TESTING 3D PRINTED STEEL PARTS

MODEL ENGINEER &WORKSHOP

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IMLEC 2026

Large Scale Tanks

BUILDING A SHERMAN EASY 8



BAMBU X2D

DUAL EXTRUDER 3D PRINTER REVIEWED



INSIDE this packed issue:

MAKE A CARBIDE TIPPED MARKING GAUGE · NANTWICH LITTLELEC RESULTS· PANNIER TANK – THE FINISHING TOUCHES · MACHINING WITH FUSION 360 · A REVERSER GEARBOX IN 5" GAUGE · CONSTRUCTING SIMPLE GAUGES · 2026 CARDIFF RALLY · THE LENTZ HYDRAULIC DRIVE · INDEX TO VOLUME 235 · THE CAMSHAFT FOR FOURUNNER MK2
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Editor: Neil Wyatt
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Publisher: Tim Hartley

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This issue was published on 16 October 2026
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SMOKE RINGS



It's an open secret that your editor has much more experience of modelling stationary steam engines than steam locomotives, so for the education and elucidation of the readership, here's a rare sight indeed. It's me enjoying a lap at the regulator of Pete Full's locomotive at the recent Rob Roy Rally in Bromsgrove, where an astonishing fifteen examples of this loco were present. I'd like to thank Bromsgrove SME for their hospitality at their lovely track at the Avoncroft Museum.

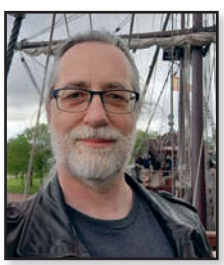
Since the coming together of *Model Engineer* and *Model Engineers' Workshop*, it's been a constant challenge for me to balance the very different styles of content, although ME&W does have considerably more pages. I've tried to bear in mind the approach of the founding editor, Percival Marshall, who was particularly keen to keep the scope of the magazine as wide as that of the tremendous hobby we all enjoy.

Due to the delay affecting IMLEC this year, I've had to feature both it and LittleLEC, so we have rather more space given to reports than usual in this issue. So with plenty of content on the live steam side of model engineering, I've included some articles on more radical topics to balance it. These including CNC machining and a first in-depth look at the properties of 3D printed metals, as well as a review of a 3D printer.

I've had a very positive response to recent content relating to tanks, so hope readers will enjoy Tony Devlin's new series on building an Armortek Sherman Easy 8. Coincidentally, by the time you read this, I should have has first-hand experience of Gerard Dean's scratchbuilt 1:6 scale Tiger at the Melbourne Show.

Finally, as this magazine reaches readers, I'll be preparing for the Midlands Model Engineering Exhibition, so if you are going as well, please come and say hello.

Neil



Neil Wyatt
Editor



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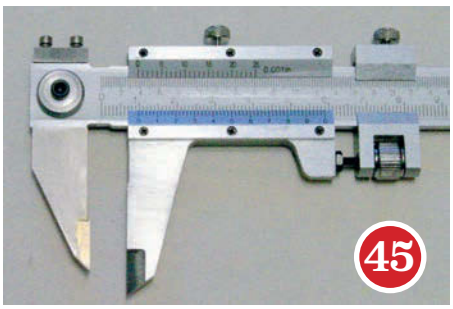
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Extra Content!

There's lots of extra content to be found online to support past articles in Model Engineer & Workshop.

Visit the www.model-engineer.co.uk forum.

Find out more about Tony Devlin's large-scale tank models on his YouTube channel 'Tony's Workshop' tinyurl.com/TonysTanks

Hot topics on the forum include:

End mill sharpening started by petro1head
Sharpen in the workshop, send off to be sharpened or just buy new?

Ideas needed for problem wth Tom Senior E type Mill
started by Mike Crossfield
Tracking down an unusual issue with a benchtop mill.

Crucible Furnace started by BOB BLACKSHAW 1
Some useful discussion about furnaces for home casting.

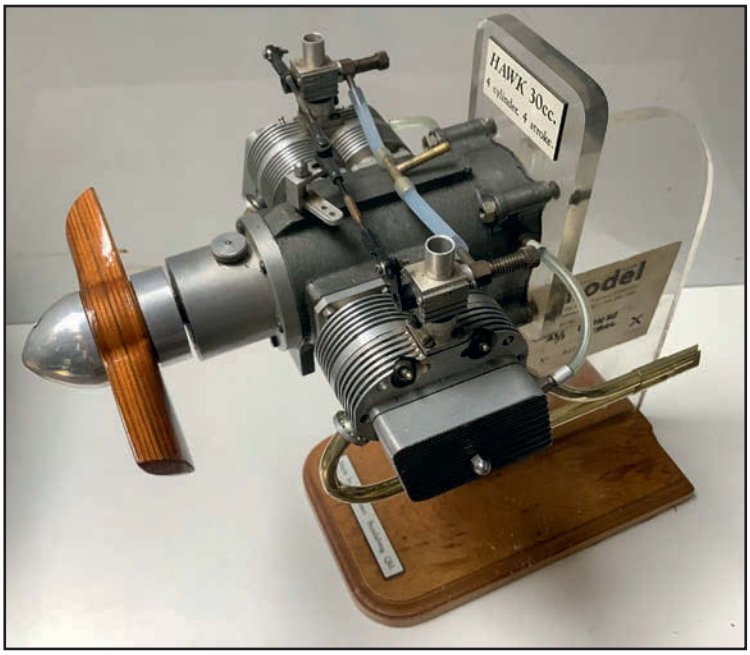
Come and have a Chat! As well as plenty of engineering and hobby related discussion, we are happy for forum members to use it to share advice and support. Come and join us – it's free to all readers!

On the Cover



Our cover features Marcus Peel pulling a loaded train under the limitless blue skies above this year's IMLEC at the Sheppey Miniature Modelling and Engineering Society's track.

Next Issue

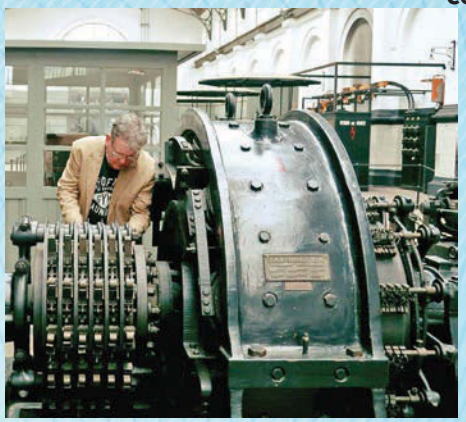


In our next issue we feature George Punter's Hawk 30 four-cylinder, four-stroke internal combustion engine.

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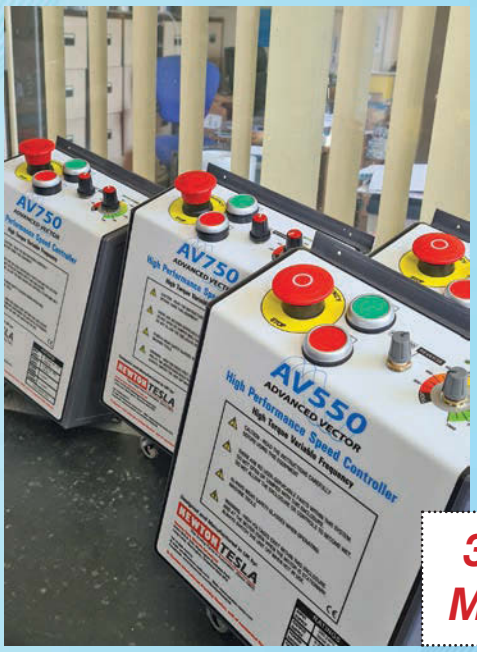
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A Sherman Easy 8 in 1:6 Scale

Tony Devlin recounts how he discovered Large-Scale Armour Modelling, before embarking on the build of a 1:6 scale Armortek kit.



Photo 1: 1/6 scale versus 1/16 scale Jagdpanther

Like many people of my generation, my interest in military vehicles started at a young age. I spent countless hours building Airfix kits, carefully painting them and applying decals while trying to recreate the vehicles I had seen in books, films and documentaries. Looking back now, those early kits taught me far more than I realised at the time; patience, attention to detail and the satisfaction of creating something with your own hands.

Over the years, my professional background in architecture naturally led me towards model making in other forms, including architectural models and small diorama projects. However, the world of large-scale armour modelling always fascinated me from a distance.

I had looked at 1/6 scale models many times over the years, particularly the Armortek range, but if I am honest, I initially questioned whether I had the skills, space or confidence to tackle a project of this size. There is also, of course, the financial commitment involved, and these are not impulse purchases.

Eventually curiosity got the better of me and I decided to take the plunge with my first build – a late variant Tiger tank. That decision completely changed my view of the hobby.

WHY 1/6 SCALE IS SO APPEALING

What makes 1/6 scale so rewarding is the incredible level of realism and engineering detail that becomes possible at this size.

As shown in **photo 1**, the difference between a traditional smaller-scale model and a 1/6 scale vehicle is dramatic. At this scale, builders can introduce materials and details that simply are not possible on smaller models, working suspension systems, realistic metal components, rubber tyres, detailed interiors and highly realistic 12-inch figures that bring the vehicles to life.



Photo 2: Visit to Armortek factory.



Photo 3: Recently completed Sdk.Fz. 7.

The level of detail is extraordinary, from tiny shock absorbers and track links through to the sheer presence of a fully assembled turret or hull assembly. The models feel less like conventional kits and more like scaled engineering projects.

For me personally, the build process itself is the most rewarding part. I genuinely enjoy handling the components, understanding how they have been designed and manufactured, and carefully preparing and assembling each section. Even the small amount of fettling or adjustment occasionally required becomes part of the enjoyment and sense of achievement. **Photograph 2** at Armotek's factory shows the wide variety of subjects.

MORE THAN JUST A HOBBY

One aspect of the hobby that perhaps does not get discussed enough is the positive impact it can have mentally. Modern life can be stressful for all of us and I have found this hobby to be an incredibly effective way of switching off from the pressures of work and daily life. Spending time in the workshop focused on a build requires concentration, patience and creativity, and for me it provides the perfect mental reset.

There is something deeply satisfying about taking a collection of raw components and gradually transforming them into a fully functioning scale vehicle.

WHY THE HOBBY IS GROWING

I believe large-scale modelling is growing rapidly in popularity for several reasons, but the biggest influence has undoubtedly been the internet and social media.

Platforms like YouTube now allow builders to share projects with a worldwide audience and showcase these models in ways that simply were not possible years ago. In the right setting, these vehicles can look incredibly realistic on camera and allow creators to tell stories around history, engineering and restoration, **photos 3** and **4.** This visibility has also helped remove some of the intimidation surrounding the hobby.

There is sometimes a perception that these kits are only suitable for highly experienced or 'elite' builders, but I honestly do not believe that is true. I certainly did not start as an expert. Like many others, I began as a complete novice and learned through trial, error and advice from the wider community.

One of the reasons I started my YouTube channel, **'Tony's Workshop'** was to encourage people who may be considering entering the hobby but are held back by the same doubts I once had. These kits are designed so that anyone with patience, basic tools, workshop space and enthusiasm can successfully build them.

TONY'S WORKSHOP

STARTING A SHERMAN 'EASY 8' BUILD – FIRST IMPRESSIONS AND PREPARATION

Over the past three years I've found myself completely immersed in the world of large-scale model engineering, a journey that started with my first Armortek build, a late variant Tiger tank. At that point, I had no experience with 1/6 scale models and, if I'm honest, very little involvement with social media either.

Since then, things have escalated quickly. Projects have included an M26 Pershing, a Series 1 Land Rover, Hetzer, Jagdpanther and, more recently, my first commissioned build, a Sd.Kfz. 7 halftrack, **photos 5, 6** and **7.**

Each project has brought its own challenges and rewards, but



Photo 4: Jagdpanther in action.

also a growing appreciation for the engineering behind these kits.

This latest project is the Sherman M4A3E8 76W HVSS, better known as the 'Easy 8', and represents my second commissioned build. The kit itself was originally manufactured in 2021 and, remarkably, has remained boxed and untouched until now.

WHY THIS BUILD?

This project came about following the sale of one of my previous builds to a channel member based in Norway. After receiving the model, they enjoyed it so much that they approached me to undertake a full commission build on their behalf.

That in itself brings a different level of responsibility, this isn't just a personal project, but something that needs to meet someone else's expectations as well.

WHAT DO YOU NEED TO GET STARTED?

Before even opening the boxes, it's worth being realistic about what's required to take on a project of this scale.

You'll need:

- Space, quite a lot of it.
- A solid work surface (or several).
- Basic workshop tools (hex drivers, sockets, etc.).
- Lifting support such as a motorcycle or table jack.
- Adhesives and thread-locking compounds.
- A reasonable level of model-building experience.
- And, perhaps most importantly, patience.



Photo 5: Three completed tanks, Tiger, M26 and Hetzer



Photo 6: Series 1 Land rover completed



Photo 7: 1/6 Scale Tiger on my Scratch built bridge.



Photo 8: Unpacking the first components, an early indication of the scale of the project.



Photo 9: The full kit laid out after unboxing, showing the volume and variety of parts.



Photo 10: The turret casting, an excellent example of the quality and engineering behind the kit.

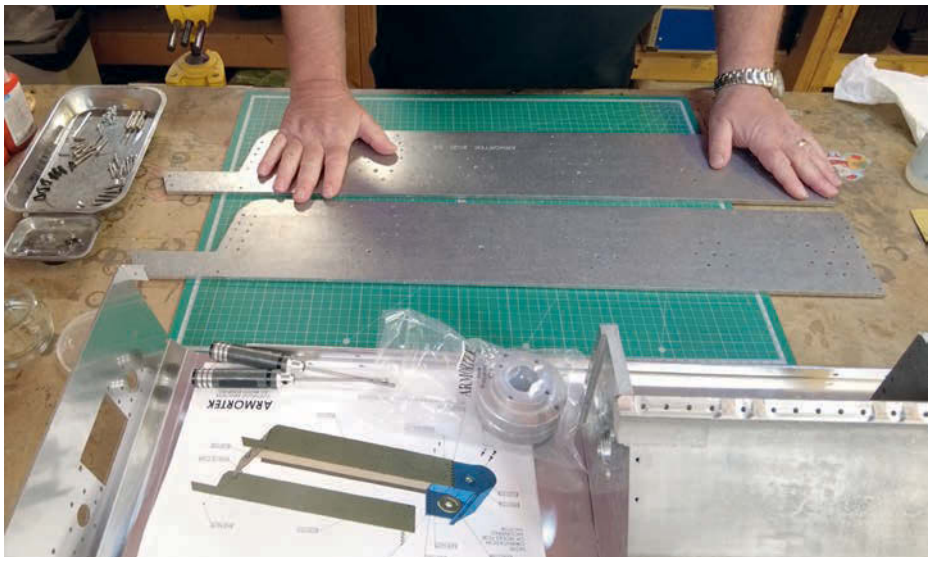


Photo 11: Checking and organising parts before starting the build.

As shown in **photo 6**, even the initial unpacking quickly makes it clear that this is not a small undertaking.

WHAT'S IN THE BOX?

The simple answer is 'a lot'. These kits typically arrive in three or four substantial boxes, each weighing in the region of 15–20kg. It's at this point you begin to appreciate the scale of what you're about to build, and also why having a good relationship with your delivery driver helps!

Once unpacked, as seen in **photo 2**, the sheer volume of parts becomes apparent. Everything is carefully packaged, with individual parts lists included in each box, alongside a comprehensive master list within the instruction manual.

In all the kits I've received from Armortek over the past three years, I've yet to encounter any issues with missing or damaged parts, which speaks volumes about the care taken during packing and distribution.

FIRST IMPRESSIONS – QUALITY AND VALUE

At first glance, these kits can seem expensive. However, that perception changes quickly once you begin handling the components.

As highlighted in **photo 10**, the turret casting alone is a perfect example of the quality on offer. The level of detail, the weight, and the finish all reflect the amount of research, design, and engineering that has gone into producing these kits.

Armortek use high-quality materials throughout, and while there is always some preparation work required, cleaning, fettling, and occasional adjustment, that is very much part of the experience. In fact, it's one of the aspects that adds to the satisfaction of the build.

WHERE DO YOU START?

It may sound obvious, but the best place to start is right at the beginning, with preparation. As shown in **photo 11**, the first task is to check every component against the packing list. It's well worth taking the time to organise parts into logical groups that follow the build sequence. Not only does this help avoid confusion later, but it also reduces the risk of damage. Fasteners, in particular, benefit from careful organisation. If you have the space, compartmentalised storage is ideal. Personally, I tend to use a multi-section tray to separate them by type and size.

Before starting any assembly, I strongly recommend reading through the instructions, then reading them again. And not just the first step, but several stages ahead. Many of the build sequences are interconnected and understanding how they relate to each other can prevent problems further down the line.

For the first session, it's best to keep things simple. Set a manageable goal, in this case, beginning with the lower hull, and focus on preparing the parts and tools required for that stage.

Taking the time to do this properly pays dividends later. With everything laid out and understood, you can approach the build with confidence and start what is, without doubt, one of the most rewarding aspects of this hobby: bringing a complex piece of engineering to life, one component at a time.

CLOSING THOUGHTS

With everything checked, organised, and prepared, I'm now ready to begin the first stage of the build. The Sherman Easy 8 is an iconic vehicle, and even at this early stage, it's clear this is going to be a rewarding project. In the next instalment, I'll begin work on the lower hull and take the first real steps into the construction of this impressive model.

To be continued

3D Printed Metal Parts



Julie Johnston makes an assessment of the properties of parts produced by this technology which is increasingly accessible for model engineers.

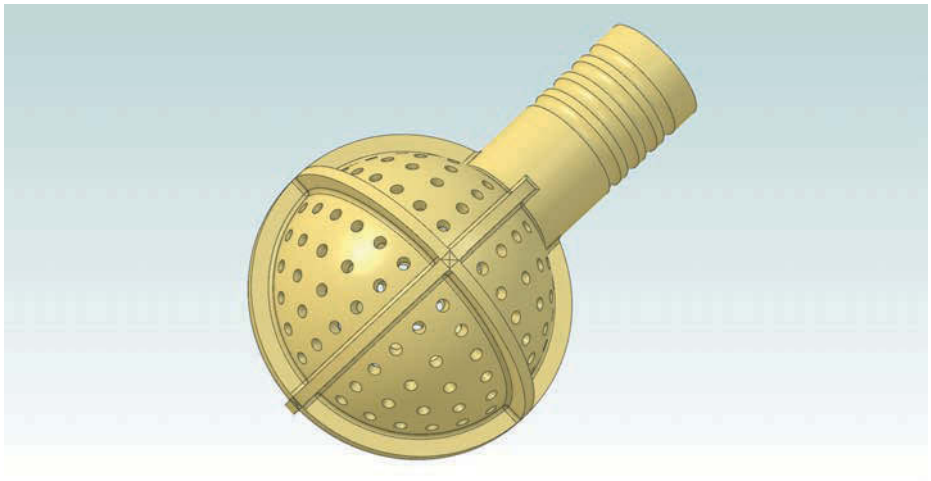


Fig 1: Water Lifter Rose CAD Model.

