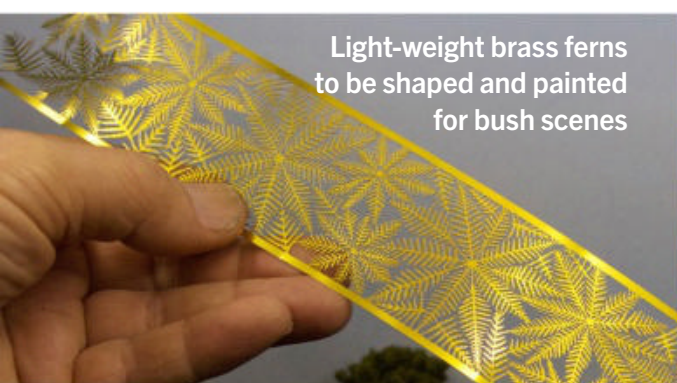
Ferns prepared for installation



Flax mould



For flax-seed heads Nigel uses a fuse-wire frame with resin on top, and toetoe are made from brushes



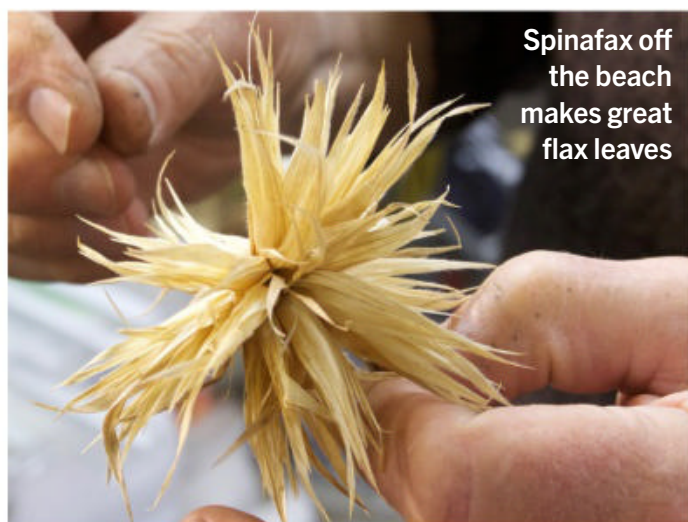
Light-weight brass ferns to be shaped and painted for bush scenes



Cut paper on twigs makes cabbage trees



A forced perspective gives more depth to the diorama and is very effective



Spinafax off the beach makes great flax leaves

Bush backgrounds

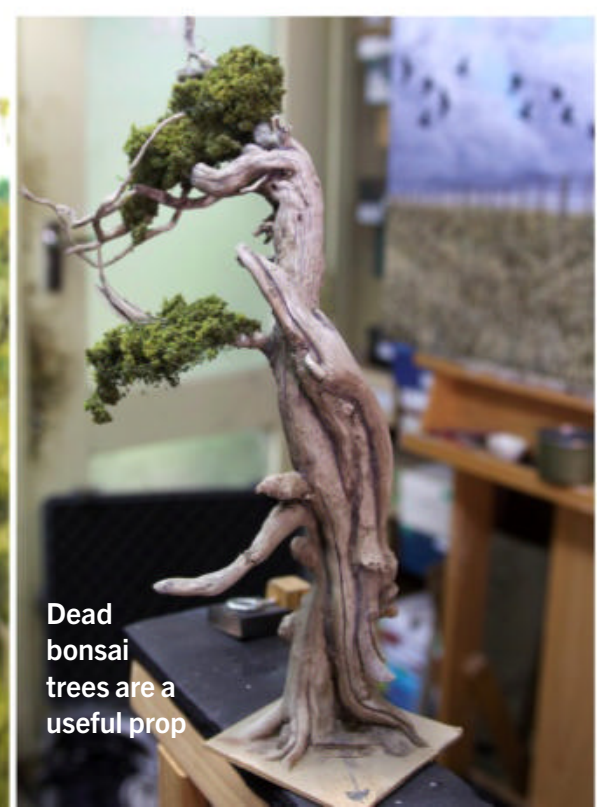
Some of these dioramas have a bush setting and creating native bush in miniature with painstaking detail is another art Nigel has mastered, learning many tricks over the years.

He uses spinafax for flax and cut paper on twigs for cabbage trees, which look amazingly realistic. For flax-seed heads he uses a fuse-wire frame with resin on top that is then painted using an airbrush.

