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WOODEN
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**IRON
GATES –
A RIVETING
TALE**

THE **Shed**

MAY–JUNE 2021

ISSUE 96

THE-SHED.NZ

TOOLS OF THE TRADE

MAKING THE RIGHT TOOLS FOR THE JOB WHEN BUYING JUST DOESN'T WORK

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WHO ARE WE NOW?

We have a great tale in this issue of *The Shed* about some sheddie twin brothers, both great engineers with a rural upbringing and both avid car collectors.

Pictured here are Bill and Bob Turnbull — see if you feel the same as I do. I recall so many of these types of guys when I was growing up. You would see them around or come across these older blokes who loved cars and could do just about anything in their sheds to keep them going or to restore them. Something busted? No worries: fix it. Something missing? No worries: make it. A curly issue? No worries: stick with it and think it out till the answer comes, no worries.

These sheddies were often seen at swap meets, etc., and you could almost guarantee that they lived on a good-sized plot of land and never really in the suburbs of a city.

Thankfully, there are still many of these characters around, but will they always be there or are they very quickly becoming Kiwis of the past?

Hard times and isolation create folks who make do and sort things out themselves. The much-maligned baby boomer generation grew up with these clever adults all around, and some of us even became these innovators as well, but will the next generations have the desire and the need to behave/engineer in the same way? Most probably not.

The Turnbull Bugatti brothers may be some of the last of that sheddie breed. Nowadays, a lot of the youngsters don't even own or drive a car. Even when we were teenagers we loved pulling out an engine to see how it worked and to see if we could make the car souped up so it would crack the ton in third gear. It taught us a lot about fixing things as well as quickly learning some sort of mechanical skills. Cars

meant freedom for us boomers and endless possibilities for road trips and adventures.

Now, I'm not saying these behaviours have departed the next generation entirely; they are still there, just not in the amounts that we all experienced growing up.

When I read the Bugatti brothers article, I could so easily visualise those two Turnbull men because I grew up listening to good buggers like them, and admiring their talents and wisdom.

No matter where our home-grown industries head in the decades to come, we should never forget that we are basically an agricultural economy and always should be, I reckon — that's where a lot of our sheddie innovators are and always will be.

Geez, I do hope these Bugatti brothers are not the last of their type in our fair land, but I fear they may be, and that's a sad day. 📁

Greg Vincent

Publishing Editor



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the-shed.nz

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EDITOR

Greg Vincent, editor@theshedmag.co.nz

SUBEDITORS

Karen Alexander, Richard Adams-Blackburn

TECHNICAL EDITOR

Jude Woodside

PROOFREADERS

Odelia Schaare, Richard Adams-Blackburn

DESIGN

Mark Gibson, Bobby Saunders

ADVERTISING SALES

Dean Payne, dean.payn@parkside.co.nz

ADVERTISING COORDINATOR

Emily Khov

CONTRIBUTORS

Murray Grimwood, Jude Woodside, Enrico Miglino, Bryan Livingston, Ian Sharpe, Bob Hulme, Dave Montgomery, Jason Burgess, Ritchie Wilson, Helen Frances, Tracey Grant, Lindsay Vincent, Nigel Young, Vicki Price, Janet Hunt, Bruce Hall, Thomas Hall

SUBSCRIPTIONS

ONLINE magstore.nz

EMAIL subscriptions@magstore.nz

PHONE 0800 727 574

POST Magstore, PO Box 46020, Herne Bay, Auckland 1147

**parkside
media.**

EMAIL contact@parkside.co.nz

PUBLISHER

Greg Vincent, greg.vincent@parkside.co.nz

BUSINESS DIRECTOR

Michael White, michael.white@parkside.co.nz

GENERAL MANAGER

Simon Holloway, simon.holloway@parkside.co.nz

CONTENT DIRECTOR

Isobel Simmons

PRINTING AND DISTRIBUTION

Ovato

PHONE: 09 928 4200

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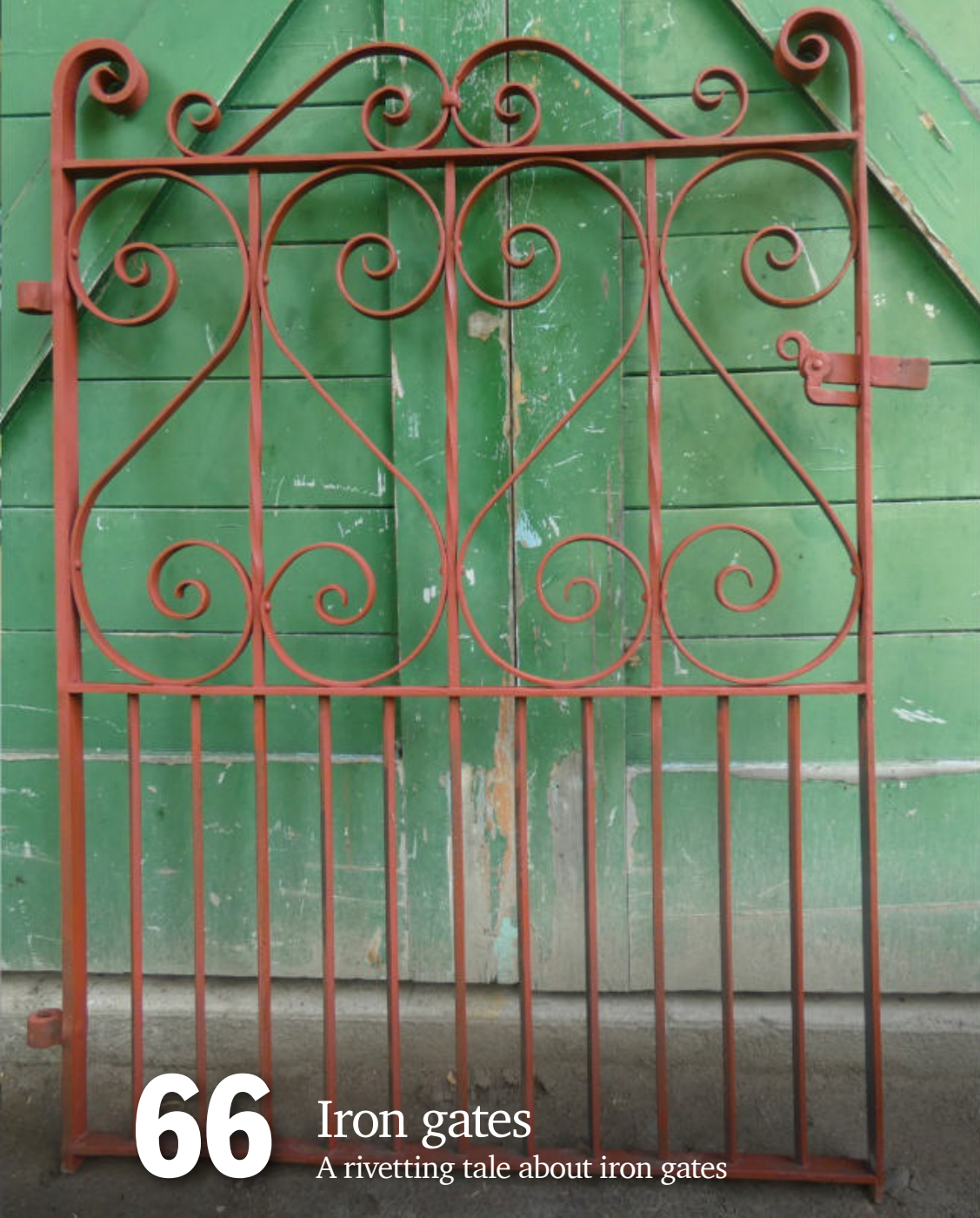
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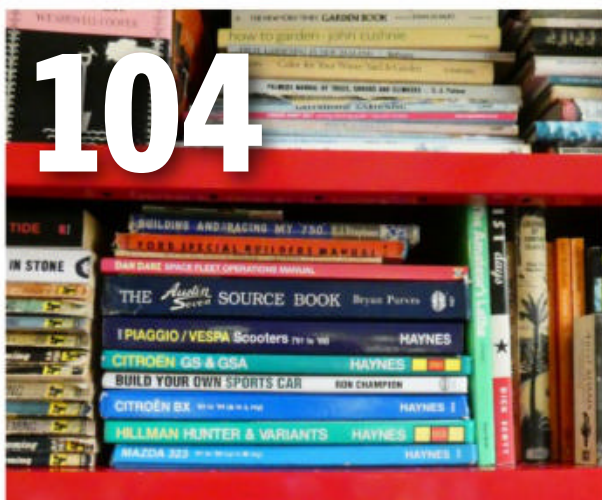
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This grandfather clock is all wooden



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SOLD

TOOLS OF THE TRADE

The delicacy of blown glass may hint at a magical world of lightness and colour, but the creation of that fragile beauty requires some heavy-duty tools

*By Helen Frances
Photographs Tracey Grant*

A bench blow. The assistant bows down the pipe while the gaffer moulds the tumbler with wet newspaper



“As glass-blowing is a specialised art and not common in New Zealand, the tools are not available to buy off the shelf”



Line boring themoil (gathering end of blowpipe) on a metal lathe

A mobile Mini Dragon furnace roars in glass-blower Fran Anderton's workshop in Castlecliff, Whanganui. Sheddie, 'doorbitch', and glass-blowing partner David Etchells opens the furnace door, and Fran takes her first gather of molten glass from the fiery crucible. David has made the blowpipe that Fran uses, and indeed many of her other glass-blowing tools, saving them both hundreds of dollars.

David reinvented himself as a rookie glass-blower and toolmaker after the death of his wife three years ago following early onset dementia. He turned to his shed and the internet for solace and inspiration and met Fran online.

Never too old to learn

David spends his time between Ōtaki, where he makes the tools for his and Fran's glass-blowing, and Whanganui, where he learns the glass arts and acts as Fran's assistant. He has been doing this for about 18 months, as well as making simple glass objects.

"I used to do clay stuff when I was a kid and as a student at teachers' college. With glass-blowing, you have to be careful you don't burn yourself and also

get used to the failures, because the glass doesn't always do what you want it to do. Every time it's out of the fire, you only have about 20 seconds to work with it. But if something isn't working, you just go onto something else," David says.

Fran's pride and joy is the portable furnace, which also doubles as a 'glory hole' — the second furnace in which glass-blowers reheat the glass object they are creating. The technological sophistication of this expensive piece of equipment combines economically with a more DIY approach to the various tools required for glassmaking.

DIY toolmaking

As glass-blowing is a specialised art and not common in New Zealand, the tools are not available to buy off the shelf. Buying commercially made tools from overseas can be pricey, any one tool costing hundreds of dollars, and that is before freight, something not necessarily factored into a glass-blower's budget. And recently there has been the wait time for the Covid-delayed postal service to get them from the US to Whanganui.

Every glass-blower has an arsenal of tools to create their glass art objects, Fran says, and, "Personal preference depends on what sort of object is ►



Checking that the outside diameter of the gathering end of the blowpipe will fit inside the blowpipe body



Reheating a piece of glass in the furnace



Blowpipe moil, wooden mock-up of moil, and plastic mouthpiece

being made and which tools the gaffer has been trained to use. Over time, they become your friends, and if you ever talk to a seasoned gaffer about his/her tools you will hear the passion in their voice. In saying that, a good tool is only as good as the person using it! Skill and precision are also elements that go into the final art piece.”

Being able to customise the tools is a huge bonus for Fran, which David is able to do in his garage-cum-shed. He has the usual lathes for metal and woodturning, a drill press, draw saw, bandsaws, linisher, sanders, grinders, an air compressor and dust extractor, and numerous filing cabinets on wheels containing hand tools and materials that enable easy access.

Glass tool making

The main tools used by a glass-blower are the blowpipe (or blow tube), punty (or punty rod), bench, marver, blocks, jacks, paddles, tweezers, newspaper pads, and various shears.

Blowpipe

David buys 19mm stainless steel pipe and cuts it to a 1.3m length. He uses white third-grade plastic for the mouthpiece.

“I measure the inside diameter, then chuck the piece of plastic on the metal lathe and cut it very, very slowly, because the plastic gets hot and frothy and jams up in the machine,” he explains.

“The mouthpiece has to be very smooth because it has to go inside the mouth and rotate”

The mouthpiece has to be very smooth because it has to go inside the mouth and rotate: “It has to not damage teeth if they get knocked — it’s a delicate procedure, so the mouthpiece has to take account of potentially fragile teeth, tongue, soft and hard palates, and soft inside-cheek tissue.”

The mouthpiece screws into the mouth

end of the pipe and has to be airtight, glued in with clear bathroom sealant, so as not to let any precious breath escape. They do wear out but are replaceable.

The other end, or tip, which David also makes, goes into the molten glass and is also airtight. He drills a 9mm hole — the only drill size that he could get to go through.

“The hole has to be absolutely in the centre,” he says, “because if it isn’t, the air pressure is more on one side, so the bubble forces out lopsidedly.”

He fashions the tip on the lathe and welds it inside the lip of the pipe. Before gathering the molten glass, the tip is preheated in the furnace. David explains, “You stick this end into the ceramic crucible where the pool of molten glass sits. The gaffer, Fran, rolls it

around until the desired amount of glass is collected, takes it out, rests it on the bench, and blows until a bubble forms. The glass cools down, so it is returned to furnace, heated up, then removed when it goes floppy. She blows again until the required volume is achieved and keeps repeating this.” ►

Some of the measuring tools that are used. The inside diameter of a piece is measured, usually when hot, so that a stopper can be made to fit



“A good tool is only as good as the person using it”

Punty rod

Made from steel rod on David's lathe, the punty is used to gather molten glass. He has made around five punties.

"I'm OK as a doorbitch and bringing the bits of molten glass on a punty to Fran who then fashions them — it could be glass for a jug handle or other bits and pieces to be added on," he says. "The bit has got to be the right temperature, the right quantity, the right malleability, and the jug itself has to be the right temperature to be able to accept the add-on — if one is too hot and the other is too cold then the whole thing shatters."

Steam stick

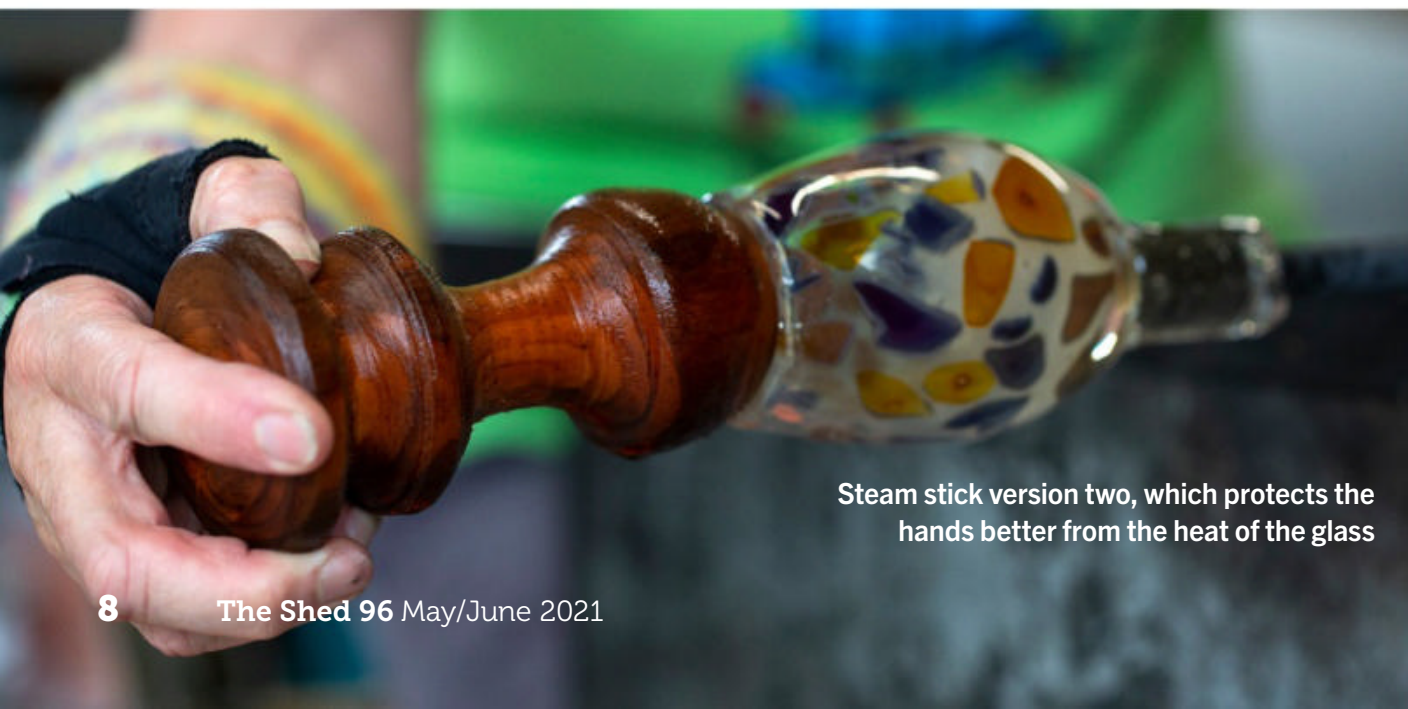
This conical-shaped tool is used to expand the neck of a vessel such as a vase or bottle. The tool is kept in water along with other wooden tools that produce steam when they come into contact with the hot glass. The heat from the glass makes the wet wood steam, the steam creates pressure, and the pressure expands the neck of the vessel. Before doing this, the vessel is removed from



The hot glass on the end of this punty is being rolled in glass colour



Pressure from steam expands this tumbler



Steam stick version two, which protects the hands better from the heat of the glass

the blowpipe and attached to the punty. The gaffer usually inserts the steam stick into the neck opening and it widens as the gaffer continues to turn the punty.

David makes different-sized steam sticks on a woodturning lathe. He uses green cherry wood sourced from a cherry orchard, which is then soaked for a couple of months before it is worked.

"You lathe the wet wood and shape it, but because it's wet you can't sand it," he says. "Then I give it to Fran. The cone shape is the bit that goes inside the molten glass so you've got enough surfaces inside the glass generating steam. The length of the cone has to be sufficient so you don't burn your hands (within 5–10cm, approximately, of the glass, otherwise your hand is going to burn). The glass is about 800°C, so it needs a long handle."

After a trial run making different sizes, David made cones based on the size of vessel that Fran was making.

"I'm one of these untrained people who sees something and has a go, and if



“I’m one of these untrained people who sees something and has a go, and if it’s wrong it doesn’t bother me, I’ll have another go”

Cutting up the steel to make a pi divider

it’s wrong it doesn’t bother me, I’ll have another go,” he says.

Pi divider

This tool is used for measuring the diameter and circumference of a glass vessel. Fran uses it for roll-ups of colour that make patterns around the outer surface of a vessel. One end of the tool is the measurement of the circumference of a circle, and the other end is the measurement of the diameter.

“We use this to make sure we have enough length of pickup colour line when Fran rolls the molten glass at the end of the punty,” David tells us.

The length of the coloured glass, which forms the pattern, is based on the circumference of the bubble.

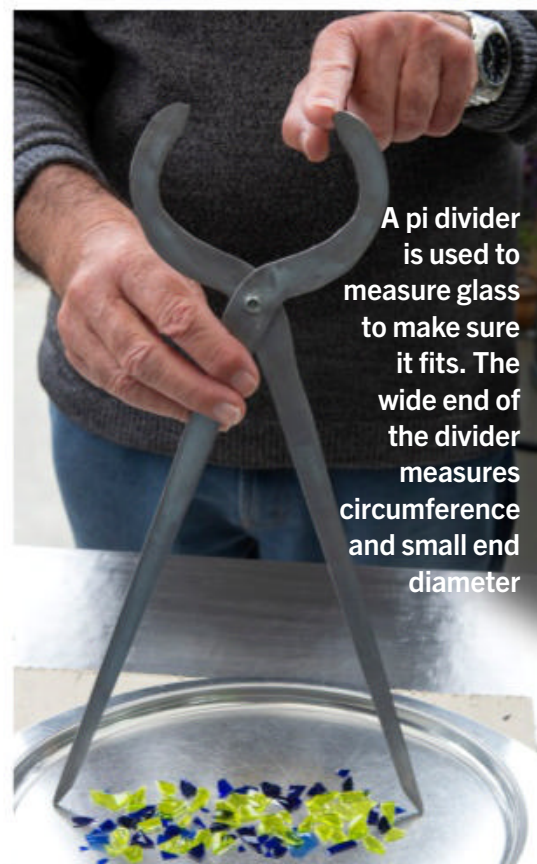
He says, “I found a pattern for it on the internet and transposed it onto paper, marking holes so I could cut it out of MDF to make a template. Once I had a template, I put it together to see if it would work and it did. I transposed the template onto some sheet steel, then cut it out using a cutting disc and an angle grinder, then smoothed it off using progressively finer flat discs.”

Corks

The square corks are used to squash a round molten-glass object and make ▶



Using the template of the pi divider to mark out the pattern on the steel



A pi divider is used to measure glass to make sure it fits. The wide end of the divider measures circumference and small end diameter



Cork blocks for flattening glass

Block

The bowl-shaped block is used to smooth and shape molten glass into a rounded shape. David makes these out of cherry wood on his lathe and keeps them soaked in water. They create a layer of steam as the molten glass is shaped. The tool is used at the beginning stages of glassmaking, before the glass is blown. Wooden blocks are usually used for making paperweights or anything round.

“Wet newspaper is used as a barrier on top of the hand to shape the hot glass,” says David. “You can wear gloves, but they can’t be wet, as they produce steam and burn the hand inside.”

Spatula (paddle)-shaped tools

David took offcuts from making one of the blocks.

“I thought, *Oh, these might be useful*, so I carved them up and put them on the finisher, got them nice and flat, and they get used a lot, making the bottoms of the stems — the flat bits of glasses,” he says.

Heart shaper

David welded a sheet of mild steel to make a T-shape so it would stay flat: “You cut a little knick in it where the heart goes and place the hot glass where you want the heart dent to form. Fran has been making hearts for 17 years. My hearts are more like squashed blobs.”

Flattening and shaping a glass head on the marver

The hot glass is rolled in glass powder to add colour

Gathering containers

These contain the coloured powder or frit with which the gaffer colours clear glass. Fran collected a number of coffee tins from Mitre 10 where she works in the garden centre. The shovel- or scoop-shaped gathering containers contain enough powder in which an object, such as a glass tomato, one of her signature fruit forms, can be rolled.

“I thought, oh yes I can do that,” so out with the grinder, out with the hammer and I made them,” she says.

Fran takes a gather from the crucible at around 1100°C.

“The tomato colour is red powder contained in the coffee-can shovels. The clear glass is at the end of the blowpipe and you roll it, then heat it up so it melts in, then you do two or three more layers,” she explains. Fran rolls a shaped piece — such as one of her signature fruits, a bottle, or vase — in the powder and reheats it so that it melts into the glass then repeats the process several times.

Marver

This piece of steel glass-blowing ‘furniture’ that David made has a polished top and is set on a tea trolley-type stand with wheels.

“The trolley was my first bit of welding and hasn’t fallen to pieces yet after one-and-a-half years,” David says. “Coloured glass frit is laid out in a pattern and measured with the pi divider and spread accordingly on the 12mm steel plate of the marver to ensure there is enough when Fran rolls whatever she is making along the marver.”

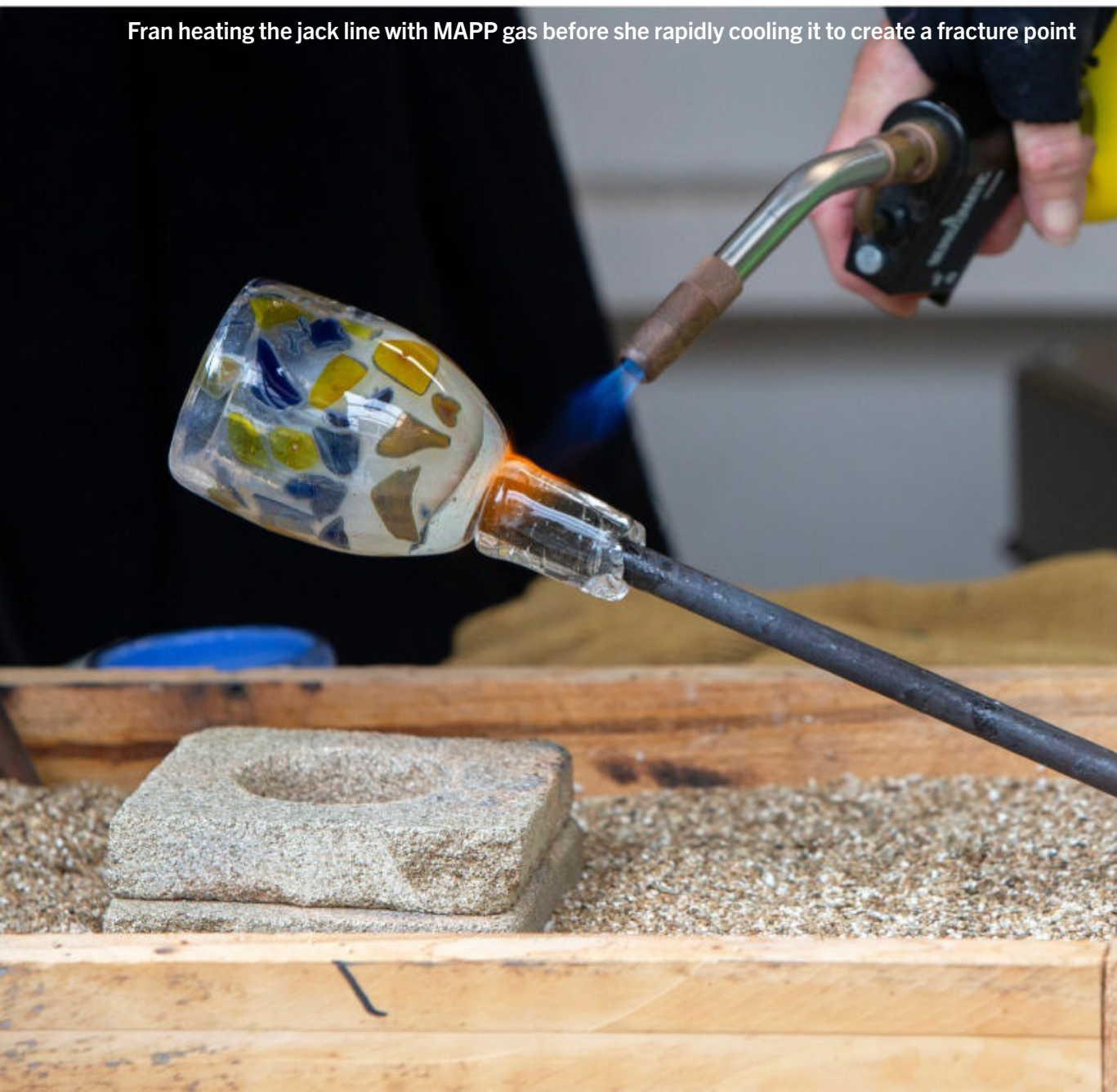
Rolling on the marver forms a cool skin on the outside of the molten-glass blob and shapes it.



The name of this table, ‘marver’, is derived from the old Italian word for ‘marble’

“The trolley was my first bit of welding and hasn’t fallen to pieces yet after one-and-a-half years”

Fran heating the jack line with MAPP gas before she rapidly cooling it to create a fracture point



Knock-off box

David made the wooden box where the hot glass object is ‘knocked off’ the punty before going into the annealer. The box is filled with vermiculite — “like kitty litter,” he says — it isn’t flammable and retains the heat.

The annealer, or annealing oven, slowly cools hot glass objects after they have been formed to relieve any residual internal stresses and make the objects tougher.

The heat in the annealing oven (basically a type of kiln) is around 515°C, and the glass has to be in for around 20 minutes to get the stress point out. It is set to 515°C for six hours while they fill it up with glass artworks. The last piece in will get 20 minutes, and then it goes down to 445°C, sits there for about 30 minutes, then slowly goes right back to about 300°C, and so on. It takes two days before the glass can be removed. ►



Making the steam stick
version two from wet cherry.
After two months of soaking,
the wood smells a bit

Getting A Head

David prepares the colours with which he will decorate one of his quirky glass heads then pre-heats the punty rod.

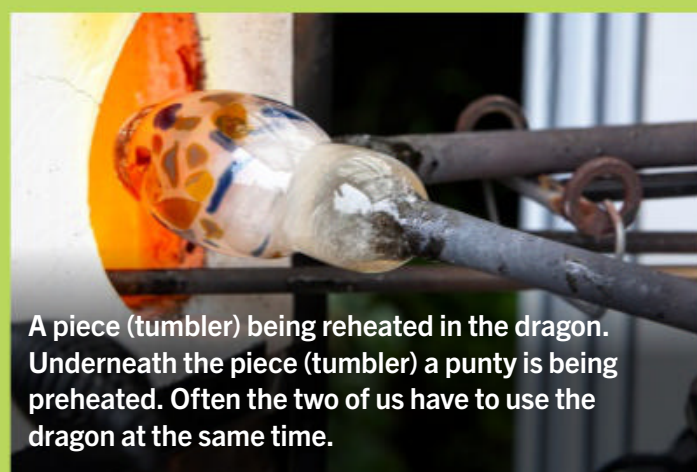
He dips the punty into the crucible of hot glass and gathers a blob of glass (a gather) then rolls the gather on the marver to get a shape, reheats the glass, spreads some coloured glass powder on the marver, and rolls the glass on the punty to pick up the colour.

He heats the glass to melt in the colour, gathers more glass, shapes it on the marver, reheats, then flattens the glass on the marver with a wooden paddle, which he made.

“Snip some cuts in the top of the head to look like hair using garden shears, reheat the glass, push indents into the face so it will accept eyes, nose, and mouth, put in the eyes, nose, and mouth, reheat the glass, stretch the neck to give you something to mount the head with, then reheat the glass. Put a stress point between the punty and the neck using diamond shears then go to the knock-off box, where you tap the punty with a piece of wood to fracture the stress point so the head breaks away from the punty.”

Wearing a face mask and thick leather gloves. he picks up the head with a pair of modified tongs and transfers it to the annealing oven, where it will cool from around 800°C to room temperature over 36 hours. ►

Sorting out the bits of frit to be used as eyes etc.



A piece (tumbler) being reheated in the dragon. Underneath the piece (tumbler) a punty is being preheated. Often the two of us have to use the dragon at the same time.

Jacks opening up end of tumbler



Jacks cutting in a Jack line - creating a stress point



Shears cutting a hair-line in the glass head



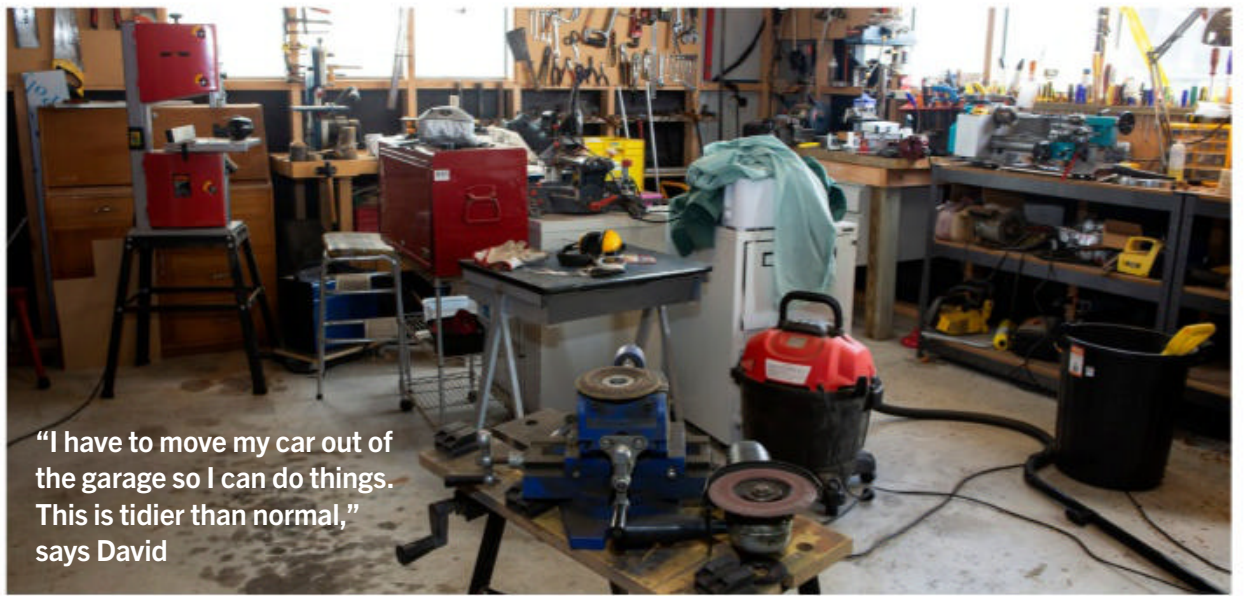
Tapping punty line to create a fracture point to knock off the tumbler into the knock off box.



This is blowing a starter bubble in the first gather.



Carrying the hot piece of glass from the knock-off box to the annealing oven. Personal protective equipment has to be worn to protect you from the radiant heat



"I have to move my car out of the garage so I can do things. This is tidier than normal," says David

All fired up

As Fran's assistant, David makes sure that everything is ready for the next session.

Wednesday mornings at 8am they start heating the furnace, and by 1pm they can start making some things, but usually by 3pm the glass really "comes around," David says. With the furnace at 1100°C, Fran does a gather of clear glass on a blowpipe to start making a vase then sits at her bench, resting the pipe and turning it as she blows air into the glass through the pipe, forming a bubble.

There are many trips back and forth to the furnace because the glass needs to be kept above 1000°C. She shapes the glass

using various tools and methods such as the marver, wooden paddles, perhaps a block, or by rolling in wet handheld newspaper. When the hot glass is rolled on wet newspaper, the steam creates a barrier. It has been used by the Venetians for many years and is remarkably efficient.

Fran uses a jack to make a jack line to knock off the piece onto a punty to finish the shape then prepares a little bit of glass to connect to the glass piece. Once the punty is prepared, she connects the punty pipe to the glass piece and then knocks off the glass piece onto the newly connected punty pipe.

The Mini Dragon furnace. Using a laser thermometer, Fran checks the temperature. Glass-blowing pipes and punties are preheated prior to use





Making glass swizzle sticks. Here, David is twisting the glass with an old pair of fire tongs



Cutting a gin stirrer off the end of a punty with a pair diamond shears

“I get a kick out of blowing glass every time I do it”

Finishing pieces

When the punty transfer is complete, the bubble inside the glass is opened up. Jacks and/or steam sticks are used to stretch the opening. When Fran is happy with the shape of the piece, she knocks it off in the knock-off box to place it in the annealer.

As part of finishing some pieces, such as the fruit for which Fran is well known, she does sandblasting and can also spend several hours taking the gloss off objects using diamond pads.

Glass-blowing is an expensive business. The furnace burns through a whole bottle of gas every Wednesday, and then there are the materials. Raw glass from Germany is around \$7 per kilo. Coloured glass is upwards of \$50 per kg.

But cost apart, glass-blowing is a lifestyle and a passion Fran says: “I get a kick out of blowing glass every time I do it. Sometimes it can be frustrating, but the reverse is [also] true when everything comes together. At the end of five hours of hot, sweaty work, the muscles are tired, but it is a happy tiredness.” ►



Always prepared

David has worked as an emergency management officer at Upper Hutt City Council; the district health board as a disaster management designer for pandemics and fires; and for Civil Defence, writing exams and training resources and training people for emergency situations such as earthquakes, floods, and fires.

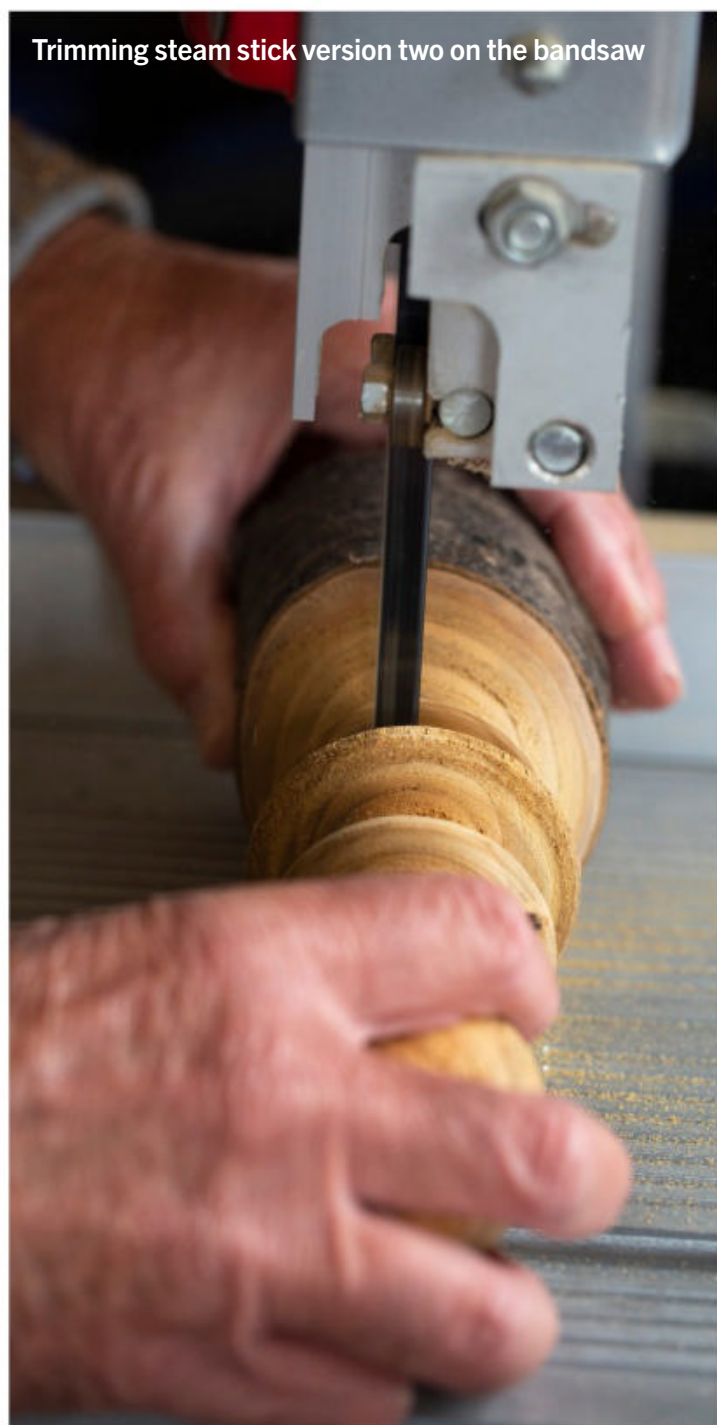
He transferred his skills into writing examinations and resources for the Aviation, Tourism and Travel Training Organisation. He drives a 1991 Mazda MX-5, which he races

at Manfeild and usually comes last. “I’m very proud of that. I’ve been racing for 15 years. It’s a confidence and concentration thing” — he’s still working on that.

David moved to Ōtaki six-and-a-half years ago, “with whatever I could carry in my sports car and began a new life”. He also collects chess sets with missing pieces, making replacements on his metal lathe, and has also crafted a complete giant chess set. He is currently making a ‘glory hole’ for Fran’s glass-blowing.



The wooden trial blowing end next to the finished and used article



Trimming steam stick version two on the bandsaw

Frantic Glass

Fran completed a three-year glass design and production diploma in 2003 and has worked in many glass disciplines since. Her work has included pâte de verre, fused glass, cast glass, and now mainly blown-glass pieces.

“I have had a fascination with glass since I was young,” she says. “Forays into collecting bottles used to drive my ex-husband crazy. For many years, I ran and operated a small business making pressed-flower pictures. This introduced me to how to handle flat glass.”

After completing the three-year diploma, she set up her own studio, eventually buying a small stucco house in Castlecliff with a large double garage and a lean-to extension that she used for setting up her cast glass work.

“Eventually, my old lean-to workspace needed renovating, so I took the plunge and had a new studio built by Versatile Garages. This has made a huge change to my working practice and is a joy to work in,” Fran says.

A self-declared introvert, she spent many months researching how she could blow glass from her home-based studio.

“In February 2019, my new Mini Dragon furnace arrived from America. It is the only one of its kind in New Zealand, so there have been many lessons to learn in the last two years. I have been grateful that David has shared this journey with me. The advantage of David working on site with me is that he can see first-hand the work a certain tool needs to do and therefore design one to suit,” she says. 📁

Frantic Glass

138 Karaka Street, Castlecliff,
Whanganui 4501, New Zealand
Phone: 027 263 7546
Email: franticglass@gmail.com



David says: “Two different types of heads and a person made by me. I also made the stool”

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CREATIVE THINKING AND PRACTICAL DOING

Auckland Library of Tools:
Tom Greer, volunteers
Sarah Tanfield and
Nico Woodward, and
Amanda Chapman
(co-founder)

Two complementary projects are creating virtual sheds for inner-city dwellers in central Auckland

By Ian Sharpe

The rise of apartments in central Auckland is generating a new kind of shed. Hackland started a couple of years ago, and is a place where people can work on projects. It has just moved into new premises at 21 Newton Road.

Founders Helena Teichrib and Cameron Stewart are keen to make Hackland as much an ideas factory as a shared workspace. They have around 40 members, who pay a weekly subscription for using the two-storey space, which features a more impressive array of tools and machinery, often belonging to members, than shown in these photos.

Large space for projects

Downstairs is a well-equipped metal shop and a large woodworking area with thicknessers, drill presses, lathes, and a CNC machine whose bed can take a full sheet of ply. A laser cutter is being set up in a booth; the industrial robot arm is already installed and can be programmed to do virtually anything in 3D.

One member is keen to build jigs that will use robotic processes to manufacture components of a modular building system

using 40mm square fir struts. Civil engineer Cameron sees this as an example of the way that he hopes the space will develop. Hackland might appeal to design graduates who have no way to build their prototypes cost-effectively. They will also have the advantage of people around them with the skills to work out how to 'productionise' their idea — often an expensive exercise.

