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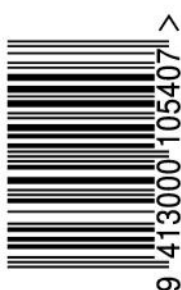


A FAMILY AFFLICTION

Restoring Series 1 Land Rovers



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WHY DITCH A WINNER?

The Series 1 Land Rover is the stuff of legend.

The 1950s were a unique time in our history, and with ample funds available in New Zealand post-WWII, we embraced the Series 1 Land Rover wholeheartedly. Many of these early models are still around, some in various states of decline, while others are cherished and restored, like the one featured in this issue that was rebuilt by Ross Hayes. Ross knows what he likes; he bought his first Land Rover when he was just 17.

The oldest Series 1 Land Rover in New Zealand is known as Number '20'. It holds the distinction of being the 20th Series 1 Land Rover produced globally and the first one imported into New Zealand. You may recall that last summer, this vehicle undertook a fundraising trip for heart research from Dunedin to Auckland. The point is that New Zealand embraced these vehicles from the very beginning, and they became an integral part of our identity as Kiwis.

The Series range evolved into the Defender range in the 1980s, which was truly a beast of a vehicle. With a longer wheelbase, coil spring suspension, centre-mounted differential, and more powerful engines, what's not to like? The Defender also became a stalwart here and worldwide, recognised as the go-to tough off-roader for farms and any rural off-road use – another win for Land Rover. However, some of you may be aware of why they discontinued this Series 1 derivative in 2016 and transformed

it into a stylish urban vehicle. It has always seemed like madness to me.

Why create another pretty vehicle when the world is filled with these? It didn't surprise me that someone would step in to fill this newfound gap in the market. Sir Jim Ratcliffe, chairman of the multinational chemicals company Ineos, was having a few beers with friends in a London pub (the Grenadier) when he lamented the loss of the true off-road Defender. His frustration grew to the point that, when Land Rover refused to sell him the tooling once production stopped, he decided to design his own replacement vehicle, which he called the Grenadier. While I don't believe the Grenadier has made a significant impact in the world, it does offer a partial substitute for the Defender. I'd love to hear from anyone who owns one and their thoughts about it.

You would think there would be a thriving long-term business in supplying spare parts for older Land Rovers, especially if the Series 1 owned by Ross is any indication. He has more projects awaiting restoration, and the passion runs so deep that the entire family has become Land Rover enthusiasts. Loyalty like this doesn't happen overnight and shouldn't be taken lightly, in my opinion. Unfortunately, it seems that Land Rover doesn't share my perspective, which is a real shame.

Greg Vincent
editor@the-shed.nz



4 A family affliction

Restoring Land Rovers is what this family enjoys more than anything



24

Project:

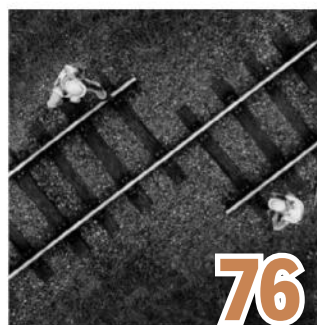
Build a portable gantry crane



98

The Shed quiz

Test your workshop knowledge



76

Arduino basics 102

Solutions to dealing with 'errors'



110

The Shed shrink

Laughter; it's potent medicine for a healthy life



60

Book review

Tools: A Visual History



112

My shed

Bill and his Harleys: 60 years and counting



84

Off the grid

What to restore, to repurpose, to build? It must be time to blend



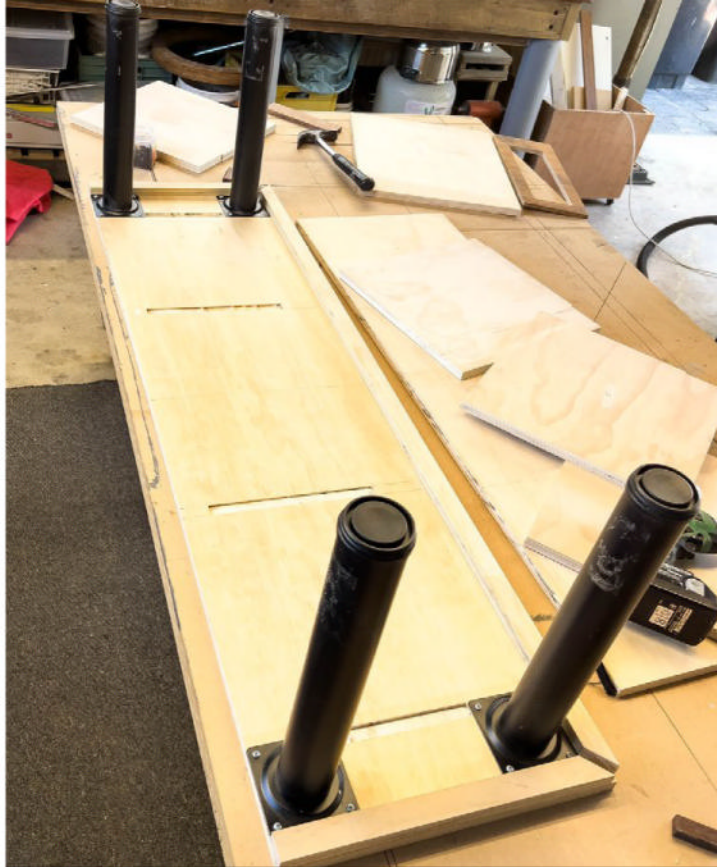
90

Minitruck restoration – part 2

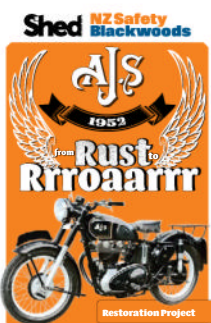
Coen's retirement project comes to an end



38 Project:
Camera shroud design using your
Alibre Atom 3D program



100 Project:
Build a wooden entertainment
unit to house a TV and stereo



48 AJS motorbike
restoration – part 4
It's time to attack the electrics



66 Building a shed – part 1
A ground-up kitset build

EVERY ISSUE

- 1 Editorial
- 20 News
- 22 Letters to the Editor
- 34 Subscribe to *The Shed*
- 125 Bookcase – essential sheddie reading and tech guides
- 128 Back o' *The Shed* – Jude has spent the last few years building a shed. The end is nigh at last



34
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A FAMILY AFFLICTION

With the genealogy of five generations of South Island engineers in the family, Ross Hayes thinks nothing of rebuilding Land Rovers for fun, family, and farm

By Nathalie Brown | Photographs: Brian High





The Hayes family in front of The Mistress: (from left) Dylan (11), Abby (17), Ailsa, and Ross



Ross in his workshop with The Mistress

Ross Hayes was 17 when he bought his first Land Rover. It was road legal, but that was about it. It turned out that it was cosmetically covering up a huge amount of rust, so it wasn't going to make the long haul.

Ross bunches his lips. "I got a bit disheartened and decided that if I couldn't trust anybody to sell me a good one, I'd build myself one."

He bought a 1954 short-wheelbase Series 1 Land Rover in December '96, just after he turned 18. "I paid \$600 to a guy out of Naseby called Owen Rawcliffe, who's since passed. I brought it back to Oamaru through the Danseys Pass and set to pulling it to bits."

He bought workshop and parts manuals from the UK and a set of Whitworth sockets and Whitworth spanners – the nuts and bolts on this vehicle are Whitworth and BSF.

6000 hours

'The Mistress', as he came to call her, spent five years, three months in the workshop – 6000 hours – while he pulled it to bits and rebuilt it.

His idea was to start with a chassis, and everything that went onto the chassis was either rebuilt or brand new. It was hard to get parts back then. The bodywork was badly beaten up. The chassis was wrecked at the back end. No brakes. The motor was absolutely shot to bits; "they didn't call it 'Smokey Joe' for nothing," says Ross. The guards had been cut to resemble an army jeep-style vehicle

His good friend, mechanical engineer Bruce Watt (see *The Shed* Issue No. 67), is a "very clever man. He's a mechanic by trade. He agreed to put my engine back together, so I ripped it apart and basically gave him a whole heap of bits. And he's made a lovely motor out of it."

Ross pauses. "To be honest with you," he says, "I ended up buying a few more little Land Rovers for the parts." He wanted to build a complete Series 1.

"The plan was that it didn't have to be all '54. I wanted to take all of the best design features from the Series 1 era and put them all into one vehicle. So, it's got a 1957 engine block in it, which



Bringing Smokey Joe home from Naseby, December 1996



The Mistress ready for paint and panel, September 2000



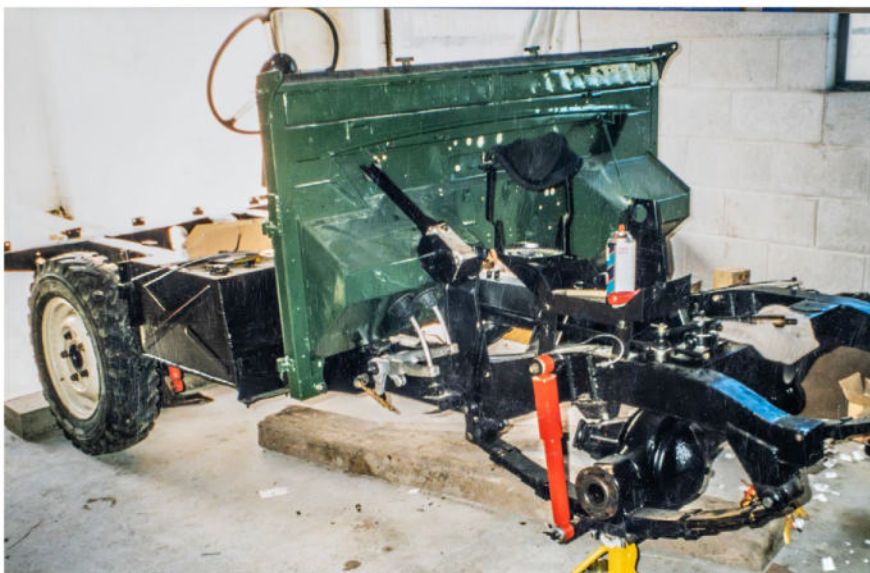
The naked chassis



The rolling chassis behind Uncle Vernon's Land Rover



Rebuilt engine in place



A work in progress

is far better than the '54. And it had miscellaneous other upgrades that they produced during the Series 1 time.

"I had some good help from a family friend. She was a neighbour of my mother's parents, and her name was Jessica Winsley. She was interested in cars and was at a bit of a loose end. So, every time I went down to the workshop for, I don't know, two-and-a-half, three years, she tagged along, and I never ever had to redo any of the work she did."

A family affair

"My family have been into Land Rovers since before I was born ... just.

"I could certainly ask them a lot of questions. It's a bit of a family affliction, to be honest. My uncles owned Land Rovers, my father owned Land Rovers, my brother owned a Land Rover, and my grandfather Clive owned a Land Rover



Memorabilia in the workshop window



The engine components ready for the magic touch of Bruce Watt

as well.

“He had repaired multiple in his life; he taught me how to rip the gear-box to bits and put it back together. He showed me how to set up the front and rear diffs. And, from memory, I think he helped set up all of the steering gear on the kingpins and preloads and all of those things that I didn’t understand at the time.

“So yeah, there was certainly a raft of knowledge. I was there at the start of the Waitaki Land Rover Owners and Enthusiasts Club. So there were like-minded people to bounce ideas off. The club’s not long folded. But its badge is still sitting on the grille.

“My brother Colin ferried me around a hell of a lot, and his vehicle had a tow-bar, so he ended up sort of using it to move bits and he was always there to lend a hand to lift things. He and my ▶

“I ended up buying a few more little Land Rovers for the parts”



Just another Land Rover gear-box



The pedal cars

Long before he was a father, Ross decided that if he ever had kids, he would make them replica Land Rover Series 1 pedal cars.

When his first child, Abby, was a year old, he began to make her a pedal car in his lunch break. He would make a tiny part, then go home and measure up the part on the real Land Rover, and reduce it down to a third of the size, and that would be his template to make the next bit.

He built 'Little Miss' the same way he built The Mistress. All the door hinges are the same; the bodywork's made of hand-beaten aluminium. The chassis is made of steel; it's still got pneumatic tyres. He also made a sprung steering wheel in the same style as the Series 1.

"I replicated the little Lucas park lights and F700 headlights. I replicated the 518 Lucas tail-lights," says Ross. "I went to the local auto electrician. I looked through his Hella book to see if I could find some lenses I could modify on the lathe. And I ended up buying parking light lens covers, both clear and red, because they were the correct shape.

"They weren't the correct size, but they were definitely the correct shape and design for what I wanted. Then, I made up little holders that I could glue



Abby and Dylan enjoy a Land Rover outing with Ross

"I'm quite proud of the fact that everything on the little Land Rovers, the pedal cars, works."



The Mistress with her two babies



Loading the pedal cars onto The Mistress



Above: The Hayes youngsters are still not too old to play with the pedal cars



Inset: Dylan's mini tool kit for his mini Land Rover



Dylan with 'Mini Master'

them into, and I machined them in the lathe to simulate the size that I needed. Then I jumped on the lathe again with a piece of aluminium and made the rest – the bulb holders and so on.

“And then I got the paint mixed for the green one to match The Mistress. I finished before Abby's fourth birthday. She's 17 now, and everything opens and shuts; the headlights, tail-lights and all of that still work. She's even got her own miniature tool roll, just like Series 1 had when they were new.”

Eleven-year-old Dylan's pedal car is bright yellow. In the UK in the '50s, the Automobile Association (AA) used Land Rovers for their service vehicles. Dylan's was painted in those colours

– black outer front panels, yellow for everything else, including period-style AA badging. The reason his was done in this colour scheme is that, when both of the children were born, Ross gave them a little Land Rover model when they were only a few minutes old. Abby's was green, and Dylan's had the AA livery, so he followed the theme for the pedal cars.

Ross says, “I'm quite proud of the fact that everything on the little Land Rovers, the pedal cars, works. I've put miniature capstan winches on the front of them, and they work. The kids have a scale manila rope, which I'd made and spliced the ends. And they've spent countless hours winching these vehicles out of mud.”



Grandad Hayes, the last in the family to operate the Hayes Engineering Works in Otarehua

father were there when I used to sing out for a hand.

“The other bonus that I had in that respect was my Uncle Vernon went to Australia for around 18 months and he gave me his 1955 Series 1 Land Rover to look after and it lived in the garage beside this one. This was great because when I wanted to figure out how something went together, I just looked at that one. Plus, it scratched that itch that I'd had for a long time to get behind the wheel of one again and drive it.”

These Landies are just good

There's a joy in driving a Series 1, Ross reckons: “The exhaust note just sounds good. That was half the reason I particularly wanted a Series 1. They just sound good, they look good, they drive good ...”

The Mistress was painted at Whitestone Paint and Panel in Oamaru and panelled nice and straight by a local panel beater. It was at his place for seven months.

“And, there was a lot of tweaking because the Land Rover build quality, let's be honest, isn't always great,” Ross says. “But idiots like me wanted to make them better than they were. So, getting doors to line up and that sort of carry-on just took a bit of time, because they never really

“The Blackhawk guys built the canopy that’s on the back of this thing to that specification, and it’s absolutely flawless”



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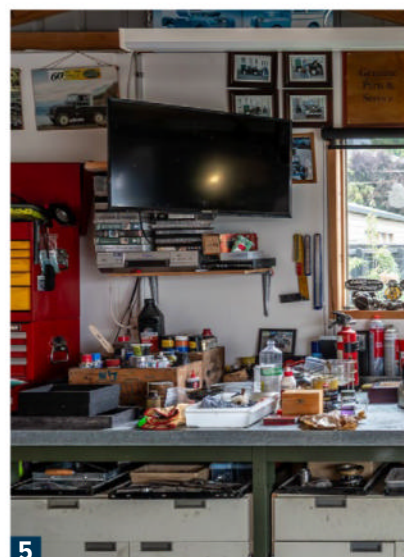


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1. The master at work. Ross is never happier than when he's in his shed. 2. toys of the trade. 3. Period fire extinguishers. 4. The Mistress in her natural habitat. 5. Ross's natural habitat



4



5

took that time at the beginning. I also wanted to make all of the little spot-weld marks disappear and actually make a Land Rover straight, because even new Land Rovers of that time were not straight when you looked down the side.”

Ross matched the paint colour from *Original Land Rover Series 1*, a reference book by UK vehicle historian James Taylor, who has written many books on Land Rover and Rover cars. Ross points out that Taylor goes into minute detail. He had the ICI paint codes, so they were loaded, and the computer did the rest.

Flawless canopy

The upholstery was done by Blackhawk in Oamaru.

Ross befriended the local Land Rover dealers Ian and Betty Craig, who lent him a factory canvas canopy, which he used as a sample.

“The Blackhawk guys built the canopy that’s on the back of this thing to that specification, and it’s absolutely flawless,” he says. “They did the fold-up seats on the inside of the deck for me. And it’s just as per it should be. They did a great job. Couldn’t ask for better.”

Ross points out that his Series 1 is basically fully optioned, with power take-off on the back so it could run around and work like a tractor in a farm scenario: “There’s a flat belt for that, but that will end up on my second Series 1, ‘The Master’, which will be the next to be restored. We’ve got a capstan ►



Hayes Engineering Works at Oturehua

The works

The Historic Places Trust’s Hayes Engineering Works and Homestead stands at the edge of Oturehua, a small settlement in Central Otago’s hot, dry Ida Valley. The buildings, workshops, and homestead have been restored and serve as both a testament to New Zealand’s agricultural engineering industry heritage and a tourism destination.

Ross Hayes is the fifth generation of engineers to have descended from Ernest Hayes, an Englishman who set up his engineering workshop there in 1895. Ross’s great-great grandfather, Ernest, built a homestead, workshops, and implements sheds from schist and mud bricks. The agricultural engineering implements invented and manufactured there were household names in rural New Zealand throughout the 20th century.

“There’s no Hayes family over there now,” says Ross. “Ernest was my grandad’s grandad, so the genealogy of the five generations of engineers in the family runs: Ernest Hayes, great-great grandfather; Stanley Hayes, great grandfather; Clive Hayes, grandfather; Murray Hayes, uncle; and Ross Hayes, the fifth-generation engineer.

“My grandfather did his time there before he went to the Second

World War. When he came back, they carried on working up until the time when the Hayes Engineering Works were split up in the 1950s.”

Some of the family went down to Invercargill, some went to Templeton near Christchurch, and the works stayed open for maintenance at Oturehua under Doug Smith and his wife, Olive (née Hayes).

“But,” says Ross, “my grandfather was the last Hayes to run the original Hayes works. The Historic Places Trust took over the works in 1980, but we still have some association with it. We certainly go over there multiple times a year. And my father, my brother, and myself, we’ve fixed up some windmills that they wanted repaired, and we’ve put three or four of them up. It’s nice to do things as a family, and we all help in our own ways.

“They’ve got a great bunch of volunteers, and they like the idea of Hayes people working on things. They’re quite happy to have us kicking around from time to time. It was nice to work in the original workshop when we were repairing windmill parts. You have that sense of history. I always wanted to do something there, so I’ve ticked that box, and hopefully, we’ll tick it again.”



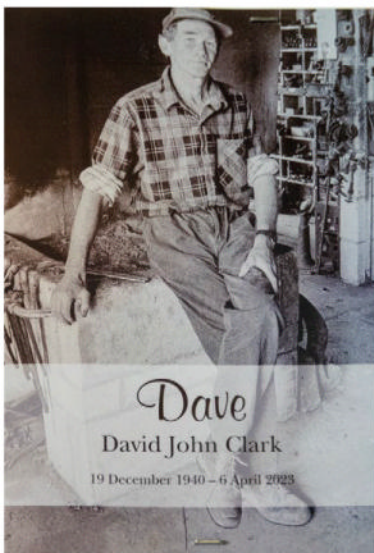
Ross's mentor, Ivan Wilson

winch for the front of it as well as what's on The Mistress. So, both of my vehicles will be fully optioned."

Interestingly, these vehicles have no legal need for seatbelts. It's not them being 1954s; they don't need them technically. However, The Mistress does have a lap belt in the middle seat in the front. And because there are seats on the deck, there are two lap belts. "We've got to be practical about it," says Ross.

Almost as per factory

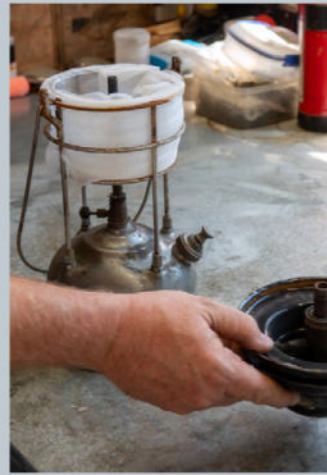
But it's got no modern gizmos. It's all totally as per factory, except for the cell phone charger. Ross's good mate Simon Henderson made a period-style-looking cigarette lighter attachment for the positive and negative terminals in the dashboard so they could charge their cell phones. ►



Dave Clark, Ross's former metalwork teacher, mentor, and friend



Unfinished business



Hats off



Easy does it

ROSS SHOWS US HOW TO CLEAN A TILLEY LAMP

Ross has a complete set of 246-style storm lanterns, also known as 'Tilley lamps', ranging from 1946 to the present day. There are four different types. Tillies were designed to come apart without tools.

First, lift the hood off and disassemble it by hand. "You need to clean it well, because a single cobweb can stuff up the operation in the top of the hood where the mantle goes," he says.

"Put it in a container of white vinegar and leave it there for 24 hours."

Then he uses a rag to polish it, and it has a completely shiny brass surface when finished: "Give the brass a little rub with a brass brush and a very light polish. It will come up like brand new."

Next, put the vaporiser into some vinegar as well. Ross has had extremely good success cleaning up old vaporisers and getting them to run absolutely perfectly.

Seals. Ross has found a place in the UK

that can supply very good quality seals.

And the little stopcock tap? It disassembles without tools as well, and so does the air plunger.

"The whole lamp comes apart really well," he says. "Everything gets cleaned inside and out with hot soapy water. And if it's carboned up, vinegar works ridiculously well. Paint them if you need to paint them or polish them if they're 'speculum' – a chromium finish, which polishes up beautifully with Brasso."

There are lamps that have been painted to look like brass: "These can be repainted if necessary, but do not use Brasso on the painted surface."

"Do use Brasso when polishing the little brass knobs and washers around the plunger and taps."

The cage can be repainted if necessary or washed in soapy water.

"Fit a new mantle and fill with kero, and it will be ready for another 60 years of service," says Ross.



Disassembled lamp



Cleaning time



Clean the glass



Unscrewing the vaporiser



No hand tools needed



Uncaged



Remove the plunger



Ready to strip



Remove the control cock



Disassemble



New seal on the non-return valve



Clean, service, and reassemble the control cock



Before polishing



Let there be light

"More than coincidentally, Simon drove this Land Rover, The Mistress, two years before I found it," says Ross. "Then he lost sight of it, and I bought it two years later. And over a bottle of Jack Daniels one night, he explained the Land Rover that started his obsession."

"And he didn't believe me when I told

him it was parked on the front lawn, because he had no idea where it had gone."

Ross takes The Mistress out every opportunity he gets. He's more than happy to fire it up and go for a drive. "My wife Ailsa and I, we'll take it into town, we just go to a café. We went camping up the Hakataramea Valley

in March with Simon and my two kids, Abby and Dylan. We just loved it.

We do local car shows. It's been a wedding car three times. It's been up to the top of the Hawkdun Range. Driving Rainbow Road was a heap of fun – lots of dust! It's done the Black Forest Road up the Waitaki Valley. It's been to the Falls Dam to our crib, God knows



"He didn't believe me when I told him it was parked on the front lawn, because he had no idea where it had gone"

Removable door top makes summer motoring fun





The vents – 1950s air conditioning



A spartan dashboard



Tail-light and emblem



Proudly displaying the former Waitaki Land Rover club badge



All in a day's work



Next job please



1. Three in a row. 2. Factory power take-off assembly. 3. Door handle – function over form. 4. Overdrive. 5. Four gear levers for different functions

how many times. Yeah, it just goes everywhere.

“I have had water over the bonnet more than once. It’s been up to five-odd thousand feet. Yep, definitely gets there. It was two days on the road, and I put it through its first mud hole, and everybody was more shocked than I was. And yeah, no, it just does what it’s asked.”

Gifted two more Land Rovers

The Mistress has been on display at the McLeans Island Swap Meet in Christchurch several times. One year, Ross befriended an older couple, the Smiths

from Kaitangata. They gave him (“I wasn’t allowed to pay, they gave me”) two Land Rovers – a 1949, which has gone to the right place and a 1954, which is parked outside his workshop, and it was built just 12 vehicles before The Mistress.

“There were 40 or 50 vehicles on a UK production line per day, and these two were built on the same line on 23 June 1954. Dispatched to New Zealand on the 2nd of July, 1954. About 50-odd years later, they found their way, both of them to be together again and in my ownership, so that’s great.”

The Smiths’ Land Rover is The Master,

which has yet to be rebuilt. It will go to 11-year-old Dylan when he’s old enough – and his parents are very old.

Ross says his workshop is his happy place, and it’s where he keeps photographs and mementos of specific people who have taught him “a massive amount of cool information”.

“My job is to make sure any knowledge I have is passed on to the next generation, and no better place than the workshop to do it,” he says. “Knowledge is never lost. We are only custodians of it for the time we are here.” 📁



Brother and sister – 12 vehicles apart



‘Lizzie’, the next project

Viking Arm

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It's a gas

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With more than 57 swap centres nationwide, Eziswap Gas is a better way to purchase industrial gas. It's also New Zealand's only 100 per cent Kiwi-owned, nationwide industrial gas provider. Win-win!





ALOT co-founder, Amanda Chapman



Open for Business

A great idea made real Auckland Library of Tools

Why buy a new tool for just one job when you can borrow all you need from a tool library? Less waste, less storage and all fees covered by a library membership. It's a win-win

By Chris Hegan | Photographs: Chris Hegan

Ever find yourself standing in Bunnings or Mitre 10 looking at laying out two or three hundred dollars for a tool that you absolutely need to get a job done but will quite possibly rarely or never use again?

If you're in Auckland, put your wallet away and head over to the Auckland Library of Tools (ALOT) on Newton Rd.

A few years ago, newly hatched and full of aspiration, ALOT got a small mention in a *The Shed* piece about makerspace Hackland, with which it shares premises. Now, in 2025, the library is a winner.

Co-founders Amanda Chapman and Tom Greer and friends manage an ever-growing team of volunteers serving a steady stream of members coming in on Tuesday and Thursday evenings and Saturdays, checking out an impressive range of items – 2026 of them at current count.

'Tool' is a flexible term

The vast majority are donated, but occasionally, the library will purchase a much-requested machine out of members' fees. 'Tool' is a flexible term here. Alongside a powerful garden mulcher and hand tools of every description are such useful oddities as an adjustable dressmaker's dummy (and a choice of sewing machines to go with it) and the movie evening kit – an ice-cream maker and a popcorn machine.

Drills, ladders, a scaffolding tower – the list is endless. Lawnmowers, hedge trimmers and chainsaws are in constant rotation. It would be a challenge to come up with a DIY project that the library does not have the tools to complete. Fortunately for ALOT, tool libraries are an international phenomenon, and the Auckland centre keeps track of everything with a licensed online database developed for the purpose. Each tool is marked with a unique

number, and the database can be searched by number or description. A member logging in and searching for 'router' will be presented with photos of the library's four routers and a wide range of sets of bits; they can then reserve up to ten items for an initial period, usually seven days, and in some cases download an attached PDF manual. If they need it for longer, they can go online and extend the loan, provided it has not been reserved by someone else. Hireage is included in the membership fee, with a small charge for battery-powered tools and the high-maintenance chainsaws.

There's advice here as well

The first job for volunteers Belle Corbett and Tushar Rao on their Saturday shift is to bring up the day's reservations and find and lay out the tools due out that day, then start serving members who come in with queries ranging from, "Those five items are for me, can you check them out please?" to "I'm building an outdoor shower enclosure. What would I use to ...?" Typical of the latter sort was Sam, modifying a desk for his partner's jewellery-making.

He had to cut a semi-circle out of the

front to accommodate a fixed apron to catch the precious metal filings and off-cuts. He correctly thought he needed a jigsaw but had never used one before. I told him to draw a strong line, go slowly and keep a firm grip. He went away happy.

Next came Nikki Hillyer, a member “for ages.” She and her partner live on a small property, and the tool library has enabled them to use their one small shed for bike stowage instead of parking them in the hall. Many other members live in apartments, where accumulating a tool collection is simply not viable.

Repair cafés were popular

In combination with Hackland, the library runs occasional repair cafés.

Last year, these were a regular fixture thanks to a one-off grant from the Auckland city council, now expired. They were well-attended with a high rate of repairs effected, and scarcely a shift goes by without someone asking when the next repair café is scheduled. But Amanda is optimistic.

“We are planning to run the repair cafés this year on a monthly basis, as the

volunteers involved are quite keen for that to happen. No specific funding for it, though.”

Amanda has been writing and sending off a slew of funding requests for a paid person to run the library.

“We really need dedicated staff to coordinate the volunteers, operations and the inventory. It’s also our intention to increase our hours at some point this year.”

Long-term volunteer Colin Maxwell regularly exhorts members to call their local councillor and express anger at their lack of support. “Any council,” he declares, “that gives no support to repair cafés or the tool library has no business claiming to be caring for the environment by way of waste reduction.”

It is hard to argue with that, but word of mouth and Amanda’s effective social media activities ensure the library is here to stay.

To join up or donate tools, go to aucklandlibraryoftools.com.



THE SHED ONLINE

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. Some uploads of the past few months include:

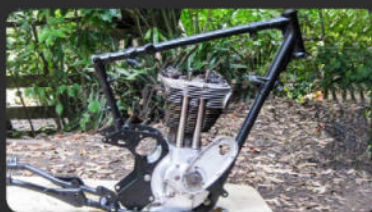


PROJECT

Two-part series – build a sturdy steel bench

Jude Woodside constructs a steel bench for his lathe

<https://tinyurl.com/JudesBench>



Video: From Rust to Rrrroarr Part Three

This short video of our AJS restoration series

<https://tinyurl.com/rrroarr3>



My bush shed in town

A deer hunter makes his home shed feel like a bush shed

<https://the-shed.nz/my-shed-going-bush-in-town/>



Giving a toss

A sheddie builds an ancient catapult for fun

<https://the-shed.nz/man-who-gives-a-toss/>



The Ayrburn Classic announces dates for 2026

Save the date: Friday, 20 – Sunday, 22 February 2026

The scenic landscapes of Arrowtown, nestled near Queenstown, came alive this past summer with the dazzling debut of the Ayrburn Classic.

Hosted at the luxurious hospitality precinct of Ayrburn, this three-day celebration of motoring mastery, culinary excellence, and live entertainment captured the imagination of thousands – and left them wanting more.

Now, following the overwhelming success of its inaugural event, the Ayrburn Classic is back – and it’s shifting into an even higher gear.

That’s right. The Ayrburn Classic returns next February for what

promises to be another world-class celebration, scheduled slightly earlier on the calendar to bask in Central Otago’s long golden evenings and late-summer glow. This festival will once again transform Ayrburn into a playground for car enthusiasts, food lovers, and seekers of high-end hospitality alike.

The 2025 edition set an incredibly high benchmark, and with over 250 classic and contemporary luxury vehicles on display – collectively worth more than \$250 million – the festival was a visual and visceral feast for attendees.

The Ayrburn Classic 2026 is calling. Come along for the ride – again.

STORAGE TIPS FOR TOOLS AND MORE

Dear Editor,

You asked for items of interest for *The Shed*. Well, here is one, and it concerns all of us.

Having a workshop where I do all sorts of metal and woodwork, I would be totally lost if I could not put my hand immediately on a tool or component for a job in hand. Spending long-lost minutes searching for an item helps nothing, especially my temper.

It is the issue of storage. We need to store all our “toys” in such a manner that they are:

- easily accessible,
- suitably organised,
- appropriately arranged,
- easily found,
- not overly expensive.

I just love companies that supply a case with the tool that you buy. This was not always the case, and so often the tool that you bought was in a cardboard box, which over time absorbed moisture, causing rusting, and it finally fell apart. With tools that have no container provided, I have resorted to building customised boxes out of MDF to hold them, sufficiently large to also contain their associated tools and accessories. If I need it elsewhere, I just pick up the box which has everything I need in it and go.

Cheap boxes

The boxes are sprayed internally with oil or WD20 to ward off the dreaded rust monster. They are labelled suitably to discern which brown box on the shelf holds what.

I keep an eye out for cheap plastic boxes in which I hold a variety of tools, tooling and components. Preferably, they nest, to help in keeping them in their place. Systema boxes are a good example of these, but they can be dear when you need 20 or so. I also use a lot of plastic bottles to hold screws and other standard parts. The bottles from the ‘Plastic Shop’ are semi-square and have white lids which are ideal to write on in felt-tip. They then sit nicely in drawers, organised generically. I do not use glass bottles!

You find out why the first time one drops on the floor. For very small parts and small drills, I use discarded pill bottles. Once again, they have nice white tops to write on. The small metal mint containers are a good size as well, but they need a bit of white paint on them before writing the contents.

More storage options

A good source of boxes are those which hold take-away food, suitably clean of course. However, as they are a bit flimsy, they do have a limited life. I use them chiefly in projects to hold groups of parts until I need them. Good for smaller and flat parts.

I also make good use of the compartmentalised flat fishing boxes. They are especially good for holding similar items which one needs to select from, such as flat washers, screws, or the various bits to go into my Dremel. I use a big fishing box to hold all my taps and dies, and their holders, a compartment for each size.

I have a good selection of files, and they are able to get blunt, rattling up against each other. My solution is to wrap each in a piece of tinfoil. Not only does this prevent them from getting dulled, but the aluminium also acts as a sacrificial anode which helps against them rusting.

Getting larger, I use crates for my building tools and painting stuff. Nice and easy to lift and go with everything inside. Once again, they need to lock together so they can stack in the corner. I also

use these for holding metal offcuts.

Thinking ahead

Long pieces of metal, threaded rod and the like can pose a problem. Pieces of offcut drainage pipe are really useful here, a few different lengths corresponding to the lengths to be stored. Sometimes for really long items overhead storage is the only option.

If I had thought properly, when I had my house built, I would have had the garage walls lined with plywood instead of GiB. It would have made life a lot easier for attaching shelves and cabinets.

Last but not least, I worry about the trip hazard that exists with power cords lying on the floor. My solution is to put a double adaptor on the overhead plug for the garage door opener, then drop an extension plug down. This hangs at shoulder height, making it easy to plug in smaller tools such as a Dremel or the like.

I hope that one or more of the above helps your readers.

Regards,
Chris Pattisonv

HIGH PRAISE

Dear Greg

I was a little surprised to read in your April/May issue that you receive little in the way of comment or feedback from your readers. I thought that as I am a relatively new subscriber, I should take the opportunity to offer my comments.

The Shed is now very much an eagerly awaited publication in my letterbox. The

stories and profiles over such a wide and diverse range of subjects is what makes the magazine, no matter where one’s primary areas of interest may lie. That, coupled with superb quality photography and in-depth narrative make for a first-class publication. I say heartiest congratulations to you and

your team at *The Shed*.

You certainly have my vote!
Kind regards
Rod Cullinane

[Thank you for your kind words of support, Rod. The entire Shed team very much appreciated it. – Ed.]

WE HAVE A GRINNING WINNER OF A SHED SUBSCRIPTION PRIZE – A HUSQVARNA ELECTRIC LAWMOWER

Hi Greg,

That's the best news I've had in a long time – thanks heaps to Husqvarna, NZ *Classic Car* and *The Shed* magazines.

I doubt you could get a more fitting recipient of this great prize – the house we had built in Karaka Harbourside is on a typically modern compact flat section – i.e., not huge.

Ideal for a cordless electric mower – does away with the need for a petrol container that not only is smelly, potentially dangerous but always seems to be empty when you need it.

A couple of comments:

Packaging: Having been in packaging for most of my working life (long time!) I

am always impressed by good packaging, and this was.

Instructions: Easy to put together – didn't need a degree to read the assembly instructions. (but might need to visit the Husqvarna shop and buy a mulch kit)

Delivery: The 'Owens' truckie who delivered the package rang me 10 minutes before arriving to ensure I was at home (I was) and then insisted on carrying it into my garage, good guy.

Again, many thanks to you, Rusty Media and Husqvarna – you made my day!

Regards,
Chris Nattrass

SOME GOOD AI ADVICE

Dear Greg,

I enjoyed Nigel Young's piece on AI in Issue No. 120, and look forward to the next instalment in 12 months' time.

A lot is bandied about regarding AI, good and bad, so it was interesting to read Nigel's take on it. I work on R&D for high-voltage switchgear that we get made in South Korea. I'm a year or so out from retirement, so recently a younger bloke joined me to provide some continuation.

Being younger, he was all over ChatGPT, Groc and others, so it has been handy using his different perspective to achieve a path forward. Mostly general stuff; finding relevant international standards, etc.



Last week, we got an email from our internet security people just warning us to be careful what we were asking, because those questions and subsequent answers became part of any future search done by anyone else. Including our competitors that could be trying to develop something similar!

No action without a reaction.
Regards,
Chris Gordon

LETTER OF THE MONTH PRIZE

Every issue, our Letter of the Month winner will receive a copy of *Best of The Shed 1* and *2*. More top projects from 15 great years of *The Shed* magazine.



Odd Jobs

Hang out on your own DIY swing chair!



Elevate your outdoor entertainment area with your very own DIY swing chair. This is a satisfying weekend DIY project that you and your family and friends can enjoy for years to come.

Swing chair to do list

- ✓ Prep and prime with the right Resene primer for your materials
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- ✓ Paint with Resene Lustacryl in your chosen colour
- ✓ Suspend your chair and hang out!



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From the archives



BUILDING A GANTRY CRANE

How to construct a workshop heavy lifter

By Geoff Merryweather | Photographs: Geoff Merryweather



When I was asked to clean out my late father-in-law's workshop, I knew that it would not be an easy task.

My father-in-law was not one to suffer from an iron deficiency, and his workshop was proof of the amazing amount of equipment you can fit into an otherwise ordinary, prefabricated metal garage.