Toetoe (often incorrectly spelled 'toi toi') is created by painting the ends of a synthetic duster from The Warehouse. He buys laser-cut, super thin ferns made of brass from the UK to make ferns. They are then bent to shape and painted. He adds moss from the bush, driftwood, and even wool fibre for more effect. "I've even used dead bonsai trees — they look pretty realistic," he says. Water scenes and rivers are created with clear resin. ►



Incredible detail on ferns and bush



Dead bonsai trees are a useful prop

Full-size models

Scattered around the museum are a number of full-size models. These often surprise visitors as they are very lifelike. You may open a door and encounter an early settler sitting on the toilet! Some models have faces that have been moulded with silicone from local peoples' heads and hands, then the casting is reversed with plaster, and then fibreglass.

The figures are sanded, primed, and finished with oil paints. Add clothes, a wig, and maybe facial hair and the end result is very realistic.

Nigel is old school and Richard Taylor of Weta Workshop is interested in his work. Weta uses the latest computer technology — at Weta, the figure to be copied is snapped by 240 cameras, the file information is downloaded to a computer, and the figure then made on big 3D printers.



The long-drop exhibit is a big hit with children of all ages



Came a Hot Friday author Ronald Hugh Morrieson was a keen musician. These guys are full size



This display area is dedicated to South Taranaki writer and musician Ronald Hugh Morrieson



Sometimes it's easy to confuse full-size models with real people at the museum



The children who visit the museum are amazed by the life-size exhibits



The amazing detail of a coach and bush scene



One of Nigel's model moulds



Some of the miniature pieces are really very tiny



Models drying after being painted



It's easy to see here the size of some of these models

Being innovative

Buildings, vehicles, and wagons are all made by hand. He has used cardboard for some building and coach construction, and presses metal foil into a die to make corrugated iron. Some roofs have shingles, all painstakingly cut from cardboard. Polystyrene, fibreglass, fuse wire, and all manner of things are used for effect.

We caught him making a five-wire fence with fuse wire and $\frac{3}{16}$ -inch copper pipe. "You have to be innovative," says Nigel.

He has found original images of coaches and wagons and built models to scale

that replicate the real thing. One diorama includes a scene from a local quarry taken from an early photograph that even includes a stationary stone crusher.

Early days of transport

We caught up with him working on his latest project — a set of 10 realistic dioramas that feature early modes of transport in Taranaki, from early Māori bush tracks to horse and wagon tracks, to the coming of the first motor car to the region.

These dioramas all feature miniature

A scene from some of Nigel's latest work, a Taranaki-region toll gate





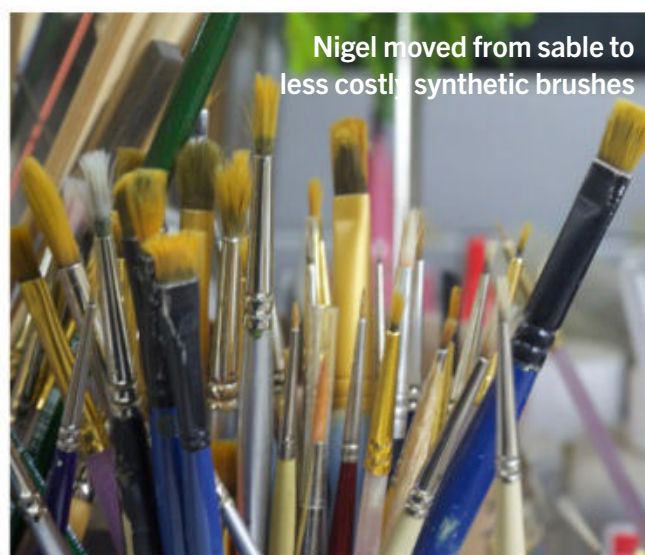
Specially made to take drills not much bigger than a human hair



Some of Nigel's model-making materials

figures made to various scales — either $\frac{1}{32}$, $\frac{1}{15}$, or $\frac{1}{12}$ of real size. Each diorama has a bush, river, or street setting and has a background of extreme detail all encased in a box and lit for effect.