Hackland is born

That's how Cameron got started. After moving here from Australia, he found second-hand furniture expensive so he hit on the idea of designing and building his own flat-pack system, for which he needed a CNC machine and the space to put it. While he has prototyped some stools and chairs, his idea is now on hold while he builds up Hackland. Right now, that involves building in a sawdust extraction system downstairs — essential for keeping the place clean and usable.

Helena, an industrial designer, entrepreneur, and cheesemaker, says that members often come along for the community as much as the workspace.

She explains the induction process is designed to tease out the willingness of prospective members to contribute as well as their desire to build.

"Some people say they are not very handy so it's not for them, but we welcome them if they add something in other ways. We want them to come to learn and there are just two criteria: curiosity and kindness," she says.

New members join by turning up for the open night — 6pm to 9pm on Thursdays — which finishes with three tasks: to put something where they think it belongs, to teach someone a skill, and to improve the space in some way.





The new location for ALOT, 21 Newton Rd, Eden Terrace.

A library of tools

Hackland shares its premises with a complementary home-grown venture: the Auckland Library of Tools (ALOT), which also operates on subscription. ALOT could, theoretically, handle dozens of new members. However, co-founder Amanda Chapman says that all staff are currently volunteers, so if it really took off they would have to reorganise.

Co-founder Tom Greer says the library has 140 members at present, but 500 have subscribed for a time. It has around 700 tools but the inventory is growing fast as Amanda is promoting the library effectively through social media, picking up tools that people have no more use for.

Tom says that Amanda started building a tiny house — difficult without tools. What she needed was a tool library. As there wasn't one around, she decided to start one "with zero tools". The library had a soft launch in March 2019, with about 100 "totally random" tools.

"Civil engineer Cameron sees this as an example of the way that he hopes the space will develop"

Suits many DIYers

The library works well for people without much garage or shed space. Frequently used items include garden tools such as mowers and hedge trimmers. Many people join for a time because they are working on a particular project; the library is ideal for those short-term scenarios. A mitre saw and a circular saw are the top items lent out, but ALOT also has specialised equipment such as nail guns and tile cutters.

If you want to join, or you think you could help out by donating tools in good condition, get in touch via the website. To find out exactly what's on the wish list, see aucklandlibraryoftools.com/tools-wanted.



Hackland's Helena Teichrib and Cameron Stewart

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:

Video of Brent Sandow's knife-making workshop

In Issue No. 92 of *The Shed*, we featured master knife maker Brent Sandow. While we were there, Brent gave us a guided tour of his well-equipped knife-making workshop. Be prepared for workshop envy



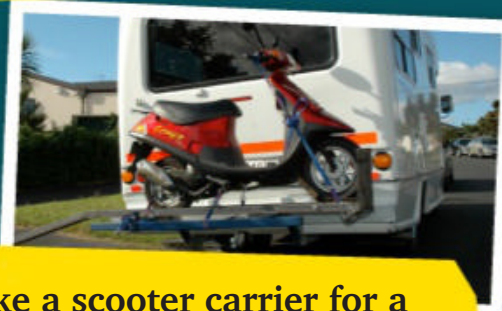
Meet the bike dude

Gary Sarten, who still lives in the house where he was raised in rural Taranaki, spends much of his time repairing bikes to give to local children



Installing wooden sliding doors

French doors give a house much readier indoor-outdoor flow, especially when they open onto a deck. Learn 'how to' from a couple of building experts, including a young Stan Scott



Make a scooter carrier for a camper van

Owning a camper van means you can take your house on holiday with you. The downside is you need to pack up your whole holiday site when you want to drive off and get some fish and chips for dinner

SOME PARKERISING TIPS

Dear Ed.,

I used your article on Parkerising steel on some coil springs for a vintage motorcycle that I am restoring — they were originally Parkerised — and they came out just fine. I didn't have a crockpot so I used a stainless steel copper-bottomed pot, which worked fine. I also used tap water as I didn't have distilled water. For the second washing of the parts I used boiling water, which heats up the parts and they dry much quicker

However, I have a couple of questions that I hope you can answer.

Is it necessary to keep the mixture on the boil all the time? I did, just to make sure, but it evaporated quite quickly and I had to top it up. I also added small quantities of acid and dioxide at the same time. Will the process still work if the temperature stays below boiling?

What is the residue in the bottom of the pot after having done a number of items over about three hours? Some of it has stuck to the pot due to keeping it on the boil. Baking soda seems to soften some of it to make it come loose.

Do we have to stir the mixture from time to time either to stop this residue from forming and sticking or to maintain the

strength of the mixture?

Can the mixture and/or the residue be stored for later use?

The steel wool has also vanished! Where did it go? And what does it do in the mixture? I teased it out as required, but it was so much that it covered the bottom of the pot and as soon as the mixture started boiling it drifted up to the surface, probably due to air bubbles getting stuck in the wool. I also had to hang the springs in horizontally as they were too long to go in up straight. The first one went in on top of the steel wool. Is this good or bad? After 30 minutes it came out pitch black, but after washing it I had to wipe off a lot of loose black powder. The following ones that came out did not have this black powder, ending up the same colour as the first one. What was this black powder? Maybe I should not have kept it at boiling point, but just under?

Does the manganese dioxide dissolve when in contact with the acid or does the heat dissolve it? Or maybe it doesn't dissolve at all and that is what the residue is?

Regards,
Brian Warren



Hi Brian,

I'm glad that your springs turned out fine. This sort of finish is ideal for them, as any coating type of finish is likely to crack as the spring flexes.

The mixture does not have to be kept boiling while parts are being treated, but should be maintained at a temperature just below boiling. However, if the mixture is a bit too cool, then that will mean the time for soaking the parts will need to be a bit longer.

Where does the steel wool go? I could say that it magically disappears, but it is consumed in the reactions involving the acid and the manganese dioxide. Stirring is not usually needed and I avoid doing that as a stirrer can introduce contaminants.

The black powder remaining after the process is a by-product of the chemical reaction, but if you have an excessive amount, you may have added too much manganese dioxide. It may have stuck to the bottom of your pot due to too much heat.

When using the mixture to treat parts one after the other rather than all in together, you will notice that the mixture will lose potency and the last part to be treated will need more time in the pot. After treating the last part, I recommend neutralising the mixture with baking soda to make it safe.

Don't store the mixture for future use, as it will have lost much of its effectiveness. A fresh batch made when you are doing the job is best. Trying to rejuvenate an old mixture by adding more chemicals is a waste of ingredients.

I hope these comments help. Hopefully we can see some pictures of progress on your vintage bike in the future.

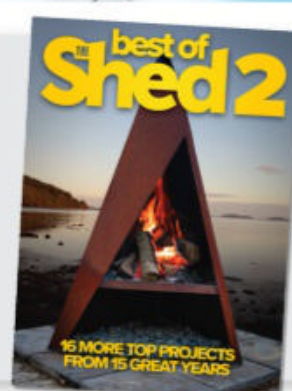
Cheers,
Bob Hulme



LETTER OF THE MONTH PRIZE

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A BEACHCOMBER'S LAMP

A handmade lamp makes for a unique host gift — and the offcuts provide the maker with a tasty meal

By Dave Montgomery

Photographs: Dave Montgomery



Beachcomber tabletop lamp

A few years ago, I was invited to stay at a seaside bach. I had a great time and as a way of a thank you, I made the owners a 'beachcomber's lamp', like the one I have made for this article. The design theme was to use materials, as

one might imagine, that could be found along the coast.

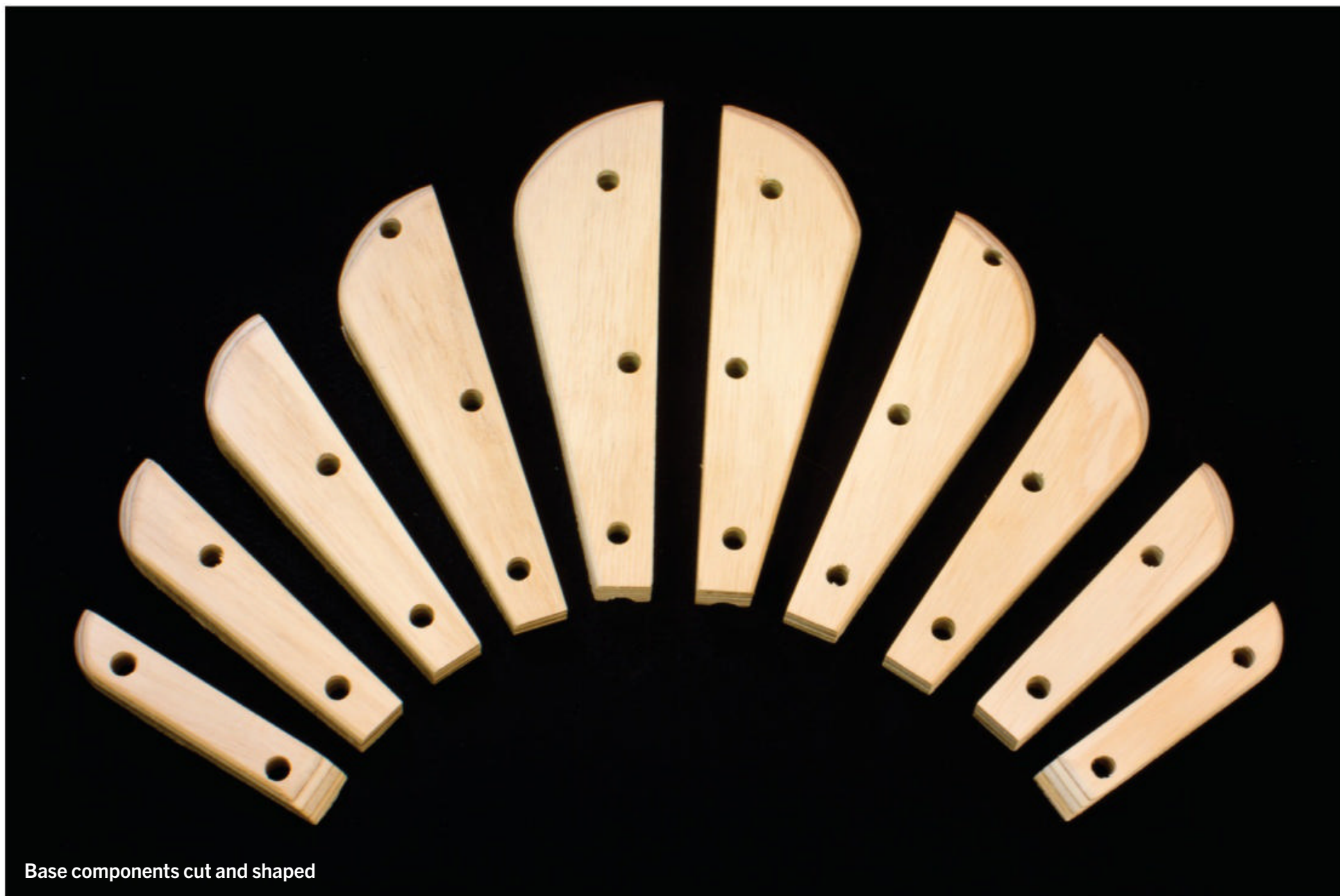
The light source is a 12V automotive LED festoon commonly used as an interior courtesy light. The LED is mounted in a festoon holder, making

it a snap should the LED ever require replacement. These types of lights range in size and brightness, as do paua shells. I selected the size of the LED once I had my paua shell, as I could determine what I thought would be a good fit.



A shell nut in a nutshell





Base components cut and shaped

Lamp components

The base is made from 18mm ply. Ten pieces are cut to shape, and each piece is tapered on a linisher. This creates a fan shape when the pieces are laminated together. Pockets are created in the inner two-most pieces to accommodate the electrical components. The base is held together with dowel pegs and PVA glue.

Both the vertical stand and horizontal arm are made from 9mm rimu that I salvaged from an old bungalow door that someone was throwing out. Pockets are made for the wiring and, with the wiring placed in the pockets, each component is assembled and held together with dowel and more glue.

The electrics consist of a mains adaptor (12V 2A), corresponding DC jack, a push-on / push-off switch, festoon holder, and LED festoon bulb. Wiring within the paua shell shade is protected from any excessive heat with heat-shield sleeving.

The shade

The lampshade is a paua shell. A more intrepid sheddie than I may wish to harvest their own shell; remove the flesh; and clean, sand, and polish it, all the while enjoying a paua fritter or two

on the side. I, however, purchased my finished shell from a reputable vendor for around \$25. Paua shells are graded by quality and size. The one I used for this project is an A-grade trophy-sized shell. Trophy-sized shells are over 150mm in length and only around two per cent of Paua harvested grow to this size.

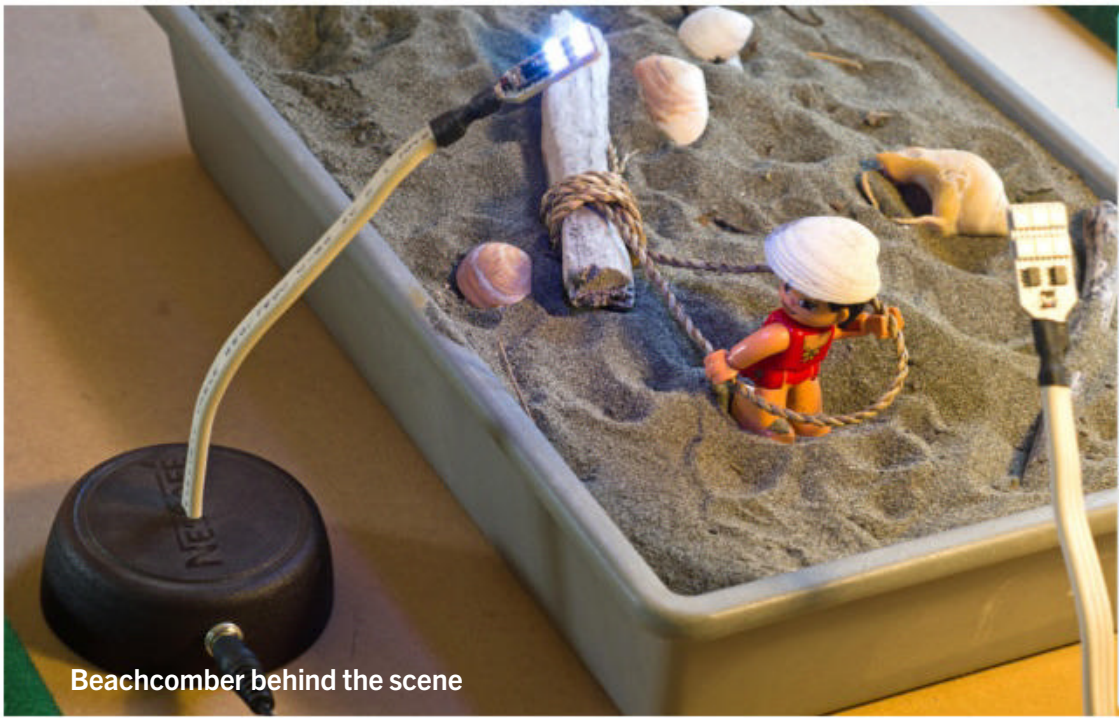
Construction

The horizontal arm holding the paua shell is made from two halves to hide the wiring. The arm is cut, filed, and abraded to shape. To get the initial shape required to hold the paua shell, I photographed the shell profile, imported it into my CAD package, and scaled it to actual size.

For the original lamp — still enjoying life at a bach in the Coromandel — I used a strip of modelling clay across the top of the shell then carefully removed this and traced the outline directly onto the stock of wood.

The channel for the wiring can alternatively be done by forming a rebate on the inside of each piece, starting at the rear of what will be the mortise, to where the wires will emerge for the shade. Once the wires are in place and the two ►

“Remove the flesh; clean, sand, and polish it, all the while enjoying a paua fritter or two on the side”



Beachcomber behind the scene

Automotive LEDs

My initial experimentation with automotive LEDs was when I was doing close-up photography. Erecting lighting stands and off-camera flash units was a chore when the scene was small enough to be photographed on the kitchen table. I thought: *Why not use miniature lighting to light miniature scenes?*

I fashioned automotive lights onto single-core mains cable, which allowed for the light stands to be bent to the right angle. Coffee-jar lids were used as bases, and two 12V DC jacks were fitted to each base. The dual DC jacks allowed me to daisy-chain several light stands around the scene as required.

halves are joined, a strip of wood is inserted into the channel formed by the rebates. The strip is shorter than the rebate length, forming a mortise to fit the tenon of the vertical stand.

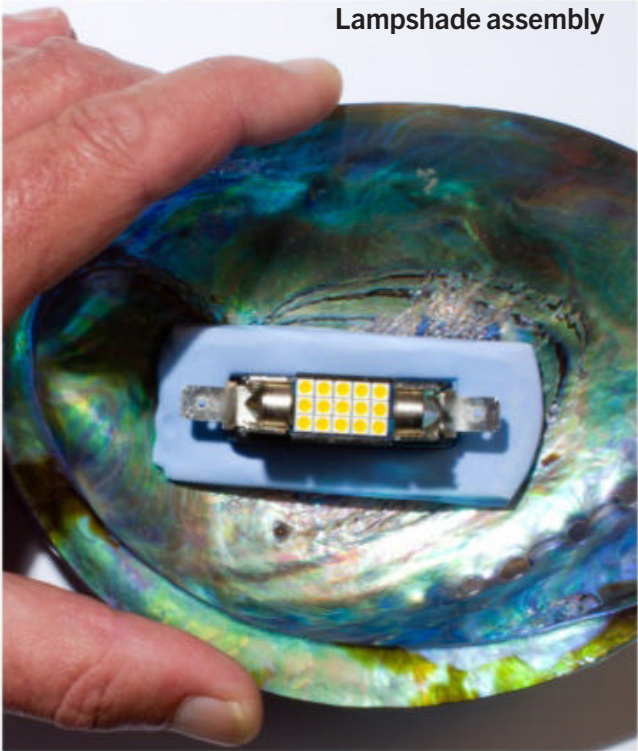
The vertical stand was made in the same fashion as the arm. Tenons at each end were cut by hand with a tenon saw.

That beach look

I included seagrass in the design to give the lamp more texture and that 'beach look'. To get a good tight finish with the seagrass, I looped one end from back to front to back again and then coiled the seagrass, ensuring that it was tight and compact as I went. When the desired



Festoon, baked spacer, and paua shell



Lampshade assembly



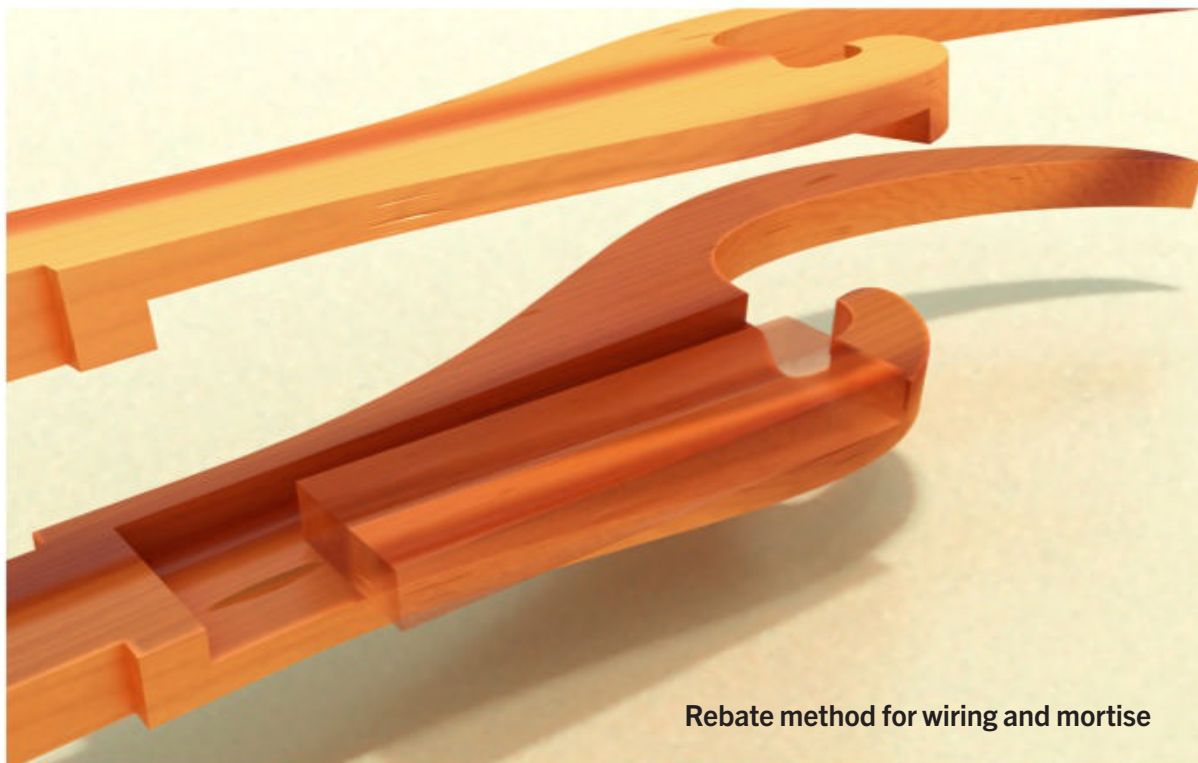
Drill-press glue jig

Lashing the seagrass



Nutus nautilus



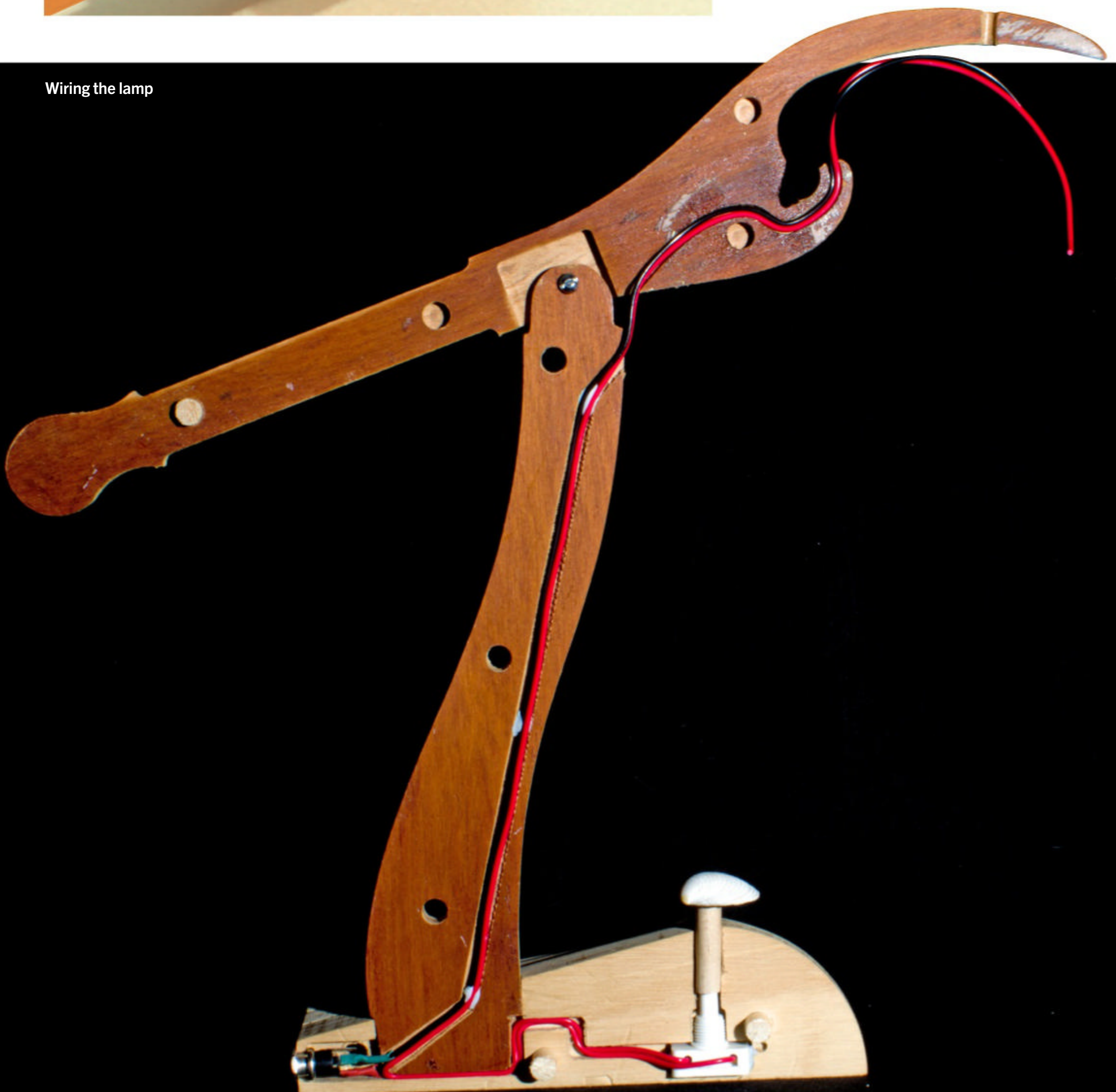


Rebate method for wiring and mortise

length of the lashing is reached, simply feed the end through the loop and pull it under the seagrass.

The festoon holder has a flat mounting surface that is not suitable for directly clamping to the shell. I used modelling clay for the festoon holder-to-shell spacer. Mould the clay to the inside of the shell and press the festoon holder into it to really make an impression. This type of clay requires baking in the oven for 30 minutes on a low heat. Carefully remove the clay and bake it. Once baked, the clay can be sanded and drilled. The spacer stops the festoon holder from becoming loose. ►

Wiring the lamp



“Speaking of which, you now have a great excuse to take those long walks along the beach”

Your new excuse

The on/off switch is activated with a shell glued to a bit of 8mm dowel. I used epoxy glue, which takes time to cure. Enlisting the aid of a drill press keeps the two pieces still until the glue is set.

The locking nut is fashioned in a similar manner, with a threaded stand-off for the nut. I added a locknut, washers, and screw to the end that is potted with the epoxy

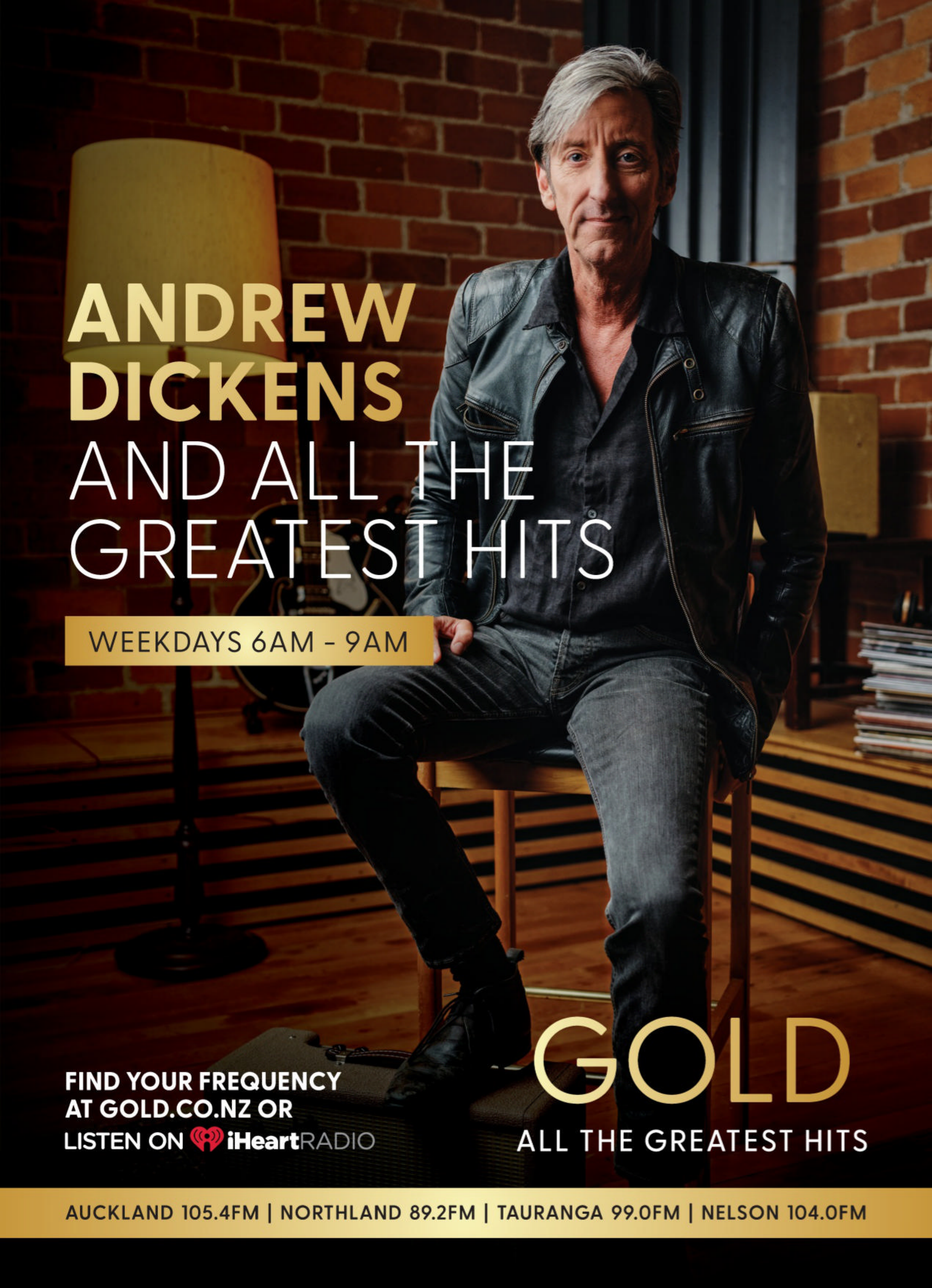
glue. This provides extra surfaces for a better bond.

The paua shell is thinnest where the paua had been attached and right about where you would drill the hole. It is best to bake the clay and use it to help support the inside of the shell when drilling, taking it slow and easy.

Speaking of which, you now have a great excuse to take those long walks along the beach.

Happy beachcombing! 🐚





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MASTERING THE LATHE 4

Learn the finer points of taper turning on the lathe

By Bob Hulme

Photographs: Jude Woodside



The turning blank

Ever had trouble coming up with the right gift for someone who seems to have everything? Well, here's an idea that's ideal for a keen gardener. Our project this issue is a stainless-steel dibble and it's more than a coincidence that it is a good example for demonstrating taper turning. But first, a brief explanation of the purpose of a dibble, for those of us without green thumbs.

A dibble is pushed into the soil to make a hole to plant a seedling. After the young plant is placed into the hole, the dibble is used again to close the hole around the plant's roots. Using this method ensures

good support for the plant and makes life easier for the gardener.

Materials

This dibble is made from 316-grade stainless steel to give the best corrosion resistance. If the dibble is going to be a gift that will be kept clean and dry, 304-grade stainless is fine. The 304 grade is a little lower in cost and is easier to machine.

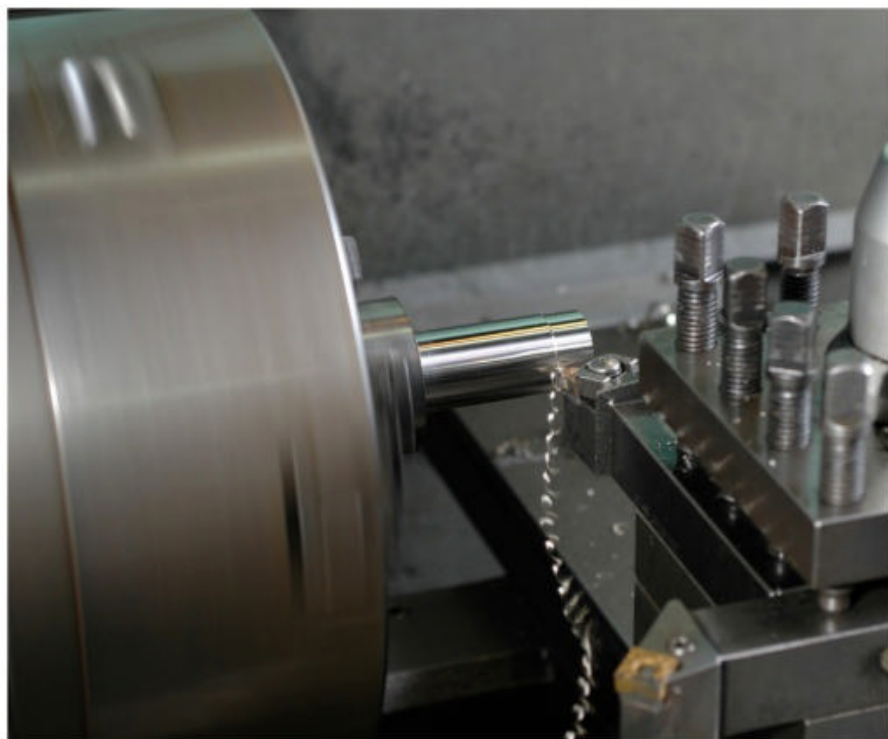
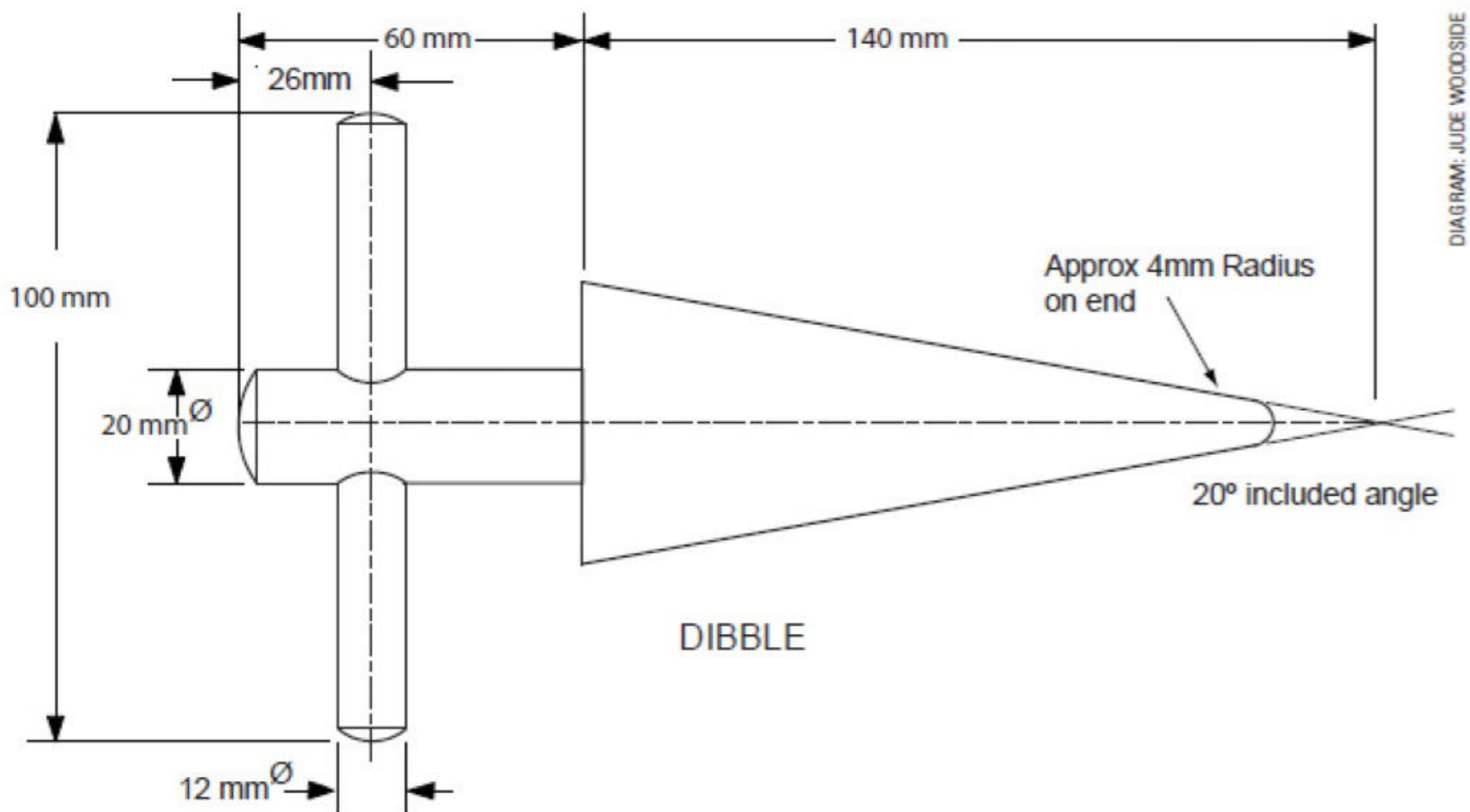
The main body is made from 50mm diameter bar, while the cross handle is made from 12mm diameter bar. To achieve a bright finish, you will also need

emery tape, some fine-grade wet-and-dry paper, as well as some metal polish. There are several brands of metal polish on the market, such as Autosol, Blue Magic, and even good old Brasso.

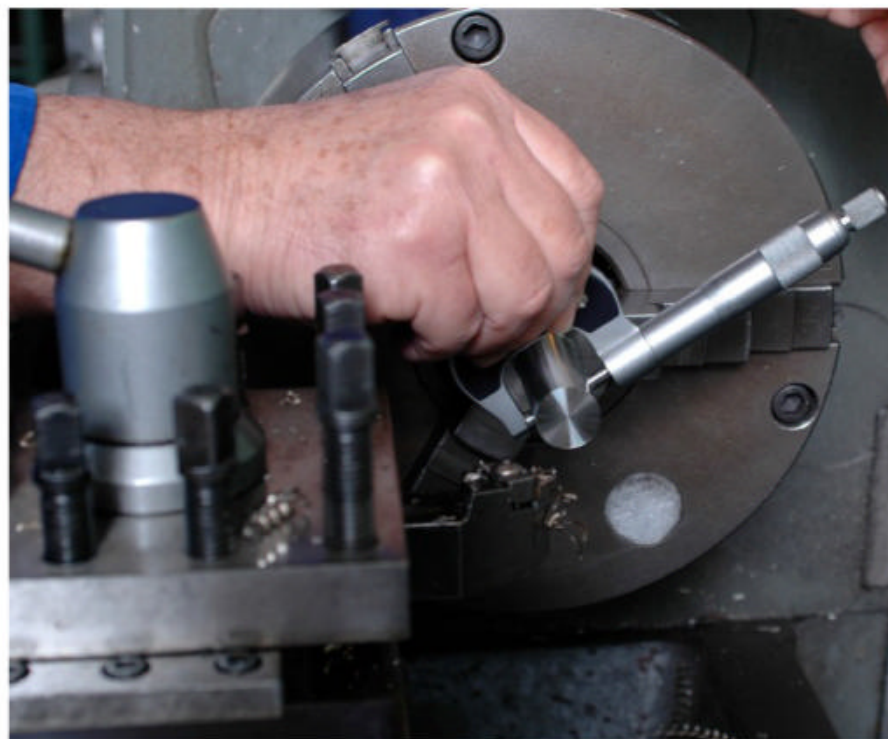
Procedure

As I have mentioned in previous articles in this series, it is vital to plan the job through completely before cutting any metal.

By working out the best sequence of operations we can avoid disasters and ensure that the job flows along with ease. For the main body of the dibble,



Turning the handle



Testing diameter

turn the smaller diameter at the handle end first so that this can be held in the lathe chuck while turning the tapered end. Form the radius on the end, and polish the surfaces at that end before re-gripping the job in the chuck — once the taper is turned you will not have this opportunity again (use a piece of thin aluminium from a drink can around the job to prevent marking by the chuck jaws — as described in the previous issue [*The Shed* Issue No. 95]). After you turn the tapered end main body, drill the cross hole. Taper turning is described further on in this article.

The cross hole for the T-handle must be accurately drilled in the centre of the 20mm handle end or it will look really

shabby. It will be difficult if you are using a drill press and is best done in a milling machine or mill/drill machine. To centre the hole, if you do not have a special edge-finder tool, you can get quite good results using a piece of plasticine and a pin (see panel, Centre Drilling).

You can use the same method to position the hole lengthwise on the handle part by lining up the pin tip with the end of the dibble and then winding along the 26mm on the longitudinal table handle.

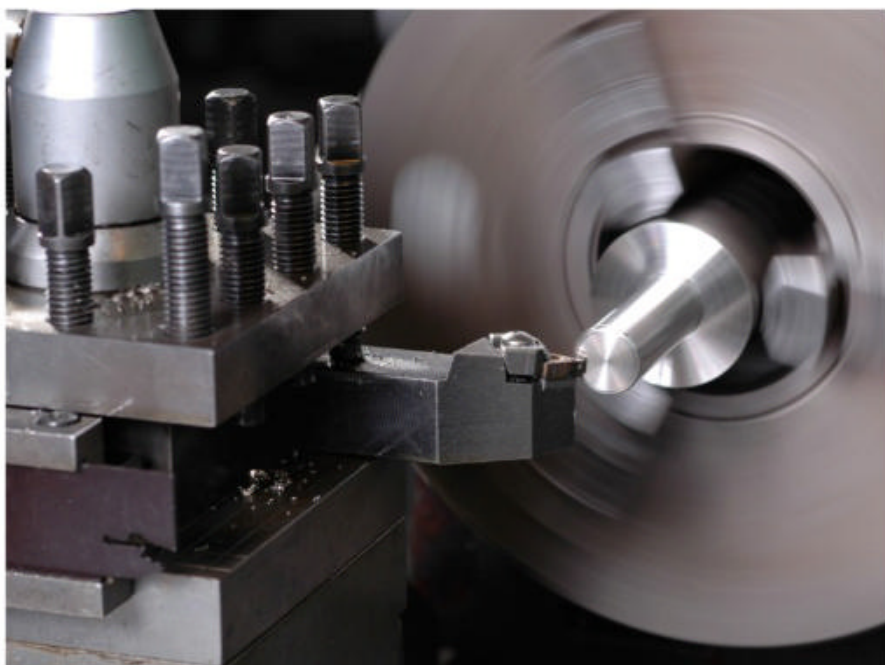
If you do not have a milling or a mill/drill machine, then I suggest that you pop into a local engineering shop and get them to do it, as it would be a shame to ruin all the good work you have done up to this point by having an off-centre hole.