The main problem involved how to get the machinery out of the workshop and onto a trailer for the 3.5-hour drive to Auckland, then offloaded at the other end. This machinery included a lathe weighing around 750kg. There was poor access to the workshop, which had a single roller door and limited access inside. Facilities on site included a small engine crane and a small orchard tractor with a front-end loader. All the construction and moving had to happen over the Christmas holidays.

In sheds all around the country, many motors have been pulled out of cars over the years with a chain block suspended from the wooden rafters. But that wasn't going to do it this time. The weight was too much for the tractors.

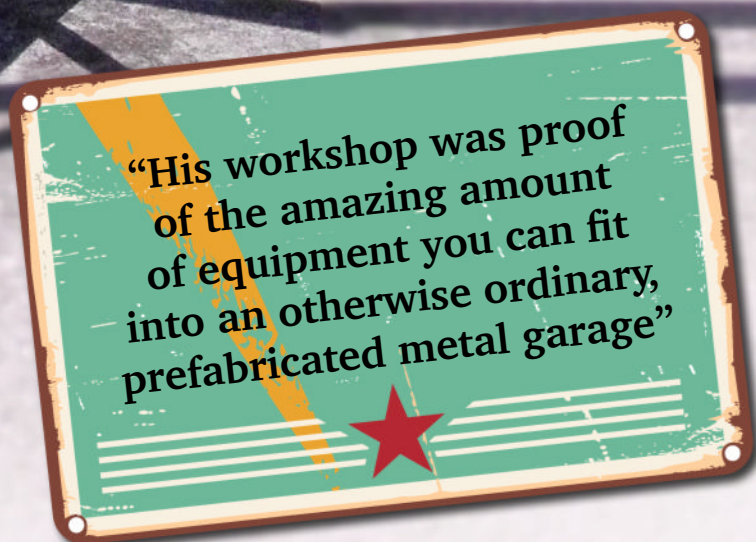
The solution was a portable gantry crane that could be taken up north in parts, assembled on site, be low enough to fit through the roller door, but could be raised inside to an adequate height to lift the machinery onto the trailer. The final product was portable in the way early laptops and cellphones were, but it worked perfectly for the project and will now live in my workshop as a general workshop crane.

Specifications

The crane consists of two vertical steel end-posts on heavy-duty castors with a 3m long UB ('universal beam' or 'I-beam') between.

The UB is actually connected at each end to steel stanchions that slide inside the bigger steel hollow section (SHS) end-posts, enabling this beam to be raised and lowered by jacks bolted to the beam at the top and to the outside of the end posts at the bottom. ►

The 3.1m long gantry crane assembled





"It is very important that it is square so that the loads are transferred straight down"

The trailer supports beam drilling. Note level



Stanchion plate drilled on I-beam to match



T-bar welded on square

The I-beam takes a mobile trolley and chain block. I preferred a parallel flange beam as it makes bolting the crane together easier and more secure; otherwise, you need tapered washers for the mounting bolts.

The most unusual feature is having these end supports in two parts that telescope together. The jack providing the lifting power for the top is a three-tonne, long-stroke bottle jack, and it's an alternative means to lift the load without your shed needing extra height for the chain block.

The lower parts of the ends of the sliders form an upside-down T-shape, and the whole is made from 90×90mm structural SHS. This size allows the 75×75mm SHS stanchion to slide inside with a minimum amount of slop.

Using 90mm SHS for both the vertical stem and the base cross-bar of the T allows you to fit removable outriggers with screw jacks later if you need stabilising supports or if you want to increase the crane capacity.

There are 20mm holes through both the external slider and the internal stanchion to allow for pins if required once the height has been set. The slider has a 350mm long, gusseted 100×10mm



Drilling locking-pin holes at 100mm centres on sliding stanchion

flat plate welded to the top, which bolts onto the UB flange with six 12mm bolts.

The castors from Rex Castors are used for industrial skip bins and are rated at 500kg each. While they are the cheapest castors available with at least this weight rating, they are still the most expensive item in the crane. There are other castors available with a higher load rating and with brakes, but the price increases dramatically. The castors I used also have cast-iron wheels with grease nipples so they won't develop flat spots or split, which can happen with rubber wheels. They will have a hard life, so you want heavy-duty, high-quality items.

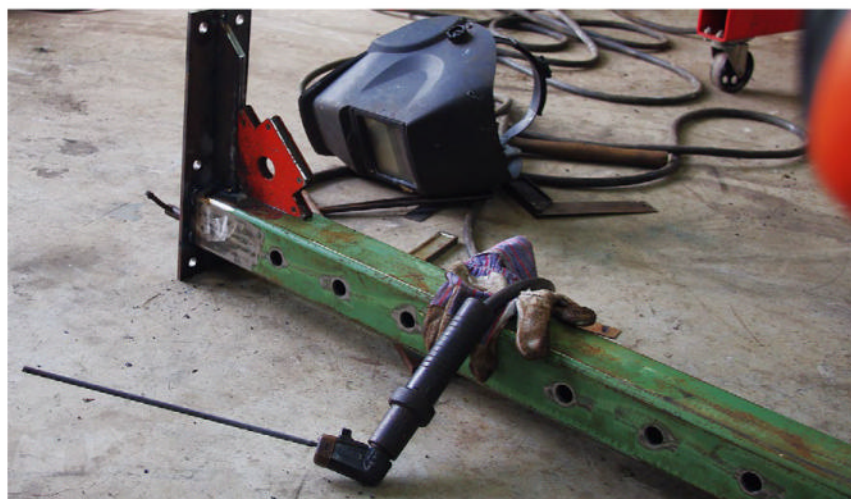
The build

The bottom half of the end-frames is made first.

Using the engine crane, support the end of the hollow section to take the weight of the steel under the drill press. Drill the pin hole first and weld the base to the upright, making sure it is dead square. Weld on the pre-drilled mounting plates for the castors, making sure they don't warp. You may need to give them a tap with a hammer to flatten them out as they pull on the welds. The



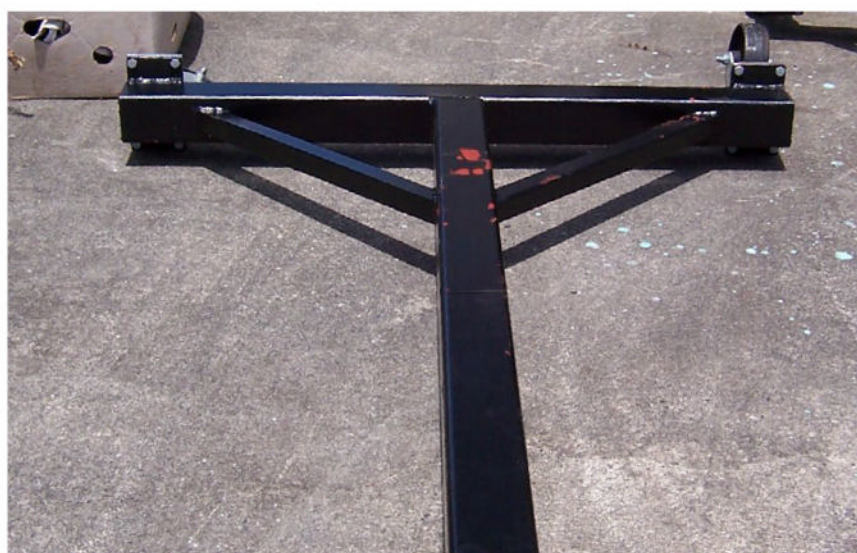
Pre-drilled mounting plates for castors sit the assembly flat on the floor



Brace the top plate with the gusset before full welding to prevent warping. The top plate bolts the sliding stanchion to the I-beam



Geoff bolts beam and end-post (upside-down) together



T-section end-post



Assembly done

castor mounting plates will sit flat on the ground and allow you to stand the frame upright while you do the angle braces.

Cut and drill the plates that fit onto the top of the sliding stanchion. They bolt onto the I-beam, so use them as a guide for drilling the I-beam flange to match. When doing the drilling in the workshop, manoeuvring 60kg of 3m long I-beam and holding it up under the big drill press is a bit awkward. I used my trailer as a trolley and noticed that the top of the I-beam was a similar height to the table, so I moved the table out of the way and rolled the trailer into place. I used a level and the trailer jockey wheel to get the beam located square to the drill.

Other alternatives would be a large pistol or D-handle drill and cutting oil, renting a magnetic-base drill or using a small drill press clamped to the beam flange as a poor man's mag drill. I also fitted a removable eye in the centre of the beam for lifting.

Stanchions

The stanchions are next.

Drill a series of holes for the locking pins at 100mm centres, with the first hole spaced from the base to match the distance in the slider base to the matching hole. This will let you put a

pin through when the two parts are assembled in the lowest position to lock them together during on-site assembly.

The top jack mount is a piece of 40mm SHS with a piece of 40mm flat on each side to form a square U-shape, with a 16mm through hole to suit the jack.

For a couple of reasons, the welding procedure is very important when the top plate is welded onto the stanchion.

The stanchion needs to remain flat to provide a good fit-up with the beam; it is very important that it is square so that the loads are transferred straight down.

Clamp the plate into position and tack on the long sides of the plate (not across the plate) to the top of the stanchion and check that it is square. Tack the gusset underneath on the long side and the top jack mount on the other side before completing the welds.

If you weld the top plate fully before bracing it with the gussets and the top jack mount, it will warp and bow downwards when you weld across the plate.

Assemble the two parts and make sure the stanchion is fully seated in the slider and that the locking pin holes line up. Fit the jack and tack on the lower jack mount.

Don't forget

- to allow for the wall thickness of the slider tube in the hole spacing, and
- to ensure that the jack mount is centred across the tube.

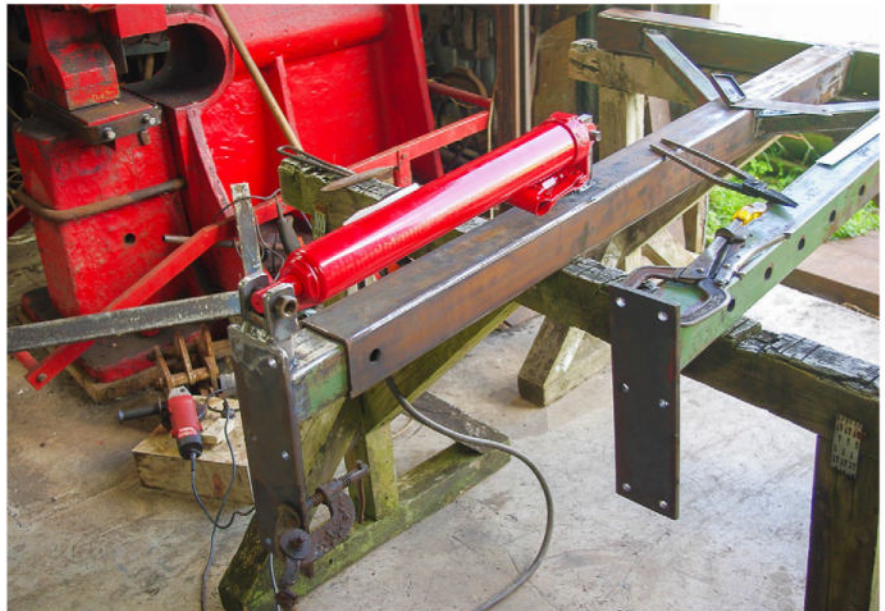
Check that everything moves freely and is in line before welding it fully.

The one-tonne I-beam trolley was found during a clean-up of the workshop when I was trying to make space just before starting the project, but they are available online for around \$300 from various suppliers. If you buy one, make sure it will fit your I-beam and suit the I-beam flange taper or parallel flange.

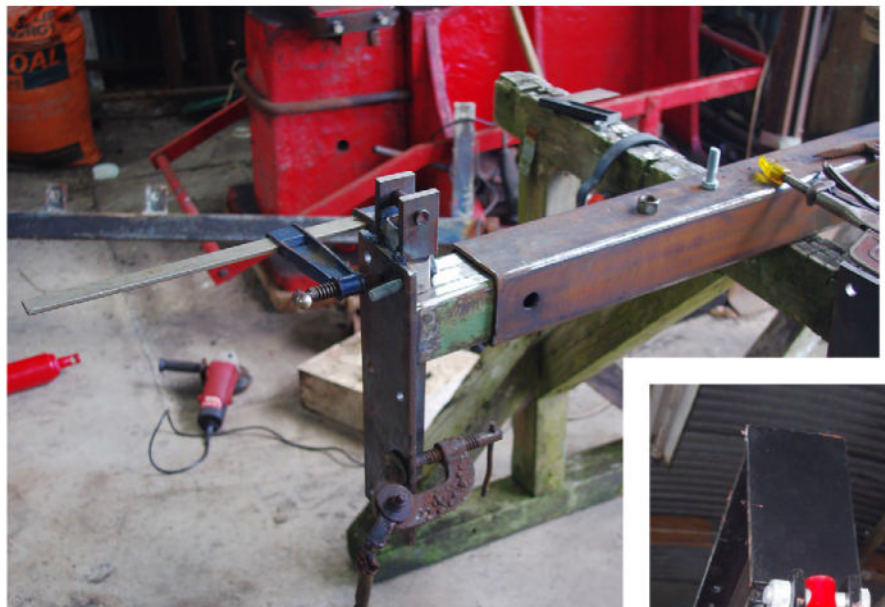
Assembly

The assembly will require some lifting equipment to stand the finished crane upright and move the parts into place.

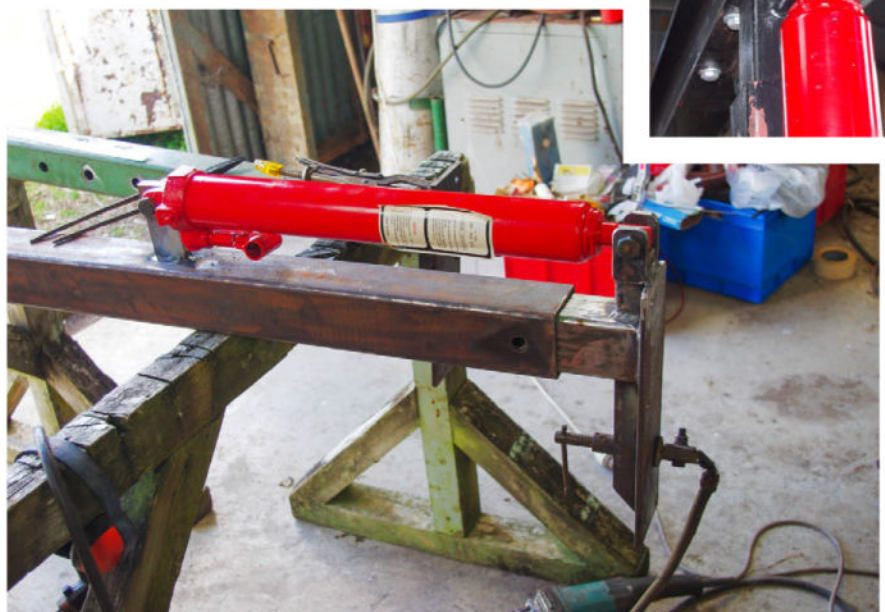
I used a tractor as I had one at each end, but an engine crane (if you can get enough height), a chain block and derrick, or a shear legs lifting frame would also work. You are not going to



Fixing jack to end-post

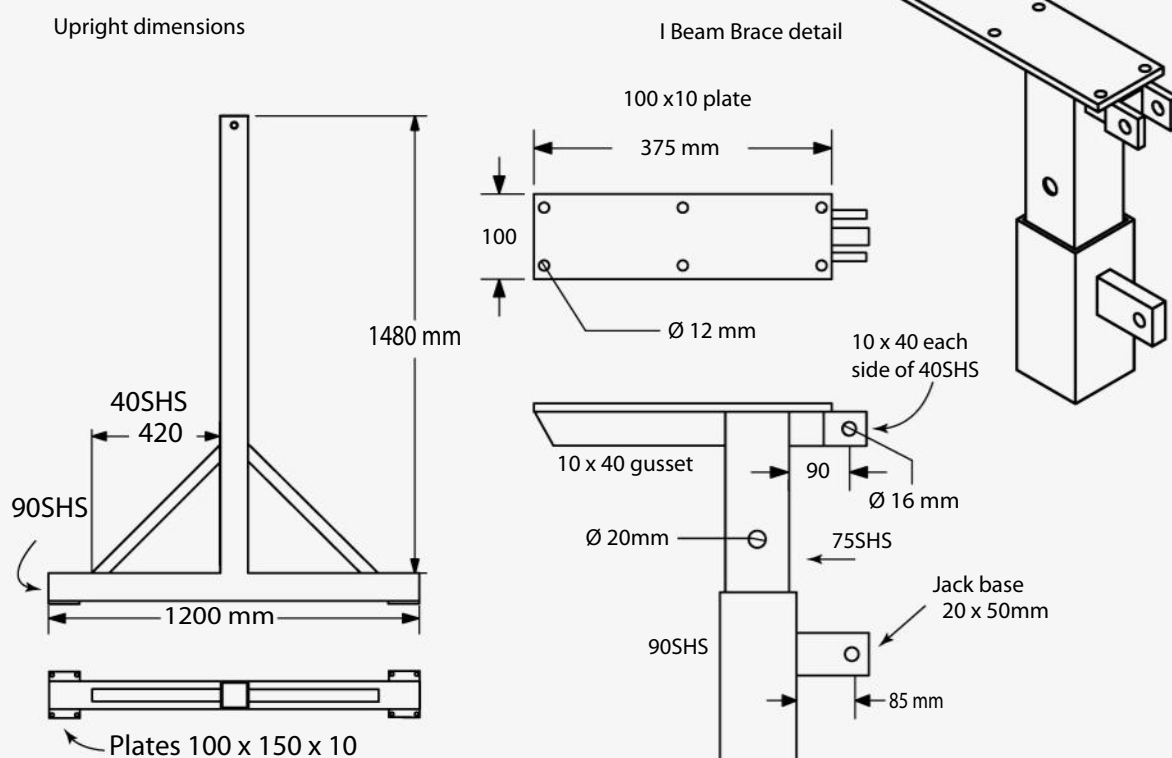


Ensure U-shaped jack mount is centred on the tube



A three-tonne long-stroke bottle jack provides lifting power

Gantry crane dimensions



be able to stand the crane up without mechanical assistance. Convincing your brother-in-law and a visiting tourist to lend a hand also helps.

Lay the I-beam upside down on blocks on a level surface and slide onto the gantry trolley. Bolt the stanchions onto the I-beam – have someone hold them in place so they don't fall over.

Tip the assembly over on an angle and slide on the bases until they are fully seated. Insert the locking pins. Stand the crane upright by lifting the I-beam up with your engine crane. Bolt the jacks on each end and remove the locking pins before pumping it up.

In the words of the famous car repair manuals, disassembly is the reverse of the assembly procedure. Resist the temptation to suspend the I-beam and remove the ends. To put yourself working under a suspended load is never a good idea.

When you are using the gantry crane, you can either fit a chain block to the trolley or use the jacks to jack up the top with the load attached to the trolley or over the I-beam, which is what we generally did.

When raising or lowering the jacks, you must operate both simultaneously so that the top assembly remains level. If one side is lower than the other with a load in the crane, then the legs will be eccentrically loaded, which they are not designed to take. Having assistance makes it much easier; for the loading, we had one person on each jack, and I was able to direct the operation to make sure everything remained level. Working the gantry crane by yourself is like being a one-armed paperhanger going from end to end.

Changes

As in all projects, there are changes which I would make if I did it again.

One is the location of the jacks. I put them outboard of the frame so that they wouldn't get damaged during a lift and to maximise the space between the legs. This hasn't been an issue in use, and having them on the inside would be a better design by reducing the span between the lifting points and reducing the overall width.

If you don't have the garage door height limitation that drove this design,

you could make it taller with a wider base. At present, mine is a bit short to lift a lot of loads with a chain block. You end up using timber blocks as cribbing to allow you to shorten the chain before lifting some more.

The leg could be lifted up higher than allowed by the stroke of the jack, and I may make a bracket that will fit the stanchion pin holes to allow the jack to be relocated to give another 200mm or so of travel.

It is important that the crane is jacked up evenly, which we judged by the number of holes exposed on each side. Some more markings with a finer graduation than the locking-pin holes, or even a small spirit level on the crane, would make this easier.

Safe practice

While most rigging and lifting is a matter of care and attention combined with careful planning, when things go wrong when lifting or moving machinery, it can happen very quickly with significant consequences. There is a code of practice published by WorkSafe that gives good guidance on



The 750kg lathe sits safely in the trailer, thanks to the homemade gantry crane



rigging and lifting and estimating loads: [worksafe.govt.nz/](https://www.worksafe.govt.nz/) – search ‘rigging’.

There are some other things to keep in mind when moving machinery. Good planning is key to a successful move. What steps do you need to take? Do you have access where you need it? Do you have enough chain, rope, slings, and shackles? Do you have heavy wooden blocks for cribbing in case you need to set down a load to reset the fixing points or shorten a chain? Do you have assistance available if you need it? A spare pair of hands makes it so much easier and safer.

Finally, is it something you should be doing? Or is it beyond the capability of the equipment? In that case, you should



Preparing for our first heavy lift

get a professional machinery mover, which make a big move look easy with all the right gear.

Gantries like this often have poor sideways stability, since you can't cross-brace the frame because the load is in the way.

I-beams have relatively poor torsional strength, and, in addition, the crane with a load can tend to be top heavy. If

the load starts to swing, it can tip over, or the trolley will come off the beam, or the I-beam can twist. The swinging load can increase the forces on the gantry, meaning they will be much higher than the item weight would indicate and potentially could cause it to fail by the beam and leg connection buckling or shearing.

For this reason, moving the crane



Preparing to lift a 300kg Italian-made mandrel tube bender

while you have a load suspended is not recommended. Before moving the machinery, I dropped it down onto a Sampson trolley under each end, keeping a bit of tension on the chain to make sure that the lathe didn't fall off. Then, I moved the whole assembly as one unit, which went without incident.

With a lot of machinery, it is hard to find a secure lifting point, and the machine can often be top heavy. Try to reduce the centre of gravity by removing milling machine heads or at least dropping them as low as possible.

My Colchester Chipmaster has a hole through the bed specifically for lifting, but the lathe that I had to move had no designated lifting point. A chain or sling under the bed casting would have lifted it from a low point (so the lathe could turn turtle as it is lifted) and was likely to damage the lead-screw.

I made a lifting plate that fit between the bedways and clamps above and below the central casting webs with three pieces of 12mm threaded rod. A welded eye close to the centre of gravity took a shackle. Making this plate was half an hour well spent and made lifting the lathe much more secure and straightforward. 📁

CUTTING LIST

Quantities are approximate. Depending on what you pay for the steel and castors, the material cost is around \$1500 with second-hand steel.

	Item	Quantity
Steel (all second-hand)	180×90mm UB (parallel flange)	Approx 3.1m long
	90×90mm SHS, slider and base	5.5m
	75×75mm SHS (stanchions)	3.4m
	100×10mm flat (castor plates, top plate)	1.3m
	40×40mm SHS (braces)	1.5m
Castors	50mm industrial bin castors, rated 500kg each	4
Bolts	M10 30mm bolt and nut	16 for castors
	M12 35mm bolt and nut	12
	M12 washers	12
	M16×120mm bolt and nut	4 for jack
	M16 washer	8
Jack	Three-tonne-long stroke	2

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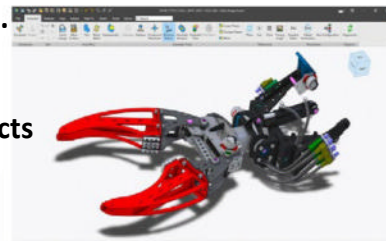
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works perfectly and I have maintained this vehicle at Autohaus Auckland with no expense spared. The receipts are photographed. A regrettable sale as this vehicle is a real head turner and a fast appreciating classic. Selling below cost as I do not have the room to store it any longer. If you are looking for the finest of this model type then this is probably the one.

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ayrburnclassic.com

THE AYRBURN CLASSIC ANNOUNCES DATES FOR 2026

The scenic landscapes of Arrowtown, nestled near Queenstown, came alive this past summer with the dazzling debut of the Ayrburn Classic.

Hosted at the luxurious hospitality precinct of Ayrburn, this three-day celebration of motoring mastery, culinary excellence, and live entertainment captured the imagination of thousands – and left them wanting more.

Now, following the overwhelming success of its inaugural event, the Ayrburn Classic is back — and it's shifting into an even higher gear.

Save the date: Friday 20 – Sunday 22 February 2026

That's right. The Ayrburn Classic returns next February for what promises to be another world-class celebration, scheduled slightly earlier on the calendar to bask in Central Otago's long golden evenings and late-summer glow. This festival will once again transform Ayrburn into a playground for car enthusiasts, food lovers, and seekers of high-end hospitality alike.

The 2025 edition set an incredibly high benchmark, and is fast becoming one of the leading reasons to visit Queenstown – amongst New Zealanders and international travellers alike. With

over 250 classic and contemporary luxury vehicles on display – collectively worth more than \$250 million – the festival was a visual and visceral feast for attendees.

Standouts included an \$8 million LaFerrari, the latest Aston Martin Vanquish, and a fleet of dream machines from Rolls-Royce, Bentley, McLaren, and more. The event's unique blend of elegance and accessibility attracted both seasoned collectors and casual admirers aplenty.

But that was just the beginning

The 2026 Ayrburn Classic will feature





People's Choice



Best in show 2025

exciting new additions, turning the volume up on what's fast becoming a landmark event. On Friday, the inaugural Tour d'Elegance will showcase the finest cars in motion, as they glide through the Wakatipu Basin's breathtaking surroundings.

On Saturday, we open our gates to the public, judging begins, and the famed Ayrburn hospitality starts to flow. In the evening, a gala dinner will bring guests together for an exclusive night of fine food, conversation, and celebration.

By popular demand, Sunday sees the debut of Ladies' Day, a most elevated celebration of women and motoring. This elegant Sunday feature will include a luxurious long lunch, Fashions in the Field, and a curated car exhibition – a nod to design, innovation, and heritage, with a distinctly feminine twist. Sunday is all about dressing up and indulging in

world-class style, alongside world-class vehicles.

One of the premier reasons to visit Queenstown

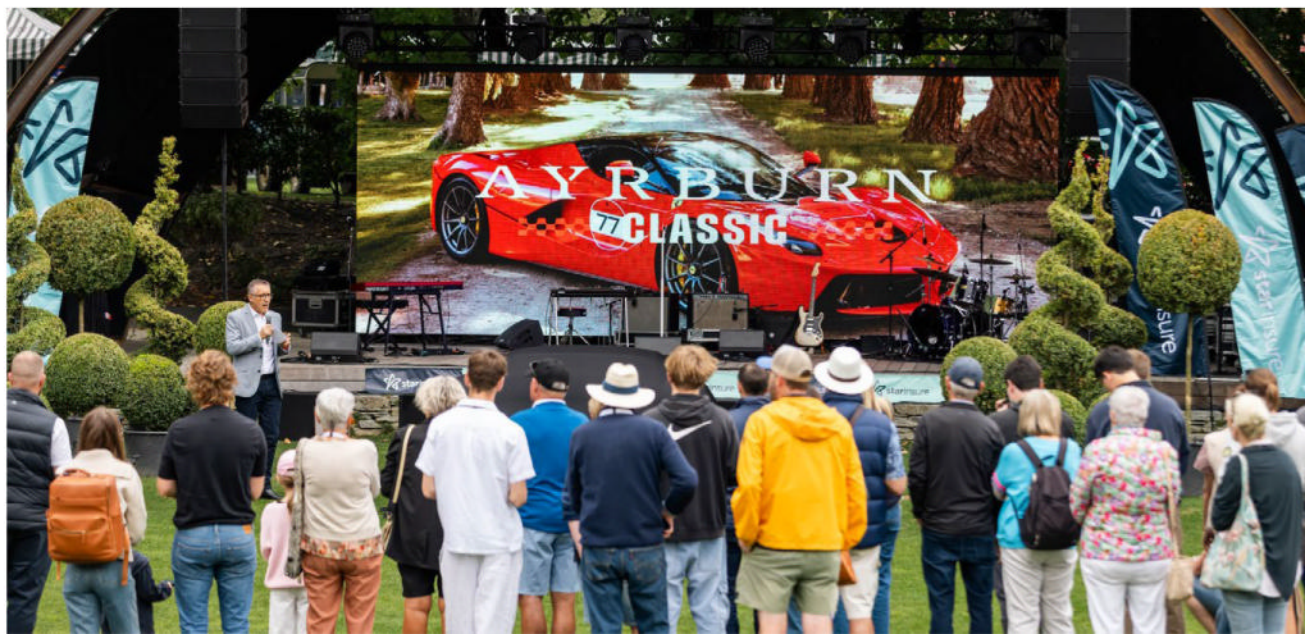
More than a festival of motoring, the Ayrburn Classic is a weekend of lifestyle and entertainment for all.

For CEO Chris Meehan, the vision for the event is clear:

"This will be one of the premier reasons to visit Queenstown. The momentum is building, and we're only just getting started."

As an attendee of the 2025 event, you'll be first in line when tickets go on sale and car registrations open. So keep a keen eye on your inbox – because 2026 is set to be even bigger, bolder, and more breathtaking.

The Ayrburn Classic 2026 is calling. Come along for the ride – again. 🚗





Camera without shroud

CAMERA SHROUD DESIGN

Bob Hulme has another project for your Alibre Atom 3d program. Sunny days can make viewing your digital camera screen almost impossible – Bob has a solution

By Bob Hulme | Photographs: Bob Hulme



Camera with shroud

I like those viewing screens on the back of cameras that save you having to squint through a little eyepiece, but I find that when using the camera on a sunny day, the screen is quite difficult to see well.

My thanks go to Murray Grimwood for his article in *The Shed* Issue No. 115, in which he showed several projects he was working on. Among them was a sunshade shroud for his camera that he had made from a standard electronics box. “Just what I need!” I said to myself.

My camera has a screen that swings out and rotates – a feature that I use a lot. So, I needed a shroud that moved with the actual screen and independently from the camera body. I also wanted to look into 3d printing, so the answer was to make a design using my Alibre Atom 3d program, and the digital file would be easily fed to a 3d printer. This is an example of how useful

a 3d CAD program can be at home (or in your shed).

Kicking off

Figuring out how to go about the digital design process was the first challenge.

I can handle creating a 3d model of something that I already know. However, working things out on the fly is only familiar to me using a drawing board; pencil; a big sheet of paper; and, of course, a good rubber.

The approach that I opted for was to create a 3d model of the actual camera screen unit and then take a stab at the shroud design. The next step was to use Alibre’s assembly feature and see how it all went together. It was then easy to go back and alter the shroud design to make adjustments so that everything would fit as intended. The rubber could stay in the drawer.

The gameplay

Naturally, the step prior to opening the Alibre Atom 3d program was to scrawl on a scrap of paper the rough ideas that were floating about in my head.

I always have to do this to figure out what might work best and to consider alternatives. Also, I needed to think about how it could be made on a 3d printer. Some things are possible using a 3d printer that simply cannot be created when machining from a solid lump of material, but there are some shapes that can be easily produced by machining that are quite difficult to do with 3d printing, such as overhangs.

As a result, rather than a one-piece device, the concept became a three-piece shroud. The separate parts could then be easily made using a 3d printer.

That done, I measured the camera screen unit carefully to make a good 3d representation of it in the program. ►

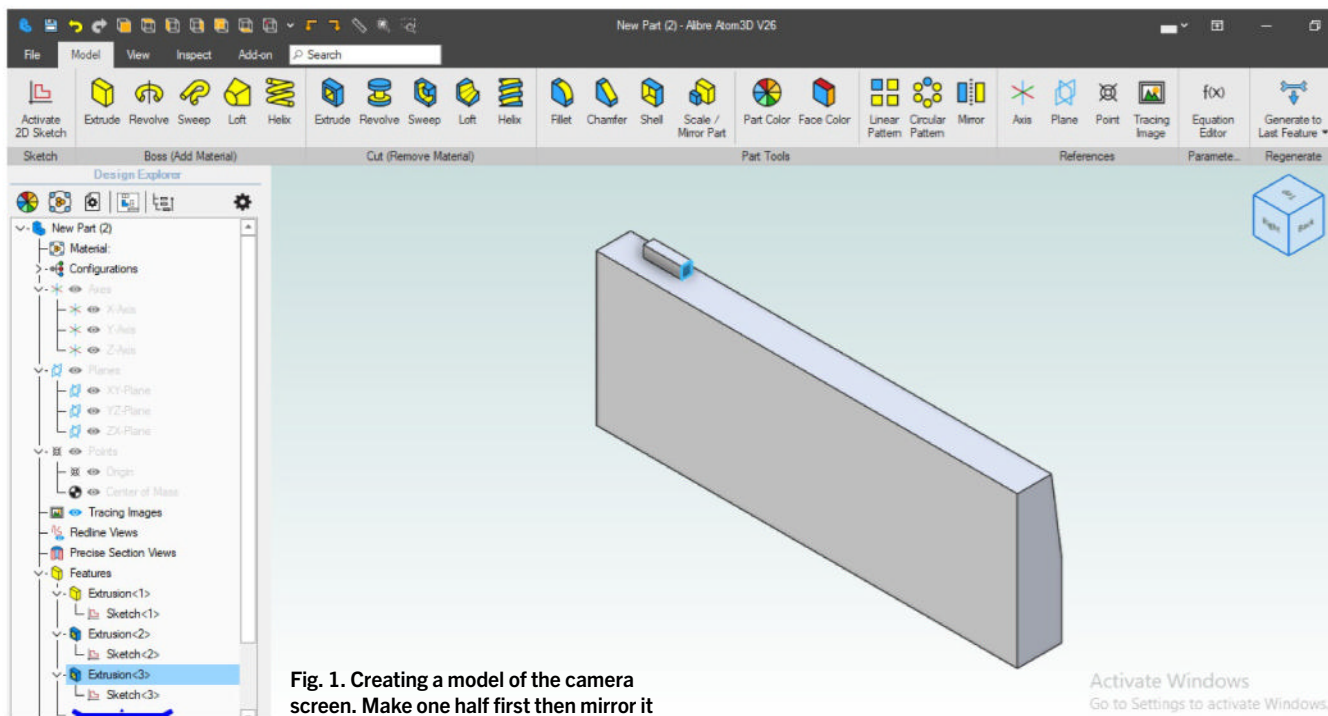


Fig. 1. Creating a model of the camera screen. Make one half first then mirror it

Creating the representation of it was not too hard, even with the tricky little lugs that are on the sides of the screen. (see Fig. 1). Once mirrored – see following – I had the image of the camera screen as in Fig. 2.

The shroud body

To save time, I decided to use the Mirror function that sits in the Tool Ribbon across the top of the screen.

This meant that I only had to sketch half of the shroud body profile; extrude

it into a 3d model; and then, using the Mirror tool, create the full shroud. Let's take a look at the steps in a bit more detail.

I began by making a sketch of half of the cross-sectional view, which can be extruded out to make a basic shape. No need to worry about closing the ends in at the moment – that is easy to do later.

The outline will be coloured red until the dimensions are inputted. That is what gets added next. Fig. 3 shows the dimensioned sketch, which is now

coloured black to indicate that it is fully defined and ready to be extruded.

If you look very closely, you will see that some angles have been defined as well as lengths. This is because I determined that the shape of the camera viewing unit has slightly angled faces on its back. In the rough sketch that I began with, one line was vertical.