My first introduction to 3D printing was in 2002 when working on an experimental battery pack for electric vehicles. The batteries were custom lead acid with connections at each end and multiple batteries connected in series by two large PCBs, top and bottom. The cases for the battery packs were 3D printed, in nylon filament, by a university that was part of the battery project consortium. I was able to visit the university and have a closer look at their 3D printing capabilities. The commercial filament printers produced very good results, but I was even more impressed with the quality of the resin printers. These build the model layer by layer from a vat of liquid resin. Each layer is selectively hardened, usually with ultraviolet light, before the model is moved up a small amount and the process repeated. At the time 3D printers were built, and sold, by large companies for commercial use and were too expensive for the home user.

Moving on to 2005 3D printers started to become affordable for home use following the introduction of an open-source self-replicating 3D filament printer, the Reprap. The development of home 3D printers then accelerated with the appearance of numerous startups competing to produce better, and cheaper, 3D filament printers. By 2013 several generations of 3D printers had been gone through and assembled plug 'n' play printers for home use were appearing. I could see a need for a 3D printer for prototyping and small production runs for home and business. After looking at the market, and visiting a friend from my motor racing days who had a 3D printer, I bought a Ultimaker2 filament printer. This printer has been used to make thousands of parts for both work and home use. More recently the Ultimaker has been replaced by a Prusa Core One, after the Ultimaker failed and wasn't deemed to be worth repairing. I have also recently added a Prusa SL1S 3D resin printer. The resin printer is more time consuming to use but will primarily be used to make patterns for investment casting.

3D PRINTING OF METAL

Starting in the 1990s 3D printing of metal rather than plastics was developed, initially using metal powder embedded in an organic binder that was then burnt out and the part sintered with a lower melting point filler metal. This method is still available for use with filament printers, albeit the burnout and sintering stages have to be done by external companies. Most commercial 3D metal printing companies now print directly from metal powder using a powerful laser, eliminating the binder and sintering processes.

There are two main variants for direct 3D printing of metals; Direct Metal Laser Sintering (DMLS) and Selective Laser Melting (SLM). The DMLS method uses a mix of a base alloy and another metal that melts at a lower temperature. For each layer a laser is used to heat the powder so that the different metals fuse at an atomic level without actually melting. In contrast SLM uses a single metal or alloy powder which is fully melted, so the process creates a material closer to conventional metals.

The first time I was able to look at a 3D printed metal part was in 2015. A business client had a part 3D printed in stainless steel as an experiment, using the organic binder and sintering process. The resulting part turned out to be slightly porous, and since the client was in involved in designing gas sensors measuring down to parts per billion, this was deemed unacceptable and they took the project no further. Over the space of a few weeks the part went from shiny grey to bronze coloured as the infused bronze tarnished and overrode the colour of the stainless steel.

Direct methods of 3D printing of metal require high power lasers (~100W) capable of quickly melting the metal powder. In addition, the chamber where the part is printed is flooded with an inert gas, normally argon, during the build process to prevent oxidation and tarnishing. As a consequence, machines are expensive and out of reach for the home workshop.

Companies such as PCBWay, **ref. 1**, and CraftCloud, **ref. 2**, have appeared over the past few years offering 3D printing services for those without access to 3D printers. Initially these companies offered plastic filament printing but more recently have added 3D metal printing. When using these companies, a 3D model of the part to be made, often as a STEP or IGES file although other formats are available, is uploaded to the company. The part is examined by their engineers, errors or difficulties discussed, and finally a quote is produced. If accepted, payment is then made, the part is printed and shipped.

INITIAL 3D METAL PRINTING

After designing the water lifter rose for my traction engines, **fig. 1**, it became apparent that CNC milling subparts and soldering them together

was going to be time consuming, and would need several fixtures for both milling and soldering. Thoughts turned to alternative manufacturing methods, i.e. casting and 3D printing.

I tried 3D printing first, two water lifter roses being made by PCBWay, **photo 1**. The parts were printed in stainless steel as prototypical copper alloys were not available at the time. After a discussion with the PCBWay engineers, via email, I decided it was acceptable to have an internal support structure inside the globe. In practice this is almost invisible from the outside.

Cost per part was $31 and shipping was $40 for a total of $102. Although I have a US dollar account, payment could only be made via a credit card for which the exchange rate was poor; total charged was £84.17p. The parts are quite accurate, as shown in **table 1**.

For comparison purposes I got a water lifter rose investment cast, **photo 2**. After getting nowhere with UK suppliers I used Stanier Engineering (Mike Jack) in New Zealand, **ref. 3**. Compared to the 3D printed parts the investment casting is cleaner with sharper features and there is no internal support structure. It also in a prototypical copper alloy. However, at £109 plus £10 postage, it was considerably more expensive. For comparison, dimensions for the investment cast water lifter rose are also shown in table 1.

The casting dimensions are mainly on the small side suggesting that the cast part has shrunk slightly when cooling. Adding a shrinkage allowance on the 3D printed pattern wasn't discussed or presumably used.



Photo 1: 3D Printed Stainless Steel Water Lifter Roses.



Photo 2: Investment Cast Water Lifter Rose.

Table 1: Size Comparisons

Feature	Design (inches)	Measured (inches) 3D SLS	Measured (inches) Investment Casting	Notes
Overall length	2.4775	2.485	2.481	
Spigot OD	0.5625	0.563	0.555	Average over 6 readings
Spigot ID	0.4375	0.433	0.436	
OD over ribs	1.580	1.579	1.567	Average over 6 readings
OD between ribs	1.375	1.374	1.362	Average over 6 readings
Width of ribs	0.0625	0.065	0.062	Average over 6 readings

3D METAL PRINTED TEST PARTS

After getting the water lifter roses 3D printed the engineer in me asked, what are the mechanical and machining properties of 3D printed metals like? To answer this, I ordered a set of test parts 3D printed by PCBWay, **photo 3**, in 316L stainless steel. All further dimensions are in millimetres unless otherwise stated.

As well as the parts shown the plan had been to 3D print two blocks with threaded holes and external threaded spigots, with the threads from M3 to M6 modelled in 3D CAD. The purpose being to check the accuracy of 3D printed internal and external threads. However, PCBWay refused to do this stating that the internal and external threads would be conventionally formed as a post printing operation, so these parts were cancelled. Each printed part was approximately $30. The final cost, including shipping, was £235. All parts were roughly the same cost, so I assume pricing is done on print time rather than a detailed analysis of each individual part.

When I received the parts, the finish was extremely good compared to the water lifter roses, so it seems that they had been post-processed. I hadn't explicitly asked for this so don't know if this is standard. There were some email communication issues when getting these parts printed, primarily concerned with the aborted threaded parts, resulting in a delay of a few weeks. This was in contrast to the water lifter roses which was straight forward.

The parts are to be used for the following tests:



Photo 3: 3D Printed Test Parts.



Photo 4: Filing Test Result.

Part A - Rectangular block for filing, milling, drilling, reaming and tapping. Design dimensions were 60 x 20 x 6. Measured dimensions were 60.13 x 20.05 x 6.15
Part B - Cylinder for turning, external threading, drilling and tapping. Design dimensions were 50 long by Ø12. Measured dimensions were 50.11 by Ø11.99
Part C - Hollow, open ended, cylinder for testing porosity. Design dimensions were 30 long by Ø12 OD and Ø10 ID. Measured dimensions were 30.14 by Ø12.02 OD and Ø10.02 ID
Part D - Thin plate for testing bendability and brittleness. Design dimensions were 60 x 20 x 1. Measured dimensions were 60.05 x 20.04 x 1.05
Part E - Two parts for measuring ultimate tensile strength. Nominal working area is 2mm square. Measured working areas were 2.05 x 2.01 and 2.08 x 2.01

Surface roughness measurements, R_a, were taken on parts A, B and D before the machining tests:

Part A - Surface roughness on the wide edge was 0.46µm and on the narrow edge 0.59µm.
Part B - Average surface roughness over four readings was 0.68µm.
Part D - Surface roughness on the wide face was 0.14µm.

These surface roughness results are very good; far better than would normally be expected with 3D printed metals. The parts have clearly been post-print finished, probably ground.

MACHINING TEST RESULTS

Part A
I started by marking out two 6mm radii on the end of the part and filing to the line, finishing by draw filing. The material cut very easily and cleanly with both normal filing and draw filing giving a good finish. The material was much easier to file than normal stainless steel. The result is shown in **photo 4**.

Machining started with two cuts using a YG 10mm diameter 3-flute, K2 range, uncoated carbide cutter running at 2000rpm. The first cut, on the top of the part, was 9mm wide and 1mm deep at a feed rate of 400mm/min. The second cut, on the end was full depth, ~6mm, with a width of cut of 2mm and hand feed. The material machined beautifully; very clean cut, good finish and no tendency to work harden. Surface finish of the milled cut on the top measured 1.15µm R_a.

Next was drilling, through the 6mm thickness, with 5.3mm, 3.2mm HSS and 1mm carbide drills. The two larger drills were 4-facet ground and did not need a starting centre. Drilling was continuous through the thickness. For the 1mm drill a 2mm carbide spotting drill was used to provide a starting centre and the hole was peck drilled, retracting every millimetre or so. The material drilled very well, smooth and the material felt soft. Nothing like conventional stainless steel which has a tendency to work harden with the slightest hesitation in feed rate, especially with HSS drills.

Then a 6mm hole was drilled and reamed with a ¼" reamer, both HSS. As recommended reaming was performed at half the speed, and twice the feed, of the drilling and was also smooth and easy. This was in contrast to some recent reaming I have been doing in hot rolled steel, which can be gummy and has caused the reamer to catch. The reamer left a good, even finish and the hole diameter measured exactly 0.250" using a Mitutoyo expanding small hole gauge and a 1" micrometer.

As a final test the 5.3mm hole was tapped M6 with an old set of Dormer HSS hand taps. Despite a nominal



Photo 5: Part A After Machining.



Photo 6: Thread Strength Test Setup.



Photo 7: Results of Thread Test.

thread depth of 65% tapping was much easier and less fraught than with conventional stainless steel. Tapping was done dry and the tap showed no inclination to bind. This was in contrast to conventional stainless steel where I find lubrication is essential, I use Rocol RTD compound, otherwise the tap tends to bind and has to be backed off every turn or so. Part A after all filing and machining is shown in **photo 5**.

In order to test the strength of the M6 thread I used an M6 hex head steel bolt, with a steel washer under the head, and tightened it with an adjustable spanner, **photo 6**. When I have performed similar tests in the past the bolt normally fractures in tension leaving an undamaged portion of the bolt in the thread. This agrees with the rule of thumb that the thread in shear is normally stronger than the core area of the bolt in tension. However, in this case the bolt suddenly began to turn freely. Obviously, something had failed but it wasn't clear what. Cutting the threaded end of the bolt off close to the underside of the part allowed me to extract the head of the bolt and the portion of the threaded shank in the part. It was clear that the bolt thread had failed in shear, leaving the thread in the test part undamaged, **photo 7**. This is unusual and may say more about the commercial bolt than the test part.

Part B

One end of part B was centre drilled in the lathe, drilled 5.4mm with a HSS drill 1" deep and the hole tapped M6 using a Dormer spiral flute tap. Drilling was done dry and was simple with none of the work hardening and peck drilling normally needed with stainless steel. The swarf was granular, not the normal spirals associated with stainless steel. As with part A the tapping was done dry. There was no need to back off the tap, and it didn't feel like it was getting difficult to turn at any point.

To be continued

REFERENCES

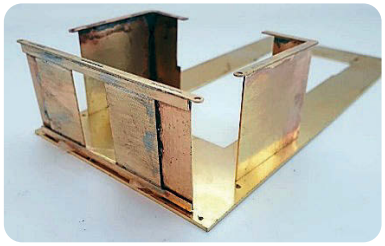
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Fourunner Mk2 Oscillating Engine PART 4



Peter Stuart completes his updated model based on David Fulton's design, described by his son Stuart Fulton in ME&W issues 4776 and 4777.



Photo 24: Pressing a brass crankpin into the dual crank web.

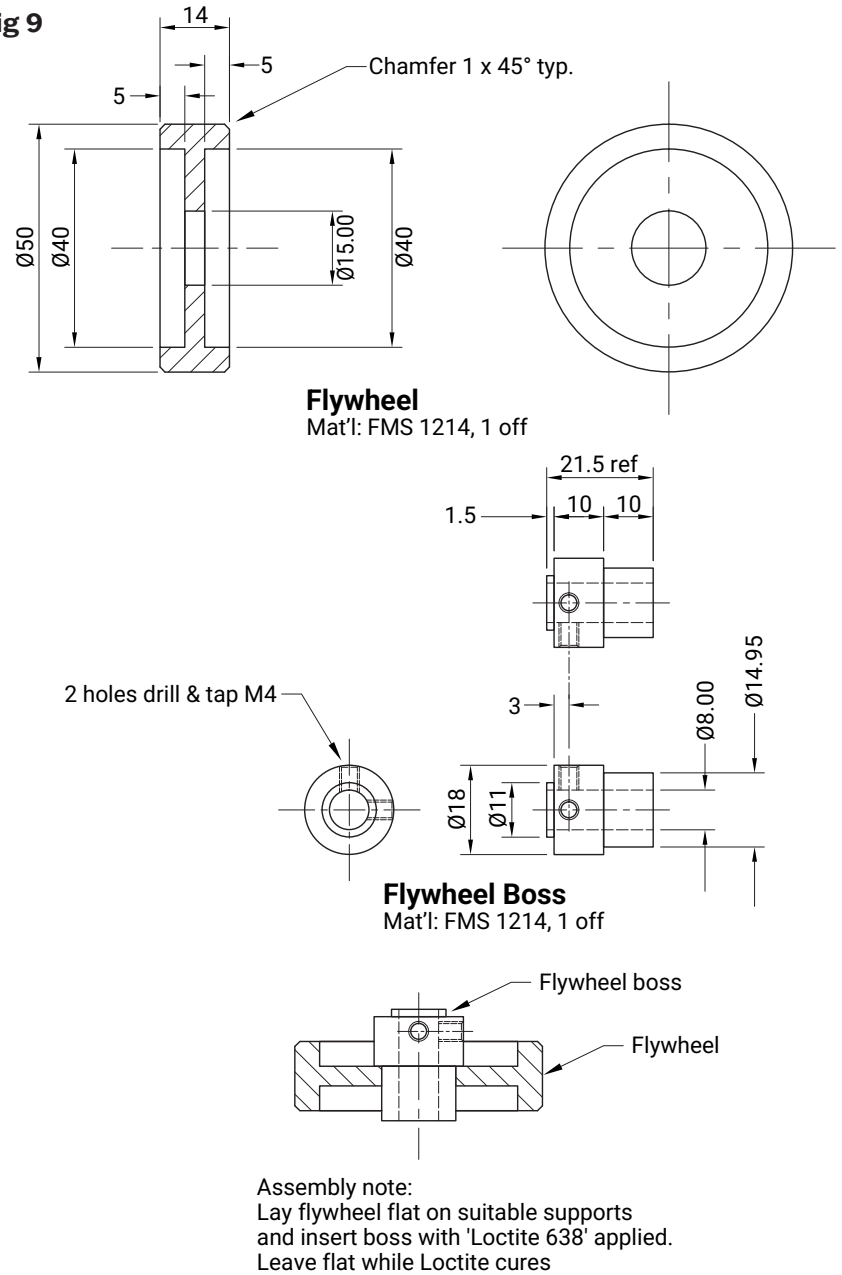
The crankshaft design is a hybrid assembly of seven parts, using a combination of press fits and Loctite joints. This came about because of the use of brass crankpins in an otherwise steel assembly.

The ends of the crankpins have to be rigidly fixed in holes in the crank webs. I found that Loctite 638 does not bond well to brass, especially when the contact area is small. I had to revert to press fits for these, using a 1 tonne hand press and two round spacers, **photo 24**.

To ensure alignment of the crank webs when pressing on the single crank webs, I used a bespoke clamp and two short lengths of 20 x 20 x 3mm angle iron to make a centring clamp, **photo 25**. The DIY clamp and two round spacers used for the pressings are shown in **photo 26**. A close-fitting 8mm BMS rod can also be temporarily slid into the bores to assist alignment.

I had more success with Loctite on the larger diameter joints where the end shafts fit into the single crank webs. The respective shafts for these were fine machined to create the gap for Loctite 638 retainer (0.05mm), but the protruding end of each shaft was left oversize to be finish machined after the Loctite had cured. This ensured true running of the assembly. **Photograph 27** shows how the crankshaft can be held by its crank webs in a large 3 jaw chuck for finish machining of the shafts. **Photograph 28** shows the completed crankshaft.

Fig 9



OTHER PARTS

The flywheel and the air/steam inlet pipe flanges are all that is left to be made, **figs 9** and **10**. After final assembly of the engine, the air/steam inlet pipe should be soldered to the plain inlet pipe flange in



Photo 25: Pressing end crank web onto crank pin with alignment clamp.

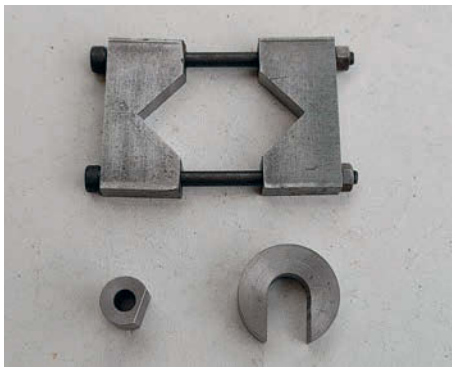


Photo 26: The bespoke clamp and spacers.

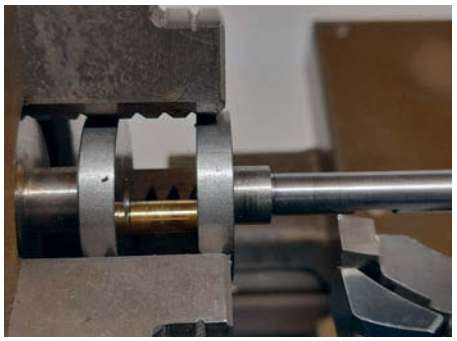
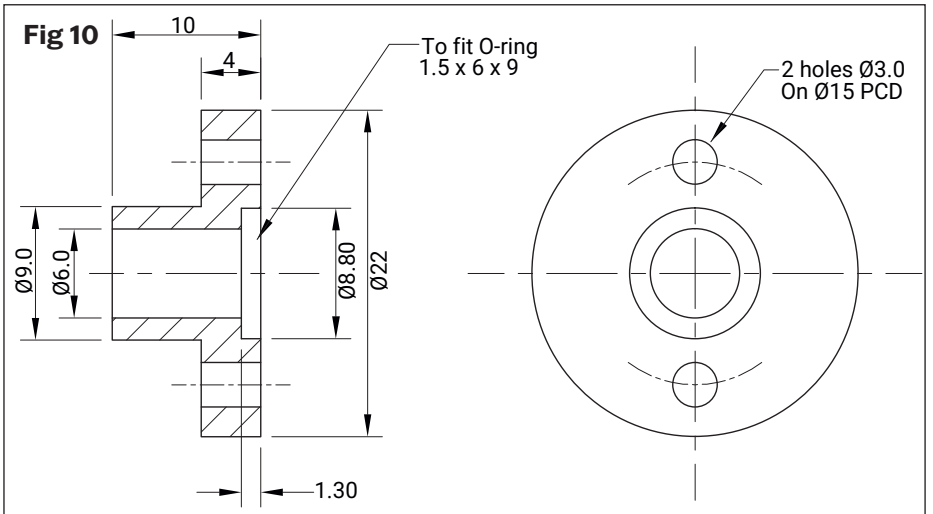


Photo 27: Finish machining of end shafts.