It is surprising how obvious even a small deviation is to the naked eye.

Cross-hole fit

The other aspect of this cross hole is its diameter. A tight fit is essential, so care is needed to make this happen.

Drills will often cut a little bigger than their nominal size if you don't pre-drill with a smaller size. I suggest you use a centre drill first. These are stubby and quite rigid, will produce a start to the hole on centre, and will not wander. Then drill through with a 6mm drill or similar size. Ideally we want an 11.9mm size hole. This will be very tight on a 12mm cross handle, but once you have polished the cross handle it will be under 12mm in diameter.



The end of the handle



Turning both the cross slide and compound slide handles simultaneously

Measure it before finally drilling the cross hole to make sure that it is not already smaller than 11.9mm. Ideally, it should be 11.91 to 11.93, but in any case above 11.9mm. If it is too tight in the hole, you can polish it down later for the right fit. In drilling the cross hole, a 15/32-inch drill is 11.906mm so is OK for the final drilling size.

To make sure that it cuts on size, sharpen it and then just touch the shoulders of the drill point on the grinder so that there is a very slight chamfer.

Also pre-drill with a size just below the 15/32 inch so that there is not much load on this drill. So, in summary, centre drill, then 6mm drill, then 10mm drill, and finally the 15/32-inch drill with the special sharpening.

The cross handle is cut to length and then each end is turned to give a rounded shape. To achieve a good fit in the cross hole and avoid scratch marks, turn the diameter down by 0.1mm for 40mm of its length. When assembling the cross handle to the main body, make sure that

you slide the small end into the hole first. This means that the cross handle will not get scrape marks and be a tight fit only where needed. Polish the cross handle all over before fitting.

The desirable fit is best described as a 'firm tap fit'. This means you will need to use a soft-faced hammer to make it go in but not have to hammer it so hard that it leaves marks on the end of the cross pin. If you think the fit might be a bit too 'easy', you can use a product such as Loctite or similar.

Centre drilling

To centre the hole in the handle, if you do not have a special edge-finder tool, you can get quite good results using a piece of plasticine and a pin. With the centre drill in the drill chuck, squeeze the plasticine onto it and push the pin into the plasticine so that it points downwards on an angle.

Start up the spindle motor and touch the end of the pin gently with the edge of a rule or similar until it is spinning without wobbling at its tip. This should then be indicating the centre axis of the spindle. Bring the spindle down (or table up) until the pin tip is very close to the fixed jaw of your machine vice. You should be able to line up the pin tip and the inner face of the fixed jaw by eye to within 0.15mm. We can call this location the 'zero point'.

It is important that, when winding the table over to find the right position, you come on to the zero point travelling in the direction that you will wind the table out to when moving to the centre of the dibble handle. This eliminates backlash error. Good lighting is important for this too.

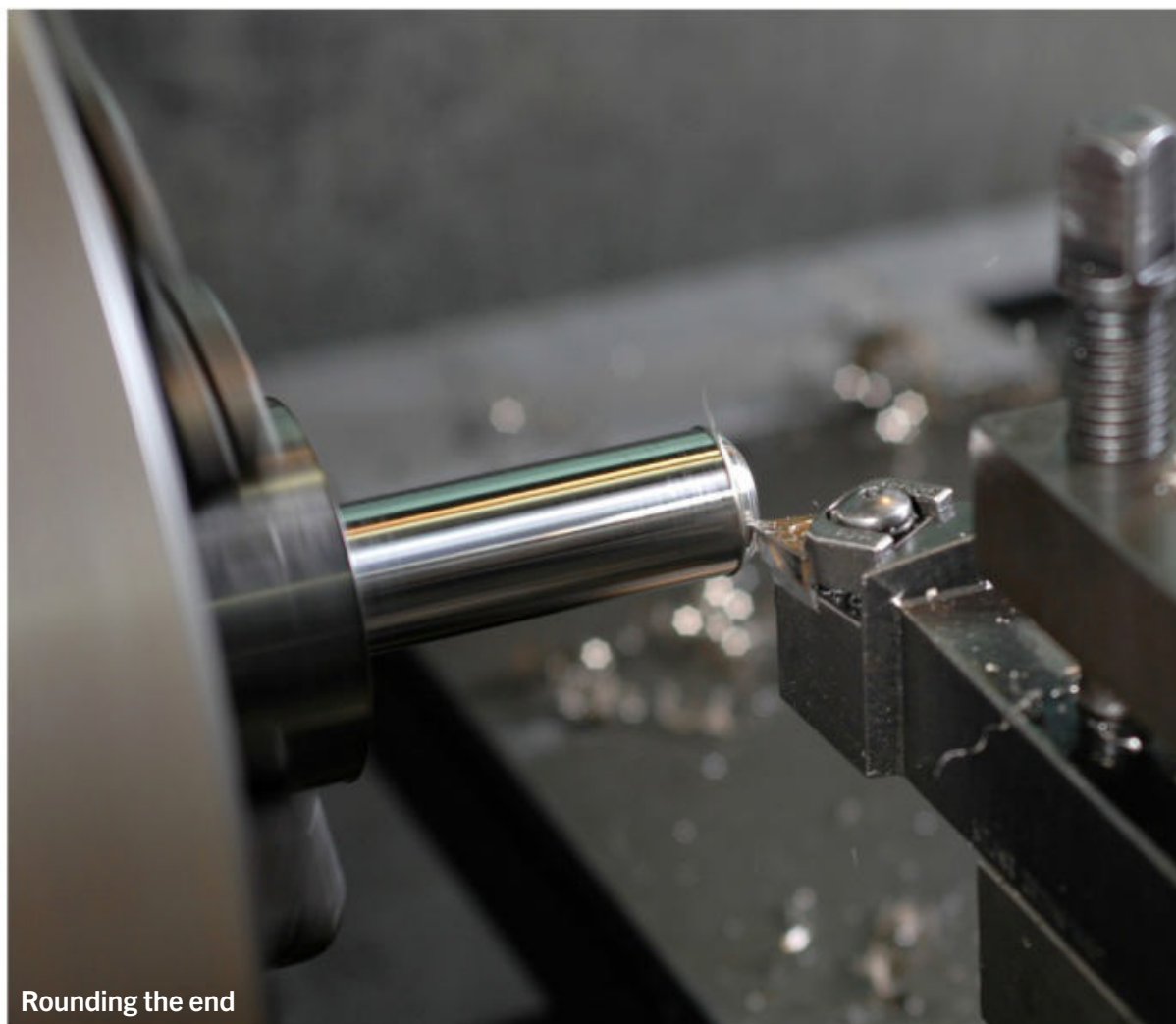
Once the pin tip is positioned as well as you can judge it, set the table cross handle dial to zero. Then wind it a further 10mm so that it will be directly over the centre of the 20mm handle area of the dibble. Measure that part first and wind over half of the actual diameter if it is different to the 20mm on the drawing. This diameter does not have to be too accurate, so it is OK if it is not dead on.



Centre finder



Pilot hole boring



Rounding the end

“So, in summary, centre drill, then 6mm drill, then 10mm drill, and finally the 15/32-inch drill with the special sharpening”



File finishing

Taper turning

There are a few methods of taper turning in a lathe, each with their own advantages and particular suitabilities.

1. Set over the tailstock method

This involves turning the job between centres and offsetting the tailstock. The advantage in this method is that the cutting tool can be power-fed and is good for long, slight tapers. The limitation is

that only slight or shallow tapers can be cut.

The tailstock needs to be readjusted back to the centreline of the lathe afterwards.

2. Compound slide method

This involves loosening the compound slide and swinging it around to the desired angle of the taper, using the gradations at its base and retightening

the bolts. If you know the included angle of the taper, then set the compound slide to half of this. The saddle is locked in place on the lathe bed and the cutting tool is fed by hand, using the hand wheel on the compound slide.

The advantage here is that it is quick and easy to set up. The disadvantages are that you must feed by hand and that you are limited by the length of travel of the compound slide. This can, however, be dealt with by taking two ‘bites’ at the taper.

3. Lathe attachments

It is difficult to purchase these now because CNC lathes can be easily programmed to produce tapers, and the two methods described already can satisfy most requirements on manual lathes. A taper-turning attachment that was available pre 1960s clamped to the lathe bed. It had an inclinable guide bar that moved the cross slide as the saddle moved along the lathe bed. Hydraulic attachments were once popular for producing a variety of shapes, and these can also be used to turn tapers. A template must be made first for the stylus to follow.



Taper set-up

The cutting tool is moved hydraulically according to the movement of the stylus. I have one of these units in my workshop, and it is surprising how useful it can be. To make this project, we will use the compound slide method because the taper on the dibble is comparatively short and is too steep for the set-over-tailstock method.

Radius forming

The radii on the ends of the cross handle and the main body of the dibble do not need to be particularly accurate or even perfect in shape. They do, however, need to look good. To produce these shapes, it is possible to approximate the curve by turning both the cross slide and compound slide handles simultaneously.

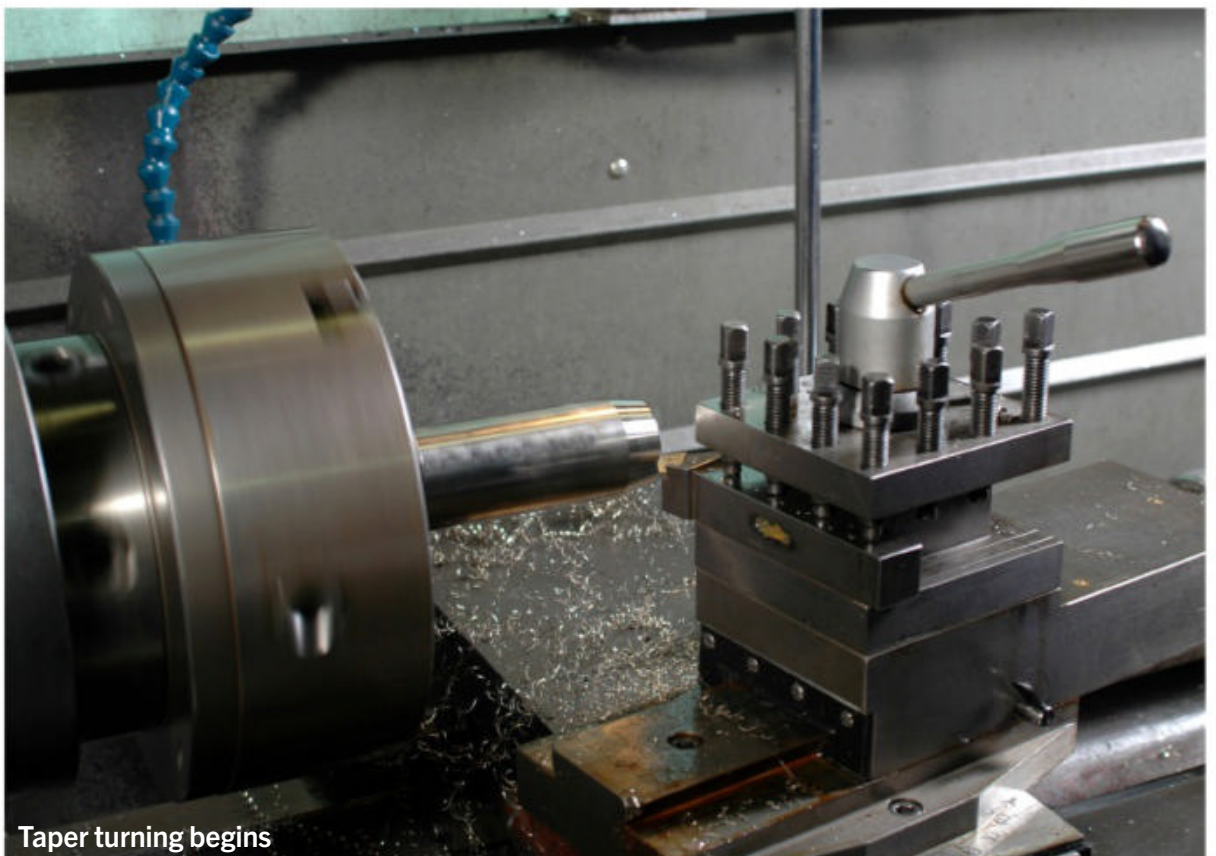
Practise this technique on some scrap first, as it is a skill that can be developed. Once the shape is approximate, use a file against the rotating job to smooth and refine the shape.

Always use a file on a lathe left-handedly to avoid having your left arm (and sleeve) dangling above the spinning lathe chuck with the obvious danger of getting caught up.

Reduce the speed to around 350rpm for filing. Faster speeds tend to ruin the file teeth.



Mounting turning with shim



Taper turning begins



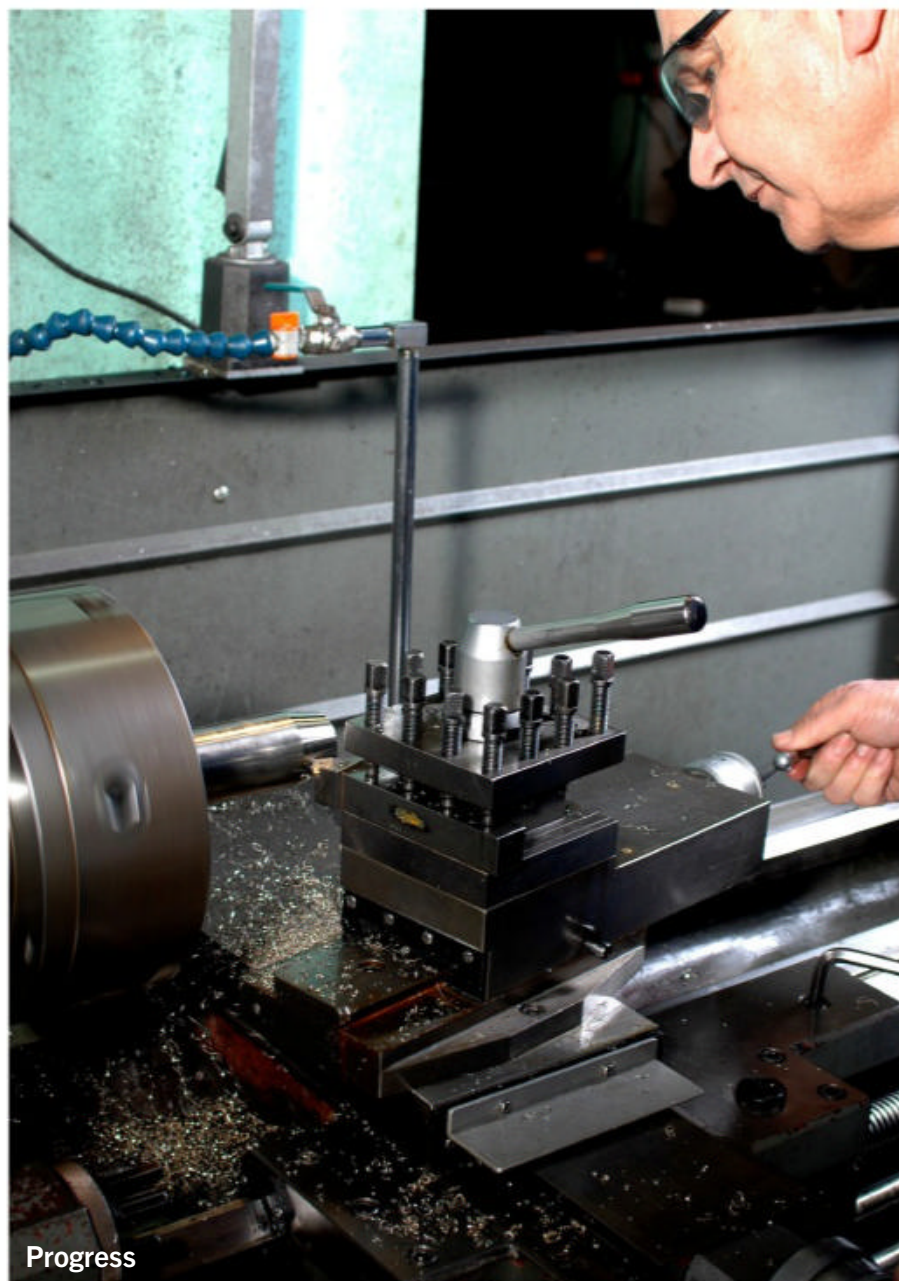
Angled cutting



Carriage set to 10 degrees



Polishing taper



Progress



Hydraulic copy lathe

At the risk of prattling on, another thing to remember is to never, never lay the file across the lathe bed. It can easily scratch those slideway surfaces that we rely on for the accuracy and smooth working of our precious lathe.

Polishing

The degree of polish needed will depend on whether the dibble is for your own use or for a gift.

Polishing is labour-intensive and involves first smoothing and blending the shapes with emery tape. Use a grade that is no coarser than you really need. With too coarse an abrasive, you only have

more work to do later with progressively finer grades.

Stainless steel is not perfect in its corrosion resistance, as anyone with a stainless kitchen benchtop can tell you. Just leave an old baked beans tin sitting on the bench for a day or two and you end up with a rusty ring that is etched into the surface of the stainless steel. Having a good polish on stainless steel improves its corrosion resistance and goes a long way to keeping it looking great.

Emery tape is used first because it is generally suited to the coarse grades of abrasive and is good for getting the shape right and blending radii to straight surfaces, etc. Depending on how good a surface finish you achieved turning the job, start with 80- or 100-grit emery tape.

When you have an even finish and the machining marks are gone, go to a finer grit, such as 180, and repeat. Keep stepping up to finer grit sizes, changing to wet-and-dry paper after 180 grit. It should be looking pretty impressive once you have given it a good spinning with 320 or 400 paper. Wetting with kerosene can also be helpful. To make that final

“Stainless steel is not perfect in its corrosion resistance, as anyone with a stainless kitchen benchtop can tell you”



Pattern follower



Dibble parts showing cross handle

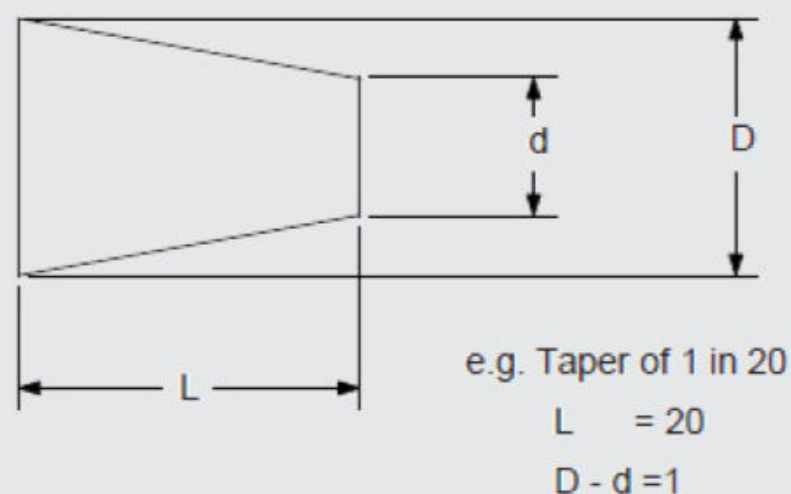
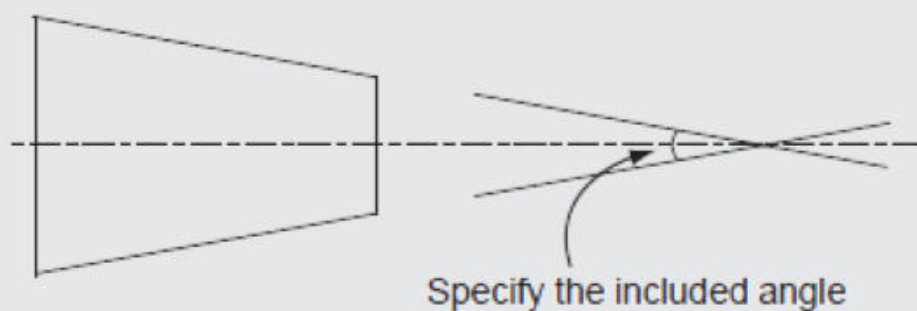
brilliant shine, use a small piece of clean rag with a paste-type metal polish, or even use a buffing wheel on your bench grinder if you have one.

A nice touch would be to have the finished dibble engraved to make it a special gift. Happy turning and happy gifting and gardening! 📁

Specifying a taper

Morse tapers are a standard range of sizes commonly used in tailstock spindles, taper shank drills, etc. The actual tapers vary slightly from size to size. Because they are old, long-established standards they are usually specified in inches per foot.

Morse taper No.	Taper inches per foot	Taper per mm on diagonal	Included angle		
			Deg.	Min.	Sec.
0	0.626	0.05205	2	58	54
1	0.599	0.04988	2	51	27
2	0.599	0.04995	2	51	41
3	0.602	0.05020	2	52	31
4	0.623	0.05194	2	58	31
5	0.631	0.05263	3	0	52





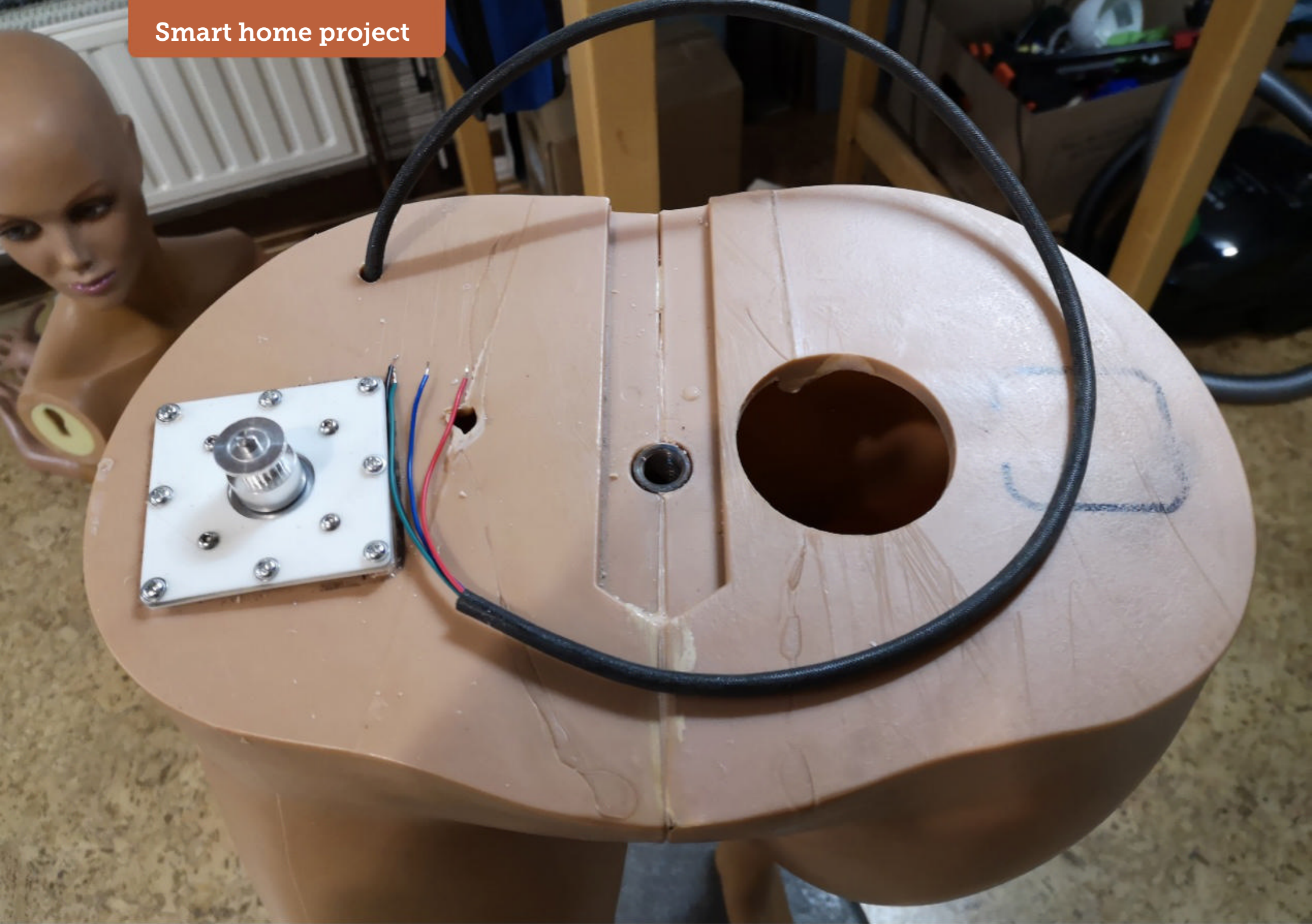
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BUILDING A BORG

Upcycling a vintage mannequin mixes technology with artistic thinking

By Enrico Miglino

Photographs: Enrico Miglino

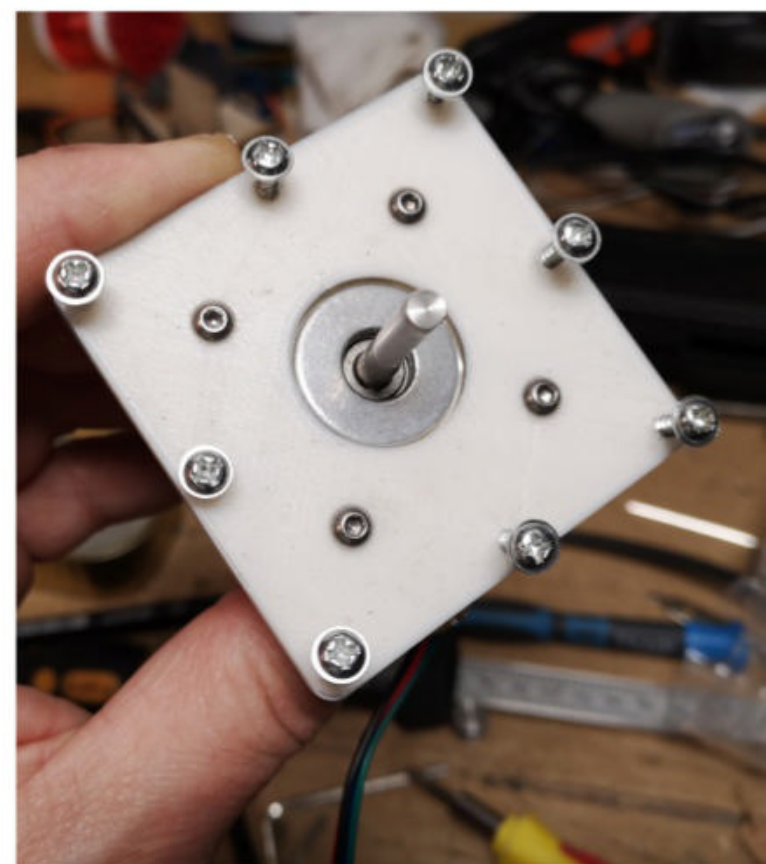
In this special instalment of our Smart Home series, a mannequin from the early 1960s has been transformed into a Borg and then — just recently — into a guardian to take care of my home security when I am away, and ... something more.

The mannequin upcycling was my first and, as it turned out, a very complex

vintage upcycling challenge. When I got it standing on its pedestal in my living room, I spent a couple of weeks just thinking about what to do with this 'creature'.

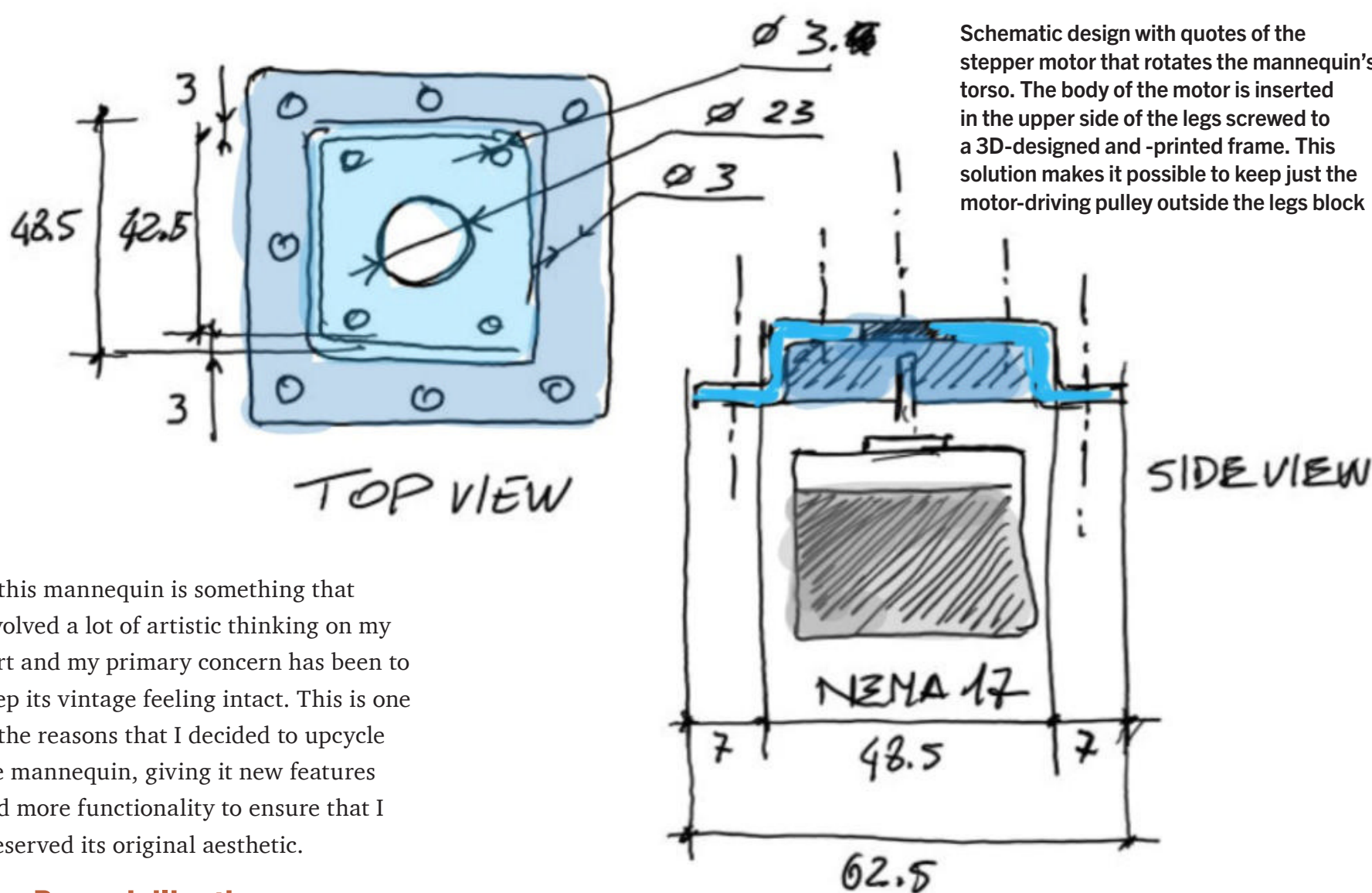
I had never seen how a mannequin is constructed internally, and I bet that in the following decades the technology will have changed considerably. The upcycling

The stepper motor fixed to the 3D-printed frame inside the top surface of the legs. This surface was originally the base connected to the torso (upper block). The original mannequin had not been designed to rotate but only to be moveable, assuming several static positions to better exhibit clothing. The stepper motor control will be connected to the torso hosting the power and motor controller through a hole drilled on the torso surface





“I spent a couple of weeks just thinking about what to do with this ‘creature’”



Schematic design with quotes of the stepper motor that rotates the mannequin's torso. The body of the motor is inserted in the upper side of the legs screwed to a 3D-designed and -printed frame. This solution makes it possible to keep just the motor-driving pulley outside the legs block

of this mannequin is something that involved a lot of artistic thinking on my part and my primary concern has been to keep its vintage feeling intact. This is one of the reasons that I decided to upcycle the mannequin, giving it new features and more functionality to ensure that I preserved its original aesthetic.

The Borg civilisation

According to the *Star Trek* science-fiction franchise, the Borg civilisation is based on a hive, or group, mind known as 'The Collective'. Each Borg drone is linked to The Collective by a sophisticated subspace network that ensures that each member is given constant supervision and guidance. The collective consciousness gives them the ability not only to share the same thoughts, but also to adapt quickly to new

tactics (en.wikipedia.org/wiki/Borg).

The creation of the upcycling detail started from a design, followed by several revisions. While the project was still on paper I focused on a series of tasks:

- give motion
- enable interaction with the surrounding environment
- give the ability to communicate (voice, sounds)
- integrate some lighting effects

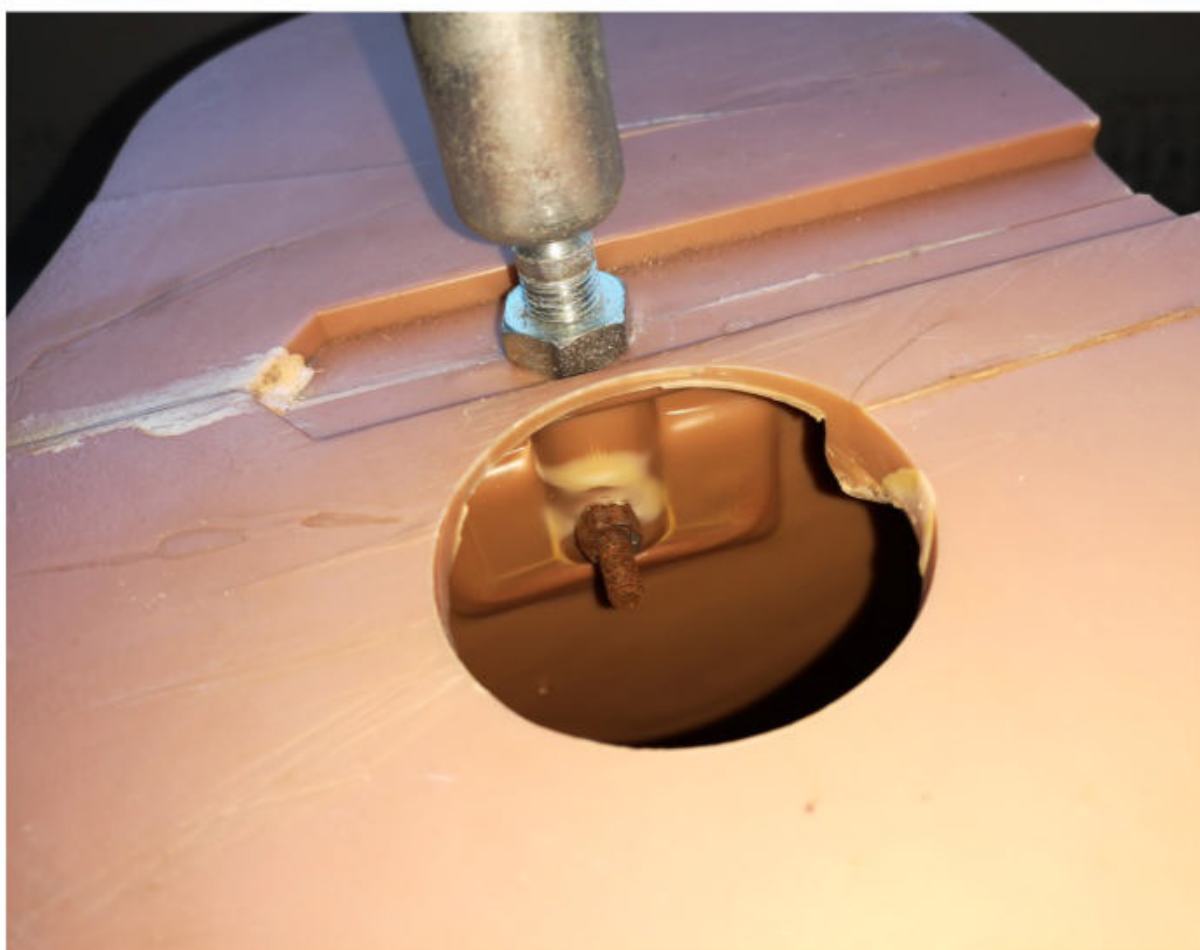
- approach natural language interaction.

Improvising the rest

Following these tasks, all the rest has been improvisation. One of the most difficult aspects you should expect when replicating this project, or doing something like this, is the software development. This phase required working with most of the components ►



The ingenious shaft screwed to the bottom block to keep the torso in place. I have reused this part with a simple hacking. The spring has been blocked on the spherical base after the shaft has been put perfectly axial to the torso for smooth rotation. After all the components have been assembled in the torso structure, its weight is increased about three times, requiring robust support to give stability



“The Borg civilisation is based on a hive, or group, mind known as ‘The Collective’”

“One of the most difficult aspects you should expect replicating this project, or doing something like this, is the software development”

already in place, and just FYI, it's not easy to reach inside the body of a human-sized mannequin.

As this was the first time that I had attempted this type of upcycling, it was not possible to draw on previous experience and I spent a lot of time on development and testing.

I worked intensively during all my spare time for a couple of months on this humanoid project. Sometimes when I was in my lab, I had the sensation of living in some sort of science-fiction movie.

Moving what I can

The first task was the design of the mechanics to make the mannequin move. The character is built in two parts: the torso and the head are connected to the legs, inserted on a heavy metal pedestal; something like the 'woman cut in half' at a magician's show.

The head can't be moved, as it is a single piece together with the shoulders, so any kind of rotation is impossible. Adding the head rotation would require cutting off the neck, which I considered too risky for the aesthetic of the body for a somewhat doubtful result.

The torso includes four articulated joints: the arms and the wrists. Both were built in a way that made it impossible to create a fluid motorised movement without a drastic mechanical change and totally rebuilding some parts. Moving the shoulders and wrist joints remains a fascinating idea, not yet abandoned, but not viable for this particular project.

If I find another mannequin, I plan to include this kind of motion. Seeing the finished Borg today, I think that animating the torso rotation was the right choice. ►



The top surface of the legs. To the left there is the 20-tooth pulley fixed to the stepper motor shaft, while the central position is to the non-rotating side of the lazy Susan bearing. The top part will be fixed to the torso for the upper body rotation. The diameter of the 3D-printed bearing can support the weight of the torso for a fluid rotation. Note the vertical shaft at the centre of the bearing that will hold the torso part



The torso rotation

To install a stepper motor to enable the torso rotation (reducing as much as possible the impact of the body of the motor itself) I assembled the body of the stepper motor inside the bottom part of the body.

I cut a rectangular hole on the back of the mannequin to access the motor controller and assemble the other electronics and wires at the bottom of the torso. All the bottom components and wiring have been added through this hole.

Basically, I designed the Borg architecture around a Raspberry Pi and an Arduino Uno — the microcontroller is to manage the movement and the analogue inputs, while the embedded Linux represents the brain that controls the behaviour of the animatronic, simulating a certain level of consciousness.

To achieve the movement functionality most of the work involved solving problems and issues related to mechanics.

A weighty issue

A challenging problem was the weight of the torso. After installing all the parts inside the body I was expecting a weight of some kilograms, however I discovered an efficient solution — 3D printing a lazy Susan bearing.

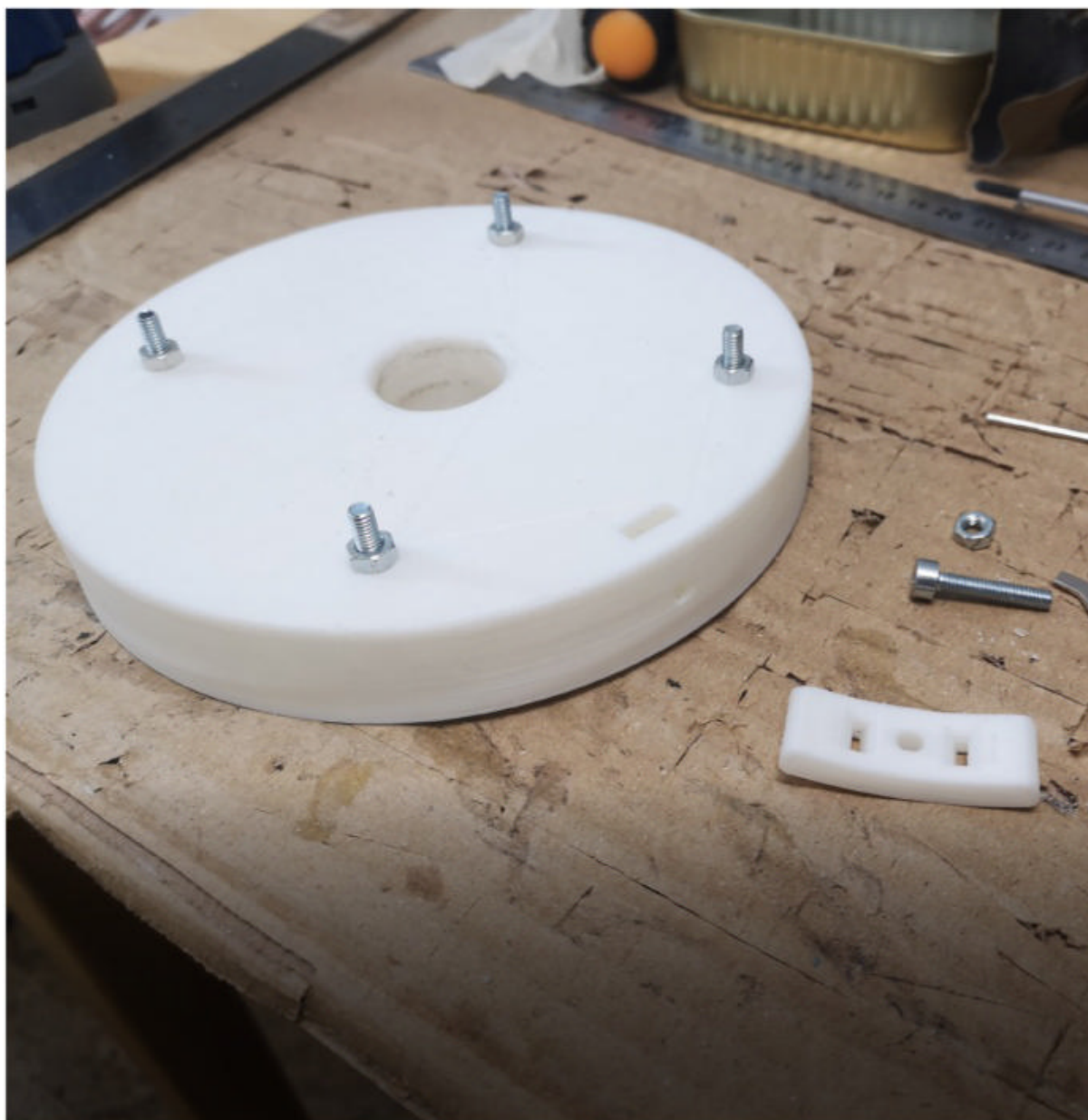
The torso lies on a consistent base while the stepper motor can be inserted in a square hole beside the bearing and connected to it through a tooth belt. When I put this in place, this solution proved the more efficient way to avoid an excessive increase of the distance between the base and the mannequin torso, thus keeping the right body proportions.