After setting the angle of the line shown dimensioned as 12mm long, all that was necessary was to put a constraint on the line shown as 7mm

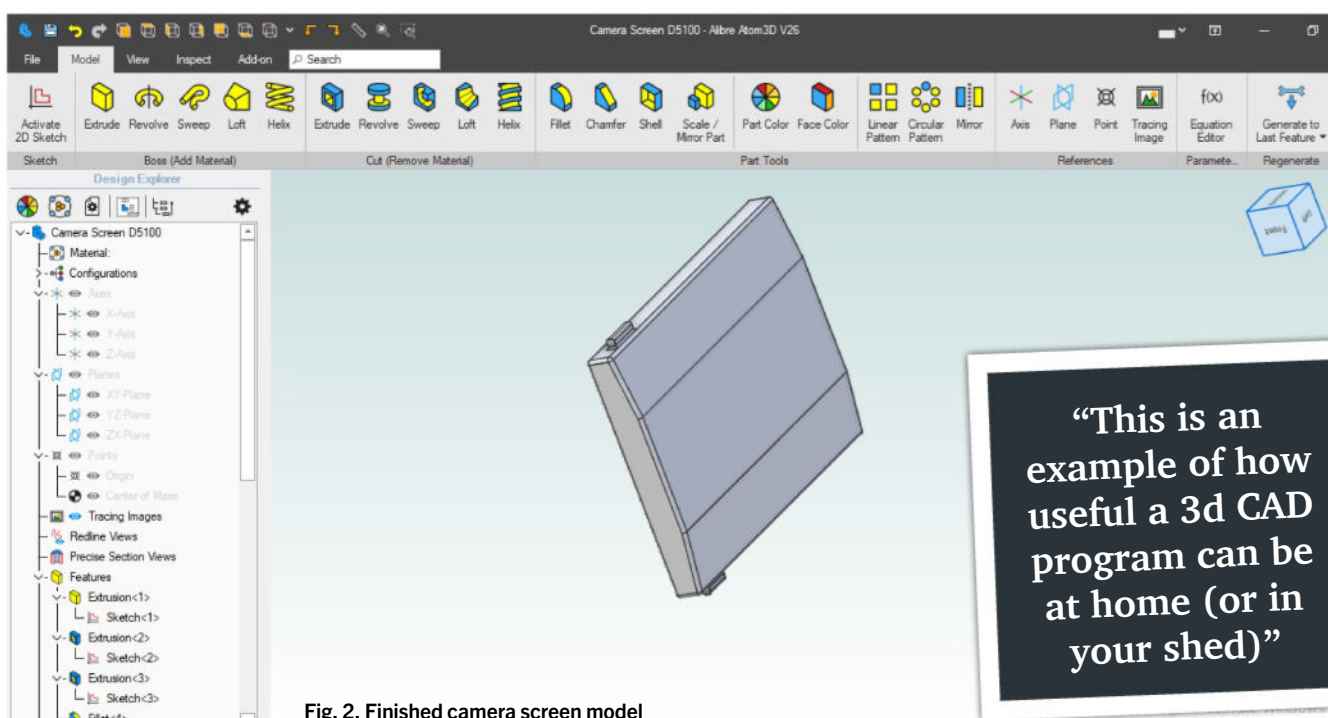


Fig. 2. Finished camera screen model

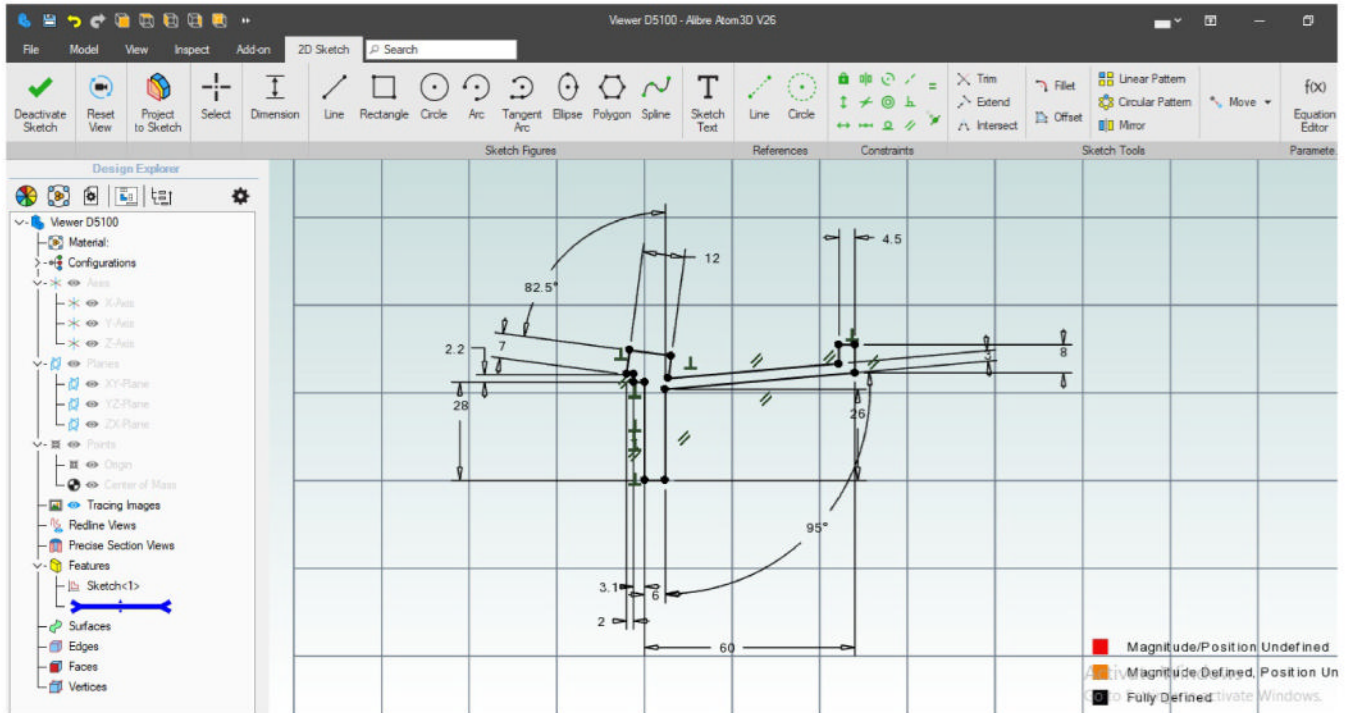


Fig. 3. The fully defined sketch

long to make it stay 90 degrees to the 12mm line – sorry, that was such a cumbersome explanation. Anyway, the advantage of establishing that relationship between the two lines is that, if I need to change the angle, then these lines will move also, as they must always stay at right angles to each other.

Using all the field

Once the sketch is fully defined, it is ready to be made into a solid object.

Click on the Deactivate Sketch button

in the top left-hand corner of the screen. Select the Extrude column from the Tool Ribbon (see Fig. 4) (be careful to select the Extrude tool from the Add Material rather than the Remove Material section). A table will then appear. Fill in the direction to extrude (forward or backward from the sketch plane) and the depth of the extrusion required. The on-screen view will change to look like Fig. 5.

The Mirror tool could be used now, but I wanted to add some strengthening

ribs to the sides, which would also help keep the angled sides stable as it is being 3d printed. The rib was sketched on a reference plane established where the first rib was to be positioned. See Fig. 6.

Once sketched, dimensioned, and extruded, the pattern tool was used to set out the other two ribs, making all three identical ribs equispaced along the angled side of the shroud. Fig. 7 shows the Pattern tool in use.

Fillets were added using the Fillet tool in the Tool Ribbon to complete the detailed

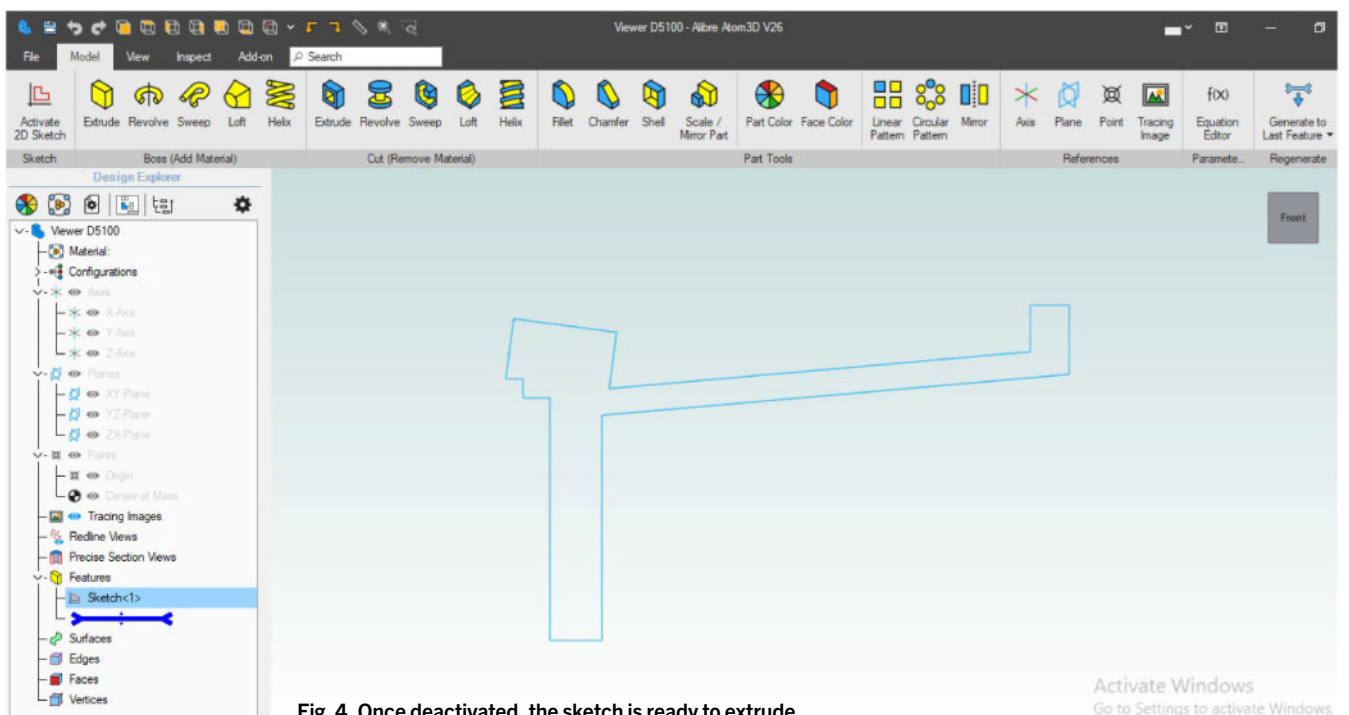


Fig. 4. Once deactivated, the sketch is ready to extrude

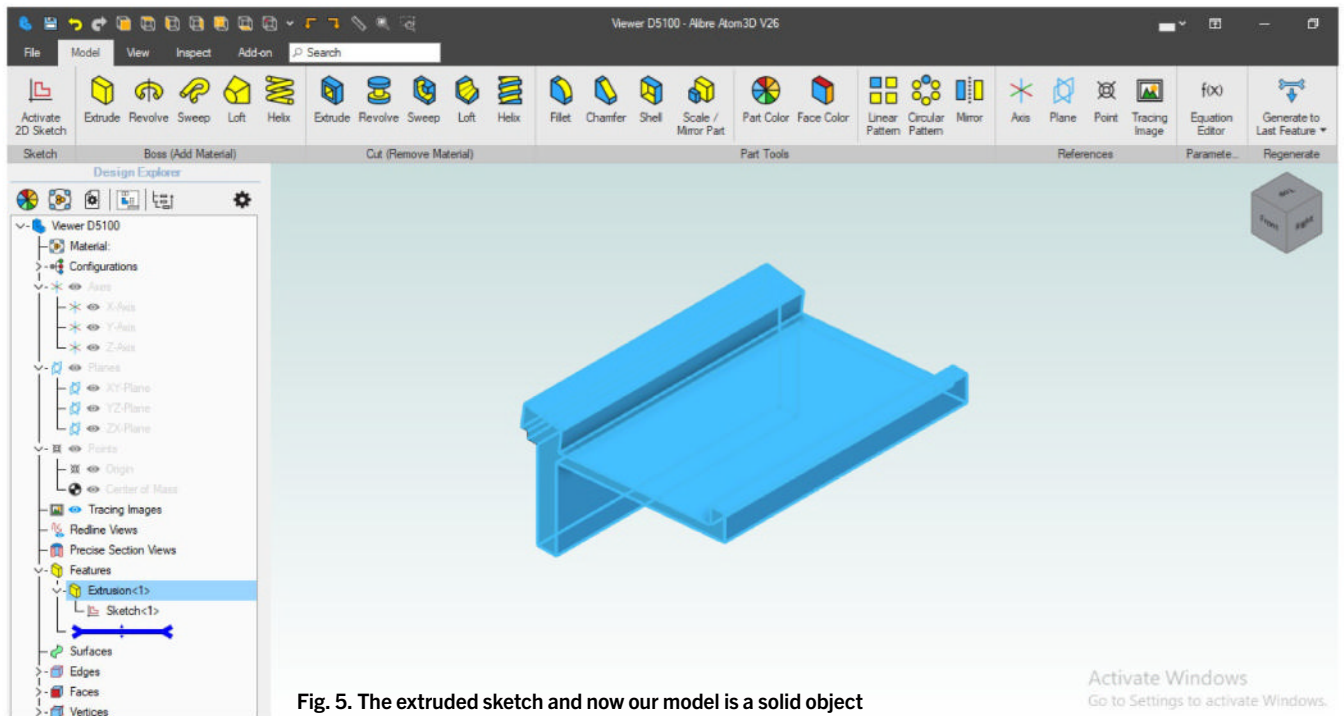


Fig. 5. The extruded sketch and now our model is a solid object

design. Of course, there should not be any corner radii on edges where the remaining half of the shroud will be mirrored from.

A game of two halves

The Mirror tool can be found in the Tool Ribbon next to the Pattern tool.

Select the Mirror tool, then click on the plane that will be the join between what we have created so far and the new, mirrored half. Click Apply and there we have our shroud – admittedly, without ends or a hole in the bottom for us to look through. Fig. 8 shows where

we are up to and also shows the mirror plane that was selected.

The end game

I decided to make the ends of the shroud straight rather than angled outwards so that there would be minimal restriction to how close the screen unit could be angled back towards the camera. Fig. 9 shows the sketch done on the end of the shroud.

You will notice that the lines overlap existing edges of the shroud. This is fine. No problems will arise for this;

in fact, it avoids any error that could occur when trying to make a sketch line that exactly matches an edge on the part model so far.

Any changes done later could mean a gap might develop and might not be detected straight away. The only constraint needed is for the top edge to be coincidental to the existing top edge for appearance purposes.

Dimension the sketch by essentially clicking in each dimension and accepting what is already shown. Close the sketch and extrude it in the

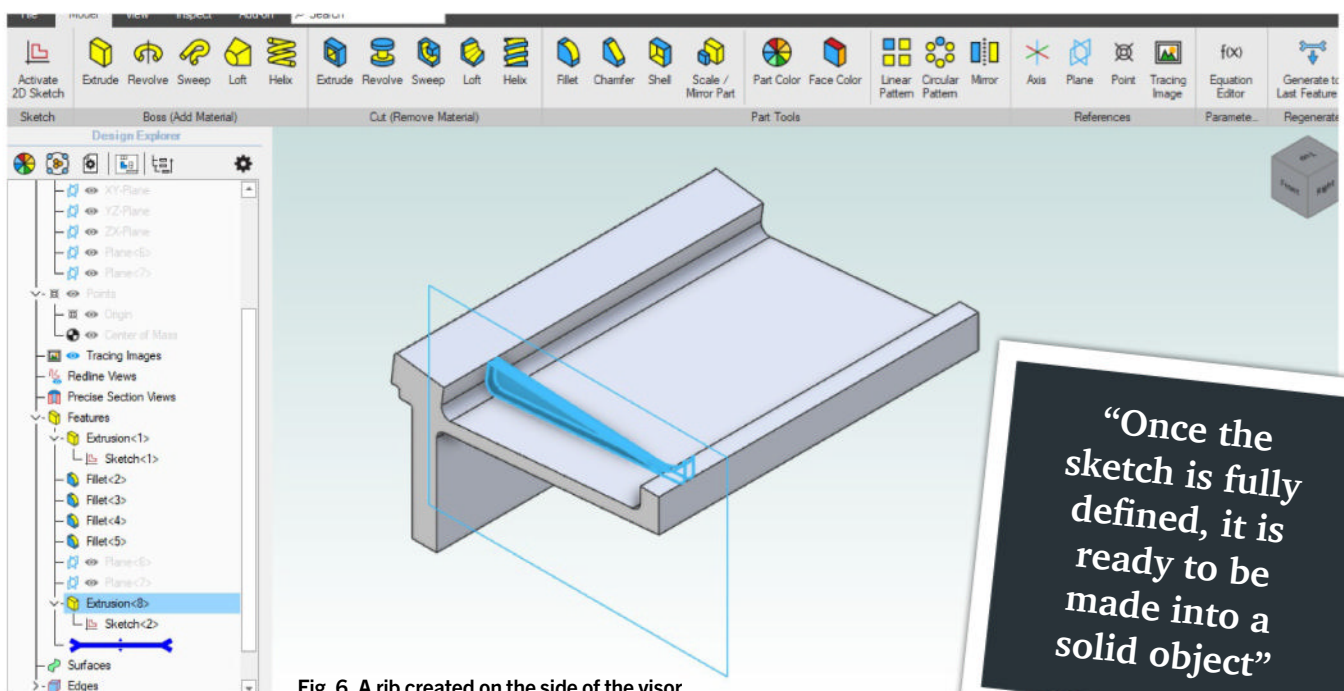


Fig. 6. A rib created on the side of the visor

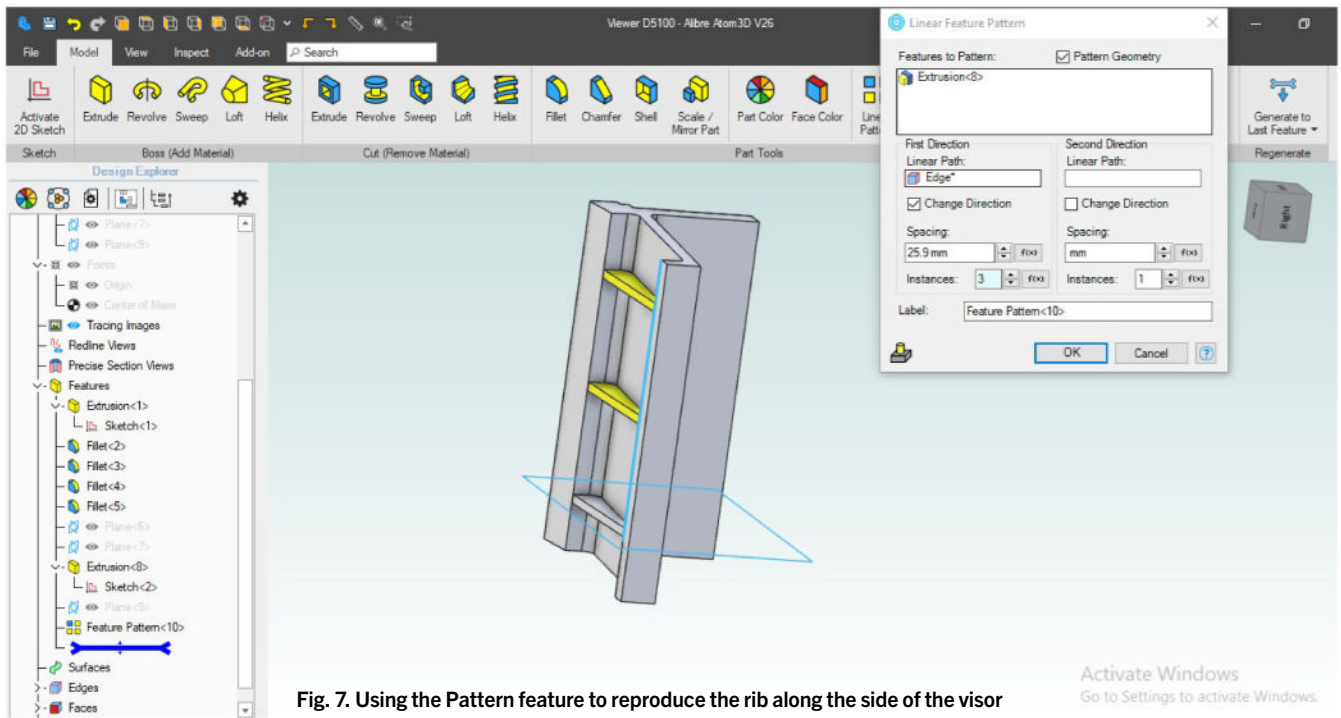


Fig. 7. Using the Pattern feature to reproduce the rib along the side of the visor

direction that will mean it is flush with the ends of the angled sides of the shroud. The thickness only needs to be around 1.5mm to 2mm. The final thickness can be edited later if needed.

For this shroud, I decided to make one end extend down far enough that it became a 'stop', preventing the shroud from being slid too far along the camera screen unit.

Creating a gap

Well, actually, this was cutting a hole in the bottom of the shroud so that it would

be possible to actually see the camera screen – I am calling it a 'gap' so that my rugby-pun subtitles still work.

A rectangular sketch was made. The corners were rounded before cutting the sketch shape down through the shroud. That was done using the Extrude tool in the Remove Material section of the Tool Ribbon. Easy-peasy, really. Other gaps needed were for screw holes so the keeper plates could be held on to the body of the shroud. These could, of course, be drilled later, but why go to extra trouble if they

can be built in during the 3d printing process?

Star player

Modesty took a holiday as I, quite brazenly, added some text on the outside of the shroud: my own surname as well as the camera model (see Fig. 10). This is another easy thing to do. Make a reference plane on the surface where you want your text to be, then select the Text tool from the Tool Ribbon. Write the text that you want to appear on the shroud into the box that appears when you select the Text tool.

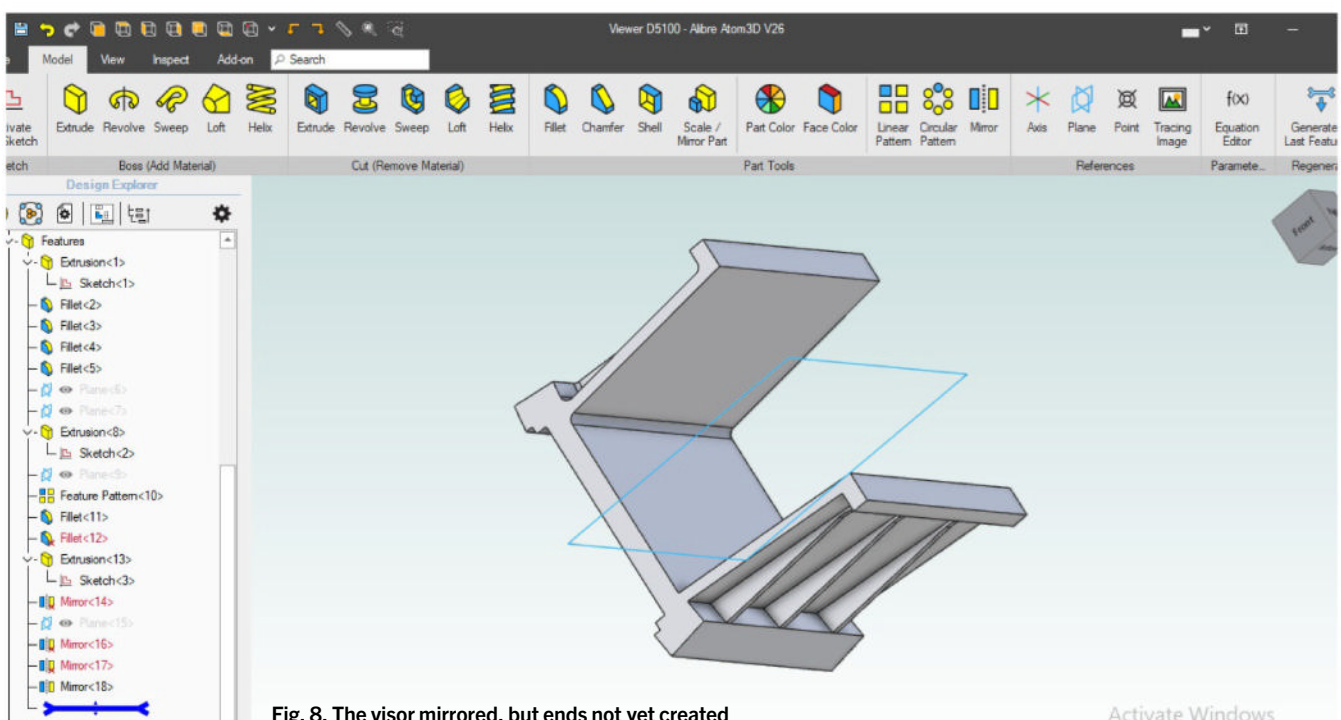


Fig. 8. The visor mirrored, but ends not yet created

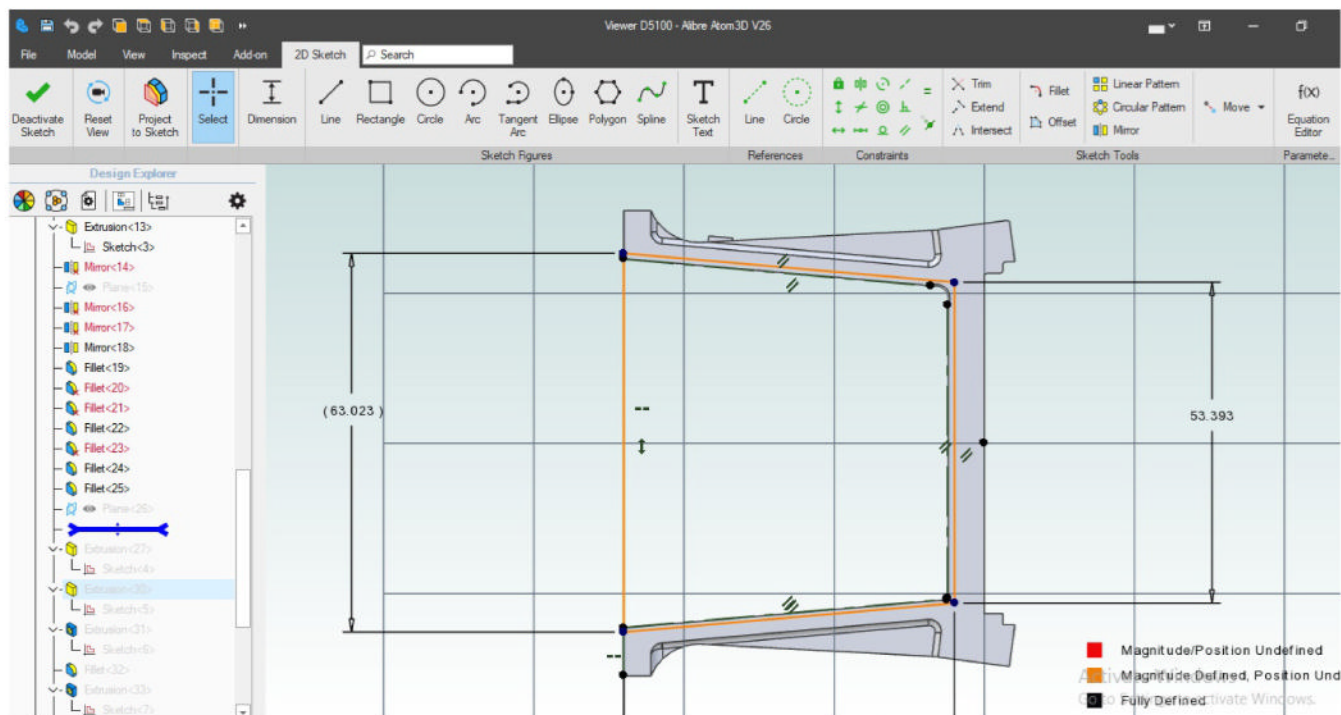


Fig. 9. Sketch for an end. Note the overlapping of existing edges to ensure there are no gaps

Here is a tip: before establishing the reference plane, orient the view of the shroud to the position where you would be reading the text from. This saves a lot of frustration and swearing if you try to turn the text later. Drag the text over and onto the sketch plane. Move it into position, then play around with text size, font, layout, etc., before clicking the OK button.

Keeping possession

Without some keeper strips screwed onto the bottom of the shroud, it would

just keep falling off the camera. So these strips were created very easily by making an L-shaped sketch, extruding it the same length as the shroud, adding fillets, and then putting in the screw holes (see Fig. 11).

Those screw holes need to be bigger in the keeper plates than in the shroud to give a bit of clearance for the screws. I thought that four-gauge self-tapping screws would do the job, so I went for 3mm diameter holes in the keepers and 2mm diameter holes in the shroud. The sizing of the L-shape is a bit of a guess

just now, but we can adjust by trial and error when checking the assembled model.

Listen to the coach

Hopefully, most readers who are interested in this will have read the series on how to use Alibre Atom 3d published in previous issues of *The Shed* (see Issue Nos 104–113). If you have not, then I encourage you to look back over your collection of copies. If you have, thank you; in that case, I have probably put more detail in here

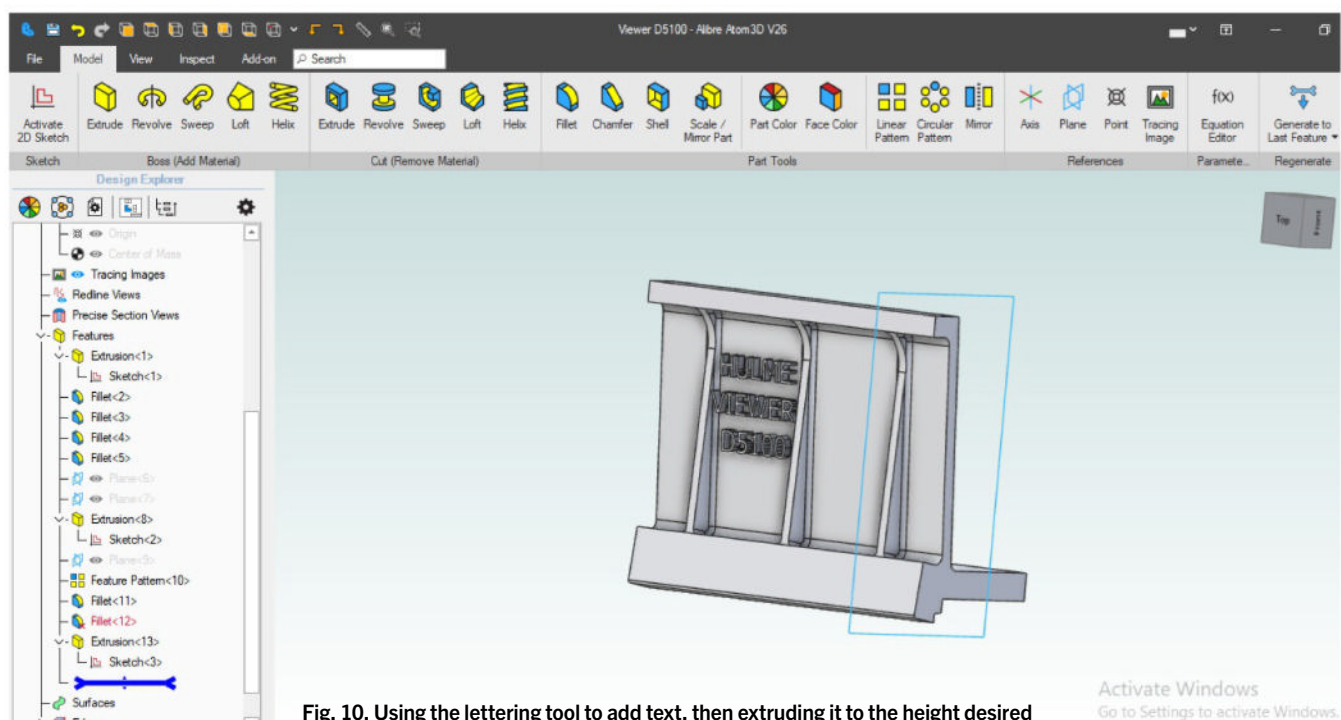


Fig. 10. Using the lettering tool to add text, then extruding it to the height desired

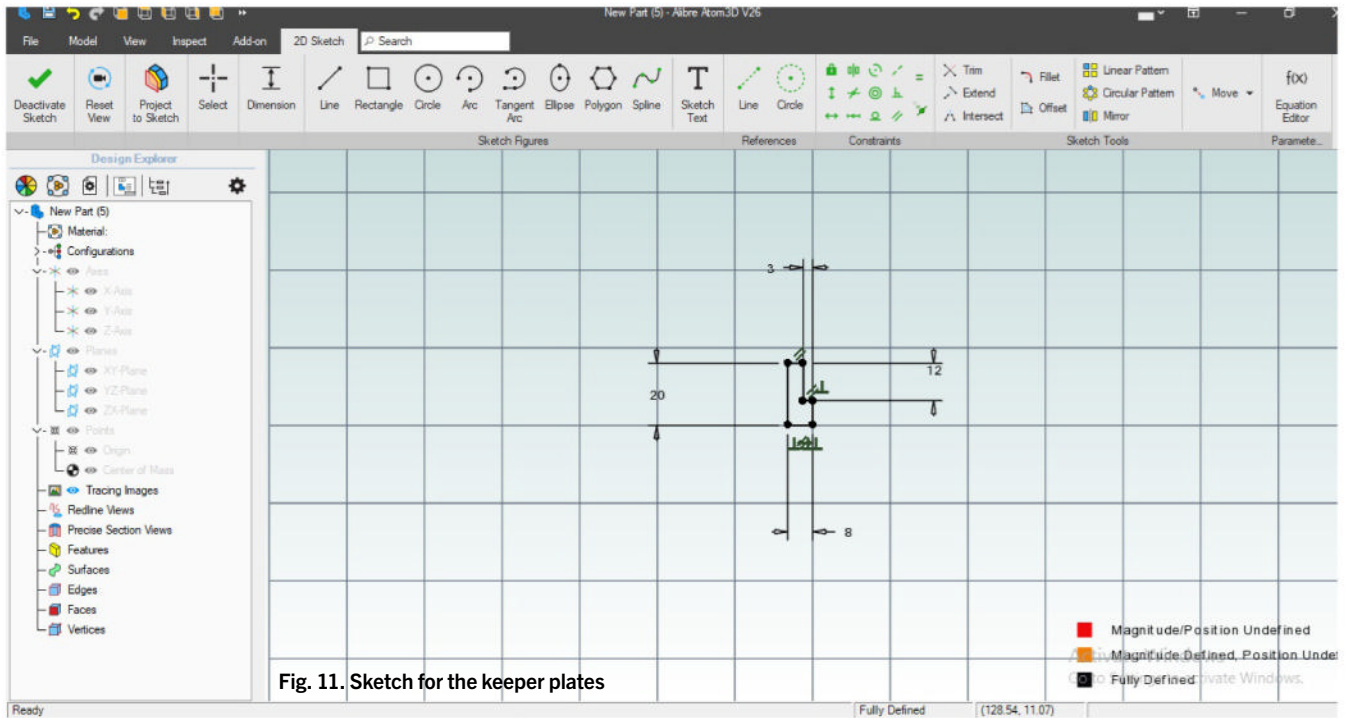


Fig. 11. Sketch for the keeper plates

than you needed, but some of this may serve as a refresher. Feel free to email the editor (editor@the-shed.nz) if you have any questions, and I will answer them.

Putting the team together

When you first start up the Alibre Atom 3d program, you see a page with previous files of things that you have created listed in the lower half of the screen.

In the upper half, there are some symbols that look like stacks of blocks.

The L-shaped stack is what you click on to create a single part, and the stack of blocks that has one yellow one is what you click on to create an assembled model.

Parts are easily added to the assembly view by clicking Insert Design in the Tool Ribbon. This prompts you to select a file. Keep adding parts until there is one model of the camera screen unit, one of the shroud, and two of the keepers.

Notice how you can move everything around by holding both mouse buttons

down and moving the mouse around. Unfortunately, everything moves at once, so it is not possible to put things together. Fortunately, there is an Anchor tool on the Tool Ribbon, which enables us to make one part stay put while others are moved. I chose to anchor the shroud body. Manoeuvre one of the keeper plates, using the Component Placement tool, until it is reasonably correctly positioned above the shroud.

By establishing constraints, it can be set in its correct position. First use a concentric constraint for two of its

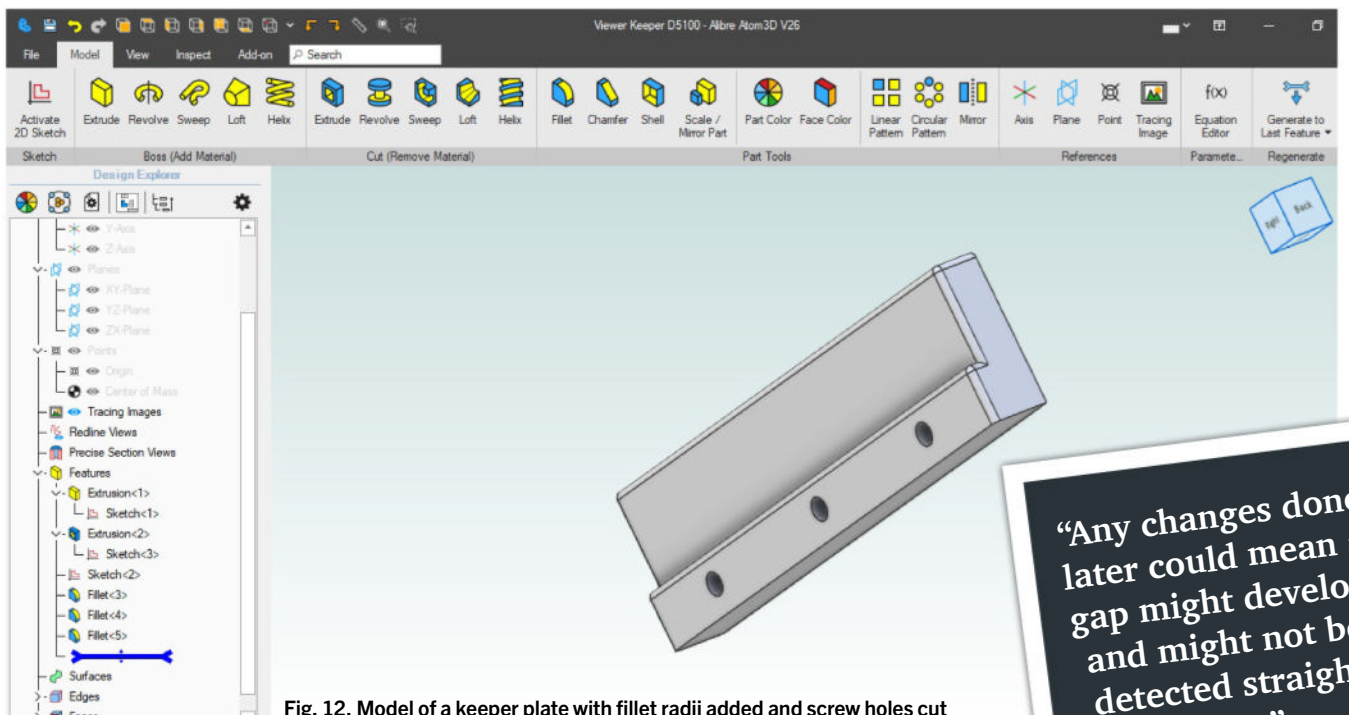


Fig. 12. Model of a keeper plate with fillet radii added and screw holes cut

“Any changes done later could mean a gap might develop and might not be detected straight away”

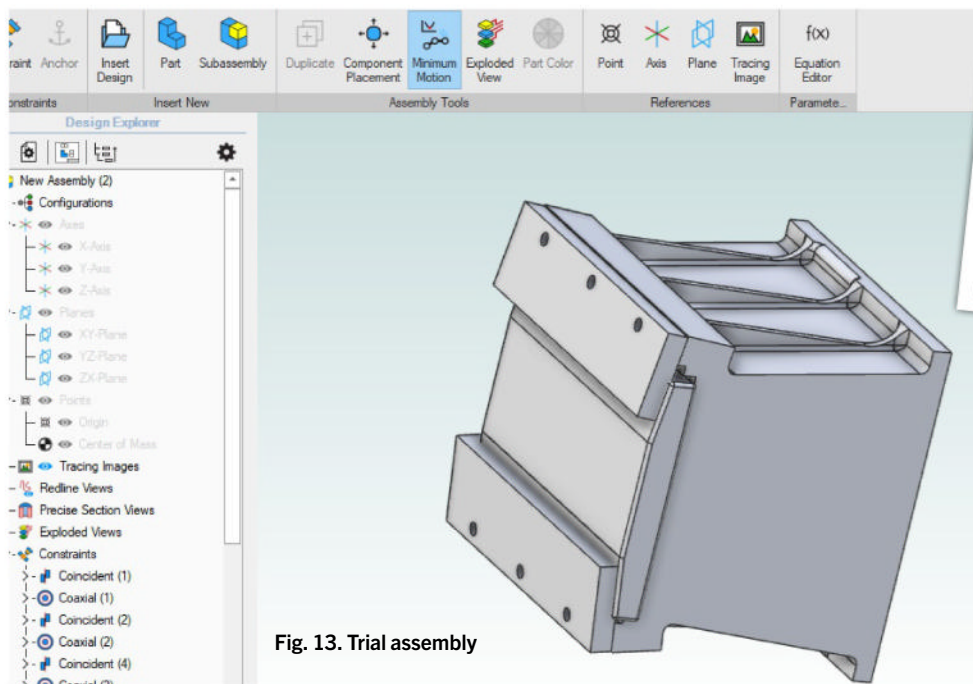


Fig. 13. Trial assembly

screw holes with the corresponding screw holes in the shroud. Then, use a coincident constraint to put the two corresponding faces of the keeper and the shroud together. Do the same for the other keeper plate.