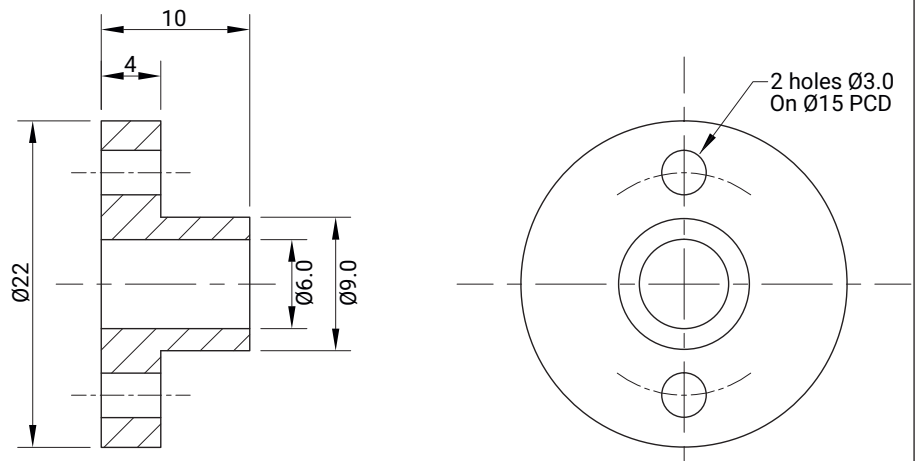


Photo 28: The completed crankshaft.

Fig 10



Inlet Pipe Flange - With O-Ring Groove
Mat'l: Brass, 1 off



Inlet Pipe Flange - Plain
Mat'l: Brass, 1 off

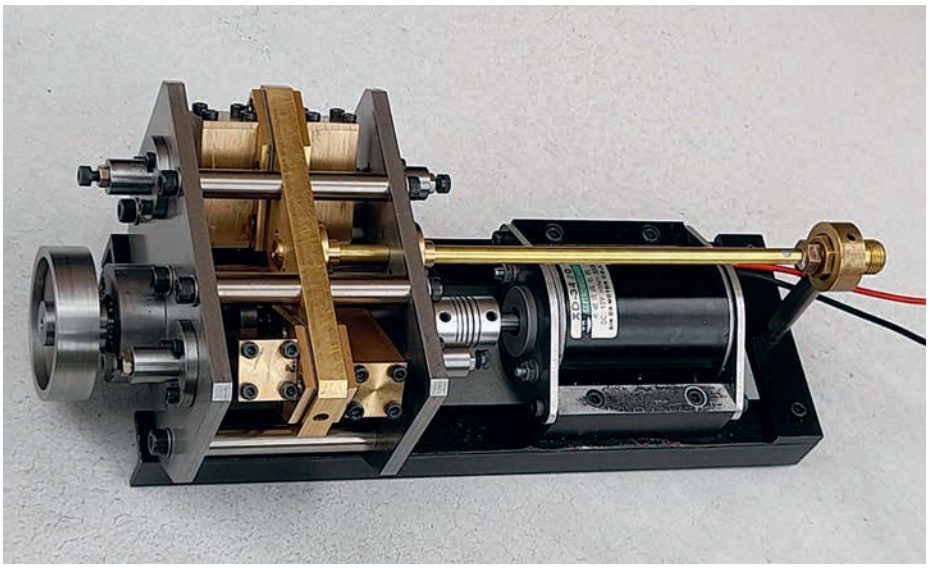


Photo 29: Generator set.

situ. It would be wise to remove the O-ring from the inner-most flange while soldering.

When you have finished building your engine and have fine-tuned it, you might be thinking about what to do with it! One suggestion is to have it drive a generator (I used a 12V DC permanent magnet motor) and power a few LEDs, **photo 29.**

Improvements to a Pannier Tank PART 4



Gerald Martyn details the final improvements made to his 3 ½" gauge locomotive.



Finished (at last!)

The injector section is put together in a similar manner to the boiler fittings, using 3/64" rivets as location pins etc. The parts prior to soldering are shown in **photo 18**. After silver soldering and cleaning up these were joined to the water sections using soft solder, **photo 19**.

The final job is to make the dummy pipes, the cab end cover plate and the water valve rod. The finished parts are in **photo 20**. With so many bits stuck together then the dimensional accuracy of the finished parts was a bit wide, so the attachment holes cannot be drilled in the laser cutting job and must be done after marking out on final installation. **Photograph 21** shows the left injector held in position using double-sided sticky tape.

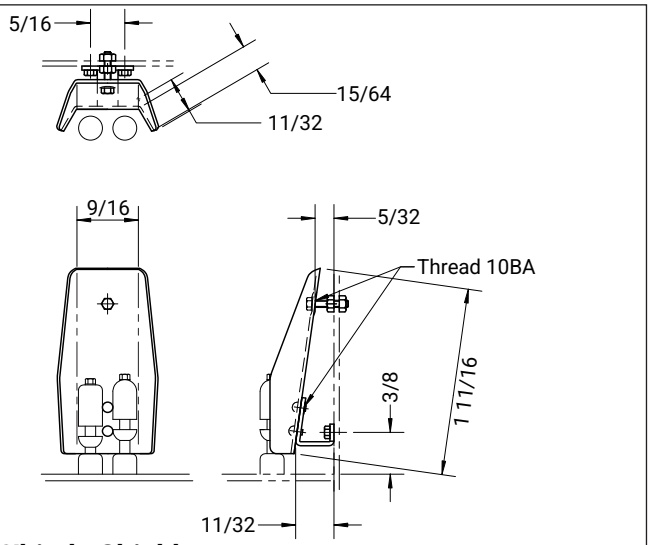
Whistles are straightforward turning. The shield is not in the 1934 photographs but one sort or another is seen in postwar pictures. When they were fitted, I don't know. My interpretation is a simplification, shown with the dummy whistles in **fig 12**, and the sheet metal parts are available from Model Engineer's Laser, **table 1**. These are listed in the table, together with the parts for the window frames. The lower bolts into the cab front should coincide with the manifold cradle and are best kept short and screwed into tapped holes. These parts can't be properly fitted until the cab is removed so are resting in place in **photo 22**.

Table 1 – Laser Cut Parts

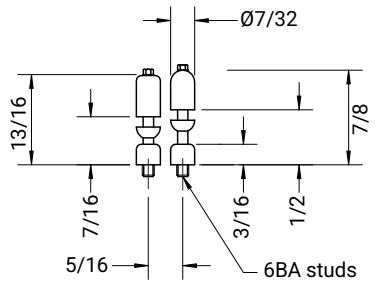
Title	M.E. Laser Part No.	Material	No. Required
Whistle Shield	39418	0.7mm Brass	1
Bracket	39419	0.9mm Brass	1
Window Frame - Outboard	39416	0.7mm Brass	4
Window Frame - Inboard	39417	0.9mm Brass	4

I've mentioned a couple of deliberate non-scale features in the design so far. These come from necessary compromises when turning a dream into a working model. We have to solve problems which come from our available bits and pieces and practical aspects necessary to let it run properly, like deeper wheel flanges for example, and to make it robust. Platework thicknesses are generally 18SWG/1.2mm which equates to a crazy ¾" in full size, but scale thickness would be rather flimsy for a working model. The windows glazing is now another example. From the basic model design we have unglazed windows with framing made from boiler banding running just around the cutout edges. The real ones had properly made frames mounted on hinges for which the bolts can be seen at the top and bottom of the inner edge in photographs. The hinges will foul our necessarily wide roof corner joint angles.

The frames scale at about 5/64" wide which is rather insubstantial, and with no visible fasteners holding



Whistle Shield
Mat'l: 0.7mm brass with 0.9mm brass bracket, laser cut part
1 req'd
10BA sm. hd. bolts



Whistles
Mat'l: Brass
1 pair req'd

Fig 12: Whistles and shield.

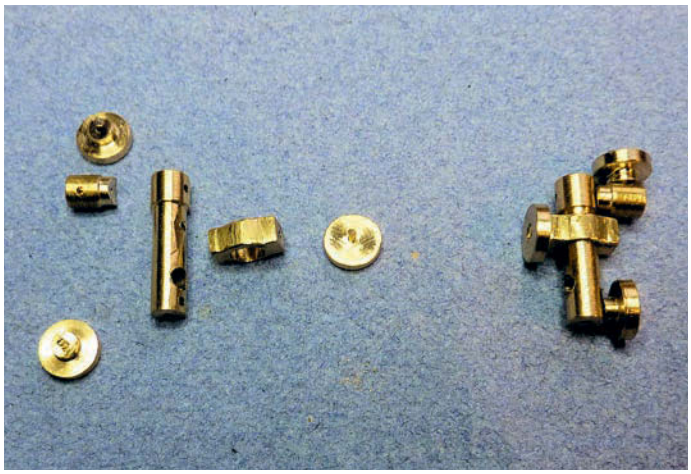


Photo 18: Injector body parts.



Photo 19: Injector sub-assemblies brought together.

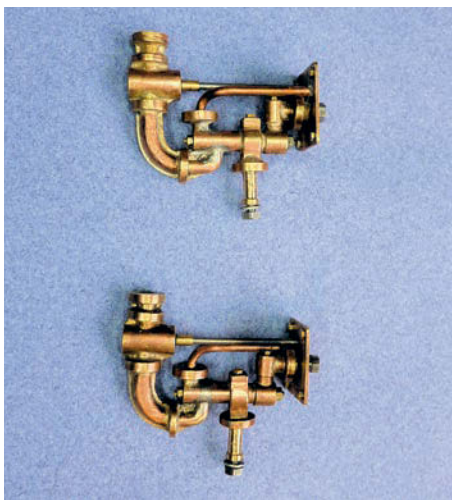


Photo 20: Injectors, minor details added.

them together then our glazing has somehow to be invisibly held in place within. To add to the problem the banding edges may not be too well fitted and, when I checked my stock, it comes in two thicknesses. I used 26 SWG (0.018") strip but have some that is 22 SWG (0.028"). Not a problem if just for me, but for others



Photo 21: Left injector roughly positioned using sticky tape.

then perhaps I should build in some tolerance. Then there's the need to split the rear windows. So, what is needed is a practical design with some means of holding the glazing, and a means of fixing it all without showing from the outside.

To do this I've drawn up some over-wide fixed frames, held together with 14BA countersink screws and nuts. These can be soldered or bonded to the inside of the cab. The frames have a 0.010" trimming allowance on the inner edges compared to the basic CAD shape. I've put a boss on the inner

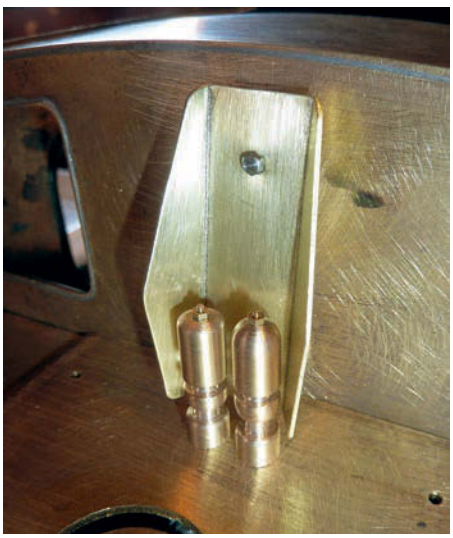


Photo 22: Whistles and shield.

frame which can be used to mount a handle if desired, and dummy hinges on the outer frame. These are clearly not scale but this will not show from the outside, and inside the cab will look neat enough to pretend it could be. Exact scale enthusiasts making models to go in glass cases should look away now.

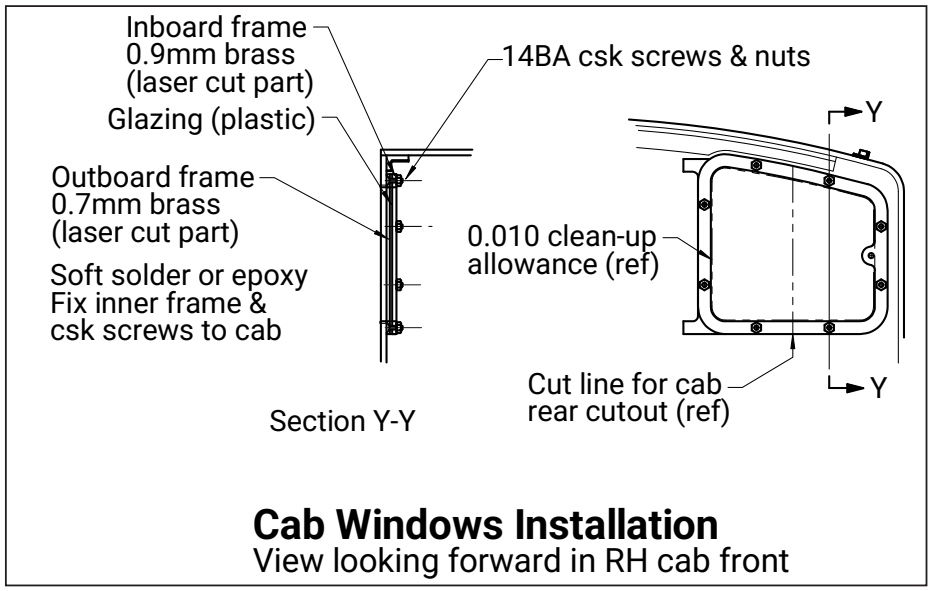


Fig 13: Glazing and frames installation.

The drawing for the glazing and frames is in **fig 13**. The frames are available from Model Engineers Laser, see table 1, and may be seen in **photo 23**. The countersinks in the outer frame will need a special cutter to be made. A flat diamond point one similar to that shown in part 9 of the original series for spotting-through cylinder fixing holes but sharpened and honed to a better standard will do the trick. Assembled with some plastic 'glazing' the windows are shown in **photo 24**. To assemble the nuts then a light duty nut runner/box spanner may be easily made from a piece of 1/8" bar drilled (experiment with the size) and then an appropriately sized Allen key is tapped into the hole to form the hexagon. To ease assembly then it's worth opening the holes out a few thou' after the initial drilling-through stage. The rear frames were carefully split using a fine piercing saw blade before cutting the glazing to suit. Because my cab was all complete and to avoid the danger of other soldered parts becoming displaced, I bonded the frames in position using epoxy adhesive.

Painting. I mentioned previously that my normal practice has been to loosely assemble the entire model, then dismantle to paint individual items before final assembly. I recommend this method. This time I fully assembled the model unpainted for test running prior to publishing. With all joints sealed and all fasteners retained with Loctite I then decided to just dismantle the platework, leaving the boiler and running gear in place.

On dismantling I discovered a problem mentioned in the original text; rusty screws. The neat small hex-head steel 10BA screws holding the tank cover plates looked smashing, but after six months running many of them had rusted in. Water slops everywhere when filling the tanks and seeps through the cover's joints. Externally all looks well, but underneath in that warm damp insulation blanket they were rusting away. The evidence of rust is in **photo 25**. Many were beyond saving, so I recommend using brass. The small head variety are not sold by our main suppliers, but an internet search found some. If the standard head type is used then they will be found to be the same size as the structural fasteners in the top beams and so do not look quite so good. The other problem area was the smokebox. I used car-shop heat resisting paint and this proved to be porous, and spots of rust were showing through. On previous models I've used Reeves smokebox black so hurriedly purchased a new tin and cleaned up and overpainted the car stuff. Sadly, I believe Reeves will be discontinuing this paint.

Painting whilst assembled or part assembled is not the easy way and getting a good finish on the bits still assembled is nigh-on impossible. Fortunately, many of them will be obscured to some extent by the platework. For paint I always use enamel, usually from Phoenix but also Humbrol. Painting is by brushing or spraying as appropriate to the part; small detail parts brushed and larger parts sprayed. In both cases the paint needs to be thinned to get the best finish. My sprayer is a very old Badger basic spray gun, with a 'Wiz' compressor. Nothing special but it usually gets there in the end. At least six coats are required to get a good finish, rubbing down with very fine (1500-2500 grit) wet and dry and repairing any flaws after each. Allowing for drying time a painting cycle takes about a week so it's a lengthy process overall and rushing it will result in setbacks. Finish with a coat of varnish after any transfers have been applied, then allow a couple of weeks or more for it to harden up before re-assembly. With a number of studs and fittings still in place I found it very difficult to get a good finish by spraying as they tended to produce shadow areas of thin or no paint. In desperation, then, I did that all important last coat by brushing thinned out varnish rather than spraying. The brush marks nearly all disappeared, thankfully.



Photo 23: Window frames as received.

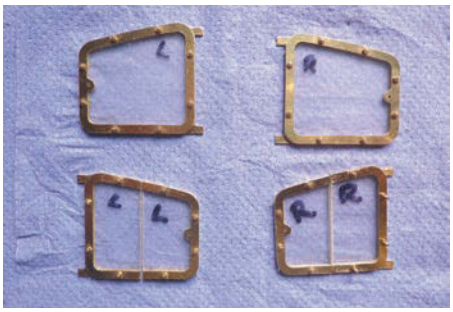


Photo 24: Windows, assembled.



Photo 25: Evidence of rusty screws.

The **header photo** shows my engine in finished condition. I've not found any pictures of the engines in this livery. As I mentioned before, I've found nothing between 1934 works photos and their escape to the west country in BR days. No doubt they would have seen some sort of overhaul during the war or soon after, so wartime black with GWR lettering is a distinct possibility. The polished brass safety valve bonnet is just wrong, of course, but if you make yours in brass then I bet you can't resist showing it off either. In this livery I think she looks good, anyway, and that's all that matters to me.

That's the end of my story. I hope you enjoyed it.

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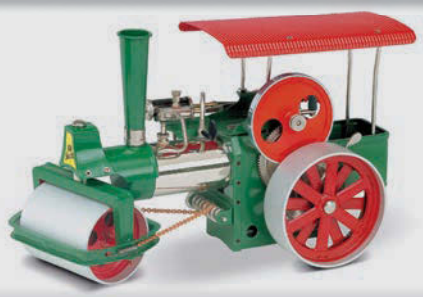
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On the Wire

News From The World Of Engineering

2026 Young and Junior Engineer Awards

We recently published details of two Northern Association Junior engineer award winners. The final group winner for 2025 was presented with his trophy, certificate and prize of £60 when Denis Mulford visited the Pimlico Light Railway. The winner of the 11 to 13 years age group was Oakley Webb. Oakley is a keen and helpful member of the society and an accomplished young engineer having completed a small stationary steam engine under the watchful eye of John Roberts who is doing a great job in encouraging youngsters into the hobby. Oakley is also a regular on track maintenance days and is able to driver any engines that he is given to drive.

Denis would like to give a huge thank you to all the clubs and societies that I visited for their hospitality and congratulate them on the work that they do for young engineers.

The competition for the 2026 Young and Junior awards is still open until 31st December 2026 and entries should be sent into NAME secretary Alan Budd. The categories are Young Engineer, 18 to 26 years, Junior Engineers groups, 8 to 10 years, 11 to 13 years and 14 to 17 years. If you have good young or junior engineers in your society why not think about nominating them for the scheme.