After making a square hole in the leftmost side of the base, I designed the stepper support with Fusion 360 so that the motor body can fit inside the top surface of the legs, while the only visible part is the 20-tooth pulley.

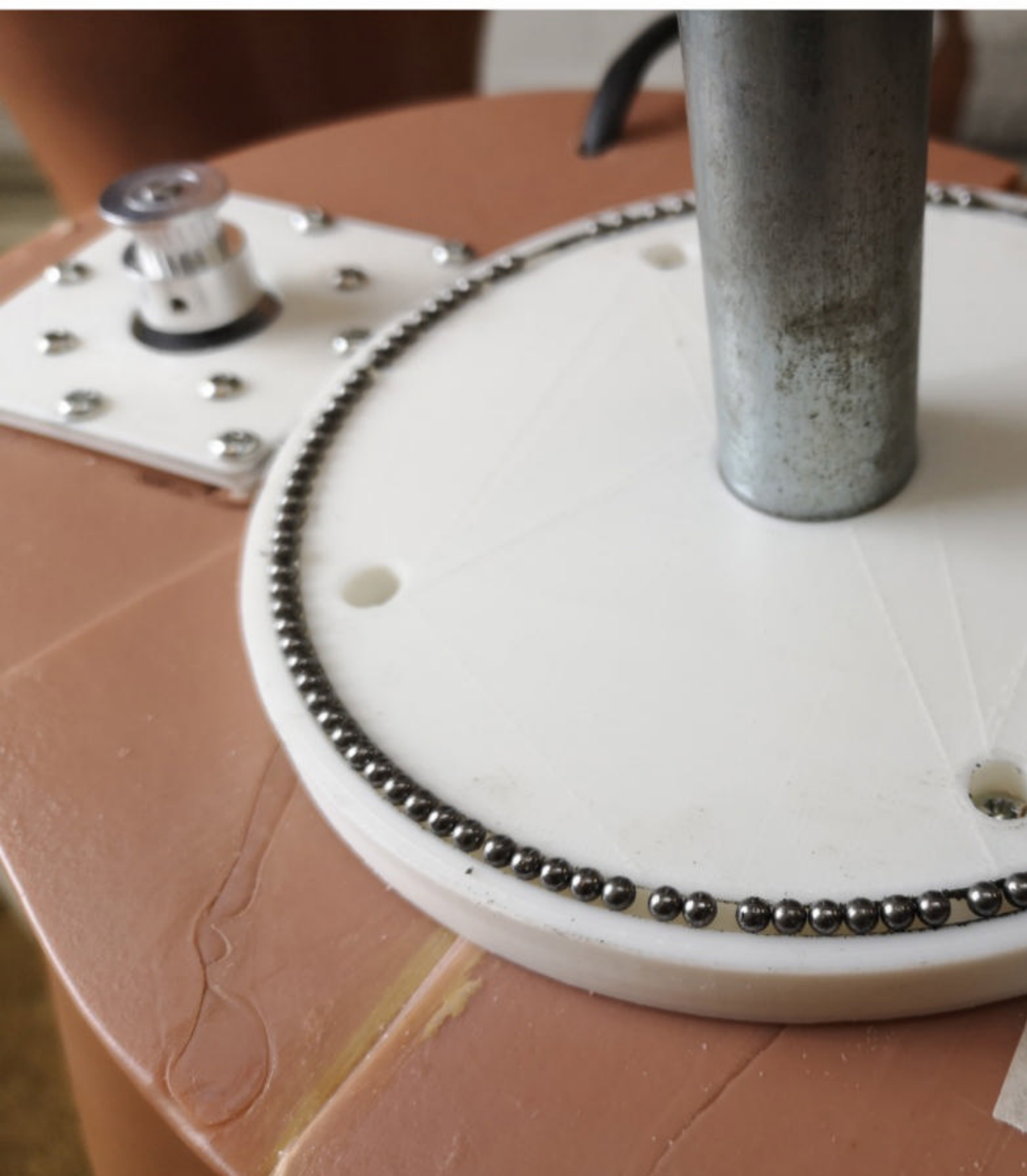
The lazy Susan

The lazy Susan flat bearing is made of two large round plates, one screwed to the base and the other to the torso.

To keep this custom bearing centred along the rotation axis of the



“Sometimes when I was in my lab, I had the sensation of living in some sort of science-fiction movie”



Preparation of the upper-half of the lazy Susan bearing. The four bolts should be inserted in four holes drilled to the base of the torso actuating the rotation. The rotating part of the bearing is connected to the stepper motor pulley through a tooth belt and a tensioner 3D-printed lock, closed by a bolt to the opposite side of the pulley. The position of the belt and the pulley is strategic to permit the same degree of rotation in both directions, referred to as the 'body central position'. The bearing is completed with a series of 3mm bearing spheres, available on Amazon as bicycle spare parts. After the rotating side of the bearing is put in place, the tooth belt is connected to the driving pulley

mannequin, I reused the shaft support blocked in the vertical position.

Lazy Susan bearings are used in low speed applications to rotate a tray, cabinet, table, or display unit. One side of the bearing attaches to a base. The other side attaches to the rotating platform. If the base is fixed, lazy Susan bearings allow the tray, cabinet, table, or display unit to rotate a full 360 degrees (en.wiktionary.org/wiki/lazy_Susan).

For the iron spheres to smooth the rotating movement between the two halves of the flat bearing, I used 3mm diameter bicycle-wheel spheres, bought as spare parts on Amazon.

After both parts were in place, I fixed the tooth belt to the bearing driven by the stepper controlled by the Arduino Uno through an L298 motor controller board. ►

Breaking news

A last-minute update: I found a missing part — my mistake — when the mechanism was in place. I added a small end-stop switch to find the point zero of the torso every time the system is powered on. Also, the switch is controlled by a digital GPIO pin of the Arduino.

The torso does not make a full rotation, so the tooth belt has been tensioned and fixed on the upper part of the flat bearing (the rotating half). With these mechanics, the top body of the mannequin can rotate about 100–120 degrees in both directions.

Arduino software

As you can see in the Arduino section of the GitHub repository (github.com/alicemirror/mannequin/tree/master/Arduino) the Arduino Uno does not only cover the relatively simple role of controlling the movement but also manages some feedback, as it is connected to the Raspberry Pi, the ‘brain’ of the Borg. This part will be covered in the next issue of *The Shed*, Issue No. 97.

To keep the various functions of



The back of the torso has been cut to access the internal space and allow assembly of the components. The cut piece has a central hole from where the main power cable will connect to a mains plug. At the bottom, I drilled a hole to connect the stepper motor wires to the motor controller, as well as the four holes inserted on the bolts of the bearing to drive the rotation. The white structure at the centre of the base is the original nylon piece and will be inserted into the base shaft as the main support

the microcontroller clear and easy to understand, I have divided the features into different header files defining the structures and constants specific to every function. For the motion, the most important values are the speed and rotation angles expressed in the number of steps of the motor.

```
typedef struct StepProfile {
    int torsoSpeed;
    int rotAngle;
    int lastAnglePos;
};

//! Number of steps per output
rotation.
//! Ref.: Nema 17 1.8 DEG/Step
#define STEPS_PER_REVOLUTION
200
//! Demultiplying factor of the large
rotating base. According with
//! the two pulleys diameters the
reduction factor is 170:14
//! To make a full rotation of the base
are needed about 12 stepper
//! pulley rotations.
#define ANGLE_DEMULTIPLIER 12

//! Stepper predefined speed
#define SPEED_LOW 30
//! Stepper predefined speed
#define SPEED_MED 35
//! Stepper predefined speed
#define SPEED_HIGH 45
//! Search zero stepper end point
speed
#define SPEED_ZERO 20

//! Increment in angles when
searching the endstop point
//! corresponding to the leftmost
position
#define SEARCH_ZERO_STEPS -1

//! Max angle in both sides respect to
the middle torso position
#define MAX_ANGLE 40
#define MIN_ANGLE 0
```

Rotation angles

To make positioning the torso easy, the number of steps is converted in positive or negative rotation angles.

To increase the performance of the



The final assembly of the body with the new mechanics for the rotation. When I finished this part, all the remaining components were developed and tested from inside the small cavity of the torso

“With these mechanics, the top body of the mannequin can rotate about 100–120 degrees in both directions”

programme, I must know the number of steps of the rotating bearing. According to the two known diameters of the connected parts, I calculated a reduction factor of 170:14; this means that a full rotation of the base needs 12 full stepper axis rotations.

To emulate different kinds of rotation of the body to give more impact, I defined four speeds: SPEED_LOW, SPEED_MED, SPEED_HIGH, and SPEED_ZERO.

The zero value corresponds to the slow-motion used when approaching the end-stop switch at boot, as well as when

the character/mannequin should change its sight/vision direction very slowly.

The microswitch position corresponds to the extreme position of one side rotation and is the initial point reached when the Arduino Uno is powered on. Immediately after the identification of the zero point, the torso rotates to the middle sight view of the body.

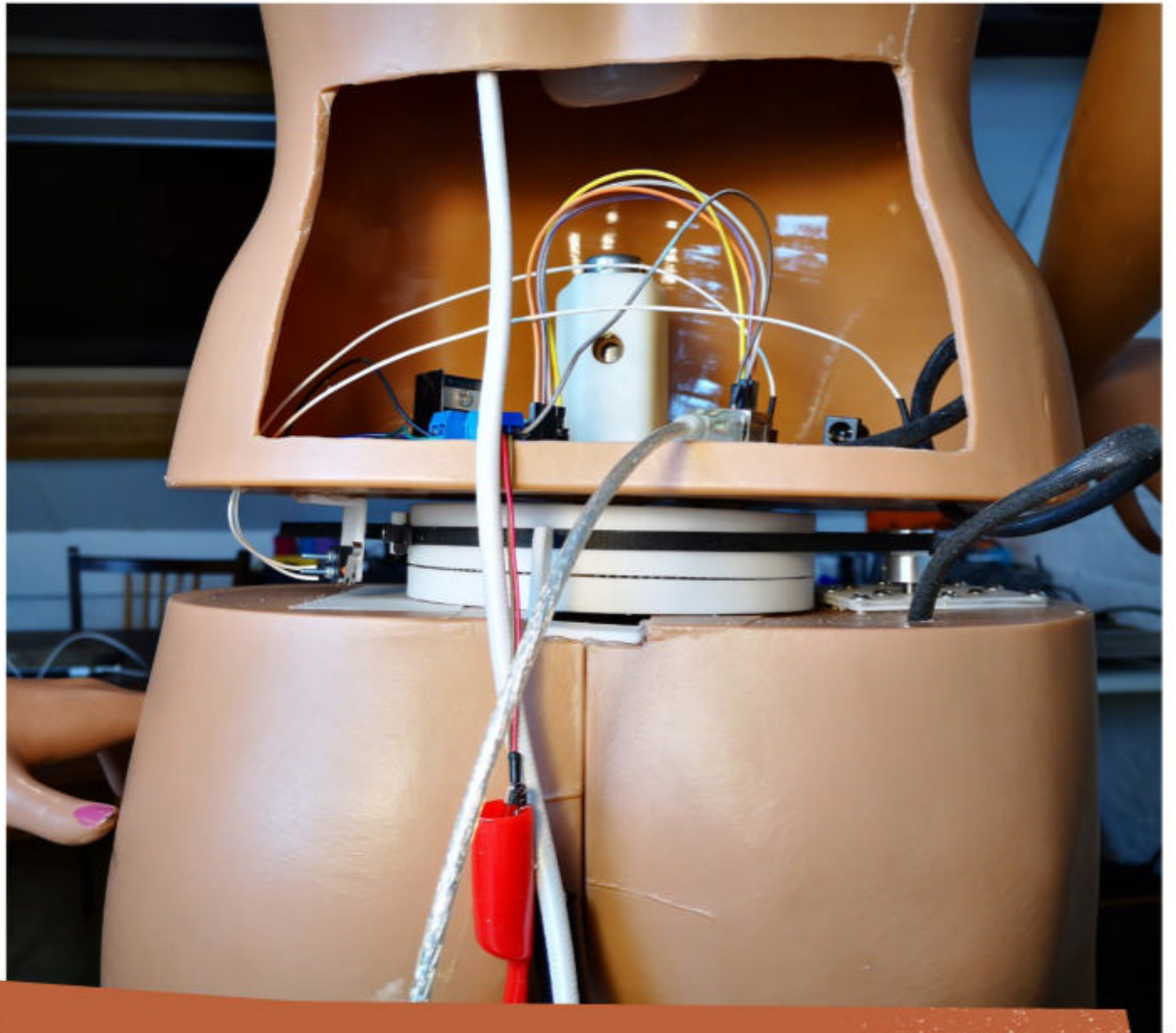
From that point, every rotation is expressed in positive or negative degrees converted in steps. Following, as an example, is the initialisation function and a series of test movements. ►


```

void setTorsoZero() {s
  // Initialize the parameters for zero
  search
  torsoControl.rotAngle = 0;
  torsoControl.lastAnglePos = 0;
  torsoControl.torsoSpeed = SPEED_
  ZERO;

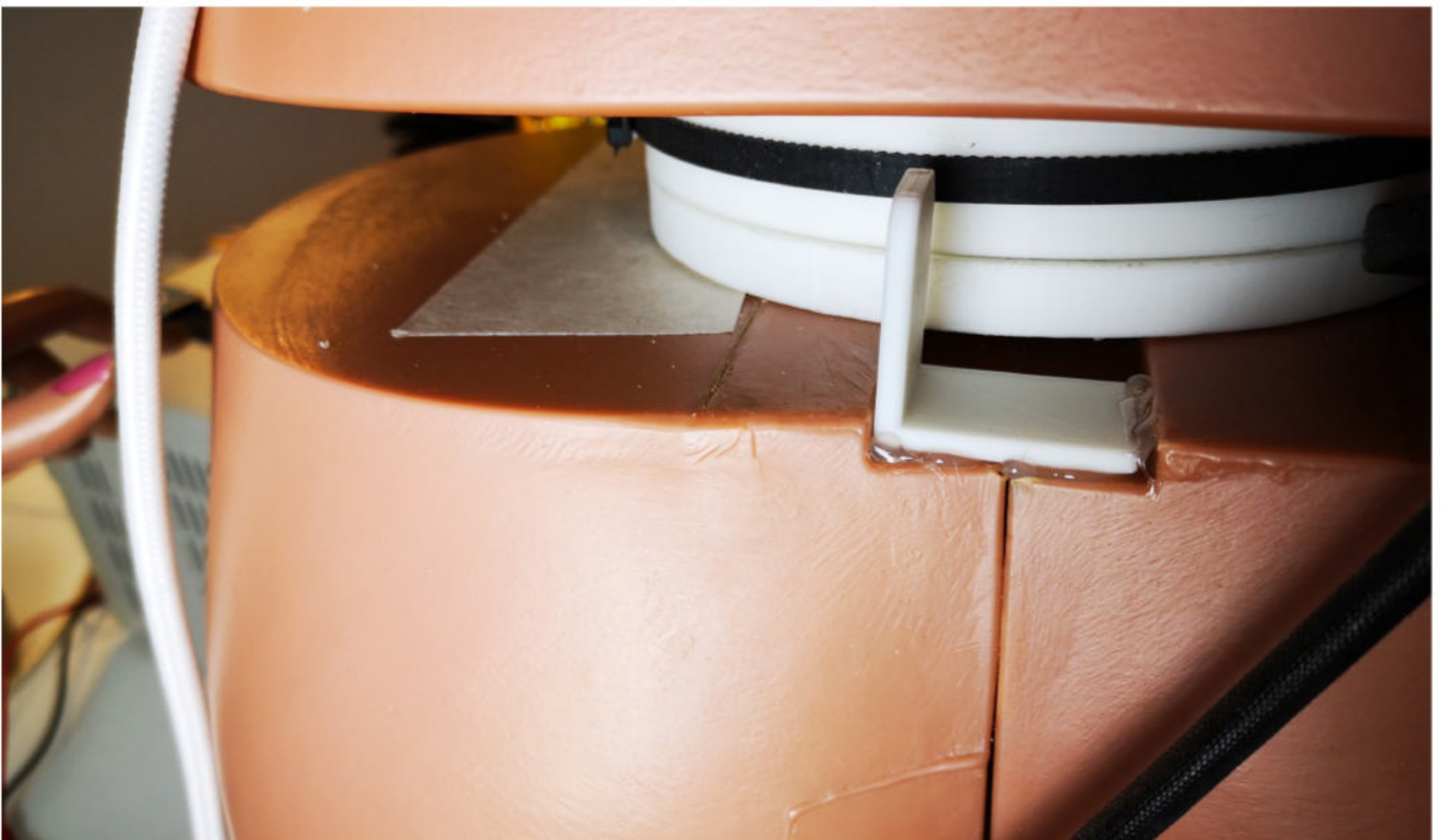
  // Search loop
  while(checkEndStop() == false) {
    torsoControl.rotAngle += SEARCH_
    ZERO_STEPS;
    moveTorso();
  } // Search loop
  torsoControl.lastAnglePos = MIN_
  ANGLE;
  torsoControl.torsoSpeed = SPEED_
  LOW;
  torsoControl.rotAngle = MAX_
  ANGLE;
  moveTorso();
  torsoControl.torsoSpeed = SPEED_
  LOW;
  torsoControl.rotAngle = MIN_
  ANGLE;
  moveTorso();
  torsoControl.torsoSpeed = SPEED_
  LOW;
  torsoControl.rotAngle = MAX_
  ANGLE / 2;
  moveTorso();
}

```



“Moving the shoulders and wrist joints remains a fascinating idea”

A last important element has been added to both sides — the end-stop switch. When the motor is powered, the first operation is a test rotation to toggle the switch on the L-shaped stop point. When this position is reached, the body is aligned to the zero point corresponding to the head looking frontwards. All the rotation movements are automatically calculated to move to the right or to the left to a total of about 100 degrees 📦





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THE BUGATTI BROTHERS

These twins forged successful careers on opposite sides of the world, both becoming masters of their craft and sharing an obsession for Bugattis

By Lindsay Vincent

Photographs: supplied and Otago Daily Times

New Zealand was barely out of its colonial nappies when, in the 1930s, twin brothers Bill and Bob Turnbull started primary school in a small country town in Central Otago.

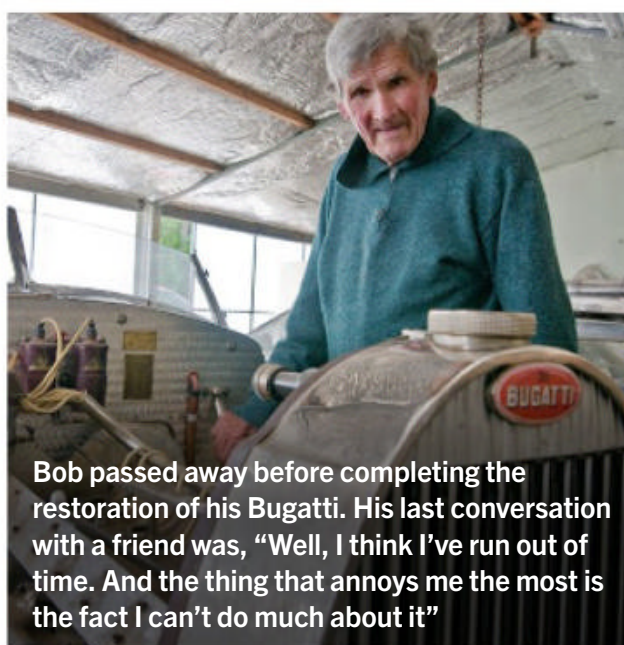
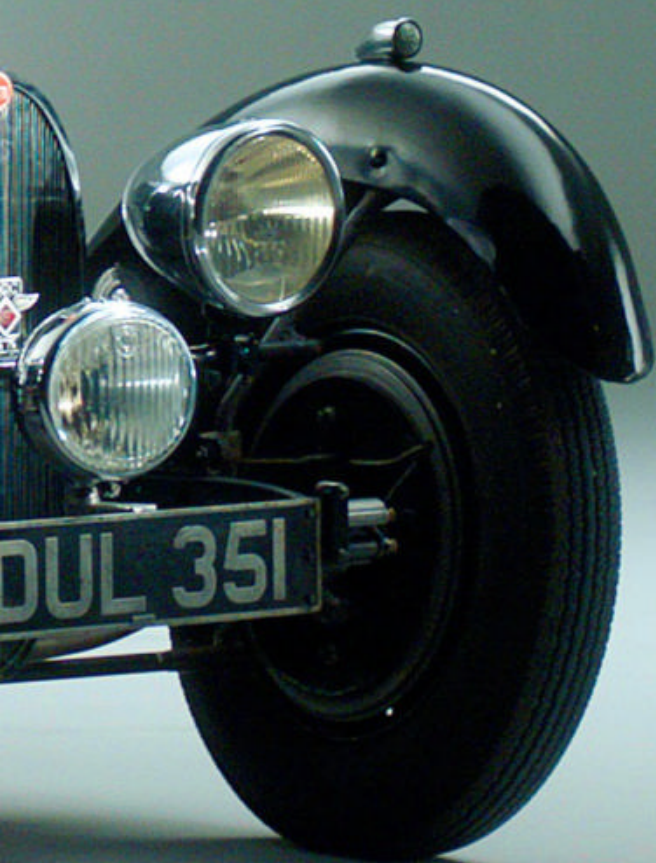
For early callers, the rigours of transforming our country into what at first became a British farm had been hard enough. However, the recession of

the 1930s made life even more trying — and for the twins, tragically so; when they were aged just seven, their mother died. Three years later, the boys were tested further when their father, Alistair, enlisted to fight for the mother country. That he was a widower with young children allowed for dispensation, but Alistair elected to “do the right thing”.

Housekeepers and an aunt substituted for the boys’ late mother.

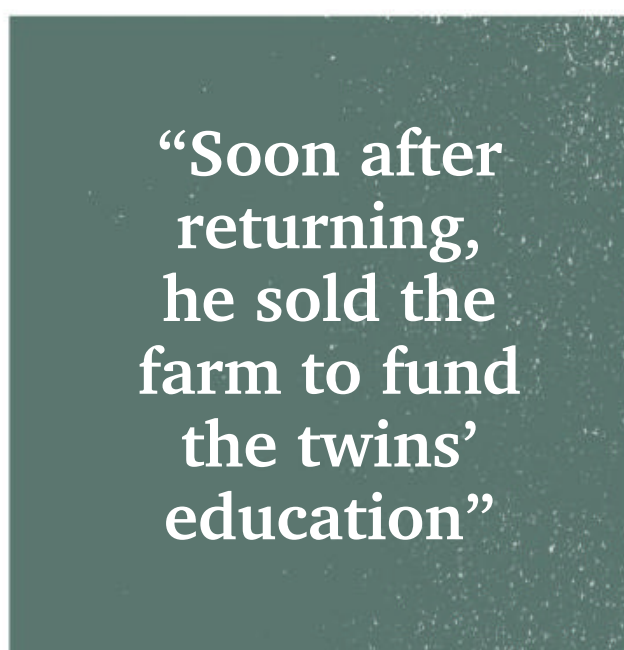
Alistair’s war ended early, in 1943, and soon after returning he sold the farm to fund the twins’ education. By 1953, both had an engineering degree. In 1960, Bill decided to chance his luck in England, intending to stay just two years.

Earlier this year Bill's restored Type 57S went up for auction in the UK

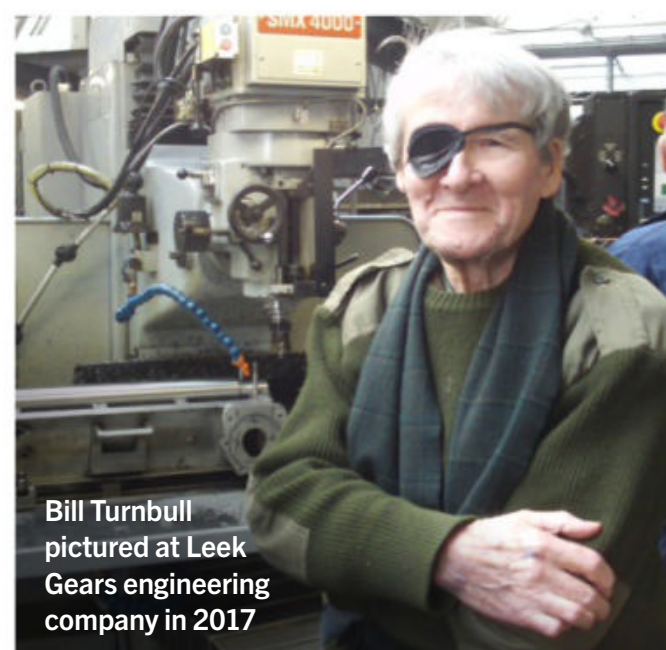


Bob passed away before completing the restoration of his Bugatti. His last conversation with a friend was, "Well, I think I've run out of time. And the thing that annoys me the most is the fact I can't do much about it"

"Bonhams, the UK auctioneers, sold Bill's rare 1937 Bugatti 57S for £4 million"



"Soon after returning, he sold the farm to fund the twins' education"



Bill Turnbull pictured at Leek Gears engineering company in 2017

Stellar engineering careers

Both Bill and Bob were outstanding engineers. Bill, after top jobs elsewhere, became the chief engineer at the UK's all-important hydraulics division of JC Bamford, the JCB leviathan.

Bob's many achievements at home in New Zealand include the invention of the unique propulsion system of Hamilton jetboats. Both twins have now passed away, Bill in May 2019, aged 89, and his brother in 2012. In February of this year, the funeral of Bill's wife, Jean, aged 85, in North Staffordshire seemingly marked the closing chapter in the intriguing lives of the brothers.

Bill had no children, and his stepson, Mark Harrington, who came with his marriage to Jean, died young in a motorcycle accident. Bob, an eccentric



Bill's Bugatti was a five-decade restoration project

introvert, never married and neither did he ever have a companion in his solitary life. He didn't even have a telephone and communicated by letter. Even in his backwater, Bob was on speaking terms with only a few people.

Legacy

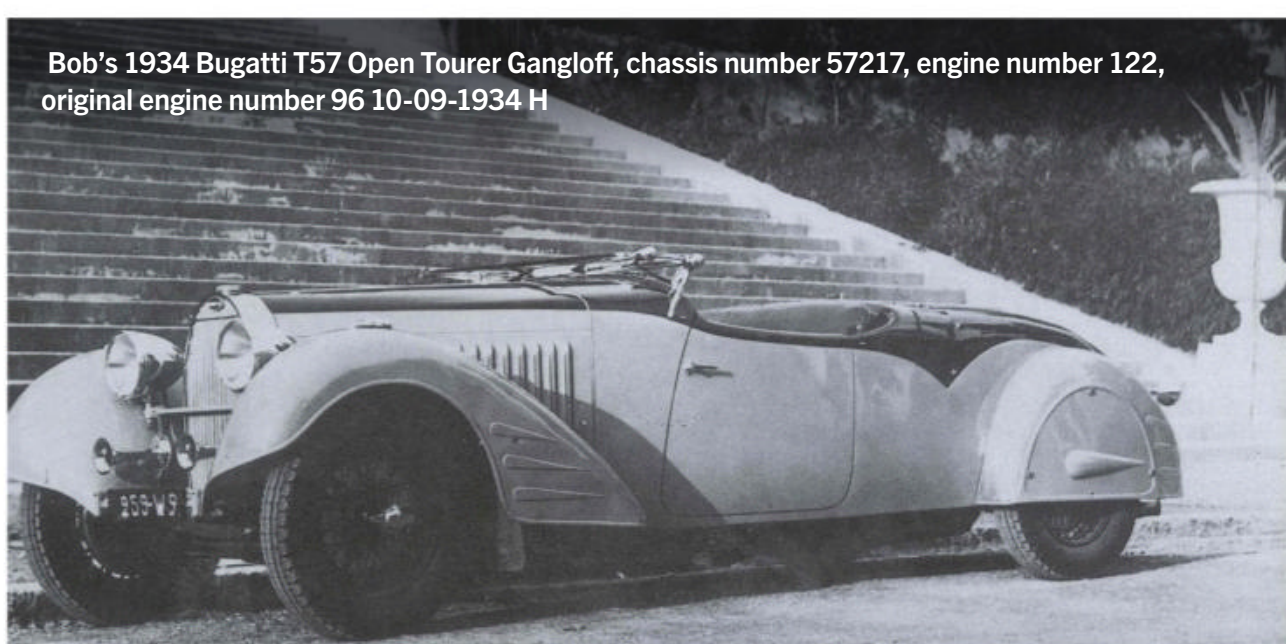
However, the twins leave a remarkable legacy.

Just days before Jean's death, in February 2021, Bonhams, the UK auctioneers, sold Bill's rare 1937 Bugatti 57S for £4 million. The auctioneer,

Malcolm Barber, paid fulsome tribute to Bill's engineering record, but few in the global online auction room knew that Bill's late brother had also owned a rare Bugatti, a 1934 Type 57. That car was sold after Bob's death to an Auckland businessman, Steve Lockwood.

Lockwood saw off foreign buyers — "I wanted the car to stay in NZ," he said. "We don't have too many iconic New Zealanders, and Bob, as his engineering achievements show — particularly because of his Hamilton Jet propulsion system — was one of them."

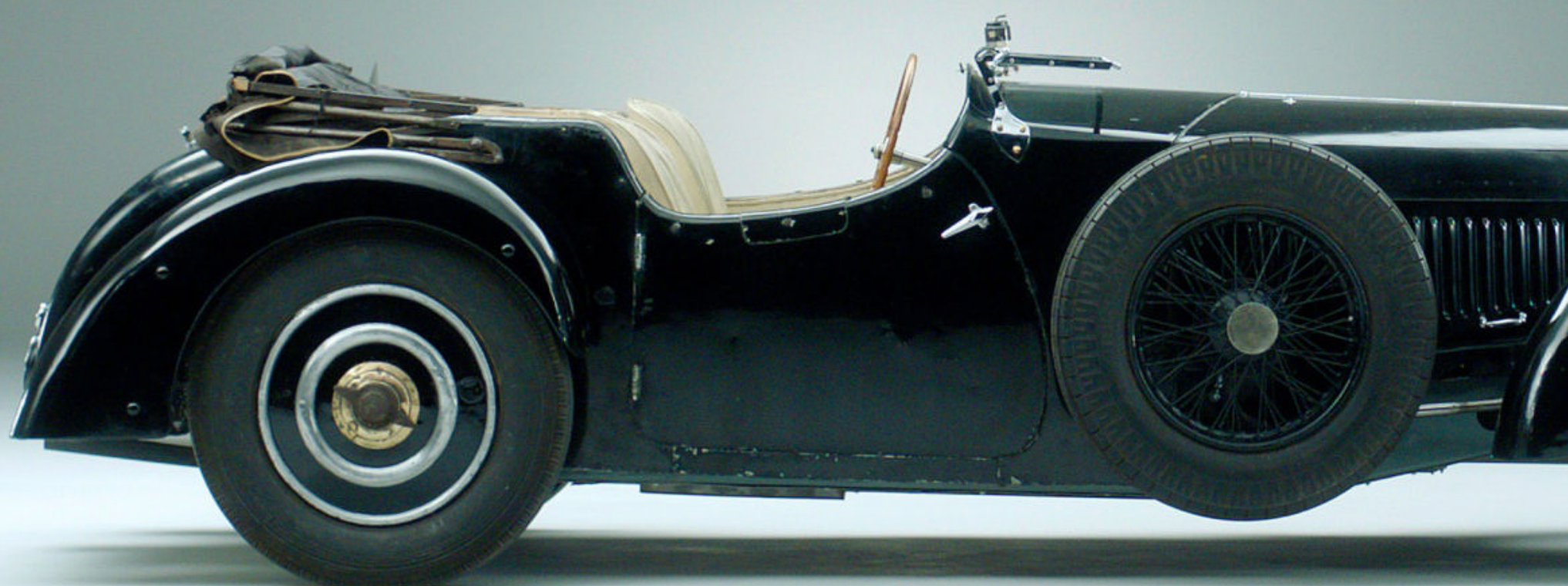
Bob Turnbull's Type 57 sold to a New Zealander who was keen to keep the car in this country as acknowledgement of the huge part Bob had played in our country's engineering achievements



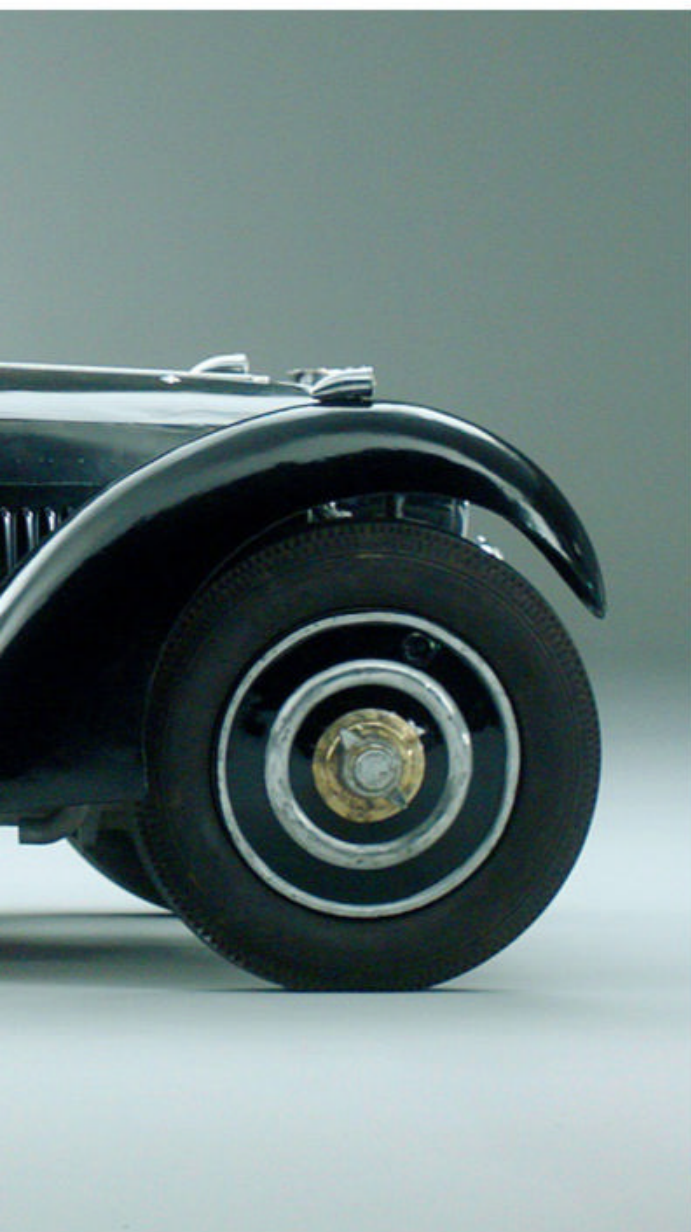
Bob's 1934 Bugatti T57 Open Tourer Gangloff, chassis number 57217, engine number 122, original engine number 96 10-09-1934 H



A troubling noise from the gearbox saw Bill take the car off the road for over 50 years



“The Bob Turnbull Trust is for the benefit of his local community but is thought to favour children seeking help with the costs of higher education”



At the time of his death, Bob lived in the tiny Otago town of Ophir, which owes its Biblical name, as the mythical place of King Solomon's mines, to 18th century gold rush days.

Bob, say locals, spent every day in his shed, where few were permitted to enter. He died before his car was fully restored, but at least the car could be driven by its new owner, since the remaining stages of restoration were largely cosmetic.

A 50-year resto

The engine that came with Bill's Bugatti was not in the car, as shown in Bonham's glossy brochure, but secured away in a warehouse in boxes. The car, which Bill bought in 1969 for £1500, had spent an astonishing 50 years in his workshop. It will be driven for the first time since it got there only after its new owner has paid out an estimated £200,000 for the final lap of the restoration.

Why so? Just after buying the car, when he was driving it on a hill climb in

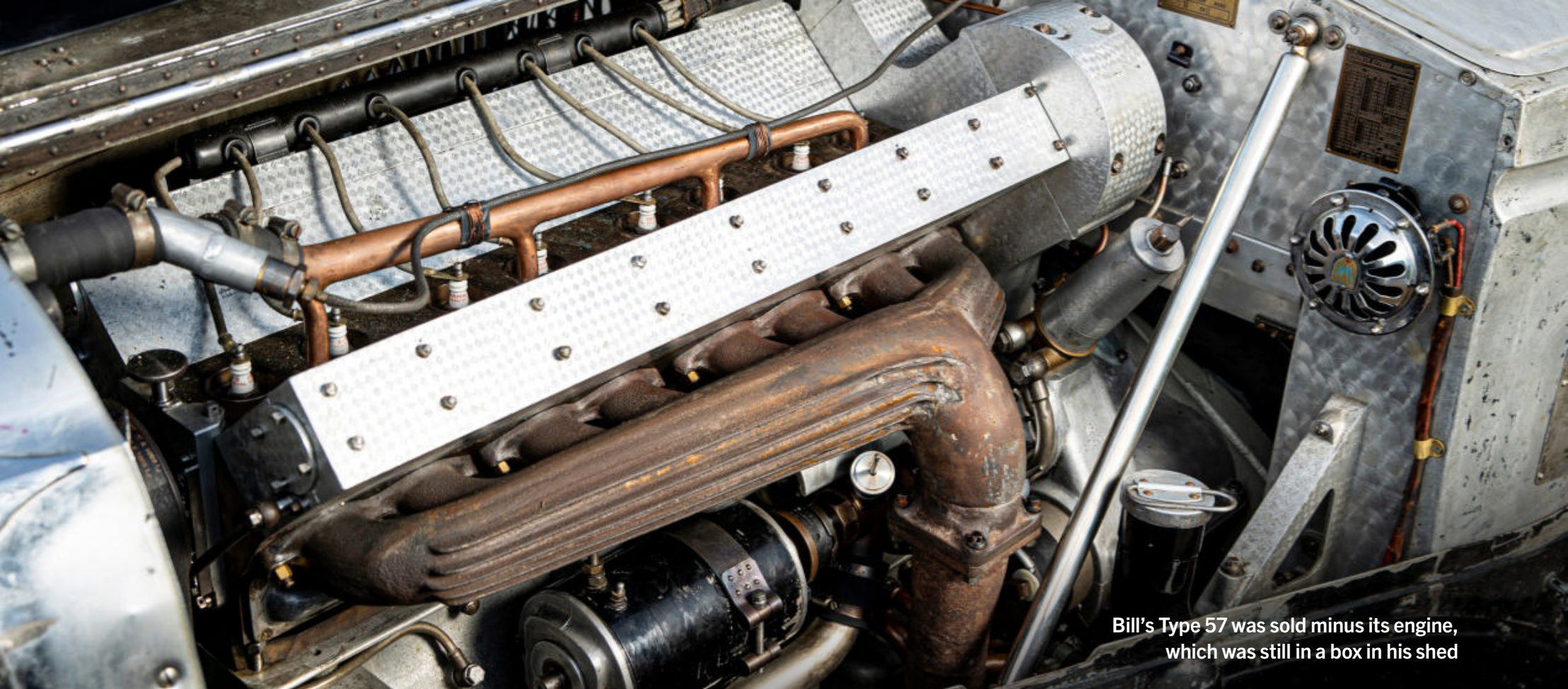
Gloucestershire, Bill heard a troubling noise from the gearbox. On returning home, he immediately started to investigate and, from that day, he never drove the car again.

That it became an obsession is an understatement, since he devoted much of his life to restoring and repairing every nut, bolt, and much, much else — the whole shebang. Motoring journalist, Doug Nye, says that when advances in technology meant Bill felt he could improve on, say, a bolt that had already been restored, he would discard it and make a new one.

“You could say ‘spot the looney’, but he just loved working on the car.”

For a car obsessive, this devotion is understandable, since the Bugatti 57 is unequivocally one of the most revered models in the history of the automobile.

In a comment recorded for a YouTube video, Bill told a mechanic from the Mercedes Formula One team, “I became aware of this car in NZ. I read about it in a Bugatti Club magazine. ►



Bill's Type 57 was sold minus its engine, which was still in a box in his shed

“You could say ‘spot the looney’, but he just loved working on the car”



If Bill felt he could improve on, say, a bolt that had already been restored, he would discard it and then make a new one





Otago Daily Times visit to Bob Turnbull's shed, 2015

There are more than a few stories beneath the hoods of the three rare cars parked in a workshop out the back of a house in the small Central Otago town of Ophir.

Sure, one could focus solely on the one-of-a-kind 1934 Bugatti Gangloff Roadster Type 57, the 1907 Sizaire et Naudin, and the 1904 Humber Humberette. Certainly, they are interesting enough vehicles. But it's perhaps better to approach the machines as one would a magnifying lens, portals to the life of their intriguing former owner.

Bob Turnbull died in 2012 at the age of 82. He'd never married, had no long-term partners, nor left behind any children. Yet he's left a legacy; memories and tales of a mechanical engineer who had a mind as strong as the blocks of steel with which he played.

"A genius," one friend says.

"A legend," says a former colleague, who compared Turnbull's abilities with those of the late John Britten, the New Zealand mechanical engineer best known for his radical motorcycle designs.

"Reclusive and shy," another says.

That last description is probably a good reason why Turnbull's accomplishments have rarely appeared in print, outside the occasional mention in publications that have more to do with vintage cars (and their passionate owners) than the inner workings of one man.

Key element in Hamilton Jet

Yet a book on Canterbury company Hamilton Jet, written by John Walsh, credits Turnbull with developing a key element in the firm's jet propulsion units — a twin-ducted reversing mechanism now used worldwide.