The whistleblower

Next, slide the model of the camera screen unit into the shroud assembly and see if anything clashes.

Alibre will show any issues when you use the Inspect function located above the Tool Ribbon. You can also take a close look by zooming in and

by rotating the model around to see if there is some clearance or maybe an interference fit.

In this example, there was some interference. So, back to the virtual drawing board I went. To edit sizes on the keeper plate model, all I needed to do was to run the cursor over the various sketches in the left-hand panel on the screen. As the cursor moves over each sketch listed, the related details on the model light up.

By right-clicking on the sketch associated with the bit needing to change, the Edit function can be

selected, which makes it possible to change anything set up originally in that sketch. Once changed and the file is re-saved, the part automatically changes in the assembly model.

Figs 14 and 15 show the interference fit issue and the resolved fit with suitable clearance after the editing had been done.

Next game

In the next issue of *The Shed*, Issue No. 122, I will visit a 3d printing business, and the project will magically come to life. 📄

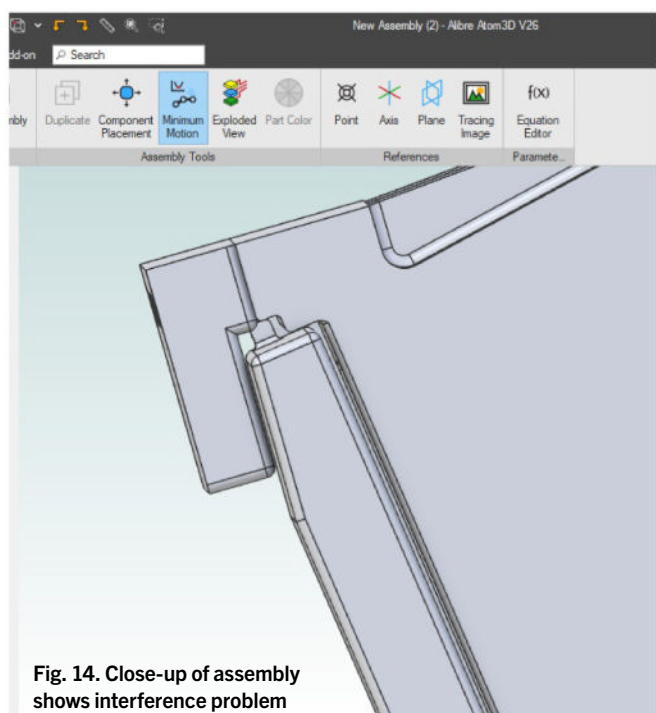


Fig. 14. Close-up of assembly shows interference problem

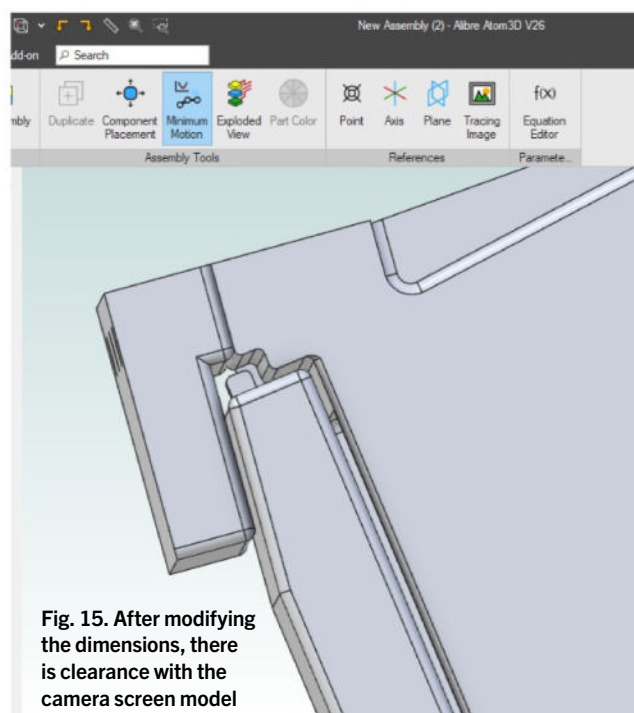


Fig. 15. After modifying the dimensions, there is clearance with the camera screen model

2007 MUSTANG GT

California Special



Owners:
Warwick (Jock)
& Eileen Bruce

Engine: 4.6L V8

- Ford Racing Intake, Camshafts, Exhaust, Cold Air
- BBK Ceramic Headers, JBA Extensions, Procal Custom Tune

Suspension:

- Eibach 1.5" Lowering Kit, BMR Sway Bar
- Steeda Adjustable Panhard Rod & Diff Link
- SVE Billet Rear Arms, Custom Painted Diff Housing

Brakes & Wheels:

- Ventilated Front Rotors
- 20" Custom Lexani Alloys

Sound System by K

- Dezines:
- Pioneer Unit, Phone,

Satellite, iPod USB, DVD, Reverse Camera

- 4x 120W + 1x 1000W Speakers

Body & Paint:

- Tru-fibre Air Ram Hood, Shelby Wing
- Custom Graphics by Lucky Luciano (House of Kolor 'True Blue' & 'Pearl White')

Hand-laid Pinstripes, Flow Coated Finish

Awards:

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RESTORING A 1952 AJS

ELECTRICALS,

UPHOLSTERY,

AND FUEL TANK

Part 4

The road to restoration never runs smooth. Peter's knowledge of electronics is severely tested, and patience and perhaps some self-improvement are required. You could call this series of articles 'Zen and the Art of Being a Sheddie'

By Peter Barton | Photographs: Peter Barton

About two years ago, I took a 500cc single 'AJS' (theoretically, a 1952 model 18S) motorbike out of 50 years' storage as a partly dismantled machine. A retirement project.

I use quotation marks around 'AJS' because the machine has turned out to be a real bitser, with at least one Matchless part (half crankcase with the engine number). The year 1952 has also turned out to be more an average than

exact: bits date from 1947 (gear-box) to at least 1956 (carburettor).

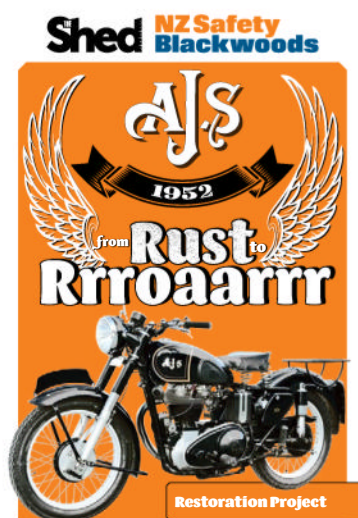
Some months into intermittent work, I thought that I could write about it for *The Shed*, and here is the fourth article describing what I have been doing on this restoration project.

Some missed targets

In the first article, I wrote about nickel welding repairs to a broken cast-iron engine cooling fin, magneto check,

head repair, valve work, and nickel plating the push rod cover tubes. The second article was mainly about how I developed nickel and copper plating, with a little bit about kick-starter repair using nickel plate on a worn shaft and grinding teeth. The third article, the start of frame painting, engine, clutch and gear-box assembly and installation, with magneto timing.

For this fourth episode, I had planned to write about how I rebuilt the



The tank comes out of 50 years' storage, dents visible



RESTORATION TIMELINE

Part five:

Suspension repairs,
front and back

Part six: Re-lace
wheels; fit brakes
and speedo

Bits of the bike come out of storage after 50 years: the rear mudguard, seat, and suspension

electrical system, reupholstered the seat, and renovated the fuel tank. There has been progress on each of these three things but little in the way of meeting targets.

Electronics experience

I have dabbled in electronics for some 50 years (64 years if you count my intermediate school-built crystal set), and I started working on my AJS electrics, fully expecting that I would

successfully complete an updated system of generation, battery storage, and lighting. That was very optimistic.

I'm quite used to projects initially not working properly, but hey, what can be difficult about a generator, regulator, battery, and lights from the middle of last century? Quite a lot, as it turns out.

I could call this article 'Zen and the Art of Being a Sheddie'. Projects are self-improving. I have had lessons of 'Be less arrogant', 'Respect those who have gone

before', 'Appreciate fellow sheddies', and 'When it goes pear-shaped, start over again with good humour'. What doesn't kill you makes you stronger?

Great intentions

Starting with the electrics then.

One thing to get out of the way was my original intention to use LED lighting, which I imagined would easily run off the current 6V system. My friend Morley, who is well experienced in



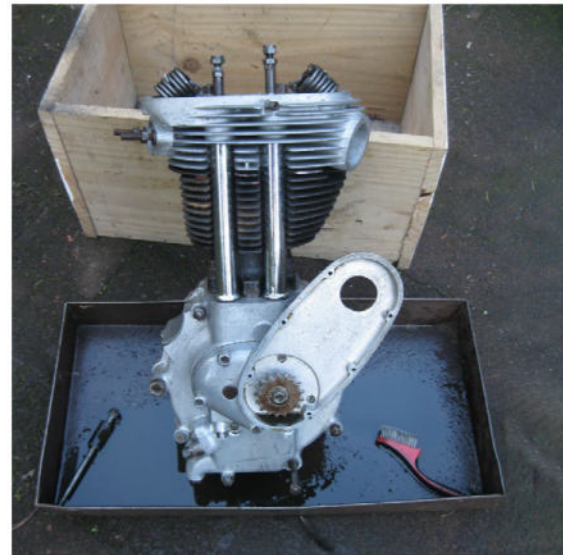
The electrical bits come out of a carton. The magneto ignition is a separate system, not shown. The generator is also not in this picture; neither is the old battery



The damaged motor comes out of storage. The broken cooling fin is fixed up as described in part one



The seat comes out of storage. The vinyl cover is still OK. Luckily, I have a spare steel seat pan. The foam rubber has become brittle and hokey-pokey-like



In part two, I described how I nickel plated the push rod tubes; the head was put back onto the engine



The generator case with its field coil, but the rest of the innards have been removed

rebuilt (Triumph cars), pointed out that I would not get compliance by updating the headlight. I checked out the 'right to appeal' on that, and there does not seem to be any avenue. I fully understand why casually dropping an LED into an old reflector designed for incandescent bulbs is a no-no: the low likelihood that the LED would be at the correct focal point means a high likelihood that other road users would be dangerously dazzled. But couldn't there be a testing procedure that would certify that the installation was careful and OK?

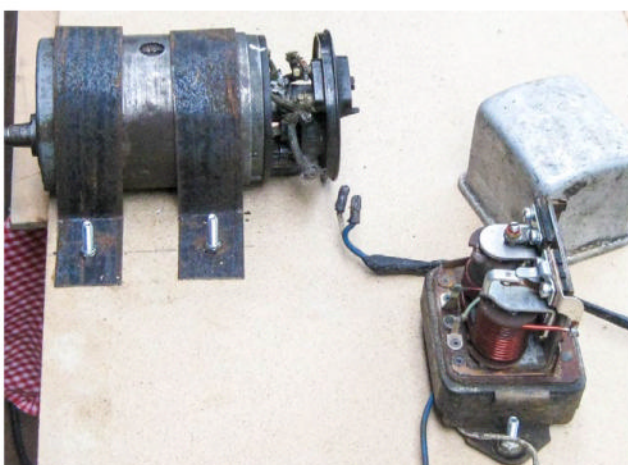
A more general comment. When I watch foreign car and motorcycle redesigns and rebuilds on TV, I get the

impression that, in New Zealand, our compliance regime is so much stricter. Unnecessarily strict? How many old and carefully restored vehicles with low volume use would be involved in accidents?

Standard generator

The generator is a 6V Joe Lucas E3NLO, which is common on English bikes from the early 1950s, and it is regulated by a Lucas RB107 cutout/regulator (terminals 'FAED'), which is also, again, common.

The E3NLO, like other generators, works by spinning some wires (coils on the armature) in a magnetic field. The magnetic field comes from a 'field



An electronic term for this is 'breadboarding': a trial circuit is screwed to a board for prototyping. Here is the E3NLO generator with the RB 107 regulator



All the components of the generator. New bearings have been fitted, the armature has been rewound, and the commutator rebuilt and lathe-turned. The cardboard 'spider' protects the end of the armature

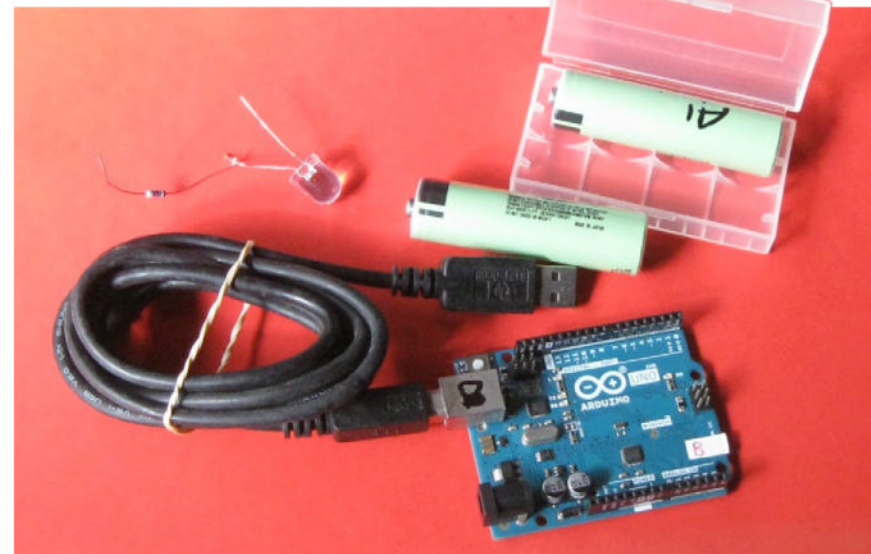


The old 6V battery comes out of storage. Not much hope for this old fella

coil': partly a weak permanent magnet and partly energised by the amount of electric current through its coils. The wires from the armature join to a 'commutator', which is a number of copper bars (12 count in my E3NLO).

The armature and commutator spin together on their shaft, and direct current electricity is picked up from the commutator bars by two carbon 'brushes'. This direct current goes to the 'D' (for 'dynamo') terminal on the regulator. Typically, the faster the generator spins and/or the stronger the magnetic field, the higher the voltage which would be put out.

However, the 'F' (for 'field') terminal



I contemplated a modern approach for part of the electricals: an LED, two 'naked' lithium cells (no protection circuit), and an Arduino Uno controller from previous projects

on the regulator is joined back to the generator (it feeds back electric current to the field coil).

As the voltage output at D increases, the F-terminal can put out less current, and that means a lower strength magnetic field. The generator output is regulated.

The electrics have never worked

The 'A' (for 'ammeter') terminal is connected to the ammeter and via that to the battery, lighting, and horn.

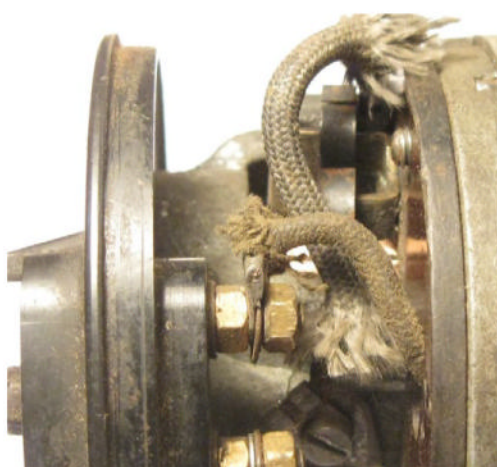
You can read while riding how much electricity is being generated or consumed. The 'E' ('earth') terminal



Commutator bars – some are in halves. Also, some bits of old mica. The half-bar at the bottom left has to be mated up with a piece I am yet to make



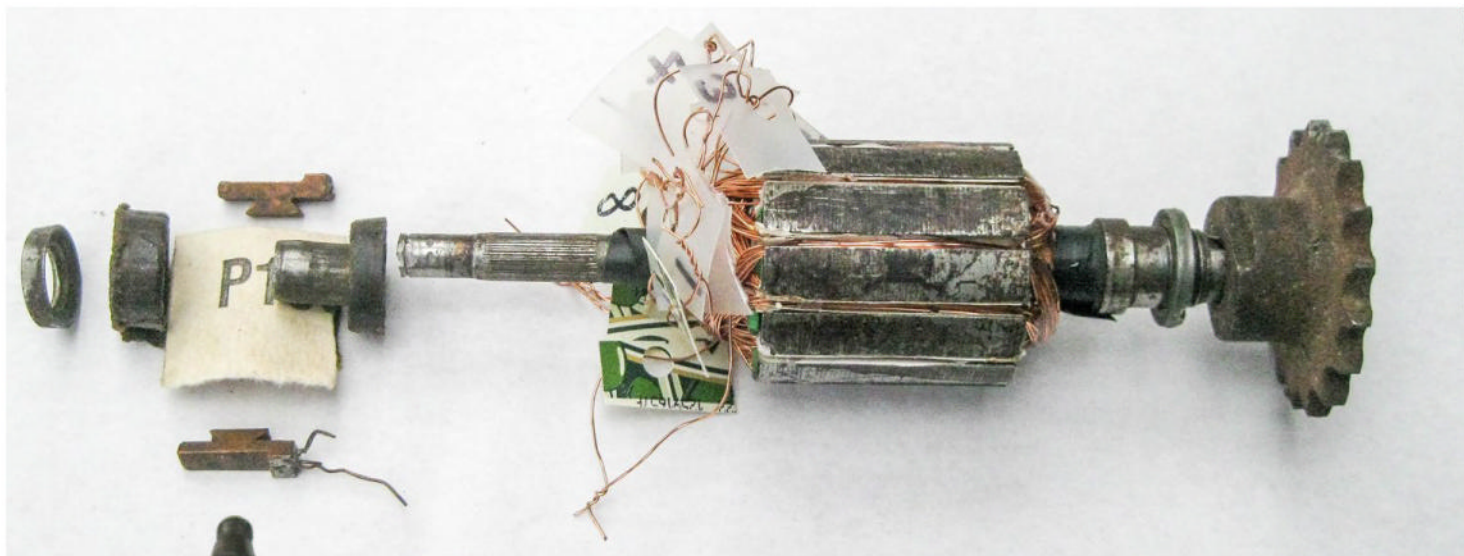
A closer view of the brushes



A close view of the commutator end of the generator: the brushes are in here and will rub against the spinning commutator



I've rewound the armature. The far end is where the commutator is fitted. Sellotape to help hold bits where necessary



The shaft, with the armature rewound. Commutator bits are to the left: two bars with their dovetails; the tube; rings, one with its insulation covering and the other with the insulation separated



The commutator end of the shaft. No commutator yet. Each coil on the armature is tagged and numbered. You can see the green insulating 'spider' under the coils



A closer view of the tube, rings, and torn insulation, which caused me some grief

connects with the bike frame. The bike frame can be positive or negative depending on which battery terminal is connected to the frame. There was a change in the manufacturer's (AMC of England) choice of earth polarity in the early 1950s; I have decided to go with a negative earth system, as that is what I am used to.

I should point out that the electricians never worked when I bought the bike, and it ran because it had a magneto, a separate system operating the spark plug.

Well ... my generator: falling apart would describe it. The spinning shaft mentioned earlier is meant to be supported by a ball race at each end. One of these bearings had lost all its balls; a few remained inside. The other bearing was very lumpy as it turned. Two new bearings were needed, but could they be sourced?

A bit of a mess

The commutator had completely disintegrated. Some of the 12 bars had split in two (each bar was made up of halves soldered together, for some reason), and one half-bar had gone. None of the bars was still attached to armature windings; indeed, they were lying in the base of the generator shell.

Luckily, it was out of the way of the spinning shaft.

The armature windings were somewhat chewed and disconnected. They had not been epoxied or sealed into their slots, so I could easily pick out the paper liners and count out the number of windings (18) which had been used originally.

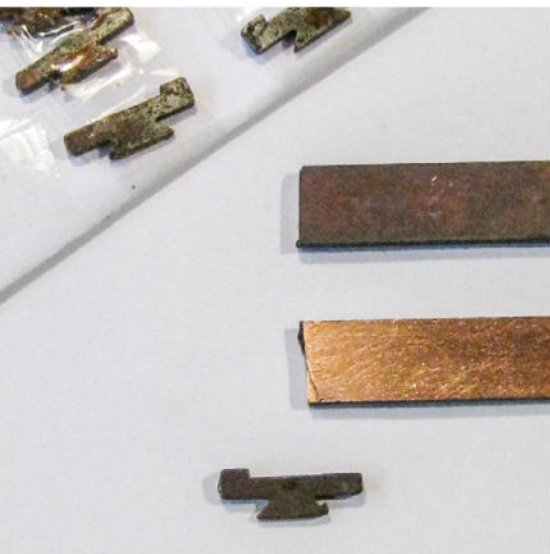
I bought enamelled winding wire of the same gauge from Jaycar. I could not tell from the chewed remains what the winding pattern was, but I assume it was a lap winding (low voltage, higher current).

Before rewinding, I lined each slot with a 'U' of heavy paper (to reduce the chance of the windings shorting onto the shaft) and cut two 'spiders' of cardboard to go onto each end of the armature, again to reduce chances of shorting.

Delicate work

I took care to wind in the same direction (anticlockwise) for each coil.

Each slot takes a left side of one coil and a right side of another. I used a 5-7 lap winding, 18 turns, and took the coil ends out to the commutator position with plenty of surplus tail, twisted together with a label which numbered the coil. A little epoxy here and there to hold things neatly in place. Testing



Strips of 3mm copper, which I found at my neighbour's shed. Cleaned and ready for marking out a copy of the generator bar below



The copper was ground to a wedge shape (discolouration on the strip from grinding heat), and then the blank was cut out



The roughly shaped new commutator bar



Two half-commutator bars have been tinned on their mating surfaces and positioned with pins ready for heat and pressing



A bit of heating and pressing, and success. The margarine container had cooling water, the butane burner blue bottle base just visible



A close-up view of the completed commutator bar

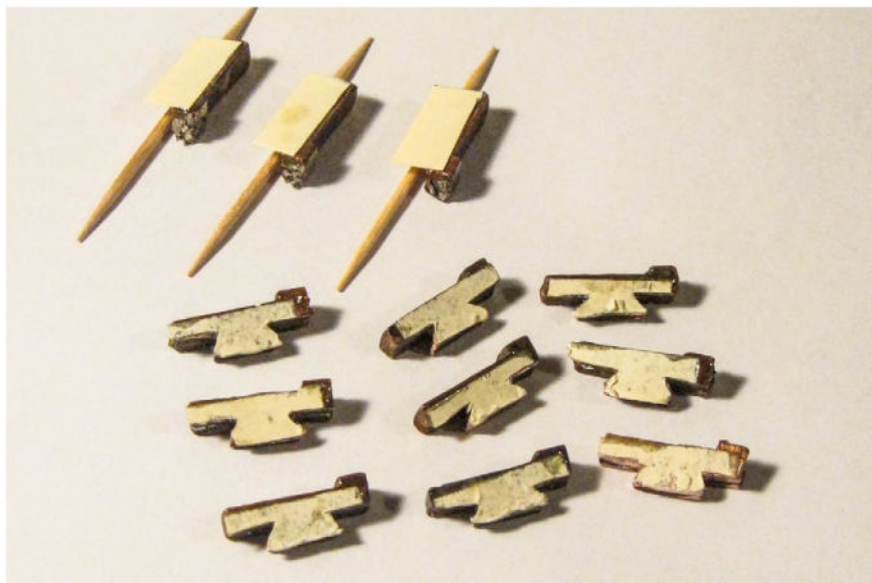
"AMAZING ... ONE PART IS OK"

the resistance between each coil and the armature to make sure there was no shorting.

I tested the resistance of the field coil and its resistance to the shell of the generator. The coil tested OK as 2.1Ω , and there was 'infinite' resistance – that is, no short between coil and shell. Amazing ... one part is OK. Replacing/ Rewinding a field coil is not something to be done lightly. Initially, there was no detectable permanent magnetism; a steel screwdriver felt no attraction. ►



The four reconstructed bars. The new piece is visible



Gluing paper and epoxy onto the sides for insulation. Twelve bars for this commutator



Starting to stack the bars onto the tube and one ring. It was nailed to hold it upright and rubber bands used to hold it all together as it stacks up. The second ring and its leather insulation are there waiting



The completed stacking and the second ring plus insulation sitting on top ready for pressing together. The new half-bar is visible towards the right

“THE COMMUTATOR RECONSTRUCTION REALLY TESTED MY PERSONAL ATTRIBUTES AS A SHEDDIE”



Pressing all into place using a G-clamp and a couple of appropriately sized sockets

A further field test is to make a small coil (but many turns) on a small steel nail, connect this search coil to a sensitive meter (I used my oscilloscope), place the search coil inside the generator shell next to the field coil, and rapidly switch an electric current on and off to the field coil. The search coil should give a flicker of voltage as the field current changes.

Testing times

The commutator reconstruction really tested my personal attributes as a sheddie. The inner part of the commutator is a tube, and this tube has an interference fit onto the generator shaft. At each end of this tube is placed a shaped ring. These rings are also interference fitting onto the tube. They engage with the dovetails on the commutator bars, and when the rings push towards each other, each bar is locked into place.

The rings are metal, and of course, they have insulation coverings which I originally thought were leather (it was the 1950s, remember). One insulation piece was a little torn, so I fixed it with epoxy.

Between each of the commutator bars, to insulate them from each other, there would have been mica plates, and indeed there were bits of mica in the debris. In my junk box, I had an



Another view of the G-clamp pressing all into place



After pressing. The new piece left of centre



Toothpick and kitchen foil ready for mixing and placing plenty of epoxy

old toaster, and it occurred to me that I could use mica (or whatever it is) from the toaster element. However, I decided to use paper and epoxy to separate the commutator bars.

The hunt for copper

One half-bar was missing, as I mentioned earlier. Its cross-section had to be wedge shaped to fit in as a sector of the circular commutator; the wedge went from about 3mm (probably $\frac{1}{8}$ of an inch) down to about 1.5mm (probably $\frac{1}{16}$ of an inch).

I tried various metal recycling yards around the city in vain for a little piece of 3mm thick copper. My luck changed when I went to my engineer neighbour and asked about his junk box! I roughed out the shape (hacksaw), angle ground to the required wedge dimensions, then filed it for a better fit.

By looking at the old solder patterns on the various half-bars in the debris, I had been able to match half-bars with their partners, except for a solitary single: the mate for my new piece.

All faces needed for the solder joints were cleaned and tinned with solder. I positioned matching halves onto each other, used pins around them to keep them in place, used a butane flame for good heat, and pressed them together when I could see some solder running.

One insulated ring went onto the



Glued

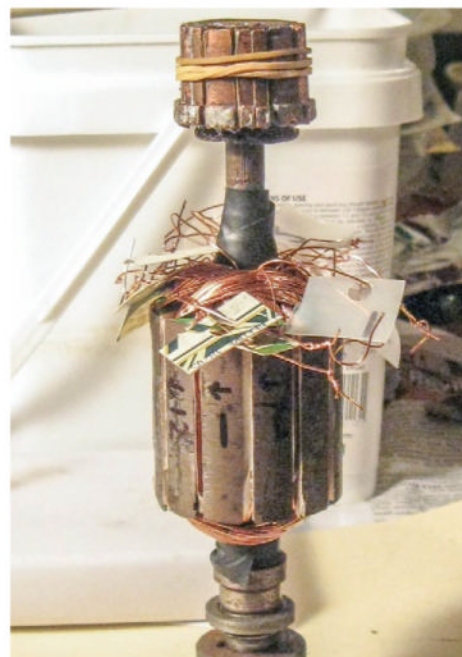


A bit of gap adjustment with toothpicks as wedges

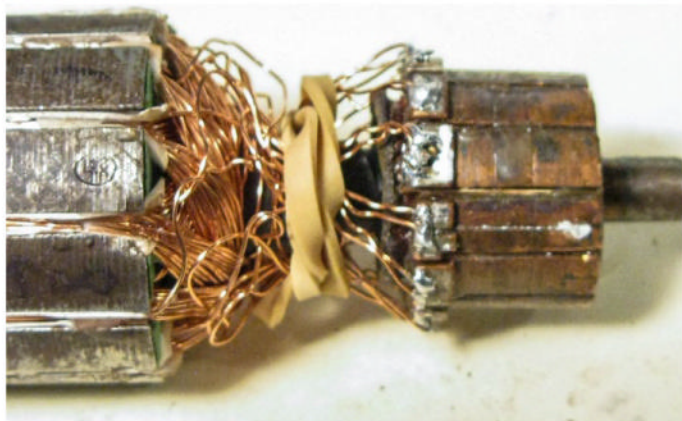


A closer view

**"WHO KNOWS
WHETHER THAT
SHORT CIRCUIT
WOULD DEVELOP
MORE WITH USE?"**



The commutator assembly is ready to go onto the shaft; it is an interference fit



Fitted, but it turned out to be a false step

central tube, which I supported with a nail banged into a block of wood.

I used epoxy to glue paper (for insulators) to the sides of the bars and then lined them all up on the insulated ring and tube, and fitted rubber bands to hold everything. Then the second ring went onto the tube and the 12 bars and the whole arrangement was pressed together using appropriate sockets and a G-clamp. There was some liberal epoxy use here.

Time to test

Time to fit the commutator onto the generator shaft, which I then tapped on with a socket and soft hammer.

The bars leaned sideways a little bit, but that should not have affected the commutator operation. Time for testing whether there was a short from the bars to the shaft ... and there was. It read 55Ω on the multimeter, and who knows

whether that short circuit would develop more with use?

I stripped down the commutator for rebuilding; all epoxy, paper, and leather cleared away. Bars separated from each other. At least the half-bars that were soldered together had actually stayed together.

I covered the two rings with cotton weave fabric and epoxy: a primitive fibreglass – no more leather! All faces (except the top surface, which will spin against the brushes) and edges of each of the bars were covered with paper and epoxy. I then fitted all parts together as in the previous attempt, and there was plenty of time for the glue to cure.

Bingo

After some short-circuit testing, it was time to fit the new commutator assembly onto the shaft.



Second attempt. A short circuit somewhere. The old insulation was thrown out, and a total rebuild was done

I decided to adapt the heat method (as used to fit starter ring gears onto the flywheel in cars) to make fitting perhaps a little gentler. The armature shaft went into the freezer (to shrink slightly) and the commutator onto a stove element, which had been given about five seconds to warm up to maybe 50 degrees. And yes, very slight tapping got the commutator into position; locked tightly once everything came back to room temperature. No shorts. Epoxied.

I did source the bearings without any fuss, even though the commutator end bearing was a peculiar mixture of imperial and metric dimensions. I used the same heat method to fit them more easily to the shaft: bearings warmed up to about 50 degrees and the shaft popped into the deep freeze.

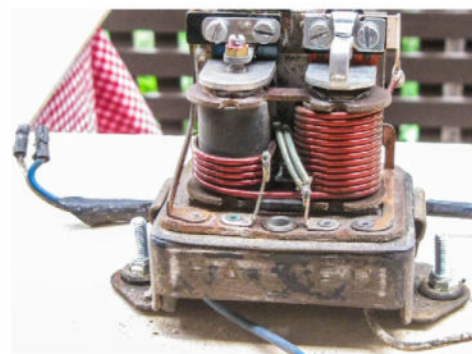
I soldered the armature coils to the commutator bars (which I then had to



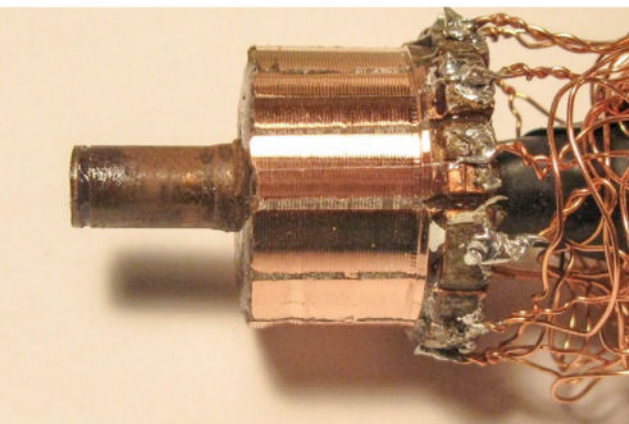
The drive end of the generator carries a chain sprocket in the primary chain case. The bearing went onto the shaft reasonably easily when it was warmed and the shaft had been in the freezer



I strapped down the generator onto a breadboard. A cover band over the brushes and the commutator left off for further tinkering if needed



The Lucas regulator and cut-out unit, cover removed. Also on the breadboard. The left wire (blue) is the field connector. The right wire (white) is the dynamo wire. ammeter and earth wires are not present



The commutator cleaned up



The bits are ready for reassembly. No problem getting new bearings

resolder at a lower height because there was some interference with the interior of the generator).

Time to reassemble and test

Morley has a lathe and turned the shaft, now with its commutator to get all the bars clean and to the same constant radius.

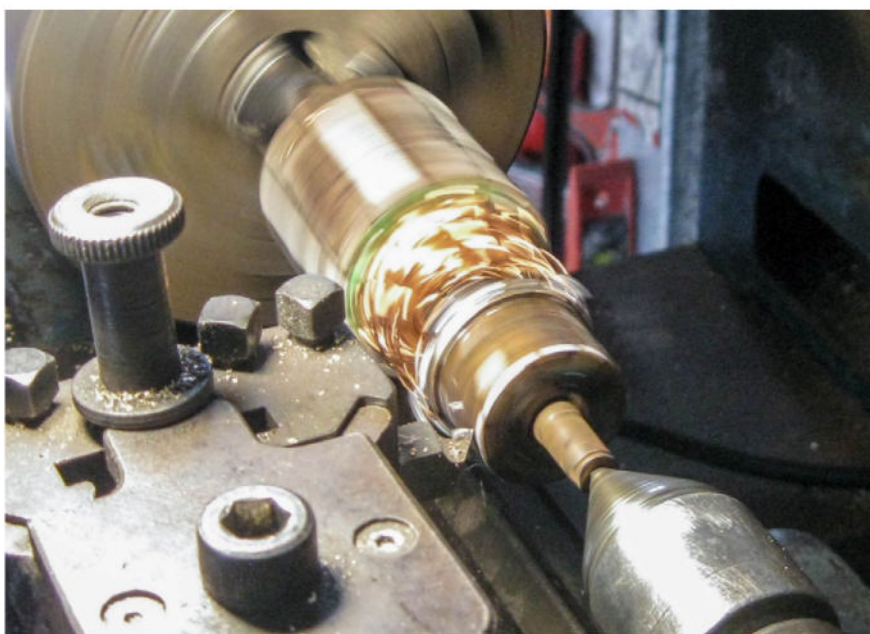
I used a ground hacksaw blade to cut back the inter-bar paper/epoxy insulation to below the surface and tidied the edges with a very small fine file.

I connected the field coil to my ex-computer power supply (5V, able to handle up to 22A) for a few seconds and got some permanent magnetism back. I could also have used a car lead-acid battery for a brief burst.

Time to reassemble and test. I reused the old brushes, which looked as though they had survived, although with some chipping.

The first test consisted of joining together (with an electric lead) the D- and F-terminals on the generator and then connecting the D-terminal to my 5V power supply; the generator shaft should spin.

By manually spinning, I could tell that it wanted to (in the wrong direction), but it just could not carry on. Using the 12V from the power supply gave me some spinning before the supply did a safety shut-down: too much current drawn. ►



Turning the commutator on the lathe to get the bars at even height cleaned up



"I DID SOURCE THE BEARINGS WITHOUT ANY FUSS, EVEN THOUGH THE COMMUTATOR END BEARING WAS A PECULIAR MIXTURE OF IMPERIAL AND METRIC DIMENSIONS"



Rust neutraliser goes on

Dud brushes?

I spun the generator (using an electric drill) still with the D and F connected; any current generated at D goes straight to the field coil to boost magnetism and therefore further boost output at D. I have a USB oscilloscope (Hantek, QC1929 from Jaycar) which converts my laptop to an oscilloscope so I can see the shape and size of an electric current. I connected it to D and hoped that I would get a steady horizontal line at, say, 8V.

Nope. I got a line mostly at 0V but with icicles hanging on a clothesline. Dud brushes?

Hopefully new brushes would solve the problem. I may have to go to a veteran bike parts site for replacements, although a web search showed me that Bosch has replacement brushes for some of its machines which would fit mine after modification.

And that (simplified story) is the current (!) state of the generator rebuild. Talk about testing a sheddie.

The battery

A few words about the battery.

I had intended to use two lithium cells with Arduino control to replace the old lead-acid one, which originally hung off the side of the bike. I have them from another project; I liked the challenge of it.

However, Jaycar has a little 6V, 4.5Ah lead-acid battery which will fit into the bike's toolkit and that will simplify things. I don't need much of a battery because there is no starter motor, and lighting is minimal. LEDs would lower



Flap disc cleaning the tank. Much bog will be needed here after rust treatment

the current draw if I can use them.

I have started stripping the fuel tank with a paint stripper, scraper, flap disc and rust converter. The next step is to fill the dents with bog. I did think about cutting out the bottom of the tank and beating out most of the dents, but this bitser of a bike does not warrant that.

I fancy a bicycle seat

I've just read a great book, *Customizing Your Motorcycle* by Chris Daniels; it's not at all about Californian-type choppers – it's way more interesting than that. Hence, my next paragraph.

For the seat, I got a replacement foam rubber cut at the Para Rubber shop, using a paper template of the steel seat base. The vinyl cover is in OK condition, and I have the clips which fix the cover over the foam. I still like the idea, though, of using an old leather pushbike seat: I think having a relatively small solo black leather seat, nickel studs, tucked well down between the tank, and rear mudguard would be quite stylish.

But would it be comfortable, and would the bike get compliance?