Sliding Paper

Have you ever seen a large machine being eased into position using crowbars, rollers and a great deal of muscle? In Japan a different solution is used for heavy industrial equipment weighing up to 10 metric tonnes – paper! Suberun paper is a low-friction sheet used for fine positioning of heavy objects, typically large industrial machines. The idea is as simple as you might imagine, it comes as a long roll of paper with one shiny, very low-friction face. Their mascot is a monkey with a banana peel… In use sheets are cut from the roll and paired with their shiny faces together. The equipment is jacked up, and the paired sheets are placed underneath. The coefficient of friction is very low, 0.02-0.03 (steel on concrete is typically around 0.5) so it is then relatively easy to slide the object a short distance into its ideal position, lift it, and remove the paper. Distances are typically small, this is for fine positioning, not long-distance transportation. The paper comes in sizes from A4 to rolls 500mm wide and 30m long. www.asu-maru.com/english

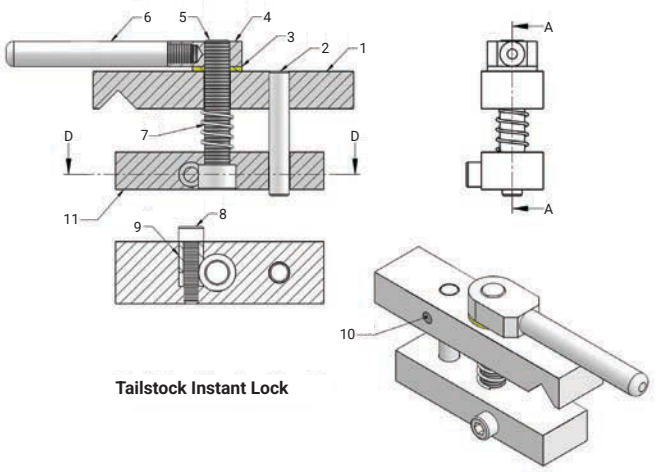






Jacques Maurel's Tailstock Lock

Eagle-eyed readers will have spotted that the figure illustrating the quick release tailstock tock was missing from last month's article. We have included it here, with apologies to Jacques,



Tailstock Instant Lock

Celebrating 25 Years Of The Midlands Garden Rail Show In 2027

The Midlands Garden Rail Show, originally known as The Large Scale Model Rail Show, first opened its doors in 2002. A quarter of a century later, Meridienne Exhibitions are proud to be celebrating twenty-five years of the show. The 2027 Midlands Garden Rail Show will take place on Saturday 27 and Sunday 28 February again at the Warwickshire Event Centre, Leamington Spa. Make a note in your diary now! This event attracts nearly 2,000 enthusiasts from all over the UK and offers visitors the opportunity to see layouts in the larger gauges and scales including Gauge 1, O Gauge, G Scale and more. There will be over 15 layouts and clubs at the event. Plenty of inspiration if you are planning your own garden railway be it live steam, gas or coal fired.



Once visitors have been inspired to build their own layout, they can visit nearly forty specialist suppliers at the show who are more than happy to guide them in the right direction of the best product to purchase.

For further details on the exhibition and suppliers attending will be updated over the coming months at: www.midlandsgardenrailshow.co.uk and on Facebook: Meridienne Exhibitions Ltd. Admission is Adult £14, Senior Citizen £13 and Child (5-14) £5.

Make Sure You Get Your Copy of Model Engineer & Workshop

Here's an important reminder regarding the closure of a number of TG Jones stores (formerly WH Smith). It seems that 19 stores across southern England closed in September, but up to 150 of 450 stores could disappear. To ensure you continue receiving future issues without interruption, we encourage you to consider one of the following alternative options should your local store close.

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IMLEC 2026



Neil Wyatt reports from this year's International Model Locomotive Efficiency Competition, held on the isle of Sheppey, with additional photos by Dave Bowen.



Photo 1: Harry Gooding sets off on the first competition run of the competition; Dave Bowen.

IMLEC is the International Model Locomotive Efficiency Competition, an annual contest that tests the thermal and mechanical efficiency of miniature steam locomotives and the skill of their drivers.

This year's competition was hosted by the **Sheppey Miniature Engineering and Model Society**, who did an excellent job of hosting the event at very short notice, **photo 1**. They also coped admirably with minor crises like needing to replace the electronics in the dynamometer car.

The competition happened over the 7th to 9th of August and the weather over the three days was blisteringly hot, and precautions were in place to minimise the risk of fire. Mercifully, the club had erected a large open-sided marquee for shelter, and a constant supply of refreshments was available.

The overall winner also gets to lift the prestigious *Martin Evans Challenge Trophy*, named for the former editor of *Model Engineer* who in 1969 inaugurated IMLEC to test the driving talent and thermal efficiency of 3½-inch and 5-inch gauge miniature steam locomotives, **photo 2**. A dynamometer car (a special measurement carriage) measures the total work done (output), while the weight of the coal used is measured to calculate the heat energy (input), and hence the efficiency (output/input).

Prizes are given for the three highest efficiency scores, plus an extra prize for the best performance by a 3.5" gauge locomotive, sponsored by *Model Engineer & Workshop*. I won't repeat all the run data as it's given in **Table 1**, instead I will give some background to each of locomotives, based on the driver's own accounts given in the excellent programme produced by SMEMS.



Photo 2: The Martin Evans Challenge Trophy.



Photo 3: Peter Wardropper pulls away; Dave Bowen.



Photo 4: Daniel Hamblin fires up his *Brittania*; Dave Bowen.

1 HARRY GODDING 3.5” GAUGE 2-10-0 BR STANDARD; MAIDSTONE MODEL ENGINEERING SOCIETY, PHOTO 1

Harry acquired the locomotive in 2025 after it had been out of use for many years, from a friend of a friend who only ran it on his private garden railway until he passed away. He rebuilt it with all new boiler fittings plate work and some work to the valve gear. He credits the original builder as the cylinder and valve bobbins were in perfect condition. He came 7th in the final rankings overall and won the 3 ½” gauge class locomotive in that gauge to finish.

2 PETER WARDROPPER 3.5” GAUGE COUNTY CLASS; SOCIETY OF MODEL AND EXPERIMENTAL ENGINEERS, PHOTO 3

This model is based on a 1947 design by LBSC with reference to works drawings and contemporary photographs. The model was started by Bill Hutchins and 90% complete when Peter acquired it, loosely assembled but unfinished with many smaller parts missing. Painting was completed in September 2019 when it was taken to the Guildford track and steamed for the first time. This locomotive has since proved to be a very competent performer. Retired.

3 DANIEL HAMBLIN 3.5” GAUGE LBSC *BRITTANIA*; CROYDON SOCIETY OF MODEL ENGINEERS, PHOTO 4

The *Britannia* was completed by Daniel’s Grandad, Richard Seaton, in 1962 to LBSC’s ‘words and music’. He ran it for nearly 20 years and gave it to Daniel in 1997 who spent five years restoring it. The locomotive was steamed again after over 40 years in 2023. Daniel is grateful for the help of the Croydon SME and Model Engineering Clearing House forum members to get to the challenge of running at IMLEC. Retired.

4 TERRY MASON 5” GAUGE 0-6-0 PANNIER TANK; FAREHAM AND DISTRICT SOCIETY OF MODEL ENGINEERS, PHOTO 5

The engine, to LBSC’s *Pansy* design came into Terry’s ownership in 1999 in a derelict state from a fellow club member. After eighteen months of restoration it ran regularly until 2009, when the boiler became unserviceable. It came back into service in 2017 with a new boiler and the coal bunker converted to a water tank to enable reliable injector performance. Terry took a creditable 4th place.



Photo 5: Terry Mason concentrates hard; David Bowen.



Photo 6: Luke Bridges with his *Polly*; Luke Bridges.



Photo 7: Chris Dore with an impressive rake of carriages.

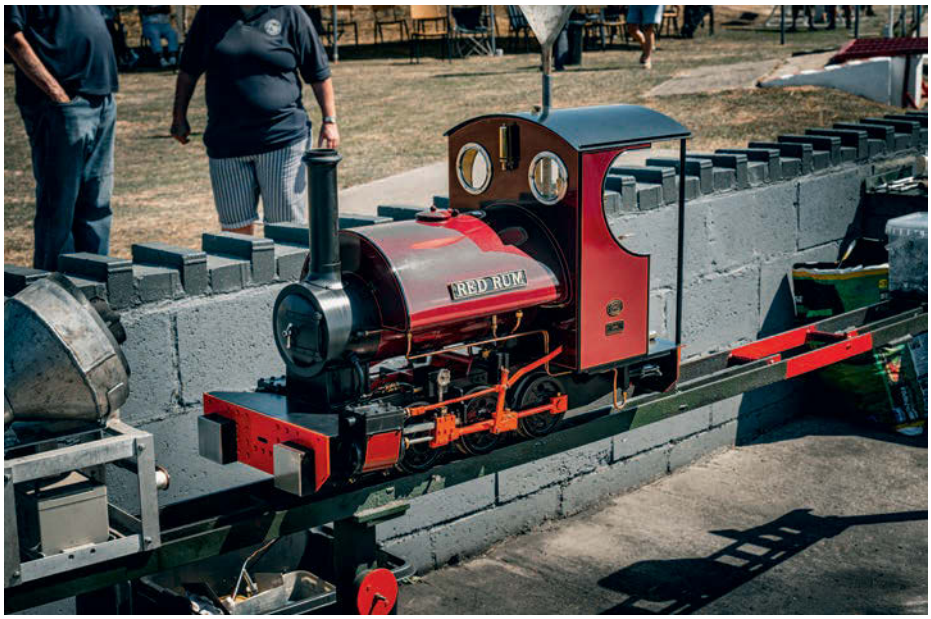


Photo 8: Martin Weekes' *Red Rum*; Dave Bowen.

5 LUKE BRIDGES 5" GAUGE POLLY 6; MAIDSTONE MODEL ENGINEERING SOCIETY, PHOTO 6

The Polly was the first loco Luke and his father built, finishing her in 2011. She is well travelled and well used regularly pulling passengers until our second Polly was completed ,when she was dismantled for overhaul and rebushing. Following his father's illness this stalled until last year when she ran again at Fareham's IMLEC and now in a second competition. Luke was placed 9th.

6 CHRIS DORE 5" GAUGE LNER B1; FAREHAM AND DISTRICT SOCIETY OF MODEL ENGINEERS, PHOTO 7

This model was bought from Station Road Steam in 2019 as a new build unsteamed locomotive. It was had seized cylinders and piston valves. It is built to Martin Evans Springbok design although the boiler has tubes arranged the same as Martins later '*Enterprise*' design. It is fitted with two radiant super heaters. A number of jobs were required including injector steam valves, twin mechanical, revised safety valves, balancing the weight distribution and springing. It is now a reliable and regular club working loco. This was Chris' third IMLEC driving this loco, and though he brought up the tail end in 15th place, it was a worthy run on a track that defeated many entrants.

7 MARTIN WEEKES 5" GAUGE 0-6-0 *METER MAID*; SHEPPEY MINIATURE ENGINEERING AND MODEL SOCIETY, PHOTO 8

Red Rum is an 0-6-0 Metre Maid design which is a derivative of the 0-4-0 Sweet Pea. It was built by Martin, finished in 1992 and attended most of the early Sweet Pea Rallies. Improvements include sintered bronze wheel bearings, stainless steel cab and water tank. It has two superheaters, two homemade injectors and no axle pump. It was called Red Rum as it looked a bit like the Llanberis Quarry locos which were named after racehorses. Retired.



Photo 9: David Shepherd brings his *Metre Maid* along the home straight.



Photo 10: Andy Crayford and his *Minx* emerge from the tunnel.

8 DAVID SHEPHERD 5" GAUGE POLLY 3; BRACKNELL RAILWAY SOCIETY, PHOTO 9

David built the loco from a Polly Kit around 5 years ago and it is used for public running at Bracknell. He has entered two previous IMLECs with this loco. Retired.

9 ANDY CRAYFORD, 3" GAUGE *MINX*; ROMNEY MARSH MODEL ENGINEERING SOCIETY, PHOTO 10

Sadly, the most successful IMLEC entrant of all time Lionel Flippance, who has been participating since 1985, was unable to run with his 5" Gauge proposed British Rail 2-8-2, which achieved the best IMLEC efficiency score ever recorded in 2012. Andy Crayford bravely stepped in to fill the empty slot at short notice with his *Minx* to the LBSC design, to take 10th place.

10 ANDY NASH 5" GAUGE 2-6-0 BR STANDARD CLASS 2; ROMNEY MARSH MODEL ENGINEERING SOCIETY, PHOTO 11

Andy bought the Standard 2 as a project. It came with a brand-new Norman Spink boiler, though it had been a runner previously. It was rebuilt by Stewart Christensen and further refined by Paul Norrington. The BR Crimson livery was inspired by the Ivatt 2 at the Keighley and Worth Valley Rly. I was given a 'Red Devil' headboard and thought that would be a suitable name. All the plates on the loco and tender were made by Diane Carney. Andy took 14th place and received the special prize of a bottle of whisky, donated by Judith Bellamy, for the effort required to achieve last but one place.



Photo 11: Andy Nash raises steam on his *Red Devil* Standard Class 2.



Photo 12: Graham Ashby cruises past the lake after a promising start.

Table 1

Run No	Driver	Society	Gauge inches	Locomotive	Laps	Passengers Start(end)	Coal Used lbs	Time Run mins	Distance Run ft	Actual Work Done ft lbs	Average DB Hp	Specific fuel consumption lb/hp/hr	Efficiency %	Final Position
1	Harry Godding	Maidstone	3.5	B R Standard	9	4	1.84	32	13246	127436	0.130	3.690	0.6219	7
4	Terry Mason	Fareham	5	Pannier Tank	8	5 (3)	1.23	27	11824	116118	0.119	2.450	0.8529	4
5	Luke Bridges	Maidstone	5	Polly VI	6	6	1.77	28	8844	122965	0.133	3.790	0.6162	9
6	Chris Dore	Fareham	5	LNER B1	7	9	2.32	27	10298	87522	0.088	4.637	0.3345	15
9	Andy Crayford	Romney	5	Minx	8	6 (3)	1.72	32	11968	113700	0.115	3.438	0.5864	10
10	Andy Nash	Romney	5	BR Standard Class 2	7	2	1.88	29	10304	89720	0.094	3.880	0.4241	14
13	David Mayall	Bracknell	5	Speedy	10	4	1.46	29	14726	155735	0.162	3.010	0.9480	2
14	Glen Davies	Bracknell	5	Simplex	11	2	1.88	31	16192	131242	0.128	3.629	0.6204	8
15	John Hunt	Leeds	5	Mixed Traffic	9	4	1.80	29	13250	151501	0.158	3.724	0.7461	5
16	Glyn Winsall	Rugby	5	GWR Metro Tank	11	2	1.34	33	16189	133203	0.122	2.430	0.8828	3
22	Tom Petch	Southampton	5	Simplex	8	3	1.78	27	11784	90047	0.101	3.94.	0.4497	13
24	Derek Drover	North London	5	LNER L1	9	5	1.82	29	13251	132158	0.138	3.760	0.6441	6
25	Danny Hayward	New Romney	5	Mercant Navy	9	5	2.44	28	13241	142336	0.154	5.230	0.5168	12
26	Andy Pope	Southport	5	King Arthur	9	6	2.38	30	13252	151657	0.153	4.760	0.5650	11
27	Ben Pavier	Southport	5	LNER Q5	8	5	1.22	25	11789	132335	0.160	2.920	0.9625	1
2	Peter Wardropper	SMEE	3.5	County Class	Retired									
3	Daniel Hamblin	Croydon	3.5	LBSC Brittania	Retired									
7	Martin Weekes	Sheppey	5	Meter Maid	Retired									
8	David Shepherd	Bracknell	5	Polly III	Retired									
11	Graham Ashby	Maidstone	5	Speedy	Retired									
12	Callum Christie	Wrexham	5	LMS Pacific	Retired									
17	Roger Holland	Chesterfield	5	A4 Pacific	Retired									
18	Ben Cox	Milton Keynes	5	Achilles	Retired									
19	Alasdair Croft	Leyland	5	A4 Pacifc	Retired									
20	Simon Holland	Chesterfield	5	0-6-0	Retired									
21	Steve Eaton	Chesterfield	3.5	Brittania	Retired									
23	Marcus Peel	Southport	5	Stanier Mogul	Retired									



Photo 13: Callum with *Duchess of Hamilton*, handrails have now been fitted!



Photo 15: Glen Davies about to enter the station.



Photo 14: David Mayall hauls a healthy load to second place.



Photo 16: John Hunt put in an excellent run for an IMLEC novice.

11 GRAHAM ASHBY 5" GAUGE 0-6-0 *SPEEDY*; MAIDSTONE MODEL ENGINEERING SOCIETY, PHOTO 12

Graham bought the loco in 2024 with a hydraulic certificate, but on first steaming there was a bad steam leak from the boiler, so it was repaired by the supplier. He brought the loco home in bits, rebuilt it and it passed steam test in January 2025 and its has been a very good runner since and turns lots of heads by its looks and performance. Retired.

12 CALLUM CHRISTIE 5" GAUGE 4-6-2 LMS PACIFIC SOCIETY; WREXHAM & DISTRICT SOCIETY OF MODEL ENGINEERS

Callum, from Northern Ireland, introduced himself as 'The International' in IMLEC. The loco is a *Duchess of Hamilton* his father Finin Christie started building from a part-built ModelWorks Kit in 2007. He only kept the wheels and chassis frames, getting the parts to finish the locomotive chassis from Blackgates Engineering. In 2025 Finin built the boiler with help of members of Drumawhey Junction Railway in Northern Ireland. The Duchess Ran for the First Time in January 2026 and was painted in time for IMLEC. Retired.

13 DAVID MAYALL 5" GAUGE 0-6-0 *SPEEDY*; BRACKNELL RAILWAY SOCIETY, PHOTO 14

David's sixth locomotive was completed in 2001. Due to the fitting of cladding the boiler barrel is smaller and it has eight tubes and 1 flue fewer than the original, but has not been detrimental to its steaming, it has four radiant stainless super heaters. The blast pipe arrangement has been modified to an article in ME; it has Gordon Smith design GWR safety valves and Don Young modified valve gear. It has been entered into a few IMLECs over the years and managed 2nd place at Southport in 2017, and Maidstone in 2021. Despite made an excellent run holding first place for much of the competition, but in the end, it was 2nd again at Sheppey! Well done and good luck next year, David.

14 GLEN DAVIES 5" GAUGE *SIMPLEX*; BRACKNELL RAILWAY SOCIETY, PHOTO 15

Glen built this locomotive about six years ago, taking approximately three to complete. I built a coal and water wagon for the locomotive which made the 2024 IMLEC competition a lot less stressful as I can run the full half an hour without taking on extra water. It has proven to be a very reliable locomotive for passenger hauling at our clubs public running days. At the last IMLEC he improved on last year's 10th place by coming 8th.

15 JOHN HUNT 5" GAUGE 2-6-0 MIXED TRAFFIC; LEEDS SOCIETY OF MODEL AND EXPERIMENTAL ENGINEERS, PHOTO 16

John has been a member of Leeds SMEE since 1987 and has attended many IMLECs but this was his first entry. The loco was built to Clarkson's design by his and his two sons' metalwork teacher, Edwin Hughes. He later joined our society and became a good friend as well as mentor. On his passing the loco went to good friend Geoff Midgeley. Geoff has now passed on and the loco came to John with double the meaning having been owned by two such good and influential friends. During Geoff's ownership he often urged John to enter the competition, who did him credit with a good 5th place.