Raised in Galloway, near Alexandra,

Turnbull began work at CWF Hamilton (Hamilton Jet's parent company) in 1955, living in Christchurch and working for the company until 1985, when he retired and subsequently moved back to Central Otago, settling into a house he'd bought years before in Ophir.

Thankfully, Turnbull documented some of his achievements, a collection of notes he typed in 1987 disclosing aspects of his work history:

"In the earlier period (1955–1970), I designed oil hydraulic equipment as well as doing design work on earth-moving equipment, the manufacture of hydro-scheme gates and lifting cylinders, concrete agitator trucks, etc.

"Work in the later period (1970–1985) included aluminium barges for Papua New Guinea, large hydraulic cylinders for the Auckland Harbour Board, and a mobile crane, but was mainly on marine jet propulsion units for commercial boats



“A mechanical engineer who had a mind as strong as the blocks of steel with which he played”

The restored collection up for sale in 2015: a 1907 Sizaire et Naudin, a 1904 Humber Humberette, and the 1934 Bugatti Gangloff Roadster Type 57

such as the Papua New Guinea barges and fishing boats.

“A small hydraulic pump designed in 1958, which was produced for 25 years, a large jet unit with an impeller diameter of 420mm, and the mobile crane are the machines which pleased me most. The jet unit won an award in a competition for inventors run by UDC in 1981.”

Britten's ability

A former draughtsman for CWF Hamilton, George Calder, who had a close working relationship with Turnbull, says the mechanical engineer was “very fussy and very talented”.

“In fact, he reminded me of John Britten in regards his ability to think completely outside the square,” Calder reflects.

“He never considered what other people had done. He always operated on first principles. He had this amazing mathematical brain that could work out anything.”

In an obituary on Turnbull in the Vintage Car Club of New Zealand's magazine, Beaded Wheels, Calder writes: “Ophir suited Bob's bachelor lifestyle and he just seemed to love the remoteness and solitude of the place. ►



Bob's car could be driven by its new owner, since the remaining stages of restoration were largely cosmetic



Bob restored his cars in a big shed out the back of his Ophir house

“He never had a telephone or many other modern home appliances for that matter. Communication was done the old-fashioned way by writing letters, which came with many pages, in tiny print, written on both sides, and if he had run out of paper he would often write extra notes sideways up the margins!”

Speaking from Picton while on holiday recently, Calder says Turnbull was a very quiet man who lived a solitary life.

“He was very shy in front of women. In some ways he was quite difficult to approach.

“He retired when he was in his mid-50s, I think, because he thought he had enough money to keep him going. He certainly didn’t like spending much.”

John Loudon, who first met Turnbull in the late 1980s through the Central Otago branch of the Vintage Car Club of New Zealand, likens his friend to an old Walt Disney comic character, Gyro Gearloose.

“He was always doing things out of the ordinary. His mind was terrific, really. Everything had to be done according to a theory. He was marvellous at doing drawings of designs he wanted,” the Alexandra man says, adding Turnbull

wasn’t a regular attendee at club meetings, “because his cars were never reliable enough”.

“In saying that, once he got the old Sizaire running well, he went two winters and summers driving from Ophir to Alex to get his groceries.

“Bob was a very private person. It took a long time to get to know him. He wouldn’t let you into his workshop until he got to know you ... and at that stage, you couldn’t move in that workshop. It was something out of the ordinary.”

In that shed at last

Ophir resident Pete Brabant, who befriended Turnbull after a chance meeting in the main street of the town about 15 years ago, was one of those who did eventually get invited into that shed.

“People in town knew where Bob lived, but no one got invited and they didn’t invite him to their places. That’s how he liked it. The only time you’d see him was when he’d drive down the road or when he went to the post office next door to get his mail.

“I’d been told about this shed. There are plenty of people who want to get in, still,” says Brabant who, with wife Julz, looked after Turnbull as his health progressively failed following a series of heart attacks.

On Mr Turnbull’s death, all assets were transferred to the Bob Turnbull Charitable Trust, of which Brabant is a trustee. Late in 2014, the trust gave out grants to 11 groups in the Ophir–Omakau area.

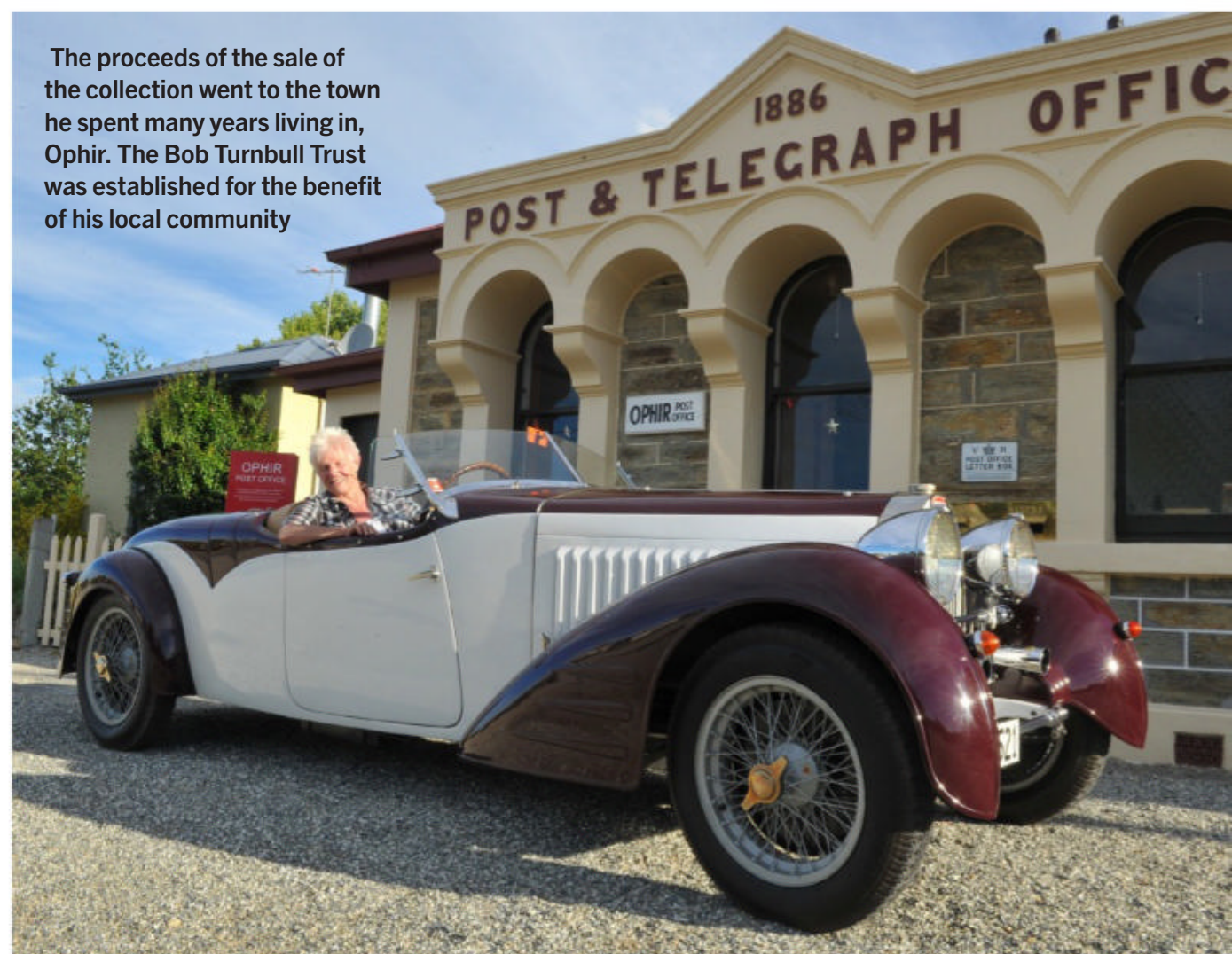
In that big shed out the back of the Ophir house, now the property of the Bob Turnbull Charitable Trust and occupied by Brabant and his wife, there are insights into other aspects of the life of its former owner.

An old bike, complete with wooden rims, hangs on a wall, prompting the retelling of a story that came to light at Turnbull’s funeral.

“Bob had borrowed a book from a Dunedin couple, and one night he turned up on a bike at 5pm to return the book. Declining the offer to ‘come in’, Bob biked back to Ophir [approx. 186km],” Brabant says.

Brabant recalls Turnbull’s last words: “Bob said to me, ‘Well, I think I’ve run out of time. And the thing that annoys me the most is the fact I can’t do much about it.’”

Our thanks to the Otago Daily Times for allowing us to reprint parts of their article on Bob Turnbull. For the complete article, see: <https://www.odt.co.nz/lifestyle/magazine/rare-engineer> 📄



The proceeds of the sale of the collection went to the town he spent many years living in, Ophir. The Bob Turnbull Trust was established for the benefit of his local community



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TO SERVER OR NOT TO SERVER

WHAT SORT OF A QUESTION IS THAT?

Nigel Young embarks on what might be the most
challenging way ever to save \$16.99 a month

By Nigel Young

Photographs: Nigel Young



If a little knowledge is a dangerous thing then I'm positively lethal. Therefore the question is: is my lethality going to work in favour of me or against me? The focus of said lethality is a decision to turn an old Apple Mac desktop computer into a server. What do I even know about servers? I find it hard enough trying to configure my email!

I tallied the points

In favour of me

1. I've been using Macs since the early '90s.
2. I've got a diploma in computer-aided design and we had to do some basic computer maintenance as a component of it.
3. I've learned stuff over the years.

Against me

4. I've forgotten stuff over the years.
5. See the comment above re. my email.
6. I can't remember what I've learned and what I've forgotten.

That last point reminds me of the line from the TV series *Yes, Prime Minister*, when Bernard Woolley says to Jim Hacker: "I don't know what you don't know, Prime Minister."

So what has brought on this fit of madness when I can use the Apple iCloud service for \$16.99 a month for 2TB of storage — and for that, Apple will take all the responsibility for the costs, maintenance, reliability, and

storage in a secure and purpose-built facility somewhere in the US? That's \$16.99 x 12 x ? many years — \$203.88 every year for, let's say, 10 years as an example; that's \$2038.80. For 20 years, it's \$4077.60. Of course, that includes upgrades and potential price drops/increases, but this is for my business and I think I'd like a little more control.

Inspired or deluded?

The inspiration for this madness came about when I learned a few months back that it's possible to have my own cloud server.

Now, that's perfectly obvious when I stop to think about it, but I direct your attention, dear reader, back to points 4 and 5. In the words of Eric Idle from *Monty Python*: "Say no more!" However, I needed an idea for an article for an insatiable editor. [Who, me? — Ed.]

It's not as if I had nothing else to do, being a self-employed designer who has to run a business, finding people willing not only to commission me but also to pay me. Then there's my current project of organising an exhibition of my photos — it'll be my second — maintenance on my W650 Kawasaki, maintenance on my W61 Wife, maintenance on the spare room that I've just been thrown into, as well as some projects I've got going on out in the garage. There's also the backyard — we're currently building some planter boxes for a vegetable garden and putting a trellis around part of our deck. ►



What have I got then?

Now that the logic and precision of thinking and planning are behind me, what do I have to work with? Right, time for lists — something I learned from W61 Wife. I have:

- one G5 PowerPC Mac that's been configured with two 750GB hard drives in a RAID array and has a decent amount of RAM (a RAID array is when two hard drives are mirrored and back each other up in case one fails)
- one old Panasonic TV that can be used as a monitor — the G5 came with two very nice 20-inch monitors that I'm still using elsewhere
- eight old external hard drives, two of which have eSATA (see, I can remember stuff: it's a flash connector back to the computer)
- one Toshiba laptop
- various cables and connectors
- a large bag of coffee

My plan is to install Ubuntu — a Linux derivative — as the operating system on the G5, something that the laptop already has. At this point I reminded myself of the comment I made in the opening paragraph regarding configuring email. I also plan on taking out the existing hard drives and installing four identical ones in a RAID array: two in the Mac and the other two in the eSATA external boxes. I would like them each to have a 4TB drive, which would give me plenty of room for expansion. Given that photographs will be a major user — and are very space hungry — that seems to be a good idea. I currently have four identical drives, but they are only 500GB and around 12 years

old, so I need to be careful here. The plan is to avoid forking out large amounts of money, but that may yet have to be challenged. So, to begin ...

An excuse to sort out the garage

Each winter, we put the car in the garage to protect it against the ravages of a Christchurch frost. Frosts usually lead to brilliant days but, as the car is the newest car I've ever owned, I'd like to look after it. That decision leads to the garage being tidied and sorted. That leads to having to take a lot of stuff out to find the Mac and the Panasonic monitor stored down the back somewhere, almost the last things to come out. Sound familiar? At least the garage is now tidy, as I suspect I'm about to be removed from the spare room — I saw W61 Wife looking at me and then at a spare bed we found while tidying.

The Mac had been carefully packed in its original box, and the monitor had been protected, so these are in good nick. The laptop had likewise been kept in a soft case. Six of the assorted hard drives were in their original boxes, while the other two had been stored carefully — and they had all been kept in my office. So, all in all, the hardware is all good.

The G5 was removed from its box and the monitor cleaned — it's a garage; dust happens! I decided to keep a record of what I spend as the project proceeds, and will keep that up to date with each article as I detail this build project.

My first purchase was a DVI/VGA video adapter, as the monitor is incompatible with the Mac; \$3.41 from AliExpress. I brought one of the 20-inch displays out to at least get it started and to see what will happen.

Will it start up?

I fired up the Mac and at first all seemed well. I went inside to do something else, and when I came back out the fans were sounding like a Pratt & Whitney jet engine spooling up at the Christchurch Engine Centre.

I shut it down. After that I did some online research and tried various key combinations. One involved holding down the Option, Command, P, and R keys — all at the same time — while trying to push the G5's power button!

It took me several minutes and sitting the keyboard on a box before I could actually push all those keys and buttons at the same time. I need to find out what drugs that programmer was on so I know what to avoid! I also discovered that I should have been suspicious when the G5 asked me to reset the clock at the beginning — it was set for 1 January 1979. Apparently that and the runaway fans were the giveaway that the Mac had a flat battery! Yes, you read that right. My car gets a flat battery, my bike gets a flat battery, various things inside get a flat battery. I found the remote for the Panasonic monitor — it had a flat battery. My W61 Wife? You know, I've never actually found any. Anyway, she would resist the idea of being plugged into a charger each night. I vaguely knew that desktop computers had a battery, but it never occurred to me that it would need to be replaced. Refer to points 2 and 3 at the beginning.

What is the battery for?

What sort of a battery? Why do they need a battery — aren't they permanently on mains power? Apparently the batteries are essentially a power backup for the PRAM, operating in much the same way an uninterrupted power supply (UPS) does — does that help?

The PRAM holds the time and date data as well as the core hardware settings required for booting up. We'll cover the UPS shortly. Well, I knew one thing — point 2: if I was going to mess around inside the G5, I was going to need an earth strap.

I rang my son. He was born with a ►



Game Boy in his hand and has recently graduated with a degree in computer networking. He informed me that, provided I hold on to the side of the case at all times, I won't need the earth strap as I'll be doing the grounding

Apparently static electricity can deep fry your chips before you can say: "Oh, fish!" I wasn't prepared to take the chance, so, as I had to purchase the 3.6V 1/2AA lithium battery, I decided to get an earth strap as well. I placed an online order with Jaycar, to be processed once lockdown shifted to Level 3. However, it would only cost \$9 to have it couriered and, given the current circumstances, I'd probably get it sooner that way. So the battery was \$15.90, the earth strap \$16.90, and the courier \$9. Another \$41.80. Current expenditure \$45.21 including GST, which I can claim back.

The project expands

Two other things occurred to me. While I was still contemplating this madness, I learned that, in these days of computer security/insecurity, if you can remember

your password then it isn't good enough. I can barely remember W61 Wife's birthday / our wedding anniversary, and anyway I'd been using this password for years; it was like an old friend. Right!

So, computer security was going to have to play a major role in my project. Could I use the Toshiba laptop as a standalone firewall? Now that's an interesting idea — something else to research.

The second thing I thought of is cooling, as I do know — refer to point 3 — that servers get hot. Now, the nice thing about the G5 is that not only is it made of brushed aluminium but one side comes off easily, to show off the insides — all behind a very clear Perspex cover that is actually intended to direct the airflow through its fans.

I have heard that computers can be water cooled, but I wasn't going to try to run a hose into my office. For a start, I'd never be able to shut the window, and can you imagine the insurance hassles? "Hello, I'd like to put a claim in for water damage to my house. I was

running a garden hose through my computer and it burst while I was away over the weekend." So, I need to do some research on the best way to cool the G5, as it has to run 24/7 to be of any use. I wonder what impact that will have on my power bill? Is there an app I can download that measures power consumption?

This gives rise to a third issue: what about a UPS in case of a power cut? Hmm — this project is expanding every time I turn around. We'll, one turn around at a time.

So much to consider

At the moment, I'm on hold until the different parts arrive, but I can research such things as the cooling and the UPS. Then there's the alternative hard drives in case I have to replace the four I have. It's important that they are identical, for the overall running of the RAID array. Finally — famous last words — there's the Toshiba laptop as a firewall. Well, that's the hardware side sorted — unless I turn around again.

Finding a home for my server is also an interesting issue. Do I keep it in my already small office and try to accommodate the G5, another monitor, the cooling system, the UPS, and the laptop? Given that the noise will always be there, is that going to be annoying? Or is that 'annoying'? At least it's right next to where the fibre comes into the house, and I can have a cable directly from the router. If I decide to construct a special home for it all in the garage, will it be as secure and do I have to consider extra dust protection? I'd also need to figure out how to run a cable out there.

Once the hardware is finally configured, it'll need cleaning. I noticed a lot of dust inside the G5 — unfortunately static electricity attracts dust like bees to honey — so I'll need to find a way to clean that without causing any problems elsewhere. Should I try to remove it with compressed air, or with a vacuum cleaner? What are the risks of each? I do know that this is not wire-brush territory. What was that about \$16.99 a month?

Fortunately, I know a guy who is a Linux guru, and I think my son can expect some more calls from me. 📧





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A RIVETING STORY

A TALE OF THREE GATES

Will Ritchie's handsome replacement wrought-iron gate go the way of its two predecessors?

*By Ritchie Wilson
Photographs: Ritchie Wilson*

Neil Robertson
of Robertson
Wrought Iron

Before it relocated to higher ground due to flooding concerns, our house's section was a bowling club. When we purchased the property in 1982, the two-storey stone clubhouse, concrete block toilets, and the high corrugated-iron fences were long gone.

There remained, however, a short section of Edwardian fencing and an elaborate 36-inch-wide wrought-iron pedestrian gate at the end of some steep steps and an alleyway that had connected

the bowling green to a back entrance in the next street.

By the time we had returned from a planned six-month holiday and were preparing to start building our house, the gate and the imposing jarrah post to which it was attached were gone.

There was no insurance on our bare section, so we didn't report the theft of the gate and its post. Wrought-iron pedestrian gates were more common in those days, and I was able to buy a

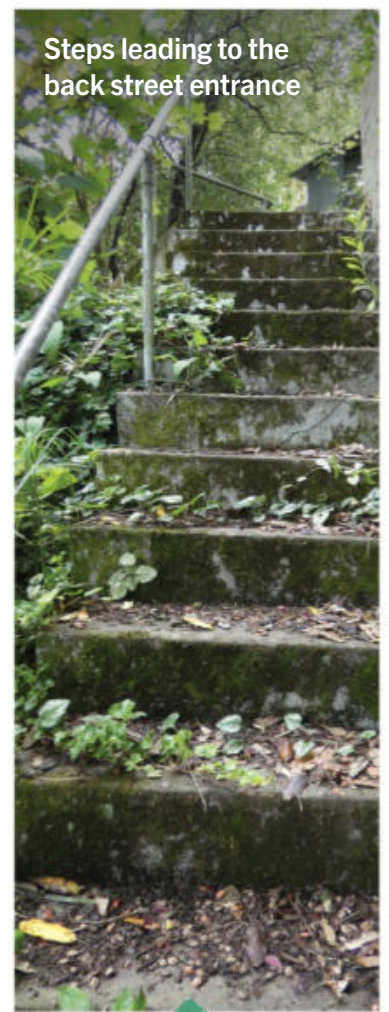
slightly battered, and much simpler, replacement at a local auction for a bit less than \$100. We ended up using the replacement as a pedestrian gate in a gap in our pine hedge on the property's main street frontage.

Lightning strikes twice

Just before the Covid-19 lockdown, a letter arrived from the city council demanding that the pine hedge be trimmed, as it was obstructing the



Replacement gate at the demolition yard. It cost extra because of its history



Steps leading to the back street entrance

“The gate and the imposing jarrah post to which it was attached were gone”

footpath. After the trimming, the gate was more visible. Not long after, we woke one morning to find it gone.

The next day, I went into town to report the theft at the Central Police Station, which is located in Christchurch’s new Justice and Emergency Services Precinct. This turned out to be closed, as the whole precinct was locked down because of the sentencing of the Christchurch mosque shooter. The High Court, where the sentencing was taking place, was also in the precinct. Except for demonstrators across the street, and heavily armed police, the area was deserted.

A security guard told me to go to my local police station. Here, details of the crime were entered into the computer system and I was given a Police File Number (PFN). With the PFN, I was able to report the loss to my insurer, who asked if I had a photo of the gate. “Not to worry,” she said, “I’ll get one from Google Earth.” And, sure enough, she sent me an image of the gate. She also sent the picture to local blacksmiths for a quote to make a new one. Shortly after, we received in our bank account the difference between the (hefty) estimated cost of making a new gate and the insurance excess. ►

The nub to be hammered into a square-headed rivet marked out





Neil and the partially finished gate

“One very nice gate that I saw in an antique shop was made in Northern Ireland by Harland & Wolff, the firm that made the *Titanic*”

Wrought-iron gates

There are two main types of ornate iron gates around. One type is a century or more old and is of riveted construction, the other is more contemporary reproduction, which is welded.

The riveted gates would have been made by local blacksmiths or imported from Britain. One very nice gate — unfortunately too large and expensive —

that I saw in an antique shop was made in Northern Ireland by Harland & Wolff, the firm that made the *Titanic*.

Gates from the UK would have been shipped to the as ballast in lightly loaded sailing ships, along with cast-iron lamp posts and verandah railings; steel pick-axe heads; anvils; and other cheap, heavy, saleable objects.

The stolen gate was riveted, and I wanted a riveted replacement. The stolen



The empty gateway



The replacement gate — too wide for the gateway

gate was the standard 36 inches wide, but the only suitable replacement available had been widened at some point and had an extra eight inches welded onto the opening (latch) side.

Modifying the replacement gate

There is great variety in the design of these old wrought-iron gates, but many in Christchurch follow a standard design pretty closely, suggesting that they were made locally, perhaps by only a few makers.

The thick uprights on the hinge and latch sides have a scroll bent into their tops and are joined together by three lighter gauge horizontal members, which divide the gate into two. The bottom half is filled with evenly spaced square-section rods.

Typically, there are four sections in the top half separated by extensions of three of the vertical square rods. In each section is a scroll of 4x30mm iron with tapered ends.

The replacement gate had an extra section attached to the opening side to fit a wider opening, as would be needed to

accommodate a wheelchair, wide lawn mower, or motorcycle. The widening involved an additional latch-side upright and the extension of each of the three horizontal strips with 225mm of steel being welded in.

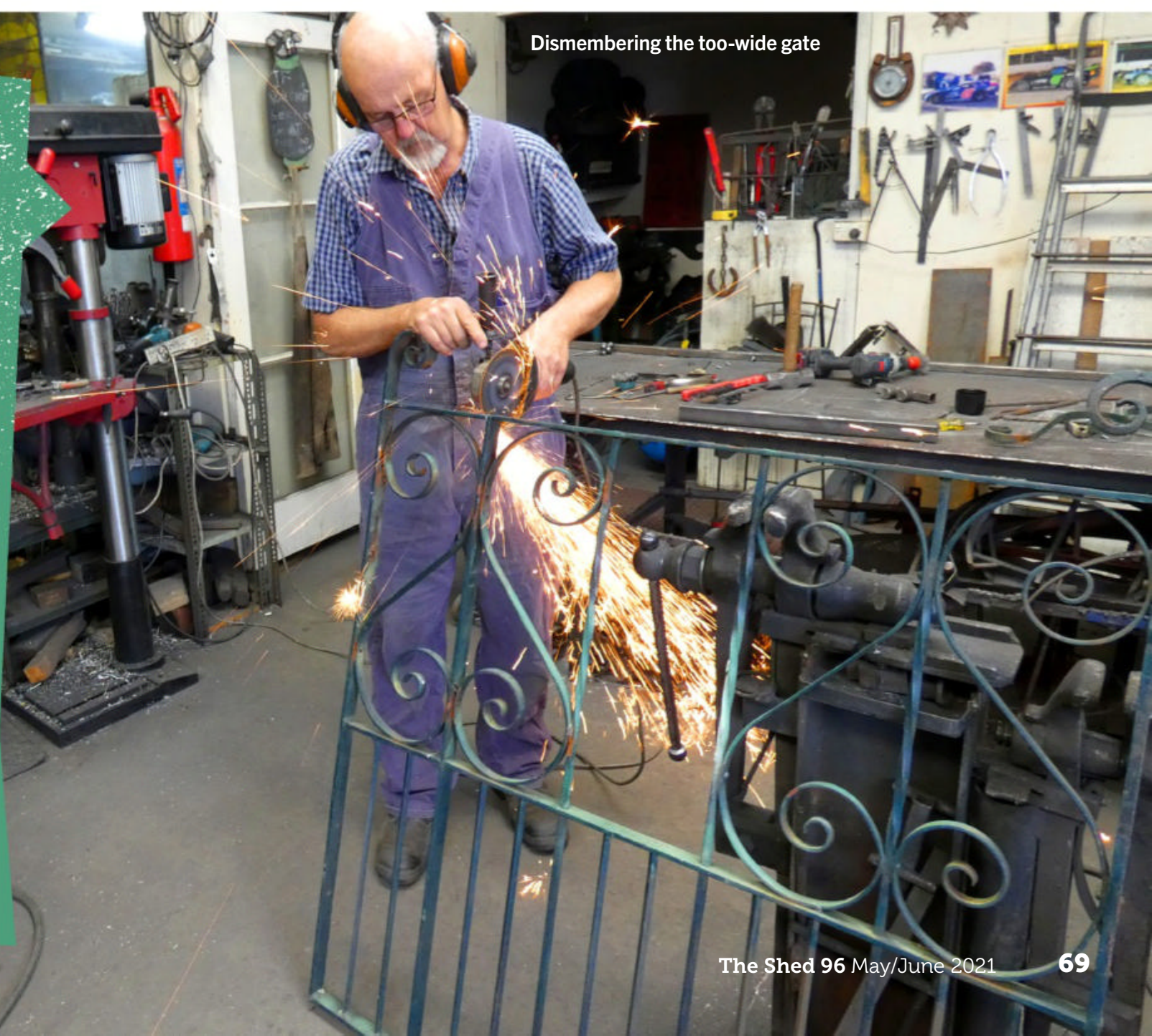
The new latch-side upright had been made from a farming fence standard: the holes for the five-wire fence were clearly visible. The latch mechanism had been shifted to the gate's new edge, and the scrollwork at the very top of the gate had been relocated so that it was again positioned symmetrically in the centre of the gate.

The three pieces of scrollwork shifted had been attached in their new positions by welding along their edges, rather than using rivets as in the original construction. The practical reason for this would become clear as the attempt to return the gate to its original width proceeded. It proved impossible to neatly cut the welds with a hacksaw, and so a thin friction disc in my 100mm angle grinder was used to, as carefully as possible, slice through the welding. This also, regrettably, removed a small amount of the gate's original metal — as had the welding. ►

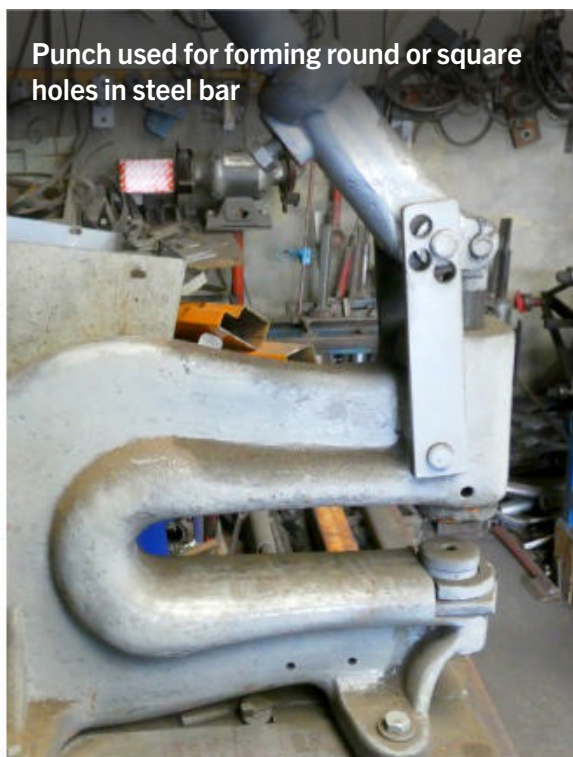


Antique riveted gate with modern hinge assembly attached by welding. Note the pin in the gudgeon, which prevents the gate being easily stolen. This was one of a pair of wider gates closing off the driveway of a large house

“It proved impossible to neatly cut the welds with a hacksaw, and so a thin friction disc in my 100mm angle grinder was used”



Dismembering the too-wide gate



Punch used for forming round or square holes in steel bar

The gate guy

I took the gate to blacksmith Neil Robertson at Robinson Wrought Iron, who I had previously met when I took photos of him and his workshop for possible inclusion in last year's *The Shed* calendar.

I had been impressed by the stuff he had been working on and was very pleased when he agreed to narrow the gate. Neil grew up on a farm in the Ashburton area and worked for local agricultural engineering firm Moore and Halliway after he left school. Forging new points on harrow tines was a regular part of the work he did.

After moving to Christchurch, Neil worked for more than 10 years for Veronese Wrought Iron making gates and garage doors. Twenty-five years ago, he left to start his own business. He used to make café furniture until cheaply made imports took over the market. These days he works on commissions; people walk in the door and ask him to make things. He also has clients who he has worked with on a variety of projects for years.

Good client

When I visited, Neil was finishing a steel-framed weathered-wood Gothic door he had made to fit a pointed Gothic arch in a

Rivets — a brief history

Cast iron is too brittle to be reliably riveted, so it wasn't until structures began to be made in steel that riveting became common. From 1810, for more than a century, boilers, locomotives, ships, and steel-framed buildings (such as the earliest skyscrapers) were made from pieces of steel fastened together with rivets. The rivets weren't especially strong, having to be made of low-carbon steel that could be shaped into rivets without cracking, but were permanent and cheap. To get a joint of greater strength, more rivets were used.

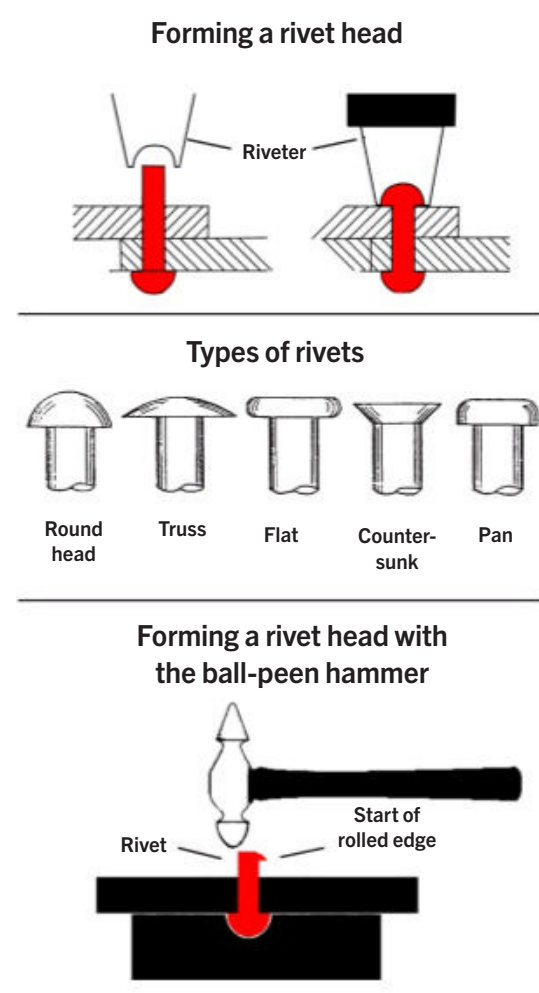
Holes in the steel to be joined were drilled, the rivet was heated red-hot, the hot rivet was inserted into the holes, and the head of the rivet would be formed using a pneumatic riveting gun whose shaped end acted as a die. The metal was more easily deformed by the pounding of the die if it was very hot. As it cooled, the rivet would contract and tightly grip the components being joined. The staccato sound of riveters was the ever-present background noise of shipyards, large construction sites, and loco works.

From about 1930, electric welding began to replace riveting in shipbuilding. Rivets were still being used in steel-framed buildings as late as 1960 because of some earlier failures in welded-steel construction, although it had been shown as early as 1926 that welded-steel structures required only about 90 per cent of the steel that a riveted structure needed.

Concerns about earthquakes resulted in steel-framed buildings being built in both Wellington and Napier, as well as in other New Zealand cities. The first riveted-steel structure was the Public Trust Building on Wellington's Lambton Quay, whose plans

were rumoured to have been hurriedly revised after the 1906 San Francisco earthquake. Napier's Market Reserve Building was completed soon after the city's 1931 earthquake, and, shortly after that, the last riveted structure in New Zealand, the Tower building at 60 Customhouse Quay, Wellington was built.

Aluminium is much more difficult to weld than steel, so aircraft, made of aluminium because it is lighter, were of riveted construction until adhesives began to be used at the end of last century. There are some examples of steel aircraft, such as the USSR's very highly regarded MiG-25 'Foxbat' interceptor and reconnaissance aircraft (top speed Mach 2.83) of the 1970s. These were mostly welded together rather than riveted. US experts, who examined an example that had been landed in Japan by a defecting pilot in 1976, were apparently unable to work out how the welding had been carried out.



Heathcote River bridge made in 1864 from steel plate and steel angle held together with large round-head rivets. The bridge was originally located in Ferrymead, replacing the ferry. It rotated on a central bearing to allow sailing craft to pass on either side



“He has an idea, I make it,
send the bill, and he pays it”

stone wall in the grounds of a newly built multi-million-dollar house.

The robust strap hinges are attached with bolts disguised as large rivets. He has already made a very long wrought-iron front fence for the same property and values the simplicity of his relationship with the client: “He has an idea, I make it, send the bill, and he pays it.”

Neil was for many years a frequent competitor in Production Saloon car races at speedways throughout the South Island, running a Mustang with a Ford Windsor 351-cubic-inch (ci) engine, which was bored and stroked to give 427ci and gave satisfactory performance. It also had an American Winters Quick Change rear end.

Each speedway track requires different gearing to achieve the best performance, and the easiest way to change this is to change the ratio of the crown wheel and pinion in the back axle. The Quick Change allows this to be done relatively easily and — no surprise — quickly.

Replacement-gate narrowing

The three horizontal sections of the framework were cut about 10mm proud of the original opening side and the protruding metal narrowed so that a rectangular tab remained. These nubs of steel were heated with an oxygen-propane torch until they were red-hot and then shaped with a ball-peen hammer — a ►





Neil managed for years without an anvil, not being able to justify the expense, but now has three — one home-made



Blacksmith's leg vice. Neil thinks that they are very good value for money at present — especially when compared with anvils. They are also rather more durable



Heating the steel tang of the gate latch so that it is more easily hammered into a head to hold the latch in place

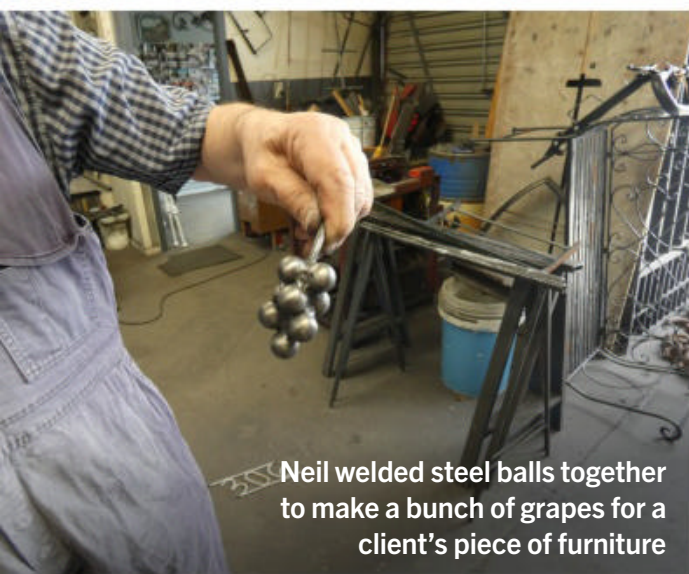
few hard knocks with the hammer's flat face and then multiple lighter blows with the ball — to form a square shape similar to the original work on the gate's hinge side.

In the original gate, the scrollwork would have been riveted onto the gate's frame before the frame was assembled. It proved impossible to form the rivet's head

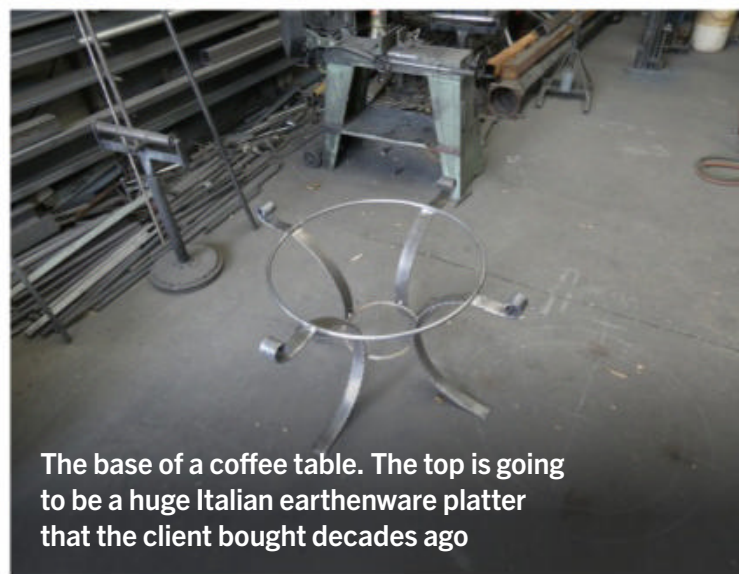
without pulling the entire gate to pieces or using some type of specialist riveting gear, which could operate in the very small spaces between the gate's members, which we unfortunately didn't have.

On the Gothic gate's frame, Neil had faked rivet heads with his MIG welder. He proposed that the rivets be replaced

by plug welds. The hole that had been made for the rivet was filled with weld, and a realistic fake rivet head was crafted on the surface of the metal. The process is very fast and the relocated scrollwork was fastened in short order. Very close examination is needed to tell that these plug welds aren't round-head rivets. ►



Neil welded steel balls together to make a bunch of grapes for a client's piece of furniture



The base of a coffee table. The top is going to be a huge Italian earthenware platter that the client bought decades ago



Ancient Drummond round-bed lathe converted to electric drive. Originally, it would have been driven by flat belts from line-shafting attached to the roof. Neil finds it very useful



Samples of Neil's work



Christchurch's wrought-iron garden gates

At the beginning of last century, most households didn't have a car and so didn't need a driveway and a wide gate.

Most houses would have had just a 36-inch-wide pedestrian gate made of either wood or iron, just wide enough for furniture to be carried through or for a bicycle and rider to negotiate. Wooden gates were produced by joinery factories like Auckland's Kauri Timber Company and metal gates either imported from England or made by local blacksmiths such as Richmond's Dave Harries.

The iron gates needed only a small number of specialised tools to make. The gate sides of, say, 1½-inch x ¾-inch steel strip would have had three narrow transverse slots punched by a hand-operated press along its length.

Tongues on the ends of the gate's three horizontal members would be inserted and fixed in place by peening with a ball-peen hammer. The two sides would usually have had their top ends beaten hot over the horn of an anvil to form scrollwork. The lower part of the gates was traditionally a series of square-section uprights, which may have been twisted when hot using a vice and a bar with an appropriate aperture.

The rest of the gate would have been filled

with combinations of lighter gauge scrollwork and square-section uprights. The top of the gate varied from unadorned, to a row of arrowheads, to elaborate iron filigree confections. The scrollwork was attached using steel rivets. These were inserted, red-hot, into round holes punched by the press and had a head formed by vigorous hammering on a tool called a 'snap'. The rivet was 'upset' by this process, the protruding shank transformed into a round head and formed a fastening of great strength. As the rivet cooled, it would have shrunk in length and pulled the metal pieces it traversed tightly together.

Over the years, most houses would eventually have had a driveway installed, and often this would have meant the replacement of the pedestrian gate with a much wider gate or perhaps a pair of gates. So, today, these iron gates are much less frequently seen.

The one we bought from a large demolition yard was the first they had seen in more than two years. It had been salvaged from an inner-city mansion, which had been wrecked in the 2011 earthquake. The previous owners were the proprietors of the city's best-known department store — yes, that one — and so we had to pay a premium for the gate's distinguished heritage.





Narrowed gate in red-oxide primer

The last part of the job was reattaching the latch mechanism. Neil suggested that the gate be rubbed down, undercoated in red-oxide primer, and finished in a green topcoat similar to the original paint. His practice is then to rub the topcoat with a rag while it is wet, revealing the different

coloured undercoat at selected places, which gives an antique appearance. The topcoat when hardened is then lightly rubbed over with fine wet-and-dry abrasive to remove its gloss.