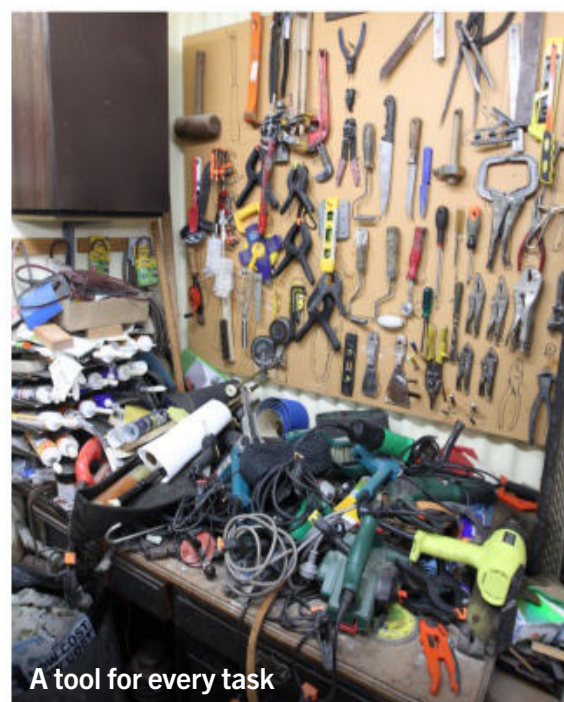
Dioramas are scattered through the museum. His biggest creation features the inter-tribal Māori musket wars and has 800 figures in the bush all made by hand. No two figures are the same. Making the 12m long diorama, which is extremely realistic, was quite a feat and took 18 months to complete. ►



Nigel moved from sable to less costly synthetic brushes



A mini bandsaw



A tool for every task



A custom-made tiny bench saw



Some of Nigel's model products

Early modes of transport

Nigel's latest big project is a set of 10 realistic dioramas that feature early modes of transport in Taranaki, from early Māori bush tracks to horse and wagon tracks, to the coming of the first motor car to the region.



Main street in miniature

Nigel recently completed a long, finely featured diorama displaying the main street of Hawera in 1902 in 1/15 scale. This was when the first motor car arrived in the town. "Apparently, the car caused quite a fuss at the time," he says. "Horses bolted, wagons were wrecked; one horse had to be shot, and the driver was taken to court." The diorama took 18 months to complete and he had to make many new patterns. The detail is amazing.



A labour of love

Nigel has his own history relating to the museum. As a boy he helped his father deliver milk to the Tawhiti Cheese Factory in the farm truck, little realising that he would eventually own the building and create a museum there.

What started as a hobby and small private collection grew with demand to become an impressive site detailing the history of South Taranaki.

Nigel sees the museum he purchased in 1976 as an ongoing artistic endeavour.

In 1988, he left work as an art teacher in Hawera to concentrate on his projects full time — plotting and then creating his collection.

Thirty-three years and a lot of work later, the museum is a busy place, with visitors from near and far.

Nigel and wife Teresa have travelled overseas to visit other model makers and museums for inspiration and returned with ideas. In 2004, Farm Power Hall was opened in a building attached to the museum. The hall showcases the evolution from horse-drawn equipment to powerful tractors and machinery up to the 1970s. Anyone with an interest in machinery, from farm tractors through to World War II vehicles, will be impressed. Nigel's life-size figures are scattered throughout the displays.

Nigel took the museum a stage further in 2010 with the Traders and Whalers attraction. This involves a boat ride through a dark river display of full-size models and artefacts featuring an early trading and whaling setting of the early 1800s and comes with realistic sound effects.

Another feature of the museum is a working bush railway. Life-sized models add to the re-creation of the bygone logging days in the New Zealand bush. Five years after finding an old rail track rusting in a remote clearing, and a lot of hard work later, it opened to the public in 1990 and runs to a reconstructed sawmill at the end of the line.

Another display area is dedicated to South Taranaki writer and musician Ronald Hugh Morrieson.

Our heritage is becoming more and more of interest these days, and anyone with a love of the past and fascination with our Māori and early settler history should pay a visit. If you're interested in model making on any level there is so much to see.

"You can put so much detail in a small-scale diorama. Some of them I have put bigger figures in the front and smaller ones at the back," says Nigel. "This forced perspective is very effective and gives more depth to the diorama."

Model-making tools

Nigel's workshop is equipped for very delicate work. As well as a lathe, two

bandsaws, and a small custom-made tiny saw bench, he has a miniature drill press. This was made especially for him and has a chuck that can take drills thinner than a needle. He showed us drills as thin as 0.0135mm — not much bigger than a human hair.