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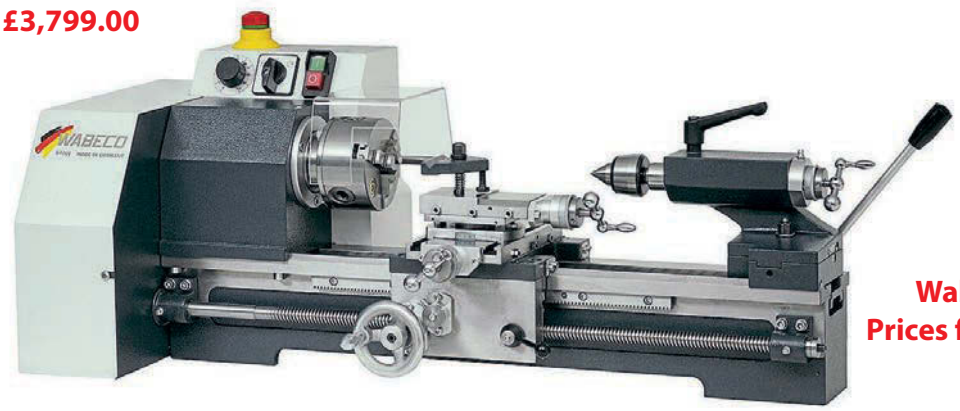
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Early Developments In Hydrostatic Transmissions PART 5



Mike Tilby of the Society of Model and Experimental Engineers (SMEE) concludes by looking at further developments, notably the tilted head.

The patents described previously give an idea of the types of design principles that can be used in hydraulic drives. Eventually many companies started developing axial piston (AP) type drives, especially for use in vehicles for agriculture and construction industries. AP designs could be more compact than the radial equivalents and two main principles were used to adjust the displacement of either the pumps or the motors. The first type was described previously and involved adjusting the tilting angle of the swashplate. The other type is generally known as a bent axis or tilted head design. In this type of pump or motor the stroke could be varied by tilting the axis on which the swash plate was mounted relative to the axis through the cylinders **fig. 16**. This has a similar effect to changing the angle of a swashplate, but it was claimed that the disposition of forces was more favourable, particularly in reducing side pressure of the pistons against the cylinder walls.

Units of this type were developed by a number of companies, but products from the UK company Dowty provide a good illustration of the interesting features to be found in this type of machinery in the 1960s.

Dowty was a very large engineering company that had been founded in the 1930s by the engineer and inventor George (later Sir George) W. Dowty. The company made components for the aircraft industry and during WW2 they supplied large numbers of parts for many types of aircraft such as Hurricane fighters and Lancaster and Halifax bombers. Some of the components they made were for hydraulic systems and, in the 1950s, they developed hydrostatic transmissions for markets outside the aircraft industry. Various types of motors and pumps were manufactured such as the 'Dowmax' swashplate motor in **fig. 17**.

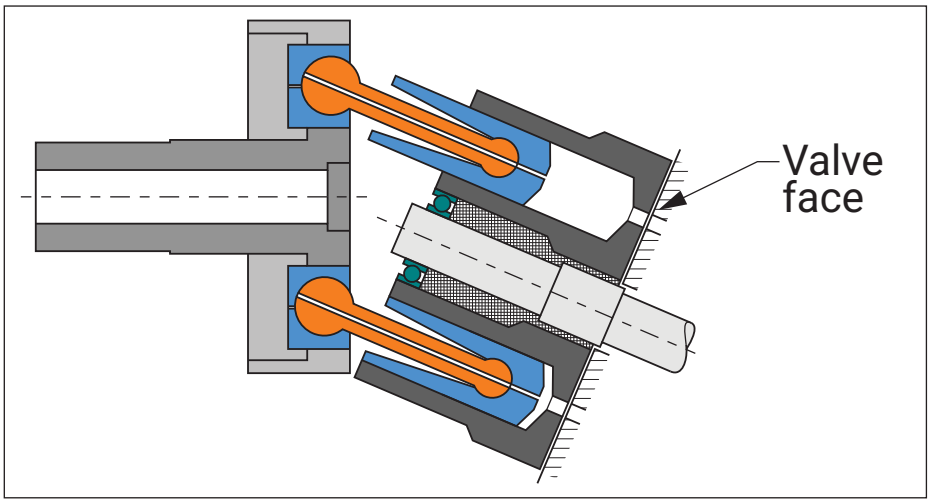


Fig 16: Tilting head pump or motor as used in the Dowmax and Taurodyne drives.

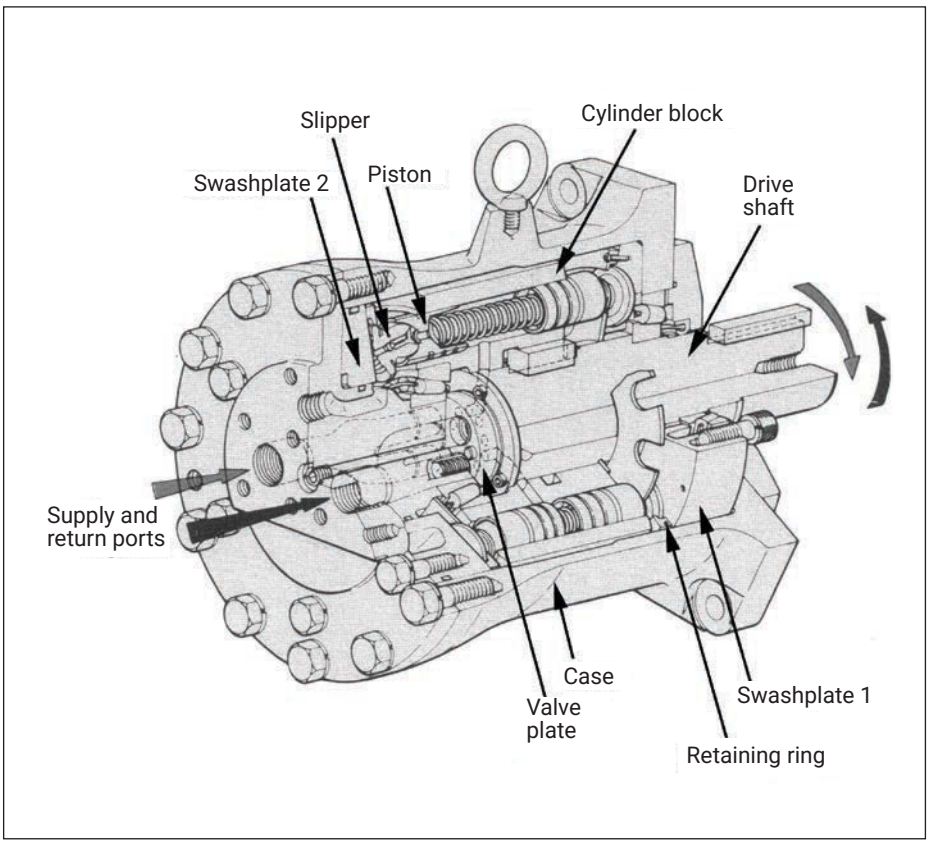


Fig 17. Dowmax motor (adapted from a Dowty sales brochure).

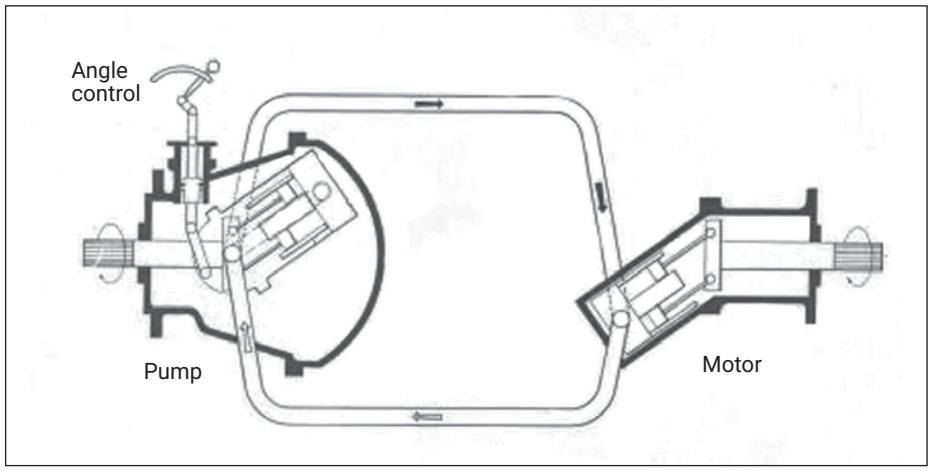


Fig 18. Diagram of the Dowmatic tilting head hydrostatic transmission in photo 7, in which the pump and motor have variable and fixed displacements respectively. (Adapted from www.dowtyheritage.org.uk).

In 1958 Dowty introduced a range of hydraulic pumps and motors under the brand name of Dowmatic which were based on the tilted head design. The motors could have variable displacements due to the head angle being adjustable. The fluid was delivered to motors in which the heads were at a fixed angle, **fig. 18** and **photo 7**. These units were for transmitting 50 to 100 hp and were claimed to be more efficient than competing designs while being more compact. They came to be used in a wide variety of machines such as excavators, road rollers, fork lift trucks, narrow gauge locomotives and dumper trucks. Hydrostatic drives have many advantages for these types of high power, low speed applications where there is a need for good control of speed and position.

In hydrostatic transmissions in general, raising the working pressure results in a number of advantages although design complexity, accuracy of the manufacturing processes and the demands on the materials used are all increased. In the mid-1960s operating pressures in the Dowmatic transmissions were over 5,500 psi. This contributed to improved efficiency because at higher pressures lower flow rates were sufficient to transfer a given level of power and lower flow rates meant frictional losses due to fluid flow were lower. It also meant that sizes of cylinders could be reduced. The use of such high pressures meant that considerable force was exerted on the small areas of the spherical bearings at each end of the connecting rods. To reduce friction and wear in the joints fine passageways were formed through the pistons and connecting rods and recesses were machined in the surfaces of the balls so that a suitable quantity of high-pressure oil was forced into the joints thereby providing fluid film lubrication.

AN ARTICULATED DUMP TRUCK

Photograph 8 shows a Dowmatic motor installed in a 95 hp DD105 articulated dump truck (ADT) which was made in the 1960s by Whitlock Brothers Ltd, Great Yeldham, Essex. (**photo 9** shows a similar Whitlock ADT). When first introduced, the DD105 was considered an advanced design in which the adoption of a hydrostatic drive enabled:

- An infinitely variable gear ratio in forward and reverse.
- The rear wheels in the trailer-unit to be driven by the engine in the tractor-unit.
- Mounting of the Perkins engine in front of the tractor-unit axle.
- The front axle to be driven without drive to the rear axle, enabling higher speed on roads.
- Torque distribution between the axles to be progressively varied via a single lever.

Two hydraulic motors separately drove the front and rear wheels through traditional differential gearboxes. During four-wheel drive, hydraulic fluid was sent to both motors in a ratio that could be varied between front and rear. For higher speeds (up to 20 mph) the fluid was sent to just the front motor and then the rear drive freewheeled with its motor acting as a pump, the fluid being circulated round the motor's casing to provide cooling.

AGRICULTURAL TRACTORS

The heads of Dowmatic drives could not be tilted by more than thirty-five degrees and this limited the maximum ratio of input to output speed and torque. This made it unsuitable for use in agricultural tractors where a greater range of speed and torque was required. For such tractors Dowty developed the 'Taurodyne' drive.

The Taurodyne drive was described as a gearbox replacement because it achieved a speed ratio that was continuously variable between 1:1 and 10:1. This was attained by making the heads of the motor and the pump both adjustable using a mechanism that synchronised the angles of the two devices, **fig. 19**. With a variable tilting head pump, maximum torque and lowest speed are attained when the pump stroke is at its minimum, i.e. minimum tilt angle. However, with a variable tilting head motor, maximum torque / lowest speed is attained when the piston stroke is maximum, i.e. at maximum tilt. Therefore the mechanism in the Taurodyne that synchronised the angles of the pump and motor presumably acted to ensure that tilts of the pump and the motor changed in opposite directions either simultaneously or in a manner that one changed only after the other had reached its limit.

In most other hydrostatic drives the maximum speed (and torque) ratio was less than 5:1 and to give a wider

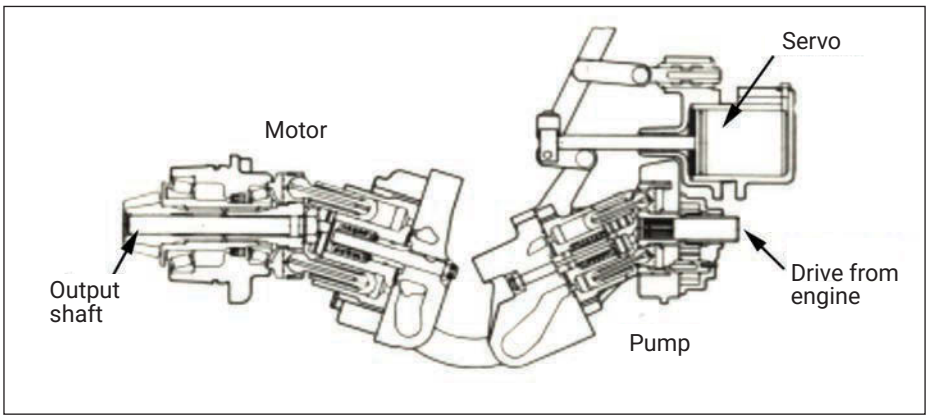


Fig 19. The Taurodyne hydraulic gearbox replacement (adapted from ref. 22).

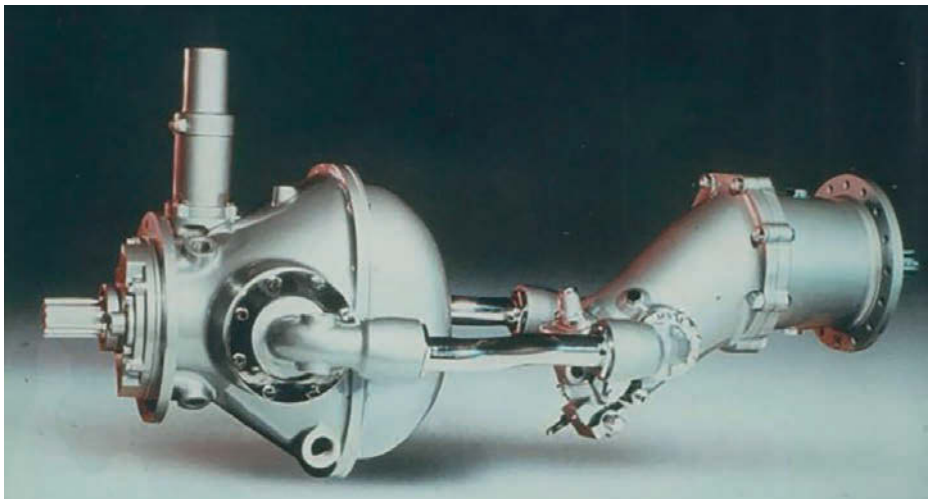


Photo 7: Dowmatic tilting head hydrostatic transmission as represented in fig. 18. (Adapted from documents on www.dowtyheritage.org.uk).

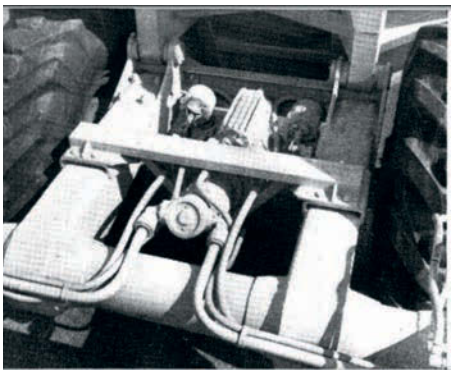


Photo 8: A Dowty Dowmatic motor fitted in the tractor unit of a DD105 4 x 4 articulated dumper truck (ADT) that was produced by Whitlock Bros. Ltd. about 1963 (from ref. 20).

range they were often combined with a mechanical gear box. It was stated that the more favourable disposition of forces in the tilted head design allowed a wider range of tilt angle to be used compared to a tilting swashplate design.

THE LENTZ DRIVE

Once people started experimenting with internal combustion engines to power railway locomotives, they had to solve the question of how to match optimum engine speed to varied wheel speeds while transmitting much more power than was needed for a typical road vehicle. Part 3 of this series described the somewhat successful Hele-Shaw drive in a petrol-hydraulic rail motor coach. Another early attempt used a type of mechanism invented by the Austrian/German engineer Hugo Lenz (1859 - 1944) who is best known for his cam-actuated poppet valve gear for steam engines. (The name Lenz is generally printed as Lentz in English language publications)

The Lentz drive was based on sliding vane-type pumps and motors and was initially used in road vehicles from about 1910. In about 1921 it was applied in a small experimental railway locomotive powered by a three-cylinder Benz-Diesel engine. This engine was directly coupled to the Lentz transmission gear. With the engine running at constant 500 rpm and developing 30 bhp, speeds of 4, 8 and 12 km/h could be obtained. About 1922 a larger locomotive was built for the Prussian Railways in which the hydraulic drive transmitted 200 - 300 bhp The locomotive was actually powered by an AEG single phase induction motor. At that time it was thought that hydraulic drives would be useful for such locomotives but it was also stated that experience gained would be relevant to application of the Lentz drive to diesel powered locomotives since the characteristics of this type of electric motor (operating at a fixed A.C. frequency) were similar to those of a diesel engine.

This version of the drive consisted of two sliding vane pumps of differing capacities, **fig.20**, which were directly driven by the electric motor. Fluid from these was delivered to a sliding vane motor mounted transversely beneath the pumps. I assume this could have been on a jack shaft for driving the wheels, but I have not seen any further details. The speed and torque developed by the hydraulic motor depended on which of the pumps was supplying the pressurised fluid. Lowest speed and highest attainable pressure and hence highest torque was obtained when just the smaller pump was connected. Mid-speed/torque was obtained with the larger pump and maximum speed, lowest pressure and lowest torque was when both pumps were in use. In 1924 Davy Paxman & Co (Colchester) built a modified Lentz drive for use in buses, **refs. 23** and **24**.

Precautions were taken in the design of the vanes to minimise wear but nevertheless, it seems that this invention was not a great success because of two drawbacks. Firstly, it resembled a mechanical gear box in that there was a limited selection of pre-determined speed ratios whereas other types of hydraulic transmissions could provide a continuously variable ratio. Secondly, difficulties were experienced with formation of gas bubbles (cavitation) in the fluid and that led to loss of power. This was made worse when the oil became heated due to heavy use or warm weather.



Photo 9: A DD70 articulated dumper truck (ADT) made by Whitlock Bros. It is shown here to illustrate what an ADT looks like. (Photo provided by Rodney Smith from ref. 21 and used with his permission).