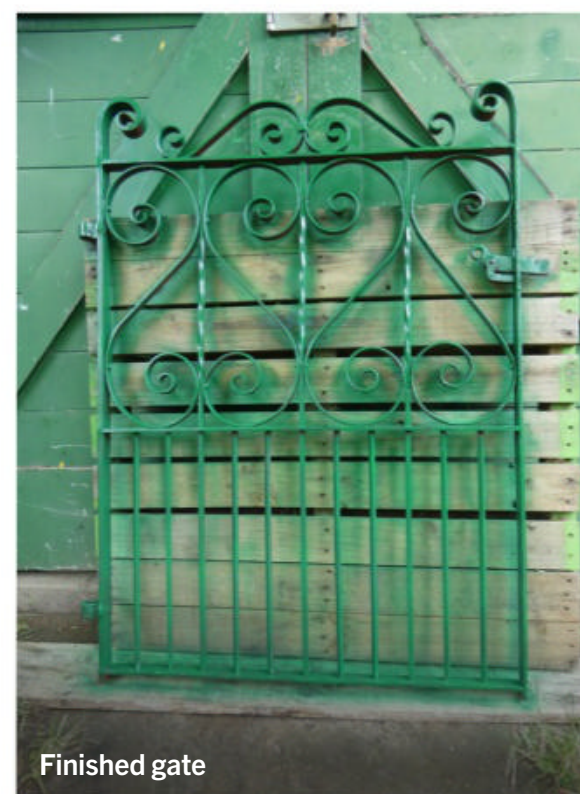
Irongate

I like to think that we live in a generally low-crime area, so the theft of the gate was disturbing. The crime would have required planning. The person responsible would have needed tools to remove the coach bolt, which stopped the gate being lifted off its gudgeons, and a van or truck would have been necessary to carry the loot away. It is still unclear how we are going to prevent this third gate from going the way of its predecessors.

On the other hand, successfully finding a replacement Edwardian wrought-iron gate was an interesting exercise; it's always good to have an excuse to visit demolition yards and recycling centres. It has certainly made me notice and appreciate these architectural antiques more. The removal of the gate's added panel complicated matters, but it was fascinating to see blacksmith Neil Robertson in action, and I was very pleased at the way the gate turned out. 📄



Applying the green topcoat



Finished gate



“His practice is then to rub the topcoat with a rag while it is wet, revealing the different coloured undercoat at selected places, which gives an antique appearance”

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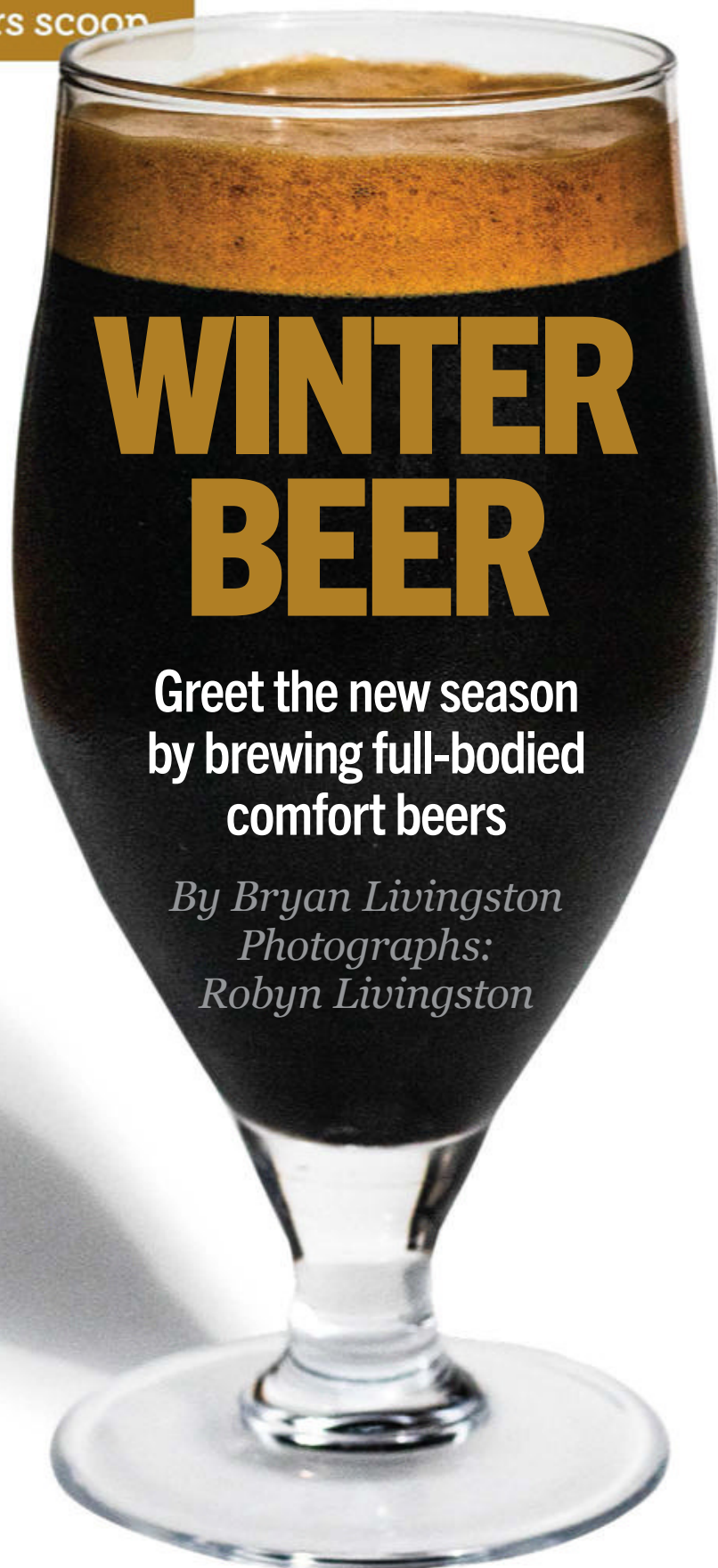
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Recipe

Brewers Coop's Winter Stout

All-grain (23 litres)

- OG: 1.060
- FG: 1.015
- IBUs: 30
- Est. ABV: 5.2 per cent

Malt/Grain bill

- 445g Weyermann Carafo III
- 250g Special W
- 4.7 kg pale ale (Maris Otter is a good option)
- 500g Vienna
- 400g Dark Munich

Hops schedule

- 17g Sabro (14 per cent AA) at 60 minutes
- 25g Sabro (14 per cent AA) at flame out / whirlpool (80°C for 15 minutes)

Yeast

2x Safale 04 English ale yeast

Directions

- Take two litres of cooled boiled water. Take this room-temperature water, cold mash the milled Carafo and Special W malts overnight. Strain and reserve the liquid until the end of the boil. Mill the remaining grains and mash at 68°C for 45 minutes. Add the reserved cold-steeped malt liquid and raise the temperature to 75°C before mashing out.
- When the wort is boiling, add the bittering hops and boil for 60 minutes. At the end of the boil, reduce to 80°C, then add the whirlpool hops and steep for 15 minutes. Crash cool to 20°C before transferring to the fermenter and pitching the yeast.

Winter is coming and the change in seasons does impact our beer drinking.

The winter months bring colder days and shorter daylight hours. We tend to hibernate more, staying inside close to the open fire rather than heading out at night. So how does the change of season affect our beer selections?

In summer we drink beer to socialise but also for hydration. When we are enjoying the hotter summer days, we tend to drink lighter bodied beers, often lower in alcohol, to quench thirst. These beers tend to be hop focused and include styles like pale ales, lagers, pilsners, and IPAs.

Winter beers tend to be more comfort beers, often malt emphasised and fully bodied. We tend to slow our consumption to lesser volumes (we don't have the same craving for thirst-quenching beers), and instead we tend to enjoy fully bodied beers with malt flavours, including

caramel, chocolate, coffee, and even vanilla. These beer styles include amber ales, porters, and stouts.

Adjusting for the seasons

The changing seasons mirror what we see with wine consumption. In summer we enjoy cold, fruity wines such as Pinot Gris, Chardonnay, Sauvignon Blanc, and Riesling. These cold wines are sipped at the summer barbecue to quench the thirst on a hot summer day. When winter arrives, red wines become more popular and we drink these served warmer to enjoy while entertaining inside.

Obviously these are more trends rather than a necessity or guidelines. Many beer drinkers still drink hoppy IPAs all year round and similarly some wine drinkers enjoy their Sauvignon Blanc all year round. But subconsciously we generally adjust our drinking around the different seasons. ►

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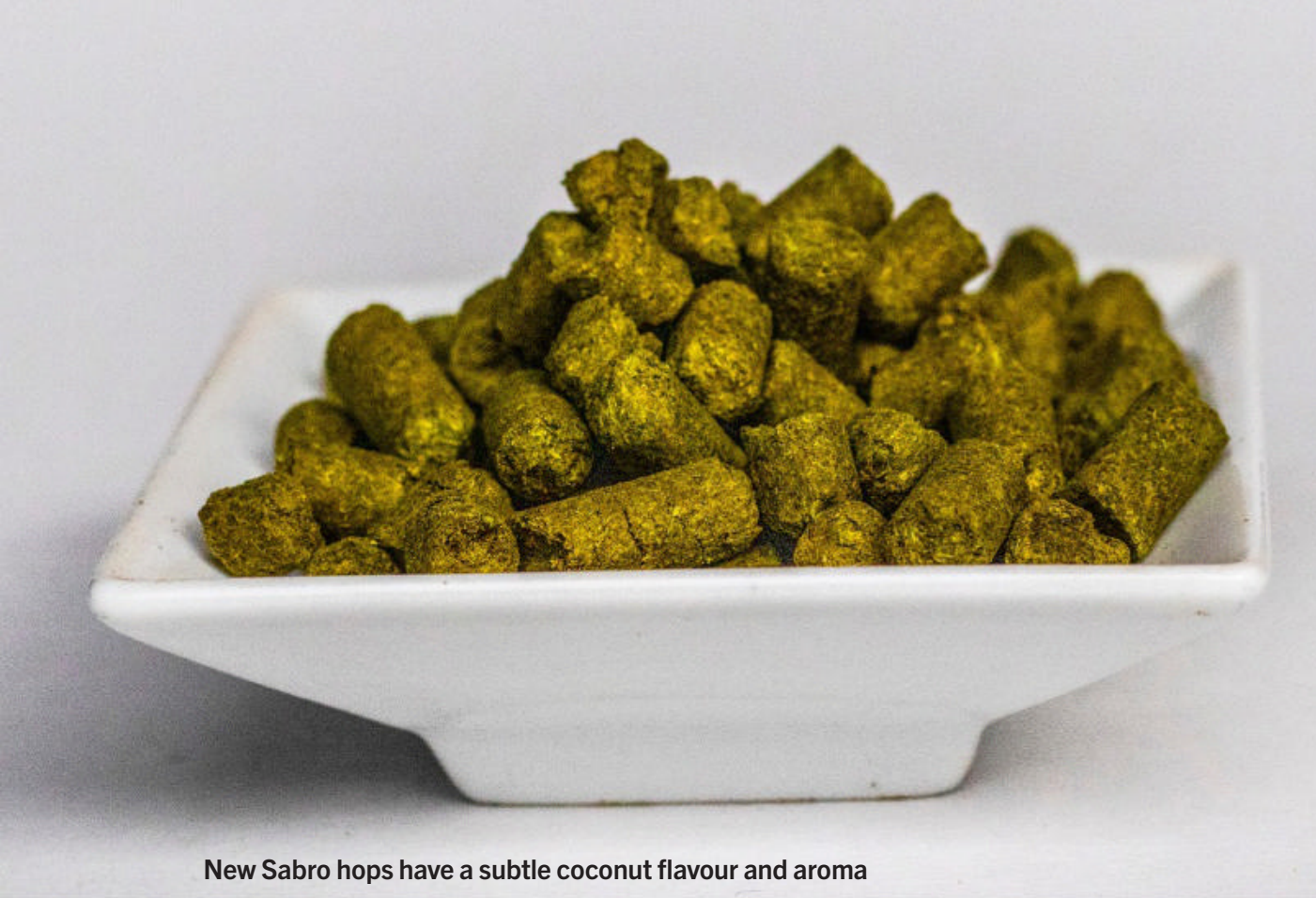
16 more great projects from our first 15 years of The Shed magazine

Want to make your own outdoor fire, bedside cabinet, or Damascus steel knife? How about an outdoor slow cooker barbeque or a ukulele? Maybe you want to learn how to make your bicycle electric? These are just a few of the projects we have included in this second edition

of Best of The Shed. All have clear instructions that demonstrate the build process and include diagrams and parts lists.

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New Sabro hops have a subtle coconut flavour and aroma

Make what you enjoy

Not everyone wants 23 litres of stout to drink over winter, so you need to select a style of beer that you are likely to enjoy. Doing a little research when planning your next brew increases your chances of making a beer that you will enjoy. Here are three styles worth considering.

American Amber Ale: If you enjoy your hoppy beers then an amber ale is worth brewing. Amber ales are sweeter than an American pale ale or IPA but less hoppy, using American hops including Mosaic, Citra, Cascade, Simcoe, and Centennial. The result is a beer that is fully bodied, mildly sweet, and while not as hoppy as an IPA you can still detect the tropical fruit and citrus US hops.

Porter: Originating in London in the 18th century, this dark beer was a popular drink among port workers. Porters are well hopped with English hops, giving a nice bitterness balanced by the dark brown and black malts. Usually a lighter bodied beer compared with the English stouts, porters were designed more as a sessionable beer for the workers after their shift finished at the port.

Stout: This is the grandad of all beers, but there are a number of different stout styles, including the dry Irish stout (like Guinness), oatmeal stout, sweet stouts, pastry stouts, export stout, and Russian imperial stouts. Alcohol contents range from 3.5 per cent to 11 per cent, and sweetness ranges from dry to very sweet. So if you have tried one stout and it's not to your taste, other substyles may appeal.

The process

Brewing these winter styles uses mostly the same processes as brewing our summer beers. However, there are two small differences that will make a good beer into a great beer.

First, the mash temperature for all-grain brews is usually higher at 68°C–70°C to give more sweetness and more body. This largely removes the need to add lactose to put sweetness in the beer.

Secondly, for all-grain brewers who are brewing porters and stouts, cold steeping your dark grains will make your porter smoother. When dark grains are mashed normally, you can get a harsh, burnt taste further emphasised by the tannins in the husk. By cold steeping these grains you don't get the same extraction of these tannins, so the result is an overall smoother beer. The all-grain recipe in this article uses this method.

An exciting time of year

Just as our lives change as we head into the winter months, so do our beer-drinking habits. But this is an exciting time of the year as we change from drinking thirst-quenching beers at a summer barbecue, to the more comforting, sweeter and fuller bodied beers that we enjoy at winter dinner parties or while sitting around the fire on a cold, stormy night.

If you have been pretty set in the ways you make your beer then maybe it's time for a change. Knock out a winter beer in the next few weeks and enjoy drinking it over the winter months. 🍷



Recipe

Winter Stout – Extract

If you haven't ventured into all-grain brewing, then try this extract recipe:

- 1.7kg Black Rock Miners Stout
- 1.5kg Amber Liquid Malt
- 25g Sabro (14 per cent AA) dry hopped when pitching yeast
- Yeast Safale 04 English ale yeast

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BUILD ENERGY AND ENTROPY

TWO THINGS WE’LL BE HEARING A LOT MORE ABOUT

Hang-glider to wheelbarrow, a foot-operated laptop charger —
our off-the-grid expert extols the virtues of repurposing

By Murray Grimwood

Photographs: Murray Grimwood

For a very long time I’ve contemplated energy: its capture, its storage, its use, and its eventual irretrievability. Two things I’m convinced that we’ll be hearing a lot more about are ‘build energy’ (the already-used energy it took to make a house, a car, a ship, or a dam) and ‘entropy’ (the direction energy moves in at every change, usually ending in heat of too low a grade to reward collection).

Almost everything we have represents expended fossil energy. I never drive over bitumen or look at a plastic tank, never glance at my petrol gauge or fuel up my chainsaw, without visualising a particular photograph from *Adventure in Oil*, Henry Longhurst’s history of British Petroleum. It is of the capped well-head of F7 Masjid-i-Suleiman, which, over its

15-year life, produced nearly seven million tons of oil. The point is that it was capped in April 1926. The point of the point is that the oil is gone — into the atmosphere, into landfills, or into low-grade heat; gone, 29 years before I was born.

It’s gonna be a struggle

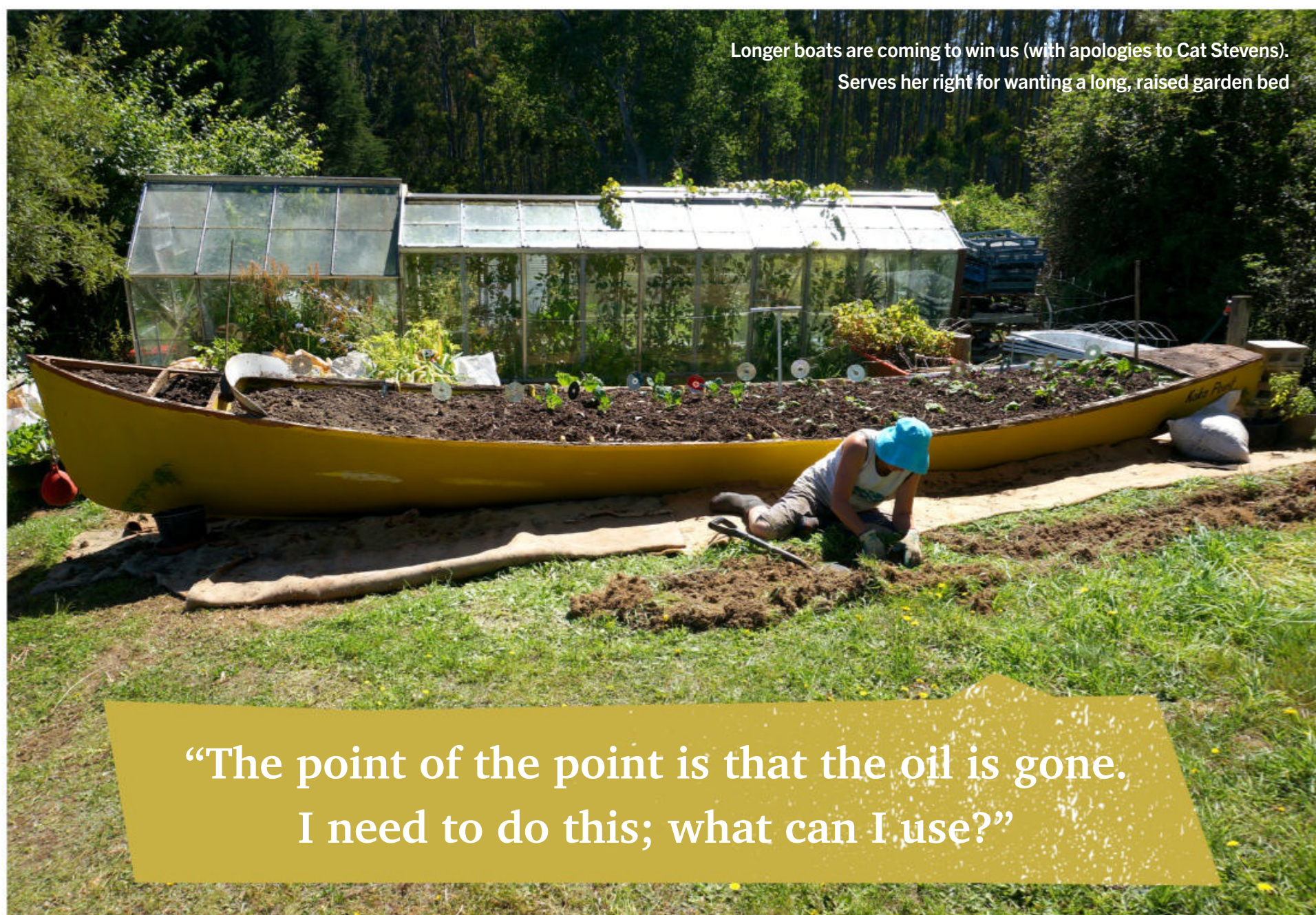
Some folk think we can morph seamlessly to replace fossil energy with renewables, but this entropy thing says that we will struggle. The further from the source and the more scattered energy is, the less work you can extract from it — the ratio is energy return on energy invested (EROEI), which I’ve mentioned here before and which we will become much more familiar with in the coming years.

Living off real-time solar energy is

nothing like living off millions of years of the stuff, compacted over millions more years at no cost to us. We will do it, but we will be thinking of energy as gold, not as some two-dollar-a-litre expendable.

One thing that hasn’t made its way into the conversation, yet, is decaying infrastructure, of which there has never been more, all of it requiring ever-more maintenance — requiring ever-more energy, in other words — as time goes on.

Decay is just entropy in a different form. Hereabouts, one of the practical ways in which we stave off infrastructural entropy is by covering our hose reels to protect them from UV degradation — one wonders whether they are purposely made to fade, become brittle, and crack! Starting with a cardboard template, we made the covers from flat-sheet galv. held with cable ties.



A next-user

Via energy thinking, I have become a next-user of things that had already been made for my purpose, and a repurposer of already existing things made for a now-obsolete task. After a while this becomes second nature, either: *I need to do this; what can I use?* or, *That looks too good to throw out; what could I use it for?* Sometimes it borders on art for art's sake; at the other end of the scale it probably qualifies as inspired; always it is cheaper

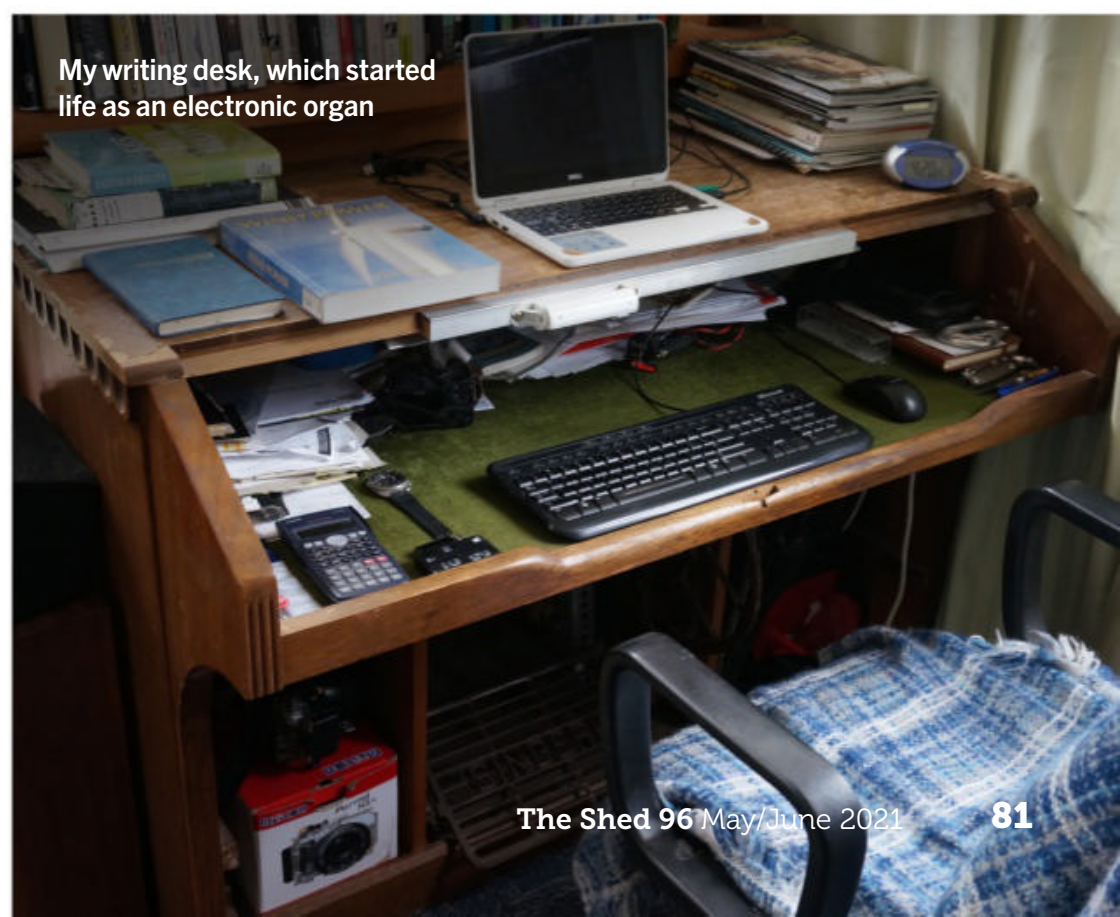
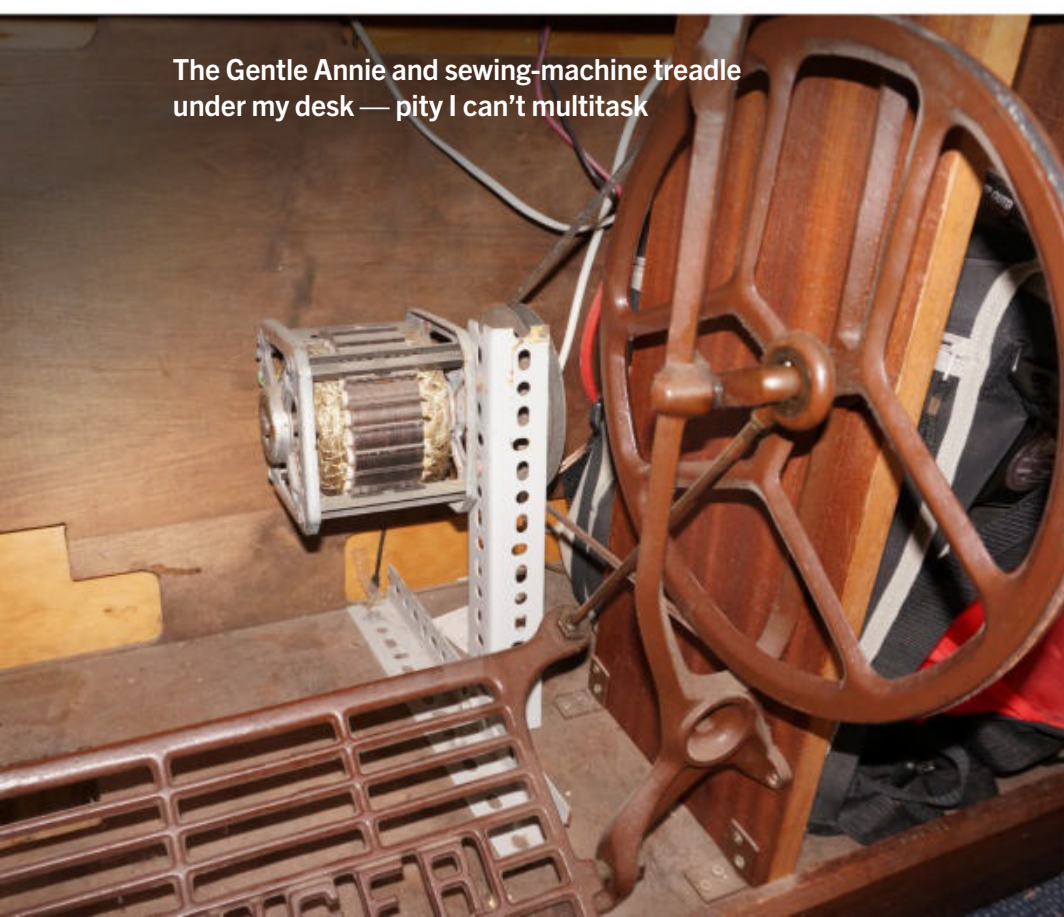
than buying new. And it's a ton of fun.

The other day, a fellow, knowing my style, asked if I would come and look at a boat. He'd bought it 30 years ago with a dream; now he was either taking it to the dump or ... I looked at it in the paddock and agreed that as a boat it was a write-off. Then, mentally perusing that never-shortening list I have alluded to in previous issues, I said we'd take it. Serves her right for wanting a long, raised garden bed.

Bitsas

Our much-hacked wheelbarrow — known as the 'bath-cart' — is constructed from two old hang-glider tubes, two old BMX wheels, and an acrylic bath. Carrying the load on the wheels and controlling it with a long lever has proven to be a winning combination, especially if you're not the one between the shafts on an uphill haul.

Another example of repurposing is my writing desk, which started life as an electronic organ. That resulted from my ►

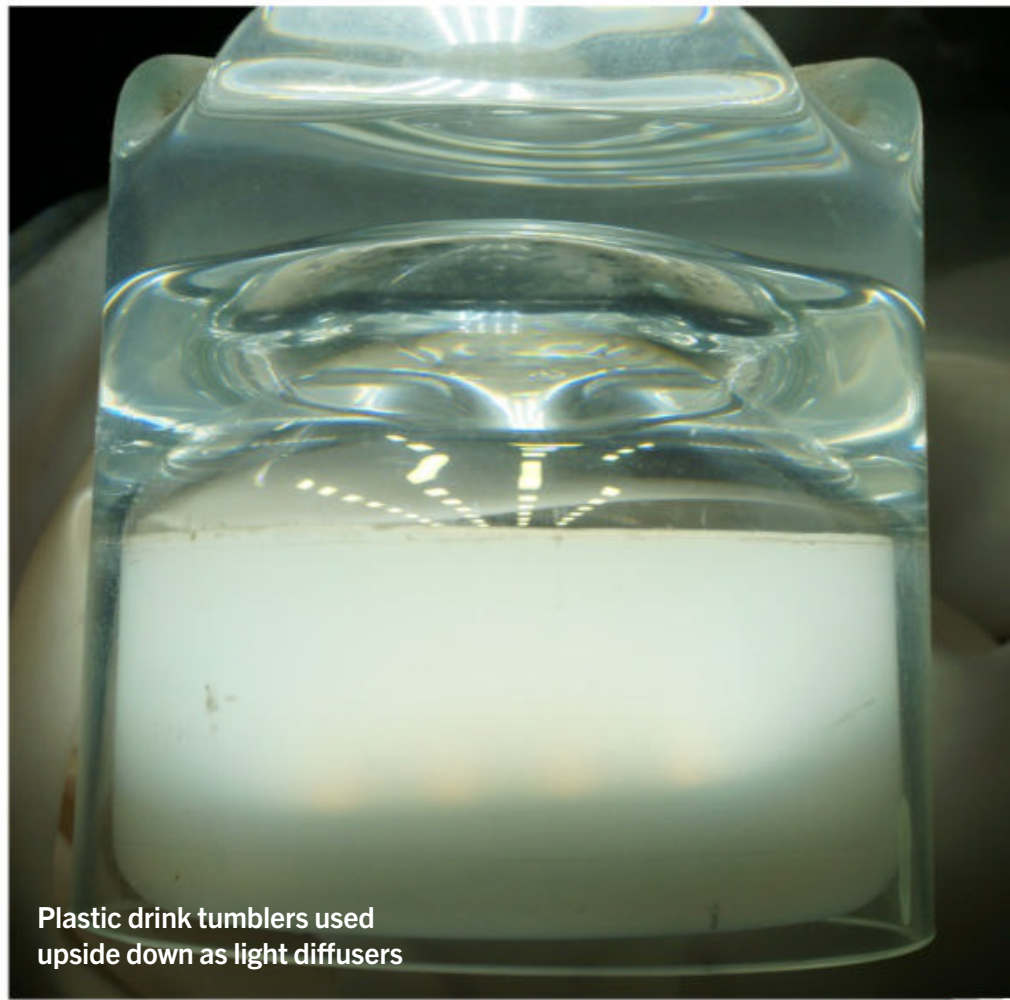




Saving something from entropy: we cover our hose reels with flat-sheet galv. to shield them from UV



An acrylic bath, a couple of tubes and a pair of BMX wheels: our most-used wheelbarrow



Plastic drink tumblers used upside down as light diffusers

asking myself: *What else do people sit in front of, besides expensive writing desks?*

What wasn't quite so successful, perhaps, was the effort to charge my laptop using a sewing-machine treadle and a Gentle Annie motor mounted under the desk. Oh, it works all right; it's just that muggins can't multitask. I can write, or I can treadle, but I'm darned if I can do both.

Other 'What could do this job?' things include the discarded pram that has delivered firewood to the house for years, and the thick-bottomed drink tumblers we used in the early LED days as light-

diffusing prisms — later iterations used jam jars.

More on the art-for-art's-sake side of things is the windmill that I made her for her birthday a long time ago, now in its second iteration, based on a BMX frame and a mountain-bike wheel. I still point out that it was built without a shop visit.

Family folklore recounts how she went to work the next day, said, "I just got the best birthday present", and proudly showed a photo.

"Hm, I'd rather shoes," came the never-forgotten reply.

Constant hot water

The principle that the earlier you tap into the energy stream the better, led to the big version of a camp shower that we use on sunny days, out in the orchard.

An old insulated chiller door is the base. An old shower door lies over it. Between them is a Butynol-lined 100mm deep tray of water. A hinged lid either reflects sunlight into the water from a stainless surface, or closes over the tray to keep the heat in longer after sunset. Being shallow, the tray can't be filled with cold while it is being emptied

The ultimate camp shower?
A flat Butynol-lined collector,
stainless-faced lid open and
reflecting sunlight. Too easy



The point of the point is that the oil is gone.
The well head of F7 Masjid-i-Suleiman, capped in 1926



of hot — there isn't enough thermal gradient — so it is total loss, just like a camp shower, and cold mixes with it just before the showerhead. The last person out fills it up until the overflow spurts, ready for the next day. The shower taps into solar energy as early as possible, is maintenance-free, and directly displaces all the energy-demanding things involved in amassing firewood, such as chainsaw fuel and maintenance.

It ain't easy

Naturally enough, it has gotten harder and harder to live this way. The push to commodify the commons — places we used to be able to go freely, things we were able to do freely — for private gain has led to ever-more rules to ensure that we all buy new, throw away early, and buy more sooner. That approach was simply unsustainable, even though many of us currently rely on it for income.

The bigger picture is that we need products that last longer and are more easily repaired, supported by a reliable and lengthy parts supply. We probably need a modular plug-and-play approach to parts too, to slow the landfill-bound waste stream.

Folk generally don't realise that waste materials are not fully separated and recycled because we are not prepared to allocate enough energy to do so — and now we're back to where this article began. What we need are rules

facilitating reuse and repurposing, not the other way around. We need to extend the life of what is already built — which inevitably represents sunk energy; we need to repurpose where possible; and we can have a ton of fun leading the way. 📦

“We need to
extend the
life of what is
already built”



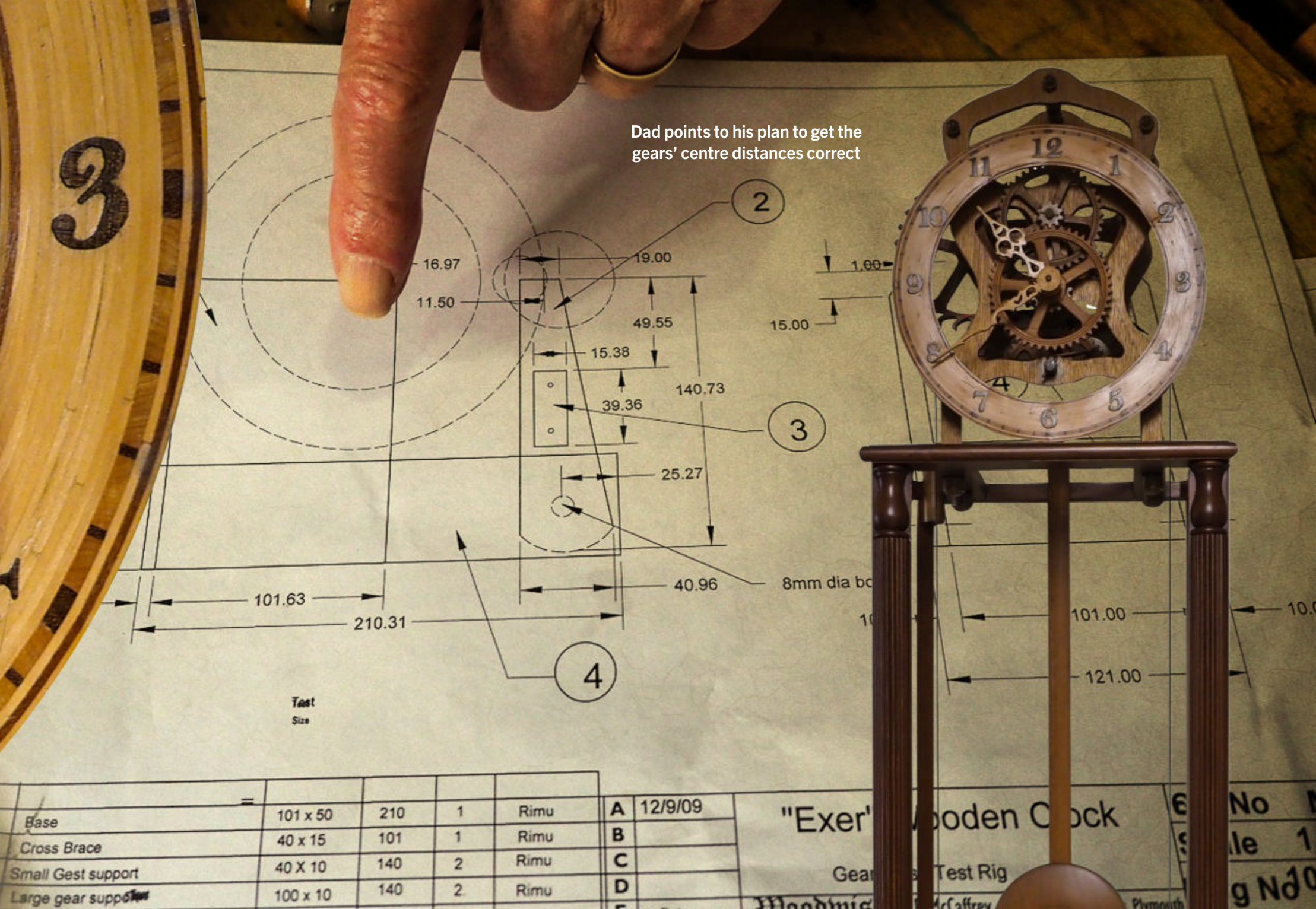
Old scaffolding makes ideal
framing for recycled bird
netting, which we stitch
together with fishing line



REX'S GRAND CLOCK

The seconds, minutes, and hours can turn into years when a craftsman is creating a timepiece

*By Vicki Price
Photographs: Janet Hunt*



Dad points to his plan to get the gears' centre distances correct

In these times of the cheaply made disposable, when watches can be designed to be bought and thrown away when the battery runs out, it is intriguing and refreshing to learn there are still those who spend their time making clocks by hand.

My father, Rex McCaffrey, is one of those people. He didn't have a plan as such but went ahead after seeing a picture in a magazine, to design and build a grandfather clock. Naturally, on a project of this scale, the hours turned into years and became filled with calculations, physics, and engineering nous, to make and, at times, remake components to get everything right.

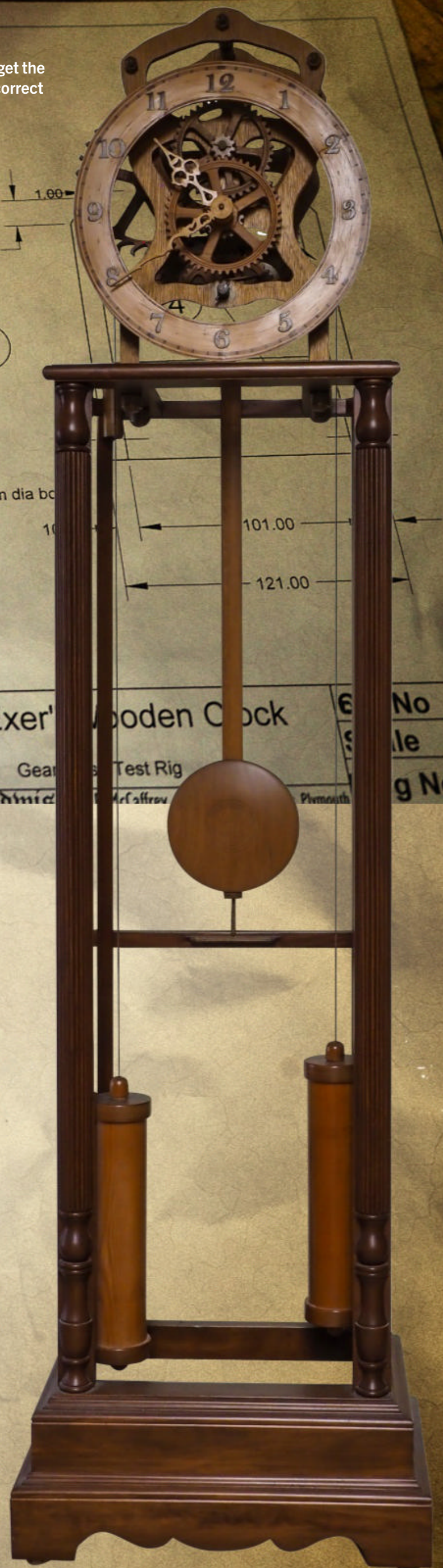
Made completely from wood

Now, and for the last ten years, Dad's clock stands in the hallway where he winds it with just a little pride — my dad is a humble man — each morning. He has to adjust the time a little on some days, due to the effect of any humidity on the cogs, because this clock is made completely of wood.

My dad is an engineer and so, while he enjoys the satisfaction of winding a wooden clock in the mornings, he employs his cell phone to ring him an alert when it's time to fill the tui feeder on the back porch each afternoon — or it's the tui ringing Dad, we're not sure.

The inspiration to make a wooden clock came from seeing an article in a magazine about a grandfather clock made from wood. There were some images of the workings, scant clues to the makings, and just enough to inspire rather than educate. So, my clever dad set to work with his mathematical brain and engineering experience to work it out step by step. He then had to work out how to make the tools needed to help build the various components, but he admits that he really did not know what he was doing most of the time.

"It's a very complicated thing," he says. "I've made a few things twice, but not all of them." ►



Nuts and bolts

It was a learning experience all the way. He had to make two escape mechanisms. The dial he made took quite a while, and when he'd got it nice and flat and circular, he arranged for it to set overnight. But, come the morning, there was a problem.

"When I looked at it the next day, it had all twisted. Obviously, the wood was under stress when it was clamped," he says.

Dad used two main timbers to build his clock: puriri, as its oily quality made it good for bearings, nuts, and bolts; rimu for the gears and pendulum, because that's what he had on hand; and he used a little mahogany and other timbers for the clock-face numerals for their decorative value.