For more information on Nigel's work and the museum check out tawhitimuseum.co.nz. 📄



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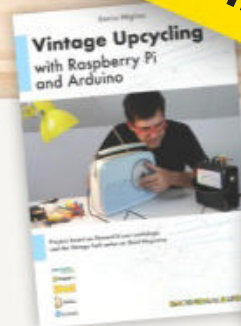
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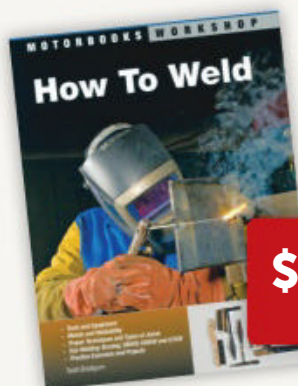
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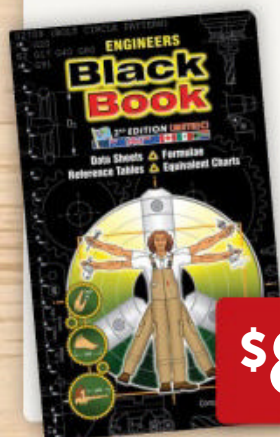
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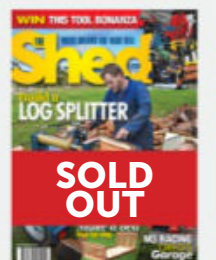
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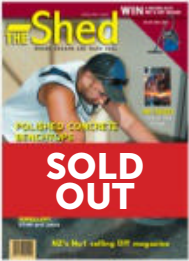
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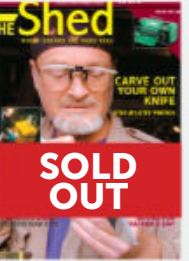
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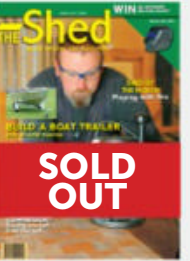
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SHARPENING THE MARKETING

Jude ponders the 'more is often less' question when considering the myriad decisions we have to make when buying basic consumables

By Jude Woodside Photograph: Jude Woodside

I had to buy some razor blades the other day. It's not something I do often. I find blades last a while — not, I hasten to add, because I am hirsute, but shaving regularly means the blades don't work so hard. I have two problems in this mundane task. First, I can never remember the brand and model of the one I am using, since I have usually been using it for several months and in that time the names and models seem to change, and, secondly, I am always shocked at the price. It seems to me that razor-blade manufacturers are using the, now familiar, inkjet printer rort: sell the device cheaply and the essential consumables at a premium.

Absurd marketing ploys

I noticed, when I needed a refill, the price of a new handpiece and a packet of five or six blades is only \$5 to \$8 — which is odd given the price of the refill is three to four times that. I am fairly agnostic when it comes to razor blades, and by now immune to the absurd marketing ploys of cramming more and more blades on a cartridge in the apparent belief that more is better. Perhaps two, or even three at a pinch, had some advantage — although I have always had my doubts — but now they have five blades and even six blades! In 2004, *The Onion*, the US online satirical magazine, published a spoof of a crazed Gillette CEO demanding five blades on a razor cartridge to outdo rival Schick, which had just upped its quota from three to four. Less than two years later, that prediction came true.

Lubrication for your chin

Now, blade cartridges sport 'moisturising' strips. The list of ingredients in these miniscule strips would make Gwyneth Paltrow blush: vitamin E, shea butter, aloe vera, and even nanoparticle silver. Amazing really — not only do the blades cut your beard, they wash your face and moisturise you at the same time.

The latest gimmick is titanium- and diamond-coated blades. Those are two of the hardest and toughest materials known to man. These blades should last forever; the manufacturers may have finally outdone themselves.

Of course, I just bought the cheapest promotional unit with five or so 'free' titanium and diamond cartridges. With materials like these, I won't need to buy razor blades for a few years, if at all. The old razor can join the ever-accumulating pile of discards in the drawer. I am sure I now have razor-blade perfection.

Bog standard

The whole 'art' of marketing otherwise ordinary products has always fascinated me. I especially love the promotions around toilet paper. This rather mundane and necessary consumable has, over the years, undergone a serious marketing makeover. Now you can get it in several plies, colours, fragrances, and chintzy designs to complement the decor of the bathroom. It even comes in textures

and, of course, extra-long rolls. All of this belies and attempts to disguise the fundamental use of the product.

In fact, toilet paper has been so made over that it's possible to pay a bit more and get 'hypoallergenic' rolls, which are just the 'bog standard' (pun intended) plain white. This implies that the manufacturers acknowledge that all the additional stuff they have added — fragrances and ink — might have a deleterious effect on that most sensitive part of the anatomy after all, and the consumer should pay more to be free of them. How considerate!

The term 'hypoallergenic' itself has instant appeal to marketers, having a serious medical overtone, but it was a term invented by the cosmetics industry in the 1950s and simply means 'possessing fewer allergy-inducing ingredients' — not quite as sexy sounding as 'hypoallergenic'.

It all goes to show that things ain't always what they seem to be; sometimes they can be made to seem so much more. 



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