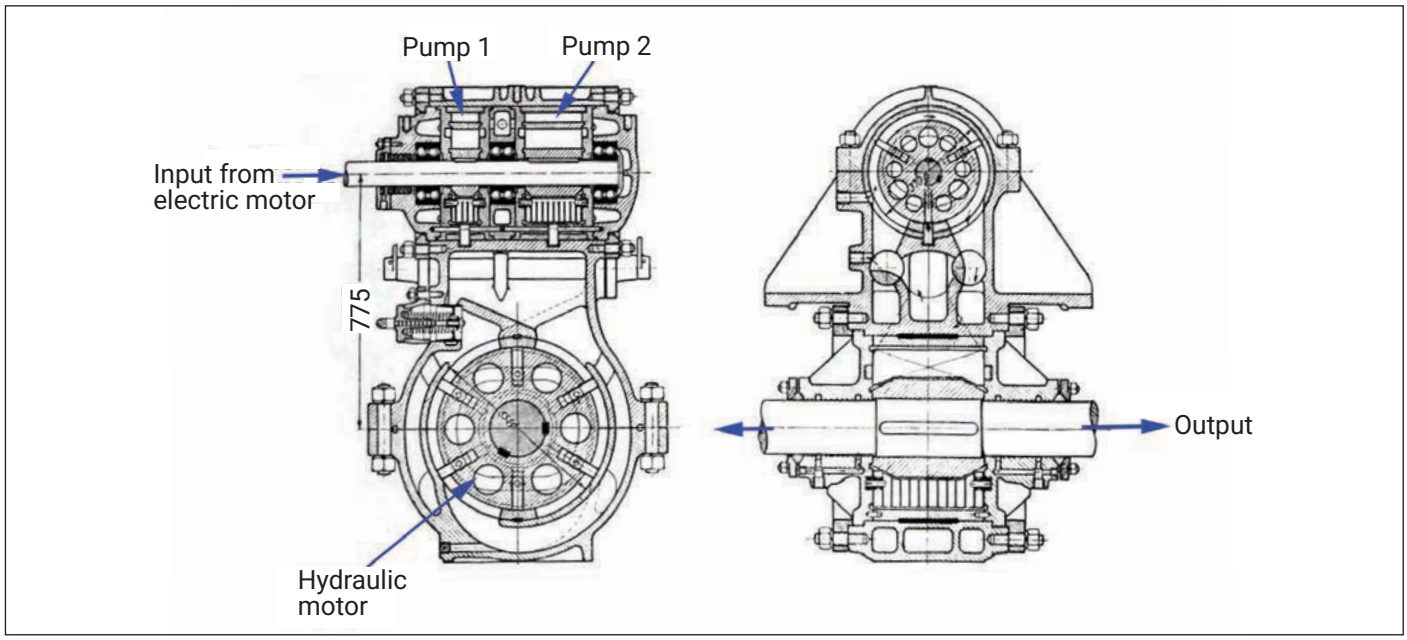


Fig 20. Lentz hydrostatic drive for an experimental electric locomotive, built about 1922 for the Prussian Railways (adapted from ref. 23).

MODERN DEVELOPMENTS

Vane.-.type hydraulic pumps and motors are still made by at least one company, **ref. 25,** but the technology has developed a great deal since the original Lentz drive. Working pressures of up to 6,000 psi are now used and pumps are produced with either fixed or variable displacements. Diagrams representing two designs are shown in **figs. 21** and **22,** which are based on information provided by the Japan-based manufacturer, Yuken Kogyo Ltd, **ref. 25**. The cylinder inside which the rotor and vanes rotate is called the cam ring. In these designs the vanes are pressed against the inner wall of the cam ring by pressurised hydraulic fluid that is allowed to enter into the bottom of the vane slots. In fig. 21 the cam ring is non-circular and shaped so as to cause the spaces between the vanes to expand and contract twice in each revolution of the rotor so that the pump delivers twice per revolution. In the design depicted in fig. 22 the cam ring is circular so there is just one pumping cycle per revolution, but the ring can be adjusted in position relative to the axis of the rotor. Clearly, as it is moved towards being concentric with the rotor the pumping rate becomes reduced to zero as in the hydraulic motor invented by Mr. Rigg in 1885 and described in part 2.

This brings to an end the current series of articles.

REFERENCES

20. Dumpers hydrostatic transmission. *Commercial Motor,* 23 August 1963 p.42.
21. www.flickr.com/photos/36618304@N05/albums/72157623885782015/with/7239992164
22. Worn, C.L.G. and Walker, A.C. (1966) A gearbox replacement hydrostatic drive. SAE transactions, 74: 286—297.
23. The Lenz oil transmission gear for locomotive work. The Engineer, 16 December 1921, p.660
24. Hydraulic transmission for omnibuses. The Engineer, 14 March 1924, p.292.
24. Hydraulics may replace gearing. The Commercial Motor 25 January 1946 p.21.
25. Yuken Kogyo Co. Ltd. Basic hydraulics and components, yuken-usa.com/pdf/special/Basic_Hydraulic_And_Components_(Pub._ES-100-2)_.pdf

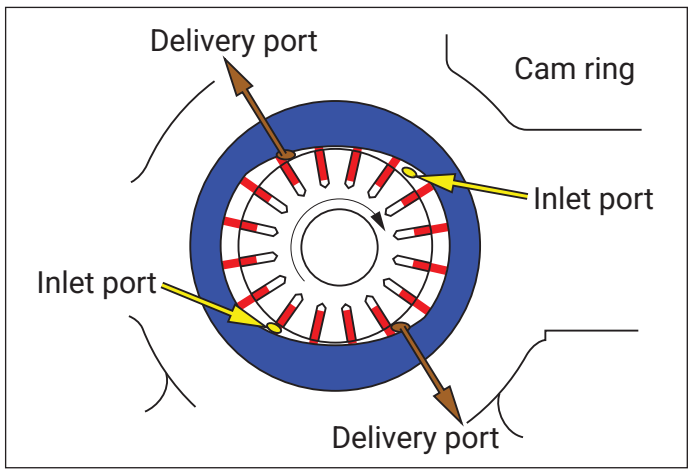


Fig 21. Diagrammatic representation of a vane type hydraulic pump with dual pumping action (based on information in ref. 25).

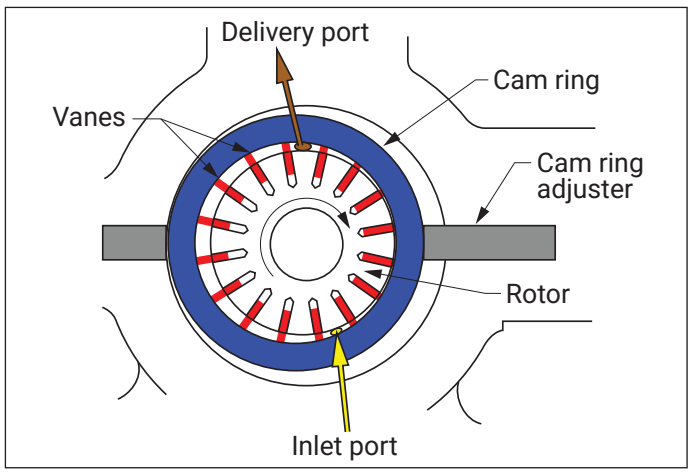


Fig 22. Diagrammatic representation of a vane type hydraulic pump with adjustable displacement (based on information in ref. 25).

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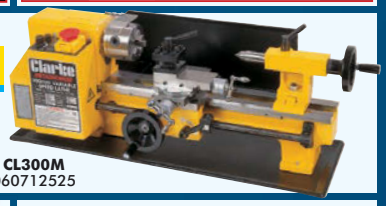
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Living with a Proxxon Mini-Mill



In the second of his occasional articles, Graham Meek details new guide pins for the replacement spindle of his Proxxon mill.

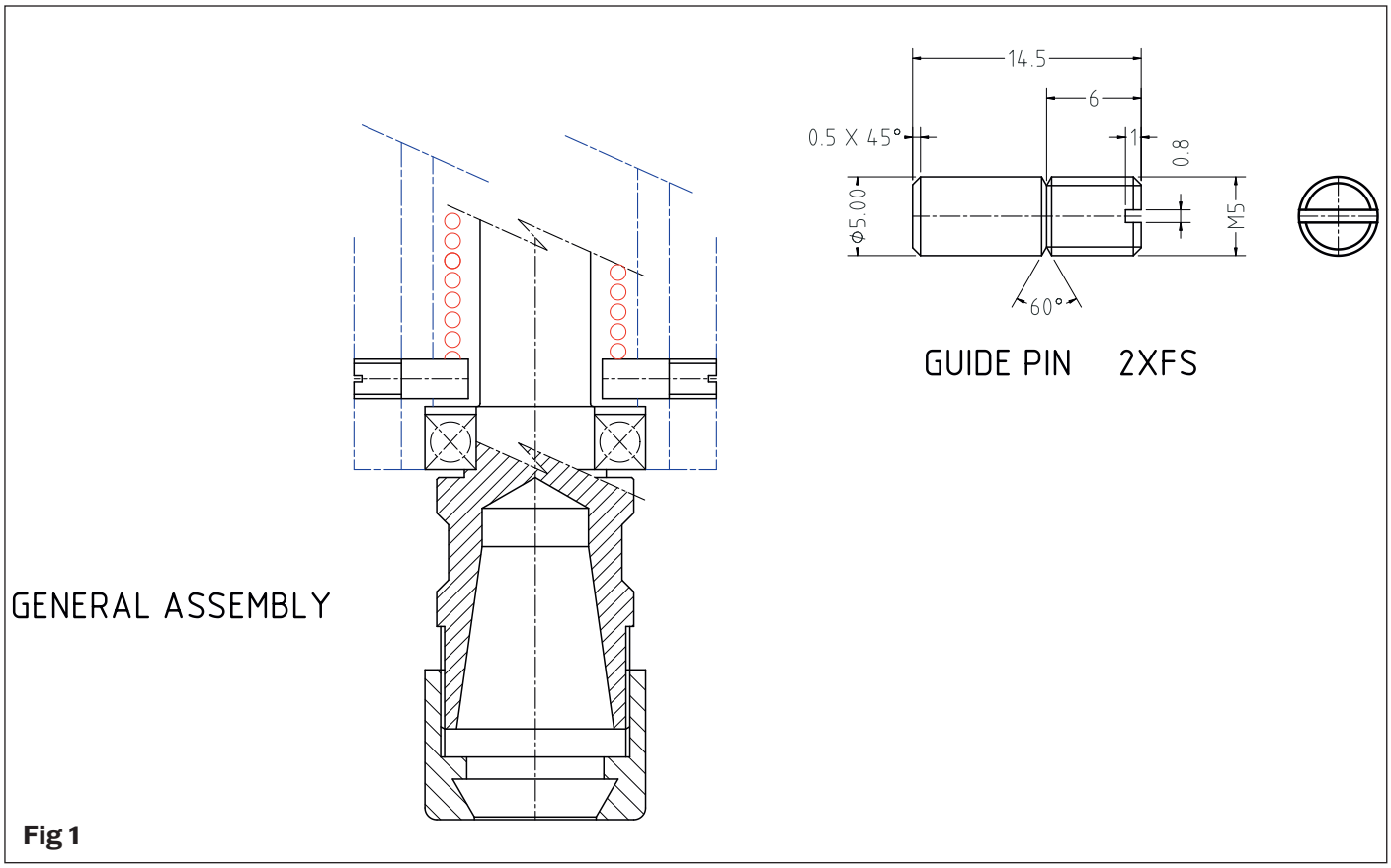


Fig 1

Following on from part 1 in *ME&W* 4780, the control of the sliding quill during drilling etc. left something to be desired. The two M5 grub screws that Proxxon use also act as the bottom support for the quill return spring is situated inside the quill between the spindle bearings. The replacement screws are best inserted with the quill dismantled, **fig.1**. As these need to be inserted from the inside out, in order to get a plain diameter working in the slot, this would need to be done in any case to remove the furrows on the sides of the slots left from the crests of the grub screws. These furrows affect the fit of the new pins in the slots. Nothing more than a few draw-filing strokes of a flat needle file is all that is required to remove the displaced metal.

Inserting the pins was found to be easy with the use of a pair of tweezers and a magnetic flat bladed screwdriver. Using (precision ground) silver steel will get the best fit possible between the slots and the pins, but it will mean the pins need to be screw cut. This not only ensures the thread is concentric with the diameter of the silver steel, but also that the pins will sit squarely in the bore of the quill housing and not cause any binding of the quill. Screw cutting also produces a full form thread for the length of the thread. Something which a die-formed thread cannot achieve due to the lead-in angles on the die which would mean the pins would not sit squarely in the bore due to the partial threads left by the lead-in angles.

There is an alternative to screw cutting that involves cannibalizing two M5 capscrews which are not threaded to in under the head. The only downside to this approach is the capscrew shank will be slightly down on 5 mm diameter. This will give some degree of freedom for the quill to rotate in the quill housing, but it will not be as excessive as the original Proxxon grub screw arrangement.

The slot in the end of the pin was produced with a 0.8 mm wide slitting saw. These pins do not need to be tightened excessively; they only experience a slight drag from the quill and are under constant pressure from the quill return spring, so the chances of them loosening over time is pretty negligible. The pin on the side where the Proxxon fine down feed attachment sits does not want to protrude above the quill housing surface when tightened. Otherwise, the attachment will not sit squarely on the side of the quill housing. If the parts are made to the drawing this will not happen.

Index

for issues 4771 to 4782 of ME&W

Compiled by David Frith.



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e.g. 299 21 refer to the particular issue and page number. Column six: A = Article, T = Trade, L = Letter, Q = Quick tip, S = Subject.

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JOSEPH	MODELLING TRAY	235	4775	15
KING	COVENTRY DIE HEAD SHARPENING JIG 1	235	4770	27
KING	COVENTRY DIE HEAD SHARPENING JIG 2	235	4771	53
KNIGHTS	CITY AND GUILDS 193 MECHANICAL ENGINEERING	235	4779	61
LEONARD	DRILL STAND	235	4772	56
LEONARD	HOUSING FOR A GRANITE SURFACE PLATE	235	4774	67
LEONARD	IT NEEDS A REWORK	235	4777	64
LOFTING	MONUMENT CLAMPS	235	4777	46
LOUSICK	TOOL AND CUTTER GRINDER 1	235	4775	9
LOUSICK	TOOL AND CUTTER GRINDER 2	235	4776	68
LOUSICK	TOOL AND CUTTER GRINDER 3	235	4777	68
LOUSICK	TOOL AND CUTTER GRINDER 4	235	4778	59
LOUSICK	TOOL AND CUTTER GRINDER 5	235	4779	65
MANDREL	REVIEW: SUNHU FILADRYER S1 PLUS	235	4776	19
MANDREL	BUXTON	235	4778	52
MARTYN	GWR PANNIER TANK IN 3 1/2 INCH GAUGE 18	235	4770	68
MARTYN	GWR PANNIER TANK IN 3 1/2 INCH GAUGE 19	235	4771	44
MARTYN	GWR PANNIER TANK IN 3 1/2 INCH GAUGE 20	235	4772	45
MARTYN	GWR PANNIER TANK IN 3 1/2 INCH GAUGE 21	235	4773	30
MARTYN	GWR PANNIER TANK IN 3 1/2 INCH GAUGE 22	235	4774	62
MARTYN	IMPROVEMENT TO A PANNIER TANK 1	235	4778	48
MARTYN	IMPROVEMENT TO A PANNIER TANK 2	235	4780	59
MARTYN	IMPROVEMENT TO A PANNIER TANK 3	235	4781	46
MAUNDER	ADVENTURES IN COAL	235	4776	74
MAUREL	USING THREADED BORE END MILLS	235	4772	59
MAUREL	HOLDING MACHINE TAPS 1	235	4773	34
MAUREL	HOLDING MACHINE TAPS 2	235	4774	42
MAUREL	UNIVERSAL DIE HOLDER	235	4775	74
MAUREL	LAPPING REAMERS TO SIZE	235	4779	48
MAUREL	TAILSTOCK LOCKING DEVICE	235	4781	40
MEACLE	GEARING AROUND 1	235	4771	26
MEACLE	GEARING AROUND 2	235	4772	67
MEEK	BELT TENSION LOCKING HANDLE	235	4774	60
MEEK	TAILSTOCK HAND WHEEL DIAL	235	4777	27
MEEK	LIVING WITH A PROXXON MINI-MILL - A NEW SPINDLE	235	4780	18
MONK	5" GAUGE STEAM TRAM 1	235	4778	44
MONK	5" GAUGE STEAM TRAM 2	235	4779	44
NOEL	RE-IMAGINING THE ANTONI VAN LEEUWENHOEK MICROSCOPE 1	235	4771	40
NOEL	RE-IMAGINING THE ANTONI VAN LEEUWENHOEK MICROSCOPE 2	235	4772	25
OWEN	VIBRATION, SOUND AND NOISE 1	235	4774	22
OWEN	VIBRATION, SOUND AND NOISE 2	235	4775	26
OWEN	VIBRATION, SOUND AND NOISE 3	235	4776	45
RAYWARD	WORKSHOP TECHNIQUES 2-FORMING CURVED BRASS ANGLES	235	4771	67
RAYWARD	PUNCH TOOL FOR SIMULATING RIVETS	235	4773	74
RAYWARD	SAMSON 1	235	4777	74
RAYWARD	SAMSON 2	235	4779	24
RAYWARD	SAMSON 3	235	4781	14
REED	SOLAR POWERED TRAM 1	235	4773	46
REED	SOLAR POWERED TRAM 2	235	4774	74
SANDERSON	HOW I BUILT A CNC MILL	235	4776	24
SPEDDING	CALIPER CONUNDRUM	235	4780	42
STANTON	SETTING LOCOMOTIVE WHEELS	235	4774	15
STUART	FOURUNNER MK2 OSCILLATING ENGINE 1	235	4779	51
STUART	FOURUNNER MK2 OSCILLATING ENGINE 2	235	4780	36
STUART	FOURUNNER MK2 OSCILLATING ENGINE 3	235	4781	28
TAYLOR	NEATER SWARF TRAY	235	4778	58
THATCHER	SILVER CREST BR CLASS 1500 1	235	4775	18
THATCHER	SILVER CREST BR CLASS 1500 2	235	4776	50
THATCHER	SILVER CREST BR CLASS 1500 3	235	4777	34
THATCHER	SILVER CREST BR CLASS 1500 4	235	4778	22
THATCHER	SILVER CREST BR CLASS 1500 5	235	4779	68
THATCHER	SILVER CREST BR CLASS 1500 6	235	4780	52
THATCHER	SILVER CREST BR CLASS 1500 7	235	4781	68
THEASBY	SHEFFIELD STEAM RALLY 2026	235	4781	23
THOMAS	TANDEM COMPOUND MILL ENGINE 21	235	4770	18
THOMAS	TANDEM COMPOUND MILL ENGINE 22	235	4771	74
THOMAS	TANDEM COMPOUND MILL ENGINE 23	235	4772	34
THOMAS	TANDEM COMPOUND MILL ENGINE 24	235	4773	40
THOMAS	TANDEM COMPOUND MILL ENGINE 25	235	4777	9
TILBY	EARLY DEVELOPMENTS IN HYDROSTATIC TRANSMISSIONS 1	235	4778	9
TILBY	EARLY DEVELOPMENTS IN HYDROSTATIC TRANSMISSIONS 2	235	4779	74
TILBY	EARLY DEVELOPMENTS IN HYDROSTATIC TRANSMISSIONS 3	235	4780	13
TILBY	EARLY DEVELOPMENTS IN HYDROSTATIC TRANSMISSIONS 4	235	4781	74
TINEY	LATHEWORK TIPS	235	4780	40
TOWERS	CHUCK LIFTING HANDLE	235	4773	67
TWISSEL	INTRODUCTION TO ELECTRO FORMING	235	4781	9
WADDILOVE	STORAGE FOR LARGER DRILL BITS	235	4773	65
WALKER	TANGENTIAL FLYCUTTER	235	4780	44
WEBB	EXTENDED COUNTERSINK	235	4775	65
WEBSTER	SETTING UP WALSCHAERTS VALVE GEAR	235	4775	34
WEBSTER	CLUTCH FOR THE ML7	235	4775	40
WESTBURY	TOOL POST INDEXING DEVICE BY "NED"	235	4779	40
WILLIAMS	PRECISION MEASUREMENT OF SQUARENESS 2	235	4770	74
WILLIAMS	LOWMEX 2025	235	4773	54
WING	SOURCE OF ACCURATE PACKING MATERIAL	235	4780	46
WOODING	GIB LOCK SCREW EXTENSION	235	4775	37
WYATT	THE BRADFORD CUP AND STEVENSON TROPHY 2025	235	4770	50
WYATT	MAKING SIMPLE TAPER TOOLING	235	4770	16
WYATT	ROYAL MAIL STAMPS TO CELEBRATE UK STEAM LOCOMOTIVES	235	4770	47
WYATT	THE FALKIRK WHEEL	235	4770	52
WYATT	CUSTOM 3D PRINTING OF CHALLENGING MATERIALS	235	4771	21
WYATT	WORKSHOP CHALLENGE-FLUTING TAPERED COLUMNS	235	4771	50
WYATT	BATTERIES AND CELLS FOR WORKSHOP PROJECTS 1	235	4772	16
WYATT	BATTERIES AND CELLS FOR WORKSHOP PROJECTS 2	235	4773	50
WYATT	STANDARD BEAVERETTE IN 1:12 SCALE	235	4774	17
WYATT	IMLEC 2026	235	4777	30
WYATT	CLUB DIARY	235	4779	67
WYATT	USING OXIDATION COLOURS FOR TEMPERING STEEL	235	4779	56
WYATT	TANKFEST 2026	235	4780	9
WYATT	BRADFORD CUP AND STEVENSON TROPHY 2026	235	4781	18
WYATT	EQUATORIAL TELESCOPE PLATFORM	235	4781	44
ZEUSCHE	EASY 3D PRINTED WORKSHOP AIDS	235	4775	30