Coming up in part five of my AJS restoration journey: the electrics continue, oil tubing and carburettor work, plus some work on the handlebars and controls. 🛠️



Rust neutraliser to the left. The small screw hole is for a plate which holds knee rubbers. There are further small holes forward (left, out of picture), which carry a small AJS badge



Vinyl seat cover is in OK condition, a spare steel seat pan (rust treated), and a foam block cut to shape at Para Rubber all ready to be wrestled together



A small antique leather bicycle seat is an attractive option

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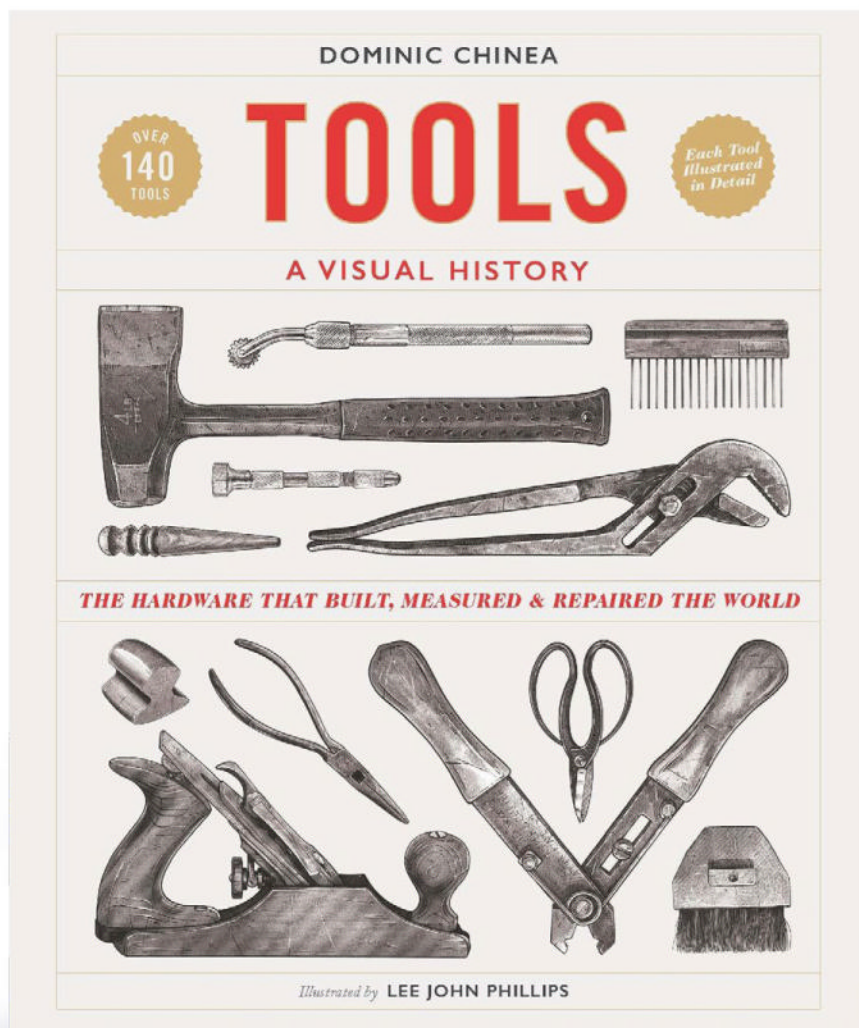
1949

We've been here for a long time, we first registered our company in 1949. Things change and so has our name over time. What hasn't changed is our commitment to the engineering craft, providing the products you need to fix it, restore it, create it. We're here for all of it with the brands you trust.



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Tools: A Visual History

By Dominic Chinaea

Illustrated by Lee John Phillips

Published by Dorling Kindersley (Penguin)

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high profile is undoubtedly the reason he was able to get the book published, but it is a really interesting read and has been put together with a great deal of skill and care. He writes in a chatty manner, describing the use of the more uncommon devices, how they have intersected with his own life and what companies are particularly associated with that type of tool. The illustrations are simply outstanding.

Excited by tools

Most tool collectors have a favourite tool manufacturer.

One collector told me that his heart beats faster whenever he sees a Starrett tool carton at a market – the red ones with ‘Starrett’ printed repeatedly across its surface. In New Zealand, Stanley is one of the most sought-after brands. It has such a long history and has been such an innovator, especially with wood planes, that it gives very considerable scope for collecting.

As Dom Chinaea says, every collector would like to own a Stanley No. 1 bench plane (1869–1943). I’ve seen a couple. One was bought by a dealer along with a box of other, lesser, gear; the dealer not knowing it was there, a gold nugget amongst the rust.

No. 1s are too valuable to be used – not that they really have an obvious use. Being relatively simple to make, there are, apparently, fake No. 1s out there. Another sought-after *Stanley* plane is the fiendishly complicated No. 444 dovetail plane (1912–1938). Most surviving examples are virtually unused, often being found in their original, fragile cardboard boxes. Their purpose was to make sliding dovetail joints, something most woodworkers very seldom need to

TOOLS

A Visual History

Review by Ritchie Wilson

Dominic Chinaea lives in England and gets up early on Saturday mornings to trawl car boot sales, looking for tools which are either attractive or potentially useful. He has written a book about a selection of his tool collection, researching the history of the tools and their makers. He has been most fortunate to have secured the services

of Lee John Phillips to draw each of the tools he has selected in the book.

Tools: A Visual History has been out for a couple of years but is still available. The price of \$48 seems to me to be exceptionally good value for such an attractive publication.

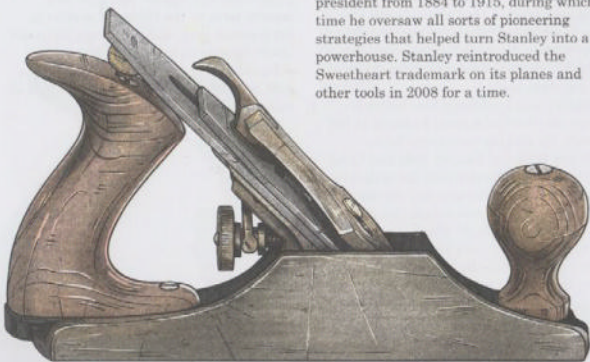
Dom Chinaea is the metalwork person in the BBC’s *The Repair Shop*. He’s the one with the thick black beard. His

SMOOTHING PLANE

After you've finished with the preparation work, this plane will take you to a nice, smooth finish. And if you can master this tool, you won't even need to use sandpaper. It's also useful for trimming joints, cleaning up edges and getting rid of little marks left by other tools.

Smoothing planes range from 140mm (5½in) to 250mm (10in) in length but the most common is the No. 4, which is 230mm (9in) long. The No. 1 was produced by Stanley from 1869 to 1943, and while very small and not often used much these days, they are beautiful tools that tend to go for a lot of money when they come up on auction sites.

Old Stanley planes (and other Stanley tools, for that matter) have the "sweetheart" trademark – a heart-shaped stamp with the initials S.W. inside. Tools with this stamp were produced between 1920 and 1935 in memory of William Hart, the former president of The Stanley Works. Hart had joined Stanley in 1854, aged 19, and became a member of the board of directors just two years later. He was the president from 1884 to 1915, during which time he oversaw all sorts of pioneering strategies that helped turn Stanley into a powerhouse. Stanley reintroduced the Sweetheart trademark on its planes and other tools in 2008 for a time.



Stanley No. 602 Bedrock smoothing plane. Some sheddies think it is the best plane (out of hundreds) that Stanley ever made

do. I would have thought that none had come to New Zealand, but at least one did because just a few weeks ago, I came across a badly corroded No. 444 body.

Section devoted to various tools

Two Stanley items appear in *Tools: A Visual History*: the Stanley knife (aka box cutter) and a No. 5 jack plane in the 'Planes' section.

The book is divided into nine parts, each devoted to tools which do a particular job, such as 'Measuring & Marking' or 'Tightening & Loosening'. This organisation groups together tools which a sheddie might not consider to be very similar: for instance, in the 'Filing, Smoothing & Shaping' section, there are sub-sections for files and planes with a final part on panel beating dollies and 'slappers'. They

make rather strange bedfellows.

China gives an overview of the history of files – which have been made since the earliest days of metal smelting – and how they are made. In England, files were made by hand using a hammer and chisel until the late 1800s. Watchmakers' files were being produced by machine in Switzerland from about 1840, while Leonardo da Vinci had designed a file-making machine (which



Finely made wooden engineer's cabinet containing the author's signwriting gear

BLACKSMITH'S ANVIL

Everyone knows what a blacksmith's anvil looks like, with its flat face at the front and horn at the back. Maybe that's got something to do with anvils appearing as a joke in Warner Bros cartoons as a ridiculously heavy object. There's one cartoon I remember of Sylvester the Cat seeing Tweety Pie in the window of a skyscraper, so Sylvester does what any hungry cat would do and starts blowing bubblegum into a bubble so big that it makes him float upwards. When he reaches the window, Tweety Pie helpfully hands him an anvil, and he plummets. Classic.

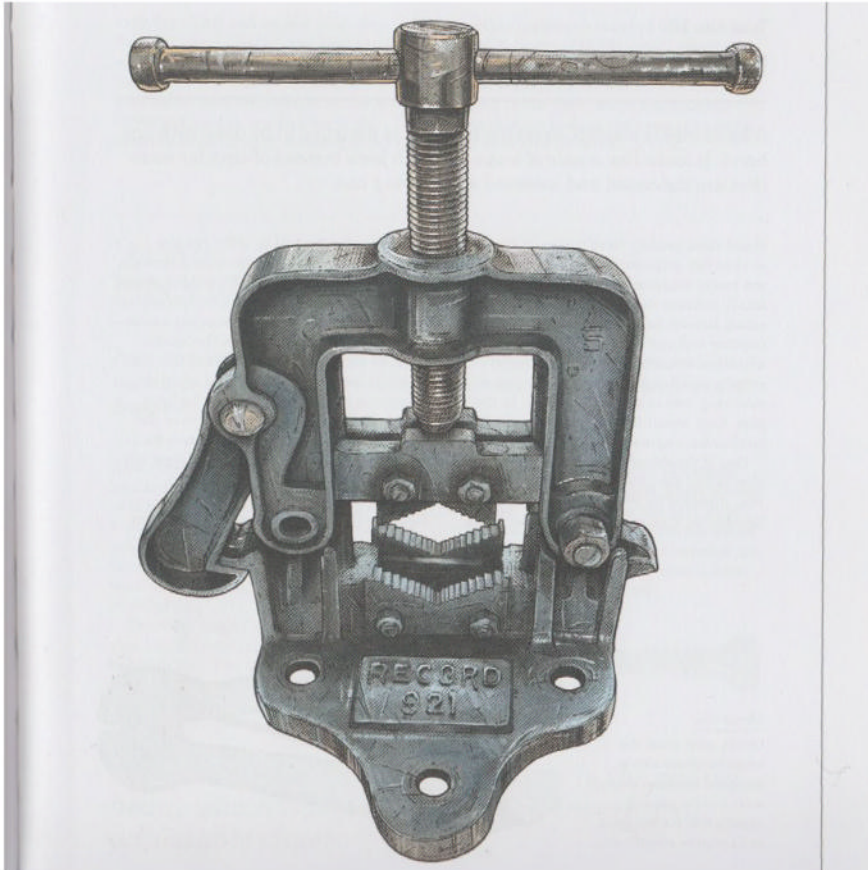


Blacksmith's anvil: big, heavy, expensive, and highly desirable



Blacksmith's vice
Blacksmith's vices are unique because not only are they bolted to the workbench, they also have a supporting leg that rests on the floor and acts as a shock absorber.

The very durable blacksmith's leg vice



An English Record-brand vice for holding iron water pipes while they have threads cut on their ends

was never made) 350 years earlier.

The workers who handmade files were known as ‘nicker-peckers’ – which was the name for woodpeckers in Sheffield – because of the sound they made as they rapidly hammered their chisels into the file’s metal, cutting the tool’s teeth. The file was then hardened by heating and rapid cooling.

Planes are truly ancient

Wooden objects found in very early Egyptian tombs show evidence of having been worked on with wood planes, so planes probably date back more than 5000 years.

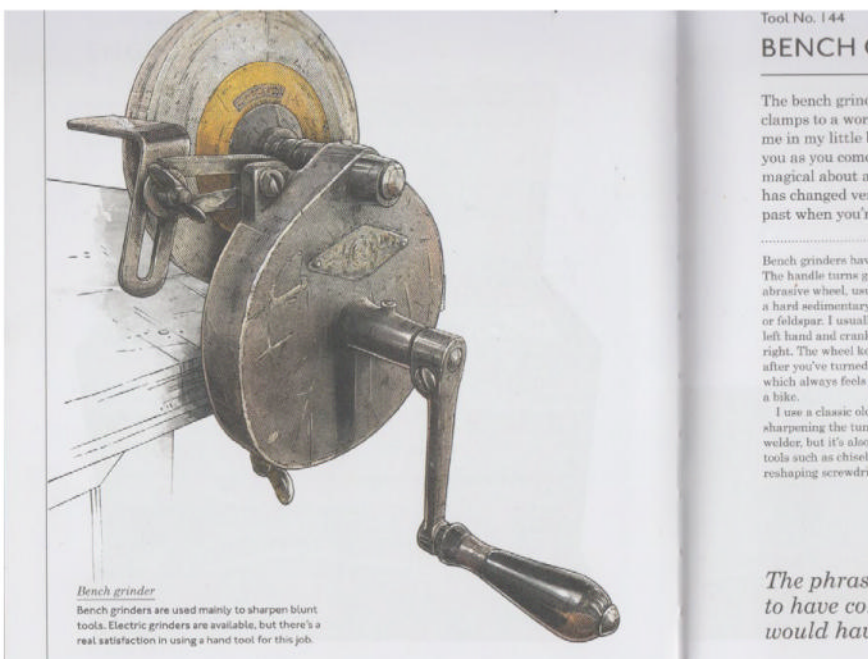
The earliest one I have seen was in the Verulamium Roman museum in St Albans, England. The plane was large,

about the size of a Stanley No. 7 jointer, and was originally wooden with an iron base which curved up at the front, like a toboggan. It had deteriorated greatly in the 2000 years since it had been made, but the design was impressively modern.

China says that bench planes come in three main varieties: Smoothing, jack and jointer. (Although there are many more specialised types such as rebate planes, moulding planes and block planes.) He doesn’t say, but I would guess the smoothing plane and the jointer illustrated are newish examples made by the Lie-Nielsen company from Maine, USA, while the jack is a Stanley No. 5.

He gives a bit of history of the Stanley company – ‘The Toolbox of the World’ – and its relationship with Leonard Bailey, who in 1867 invented the modern bench plane we are all familiar with. Today, Bailey is a revered figure and, in 2019, a biography: Leonard Bailey and his Woodworking Planes. *An Unrecognised Genius of the American Industrial Revolution*, written by Paul van Pernis and John G Wells, was published.

It could have well been called: *Leonard Bailey: An Unhappy Life*. The other two planes pictured are a Japanese plane – which is pulled rather than pushed – and a moulding plane. Dom Chimea relates how he was given a box of moulding planes by a Repair Shop viewer. Another result, I suppose, of his high public profile.



Hand-powered bench grinder of the type that used to be found in every farm shed

Dollies and slappers

The other tools in this section are dollies and a ‘slapper’ which are used in panel beating.

Dom Chimea is restoring a Porsche 356 sports coupe and bought a retired

“The
illustrations
are simply
outstanding”

motor bodybuilder's extensive collection of hammers and dollies. He has also embarked on a project to manufacture a run of wheeling machines (called English Wheels in America) in cast iron. These two-metre-tall machines are used to shape car body panels which have compound (three-dimensional) curves. His life has obviously changed greatly from the days when he couldn't afford to even consider buying one of these iconic machines.

The gorgeous illustrations are by Lee John Phillips, who also did the drawings in Sally Coulthard's *How to Build a Shed* (2018), which I reviewed in *The Shed*. They are so impressive that, before I recognised the artist's name, I assumed they had been generated from photographs by some AI program. Phillips, as well as being a very sought-after illustrator, also makes intricately decorated wooden spoons. He has also embarked on a project to draw every single one of the thousands of items in his late grandfather's shed: tools, nails, tins of paint, screws and so on.

He has techniques to reproduce the appearance of surfaces with wonderful verisimilitude. His illustration of a machinist's chest (one of a number Chinae owns, apparently) incorporates a printed table attached to the inside of the chest's lid. The drawing of the table is startlingly realistic, and it's hard to imagine how the artist managed to



Webbing stretchers
The gooseneck webbing stretcher (left) and the more simple webbing stretcher (above).

Seldom-seen upholsterer's tools for stretching the webbing of a chair's seat

achieve such realism. Amusingly the illustration of the G-clamp (or C-clamp if you like) is, like a number of mine, missing the cast iron anvil at the end of the tightening screw, which spreads the force of the clamp over a larger surface. I also noticed that the caption for the ring and open-ended spanner had been swapped with the one for the double

open-ended spanner. A mistake which is easy to make and hard to spot!

Tool history

The book's subtitle is *A Visual History*, and so Dom Chinae has a bit of history for most of the tools.

I imagine he consulted books with titles like, say, *British Handtools and*



Slip-joint pliers
As the name suggests, slip-joint pliers have a pivot point that can slip or slide into several positions.



The original tape meo steel wound up inside



A curved wooden plane used by coopers for finishing the tops of barrels

their *Makers* to get the information. *Smith's Key* – an 1816 illustrated catalogue of tools made at that date in Sheffield – is mentioned repeatedly, although it doesn't get a listing in the index. Neither do any of the manufacturers that Dom Chinaea looks out for at car boot sales, such as *Snap-On*, *Snail*, *Pearson's Perfect*, *Sykes Pickavant*, *Channel Lock*, *Brades* and *Moore & Wright*, all of whom get a mention in the appropriate section of the book.

Most readers of *The Shed* would recognise many of the tools illustrated and described in *Tools: A Visual History*, but I expect no one would be able to name them all.

Because of his varied work background, Dom Chinaea has come into contact with the specialised gear of a number of trades, from signwriting, to cooperage, to set building, to gilding, to exotica which don't find a place in the average shed. I would imagine that naming the different types of scissors, for instance, would be tricky for most readers. I have an advantage because my wife is an accomplished dressmaker who has, coincidentally, recently bought a pair of bonsai scissors.

Dominic Chinaea's second book, *Machines: A Visual History*, also with drawings by Lee John Phillips, was published at the very end of last year. It tells the story of 100 machines which



Dom Chinaea's Snap-On-brand toolbox

Dom has encountered, many being featured on *The Repair Shop*.

Machinist's chests

The title page of *Tools: A Visual History* is illustrated with an excellent drawing of a *Moore and Wright* machinist's chest.

These are miniature chests of drawers which were designed for toolmakers to keep their valuable and delicate measuring and layout tools in. They were made of woods such as walnut, beech and oak and the drawers were lined with green felt, like a card table, to lessen the chance of damage to the micrometers and squares stored.

They were never cheap, and high-quality catches and corner reinforcing were used. *Moore and Wright*, whose principal business was making measuring equipment, no longer make machinist's chests. Gerstner, the famous American maker, still produces a range of models, some of which cost more than US\$2000.

A century ago, wooden engineer's tool chests must have been a feature of most machine shops. In the UK, brands such as *Neslein*, *Union* and *Emir* were common, while in the US, *Hammacher Schlemmer & Co*, *National Tool & Chest Co*, *Wedell & Boer* and *Starrett* were just a few of a multitude of makers.

Today, machinists' chests are very sought after, and folk go to a lot of trouble to restore them. I've seen one or two locally and also, in an antique shop, a user-made one. My brother-in-law has a specialised one which he inherited from his grandfather, who was an engineer in the regular Army. It was probably used for storing and transporting surveying instruments. The tradition in the family is that he used this gear to lay out golf courses at a number of Army bases around New Zealand.

A notable feature of *Gerstner's* machinist's chests is that they have a diamond-shaped mirror attached to the underside of the lid. No one seems to know what the mirrors were for. My theory is that they were used by tool makers to see that their neckties were properly fastened.

In old photographs, all the guys in a tool room are wearing jackets and ties as they worked at their lathes. 📷

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BUILDING MY DREAM SHED

Part 1

FOUNDATIONS

She's a hard road to find the perfect shed. However, *The Shed* magazine founder Jude Woodside is giving it a bloody good nudge

By Jude Woodside | Photographs: Jude Woodside



Like everyone else, I have been constantly frustrated with working in cramped workshops. Even relatively large areas, such as my last one, succumbed to the pressure of too many tools, too little space.

When I moved again, I was determined to build the shed of my dreams. I started designing at 200m², but cost quickly whittled that down

to my current 160m².

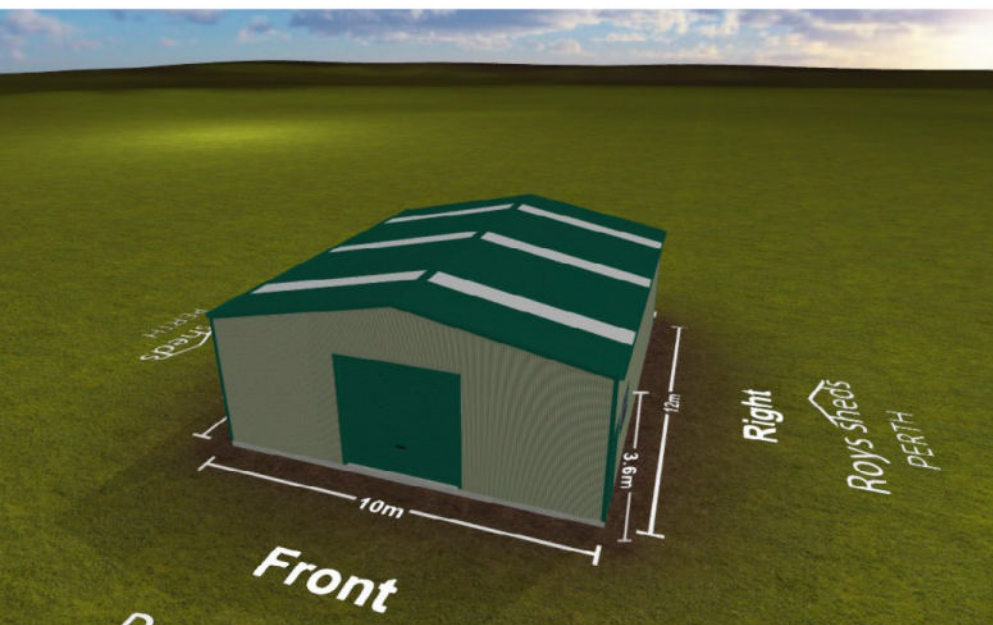
I found a useful design tool online – most of the shed suppliers have them; this one was particularly good (although it was from a manufacturer in Western Australia), and I was able to try a series of different scenarios (<https://royssheds.com.au/>) which I could print off and get quotes for from local suppliers. The tools don't expect you to have any CAD experience, it is

very intuitive, and you can get a good perspective on your future shed inside and out, along with a variety of custom fittings such as doors, windows, etc.

Getting quotes

Armed with a design that I was happy with, I traipsed around the shed builders and got quotes. The best quote was from a local company called 'Affordable Sheds'. It is selling a kitset shed designed





The design developed on Roys Sheds app



by Fair Dinkum Sheds (now called Cyclone Buildings here in New Zealand) in Australia.

The firm was very approachable and helpful in determining all the details. Rewa Pomare, a co-owner and the public face of the company, drew up the plans, and I made what changes I needed.

I had decided that I would put the shed in a paddock adjoining the house, and worked out where it would sit in relation to the house (I didn't want to stare at a big green wall all day) and also where it would sit in relation to the ecliptic and the prevailing weather. You might not think that very important, but here we have a prevailing nor'wester, and I wanted to take advantage of that for ventilation. A very large steel shed painted green will absorb quite a lot of heat. So I situated two roller doors so I could have through ventilation in summer. It's also handy to know where the sun is at various times of the year, especially in colder areas. One wall faces north, but the east-west orientation allows for the prevailing wind to flow through. The orientation also allows for maximum light to reach through translucent roofing, both in the morning and later from the southern roof in the afternoon.

My area is also in a high wind zone, and that can require special engineering requirements. Affordable Sheds arranged all the plans, engineering details, wind load calculations, soil type determination, etc., and organised the building consent for me, which saved me an enormous amount of time and frustration.

Duly, with the shed ordered and scheduled to be delivered, I forged on with preparing the foundation.

Excavation

I had been preparing the site with a friend who owned a couple of small diggers. We had previously been doing a considerable amount of work on the property, removing old, broken concrete and rebuilding paths.

I knew I needed better access to the shed for trucks. We had to remove two trees, one large macrocarpa and the other a rather beautiful silk tree, which

Excavating the road and digging a trench for the three-phase power

lent the place a certain grace; I was a bit conflicted about removing it.

We carved out the outline of a road, installed a double gate into the paddock, and excavated trenches for the three-phase power and a drain to help keep the road stable.

Then I put boxing along both sides of the road to contain the rock. We laid geotextile to prevent the rocks from simply sinking into the clay and laid the various grades of rock, compacting each layer. We used 60mm grade as the base course and then 30ap for the top. This road has held up very well, carrying five trucks with a total of 50 tonnes of rock and 10 concrete trucks with 55m³ of concrete.

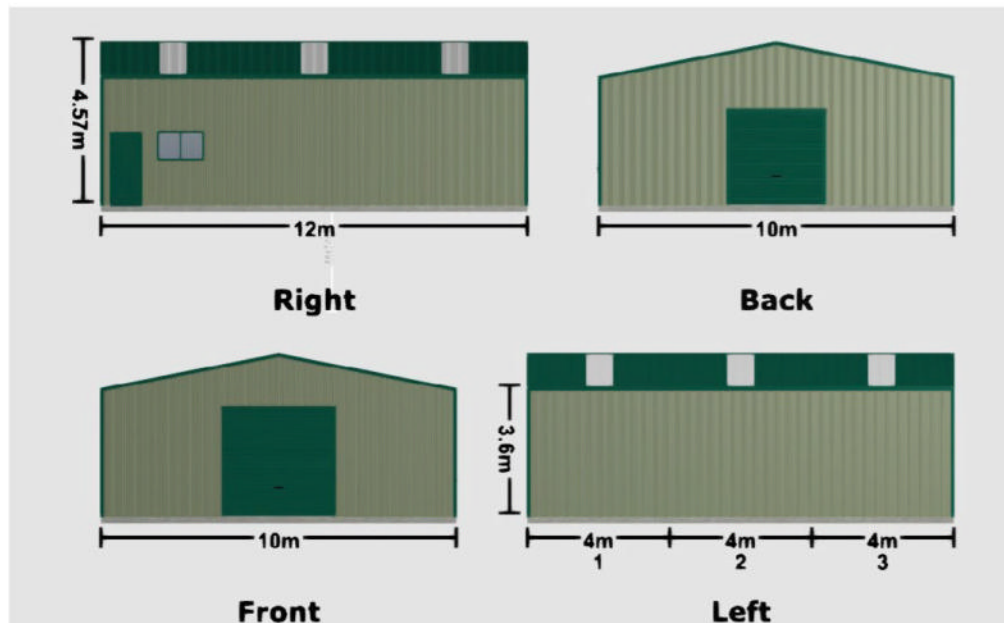
Rain, rain, and more rain

The weather throughout this time was unrelentingly wet.

We had the tail-end of a cyclone in February 2022, and the ground was quite sodden. At last, in May of 2022, we were able to start on excavating the foundation. However, we didn't get far. We managed to get two trenches dug before the weather closed in for winter. After that, the unrelenting rain meant that we couldn't get a machine close to the pad for fear of losing it in the mud.

I have had no experience in making concrete foundations, but my friend Lee, an engineer who had been doing the digger work to that point, had built a pad of his own.

Although we did get a good solid pad, in hindsight, I would have gotten a good concrete layer in earlier to do the foundation. We dug ours a bit too deep in parts, and we could have saved a bit



The app automatically generates the required views



**“Which
saved me an
enormous
amount of
time and
frustration”**

**We managed to get a start on
the pad excavation**



Boxing the road and adding a drain

of cost in concrete, plus it would have been far quicker.

However, we didn't get a chance to touch the pad again for over a year, the weather was that bad. In February 2023, we had Cyclone Gabrielle, and the Indian Ocean oscillation continued to supply us with a regular drenching.

Pad preparation

In October 2023, we were able to finish

the excavations, get the sides on the pad, lay and compact the rock base (53 tonnes), and get the plastic damp course sheet and reinforcing steel down.

I wasn't overly happy with the steel layout on the plans; they required too little steel around the perimeter, in my uninformed opinion, so we made up some cages to reinforce the edges. It may have been overkill, but rebar is the cheapest part of the equation, so we did it rather

than be disappointed later. My placer, later, agreed we did the right thing given the depth of the excavations. It was a steep learning curve, but everything has a logical sequence. You dig out the area, excavate the foundations at the edges, lay rock into the centre and compact it, then lay finer material on which to lay the plastic damp course. After this, you can begin to add your reinforcing steel, the last part of which is the reinforcing



And this is how it stayed until spring



Then the rain came

mesh, overlapped according to the code and lifted to the appropriate level from the concrete surface.

A fair bit of work

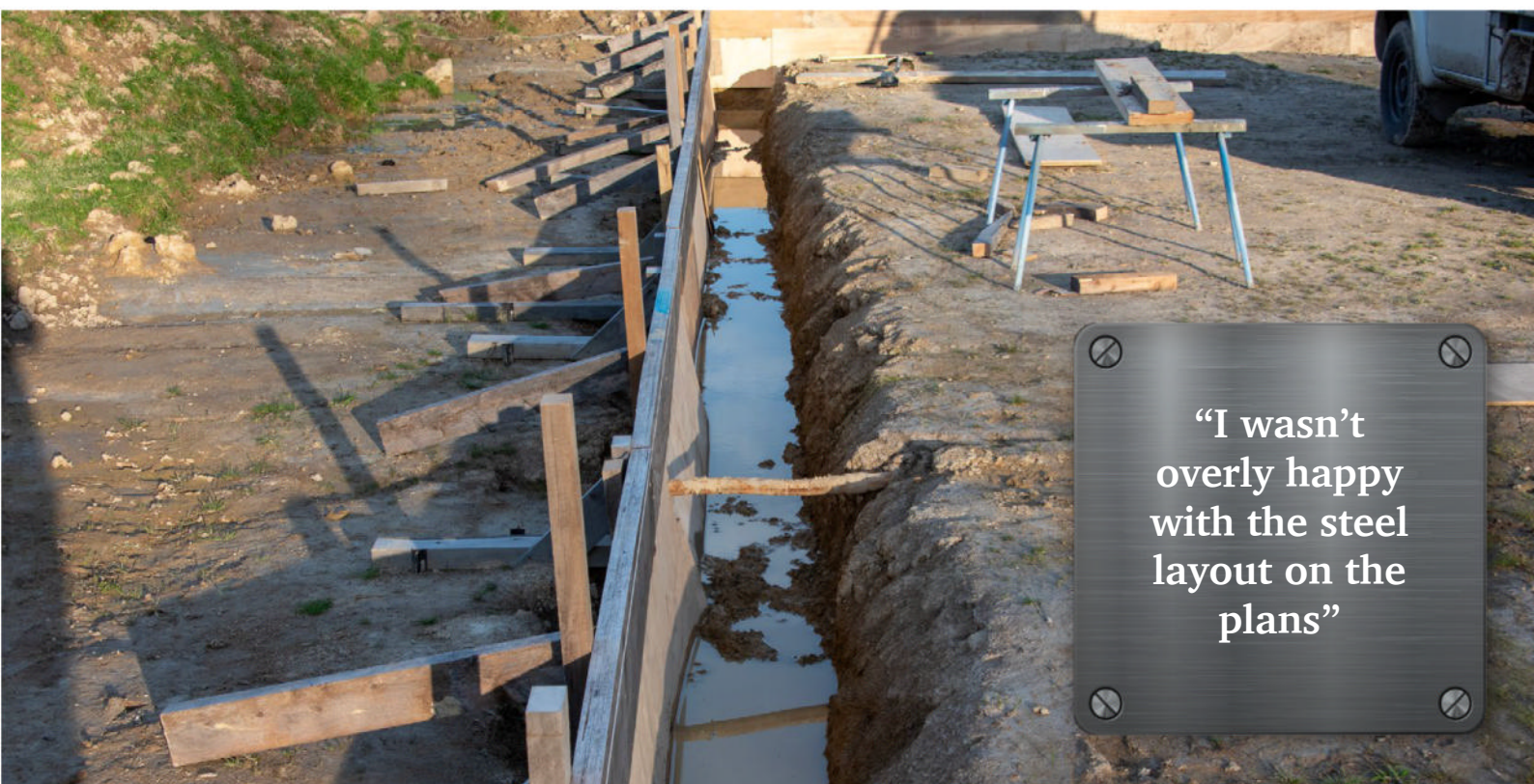
For a shed of this size, it's a lot of work and no doubt my inexperience made for even more work. I had help to put the boxing in and compact the rock, but much of the rest I did alone, except for large jobs like laying the plastic, which

goes more smoothly when you have help. Similarly, carrying the reinforcing mesh is a two-man job.

With the steel in place, I called in the inspectors to check that the foundations complied. We passed. So the next stage involved finding a concrete placer to organise pouring the pad. That took longer than expected, but I found one, Daniel Persico, who could do the job, and he arranged the concrete order and

a pump truck. It took until mid April 2023 to get the pad laid.

Prior to the pour, Dan had walked around the site looking at my boxing, regularly kicking it and saying, "No, no, needs strengthening." As he pointed out, in any one corner, I would have about five tonnes of concrete pressing on the sides, and to ensure that they held their shape, I needed to reinforce the boxing. He even suggested how: By banging



"I wasn't
overly happy
with the steel
layout on the
plans"

By October 2023, we were able to finish the boxing, although the conditions weren't ideal



“This was where I made the first of many mistakes”

Delivering the first of the 50 tonnes of rock for the base



Spreading the base rock. The day after this photo was taken, in early October, it snowed



By January 2024, the foundations were finished, the damp course and steel tied and in place

in two waratahs (Y-poles) about 1m apart and jamming a 100x25mm board between them, and the boxing in the areas that he felt were too weak.

Time to pour

Dan worked out in his head how much concrete we would need (about 55m³), and he was absolutely right; we only had a very little over. He arranged the concrete pump and organised with the concrete plant for the trucks, and arranged that I could pay the concrete supplier directly – he had no mark-up on the concrete.

On the day, Dan and his crew turned up at 4.30am with the pump truck, the first concrete truck turned up at 5am on the dot, and the process began in the predawn darkness. It was largely over by noon and finished overall with final machine polishing by 2pm. As flat as a pool table. We had very little bulging at the sides thanks to Dan's early intervention.

Tension cuts

I waited a few weeks for the concrete to fully set and got a concrete cutter in to make the tension cuts in the slabs. This is necessary to ensure that, as the concrete ages, it doesn't crack.



The pour started early

This was where I made the first of many mistakes. The plans didn't show clearly that the cuts were to be offset by 200mm from the 4m divisions depicted on the drawing. To be fair, this was explained in the fine print; I just hadn't seen it. Neither did the concrete cutter. In the end, this wasn't a problem, although it's not a good idea to put the uprights straddling the cut lines.

I was ready to start the assembly. Had I been more alert, I would have read the plan details two or three times before I started. Instead, I watched a video that Cyclone Buildings had made for constructing a much smaller garage. It was misleading and led to my next dumb mistake.

In the video, the walls and ends are all offset 100mm back from the edge. That was true for the side of my shed, but the ends were intended to be placed on the edge of the slab at the ends. I went ahead and blithely marked lines 100mm back from every edge. I did eventually work out a means to overcome most of this issue, but it cost me time and a lot of fiddling about.

The portals

It was time to begin assembling the portals. There are five portals in total. ►



It was all done by the afternoon



The portals being assembled on the pad



With the help of Andrew and my friend Brian Hill, we made serious progress and had the portals up in two days, along with the purlins installed

Each upright is built from two C-sections that are bolted together, and this in turn is attached to the rafter at 11 degrees to the perpendicular.

I began by laying out all the parts of the uprights on the pad, the four C-sections of each upright and the four C-sections for the rafters. The C-sections bolt together with a cross-beam between them and reinforcing plates at the head to align them. They are joined with high tensile 18mm bolts. I had to buy a long impact socket specially for the job. My impact driver took quite a thrashing, and I managed to shear several socket drivers in the process.

It is important to make sure that the uprights are square – best done with the diagonal measure, checking that the diagonal points of the structure are equidistant as you do with any square structure. Once you have the first portal made up, it's a good idea to run around it with chalk to sketch the outline on the pad. Aside from the galvanised connector plates, the rafters are also strengthened with a single C-section that runs between the rafters and two braces that brace the corners of the uprights and the rafters.

These are made of smaller C-section material, also somewhat thinner than the main components. These have to be cut to fit. One part slides between the components of the uprights and also

between the rafter components. Once in place, it is necessary to drill holes to bolt the sections on. With the bracing in place and the brackets that will attach the portals to the base, it was time to tighten all the bolts and recheck for square.

Erecting the portals

With all the portals done, it only remained to erect them.

This was the subject of some head scratching, since these things aren't light. In the end, we opted to go with a scissor lift, which, although unorthodox and probably not recommended, nevertheless was remarkably easy.

I am not too confident at heights any more; it comes with age. I don't bounce quite as well as I did when I was 10 feet tall and bulletproof. I had my son-in-law, Andrew, do the honours until I had the courage to get up on the thing myself.

Once in place, we held the portals tied to the lift until we had drilled the holes for the bolts to secure them. This is where I made my second mistake and erected the first outside portal the wrong way round. Again, due to not reading the plans more closely. However, I was able later to fix the issues (not having the portals on the edge of the slab and the wrong way around) by turning one and re-siting the other. But



Andrew Gray, my son-in-law, doing the high stuff, connecting the portals with the purlins

it required getting a crane truck and a lot of re-jigging of the purlins.

Once the portals were in place, we could hold them with the purlins and using improvised supports.

The devil's invention

The purlins and all other parts of the structure are held in place with Tek screws directly driven with an impact driver. I was wont to consider them an invention of the devil at times.

Often, they simply wouldn't cut the steel or would take ages to cut through. The steel used for the main members is quite hard. Fortunately, the kit contained plenty. They are designed so you don't have to drill holes first, but occasionally I resorted to drilling.