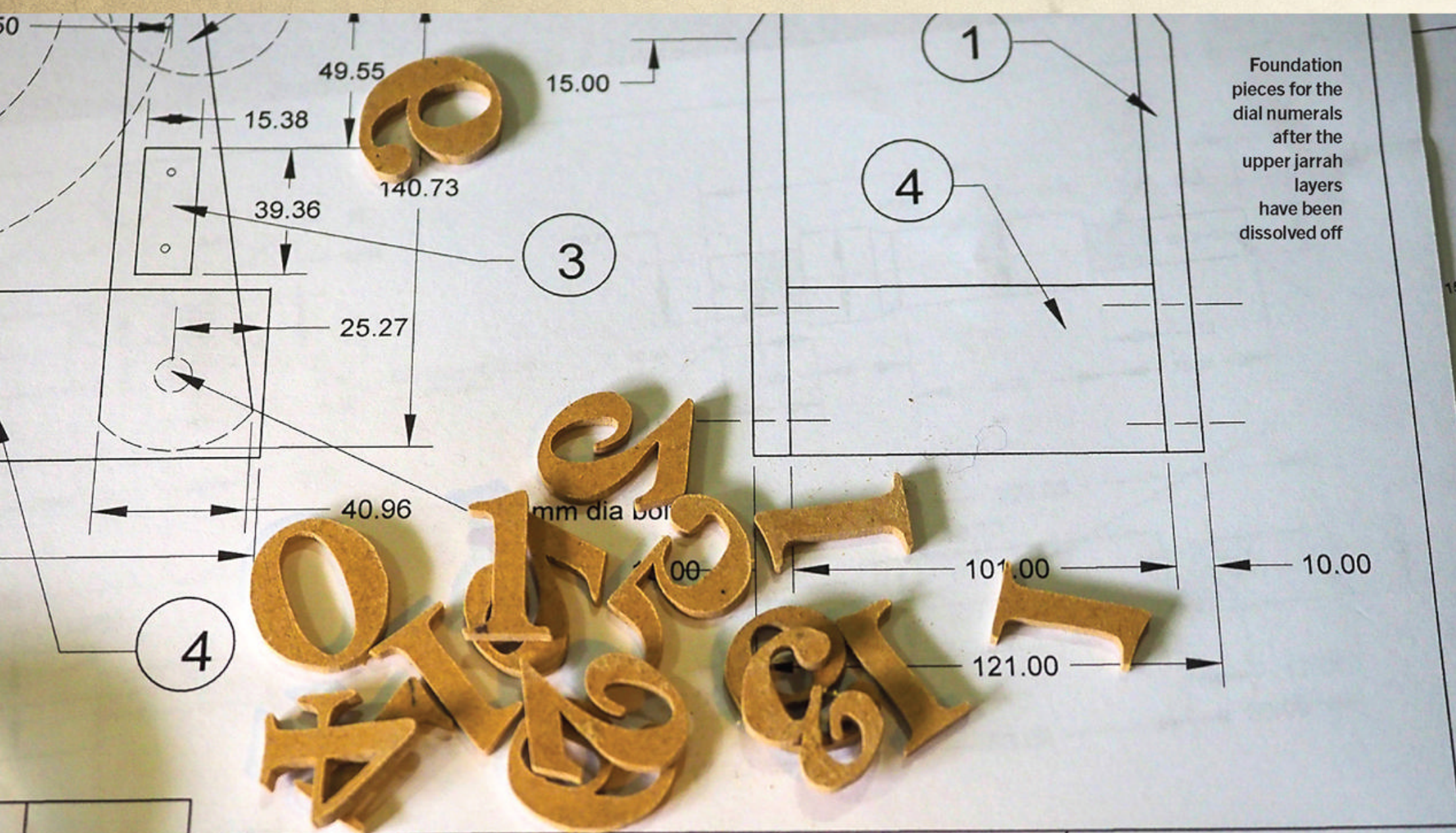
For the hands, which Dad reckons were probably the easiest things in the whole project to make, he used kahikatea from an old packing case that he'd noticed had quite a nice grain to it and was big enough for two hands. He printed a design off the computer, stuck that on

the timber, and cut around it using his vintage pedal-powered jigsaw machine.

The jigsaw was also employed to make all the gears and the numerals for the clock face. For the latter, he made up a sheet of thin jarrah, glued it onto a piece of 4mm thick timber, using glue that would later enable the veneer to be pulled off, then planed the jarrah down to 1mm thick. He then stuck the paper numeral — again, printed off the computer — onto that and cut out each number in turn. Once cut out, he soaked the thin layer of jarrah off the backing wood.

Dad explains the basic make-up of a clock, in a nutshell: "There's two parts to it. There are the dials, that's all this stuff in the front, and this is the mechanism in the back, the timing mechanism. And it's nothing but the gears onto here, which, that shaft there, goes through to the front and drives the minute hand. The minute hand is geared down to the hours hand. This mechanism here, this tick-tock, is what stops it unwinding in about 10 seconds flat."

"It's like a cat chasing its tail in a way — where do you start?"



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The jig for holding the clock dial while it was being glued

Cat chasing its tail

It all started with the gears. It was a difficult but necessary place to start. He began with the ordinary ones: “Before you start making the gears, you’ve got to work out where they’re going to be, because you can make a gear any size you like with 20 teeth on it — it could be bigger or quite small. It’s like a cat chasing its tail in a way — where do you start? Because once you start making the gears, you first have to work out what shape to make the teeth.”

He then used a car jack to make plywood for the gears, from three layers of rimu glued together at right angles. The jack was then used to clamp the lot under the workshop door frame. It was a success and “the door still opens and shuts all right; it didn’t push it out of shape.”

Then came the problem of working out what diameter the teeth on each gear would be so that the shafts were in the right place. It proved to be a very complicated process to work out how many gears, how many teeth on each gear, and what angle they would be for the clock to keep time correctly.

The gear wheels

There are four gear wheels that change the speed of one hand, slow it down to the next gear, making it one-twelfth the speed. That makes it a 4:1 ratio. The other gear has a 3:1 ratio and is a bigger gear. A 4:1 plus a 3:1 makes a 12:1, because $3 \times 4 = 12$. One gear turns eight times in 24 hours, turning each gear in sequence until the last one turns once in every minute.

The gear called the ‘escape mechanism’, or ‘escape wheel’, has specially shaped teeth, which makes it the most difficult to design. Dad had to work out the exact shape of the teeth required for it to perform its duty accurately. Once he had figured this out, he drilled a hole at the base of each tooth, ready for cutting out the teeth with the jigsaw. The hole in the middle wasn’t finalised, as he needed to line it up so the teeth, once cut, lined up dead true on the lathe. He then bored the middle hole proper.

To get the exact spacing for the spindle holes, the gears had to be a certain distance apart from each other. He had one piece able to move in and out for adjustment, another stayed in place and spun around, and another moved into it ▶

Dad with the escape wheel



The 100-year-old treadle fret (coping) saw, used to cut the gears and numerals



“The ‘tick’ sound is made from the first action and the ‘tock’ from the other”

until he got the right meshing. So, while he did need to work out where all the holes were going to go before he could work out the settings, when he came to assembling the clock and before drilling the holes, Dad checked the mating pair of gears out together to make sure they came out right.

“There were variations,” he says, “but it didn’t matter; it was only 0.5mm or something, but it made a difference to the mesh of the hands.”

The nuts that hold the frame in place are made using a tap. Another tool he used was an external thread chaser, to form the bolt’s threads.

“It’s got all the teeth on the end of it and you scratch it along very carefully while the bolt blank is rotating slowly on the lathe, keeping the chaser moving at a constant speed, and slowly you make a little line or mark on the surface and you keep going until it gets right down the full depth of the thread. It was one of the first ways they used to cut threads, back in 1802 or so,” he explains.

Tick-tock around the clock

Now we get to the heart of the clock — the C-shaped piece called an ‘anchor

escapement’ that rocks back and forth by tactician of the pendulum. It hooks underneath the escapement tooth and holds until the pendulum swings back towards the other side. The top anchor is now moving out from the tooth, while the lower part of the ‘C’ has moved under another tooth, ready to catch the escapement again as the top of the ‘C’ releases. The ‘tick’ sound is made from the first action, and the ‘tock’ from the other. Each ‘tick-tock’ moves one tooth on the escapement.

The anchor escapement is connected to the pendulum at the back and is moved by a short lever. The energy to do so comes from the pendulum and goes back to the pendulum by a short kicking action. In sliding down the outside of the escape wheel, it gives the pendulum a push at the end of its stroke, and keeps it going a little bit further each time, or tries to.

“You’ve got to drive the pendulum backwards and forwards,” my dad says. “It’s the outer slope of the tooth there that drives as it slides down that. The top one slides down, then the bottom one slides on it, so that each has two slides.”

So, the clock goes ‘tick’ on the first slide, then ‘tock’ on the second, and it takes one

second for each action to happen and the pendulum to swing across.

“There’s two seconds between each tooth and there’s 30 teeth, so they make 60 seconds.”

Dad says that he tried to get as near to 60 seconds as he could, but because two of the gears are identical, to simplify construction, the pendulum needs to be longer to compensate for the gears’ tooth error: “They have 60 teeth, whereas one should have 64 and one should have 60 to get it right. It’s supposed to be a 60-second clock, a half-second clock, like the ones you used to put on the mantelpiece with short pendulums. These clocks with short pendulums go twice as fast, so they need extra gears to slow the clock hands down.”

The pendulum

The pendulum bob is made from two pieces of rimu glued together.

At the top of the pendulum, it has a

little pointed piece like a biro which sits in a groove so it can rock backwards and forwards. There is a bolt through the middle of the round bob, with a thread, so you can wind it up or down. This affects how fast it swings.

“The shorter it is, the faster it moves. It’s exactly the same principle as a metronome, only it’s up the other way.” Says Dad, “The further down it goes, the slower it is; the further up, the faster. So, if you pushed it up halfway, it would go twice as fast.”

Dad used two paint tins filled with nuts and bolts for weights when designing this most important driver of the clock. He explains how winding the clock with the key (also made from wood) puts energy in and winds the weights up, then gravity and the controlled mechanisms of the gears make it unwind at a certain pace to tell the time.

Each morning, he takes the key off its hook and winds it 16 half turns, or eight

full turns, and then it will go for about 26–28 hours.

“I usually wind it before the weights hit the floor,” he says. “When you’re winding it up, the string is all on the bottom shaft, and then you get so far and it starts to wind on top of itself again, and it takes a lot more to wind it up — it’s quite hard.”

When you wind the clock, you take the weight off the pendulum and it stops. A little scale at the base of the pendulum indicates the central resting position of the pendulum bob. When the clock stops, the pendulum comes to rest either side of the central position.

“So that’s the side you’ve got to push towards to start it up. If you push it the other way, then you’ve got to re-adjust all the escape mechanisms, all the ‘tick-tock’ part anyway,” he says. Dad had to estimate how heavy to make the weights using lead pellets that he bought from a sports shop, with which he filled the completed rimu tubes. ►

“Each morning, he takes the key off its hook and winds it 16 half turns, or eight full turns, and then it will go for about 26–28 hours”



Dad holds the escape wheel at the treadle, to which he’s fitted a magnifying glass and dust blower for precision work



Lathe turning tools and calipers, some of which Dad has had since he was an apprentice fitter and turner at A & T Burt in Dunedin



The handmade clock being wound by hand

Smooth running

Moving parts in any machinery will need their way smoothed from time to time, and mechanics made from wood are no exception. To keep everything moving freely, the clock needs lubrication, but not with oil.

“Oh no, you’ve got to keep it dry,” Dad says. He uses graphite powder, which is pure carbon: “I put a wee bit on the teeth (you see they’re quite sort of black) and on the little spindle in the escape mechanism that goes backwards and forwards.” He knows when to lubricate it when the clock stops, despite being wound up: “The swing gets shorter and shorter, and when it gets to that point, the ‘tick’ goes, so it’s got to go past that point to make the ‘tick’ work. If it gets stiffer and stiffer, it won’t go past that and it just stops.”

The dial

Then it was time to make the dial.

First, he made a jig, a wooden frame, which he turned the centre out of before cutting the outside off. This gave him a ring to hold the dial.

“You’ve got to do a lot of that,” he says of making jigs. “I had to make a double round ring for the dial and put everything inside there and slowly build it up.” He then cut many little strips of kahikatea and mahogany and soaked them in water so that they would bend around the inner circle, building up to a beautifully decorative dial.

After release from the jig, it twisted, so Dad then had to design and make a support ring and brackets to hold it flat and in place while it went onto the clock frame. Happily, this worked, and

the finished dial was ready to receive its carefully crafted numerals and hands. The latter were slipped onto pegs that were slightly tapered, so that when he pushed the hands onto it, they jammed on securely.

Hard case

For the case timber, Dad bought a macrocarpa sleeper from the garden centre, the sort normally used for garden edging. He cut it all up and stained it. “Cheap rimu” he calls it.

Originally, he was planning on making a large case enclosing the workings of the clock, such as a traditional grandfather, or more correctly, a ‘longcase’ clock. But he changed his mind after making it from pictures he had seen in a magazine.

“I made the base up and I made it ►



“Oh no, you’ve got to keep it dry,” Dad says. He uses graphite powder, which is pure carbon

A woodturning corner of the workshop

The gears in
all their glory,
showing how to
tick and tock

“I made
the base up
and I made
it too big,
so I had to
cut it in the
corners, cut
the corners
all down, and
make it all a
bit smaller.
It just felt
too clumsy”



Above: Dad's neat and tidy workshop runs like clockwork

too big,” he says. “So I had to cut it in the corners and cut the corners all down and make it all a bit smaller. It just felt too clumsy.”

He has instead created what is called a ‘skeleton’ clock, where all the workings are visible. This type of clock — albeit metal, not wooden — possibly originated in Austria or France near the beginning of the 19th century, becoming popularly made in England circa 1820, where they developed the most.

Timekeeping

Dad wrote a log of his own clockmaking efforts during those three years that it took to build it, and while he didn’t finish the log completely, it gives some idea of his working process. He now has a folder bulging with calculations, drawings, measurements, charts of gear dimensions, cutting lists for gears, noting pitch,

amount of teeth, contact angles, shaft hole sizes, and so on. If he was to put it together for others to learn from, he would have a pattern and instruction book of how to design and build a grandfather clock from wood, easing the process for anyone else who would like to take this project on.

Dad, while admitting it was an extremely complicated thing to take on, is humble about his achievement, saying, “I just had to join up all the bits and make it look flash.”

So Rex’s Grand Clock stands in all its glory at the end of the hall, with all its ingenious workings on show, a fascinating monument to the era of mechanics, of mathematics, and of physics, not to mention persistence and patience. *Tempus fugit*, says the Latin phrase for ‘time flies’, but this clock was determined to take its time, the finished thing a marvel of engineering and time well spent. 📁

Glossary

Escape mechanism — a pivotal piece that controls the speed of the energy released by the weights and transmits it to the gears in a measured way to keep time.

Angles, pitches, teeth — ‘teeth’ are the bits that stick out on a gear or cog. The ‘pitch’ is the difference between each tooth. The ‘angle’ is the angle of the tooth itself, and they all need to be the same so they can mesh in with each other.

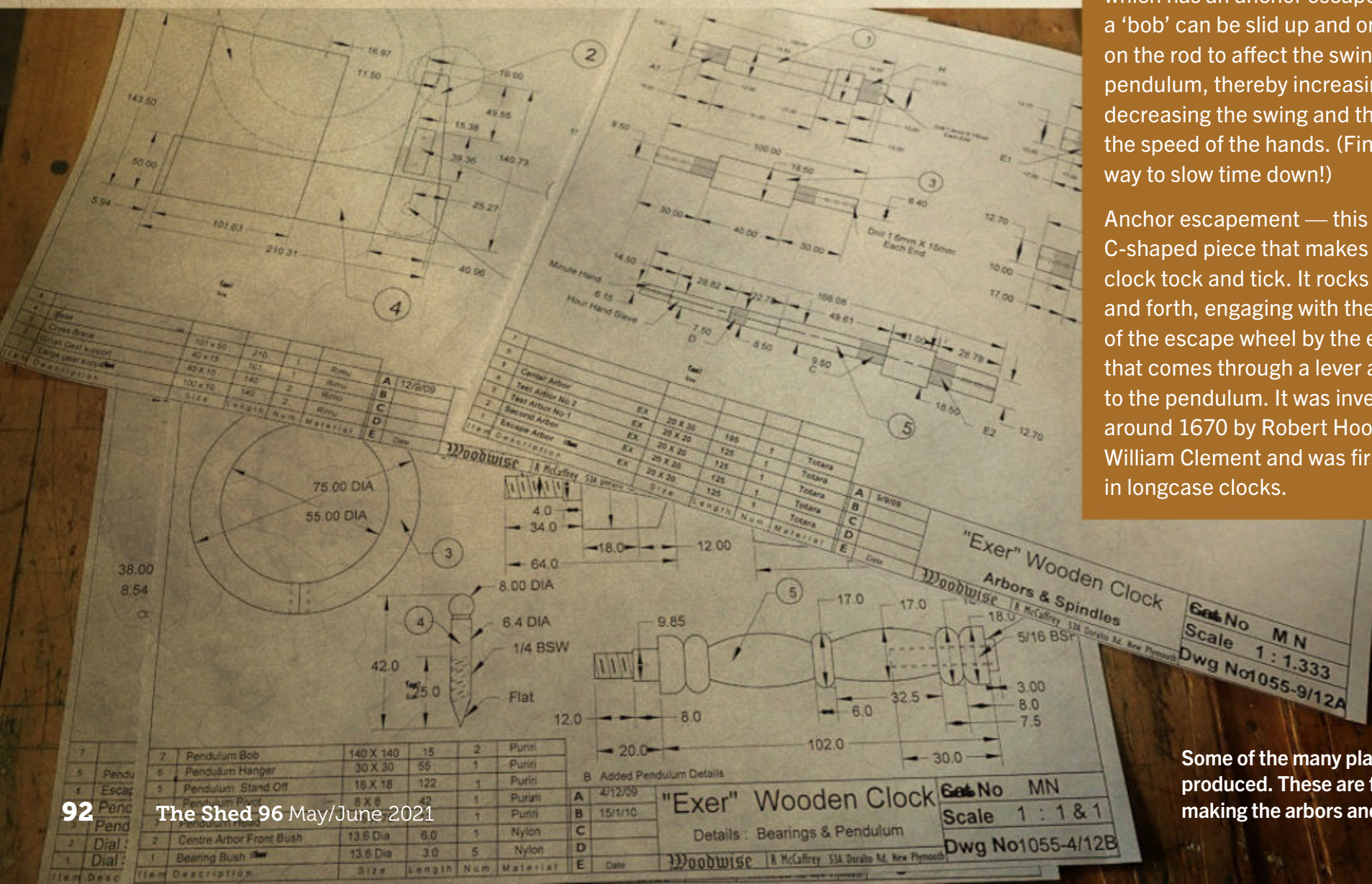
Jig — a piece of equipment that you make to hold something, so that you can press it, drill holes in it, or line it up with something else that you are going to do.

Spindle — also called the ‘arbor’, is a rounded shaft on which a wheel or gear is mounted in order to spin freely.

Weights — weighted tubes filled with lead that drive energy to the escape wheel. The pull of the weights makes the escape wheel turn, the energy of this travelling through all the other wheels or gears in turn and ending in the hands turning on the dial.

Pendulums — these were added to clocks from about the mid-17th century and made clocks more accurate. In a clock such as Dad’s, which has an anchor escapement, a ‘bob’ can be slid up and or down on the rod to affect the swing of the pendulum, thereby increasing or decreasing the swing and therefore the speed of the hands. (Finally, a way to slow time down!)

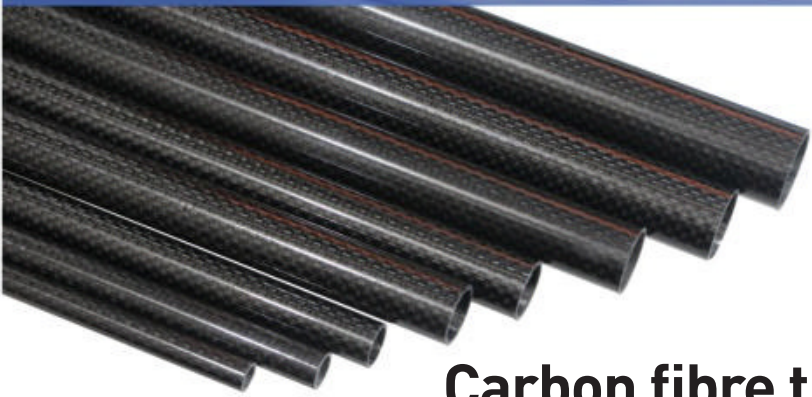
Anchor escapement — this is the C-shaped piece that makes the clock tock and tick. It rocks back and forth, engaging with the teeth of the escape wheel by the energy that comes through a lever attached to the pendulum. It was invented around 1670 by Robert Hooke or William Clement and was first used in longcase clocks.



Some of the many plans produced. These are for making the arbors and spindles



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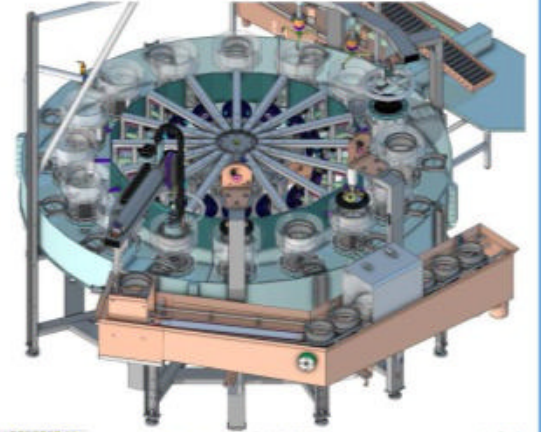
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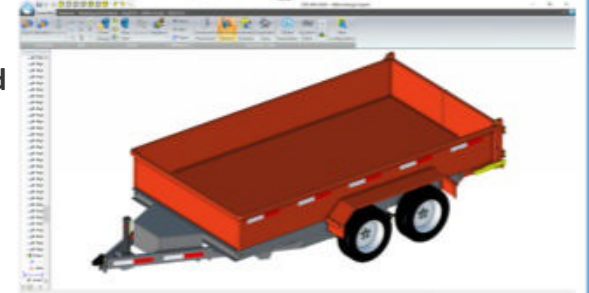
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BATHURST DAY AT WOODSY'S

Cars, racetrack snacks, and a few bevvies —
we all need some Bathurst days during these Covid times

By Bruce Hall

Photographs: Thomas Hall

It is 'Bathurst Day' at Woodsy's house; the Australian sun beats down on a darkened shed with the projector screening the 'Big Race'. Just in case you can't see the giant screen at the end of the shed, there are two more flat-screen TVs above the fridges and another in the house so those seeking a quick 'stretch of the legs' don't miss any action.

The youngsters who race around the yard are warned that the race cars are not play toys and the house is out of bounds. A serve of hot chips and some toy cars will keep these guys amused while the

big kids are fixated on the screen. This is a repetition of a scene that has played out here each October for nearly 40 years.

Bigger than Christmas

Hosting Bathurst Day is a tradition in Tony Woods' life. It's probably a bigger day than Christmas at his neat home in north Brisbane.

The cars are out, the shed has been scrubbed, the deep fryer is turning another batch of frozen potato goodness into golden snack food, and the beer of choice has been chilled to perfection.

"This is a repetition of a scene that has played out here each October for nearly 40 years"



The crowd gathers, and the thirst is on for a brew and the race



It's like a movie theatre in here — except no air con!

“In years gone past, before the shed was built, there would have been up to 50 people crammed under Tony’s house”

There are Chiko Rolls crisping up in the oil, and decent rib fillet steak has been purchased for the lunch time burger break.

Tony is a bit despondent that Dagwood Dogs can't be found this year, perhaps due to Covid putting a stop to all the big city shows, but these other snacks should make up for it. In years gone past, before the shed was built, there would have been up to 50 people crammed under Tony's house. Today, a rolling crowd in and out keeps the audience at around 10 — well within the government requirements currently in force.

Tony is a life member of the Apex Club Albany Creek, and passionate about his time with the Apex. Many past members will grace his doorstep at these events to pay homage not only to the race but also to the man whose passion has seen so much done for his community.

We come bearing gifts

We greet Tony with a carton of his favoured ale as a thank you for his time, and while his polite “You shouldn't have bothered with that mate, there is plenty here” is a tip of the hat to Tony's mannered ways, the twinkle in his eyes says it will not be long before it too is cooled and offered around.

In a nod to tradition, there are also a couple of unusual beverages to hand: one a not-so-subtly named coconut rum called ‘Wipeout’, and another the ever-popular Passion Pop. These were the drinks of choice of the much younger versions of the crowd here today. I think they may remain unopened as the evening progresses. Well, we can only hope ...

Tony was born and raised in Brisbane and has had a varied career over his adult life. Starting out working part time in a service station, he moved into ►



Special plates from vehicles in Tony's life



Tony has a fondness for the early Holden motors

the banking sector for 29 years with the Commonwealth Bank, and when made redundant became a bus driver with the Brisbane City Council, where he has been serving for the past 14 years. Tony's wife, Kerry, has been by his side since 1981 and has indulged his love of motorsport, football, social groups, and collections.

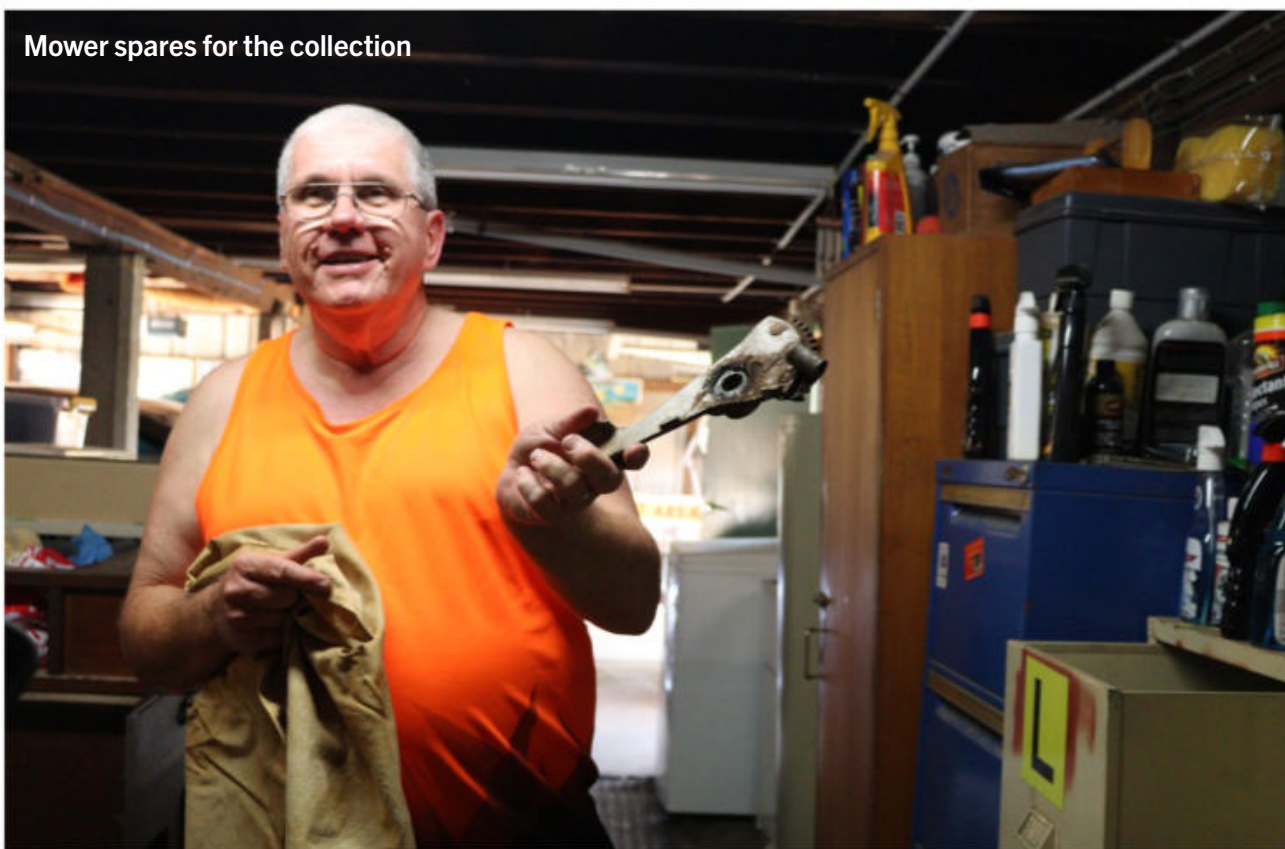
It's in the blood

Tony did not train as a professional motor mechanic, but his love for speedway — beginning at the age of 10, when first taken by his father — has meant that he is a dab hand with the spanner. The passion was a family affair, with his father involved in early speedway and Tony's late brother-in-law Wayne, also an avid car builder and driver in the '80s and '90s. Tony has Wayne's car sitting as part of his collection in the shed and yard.

Tony has a sentimental attachment to his big boys' toys, from what could generously be described as a Hillman in the corner of the yard to more recently purchased barn finds. Each battered

vehicle has a story, and each has a person associated with that story who Tony wants to ensure is not forgotten. As the curator of a very special series of collections, he spends a lot of time and energy showing others his rare beasts. A flatbed truck and trailers are part of his fleet. It takes a lot to own a stable of stock cars and house them in Australian suburbia and these allow Tony to ship them around to displays.

Mower spares for the collection



FJ as bought with original racing patina from the 1980s

The Shed's roving reporter ensuring the tucker is OK to be served up





FJ Holden number 68, built by Eric Campbell in the '90s

“Each battered vehicle has a story, and each has a person associated with that story who Tony wants to ensure is not forgotten”



Even the original electrical emergency kit's there

What's a seat belt?

Australian Dirt Track speedway race cars were a unique style, with 'Humpies', as the Australian FJ and FX Holdens were known, being some of the earliest locally made cars to race. Tony has three of these antiquities under cover, plus what was originally a Fiat Topolino, two 1950s

Hillmans, and an XP Falcon hardtop with a 289 Ford Windsor motor. Tony also has two beautiful original Holdens, and a 1963 EH Holden (which was off site the day that we visited).

The mint-condition two-tone green FJ is warmed up and waiting for a quick spin around the block. *The Shed's* young photographer for the day had never experienced being in a car that had no seat belts or synchromesh gears, and which had wide seats that you slide on ever so slightly as the car rolls around corners.

The doors clunk solidly, and Tony keeps the old girl well protected from the weather, be it water or sunlight. Original to the last nut and bolt, 1950s rubbers don't do much except glue the glass in, and watertightness is no longer a feature. Tony even has the original electrical emergency repairs box as sold by the Holden dealer, and he points out the original indicator stalk accessory, and the original darkened glass mirror shade to block out the glare of following headlights at night. With an original valve radio that finds AM only — no FM in this old girl — it takes a ►

few minutes to warm up before crackling into life. He purchased this car for a very moderate sum from a dealer some years ago, and it has certainly gone to a good home.

Treasures great and small

Tony does not limit the collection to full-size vehicles. He also has a display of original 1950s Matchbox cars that were his childhood toys. Looking after things is part of his make-up, and he not only treasures these little cars but also has all the original boxes for them. Everything is kept in pristine, ordered, identified, and carefully filed stashes. The large amount of memorabilia is carefully filed in cabinets and boxes, with labelling and preservation that would make a museum curator proud.



Tony's late brother-in-law Wayne's XP hardtop

“Pride of place in the collection is probably the only FJ grille in existence that is brand-new old stock”

The shrine to the ultimate Australian icon



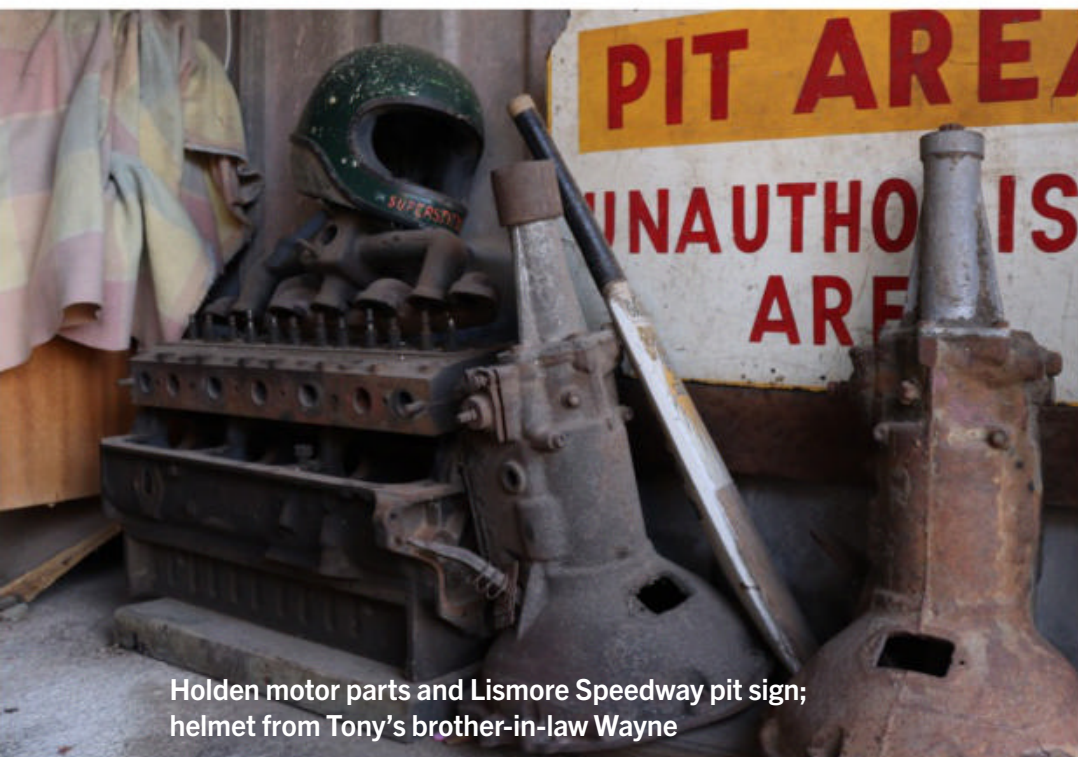
Two-tone green glory



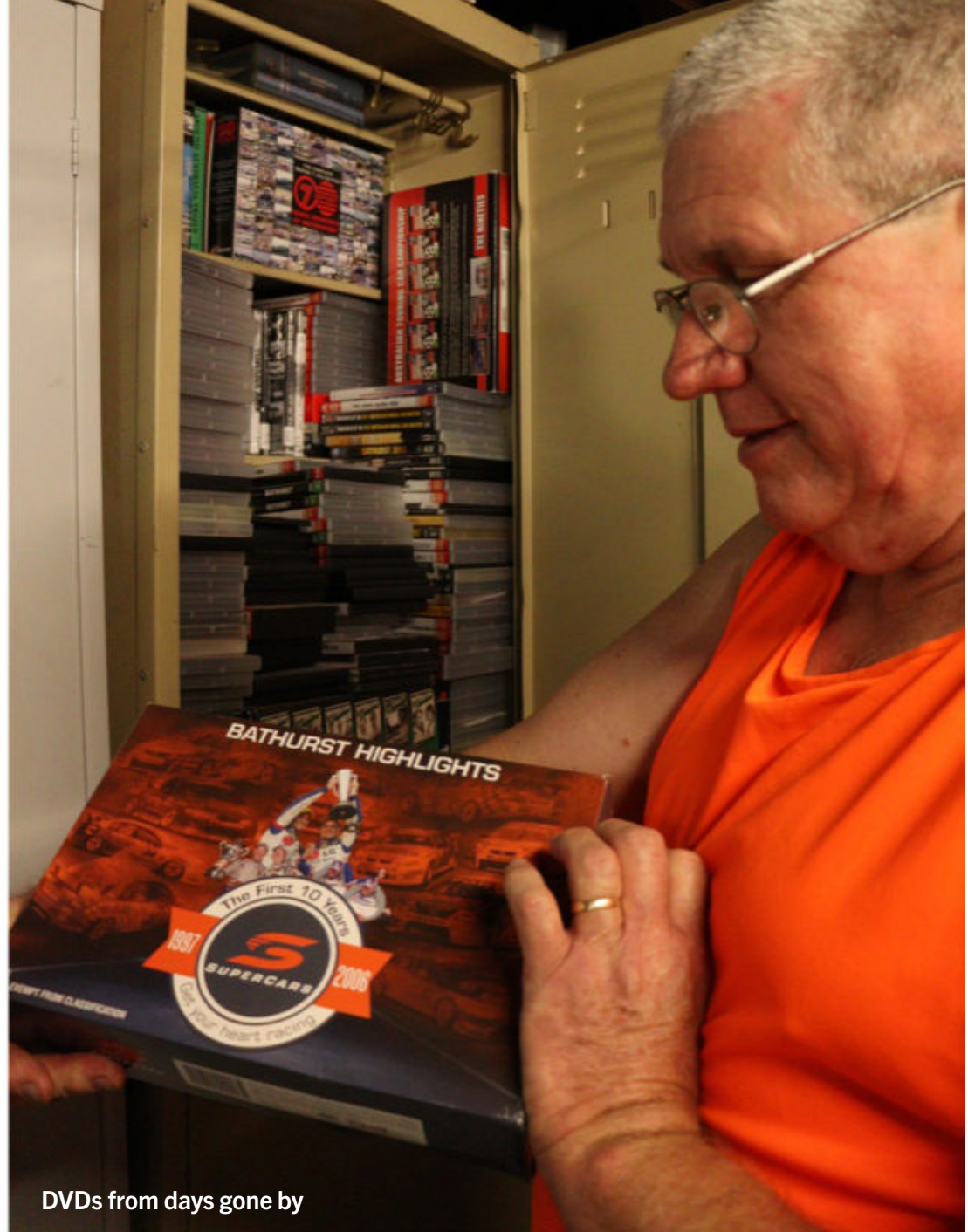
So many original spares



The first night's Ekka Speedway program 1967



Holden motor parts and Lismore Speedway pit sign; helmet from Tony's brother-in-law Wayne



DVDs from days gone by

In the shed, there are speedway programs forming a collection that stretches back to the very first meet at the Brisbane Exhibition Ground in 1967. Carefully documented photo collections sit in archived albums.

On top of the tall steel filing cabinets is motorsport footage progressing from

Super 8 film, to VHS tape, then DVD, and now hard disc drive backup. Also housed is a unique collection of tapes, books, ephemera, and collectables normally seen in a larger museum of vehicles. As we explore the darker reaches of under the house, the grin on Tony's face widens as he explains how

the bedraggled cloth he pulls out of a drawer to look at is a homemade flag from a time when a lot of his visitors watching the race in the shed were kids, and this is proudly taken out to hang beside the 'Happy Bathurst Day' flag on the iconic Aussie rotary clothes line in the backyard. ►



Tony Woods' speedway-raced FJ Holden



Rear of the FJ



Inside Tony's favourite FJ



Not a race is missed in various formats



Even the stickers got reproduced to restore this one



Hillman with Chev power plant

“These cars were paid per roll in the race, something health and safety officers would have conniptions about these days”

NOS

Pride of place in the collection is probably the only FJ grille in existence that is brand-new old stock, has never been fitted to a vehicle, and never will be if Tony has a say in it. This was bought at an estate auction for only \$20 while Tony still lived at home. It was stored wrapped in a blanket under his mother's bed. When she went into an aged-care home years later, it even followed her there to be stored under that bed! When Mrs Woods finally passed away, Tony had a special display box commissioned that now sits above the shed projector. It is taken down once a year for cleaning. He also holds boxes of original new-old-stock Holden gizmos, ranging from electrical components to mechanical parts. He is torn at times whether to fit these rare parts to his stock car collection vehicles or to hold onto the new stuff and hunt down other bits when required.

Stripped before sunset

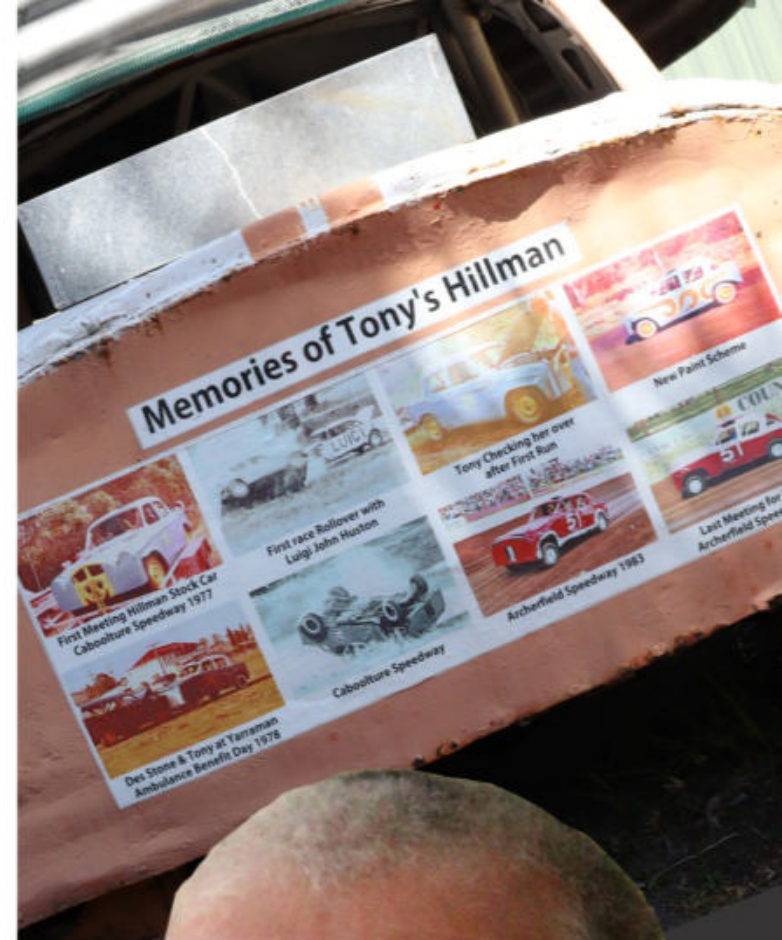
The forlorn hulk in the corner of the Woodses' backyard is the first stock car Tony ever built. It was a fully functional, registered Hillman with just a few days left on the rego when the man who owned it donated it to Tony and his mates. By the evening of that first day, the car was stripped and became what was known as a 'rollover' car. These cars were paid per roll in the race, something health and safety officers would have conniptions about these days, and the car suffered proportionally to its duties. It finally had a terminal crunch in the front, which ended its days as a four-cylinder vehicle, but this was not going to stop its journey. Tony and his mates retrieved a dumped Holden 'grey motor' from local mud flats, fitted it to the car and, some decades later, this motor still runs perfectly. The car will, however, need a good buff to bring it back to showroom condition. ►



Hannah the dog is getting tired; thrice hit by a car and having survived cancer, she is visiting from up the road as her owner is away at the moment



Hillman rollover car



A real sense of pride

A city is really only a collection of villages squashed together. Tony is proud of his village at Albany Creek; proud of his sons who have the same sense of loyalties to sport, motor racing, and supporting local events; and proud of the friends who have stood by his side helping out on his projects.