A Carbide Tipped Marking Gauge



John Purdy, in Canada, transforms a Vernier Caliper to Carbide Tipped Marking Gauge

For many years I have used a vernier caliper, with the end of the fixed jaw ground to a point, as a marking gauge for laying out dimensions as a sanity check before cutting/drilling/milling, and it has worked very well, **photo 1**. But it has one drawback in that the point dulls fairly rapidly, in spite of the fact that the caliper is labeled as 'hardened'. This has resulted in the fixed jaw getting progressively shorter due to repeated sharpening. As a result I had, for a while, toyed with the idea of adding a carbide tip to the fixed jaw. With this in mind I acquired a cheap 8-inch caliper to modify. The original was 6-inch, but on a few occasions it could have been longer. Although I have used a standard vernier caliper I don't see why a digital one could not be modified the same way. In fact, it would make setting to zero a lot easier, just close the jaws and press the zero button.

After mulling over how to modify the fixed jaw to add the carbide insert and get it parallel to the other jaw and have the caliper still read zero when closed, I decided it would be much easier to just make a new fixed jaw. The general idea is shown in **fig. 1**. No dimensions are shown as it will depend on the specific caliper used, but it will give an idea of the shape of the new jaw.

First step was to disassemble the subject caliper by removing the end stop, movable jaw, and depth rod. I also removed, from the moveable jaw, the vernier scales, locking screw and fine adjustment unit. This allowed the bits to be held more securely while being modified.

The movable jaw was modified by cutting off the inside measuring ear and part of the body on the left end, back to the edge of the vernier scale mountings. The bar was modified by cutting off its inside measuring ear and the fixed jaw, both back to just slightly wider than the width of the bar. I did this initially by using a cutoff disk on the angle grinder as I wasn't sure how hard the material would be. I then cleaned up the cut edges with a carbide end mill.



Photo 1: Original modified caliper.

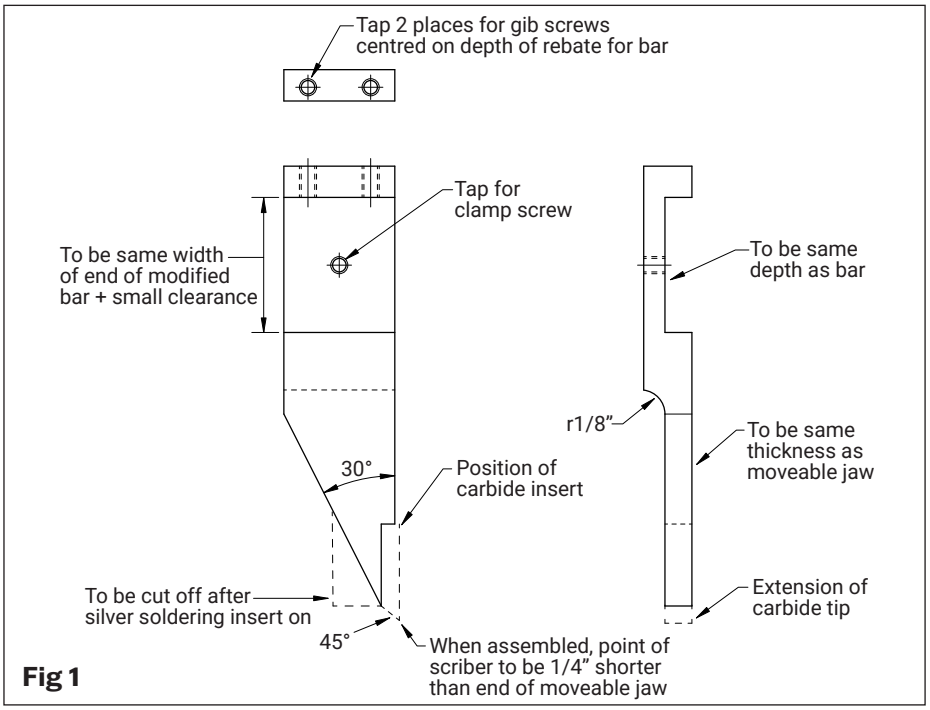


Fig 1

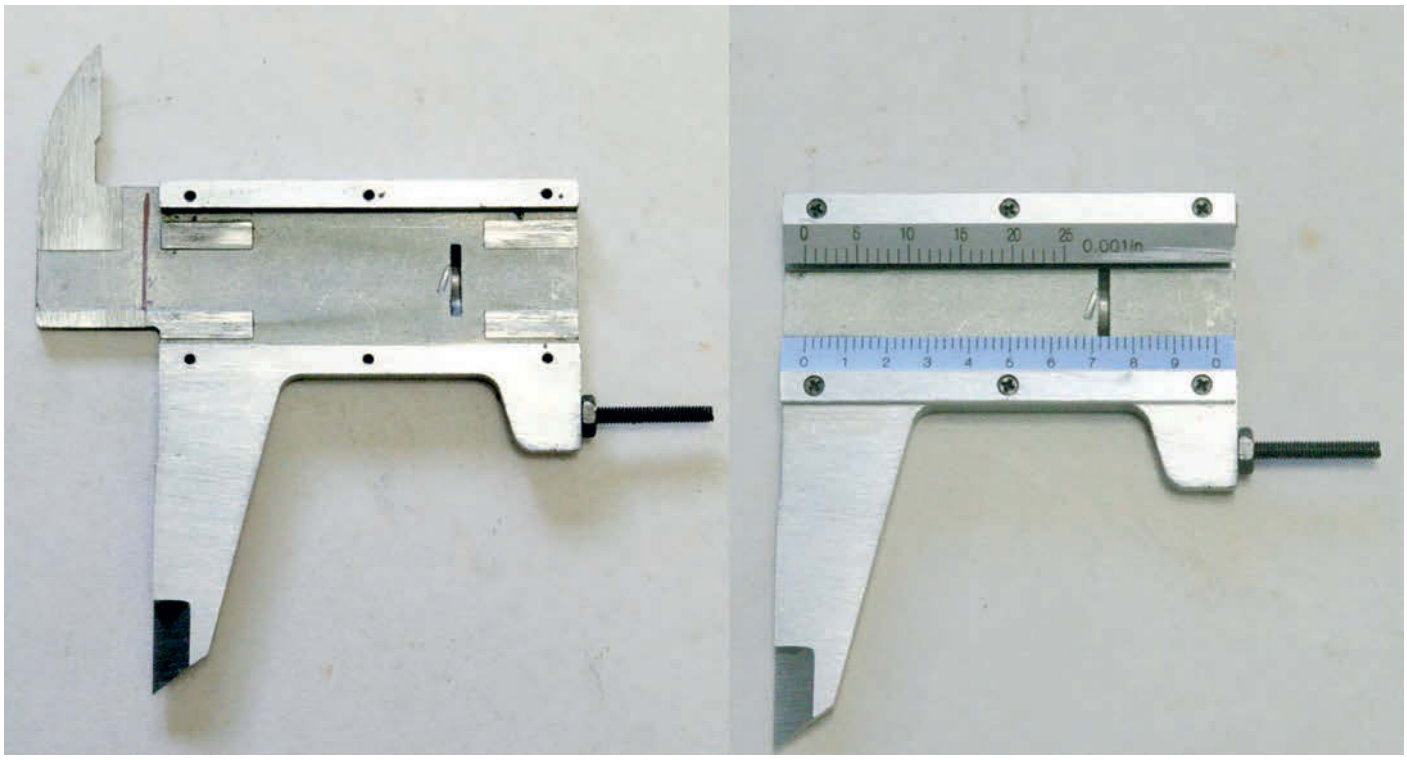


Photo 2: The moveable jaw before and after surgery.

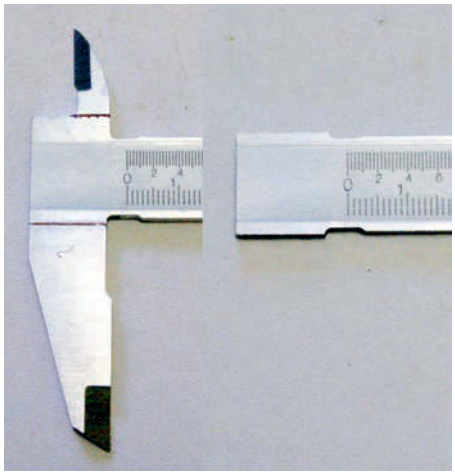


Photo 3: The bar before and after surgery.

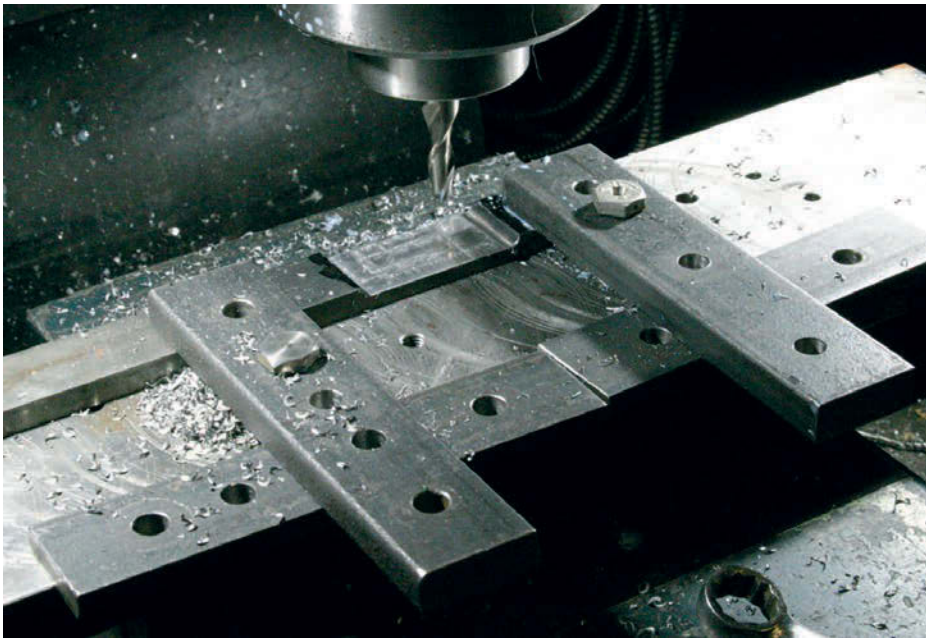


Photo 4: Milling the jaw down to the same thickness as the movable jaw.

Photographs 2 and **3** show the two, before and after the surgery. That's the last of the modifications to the movable jaw, so it could now be reassembled, with or without the depth measuring rod as desired.

The next job was to make a new fixed jaw. For this I used a length of ¼ by ¾ inch mild steel. First operation was to hold it in the milling vice and mill a recess across the width at the end, the same depth as the thickness of the caliper bar to fit the newly modified bar. In my case 0.140" deep by 0.700" wide, leaving a 0.125" wide section on the end the full ¼" thick. This section will be drilled and tapped later for two 2-56 screws.

The length of stock was then clamped, upside down, to my angle iron sub-table held in the mill vice to mill the thickness of the lower portion of the embryo jaw down to the same thickness of the movable jaw, .140" in my case, **photo 4**.

I find the use of this sub-table held in the mill vice very convenient for small items that would normally be clamped down to the mill table for machining, as it saves removing the vice and then re-installing it and clocking it parallel to the table again.

The edge that would be next to the movable jaw was skimmed in the mill to just clean up and the recess for the carbide insert milled. The piece of carbide I used was a nominal 3/32" x 3/16" x ½". As I wanted the insert to be 0.025" proud of the face of the jaw and extend 0.094" beyond the jaw material, I milled the recess .070" deep by 5/8" long. The recess was positioned so that when the insert was in position the overall length of the jaw and insert would be ¼" shorter than the movable jaw when on the bar. The embryo jaw was then cut off the parent bar and the cut end milled back to make



Photo 5: Tapping for the gib screws.



Photo 6: Grinding the sides of the insert to the same thickness as the jaw.

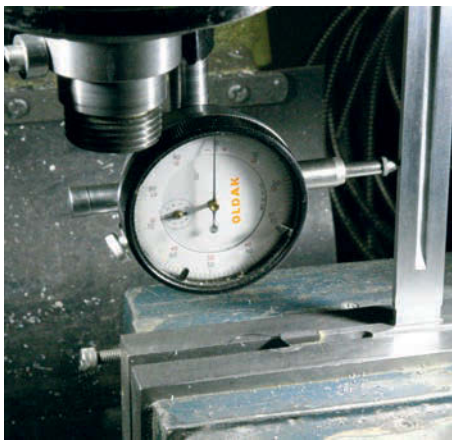


Photo 7: Setting the bar vertical to true up the carbide insert at 90 degrees.

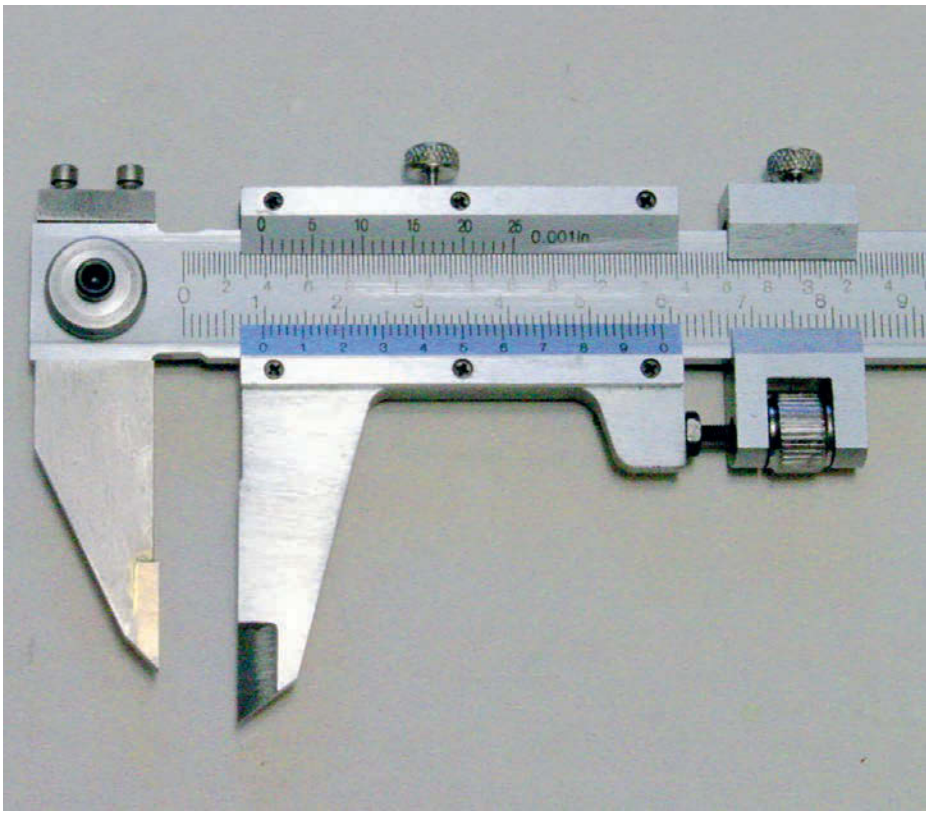


Photo 8: The newly modified carbide tipped caliper marking gauge

it 0.344" shorter than the movable jaw. This would allow the insert, when silver soldered in, to be ground back at 45° to make the scriber point and not cut into the jaw material. The other edge was milled off to make it the same width as the end of the bar that extended out beyond the movable jaw when set to zero.

For the two gib screws (for the lack of a better name), the new jaw was set vertically in the mill vice and drilled and tapped 2-56, centred on the recess for the bar and 0.125" in from each end, **photo 5**.

The back was now hack sawn and milled to the profile shown in fig. 1 following the dotted line at the bottom. The section outlined by the dotted line was left on at this stage to facilitate wrapping some wire around the insert and the jaw to hold it in position while silver soldering it on.

After silver soldering the carbide insert on and cleaning it up, the back of the jaw was then milled back to the solid line profile in fig. 1. Using the bench grinder the bulk of the excess carbide insert that was over hanging the sides of the new jaw were ground off by hand and the end was ground to a 45° angle by eye. The jaw was then clamped to the sub-table, and the sides of the insert were trued up and ground back to the thickness of the jaw with the diamond cup wheel from my Quorn, **photo 6**. After clamping at 45° in the vice, the end of the insert was cleaned up and ground to a sharp point.

A hole was drilled and tapped in the middle of the recess for the bar for a 5-40 screw to clamp the new jaw securely to the bar. Before tapping the hole, the movable jaw was set to zero on the bar and locked, the new jaw was installed on the end of the bar and pushed up to the movable jaw and clamped in position using the two gib screws. The tapping hole was then used to align the drill to drill through the bar.

Before taking it apart again the bar and jaw were clamped in the mill vice and, using a dial gauge on the edge of the bar, the knee was run up and down and the bar adjusted till it was vertical, **photo 7**. The face of the carbide insert was then lightly dressed with the diamond wheel to true it up at 90° to the bar.

After taking it all apart, the bar was mounted in the mill vice and the hole opened up using a 1/8" carbide end mill then elongated 0.020" either way to allow some adjustment of the fixed jaw to zero it.

An ½ inch diameter thick washer was turned up to spread the clamping force from the 5-40 screw over a larger area to make for a more secure fixing.