By now it was July 2023, midwinter, but I was happy that, after what was literally years, the shed was underway at last. It seemed that it would be only a matter of a few months and I would be in it working. What could possibly go wrong? 📄



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A man with a full, well-groomed red beard and short blonde hair is looking directly at the camera. He is wearing a plain white t-shirt. His right hand is raised, with his fingers running through his hair. The background is a solid, bright yellow. The title 'ARDUINO 102 ERRORS' is printed in large, bold, black capital letters across the lower half of the image, partially over the man's chest.

ARDUINO 102 ERRORS

By Mark Beckett | Photographs: Mark Beckett

Our Arduino wizard shares some thoughts and solutions to dealing with ‘errors’ and provides guidance on how to display to the user that something has gone wrong ... somewhere

In the last few issues, we’ve covered a range of subjects with ‘Display’ in the last issue, *The Shed* Issue No. 120. These have all assumed one thing – that there are no errors and everything is working correctly.

Anyone with any experience knows that things don’t always go to plan, and having a contingency or recovery option is useful, although some might say essential.

It’s no different in the software world. Errors could be caused by hardware failure, programming, or something the user does that was totally unforeseen. I’ve seen software writers comment, “Why would anyone do that?” when a user crashes the software program they wrote. My answer is “Because they can”, and we all know that quote for ‘assume’, which is appropriate when you expect everyone else will have the same workflow and thought pattern as you did.

This article hopes to provide some thoughts and solutions to dealing with errors and indicating or displaying to the user that something has gone wrong.

Hardware faults

These are generally a connected item that fails or becomes disconnected.

If it is an analogue sensor (i.e., temperature sensor), the reading will be out of range, so it can be detected.

In the last issue, I provided an example of scrolling text on an LCD. If there was no temperature sensor detected, it displayed the error for the user and continued (despite it not working as intended).

Back in *The Shed* Issue No. 43, June/July 2012, we added some intelligence to a classic car temperature light. Part of the error checking was that if the sensor was disconnected or shorted, the light flashed a different number of

times to signal to the user what was wrong.

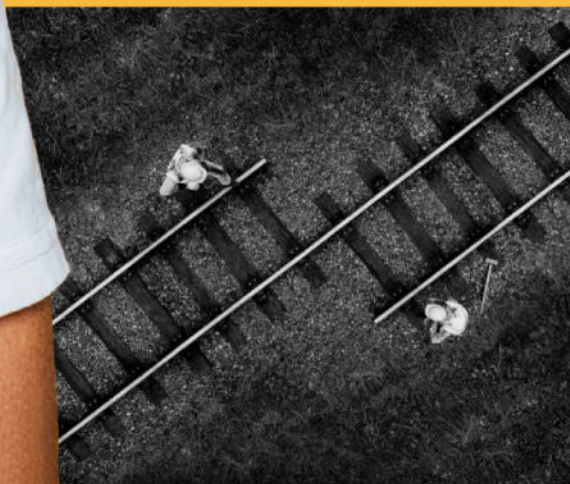
However, if the input is a normally open (NO) switch, then a broken wire or faulty switch will not register and hence will not be detected by the software. Therefore, it’s important that the user gets feedback when they press the switch so that they become the detection method. An alternative option is to use a normally closed switch as we do in the lift trip safety systems at Mt Lyford.

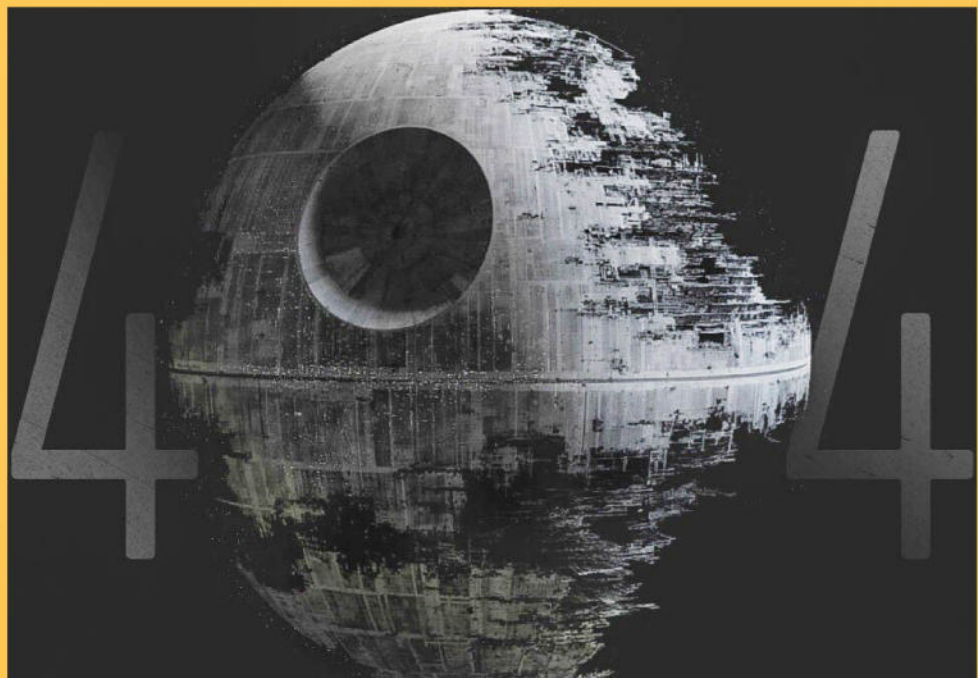
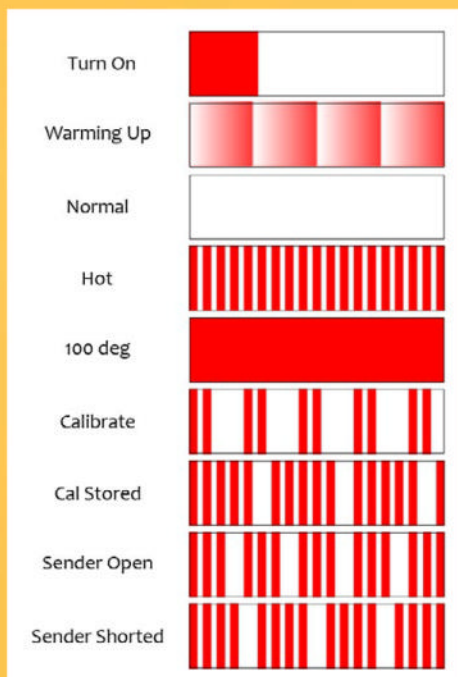
FWIW wired security systems use normally closed contacts and a resistor at the end of the line to detect open or shorts on each input.

I2C and other connected devices (LCD, PCF8575 IO expander, Neopixel, One wire, etc.) can be checked to see if they are present on the bus. If they aren’t, then the software can raise an error. ►

“Anyone with any experience knows that things don’t always go to plan”

OK





The Shed Issue No. 43 temperature sensor error code

This is where adding a POST (power on self-test) is very useful and can signal to the user that the item is working.

Software faults

These can be much harder to detect, but one option is to make use of the watchdog timer (WDT), which I touched on in Issue No. 119. There was a sketch provided to show its operation.

The basic principle is that the WDT is an internal timer within the Atmega328 chip. Once set, it expects a reset before the timer expires, and it resets the microcontroller. It's also possible for it to call a routine that allows you to indicate to the user that something is wrong.

For my latest lift trip safety system at Mt Lyford, the software continually checks for a disconnection on the I2C bus or if the WDT is triggered and sets the heartbeat LED to a solid red. This signifies that something is wrong and requires attention.

For the 'why would anyone do that?' scenario, my suggestion is when you get someone to test something, give them very little information, so they will do unexpected things or things in a strange order. Standing over them and instructing them to press this, then do that, is no different to you doing the testing (which hopefully you've already done).

If you are chasing an error (or a fault), it's helpful if it can be repeated,

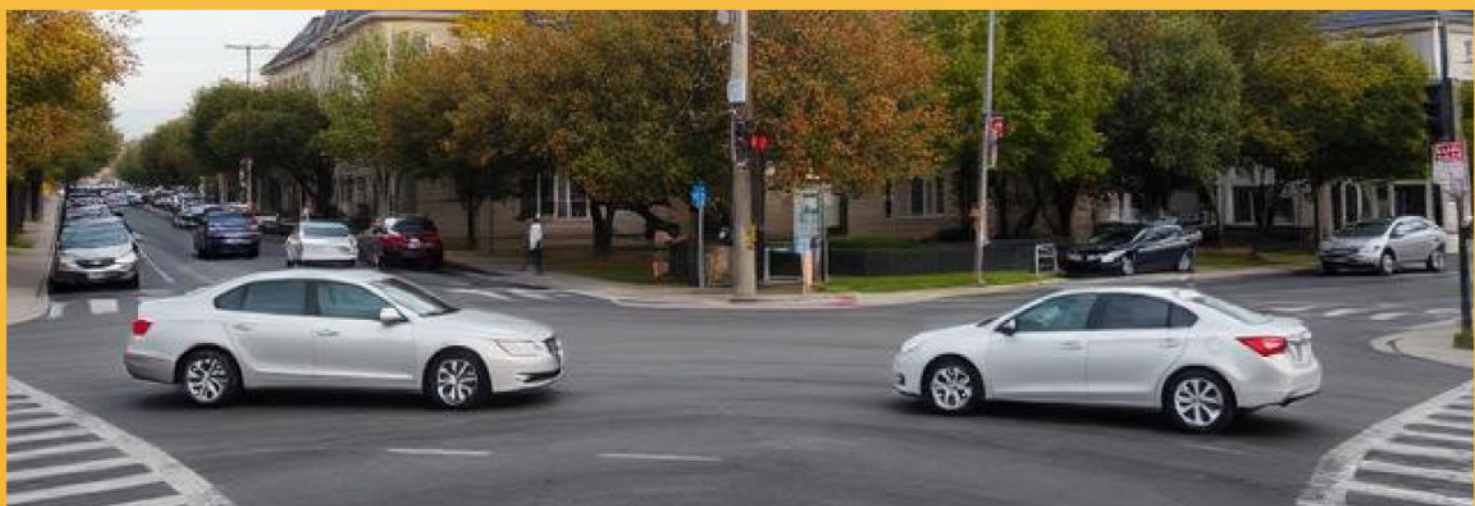
so during testing, use someone that takes notes or writes down what they did so you can recreate it.

During my coding, I tend to develop one part and test that before adding another aspect. It makes it easier if you have to backtrack, as you know it worked the other day.

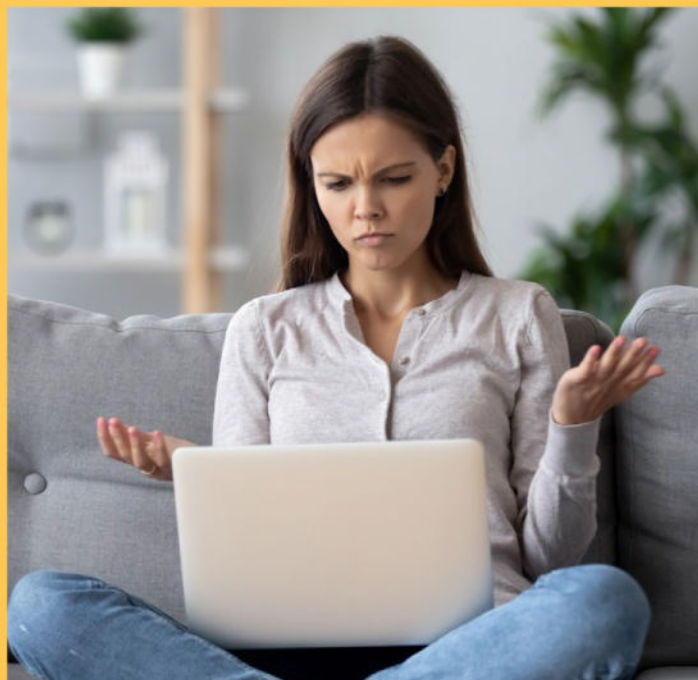
The wrong thing

We've all experienced the error beep that tells us we did something wrong. Unless you have buttons with lights built in that you can flash, you'll have to arrange your code to either limit the user's actions or sort it out so it works.

We all know that reading the manual or instructions is something only



Hardware error



When it all goes wrong

done when it's broken, so my advice is, whenever possible, ensure that the action associated with that button press or interaction at that time gives the expected result. Any other is either ignored or shows the user that the one they pressed was incorrect.

An example is a reset button, which only works when the system is tripped. When it's running, simply ignore it, and eventually, you'll work out that it does nothing.

But what happens if the button is jammed?

Most systems do a POST, and this is a time to check that the button or switch is not pressed/jammed. If it is, then call the error routine to warn the user there

is a problem, as I demonstrated in Issue No. 120. Here is the link to the example code, which was also in that issue:

<https://drive.google.com/file/d/1TeaCJq8kqcq2JSz3kDSyXgs12mqGAa9-g/view>



Error trapping

Adding an error routine is good practice and can be a simple light that flashes. This will limit the damage and display to the user there is an error that needs rectifying.

In my lift trip safety system at Mt Lyford, the error routine de-energises the engine solenoid (see Code Panel 1) and changes the heartbeat LED.

For other errors, there may be a recovery option, but generally, it's fatal, and the solution is a power reboot.

In your error routine, you could flash the internal LED fast or turn on a separate LED. However, I would recommend that you return any outputs to a start-up state rather than whatever they were when the fault occurred.

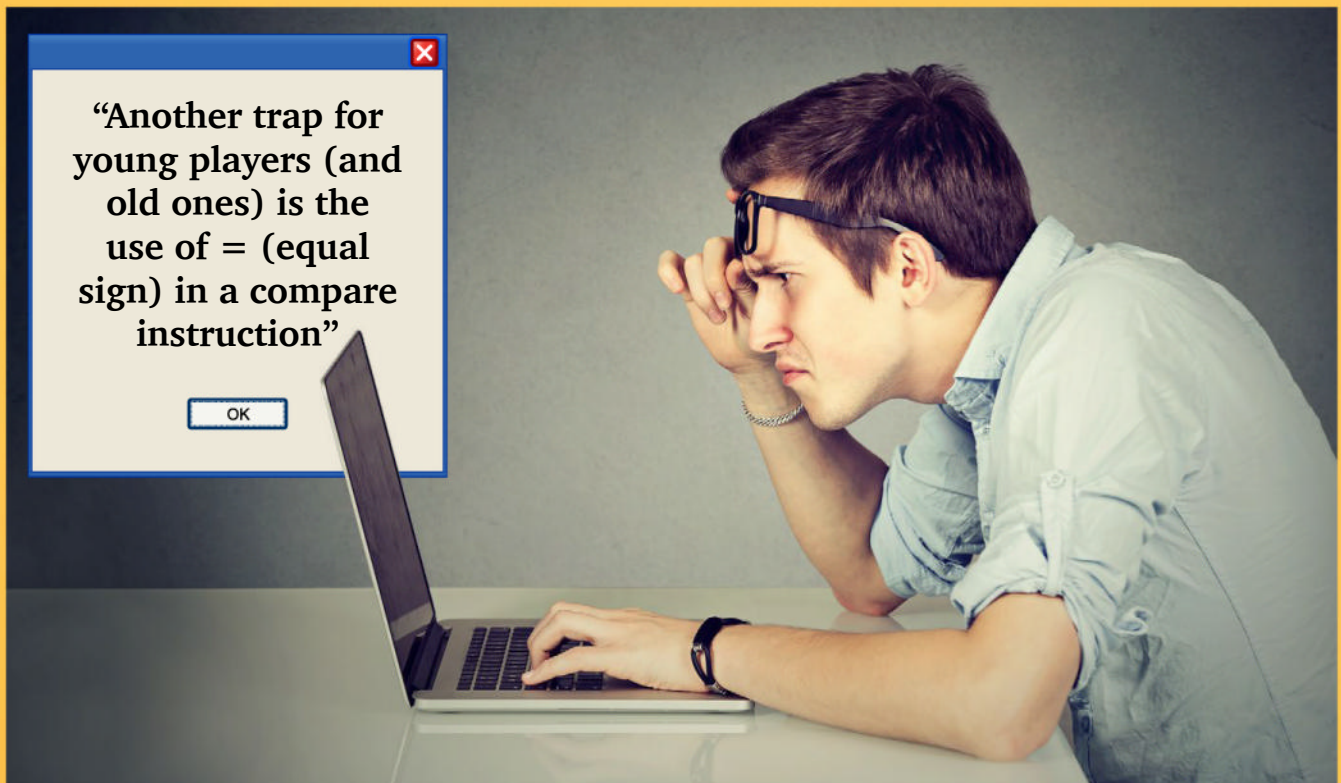
I've included an example sketch that flashes an LED, but when the button is

Code panel 1

```
void ErrorMode()
{
  /* This is where errors in hardware or code come to
  The idea is you never leave here
  */
  do
  {
    Relay1State = HIGH;          // Turn OFF the Engine Solenoid
    digitalWrite( Relay1, Relay1State);
    strip.clear();
    strip.show();
    strip.setPixelColor(HeartbeatLED, SetRED);
    strip.show();
  }
  while (ErrorState > 0);        // Any error code number
}
```

“This is where adding a POST (power on self-test) is very useful and can signal to the user that the item is working”

OK



Software error

pressed, it goes to the 'Error Routine' and flashes much faster.

https://drive.google.com/file/d/1TZ08GzLSnvVwcUvB_tw1ZfRkOrtLF2h/view?usp=sharing



Resolving errors

As the sketch gets larger and more complicated, sorting out where it's getting lost or going wrong is harder to manage.

As I mentioned earlier, I try to sort out various parts of the code as I go. This means that when it's not working later on, you do have a point to return to and see what changes could be causing the issue.

I have learnt to save my code regularly and use the date and time so I can refer back to see where it was working previously (i.e., MtLyford_TripV3_020325_1744).

Usually, this results in a facepalm moment along with the comment, "What the hell was I thinking?" before fixing my blunder.

Once you've sorted out how to make it fail, one trick is to add serial print

information at specific points.

In this example, I was having issues with the 'Reset' button being ignored under certain conditions. By adding these outputs to the 'Serial Monitor', I could check if it was working as it should.

Something to be aware of is that each serial print takes some time, so the loop time of the sketch is slower. This may mask other problems, so when you don't need them, comment them out until you're at the final finished code, and you can remove them altogether.

Another trap for young players (and old ones) is the use of = (equal sign) in a

compare instruction. When you compare variables or a variable with a value, take care to use == (double equal sign), or that variable will become the value you're checking against.

This reference talks about it:

[arduino.cc/reference/cs/language/structure/comparison-operators/equalto/](https://forum.arduino.cc/reference/cs/language/structure/comparison-operators/equalto/)

– but in my opinion, this is a better explanation:

<https://forum.arduino.cc/t/equal-not-equal-double-equal/40620>

– this includes a handy hint for changing the order, which causes a

Code panel 2

```
if (ResetSwitchState != LastResetSwitchState)
{
  LastResetSwitchState = ResetSwitchState;
  if(ResetSwitchState == LOW && (RunState == 4 || RunState == 0))
  {
    Serial.println("Reset Button LOW ");
    Serial.println("Calling Trip Reset");
    RunState = 1;           // Waiting to detect Engine is running
    TripReset();
  }
  if(ResetSwitchState == LOW && RunState == 5)
  {
    Serial.println("RunState 5 Reset Button LOW ");
    Serial.println("Calling Trip Reset");
    TripReset();
  }
}
```




Design error

compile error rather than something hard to find.

Comments don't compile or change the actual working code, so feel free to leave them or use plenty, so that when you come back in six months' time you may have some idea of what you were thinking back then.

Errors during compile

These can be difficult to find, and sometimes the error message highlights a line that has nothing wrong with it.

Many are due to a missing } (closing parenthesis) somewhere in one of

the routines.

I can't understand the pattern used by the compiler when it does its thing, so start at the top with the cursor next to the first { and scroll down to make sure the bottom one is highlighted. I prefer to have the start parenthesis on the next line so it's much easier to spot and check during any compile errors, but a lot of code you get from examples and the internet have it after the instruction.

Spelling and proper capitalisation are also important, as in Code Panel 2, where Serial.print has a capital S but small p.

While a : (colon) and ; (semicolon)

are very similar on screen, their meaning is different and will throw a compile error as well. Usually, the line is highlighted, but this can make it even harder to find. Pictured is where I changed the semicolon on the line Serial.println("Calling Trip Reset");

Don't be concerned with the compile warnings as long as it compiles and has no errors.

Phone a friend

While reaching out to the WWW forums and posting your issue might seem like a great idea, the reality is you're more likely to get flamed or told to refer to the documentation. That really isn't helpful, but it is understandable, given some of the help requests I've seen.

My suggestion is to do a search with a good description of the issue. For example, searching "won't display" is less useful than searching "Arduino displays garbage". Remember, these search engines use a crude version of AI to meet your search criteria and display results.

If you know which instruction is causing the issue, then include it to narrow down what results you get. I can almost guarantee you'll not be the first one to run across the issue.

Self-help is the best way to learn, so when in doubt, see if you can find examples using that instruction and try playing with some code to make it fit what you're trying to achieve.

Once you've learnt the solution, it will remain somewhere buried inside your head, and just maybe you'll recall it later, or, as is usually the case, recall that you used it somewhere in the past but not which sketch it was.

When I was active in the element14 forums, it was amazing how the 'instant brigade' (a term we dubbed those who expected instant results) were using computers and smartphones from a really young age but were incapable of searching for themselves. Needless to say, the ones who had checked and were sort of close but on the wrong path got some help, while the others were ignored.

Hopefully, this article has thrown a bit of light on errors for you and how to deal with them. 🙏

```

640
641 if (ResetSwitchState != LastResetSwitchState)
642 {
643     LastResetSwitchState = ResetSwitchState;
644     if(ResetSwitchState == LOW && (RunState == 4 || RunState == 0))
645     {
646         Serial.println("Reset Button LOW ");
647         Serial.println("Calling Trip Reset");
648         RunState = 1;
649         TripReset();
650     }
651     if(ResetSwitchState == LOW && RunState == 5)
652     {
653         Serial.println("RunState 5 Reset Button LOW ");
654         Serial.println("Calling Trip Reset");
655         TripReset();
656     }
657
expected ';' before 'token'

exit status 1
expected ';' before ':' token

```

IDE error for Code Panel 2 syntax error



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WHAT TO RESTORE, TO REPURPOSE, TO BUILD?

Murray asks himself, “Why am I off the grid? Why do I fix rather than replace?” The answer is simple: he’s getting himself ready for a post-oil world

By Murray Grimwood | Photographs: Murray Grimwood



“The bike-blender problem was a nice wee exercise, right up my alley”

The ingredients: a perfectly functioning blender and a second-hand training frame. Horizontal roller bearings and cage now position the vertical spindle

Every now and then, a column called ‘Off the Grid’ needs to ask: Why? Why go off-grid? What is the driver? And the repercussions?

This little offering was triggered by my better half asking me if I could build a bike-based smoothie maker after she had watched one being used at a recent event. Sure, no problem – but apart from teaching lateral thinking, what will it achieve? Will we really end up going that way?

The pre-ponder

I spent the ensuing days pondering. What we’ve done is climb a ladder of technologies, kicking each rung away as we’ve climbed and, thus, unless we rebuild a technology completely, we cannot go back. We always assume the present one will be permanent, but I’ve lived through vinyl, reel-to-reel, cassette, 8-track, 5-inch floppies, 3.5-inch floppies and CDs; who is

to say data sticks or the cloud are information-storing permanencies? Or take telephones: dial telephones and rotary-switch exchanges no longer exist; heck, even copper connections are being removed. Yet, if cell-phone technology becomes unavailable, what do we revert to? Two paper cups and a bit of string?

Blending technologies

Philosophising aside, the bike-blender problem was a nice wee exercise, right up my alley.

Scoping first, the target user group is children, who tend to come in a range of sizes, so either a dedicated adjustable bike or an adjustable-height bike mount seemed to be called for. The latter opened up a minefield – accommodating quick release or not? Pegs? Width? So we dedicated her old mountain bike permanently to the cause; it comes with a long seat adjustment, and it meant I could tailor-make the mount for no-hassle setting up.

As for a stand, I couldn’t do better than the proprietary stationary-training type, and cheap second-hand ones are common enough. We acquired one, I hung an old wheel in it, and began that delicious mental inventing/designing process as the wintry shadows lengthened.

Meantime, somewhere far, far away

The Trump tariff-announcing OMG moment(s) were the backgrounder to this, so I was writing and lobbying too.

As with design, seeing the whole is essential: seeing the big picture, the all of it. Most commentators failed that test; it was all Trump, Trump, Trump. Many, indeed, seemed convinced that all that was needed was to remove him, and we’d be off to the races again, pedal to the metal.

But Trump, big picture, is a symptom, not a cause. If things had recently been as good for Middle America as the touts

would have us believe, he would never have had a second coming. Or perhaps even a first.

And when things cannot go on as they are, they tend to cease, regardless of the facilitating trigger (be that a person or an event). An inevitable morph can be smoothed, but only if led proactively. Attempting to prolong the past when it is irredeemable typically results in a path less smooth, even if initially it

seems more pleasant (like heading back into your nice warm stateroom from a sloping *Titanic* deck).

Brainwave – or shafted?

Interrupting that train of thought, I realised that acquiring the bike trainer had just solved most of my problems (smoothie-making-wise – I have a long list of others!).

It had a now-superfluous spindle

through a couple of robust, well-mounted bearings. For some unfathomable reason, they'd forgotten to include a Breville mixer drive-dog on one end, but I guess you can't have everything!

I pulled it apart, turned it over every which way but Sunday, tried this, tried that ... and finally discarded the promising-but-didn't-deliver shaft; it was just too specialised. Instead, I ran a length of M10 threaded rod through the bearings, resulting in something I could work with on my terms.

My last operation of the evening was to clamp a round hunk of rubber in the lathe, drill through the centre, and hand-wind the M10 rod through it.

Trump to sheddies

What this era is about, and (if I'm right) will be defined by, is that humanity has tapped out the planet. We're creaking at the seams – even if we're being peddled a happier message. And we're about to jostle over who gets what's left.

Some may say that this is no place to discuss such, but I suggest there's none better. After a period of offshoring our making skills and repairing expertise, I think we're entering one where those skills will be back. In spades. As will the demand to pass them on.

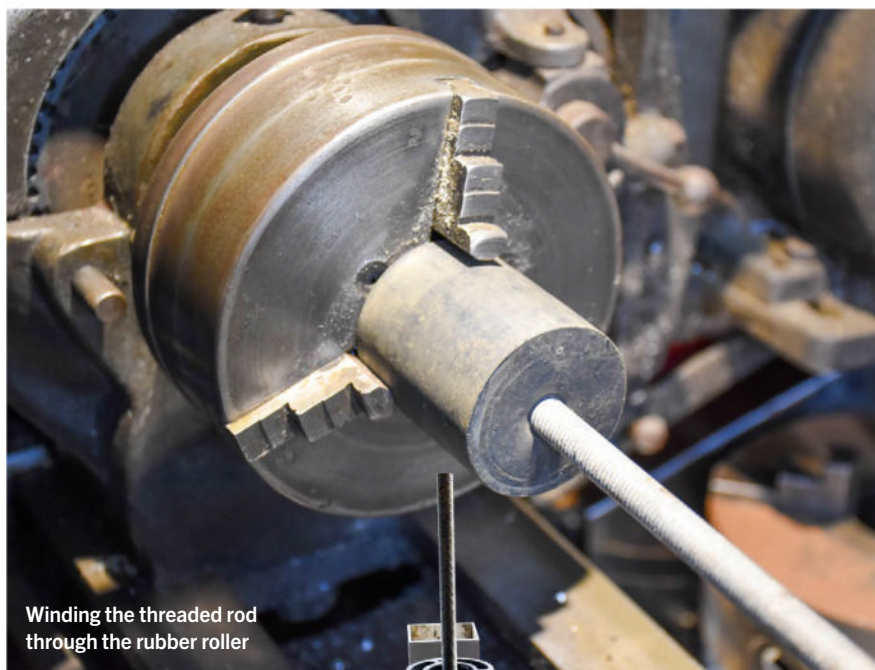
This is why I do much of what I do, making things out of other things, formally called 'repurposing'. It's not because of an imperative need – I can whisk up a smoothie using an eggbeater or a bent piece of No. 8 in a hand drill, anytime – but to lay the foundations of a way of thinking; "Ah, I could use this to do that".

I suspect I'll look back and see the teaching of repurposing as my biggest (only?) contribution to the world we leave our grandkids.

Morning in Otago (to misquote Reagan)

I carried the training frame out to my favourite place, shimmied her old bike out from well back in the bike stack, and had a quick measure-up.

Off to the resource library (collection of stuff under the trees) and back with a likely looking hunk of 50x50 alloy box-section. I could tell you I was smart



The roller is still there, now grub-screwed to the threaded rod and acting as a shaft locator



I got this bit right-way-around; box-section attached to frame



But not this bit – the moment I realised it was 90 degrees out ...

“This is why I do much of what I do, making things out of other things”

enough to work out how I was going to mount the roller before I mounted the alloy upright. Alas, if I did, I'd be lying ... A quick angle-cut, a couple of stabs with the hole-saw, and I had it standing up alongside the back wheel.

Next, I turned the spindle-mount around in space, trying to figure out a cunning way to use its tensioning knob. Nothing seemed to work until I realised that I could solid-mount the spindle and shift the bike sideways with the mount-clamps for roller/tyre squash-adjustment. No point in having two variables, so the knob got relegated to the useful-bits drawer. I marked where the plastic would be buried in the box-section, drilled and filed a perfect slot for it, then realised I'd not transferred the height lines to the correct face!

A deep breath

Yes, I swore. I shook my head. I looked at the sky. Repeated all three. Several times.

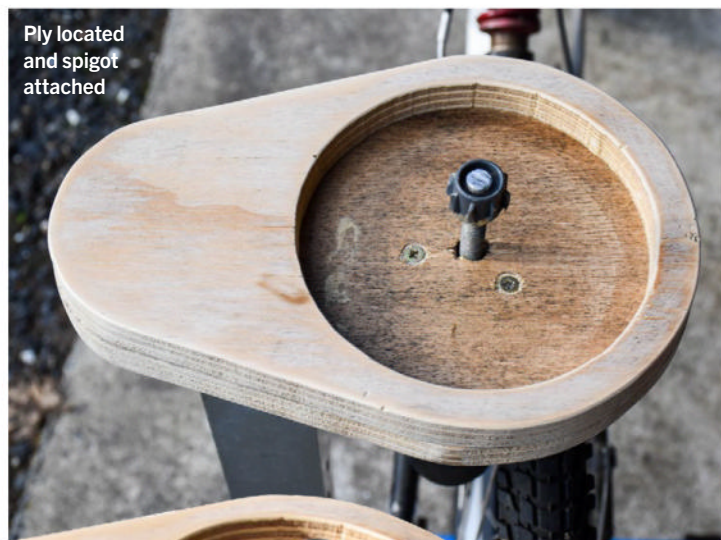
Then I went in to make a coffee



Ply coming together



Somewhat reminiscent of an old motorcycle crankcase cover



Ply located and spigot attached



First spin



The rivet-fix; a permanent reminder to think first

“Neither a borrower nor a blender be”

before tackling the drudgery of making a replacement upright. That coffee was a good call; it gave me time to figure out that chopping the wrong 'un once, then reassembling it 90 degrees rotated, would be much quicker than a total refabrication. A quick post-coffee

saw-drop, some angle-alloy splints, a very careful recheck that I'd got it right way around, a few rivets – and we were back in bizzo.

Afternoon – drive time ...

As the afternoon wore on, I found a piece of plywood and sketched a



A blend of technologies? She's talking to Australia on that phone; no strings attached

shape somewhat reminiscent of an old motorcycle crankcase cover.

Jigsawing two out, centring both, and relieving the upper one to receive the jug took a pleasant while. They got screwed down onto the plastic bearing-housing, using already-there-in-the-plastic holes.

The Breville drive-dog had a left-hand-threaded brass inner, which I drilled out and re-tapped M10, then wound a lock nut down the threaded rod, chased that with the drive-dog, and tightened them together at the appropriate height. Then I chopped off the rod and, with a few adjustments and a trial pedal, placed the finished product across the workshop entrance to await her coming home from work.

Let's just say it hit the spot. Also, for some strange reason, everyone who has seen it loves it and wants to borrow it, far more than is usual with my concoctions. I'm tempted to throw them some mangled Shakespeare: Neither a borrower nor a blender be ...

Is this a number 42 (i.e., an answer to the ultimate question of life, the universe, and everything)? Probably not. I sense that the trend that is forcing a

de-globalisation of trade will also force a de-complexifying of technologies, a 'great simplification'. I also expect increasingly erratic availability of fossil energy and much triage as a result. Treadles (sewing machines and lathes, fretsaws, etc.) are where we ended up last time foot-power was seriously used to drive machinery, but perhaps that was only because treadles predated pedals. We may well use treadles/pedals to power things (it certainly leaves your hands free, and legs are more powerful than arms), but I suspect our drivetrains will be less primitive than rollers on tyres; that's just too inefficient if we're valuing energy at the margin. If I were to build one looking for efficiency, I'd use a chain-to-bevel gear – the little gears out of a Singer 201K come to mind. But you could make a bench-mounted, hand-driven one easily enough too; it would be somewhat more kitchen-friendly.

On the plus side, as far as I know, at least at the time of writing, there were no tariffs incurred in this build, and nobody is being sent home because they didn't blend in. And besides being fun



to construct, it seems most folk think the bike blender is fun to use. There are worse outcomes. 📁



My minitruck project turned into a wee drama when I decided to replace the two-cylinder 547cc engine with a three-cylinder 1000cc motor

MY RETIREMENT PROJECT

Part 2

As the project reaches its conclusion, Coen decides that he needs more grunt in his minitruck, but there are supplier problems aplenty to annoy and frustrate

By Coen Smit | Photographs: Coen Smit

“The little two-cylinder engine disintegrated in spectacular fashion”



The 1000cc engine and gear-box are readied for refurbishment and transplantation in the very near future

To briefly recap: having recently retired, I decided that I needed a project to slow down, if not mitigate, the sedentary lifestyle that overtakes many of us in retirement. Consequently, I purchased a small 1968 Daihatsu Hi Jet four-wheel-drive truck to refurbish and take me to remote places in nearby bushland where I like to walk my dog.

Those of you who have read my first article will be aware of the various travails that beset my project. One of these was the small two-cylinder motor that originally came with the little truck.

To cut a long story short, I eventually managed to rebuild it and get it running, complete with new pistons, a repaired head, etc. Although it ran as it should

(albeit briefly), I soon discovered that it wasn't really up to the task, as any sort of headwind or hills had me reaching desperately for the lower gears! That'd be OK on the quieter backroads, but unfortunately before I get to them, I have to spend some time on a two-lane highway frequented by huge logging trucks moving their loads between a timber mill and the local woodchip port, as well as other sundry, trucks, cars, milk tankers, and the like.

Nervous times

On such occasions, my anxiety level tended to rise sharply, as I'd get a front-row seat of the radiator grille of one of these behemoths rearing up in the rear-view mirror, knowing that just the grille

was larger than my little truck and that the operator on a tight schedule wanted to keep the 40-odd tonnes rolling along at the 80kph speed limit. It took the shine off my project somewhat!

To remedy this – and hence this part two of 'My Retirement Project' – I decided to replace the two-cylinder 547cc engine with the three-cylinder 1000cc motor that came in the parts van. Hopefully, I'd be able to keep my head higher once this was accomplished!

However, before I could even plan the engine swap, the little two-cylinder engine disintegrated in spectacular fashion a few kilometres from home. It belched a cloud of smoke that totally obscured my faithful canine companion in the tray and caused one anxious

young lady to pull up behind me to make sure I was OK!

Hindsight is a wonderful thing

I realise now that money spent on getting the original motor back on the road could have been better allocated to the three-cylinder, but, as they say, the benefit of hindsight is 20/20 vision, and, on a more positive note, the journey is as important as the destination.

The first task was to extract the three-cylinder motor from the van. Once all the hoses and wiring were disconnected, along with driveshafts, only four bolts held the motor, clutch housing, gear-box,

and transfer case up under the chassis of the van.

After lowering the whole assembly to the ground as gently as possible, I used my little tractor to lift the van's body up and over it. Once I had it strapped down on a pallet, I could get a good look at what I was in store for.

The most obvious part missing was the starter motor. I needed it to be able to check compression, and the starter from the two-cylinder motor didn't fit. Also absent were the distributor rotor button and a decent set of points.

Starter motor blues

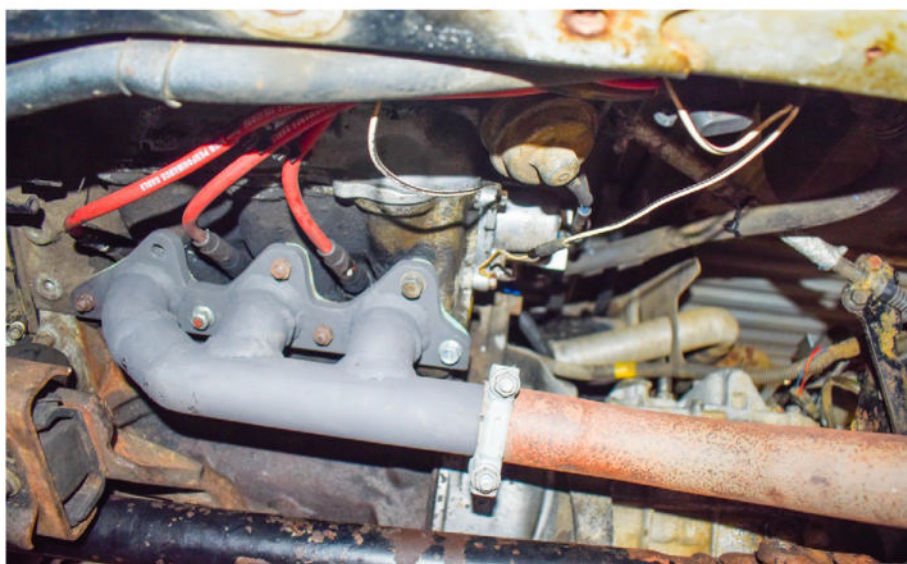
Not surprisingly, I was in for another

steep learning curve.

Try finding a starter motor when you don't have a model number, etc., to recite to a supplier!