The day wears on, and we leave Tony and his mates to finish watching the

race. As we go, Tony, while manning the deep fryer, expresses his thoughts about getting the local community groups up and running again post Covid. In a way, it is a minor miracle that we can even gather here today when other Australian states are still under lockdown. The event is helping all of us feel a little more normal in a very strange world. We need more Bathurst Days in peoples lives at the moment. 🍷



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JOHN HAYNES: THE MAN BEHIND THE MANUALS

BRITISH BUSINESSMAN JOHN HAYNES DIED IN 2019, AGED 80, AS A RESULT OF A FALL

By Ned Temko

Review by Ritchie Wilson

• Published by Haynes Publishing •
Hardback • 248 pages • \$46

That he wasn't just a businessman is shown by the flood of sympathy emails, from all around the world, received by his company and museum. This is because John Haynes was the publisher of the much-loved Haynes car repair manuals. Many readers of *The Shed* will own examples of the 200 million sold. I counted up the Haynes manuals on my own shelves: 11.

Successful from day one

John Haynes: The Man Behind the Manuals tells his story from a childhood on tea plantations in Sri Lanka (known then as Ceylon) managed by his father, his time as a boarder at an English public school (crucial to his later career), his experiences as an officer in the RAF, and the establishment of his publishing empire (successful from the very start) and a car museum housing 400 vehicles.

Author Ned Temko didn't speak to John Haynes himself but was able to extensively interview

John's wife and sons, his brother David Haynes, friends from the air force and racetrack, and employees of the publishing business and of the Haynes International Car Museum.

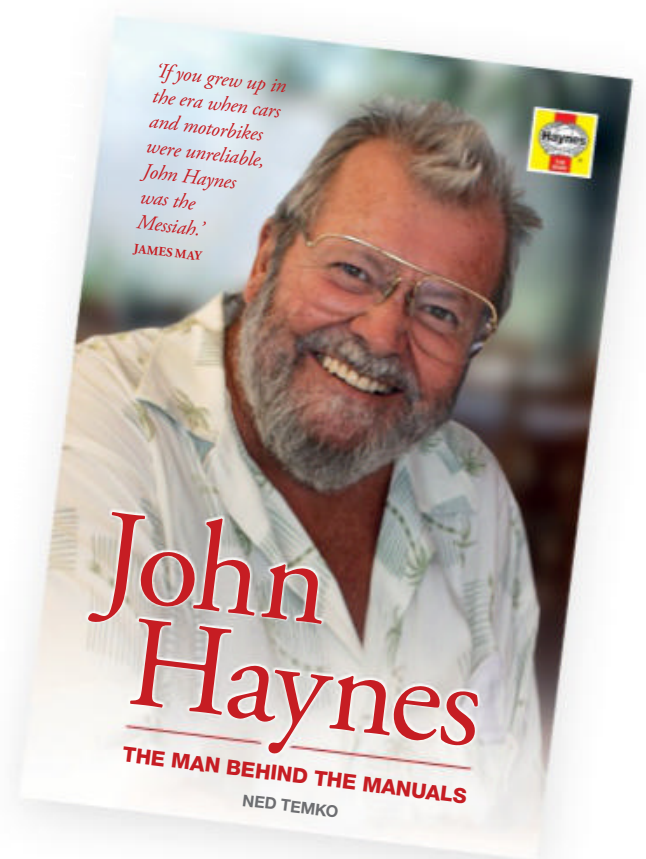
The family must have been happy with the resulting book, because it was published by the company which John started in 1966, Haynes Publishing — and a very nice job they have made of it.

“These were bought so that Haynes Publishing would be seen as “a real publisher” and have access to mainstream bookshops”

A family man

John Haynes didn't have the discarded wives and estranged children that many successful men leave in their wake. He was married to Annette for 56 years and appears to have been on consistently excellent terms with his three sons, who all ended up working in the family firm. Sadly, his middle son, Marc, suffered his whole life from the progressive syringomyelia spine condition and predeceased John in 2016 at the age of 47.

The relative tranquillity of his domestic life is in contrast to the stresses of a very rapidly expanding business in often difficult economic times. Most of the chapters end with some portent of doom: “a new crisis would soon loom”; and “board members ‘were seriously concerned that the UK company was on course to go down’”, to take just two random examples.



One feature of Haynes Publishing's history is the number of acquisitions that were made, most of which made little or no contribution to the company's profits. Some were publishers of mainly motoring books, such as GT Foulis & Co. Ltd and Patrick Stephens Ltd, but others were general publishers which, Temko says, were bought so that Haynes Publishing would be seen as “a real publisher” and have access to mainstream bookshops.

International purchases

I was surprised at the extent of Haynes's involvement in the US. John and Annette bought a house in California and lived there for a few years, most of the company's profits were earned there, and from the late 1980s all the manuals were printed in Tennessee. The two major American publishers of motor manuals were either bought by Haynes (Chilton), or abandoned the manual market (Clymer). Haynes Publishing developed a significant digital business this century, and this led to it being bought in early 2020 by the French company Infopro Digital for £115M.

The aspect of John Haynes's life that I found most interesting was his start in publishing. His boarding school, remarkably, allowed him to avoid rugby and cricket and to spend his time first in the art room and then in the technical department, where he built a two-seater sports car based on the remains of a 1930s Austin Seven, bought for £15 from the local car wrecker.



The reviewer's bookshelf

John with his treasured Jaguar XK150 during the motoring tour to Norway's North Cape in 1992



These two aspects of his school life came together when he wrote and illustrated a 48-page guide to making an Austin Seven '750 special', which he ran off on the school's hand-operated, spirit-based copying machine. He took a small advert in *Motor Sport* magazine and sold all 250 copies produced in 10 days at 5s each. He continued to sell *How to Build Austin Specials* for a number of years, including during his time as a national serviceman with the RAF in Germany. His then-girlfriend, Marianne Vissers, arranged for the book to be professionally printed in Germany. There is a small, but lovely, contemporary photo of her in Temko's book. My somewhat later version of *How to Build Austin Specials* was printed by his brother David's printing firm in England. It has a list of 16 other motoring titles published by Haynes on the back cover. Most are credited to JH Haynes, but other authors are GB Wake and H Thornton Rutter, with two books each. Temko says that GB Wake was a pen name of John Haynes, and I would bet that H Thornton Rutter is too. John Haynes is consistently presented in Temko's book as full of fun and his choice of noms de plume reflects this.

Moving to the next level

Most motor manuals of the time, including *How to Build Austin Specials*, were of limited practical use. While helping a fellow RAF officer rebuild his Austin-Healey 'Frogeye' Sprite,

"The Vauxhall Viva HA is singled out as an example of a car so unreliable that most owners bought a Haynes manual"

John Haynes had the idea of creating a large format manual that used photographs to illustrate, step by step, the entire repair process. He bought a Pentax camera, gave his wife Annette an IBM proportional-spacing electric typewriter as a wedding present, and recorded the dismantling and reassembling of the car's engine in their apartment's spare room. The resulting 1966 book sold 3000 copies in three months. The success of this and subsequent manuals persuaded John Haynes to give up a successful career in the RAF and work full-time as a publisher.

Sales of the Haynes car repair manuals in the 1960s, '70s, and '80s benefited from two pronounced trends: car ownership was becoming much more common, including among

people of limited means who often did their own repairs, and the durability of affordable cars was declining.

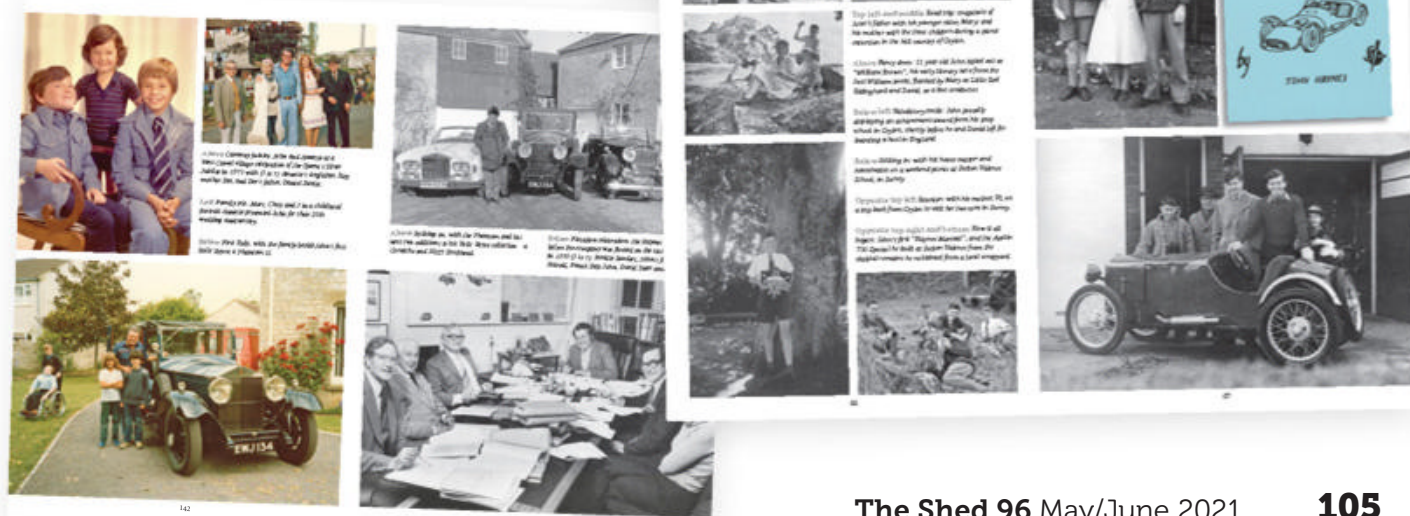
The Vauxhall Viva HA is singled out as an example of a car so unreliable that most owners bought a Haynes manual. My own experience of the Viva was much more positive — I found it a nice car, and very cheap to run.

In the US, twice as many Porsche 911 manuals than actual cars were sold. Joey Tribbiani from the TV show *Friends* would have had one.

As cars have become much more reliable and complicated, sales of Haynes manuals have declined. The range of manuals has, however, increased. The *Man* manual was published in 1999 after Haynes was approached by the UK's Men's Health Forum for permission to use the Haynes's manual format for an illustrated book on men's health issues, written by Dr Ian Banks.

The company decided to publish it as an actual Haynes manual, and it became a bestseller, with a new edition produced in 2007. This was quickly followed by many similar manuals such as the *Baby* manual and the *Spitfire* manual. Some are more tongue in cheek.

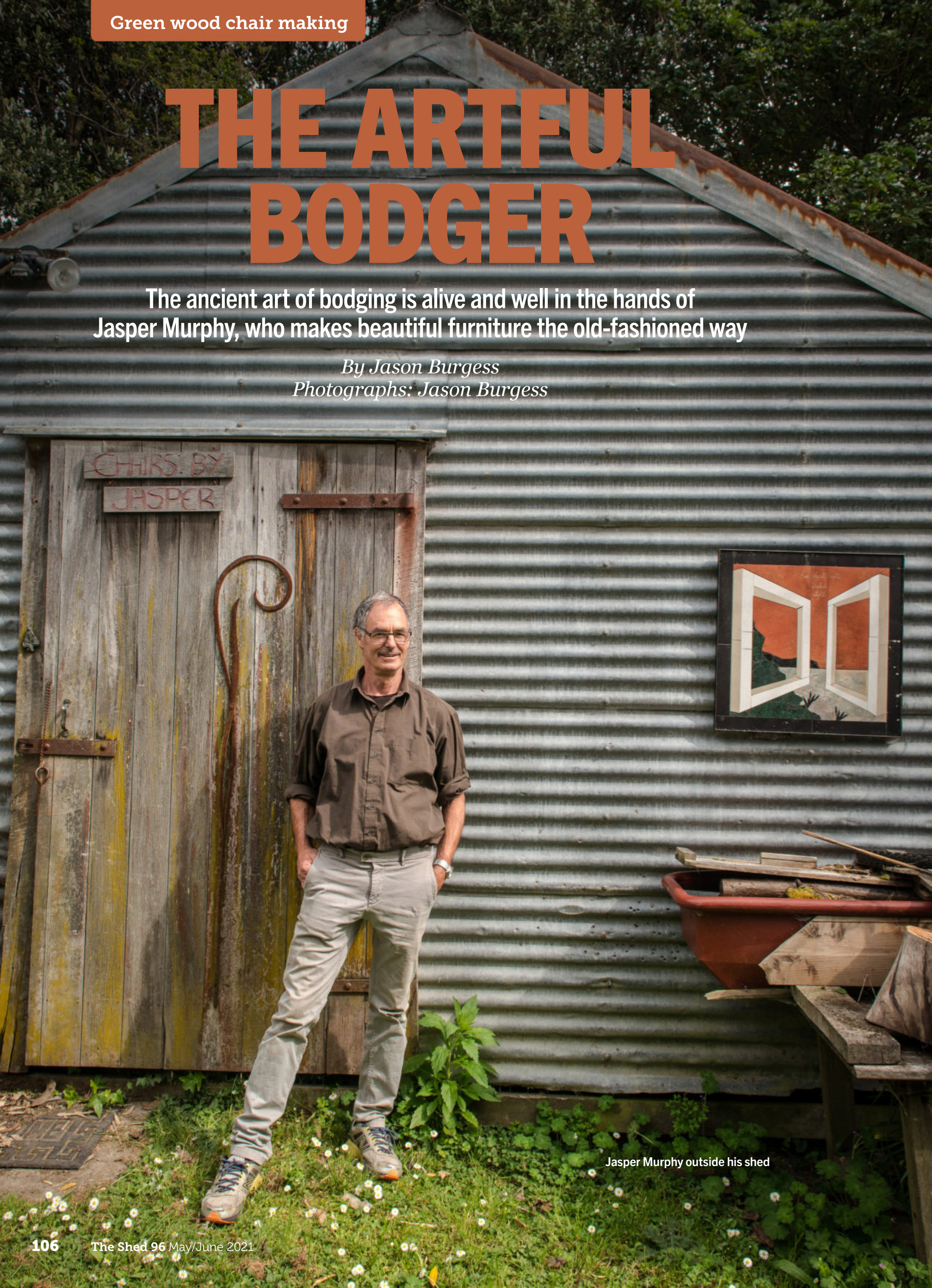
There is even a *Shed* manual. 🏠



THE ARTFUL BODGER

The ancient art of bodging is alive and well in the hands of Jasper Murphy, who makes beautiful furniture the old-fashioned way

By Jason Burgess
Photographs: Jason Burgess



Jasper Murphy outside his shed

There are few people in this country more experienced at bodging, aka green wood chair making, than Gisborne's only bodger, Jasper Murphy. He's been splitting, shaping, turning, and assembling chairs from a corrugated-iron shed at the back of his organic citrus orchard for nearly two decades.

The rough-hewn rimu and mataī-planked floorboards of his workspace are dominated by two essential pieces of equipment: a treadle-operated pole lathe and a sit-on shave horse. Both look like proverbial bodge jobs. While rudimentary in appearance, these timber-composite contraptions are the very pieces of equipment that the skilled bodgers of old would carry with them or make on site in the beech-wood forests of the Chiltern Hills in England.

Shaping a leg on the shaving horse



The classic Windsor chair, a hallmark of the bodging tradition

“I don’t like power tools, they don’t give you time to think”

Bag of tricks

“Bodging is so simple,” says Jasper. “You don’t need a lot of flash tools. When I built the lathe and horse, I looked around the internet for plans and then went out into the shed to see what materials I had.” Keeping to tradition, Jasper makes all his hand tools too. The great thing for him is that everything in a bodger’s bag of tricks is manually operated. “I don’t like power tools, they don’t give you time to think,” he says.

Bodging is a heritage craft that dates back about 500 years, but which, in the wake of industrialised processes, disappeared around the time of World War II.

In the last couple of decades, it has ►



“I have to do the whole lot because I’m the only one here. I haven’t got a village”

Cleaving legs from green wood with a handmade club and froe aka shake axe



The cleaving workstation



A quiver of axes for fine trimming

been experiencing a renaissance in the Northern Hemisphere. Early chair making was one of the first piecework industries. Bodgers did the legs, ‘bottomers’ — or ‘benchmen’ — shaped the solid seat base, benders did all the bending of the arms and backs, chair makers — or ‘chairblers’ — assembled them. “The bodgers were itinerant,” Jasper explains. “They did their work, stacked the legs up in the woods, air-dried them, and then shipped them off to a village or factory to be put together. I have to do the whole lot because I’m the only one here. I haven’t got a village.”

For Jasper, that includes weaving his own seats with seagrass, using one strand for patterns: “I can do it while watching television. Round and round. Front to back and then from the sides. I pull the cord through by hand and use hand clamps to hold it tight.”

Time to leave the farm

As a former sheep and beef farmer, Jasper has plenty of innate practical skills. He grew up inland from Whangara, best known as the setting for the film *Whale Rider*. There were no school buses in those days, so he spent his early years learning by correspondence, and woodworking was a big part of his education.

In the 1990s, his doctor warned him off farming due to back issues. He and wife Judi took off for the UK so that she could study to be a midwife. It was there that he first read *Green Woodwork* by Mike Abbott, a book about making chairs using the traditional techniques and tools of the bodgers. “I read it then tucked it on the shelf and thought, *One of these days I’ll get around to it.*”

When the couple returned from England, Judi became a midwife and

Jasper became a house-husband. He revisited *Green Woodwork*, learned the basics, and built his pole lathe and shave horse — the same ones that he uses today. On his 50th birthday, Jasper revisited England to attend a course with Mike Abbott.

When Abbott got started, there were no original bodgers left alive. He learned by taking old chairs apart to find out how they were made. Even today, it’s all self-learning. Lots of trial and error. “If you make the wrong assumption, it can all go pear-shaped,” Jasper says. “We’re still using the traditional tools, but sometimes you wonder, *Are we getting back to what they were doing originally? Or are we taking it another step up the chain?*”

The secrets of chair making

Jasper believes that one of the secrets to the strength of this style of chair is the

“Legs should be split from the same piece of wood, usually side by side to achieve a grain match”

effectiveness of the narrow, cigar-shaped rungs, tapered at each end to take the weight off the mortise and tenon joints and relieve any tension.

“The chair is more comfortable, as it has an ability to flex rather than remaining rigid,” he says. “A lot of modern furniture is beefed up because they are using inferior-quality wood, but all they are really doing is overloading all the joints. The wood is not hard or solid enough so it often can’t cope.”

The other advantage to shaping rungs this way is that it is hard to detect a defect: “Cigar shapes are not necessarily symmetrical but if they were dowels then you’d spot a mistake straight away.” The rule of thumb is for the mortise depth to be 1.5 times the diameter of the tenon — “Less will crush the walls on the mortise and longer makes it more likely to break outside the joint,” Jasper says.

Cleave, cut, shape, and turn

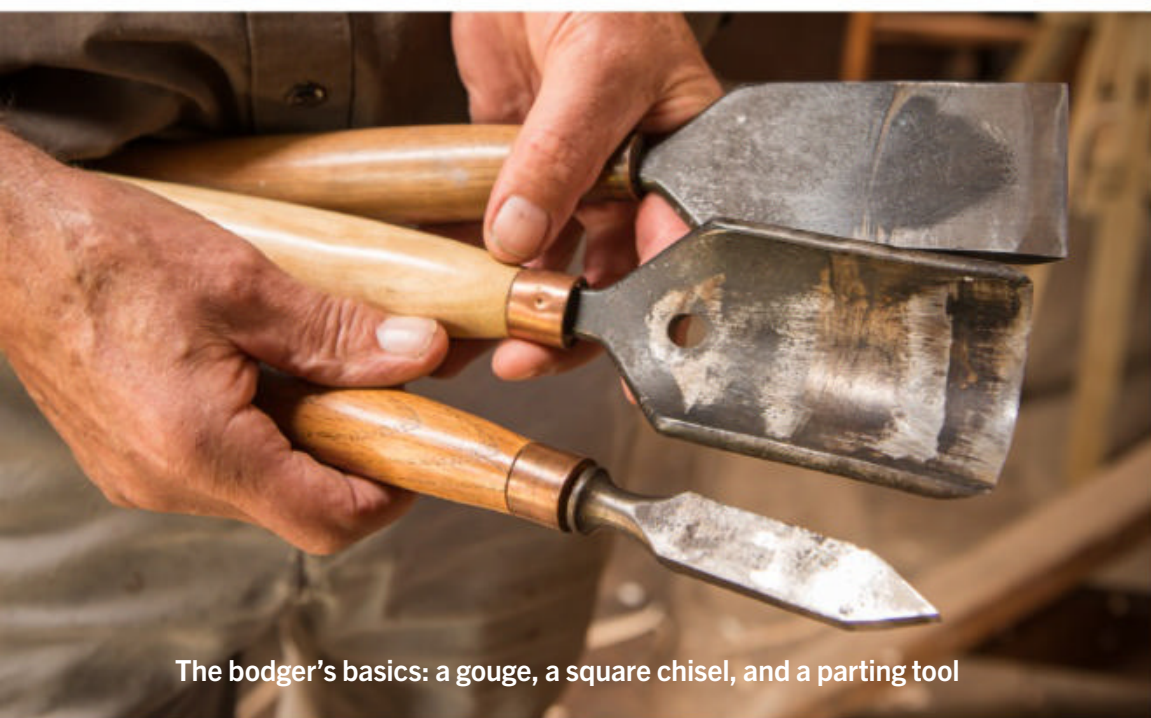
When cutting his leg pieces from green wood, Jasper works from 1–1.2m long lengths to get to the 900mm required for an ordinary chair — a little longer for a rocker.

Legs should be split from the same piece of wood, usually side by side to achieve a grain match. An L-shaped ‘froe’, or ‘shake axe’, is used with a mallet or club for cleaving rough timber along the grain. A froe offers a kind of precision that is hard to achieve with a maul or splitting wedge. Finer trimming is done with a one-sided blade, like a small Gränsfors carving adze, which is used like a chisel rather than an axe.

The shaving horse is a Viking-era equivalent of a Black and Decker Workmate. This is where split timber is ‘shaved’ into a round that can be worked on the lathe. It is a simple device to ►



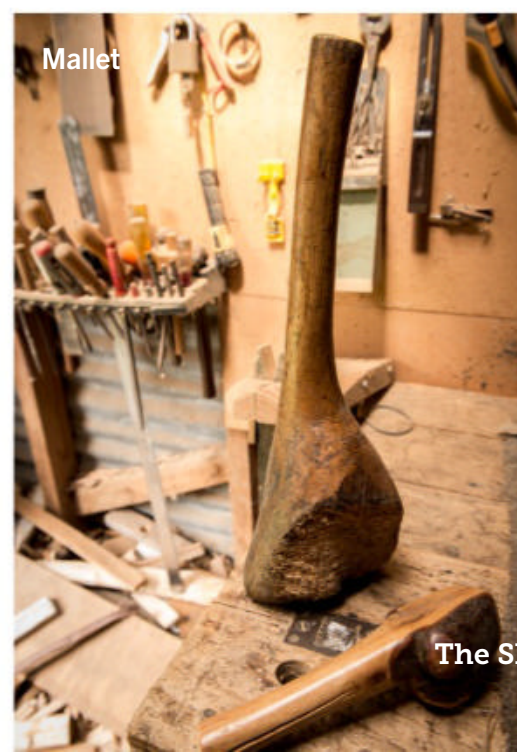
Jasper's pole lathe, modified with bungee cords for interior use



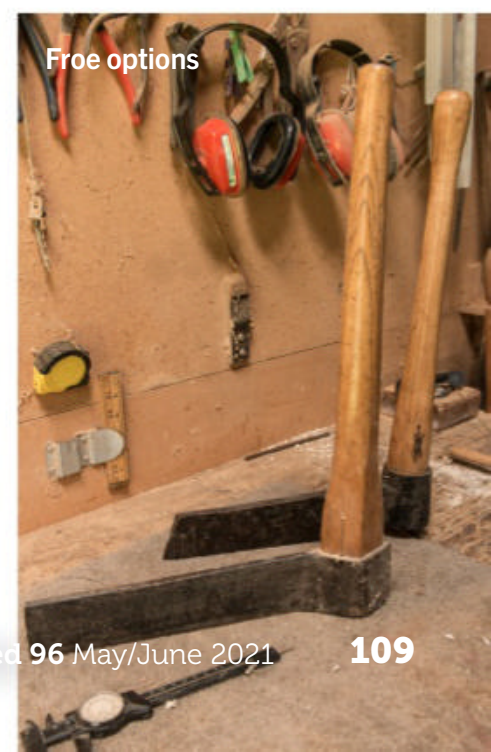
The bodger's basics: a gouge, a square chisel, and a parting tool



A Gränsfors carving adze



Mallet



Froe options



During lockdown Jasper created a green wood spoon a day



Drill angles can be accurately determined by lining up two mirrors and two set squares

construct. Basically, the operator sits and uses a pedal system to close the woodblock vice that holds the wood as it is worked. A ‘draw knife’, or ‘spokeshave’, with a low angle bevel and dropped angle bars, is used for shaving the timber into a round on the shaving horse. “Bevel up, flat side down,” advises Jasper. “It operates like a plane, shaving the timber down to size. Long straight strokes going with the grain.”

Pole lathe

When it comes to the pole lathe, Jasper says, “All you need is something to pull your string up and down, something to hold the middle so it spins, and something to put your tools into.” He made his from rimu flooring, a bit of pine decking, and some four-by-two chopped up with a chainsaw. “Basically, it has to have moveable poppet heads with metal centres on a bed that is level. Mine are

bits of an old threaded bar.

“The treadle concept is as ancient as the Egyptian civilisation. You can build one in a day if you know what you are doing.”

While a traditional lathe has a flexible 4.5m pole out in front (often a sapling), Jasper has modified his to fit into his shed by using two uprights with a bungee across the top supporting the treadle cord that wraps around and spins the timber that is being shaped. The foot treadle has a swinging arm that is kicked across to direct the cord along the wood so each section of the wood can be worked. Leg power is all that is required for this reciprocating lathe — you can only cut on the down stroke.

Turning wood on this lathe requires just three tools: a gouge for making a rough round, a square chisel to smooth and shape (a wider chisel is useful for beginners), and a small gouge or parting tool. “These three chisels are all I need to make the chair parts,” he says. “I made them from truck springs, and they are perfectly adequate for working with



The pole lathe provides the bodger with complete control over his materials



A simple tool for drawing a centre line



Gauging a tenon size



Chair leg with drilled centre lined up against set square and mirror

green wood, which is softer. As you are only cutting in one direction, because the wood is moving backwards and forwards there is no heat build-up to dull the steel. They are also easy to sharpen.”

Know your wood

Bodging is more than just shaping and turning timber. An understanding of the cell structure of wood and how it shrinks is critical. “Once you have got your head around that,” says Jasper, “the next thing is learning how much a specific type of timber is going to shrink. Oak shrinks a lot; mānuka, a reasonable amount; while Tasmanian blackwood hardly shrinks at all. You have to know this when you are turning your tenon sizes so that they will fit into their mortises.

“Most people make the rungs, turn them, dry them, and then re-turn the actual tenon before it goes into the leg. Mike and I have decided that the best way is to turn the whole rung, including the tenon, green and let it dry. When you dry green wood, it turns oval because it shrinks twice as much around the outside as it does in the middle. The oval end of the dried rung is then forced into a round hole in a green leg. As it enters, it bends all the end-grain fibres inwards, which creates a fish-hook effect. It’s like a clip. You are pushing hard into soft, and the soft moves to accommodate it, but when it dries all those bent-back fibres are locked in the wrong way. When the leg shrinks, the joint is impossible to break without cutting and splitting with a chisel.” ►

“It’s more than just shaping and turning timber. An understanding of the cell structure of wood and how it shrinks is critical”



A Jasper-built bending jig for shaping chair backs

“When I’m looking for green wood, I prefer to know what it looks like standing up. I look at the whole tree”

Bending green wood

“When I’m looking for green wood, I prefer to know what it looks like standing up. I look at the whole tree. It needs to have a good straight trunk. You don’t want the knots and bowls because there is too much tension in them.

“Every wood will bend differently. Kānuka has really tight fibres, so you might only achieve a 50 per cent bend, whereas oak will bend easily and dry still fitting the form. The end use will determine what wood to use. A rocking chair works well with oak or ash. For making standard dining-room chairs, kānuka is as good as you’ll get. The rest of it comes down to whatever I can get my hands on. I make spoons too; I use apple for them. Even with spoons, you need to understand the shrinkage because you shape them green and then dry them.” ►

Why the title ‘bodger’?

While people today might associate the word ‘bodge’ with a bad or botched job, historically a bodger — a maker of legs and braces for Windsor chairs — was considered a skilled tradesman. Some speculate that the term ‘bodger’ is derived from ‘badger’, because both a badger and a bodger spend their entire days in the woods! Others say it is because when it comes to chair making, bodgers only did half the job.





The rudimentary-looking shaving horse with its pedal-operated woodblock vice



Assembling a chair

Steam then dry

Jasper favours steaming before drying: “In wood, there is free water and bound water. Steaming pushes out most of the water from within the cell cavity, the free water. The bound water is within the cell wall. When you dry the wood, you lose the free water before the bound water and losing the bound water is when the wood begins to shrink. If you want to bend chair legs — because you normally shape the back legs — you do the bending straight out of the steamer and put the chair together the next day. You want the moisture level in the legs to be at about 30 per cent so that it is going to shrink and tighten your joints.”

Jasper’s steamer consists of a piece of chimney flue that sits on a pot on top of a gas stove. The legs hang down the inside of the flue. They are left to steam for about an hour per inch of diameter — “It’s a rule of thumb”. Drying the rungs often involves a combination of a steamer and hot-water cupboard. Up to a couple

of weeks. This process can be sped up next to wood fire, but you won’t want to overdo it and have them split. You’ll know when wood is dry by the noise it makes when you bang the pieces together. A hollow ringing sound means it is dry.

Assembling a chair

Jasper advises, “When assembling, always start the side frames of the chair first. The front and back will come across the top of the joint and lock it together. When I first started, I tried using glue because I wasn’t confident. But glue fills the vacant spaces, dries before the leg is dried and as the legs shrink it has nowhere to squeeze to and will create lots of little cracks.”

For town or city dwellers seeking a supply of green wood, Jasper suggests getting friendly with local arborists (with a crate of beer). The same goes for spring makers, blacksmiths, and engineering shops. “Anyone who can temper steel can help make your tools,” he says.

Contact: murphy.jasper@gmail.com 📧



A footstool



Seagrass fibre for weaving the seat and chair backs

Bookcase

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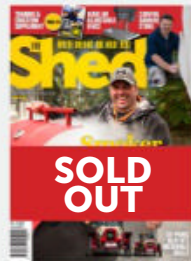
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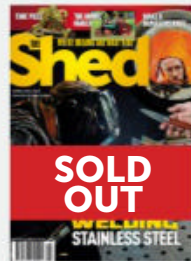
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sam.rog@xtra.co.nz

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Keith Dickson 07 574 1309 or 021 170 2394
k.m.dickson@kinect.co.nz

THE TE PUKE COMMUNITY MENZ SHED

Joan Dugmore 07 573 8655
joandugmore@xtra.co.nz

MATAMATA COMMUNITY MEN'S SHED

Peter Jenkins 07 888 6307
matamatamensshed6@gmail.com

HAMILTON COMMUNITY MEN'S SHED

Brett Rossiter 07 855 6774
secretary@hamiltonshed.com

CAMBRIDGE COMMUNITY MENZSHED

David Callaghan 07 823 9170
callagain@xtra.co.nz

WHAKATANE MENZ SHED

Gil Clark 027 901 4212
menzshedwhk@gmail.com

TE AWAMUTU COMMUNITY MENS SHED

Clive Partington 021 942 844
teawamutumenzshed@gmail.com

KAWERAU COMMUNITY MENZ SHED

Peter Tebbutt 07 323 7144
hama@xtra.co.nz

OTOROHANGA MENZSHED

Darcy Lupton 07 8737 350 or 021 3322 05
edluptonoto@gmail.com

ROTORUA COMMUNITY MENZ SHED TRUST

Peter Green 07 347 8393
rotoruamenzshed@xtra.co.nz

TAIRAWHITI MENZSHED

James Aramoana 022 4650 396
tairawhitimenzshed@gmail.com

TAUPO COMMUNITY MEN'S SHED

David Herd 021 153 8967 or 07 377 2059
menzshed.taupo@gmail.com

TAUMARUNUI & DISTRICTS COMMUNITY MENZSHED TRUST

Graeme Croy 07 8955191 or 027 2442513
taumarunuished@gmail.com

MENZSHED WAIROA CHARITABLE TRUST

Maureen Pene 027 3310 022
maureen.pene@gmail.com

MENZSHED NAPIER TRUST

Roy Schimanski 06 845 2473 or
020 405 21460
royschima@hotmail.com

MENZSHED HASTINGS TRUST

Chris Gray 06 871 0331
secretary@menzshedhastings.co.nz

MENS SHED WANGANUI INC

John Wicks 06 342 9854
johnwicks@xtra.co.nz

MENZSHED DANNEVIRKE INC

Ian Barnett 06 374 2737
dvkemenzshed@gmail.com

FEILDING MENZSHED

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

MENZSHED MANAWATU

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

PAHIATUA MENZ SHED

Ken Russell 027 241 3717
kjrussell43@gmail.com

LEVIN MENZ SHED

Tony Murdoch Shed 06 367 35176 or
Pte 06 368 7737
menzlevin@gmail.com

MENZSHED FOXTON

Dave Adamson
menzshed.foxton@gmail.com

EKETAHUNA MENZ SHED

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



OTAKI MENZSHED

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

MENZSHED KAPITI INC

Alan Muxlow 04 904 2318 or 027 611 4841
menzshed.kapiti@gmail.com

PLIMMERTON COMMUNITY SHED

Mike Gould
mjgould@tauatapu.net.nz

HENLEY MENS SHED INC

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

MENZSHED CARTERTON

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

GREYTOWN MENZ SHED

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

FEATHERSTON MENZ SHED

Garry Thomas 027 450 0660
featherstonmenzshed@hotmail.com

UPPER HUTT MENZSHED

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

MENZSHED TAWA

Gary Beecroft 04 2323993 or 022 5898581
gary.beecroft@xtra.co.nz

MEN'S SHED NAENAE

Archie Kerr 04 569 7069
menzshednaenae@gmail.com

MARTINBOROUGH MENS SHED

John Mansell
martinboroughshed@gmail.com

EASTBOURNE & BAYS MENZ SHED

Mike Parker 04 562 8688
mikeandcarolynparker@gmail.com

CITY MENZSHED WELLINGTON

Don McKenzie 027 448 0611
don@sandon.co.nz

MOTUEKA MENZ SHED

Peter Cozens 021 277 3866
pacozens@gmail.com

MENZSHED - NELSON INC

Phil Chapman 027 261 8278
nelson.menzshed@gmail.com

HAVELOCK MENZ SHED

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

PICTON MEN'S COMMUNITY SHED

Kerry Eagar 03 573 8007 or 03 573 6608
eagark.s@clear.net.nz

MENS SHED WAIMEA

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

TAPAWERA MEN'S SHED INC

John Wilmshurst 03 522 4616
menzshedtapawera@gmail.com

BLenheim MENZ SHED

Trevor Dennis 021 984 883
trevor.dennis@xtra.co.nz

WESTPORT MENZ SHED

Joanne Howard 03 7897055
westportmenzshed@gmail.com

KAIKOURA COMMUNITY SHED

Peter Fey 021 078 1578
vicki@kaikoura.link

WESTLAND INDUSTRIAL HERITAGE PARK INC

Rob Daniel 03 755 7193 or 022 173 5598
rob.daniel@slingshot.co.nz

CHEVIOT COMMUNITY MENZ SHED TRUST

Bruce Nicol 0274 555 163
bruce@nicol.net.nz

AMBERLEY MENZ SHED INC

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

MCIVER'S OXFORD COMMUNITY MEN'S SHED

Ray Charles 0224087755
oxfordcommunitymensshed@gmail.com

PEGASUS/WOODEND MENZSHED

John Burns 021 347 805
menzshedpegasuswoodend@gmail.com

MENZ SHED OF KAIAPOI

William Titulaer 027 337 2323
williamtitulaer@yahoo.com.au

MENZSHED DARFIELD/MALVERN INC

Tony Zwart 03 318 7370 or 021 223 1648
zwarta@xtra.co.nz

BISHOPDALE MENZ SHED

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

ST ALBANS MENS SHED

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

NEW BRIGHTON MENZ SHED

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

LINWOOD MEN'S SHED

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

HALSWELL MEN'S SHED

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

REDCLIFFS COMMUNITY SHED

Cameron Holdaway 03 384 4055
redcliffscommunityshed@gmail.com

ROWLEY COMMUNITY MEN'S SHED

Sven Christensen
vikings.burnettchristensen@gmail.com

FERRYMEAD BUSMENZ SHED

Ken Watson 03 355 7366
ChChBusMuseum@gmail.com

TE PUNA AUAHA LYTTTELTON

Paul Dietsche 027 536 7546
tepunaauaha@gmail.com

ROLLESTON MEN'S SHED

Stephen Rushton 021 106 0148
rollestonshed@gmail.com

MEN'S SHED OF LINCOLN SOCIETY

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

AKAROA COMMUNITY MEN'S SHED

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

ASHBURTON MEN'S SHED

Stewart Dunlop 03 3083910 or
022 133 7817
ash.menzshed@outlook.com

TIMARU MENZ SHED

Adrian Hall 021 162 6203
timarushed@gmail.com

ARROWTOWN MENZSHED INC

Russel Heckler 03 442 0204
hecklerdenise@hotmail.com

OAMARU MENZ SHED

John Walker 027 445 5265
jjms@actrix.co.nz

ALEXANDRA MEN'S SHED

Neil McArthur 03 448 9377
alexmenshed@gmail.com

NORTH DUNEDIN SHED SOCIETY INC

Gerard Kenny 022 053 2152
northdunedinshedsoc@gmail.com

TAIERI BLOKE'S SHED

Nick Wilson 03 742 1206
jean.nickwilson@gmail.com

MATAURA MENZSHED

Mike Whale 027 299 7218
orcas@xtra.co.nz

RIVERTON

Russell Bickley 027 206 1184
bickr_e@yahoo.co.nz

MENZSHED INVERCARGILL

Peter Bailey
peteolly@xtra.co.nz



SOLD!

New pastures are a great excuse for a new shed

By Jude Woodside

I have recently sold my house and land. I didn't want to — it wasn't on the market — but it was the second time that I had an unsolicited approach with offers several times more than what I paid for it. It will allow me to replace what I have and have money left over.

My problem was that with a huge development taking place across the road I felt deflated. Nothing I did to my place would have any long-term relevance, all of it would sooner or later — and probably sooner — succumb to the bulldozer. My peace and quiet and the bucolic nature of the place would be gone forever. I would have the non-stop thump and bang of a suburb being constructed literally on my doorstep, and the continuing racket of occupation on the weekends.

The daily horror story

At the same time, I know people who are struggling to get into a home of any kind because the prices are absurd. This isn't new to any of us; we are inundated daily with shock-horror stories of the 'housing crisis' as though this wasn't something Blind Freddie's dog could see coming several years ago. We now have the highest priced homes in the world!

Successive governments have put reform of the sector in the too-hard basket; some out of self-interest, and others for fear of spooking the horses.

What this means, of course, is that our children can kiss goodbye to the dream

of owning their own home and can look forward to either renting or paying a mortgage forever. Some will be over-leveraged and any increase in interest rates could bankrupt them. Others, facing escalating rents and static wages and benefits, will become homeless. In the past housing wasn't seen as a commodity; now it is.

More will be required

Over 40 per cent of houses sold in February went to investors. In my country town most of the houses for sale are ex-rentals where investors are cashing up in the frenzied atmosphere, and they are being bought by other investors who are not quite so canny. Most are selling for more than twice their Registered Valuation, a multiple on the last purchase price.

It is clear that the government needs to take some drastic action to control speculation and the rapidly escalating rents. What the government has announced — as I write this — is a start: increasing the bright-line test and removing the tax exemptions for investors.

Hopefully, that will reduce the frenzied speculation in the market. However, I think the government will have to do more, including the possibility of controlling rents in certain areas. This is commonly done overseas, where it is common for families to rent for several generations.



The alternative is for the government to get into the rental market wholesale as it does in Scandinavia — not just for lower income people but even for the middle class. It would allow for high-quality apartments to be built in our inner cities, not the rubbish we have had thrown up in the past 20 years, and allow people to rent for a lifetime, rather than own. It is a no-brainer for state investment, where long-term planning makes sense, and it is an effective means of regulating rents in the wider population.

A new shed

As for me, I have bought somewhere else — not too far from here; somewhere where I cannot be built out in the foreseeable future. It's a great house, a smaller piece of land, and I will need to build a new shed — but I am looking forward to that. I have been planning it already using an online shed designer. I love my current shed, but it is a rule of nature that stuff expands to fill the space available and I could use more room.

The build process and the outfitting will doubtless afford me material for more stories in the upcoming year. Meanwhile, I trust you are all well housed and warm for the winter. 🏠

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