My first foray ended in a disastrous encounter with a supposedly reputable interstate supplier of this sort of equipment and having to call on Victorian consumer affairs and my bank to sort out a refund for the unit it supplied that didn't fit.

As a last resort, I turned to a local automotive electrical firm and gave it the engine on its pallet. It took about a month, but the firm sorted it out and was able to modify a unit slightly to make it work. First lesson learned.



My custom-built exhaust manifold



A view looking back to the gear-box

“[Causing] one anxious young lady to pull up behind me to make sure I was OK”

When I first thought about doing the engine swap, a visual comparison suggested that the two engines on their subframes were interchangeable – something I would have expected given only one year's difference in their date of manufacture and the same vehicle with a different body. You know the old saying that goes with the word 'assume', so there's no need to dwell on it further! Of course, they were different!

Off to a local engineering company to adapt the replacement motor's subframe to the truck chassis. Lesson two learned.



The relocated engine mounts and subframe to the chassis



"I toyed with the idea of going up a wheel size, from 12 to 13 inches"

Here comes lesson three

Lesson three arrived when it came time to fit the exhaust manifold to the exhaust pipe and muffler.

What appeared to be the correct exhaust manifold was anything but. The previous installation in the van must have met the same problem, as the one used was only held on by three bolts and, on the little truck, had also fouled the propeller shaft for the front-wheel drive. Back to the engineering firm to have a bespoke exhaust manifold constructed!

My first outing with the three-cylinder soon highlighted the next problem. The differential ratios in the truck did not match those in the van, and the engine revved its head off at 60kph. Time to swap those over as well!

I toyed with the idea of going up a wheel size, from 12 to 13 inches. However, although there are any number of four-bolt, 13-inch wheels around, I could only find one set of wheels that had the correct bolt spacing, and the owner was asking A\$900. Neither the price nor the fact that they are mags really appealed to me, so I decided to change the differentials over and pray that they were up to the job.

The temperature sensor still reads catastrophically hot soon after starting, but this is not reflected in the actual running temperature of the engine. I fitted an after-market temperature sensor that reads both cylinder head and oil temperatures through external sensors bolted to the cylinder head and the oil filter. Peace of mind, hopefully.

But wait, there's more

The little truck hadn't finished emptying my bank account when I learned that the brake master cylinder was unable to hold pressure for long.

Off I went to the local steering and brake specialist only to learn that it would have to be sent away to Melbourne and the experts there wanted A\$100 up front to inspect it and another A\$900 to fix it ... if they could!

Fortunately, my parts vehicle still had its own brake master cylinder, although it included a vacuum booster attached directly to the master cylinder, which the little truck did not have. I found a replacement master cylinder online



New brake master cylinder and booster installed



“As a last resort, I turned to a local automotive electrical firm and gave it the engine on its pallet”



I soon discovered that the small two-cylinder motor that originally came with the little truck wasn't really up to the task of handling any sort of headwinds or hills



Over the length
of the project,
little has been
straightforward





I decided to change the differential and prayed it was up to the job

for around A\$400 and did a swap over without too much difficulty – except for lengthening the brake lines (A\$60).

Would I do it again?

So, what have I learned from this retirement project?

First, your pockets need to be deeper than you first thought. Over the length of the project, little has been straightforward, and that has translated into extra dollars having to be committed to the project. In retrospect, the money spent on doing up the two-cylinder unit was wasted.

Second, when dealing with an online supplier, it definitely pays to first read the poor feedback left by previous customers, especially those that give one or two stars. If I had done that in the first place, I would have saved myself considerable frustration.

At the time of writing this article, the little truck is running well; it now has enough power to mix it with the trucks and cars on the highway.

Would I do it again? Probably, but just a bit more carefully! You have to do something to keep the mind and body active, don't you? 📱

“So, what have I learned from this retirement project?”



My completed minitruck is running well; it now has enough power to mix it with the trucks and cars on the highway

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1968 Ford Escort Mark 1,
Alan Mann Racing Tribute



YOU CAN'T BEAT THE FEELING

Who would have thought it would become such a worldwide motorsport star when Ford introduced the humble Escort in 1967? Its popularity, particularly in Mark 1 form, has now reached iconic status. We meet Elliot Frame, the owner of a very special Escort, an Alan Mann Racing replica, finished in tribute to his father. Most children love speed, and motorsport typically comes courtesy of a parent, and Elliott is no different. His engineer father, Mark, had a love for motorcycles and going fast; however, when children came along, he swapped two wheels for four, in the form of two Ford Escorts. Little did Mark know it at the time, but the humble Escort was about to weave its way into the family fabric once and for all.

ALSO FEATURED IN THIS, THE LATEST EDITION:

The Ayrburn Classic delivers, Delage journey to Art Deco Napier, Holden Commodore survivor, Asian Sorte part 1, Peter Bruin – race engineer/driver, Europe tour by Porsche, Ford Ltd – a Galaxie far away, a lady's Ferrari, Honda's jewel – the S600, Sydney concours, events, and much, much, so much more.

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THE Shed

QUIZ NO. 3

You've got a shed,
and you know how to
use it – but do you
really understand how
everything works?
Test your sheddie
knowledge here



1



What is the common name
for dihydrogen oxide?

- (a) Rocket fuel
- (b) Water
- (c) Antiseptic

4



What type of bolt is
shown in the picture?

- (a) Plough bolt
- (b) Coach bolt
- (c) Countersunk coach bolt

2



What is 4340 steel?

- (a) High-tensile steel
- (b) A grade of stainless steel
- (c) Mild steel

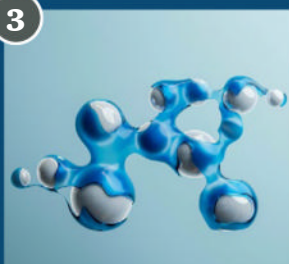
5



The website info.cern.ch
was famous for what
reason?

- (a) The first search engine
- (b) Predecessor of
Wikipedia
- (c) The world's first website

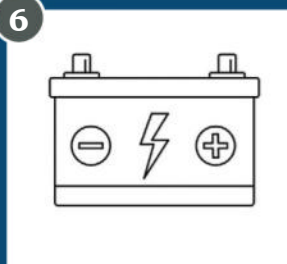
3



Which of the following is a
cyanoacrylate?

- (a) Synthetic oil
- (b) Marking blue
- (c) Thread locker

6



If you connect two 12-volt
batteries in parallel, how are
the terminals joined?

- (a) Same pole to same pole
(i.e., +ve to +ve)
- (b) Differing poles connected
(i.e., +ve to -ve)

7



In the previous question, what would the output voltage be?

- (a) 12 volts
- (b) 6 volts
- (c) 24 volts

8



What does the educational term 'STEM' stand for?

- (a) Simple technology engagement method
- (b) Science, technology, engineering and mathematics
- (c) Standard technical engineering module

9



What degree should Homer Simpson have (but doesn't)?

- (a) Thermodynamics
- (b) Electronics
- (c) Nuclear physics

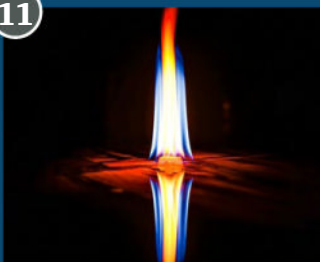
10



What sort of weapon is a Trebuchet?

- (a) Catapult
- (b) Bazooka
- (c) Land mine

11



Heat transferred through a metal is called what?

- (a) Reflection
- (b) Polarisation
- (c) Conduction

12



What is the pipe fitting in the picture called?

- (a) Nipple
- (b) Teat
- (c) Unifer

FUN FACT!

Did you know ...

Where the word 'shed' originates from?

According to Wikipedia, the word is recorded in English since 1481, as shadde, possibly a variant of shade. The word 'shade' comes from the Old English word 'sceadu', which means 'shade, shadow, darkness'. The Old English word is spelt in different ways, such as 'shadde', 'shad', or 'shedde', all of which come from an Old Teutonic/Anglo-Saxon root word for 'separation' or 'division'. The first attested usage of the word, in 1481, was in the sentence, "A yearde in whiche was a shadde where in were six grete dogges".

Answers

- 1 (b) Water (H₂O)
- 2 (b) High-tensile steel
- 3 (c) Thread locker cyanoacrylates are chemicals which set in the absence of air
- 4 (a) Plough bolt. These are, as the name suggests, used to mount plough blades
- 5 (c) The world's first website. It was created by British scientist Tim Berners-Lee, who is credited with inventing the World Wide Web in 1989 while working at CERN (European Organisation for Nuclear Research) as a means for scientists to share information
- 6 (a) Same to same
- 7 (a) 12 volts
- 8 (b) Science, technology, engineering, and mathematics
- 9 (c) Nuclear physics
- 10 (a) Catapult
- 11 (c) Conduction
- 12 (a) Nipple

How many questions did you get correct?



UNINTENDED CONSEQUENCES

By Nigel Young | Photographs: Nigel Young



A scene from the latest series of *Midsomer Murders* on our new 65-inch TV. There was an error in my final assembly – you may be able to spot it

Our decision to buy a new 65-inch TV was not as straightforward as you might think.

Our 15-year-old 42-inch Panasonic Viera had served us well, but we wanted a larger screen. The area in our small living room had only one place to put it, and it was 2400mm long, between a corner and a fold-back door to our deck. In addition to the TV, the space had to

Having successfully built a stylish kitchen table, Nigel reckons that he should now have a crack at an entertainment unit to house their TV and stereo. The result is satisfying, but the journey was not without its issues

accommodate a curtain for the fold-back door and two speakers on either side.

The speakers are 950mm tall and each has a footprint of 320x290mm. These are 200W AE speakers and are fed from a Rotel 160W integrated amplifier. The system sounds awesome, which is why we put our TV through it, preferring to use our stereo instead of a sound bar that is preferred these days. Perhaps I'm showing my age, but I've been around stereos and sound long enough to know what I like.

Decisions, accommodations, and existing technology

Two decisions then had to be made – if you don't count the 'What TV should I buy?' one, which added a further 43,000 questions over five separate showrooms, salespeople, continents, and online forums.

The number of variables in modern TVs is astonishing. The first question was how to install it – do we use a TV cabinet or do we attach it to the wall? The second was around the stereo connection and how to proceed with that. This also had an impact on our timeline – if we chose the TV cabinet route, which we did, then we'd have to have one before we could buy the TV itself.

As it turned out, there wasn't a provision for a wall-mounting bracket on the one we bought, which I was glad of, as I don't particularly like wall-mounted TVs – they seem isolated somehow, not really fitting in with the rest of the living area.

Is store bought an option?

Now the cost of TV cabinets – or 'entertainment centres' as they tend to be called – can be huge, with many being made from MDF – not a favourite material of mine. One of the reasons for the cabinet over the wall-mounted bracket was to accommodate the Rotel amp along with a DVD player that still gets occasional use. It, too, is an analogue RC plug system that needs to be allowed for, along with an Apple TV box. Cabinets also give a place to put remotes and the like, so we settled on that.

Our existing one was the classic scaffolding plank spanning black-painted concrete blocks – a cheap and great-looking alternative at the time. To be fair, however, the scaffolding plank is only 240mm wide, while the pedestal for the Panasonic is 320mm. So, we've always had to be careful about how we placed it. The plank itself is 2840mm long and 35mm thick, and when cut in

“I decided to match the look and feel as closely as possible”



All the pieces I need for the cabinet, along with the cutting schedule I drew up in SketchUp.



I've put a piece of masking tape on each piece to number them in accordance with my cutting schedule – it's intended to lessen any confusion ...

half, it gives us two shelves at 1420mm each. However, given that the concrete blocks are 190mm wide, the span only had to be 1040mm while allowing for a centre load of 16.5kg, spread over the 450mm wide pedestal. The last thing we wanted was for the shelf to sag.

We were able to get away with the 240mm width of the plank due to the TV pedestal. However, newer TVs don't use them – they have feet at either end to support the 65-inch length, and these are separate and require a minimum width of 350mm to provide the necessary support. It was interesting to learn that while the 42-inch Panasonic weighed 16.5kg, a newer 65-inch model would only weigh 6.2kg more, coming in at 22.7kg.

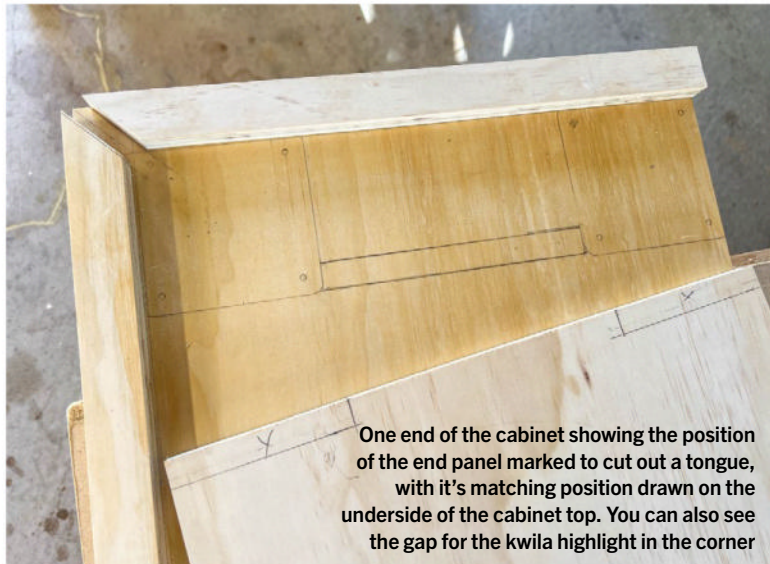
The planning

Since the scaffolding plank-and-concrete block solution was no longer workable, and an MDF solution wasn't even being considered, I decided to make it myself.

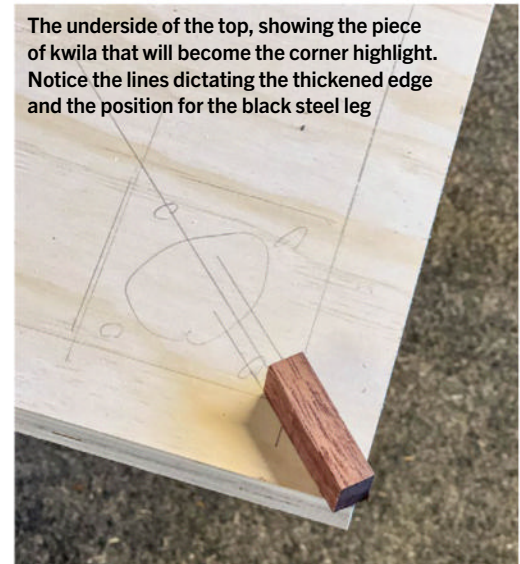
Several years ago, I had built our dining table, using 18mm ply, black tubular steel legs, and some mahogany highlights, so after a great deal of thought, I decided to match the look and feel of that as closely as possible.

To this, I would add a coffee table and two full-height bookshelves, which would get the same treatment. The coffee table would be two-thirds the length of the TV cabinet, while the bookcases would be 1000mm wide and 300mm deep. These will be covered in the next article.

I drew up several ideas in my sketch book prior to modelling it in SketchUp. I had also drawn up a preliminary cutting schedule, from which I decided I needed three sheets of the ply. The SketchUp version allowed me to improve on this, enabling me to lay out components from each of the three projects in the most economical way. I thought I was going to be able to get away with two sheets, but there would have been too much compromise, and I didn't want to do that. At \$90 a sheet for 18mm, 1200x2400mm non-structural ply, I'd rather spend the money and have some left over for another project on another day. I would be able to repurpose the



One end of the cabinet showing the position of the end panel marked to cut out a tongue, with it's matching position drawn on the underside of the cabinet top. You can also see the gap for the kwila highlight in the corner



The underside of the top, showing the piece of kwila that will become the corner highlight. Notice the lines dictating the thickened edge and the position for the black steel leg

original scaffolding plank and concrete block solution either in the office or out in the workshop.

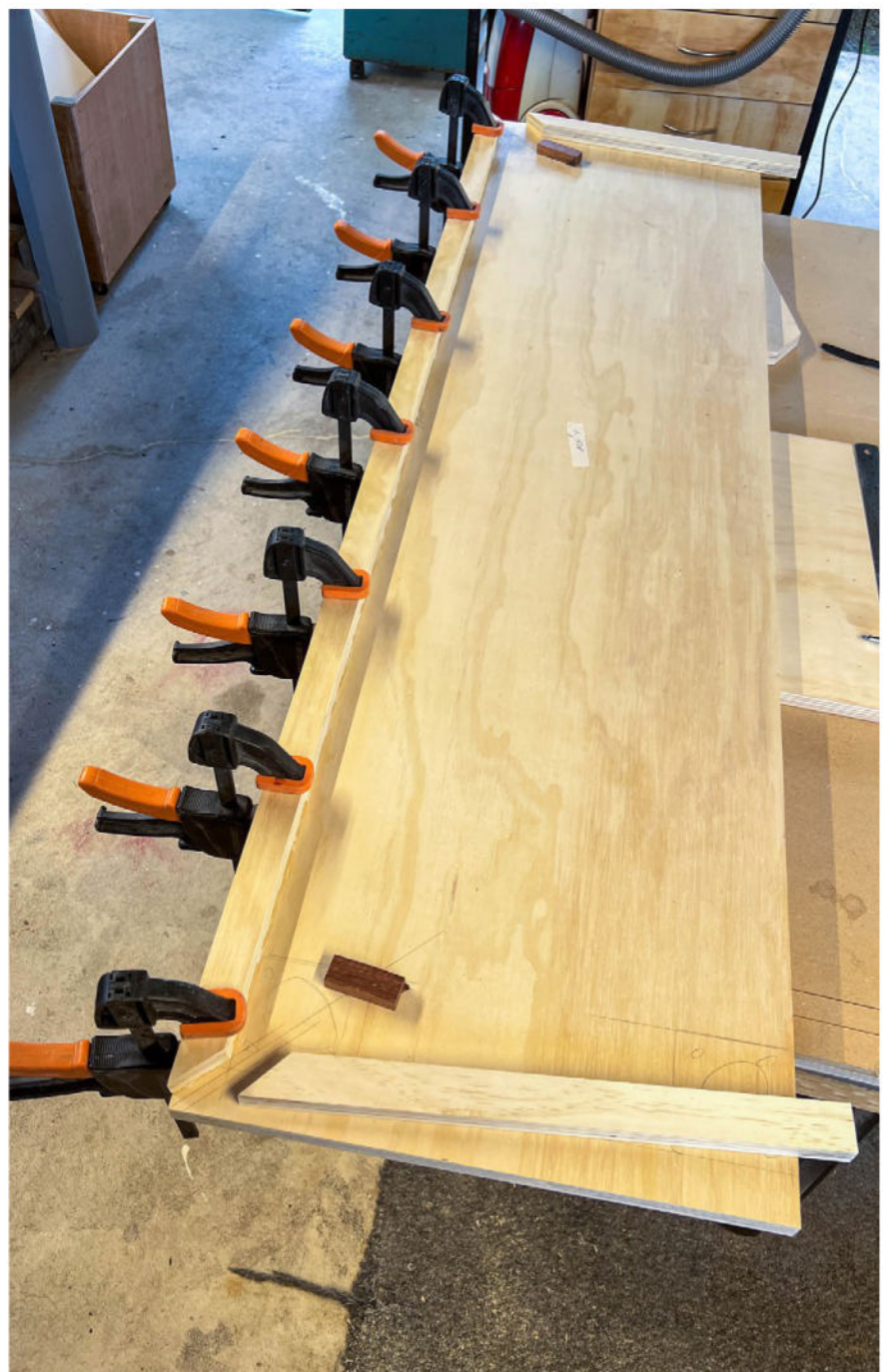
Other materials required

Apart from the ply, the only other materials I needed would be a piece of 6mm ply to go across the back and some black tubular steel legs to match the dining table.

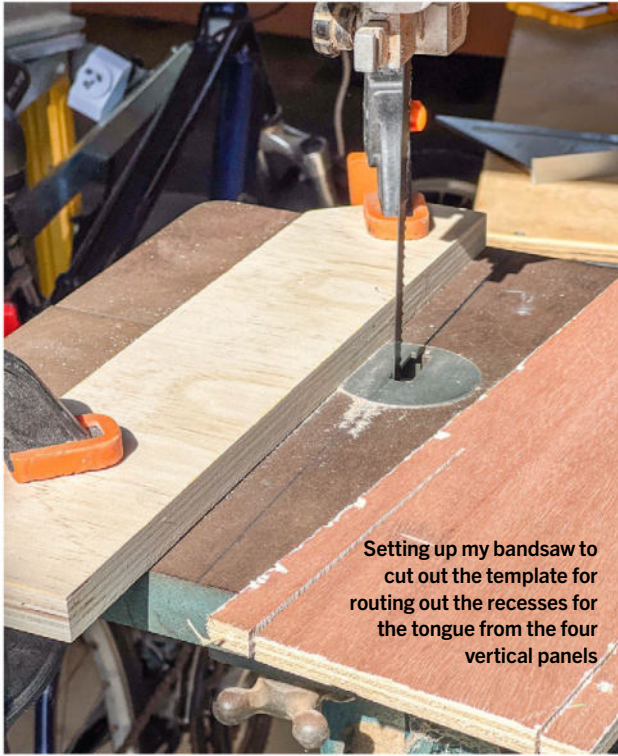
I would cut a hole in the back of the ply for cables and some airflow for the Rotel amp. I still had some of the kwila decking I had used for the corners of the dining table, so I could do the same highlights on each corner of the TV cabinet. I would also do them on the coffee table.

I bought the 18mm ply and black tubular legs and began. I stored the sheets on top of my 1220x2440mm assembly table, and then laid a sheet of 10mm MDF – an old cover sheet I had on hand – over the top. This allowed the edges to be kept back and therefore not exposed to damage, while allowing the ply sheets to be stored flat until I was ready to cut them up.

The TV cabinet was the priority, as we ended up buying the new TV prior to making the cabinet, and used it sitting almost on the floor – we had two 25mm thick, black-painted concrete blocks from the original stand. By putting black carpet on top, we could at least use it until the stand was ready. I was a bit nervous about this – between a rather large dog and two boisterous grandchildren doing handstands and the



The front part of the thickened edge glued in place



Setting up my bandsaw to cut out the template for routing out the recesses for the tongue from the four vertical panels



A piece of tape on my drill bit indicates the depth of the holes I drilled for the corners of the recesses for the vertical panel tongue

like, I was hoping it wouldn't get crashed into.

The process

First up was to cut the ply, and for this, I used a homemade track clamped to my assembly table.

The 200mm (eight-inch) skill saw is fitted with a 60-tooth Diablo blade, which produces a very fine cut, and by

allowing it to cut into the MDF cover sheet below, I didn't have to worry about the underside of the sheet chipping as the blade returned. I have a dust extractor fitted, and if you look closely, you can see the other two sheets below the cover sheet.

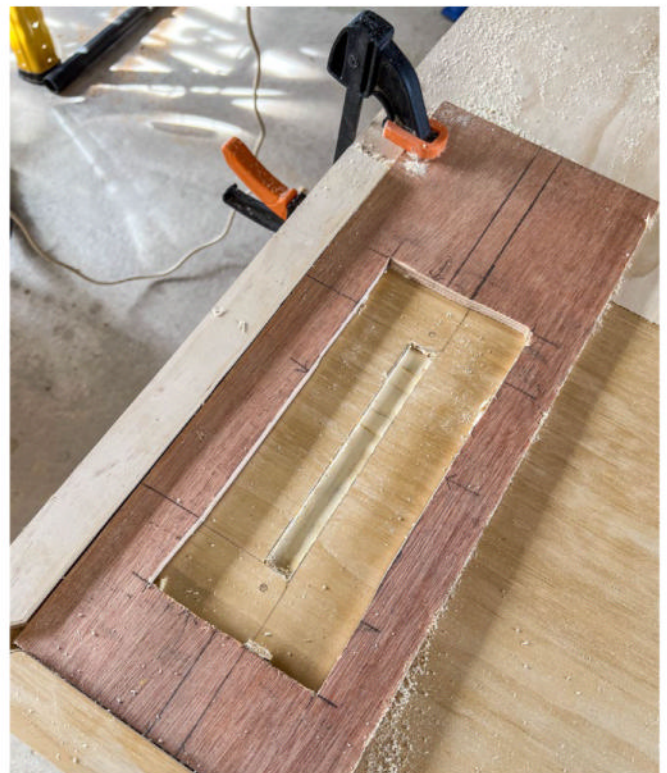
Once the pieces were cut out, I numbered them to match the cutting schedule I had drawn up in SketchUp.

Turning the top upside down, I marked out the edging, the position for the hardwood corner highlight and the position of the screw fittings for the black tube legs that would sit outside the actual cabinet. The edge was glued in place and would be rounded to match the dining table.

Next up was positioning a rebate, which would take the insert I would cut



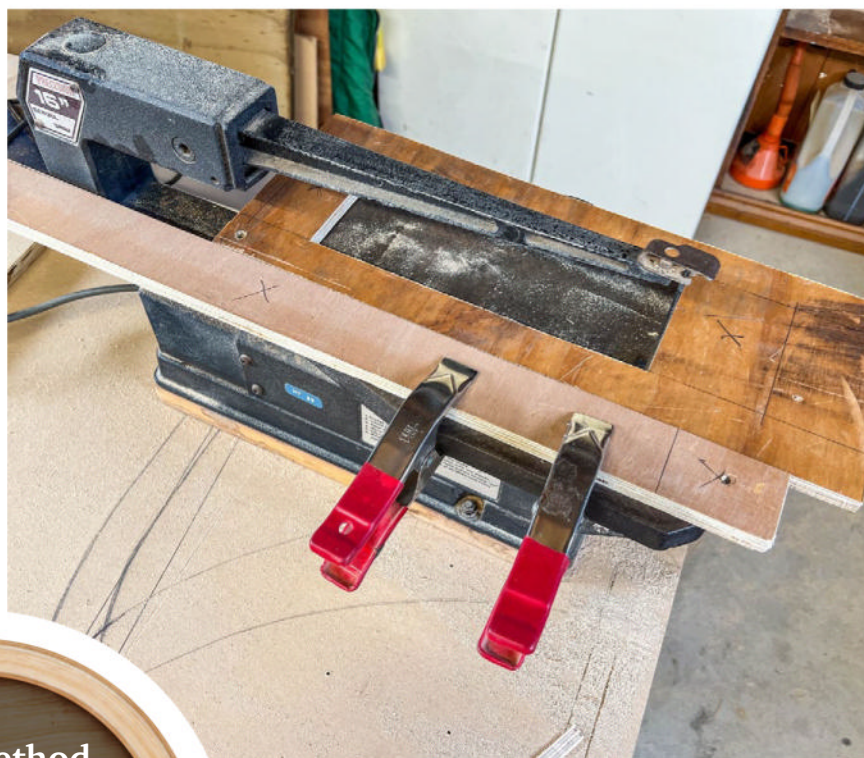
The hole I drilled in the middle so that I could mount it on my scroll saw



The template in place and the recess routed out



Using my router to cut out the recesses



Cutting out the router template on a scroll saw



out from the four vertical panels – two ends and two middle dividers.

To get these right and true four times, I made a template from scrap ply and used a scroll saw to cut it out. This was for my router, which I was going to use for the rebating. This required me to drill a hole in the middle to mount the blade within the ply, and then cut it out from there.

Scroll saws are great – I'm sure someone watched their wife using a sewing machine one day, and thought that the mechanism could be adapted to take a saw blade. I screwed the black tube legs in place to check everything fitted and that my cuts would be accurate.

I used a sharp knife to cut through the top layer of the ply, along with drilling holes in the corners to ensure a neat finish to the rebate. I put some masking tape around the end of the drill bit to know how deep I had to drill. The method worked well and I finished up with the underside of the top with its thickened edge, four rebates ready for their vertical panels, the four steel legs, and the corner highlights. ►



The underside of the TV cabinet showing the fattened edge at the front and on the sides, the gap for the kwila highlights in the corners, the recesses routed out for the four vertical panels, and the other panels and a black steel leg all waiting to be installed



The corner highlight glued in place, all set to be trimmed



Two of the steel legs and the soon-to-be vertical end panel. Once it was glued in place, there was no going back



The underside of the cabinet with the four steel legs in place



The underside glued and fixed in place. It was a bit messy but cleaned up quite well, and it was on the underside of the cabinet

Fitting the legs

The legs had to be fitted next, as the fixing would have to fit under the side panels, and once they were glued and fixed, there was no going back.

I was a bit nervous about this – but it simply meant that I had to check and recheck everything as I went, which is good advice anyway. The two end panels had to be 18mm longer than the inside ones, as they had to accommodate the depth of the base. I didn't do such a good job of this, but once it was sanded and finished, it wasn't so bad – and anyway, it was on the underside and wouldn't be seen.

I also learned a lesson about how too much sanding with ply will strip away the layer – it too was on the underside that wouldn't be seen. The middle panels were fitted next, and here was where I made my first mistake – although I still can't figure out how it happened, as I was constantly checking. See if you can



“I was a bit nervous about this – but it simply meant I had to check and recheck everything as I went”



Trying to keep everything square with a strap. Since I was planning on gluing the underside of the cabinet to the side panels, I clamped a piece of scrap ply to support it while the glue dried. The ruler was to prevent it from also being glued to the support

see it in the final pictures.

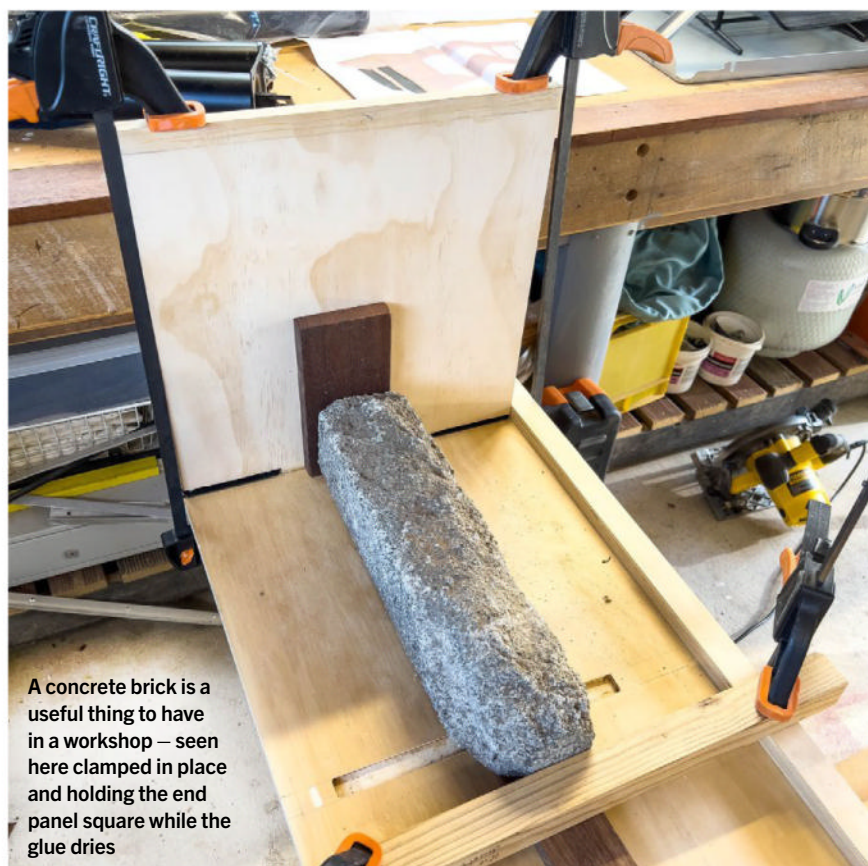
Finally, the corner highlights were glued in place. These would be cut back with a double-edged handsaw that I had bought for the job.

Shelves and finishing

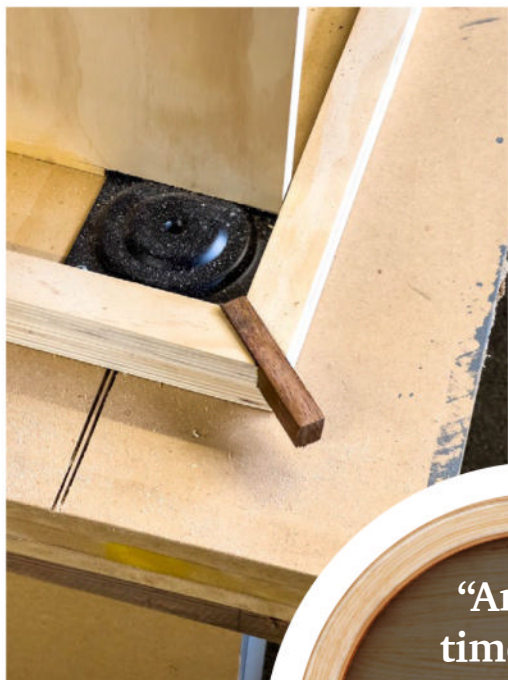
I had drilled the middle panel to accommodate a shelf for the Rotel amp with the DVD player and Apple TV box beneath.

Next, I cut out a sheet of 6mm ply for the back. I cut holes in the middle for the cables and airflow and then screwed it to the back as it braced the whole cabinet. The legs were fitted and fixed to the actual sides with a very discreet screw through the lower part of the sides. These ensured that there would be no movement between the legs and the cabinet.

Finally, I gave it several coats of Danish oil. I had previously done this to the underside of the top, as that was the only opportunity I would have to do it



A concrete brick is a useful thing to have in a workshop – seen here clamped in place and holding the end panel square while the glue dries



Kwila corner highlight in place. It would be trimmed back and then rounded off when I put a bull-nose around the thickened edge

properly. Once I've made the matching coffee table and bookshelves, I'll update the kitchen table to match and then tint them all the same.

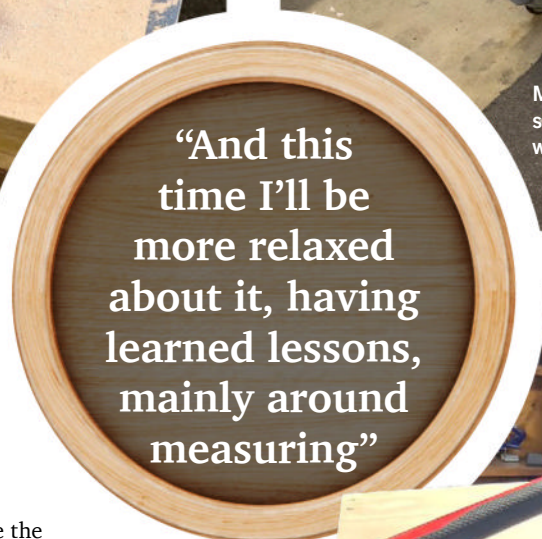
Lessons learned

While my kitchen table was the first time I had really tried something like this, the TV cabinet truly was a step up.

The planning and process were critical for me – SketchUp really is a great tool for this. There is actually very little that I will change when I come to build the coffee table. Apart from design differences, the construction process is still the same.

I still have the template I used for rebating the underside of the top to take side panels, along with scrap kwila for the four corner highlights – the TV cabinet only had two. I only used two-thirds of a sheet of the 18mm ply, which left me with the other third for future projects.

From a cost point of view, the four legs were under \$10 each and the ply was \$90. So, just on \$100 in materials, and we're pleased with the result. Next will be the coffee table – and this time I'll be more relaxed about it, having learned lessons, mainly around measuring, even though I was convinced I had it right. Oh well, one of the first lessons I ever learned was measure twice, cut once. And perhaps several more times – just to make sure. 📏



My concrete brick, still doing duty as a weight. These middle panels were also screwed in place, since they couldn't be seen anyway



The TV cabinet all set to go once the corner highlights are trimmed and the bull-nose formed

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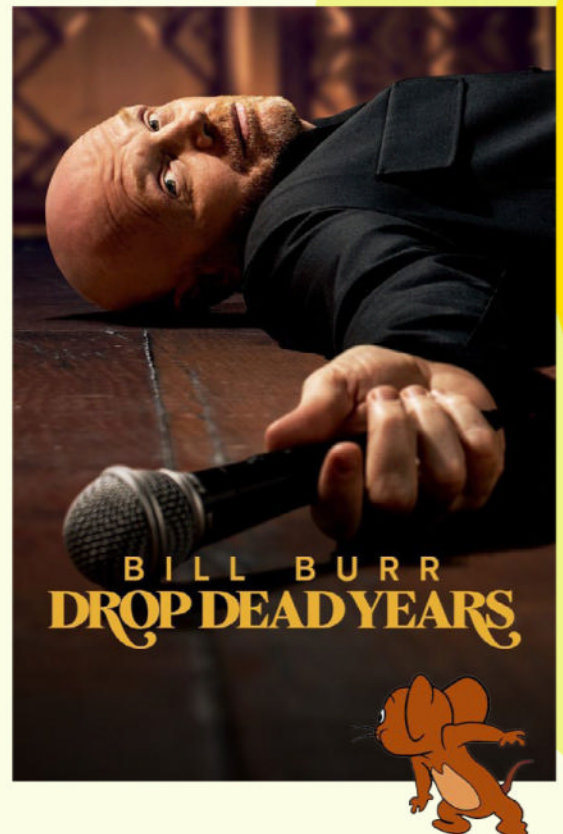
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Helping grow the country

THE DROP DEAD YEARS

By Mark Seek | markseek@rocketmail.com

Our *Shed* shrink suggests there is a cunning way to avoid an earlier-than-anticipated meeting with your maker: have a laugh and have one often



Firstly, let me explain the title of my article.

Yes, you could say it's a bit dramatic. The person to blame for my topic shed dwellers (most importantly you male shed dwellers) is none other than standup comedian Bill Burr.

Burr attempts to make light of the claims that statistically men between their mid-forties through to 61yrs of age are "at risk of dropping dead!" and yes, this is a uniquely male phenomenon.

When I heard this, I panicked a little because, according to my calculations, I only have 2 months to go until I'm past the "at-risk-of dropping dead" and that I will most likely die from some long-term prognosis rather than falling face down into my bowl of cereal.

What about women?

If us blokes are dropping like flies, how do women fare?

Well, according to statistics it is highly unlikely that a woman will die from "dropping dead" You can watch his entire standup show on YouTube and I can tell you it's better to hear it from Burr than some GP or other health professionals as they tend to leave humour in the waiting room.

Humorous stories about human frailty often collide with the reality of my work in the mental health space. Funny anecdotes can surely be helpful when my day includes discussions about suicide, addiction and the myriad of mental disorders, etc. "Humour is the best medicine" is a phrase I'm sure you have all heard. So why are laughter and humour necessary? And how does it trick us into feeling good?

A good laugh

Some of the best comedians often entertained WW1 and WW2 troops at a time when they needed some cheering up.

Many entertainers honed their craft with servicemen and women. Legends like Bob Hope and Dick VanDyke amongst others. Novelist Mark Twain once said, "Humor is the great thing, the saving thing after all. The minute it crops up, all our hardnesses yield, all our irritations, and resentments flit away, and a sunny spirit takes their place." He's certainly got a point.

Humour may very well be the best thing. It's true: laughter is a strong medicine. It draws people together in ways that trigger healthy physical and emotional changes in the body. Why

not try attending a stand-up comedy night? The physical benefits of laughter can strengthen your immune system, boost your mood, diminish pain, and protect you from the damaging effects of stress. Nothing works faster or more dependably to bring your mind and body back into balance than a good laugh.

Being essentially happier

Humour lightens your burdens, inspires hope, and connects you to others, including the ability to keep you grounded, focused, and alert.

If I have failed to convince you by now, here are some other interesting facts. There are three emotions hardwired into our beings: Happiness, sadness and anger. So, if we can understand this, it may help us to pay more attention to the source of being essentially happier.

As children, we used to laugh hundreds of times a day sitting in front of cartoons, shows like Tom & Jerry, The Wacky Racers and in more recent times The Simpsons and Sitcoms like, Home Improvements and Tool Time with Tim Allen.

Being adults, we may have convinced ourselves there are more important things and laughter is relegated to childish practices. Adult life tends to



Dai Henwood –
legend!



**“As children, we used
to laugh hundreds of
times a day”**

be more serious, and laughter is more infrequent.

Taking the piss

Recently, I’ve become acquainted with some blokes who ride motorcycles in my neck of the woods.

I have enjoyed their company and often when we’re having a coffee out comes the friendly banter, mostly about how they think about Harleys; Yes, my new bike is the object of ridicule humour and the taking of the piss.

What I’ve noticed about this interaction is that it makes me feel happier (my wife has noticed this too). Laughter boosts the immune system. Laughter decreases stress hormones and increases immune cells and infection-fighting antibodies, improving your resistance to disease.

Laughter triggers the release of endorphins, the body’s natural feel-good, natural high chemicals. Endorphins promote an overall sense

of well-being and can even temporarily relieve pain. Laughter protects the heart as it improves the function of blood vessels and increases blood flow, which can help protect you against a heart attack and other cardiovascular problems. Laughter burns calories too, okay, so it’s no excuse not to renew your gym membership for 2025. Still, one study found that laughing for 10 to 15 minutes a day can burn approximately 40 calories – which could be enough to lose 1-2 kilos over the course of a year.

The key to a long life?

Laughter lightens anger’s heavy load.

Nothing diffuses anger and conflict faster than a shared laugh. Looking at the funny side can put problems into perspective and enable you to move on from confrontations without holding onto bitterness or resentment. It may be just a little bit of a stretch to say it may even help you to live longer.

However, a study in Norway found

that people with a strong sense of humour outlived those who don’t laugh as much. The difference was particularly notable for those battling cancer. Kiwis, now we have a quirky sense of humour and over the last 20 yrs or, so our comedians have been very successful not only at home but on the big stage with the likes of the Flight of the Concorde, Billy T James, Fred Dagg and Tofiga Fepulea’i – one half of the duo The laughing Samoans.

It’s important that we can laugh at ourselves and avoid getting too hung up on being too PC. So, there you go, one more reason to get out of the house, treat your better half to a night out and show up to one of those comedy nights. Support your local comic relief. They can help in more ways than perhaps you were aware of, and if that’s not feasible, look up some YouTube comedians of the past: Billy Connolly, Robin Williams and our current own Kiwi legend Dai Henwood. 📺

BILL AND HIS HARLEY

60 years and counting

By Vicki Price | Photographs: Vicki Price

Bill Jackson's dad was an engineer and decided that his son should go to university to study law, unlike the rest of the family. However, strong engineering genes shone through, and in the '50s, Bill accidentally became interested in restoring American motorcycles. The result: a sheddie was born



You know you are visiting a Wellington sheddie when, like a hobbit climbing a mountain, you ascend steep outdoor steps to access his shed – which stands as if it is propping up the rocky cliff behind it.

Technically, this is one of three shed spaces used by retired accountant Bill Jackson. And despite tricky access, or perhaps because of it, it is his favourite. Bill's not sure what this old building used to be, but an "old boy" once told

him it had been a gambling destination for the horse-racing fraternity. It certainly feels like history. It is a shed with an old soul.

The view is another advantage for a shed up high: the sun streams in, making it warm and light. Despite the steep steps, Bill and his mates managed to lug up there a metal lathe, drill press, and other equipment, as well as all his tools and other general paraphernalia that accumulates in proper sheds.

What goes up must come down, and

so it is when bikes that Bill has restored need to be carried down (with the help of mates) to ground level, where they enter his other shed for final additions to be worked on.

Bill's sheds have been busy over the years

"At one time, I had the remains of about 18 bikes here, old bikes, 100-year-old stuff," Bill says.

Not now; he has sold them all, except for a couple that he has special



It has been nearly a lifetime love affair between Bill and his Harley-Davidson

relationships with. One, a 1918 Harley-Davidson, he has had for nearly his whole adult life, and it was this bike that instigated his long love affair with bike restoration. The other is a 1919 Indian with a sidecar. The last bike that he sold (another old Harley), he had worked on until it was almost finished.

"I'd done most of it," he says. "I basically had finished it, but I hadn't painted the frame, and I was faced with pulling the whole bloody thing to pieces. You know, I'd built so much stuff for it, I

"One, a 1918
Harley-Davidson, he has
had for nearly his whole
adult life"



Bill and his wife Nola enjoyed many pleasant rides around the South Island in this Indian and its sidecar

just couldn't face pulling it apart again." So, he sold it.

Business time for Bill

An accountant might not seem the most likely shed enthusiast, but Bill's family, going back 200 years, have been handy with their hands and brains; many of them were engineers.

Bill might have been one himself, but his father, Albert Jackson (who had his own engineering factory in Wellington's suburb of Miramar), encouraged his son to pursue an academic career, good as he was with his schoolwork. All of Bill's brothers joined their father in his business, so Bill's university-trained

career was a bit of an anomaly for the Jackson family.

Bill reckons that if his father had had the opportunity, he would have gone to university too, but he didn't even go to secondary school, because in Australia where he lived then, you had to pay to go there. Instead, he was apprenticed at 13 years old.

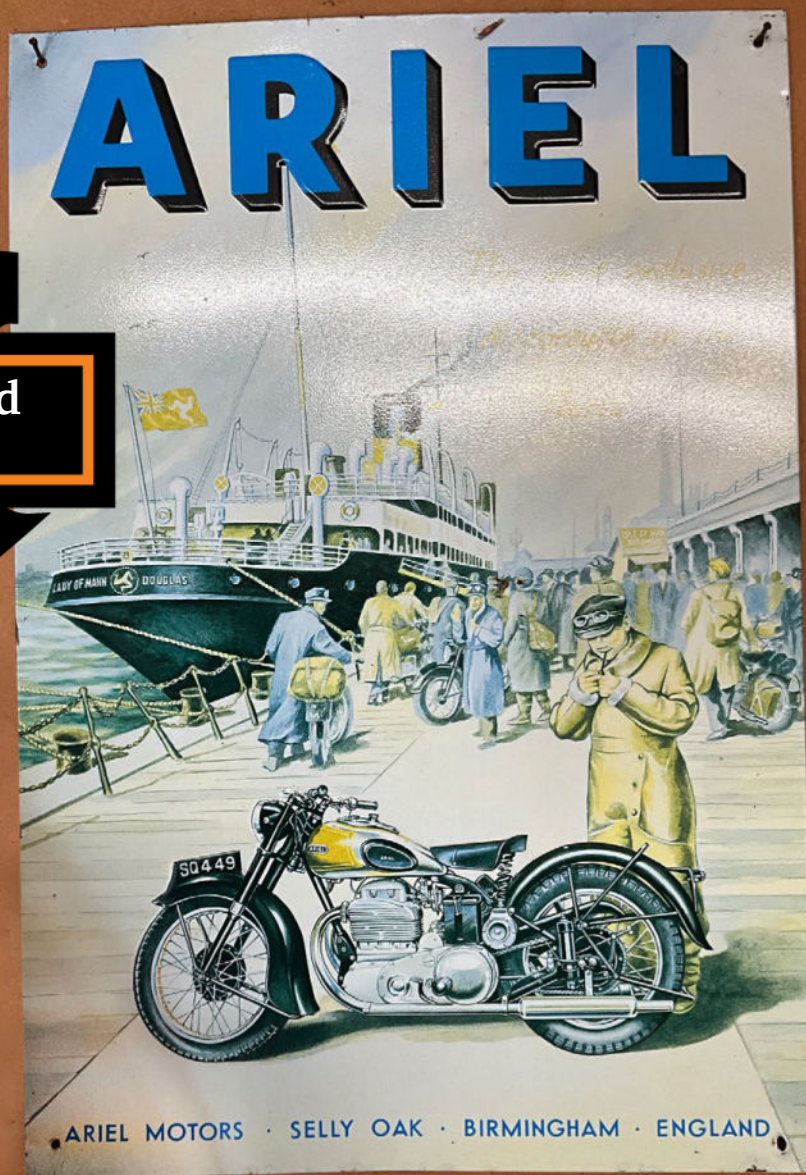
"But he was a very clever guy," Bill says. "If he'd been born today, he would have gone and got a degree." Bill remembers helping his father in his business after school and during school holidays. After his dad sold his factory in Wellington, he began a small engineering business on the

Kapiti Coast, in Raumati, making wrought-iron furniture and the like. Bill was roped in to help.

"I didn't particularly want to," he laughs, "but he said, 'you're coming in to help me', you know." It was the early 1950s and a newly emerging settlement. Albert had built his business in Wellington into a large factory, employing about 30 guys, making drill presses, guillotines, and other big machinery, but the business in Raumati was small scale in comparison, and after four years, the family returned to the city.

"We moved into the same street we lived in before, but not the same house."

**“A \$500
deal was done, and
a new sheddie
was born”**



The sheds have various paraphernalia decorating the walls, including this old advertisement for Ariel motorcycles

A love affair begins

Bill had a hardware shop in Wellington's southern suburb of Kilbirnie when he accidentally became interested in restoring American motorcycles.

He recalls: "A chap across the road had a business where he was buying wrecked cars and pulling them to pieces and everything, and I'd sort of got friendly with him and would go over and have a chat when I had nothing to do.

"One time I went in there, he had a motorbike sitting there; it was an English one. It didn't have a motor in it, but other than that, it was all there. It was an Ariel, a 1950s Ariel. And I looked at it and said, 'Oh that looks interesting'."

At that stage, Bill didn't have a hobby other than attending to things around the house. He asked the guy where he got the bike from, and he replied that he'd found it under a house in Lyall Bay. Bill asked if he had the engine and everything, and the chap said, "Oh yeah, that's all upstairs."

Bill asked him what he wanted for it, a \$500 deal was done, and a new sheddie was born.

A lavender Harley haze

In true sheddie fashion, when Bill went back with his trailer to collect the bike and its parts, it wasn't the only thing he left with. The guy suggested that Bill

might like to add another bike to his trailer.

"He said, 'You might as well take that Harley-Davidson over there with you.' I said, 'What Harley-Davidson?'" Bill went over and lifted a sheet. What he saw was just a frame, a petrol tank, a back mudguard, a rear stand, and no forks or handlebars. When he got home, Bill lost interest in the Ariel straight away.

He started looking for parts for the Harley. "That's what got me. I could see how old it was. It had the original paint on it. I got very lucky and got bits and pieces from everywhere." One of these sources was a guy in Napier, who Bill came across in a vintage car magazine,



Bill's Harley had many admirers when exhibited in Te Papa



The flash new 'warning system' (horn) was a welcome addition to the Harley

"Harley didn't make purple bikes; they were green (after the war; grey before)"

advertising that he had some early Harley parts.

There, Bill found a petrol tank, all the linkages, and the motor and gear-box, most of which somebody had painted purple. The guy had got it all from a farm. Bill bought it off him for "next to nothing".

Years later, Bill and his wife Nola visited the museum near where he'd bought the Harley parts and noted to the gentleman who ran it that it was a great museum, but there weren't any motorbikes. The guy replied that he had had motorbikes there, but that he had sold them all, although he did have a few bits and pieces in the shed – Harley bits and pieces.

Naturally, Bill asked if he wanted to sell them. There was a petrol tank and a pair of mudguards, and they were purple. Harley didn't make purple bikes; they were green (after the war; grey before). "So, it had come off the same bloody bike!" Bill says. Apart from a missing frame, he now had the makings of one bike, giving him more impetus to restore the thing. "I think I was meant to have it, that's what I've always felt."

World famous in Wellington

When asked if he rides the Harley, Bill explains it has never run. "I finished it for the 'hundred years' exhibition at Te Papa. "Somebody told them that I had it. I'd finished it all, but it wasn't put together. They said, 'well if you can promise to put it all together, we want to put it in the museum.'"

Bill and a friend went to work. But when they came to put the exhaust valves in (they have a little hole in the end to hold the spring), the valves were hardened steel, and despite using all sorts of equipment, neither one of the men could drill them. Bill figured that as they were an internal part of the bike, no one would see them, so they left them out.

The bike got a lot of attention at the museum, and Bill never got around to putting the valves in. Eventually, he heard about a guy who could drill into the valves, and as he had to make up the system to be able to do it, electrically, it cost him \$275 to have the two holes drilled. "The guy said if you come back with anymore, it'll cost you bugger-all,

but I've had to make up the equipment to do it."

That first bike led to more bikes. "I started picking up things left, right, and centre." Bill has restored about six or seven and has sold them on. "It's a great hobby actually – well, for someone like me; even though I'm an accountant, I love working with my hands," he explains.

Another lucky find

Up in the back shed, Bill has a milling machine, a sandblaster, and a lathe.

After the bikes are worked on here, they are moved down into the front shed, where he does the tidy-up and finishing work. When it came to the Harley, it was while on a holiday in Australia that Bill discovered a real treasure to help complete the bike.

He was visiting a friend in Queensland, who offered to take him to see a friend of hers who had motorbikes: "At this stage, I was collecting parts for this and had pictures of another bike. I was talking to him, saying, I've got a fair bit of this, but I'm still looking for a bit of this, that, and another. He said, 'That's interesting, hang on a minute.'"

The friend went downstairs to his garage and came back up with something.

"He said, 'I've had this for 30 years – it's yours.'"

It was the exact right seat for the bike. Bill says that he's never seen another one. "Usually, the seats are not Harley-Davidson, they've got another name on them. But this is an absolutely original one. That's the sort of luck you get sometimes." But when Bill brought it back to New Zealand on the plane, customs wanted to confiscate the seat, as it contained horsehair. "And I pleaded with him, I said, 'Look, I've never seen another one' ... and the guy said, 'Alright, take it.' I was a bit lucky."

"The Silent Grey Fellow"

Bill does all his own turning and made a "helluva lot of stuff" for the bike. He remade the metalwork on the front, the chain-guard, as well as other bits, including about "every nut and bolt", he says. He needs the carburettor re-plated before it is put back on the bike.

"But there're no platers around anymore." ►



Lucky to be here: this original seat must have charmed customs at the border, when Bill brought it home from Australia



A rider's-eye view, the like of which many thousands around the world would have enjoyed



Pin-up Harley – Bill's first love in vintage bikes

The 1915 Harley is one of only two in New Zealand; the other one is in the Motorcycle Mecca Museum in Invercargill. The website describes the bike as the oldest Harley-Davidson found within their collection and was “equipped with a solid V-twin engine developed for the rollout of its 1915 models [and] included a staggering 29 modifications compared to previous models, as well as a three-speed gear-box (instead of the earlier two-speed hub unit)”.

It was the last model to feature a tank with square corners and was so successful that it became the highest selling Harley bike at one point. “The racing version was particularly popular with dirt oval and board track racers,” it says.

In 1907, the V-twin engine gave about double the power of its single predecessors, and this, with its new top speed of 60mph, led to production jumping from 450 motorcycles in 1908 to 1149 in 1909.

The 1919 rollout upgraded the engine with a mechanically driven oil pump, enabling, unusually for the time, a one-year guarantee to be given with each new bike. It even had a ‘warning system’ – an electric horn. A British advertisement described the bike as “Powerful, yet remarkably quiet and docile”, calling it “The Silent Grey Fellow”.

An Indian for the road

Unlike the Harley, Bill has ridden the Indian a lot.

His father made a sidecar for it (he had the original, but it was bugged



Built in 1919, this bike has seen a lot of action



Bill's father Albert made a new sidecar for the Indian, after the original wooden one needed replacing



Thin spring steel wound around the pins at the base of the pistons kept the bike going – until it didn't



Bill worked out how to make his own spokes



“It's a really comfortable ride,” Bill says of the Indian

and made of wood), and Bill took his wife around the South Island in it several times.

"It's a really comfortable ride. With my wife in the sidecar, the luggage on the back, bags on the carrier, it'll do 60 miles an hour," he says. The pair stopped off at bike shows around the South Island and found that spectators showed a lot of interest in the old Indian, except in Gore, Bill observed. He enjoyed taking local kids for rides in the sidecar at the shows, which was very popular.

The bike has a 1000cc motor. A veteran Indian is pre-1918, so as this one was built in 1919, it just misses out on that classification. But it has only had three owners. Bill repainted it, and he had to re-do the motor, as it had blown up: "When I pulled it apart, the guy I bought it off, he reckoned he'd done the motor, but he hadn't. Typical, y'know."

One day, after the bike stopped going, Bill made an unpleasant discovery. Instead of ball bearings at the bottom of the pistons, there was a thin piece of spring steel wound around the pin.

"I think it probably happened in the war, because an old guy told me this is what they used to do. The motor probably blew up, and what they did was they didn't put the ball bearings in the bottom; they just wound a piece of spring steel around the pin. And we did thousands of miles on it like that! And then one day, it just stopped going, and when I pulled it apart, I just could not believe it," Bill says.

The bike was quite noisy, with a loud rattle, but it went fine. Then, at the local polytechnic, Bill met a Dutch guy

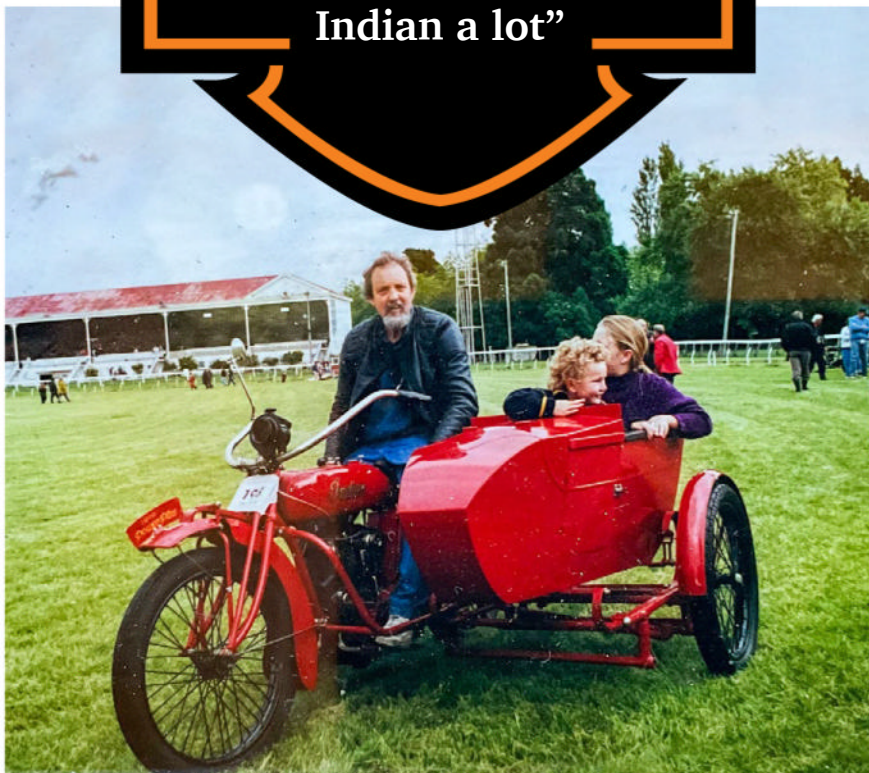


Bill holds a treasured photo of his wife Nola and himself on one of their many rides together

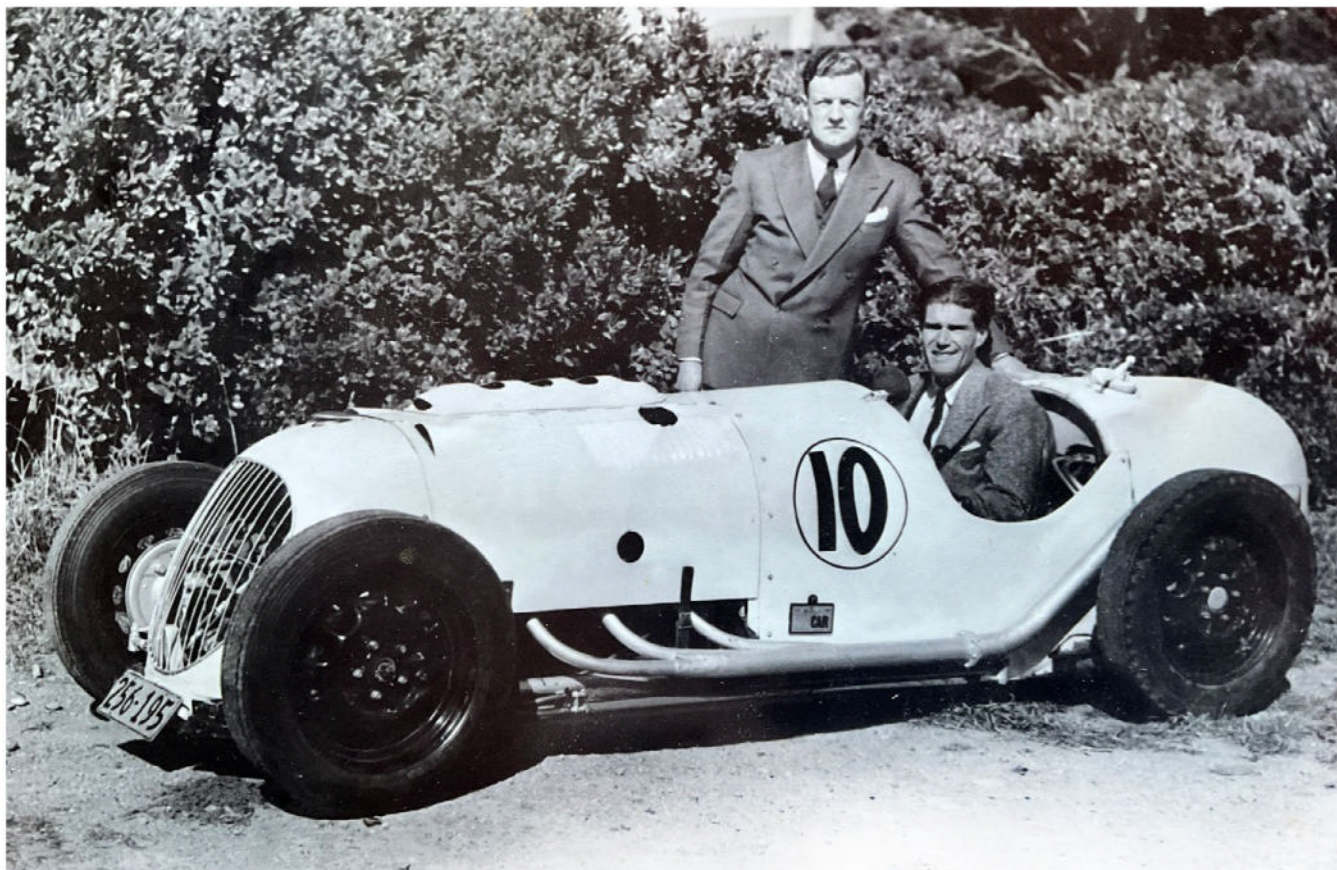
"Unlike the Harley, Bill has ridden the Indian a lot"



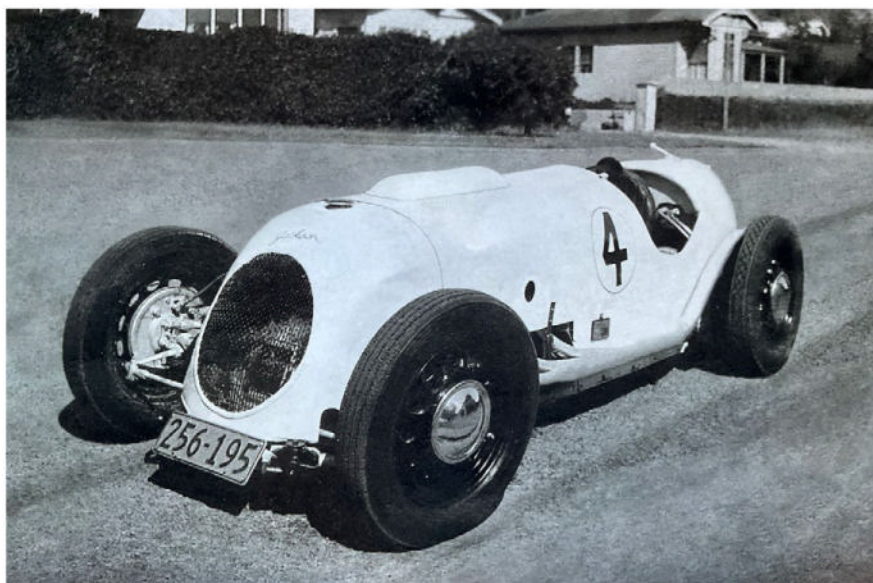
The bike had been quite noisy with a rattle, before Bill discovered why



Generous with his time, Bill made many kids happy, giving them rides in the sidecar while attending bike shows around the country



Bill's father, Albert Jackson, stands beside his foreman-turned-race car driver John McMillan, in the car that Albert built. Together, they won New Zealand's first Grand Prix in 1950



The Jackson Special

**"You can't
imagine the
heat inside a motor with
a wooden piston, but
apparently,
they worked
fine"**

who told him that, during the war, if a piston broke, they would put a wooden one in because they couldn't get the metal: "They'd turn up a wooden piston. Now, you can't imagine the heat inside a motor with a wooden piston, but apparently, they worked fine. It's just amazing what people do."

New Zealand Grand Prix 1950

All this engineering and tinkering prowess surrounded Bill growing up.

As a lad of 10 years, he recalls seeing his father's race car in the shed. Albert built this car in his factory in Miramar, giving it a '39 Mercury V8 motor and Morris Oxford wheels.

It reached speeds of 160mph, which helped it win New Zealand's first Grand Prix at Ohakea in 1950, with factory foreman John McMillan behind the wheel. Albert sold the car he'd named the 'Jackson Special' soon after the race. It still exists, but everything on it has been replaced or modified, so that when Albert saw the car years later, he told the owner, "There's nothing left



The milling machine stands in front of the blue sandblasting cabinet



Bill and the Harley during its restoration

on that car that I built. It's completely different."

Burt Munro and a shed closer to heaven

Bill recalls meeting this famous and ultimate of sheddies, in Invercargill, Burt Munro: "I actually met Munro once. A friend of mine took me to his place. He was living in a garage with a dirt floor, with a bed in the corner, and I think he had an outside toilet." Bill remembers him as being quite friendly but not very popular with the local community. "I think he was always trying to get something for nothing," he says.

We trek through the garden to another shed, where we find Bill's lathe.

"My younger brother's a toolmaker, and he gave me a couple of lessons on it, and, without skiting, I've become pretty excellent. I've made things for people that they can't get made anywhere. I really like turning."

A friend of Bill's, when he was in his early 20s, owned an Indian Scout that he wanted to restore and improve along the way. Bill doesn't agree with making



Bill has many great memories made with the Indian



Bill sits astride 1000cc of horsepower



This family-built drill press was only just saved from being sent to the tip



improvements on old bikes; he prefers to replicate the original parts.

His mate had bought cylinders from Australia, which were longer than the original ones, chosen because they went faster. But when he put these cylinders on, they came up further than where the original ones sat, and so the manifold didn't fit. When he went back to the people who made the barrels, they didn't make them anymore. So, Bill offered to make him one.

"It was a big job, I tell you, and difficult," he says.

He had the barrels on his table when his tool-making brother and a friend visited: "His friend picked it up and said, 'Where did you get this from?' And I said, 'I made it.' He said, 'Really?' So I told him the story." Bill's tool-making brother said, "Well, I couldn't have made that"; whether he was telling the truth or not, I don't know."

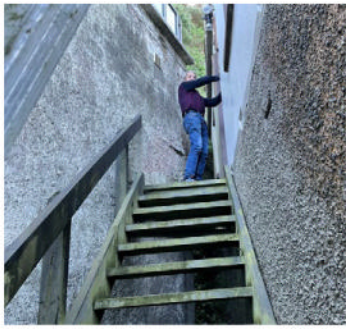
Gudgeons of steel in thousands of an inch

Bill's mate in the Hutt Valley, who is an ex-engineer, has grinding equipment, which came in handy one time when he was making gudgeons. A friend of Bill's has a 1915 Indian, "his motor was buggered", and he couldn't get anyone to make the pair he needed.

"When you make these things, you have to have them hardened," Bill says. "You have to make them so they're oversized, about 12,000th of an inch oversized, so they're quite easy to make, I think, because you're not too fussy; it doesn't matter whether they're 10 thou over or 12 thou over. Then we'd send them away to have them hardened and then I'd take them down to my mate and he grinds them down (the hardening goes through to about 25 thou) so he can take 10 thou off and they're absolutely perfect."

It's the older bikes that Bill enjoyed working on as it is these that he could make parts for. He enjoyed working on newer models too, "but there's not that much you could make. Whereas with these old things, you can make everything. I've made mudguards, petrol tanks[, and so on]."

It's in his blood. The drill press in Bill's shed was made by his father, and when



Heavy lifting: Bill and his mates have carried many motorcycles up the steep steps to this shed-with-a-view, along with the machinery to work on them

“You’re not gonna bloody give this away – Dad made it”



Bill Modelling a vintage helmet for a laugh



It's been quite a ride — despite never having ridden the Harley, he has enjoyed tinkering on it and many other bikes for a shedload of years

his brother didn't want it, it came here. "My brother had it, and I went up to see him. He was shifting house, and he was gonna give it away, and I said, 'You're not gonna bloody give this away – Dad made it!' And I tell you what, it works really well, it's not rickety or anything; I use it a lot."

Fascinating stuff

Bill says that he ought to have a clear out and throw a lot of stuff away, "but I can't bring myself to do it".

One gadget is for making wheel spokes: "I spoke my own wheels. You have different sizes depending on the thickness of the spokes. Somewhere, I've got a thing that you set them up on there, and you 'true' them. You run it around and tighten the spokes, put them on one side, and pull them over. You're spinning it and can see where it's running out [of alignment]."

Bill learned his skills from polytechnic night classes, and his brother gave him two lessons on a lathe. The lathe in question was bought from an old guy in the Hutt Valley. It's an old machine, but "perfect for the sort of work we do; that's what they're made for". It was duly dismantled and carried up the stairs to the workshop.

The lathe joined a collection of English carburettors from the '30s or '40s, a sidecar circa 1915 that Bill had saved from a guy who was going to throw it away, and other historic items that clutter up this amazing shed, although nowadays it is a lot emptier than it was a few years ago.

Finding a sought-after part in a box of parts at an auction usually meant buying the whole box; office furniture that was going to be taken to the tip ended up here, and architectural plan drawers now contain motorcycle parts.

"I actually should have been an engineer – gone to university," Bill says, "I don't know why Dad didn't want me to be that; he wanted me to be a lawyer – and I did a year of that and didn't like it at all – it was boring as."

So, Bill switched to accounting. And became a sheddie. 📁



The Myford Super 7 lathe was first produced in England in 1953 and is still widely in use today



Bill's sheds have been and continue to be his happy place

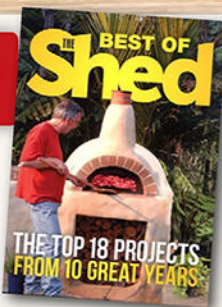
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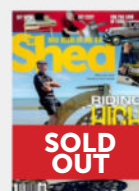
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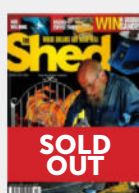
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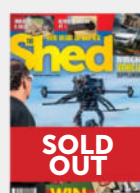
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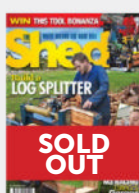
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Apr-May 2016



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June-July 2015



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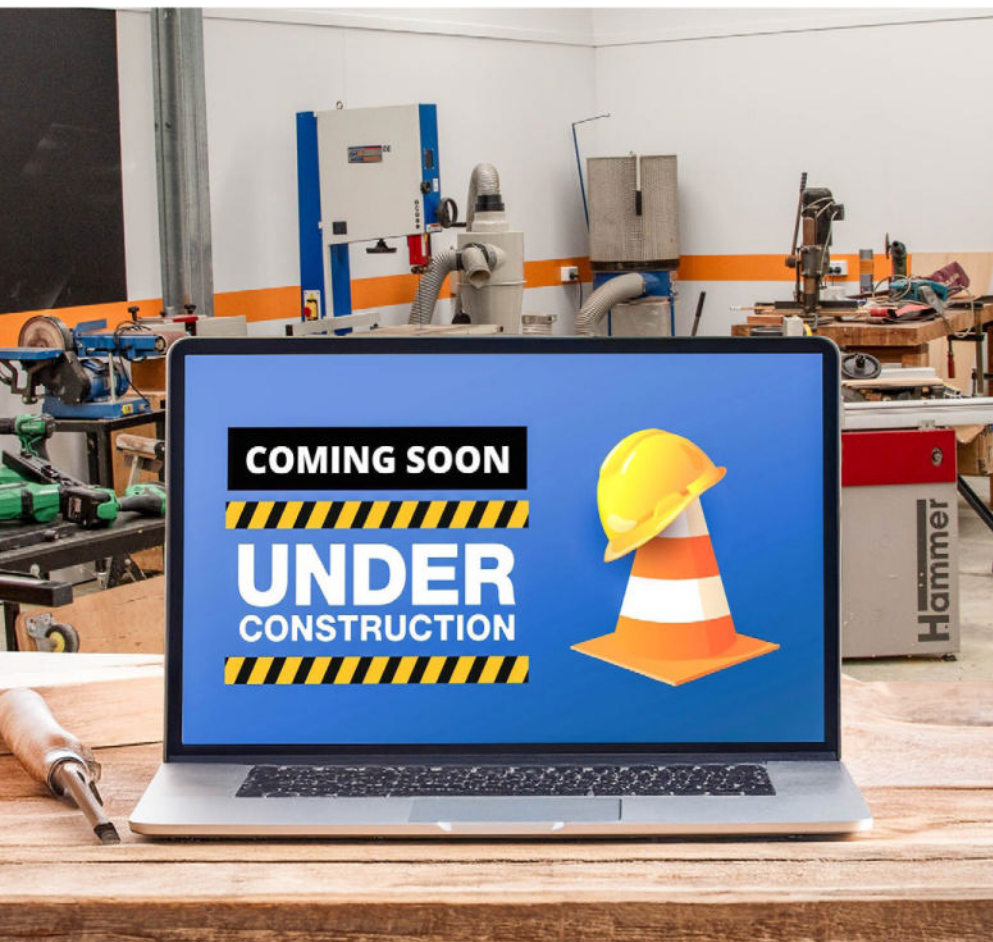
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NEW TRICKS, OLD DOG



Jude has built himself a new dream shed and has some big plans on what he will create in there – and it's not what you would expect

By Jude Woodside

Now that my shed is actually finished, I can move on to the fun bit, using it.

First of course, I have to fit it out with the usual benches and cupboards to store things. I have shelves full of fittings, fixings, solvents, oils and paints. Not to mention power tools and accessories.

The challenge is to come up with storage solutions, ideally close to where they are most likely to be used, or should I have one centralised repository? Shelves or cupboards? Freestanding or wall-mounted?

Then there is the subject of benches. I am planning on at least four and at least one mobile adjustable height workspace. The

first will be the mitre saw bench. There are no end of YouTube videos on how to build one, but I haven't seen anyone build it quite as I intend to, which is a plus and a convenient segue way into my news.

Jude TV is coming

I am planning to start a YouTube channel to document, not just the establishment of the space itself, but also what I later get to build in the shed.

I am hoping to continue documenting these things for this magazine as well, and I'm expecting to have a website to accompany it. It's exciting and also a bit nerve-wracking. Not the least when I consider how much work is involved in all that.

I have some equipment to do the video side and some experience in the process, but to be fair, my previous professional experience with video was over 35 years ago, and technology hasn't stayed still. So I have been getting reacquainted with video recording, video editing and special effects. Not to mention the intricacies of audio.

Planning ahead

I designed the shed with video in mind, especially the translucent roofing panels and the colour of the shed interior was explicitly chosen to allow the most light reflection without being pure white or mid-grey.

Pure white tends to make things look dark as the camera tries to compensate for it – it leaves over-exposed patches in the background. Mid grey makes the space a bit too grim.

I thought I was well-versed in video, having worked in the field for over 10 years. I purchased a reliable video camera just prior to lockdown to do some video for a former client. Lockdown scuppered that plan, and with one thing and another, I didn't get a chance to do all the practice I assured myself I could do in the meantime.

So when a friend asked me to make a short video for him, it was a good excuse to get the gear out and see if I could still do it. I can – but I could do better.

I will keep you posted when I do finally burst onto the small screen, but for now, this old dog is re-learning his old tricks. 📁

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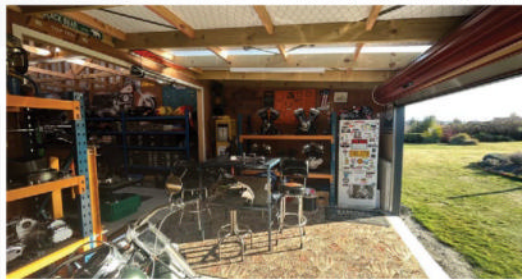
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