After re-assembling all the bits and pieces, the new jaw was set to zero by slacking off the clamp screw and the gib screws, setting the movable jaw to zero, then nipping up the gib screws just tight enough to take out any slack but allowing the jaw to move. Using the thumb and fingers, the bottom of the new jaw was pressed hard against the movable jaw and the two gib screws tightened along with the clamp screw. The movable jaw was then moved back and re-set against the fixed jaw and the reading noted. If not zero, the procedure was repeated until it was.

Photograph 8 shows the complete modified caliper.

Bambu X2D 3D Printer

Rod Jenkins reviews this new twin-head machine and discovers some of the recent advances in 3D printing.

I've had my Creality Ender 3 S1 Pro 3D printer for a few years now. It has served me well as a follow on from my first Prusa clone and with the addition of a Creality tent enclosure has managed some prints in difficult materials. The S1 Pro has an all-metal print head with a direct drive extruder so will print, for example, Nylon (Polyamide, often abbreviated to PA) but I have only had success with small items due to warping issues caused by differential cooling of the print. I have always argued that speed of printing is not a significant issue for me as an amateur tinkerer, but I must confess that it would be nice to knock out a prototype in PLA in half an hour (my design skills are such that several iterations would be required). I had first thought about upgrading the S1 Pro to a faster operating system, such as Klipper, from the original Marlin but I'm not really interested in delving into the minutiae of firmware tweaking with the risk of 'bricking' the whole thing. I like to follow the exploits of 'Clough42' on YouTube and watching his review of the Bambu H2D I become intrigued by the possibilities that are opened up by having a second print head. In May 2026 my YouTube became awash with reviews of the Bambu Labs X2D and this seemed to fit the bill for my requirements at a price point that I was willing to pay.



Photo 1: Bambu Labs X2D 2.

At this point it is perhaps useful to remind ourselves where we are with Fused Deposition Modelling (FDM) 3D printers marketed for the consumer. More and more printers these days are sold as tools rather than a hobby in themselves. They have evolved from an open gantry with a sliding bed to a system that moves the print head in the X, Y planes and the bed in the Z direction. Multi-colour printing has become popular using a cassette that holds several spools of filament that can be fed to the print head as required by the software. A consequence of this system is that a lot of filament needs to be wasted in the changeover as the original filament needs to be purged from the hotend and the new filament loaded, brought to temperature and the flow established with the waste filament ('poop') discarded before printing is resumed. This system can deal with different types of filaments but there is a danger of cross contamination which can lead to layers failing to bond if the purging is not thorough. Consequently, some 3D printers now have multiple print heads which overcome the above disadvantages.

So, what is the Bambu Labs X2D that I purchased? It is a fully enclosed printer with two extruders – the primary extruder and a second extruder that is described by Bambu as an auxiliary, **photo 1**. The build volume is 256 x 256 x 256 mm but, because the auxiliary extruder is mounted next door to the main extruder, the distance that this can cover in the X direction is reduced to 235.5mm. The maximum nozzle temperature is 300°C and the maximum hotbed temperature is 120°. The chamber can be heated to 65°C. These parameters suggest that most engineering/functional filaments, with the exception of really exotic (and expensive!) materials like PEEK, should be capable of being printed on the X2D. The printer has an air extraction filter with activated carbon to adsorb noxious fumes that may arise during the printing process.

Why is the second extruder designated as an auxiliary? Let's go back to the early days of 3D printers. Back then the filament was fed into the nozzle via a mechanism that advanced the filament into a tube that was then connected to the moving hotend. This had the advantage of not having to put the weight of the feed mechanism on the moving parts. The disadvantage was that the feed was not as precise as having the feed straight into the hotend and is also slower. An aside for the moment: this tube feed is known in the 3D printer world as a Bowden tube. Ernest Monnington Bowden invented the brake cable for bicycles where the tension in the cable works against the incompressibility of a flexible outer tube of wound strip. Disappointingly Colonel Bowden, the pioneer of powered model aeroplanes together with Edgar Westbury, does not seem to be related to Ernest even though model radio-controlled

aeroplanes often use Bowden tubes to move control surfaces. Bambu decided that they would make the auxiliary extruder of the Bowden fed type for reasons about which we can only speculate: The second extruder is smaller than the primary mechanism and is, presumably, cheaper. It adds less mass to the print head assembly which will allow increased acceleration and speed and the size, despite the small restriction mentioned previously, allows printing over almost the whole area. It is also possible that Bambu did not wish to compete with their own H2D which uses two identical primary type print heads.

The X2D is available with an AMS (Automatic Material System) which is mounted on top of the printer and allows the choice of up to four different reels of filament to be automatically selected by the software. I see this as being primarily designed for multicolour printing solely through the primary extruder. The auxiliary extruder is fed from a spool mounted on the side of the printer even if an AMS is fitted, **photo 2**. Incidentally, not the fruit desiccator I use as a filament dryer.

Bambu Studio is a free downloadable software program that lets the operator slice a 3D object for printing and allows full remote control and monitoring of the print via a camera built in to the printer. The printer itself has a very nice touch screen for local control and another app, Bambu Handy, is available for download to a phone or tablet which also allows for remote control and monitoring. Both of these programs use Bambu's cloud services but it is possible to set up a local network or the printer can use a USB stick to import sliced data without any other connection to the outside world.

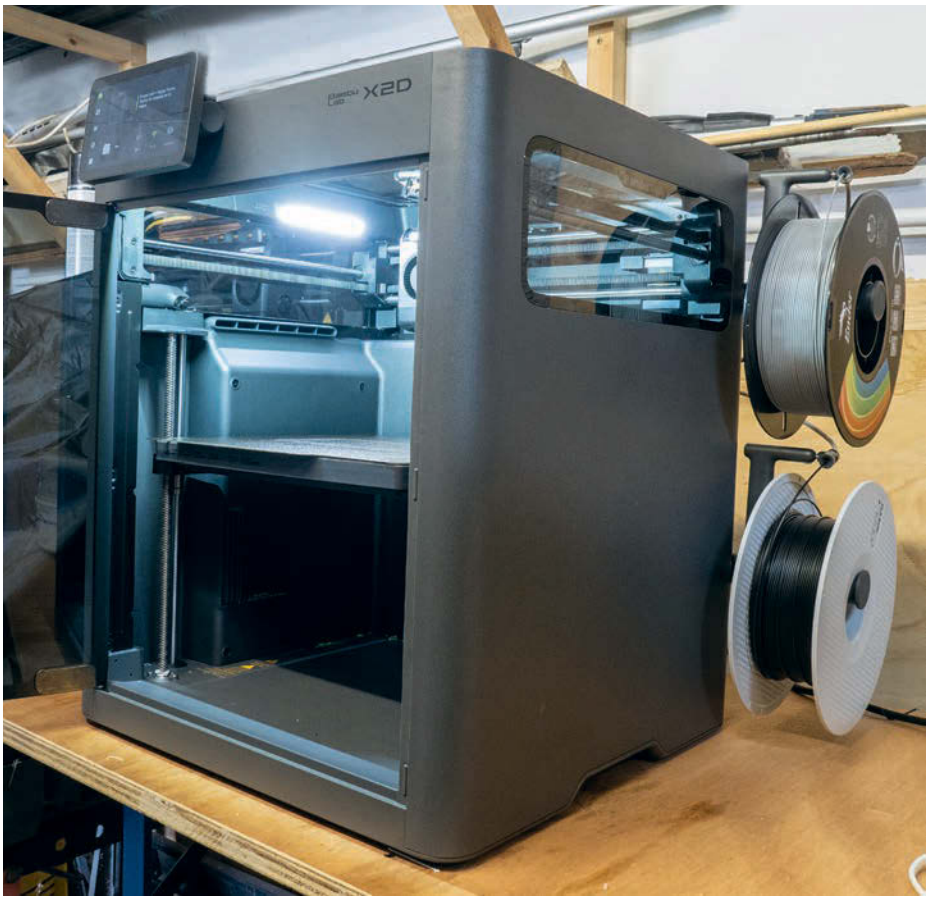


Photo 2: Dual filament reels mounted on the side of the printer.

Bambu envisages that the auxiliary extruder will mainly be used for support materials. If a dissimilar filament from the body of the model is used for



Photo 3: Pandas with the grey face printed through the primary extruder and the white face through the auxiliary.

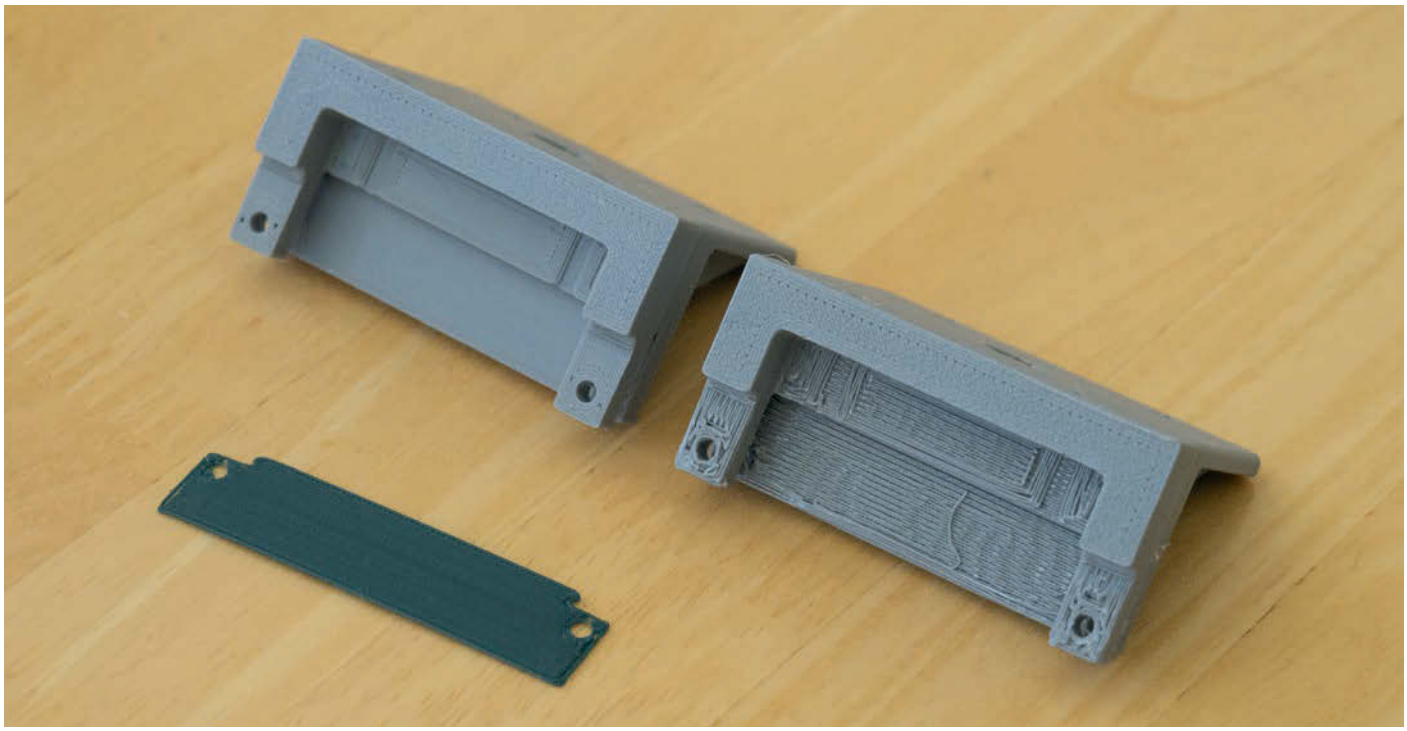


Photo 4: Demonstrating how a support interlayer aids easy support removal and improves quality.



Photo 5: A box with 3D printed text.



Photo 6: An 80mm diameter tyre printed in flexible TPU.

support then there is less likely-hood of the support sticking to the model. Typical examples are PETG used to support PLA and vice versa. Another use of the auxiliary is to use a cheaper filament to support a more expensive filament – ABS can be used to support Carbon Fibre Nylon. A further refinement is that an incompatible filament can be used just as an interlayer between the support and the model so advantage can be taken of the higher speed of the primary nozzle for both the model and the support with just the interlayer being printed less quickly. It is worth pointing out here that Bambu sell specialist support materials. Their main advantage seems to be that any contamination left behind from changing the filament type will not affect subsequent layer adhesion and is more focussed on use with a single extruder machine with an AMS. I cannot see that these offer any real advantage on a 2-extruder machine. I did not spend the extra £200 necessary for the AMS. The auxiliary extruder head Bowden feed cannot be used with soft filaments such as TPU and Bambu also state the standard 0.4mm hotend should not be changed to 0.2mm in the auxiliary. Changing the actual print nozzle is very easy in either head and no tools are required.

When the printer arrived it was unpacked and set up on a temporary table in the house before being moved to the workshop. The printer has a setup routine which self-tunes and seems to involve trying to shake itself

to bits (this is because it's deliberately detecting its resonant frequencies so it can avoid them – Ed.) Put it on a sturdy table. There are several pre-sliced models in the machine and a two colour Bambu panda seemed like a good starting point. I loaded grey PLA filament into the primary extruder and black PLA into the auxiliary. When some white PLA arrived the next day, I printed another panda with white in the auxiliary extruder and black in the primary to compare the quality of the printing. **Photograph 3** shows the two pandas side by side and I cannot detect any real difference between the grey and white prints, probably because the slicer compensates by printing more slowly through the auxiliary. When using more than one filament the X2D also prints a priming tower on the bed to ensure that flow pressure and other parameters are correct. I'm not sure how necessary this is and there is an option to turn it off in the slicer.

My second test was a prototype stepper motor mount. Ideally, I would print an object like this with the large flat surface on the bed, but I wanted the horizontal layer strength in the mounting arms which necessitated support. The right-side model in **photo 4** shows the result of a PLA print with PLA support removed on the right and on the left the result of using PETG as an interlayer between the support together with one of the removed interlayers (PETG does not adhere well to PLA). Not only was the support easily removed but the surface finish on the supported area is no different to the rest of the print. I don't really see printing of two-colour pandas as my main use of the X2D but I can see that two colour printing could have a use in my model engineer's workshop. **Photograph 5** shows a PLA box for my few left-handed taps and dies. Box and lid were designed in Fusion. The text on the lid was extruded in the negative direction, each character becoming an object two layer lines deep. The lid was imported into Bambu Studio as a step file and each object was 'painted' white, the colour of the filament in the auxiliary extruder, before flipping the lid face down and printing.

I've found that I have use for a soft filament rather more than I expected and use TPU 95. As mentioned, Bambu states that the auxiliary extruder is not suitable for printing TPU. It does however work very well in the primary extruder although it is necessary to by-pass the normal filament route and feed straight into the extruder. Bambu sell a TPU 95A HF (High Feed) which they claim is capable being printed three times faster than normal TPU 95. I did spring for a reel of this although it is more expensive than normal TPU. **Photograph 6** shows an 80mm diameter tyre printed in this filament in just less than three hours.

Probably the main driver that pushed me over the edge to purchasing the X2D was Clough42 demonstrating the production of a bellows way cover using a method devised by Youtube's 'Functional Print Friday'. The model is printed flat with zig-zagging alternating layers of TPU from the primary extruder and PLA support from the auxiliary. **Photograph 7** shows the flat pack as printed, **photo 8** is the pack disassembled with the aid of a butter knife from the kitchen and **photo 9** shows the extended bellows. I was impressed, the PLA interlayer came out easily with the aid of the butter knife and the bellows itself seems to be very tough: I certainly can't pull it apart.

As I mentioned, with my S2 Pro printer I had not managed to print larger items in Nylon, even using a brim to aid sticking to the bed.

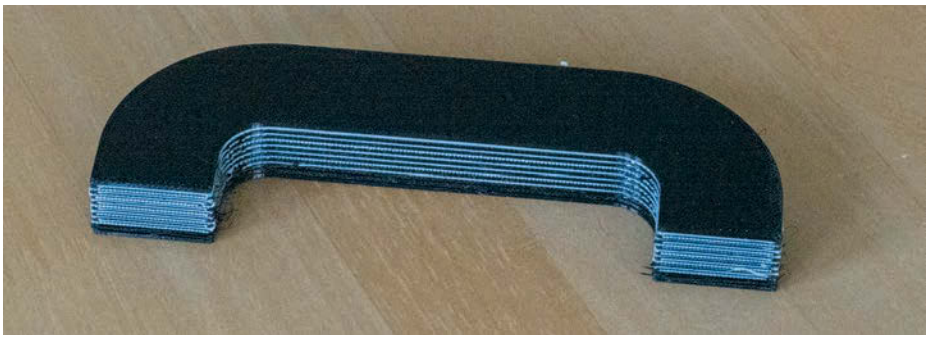


Photo 7: Bellows flat pack as printed.



Photo 8: Bellows with support removed with a butterknife.



Photo 9: Extended TPU bellows.

Photograph 10 shows a 63-tooth 20 DP change gear printed on the X2D. I did use some glue stick on the bed prior to printing to aid retention and the print came out warp free without the use of a brim, thanks to the heated enclosure. I also printed some small helical gears of the type used to provide the 2:1 ratio cam shaft drives in some Westbury i.c. engine designs.

My final challenge to the X2D was printing Carbon Fibre Nylon (PA6-CF). Sometimes marketed as 'black aluminium' this material is remarkably stiff, although considerably less tough than the alloy. I was keen to see if it is suitable for a guitar bridge clamp. The printed frame came out looking beautiful, **photo 11,** and hand testing suggests it will have adequate stiffness although I understand that this filament is prone to creep. We shall see. I also took advantage of having the PA6-CF installed to print another version of the stepper motor mount, this time with ABS as support material, shown in **photo 12** together with the priming tower.

What do I think of the Bambu X2D? This printer uses an array of high-tech sensors to ensure that the experience is pretty much seamless for the user. Once the printer has downloaded the slicer file it takes about five minutes to go through a series of tests before starting to lay down filament, including ensuring that the hot end is purged and flows. This produces a few little coils of filament that are ejected out of the rear as poop so printing a little hopper to catch this is an early priority – though an old ice cream tub would probably do. When it does actually start to print the speed at which it throws the print head about is quite alarming to those of us unused to the modern 3D printer. Everything, though, prints very nicely at a speed that is probably three times faster than my old printer. All the examples I have mentioned above were printed using the default settings whether with Bambu or generic filaments. The exhaust filter works very well. A large print in ABS did not produce the throat catching styrene fumes that have led me to avoid this filament in the past. The software is pretty straightforward though there is a learning curve. When I get stuck with the software, I just ask a question in my PC browser and AI usually comes up with a good answer. My only real gripe is that it tends to assume the use of an AMS which can make it a bit clunky getting the software and the printer to agree what filament is loaded into which nozzle. The printer lives in the workshop and the ability to operate and monitor from my desktop PC or phone in the house is particularly useful. I have tested a few of the more exotic filaments for functional and engineering projects and everything has printed most satisfactorily. There are plenty more different filament formulations available to play with having properties that are best suited to a particular application. On Youtube 'CNC Kitchen' and 'My Tech Fun' are presenters who undertake rigorously scientific evaluation of the properties of many types of printed filaments and are recommended viewing.

The Bambu Labs X2D fulfils all that I require from a 3D printer, and I consider my £569 +£15 carriage well spent. I wonder what innovations will come along to make me upgrade next?

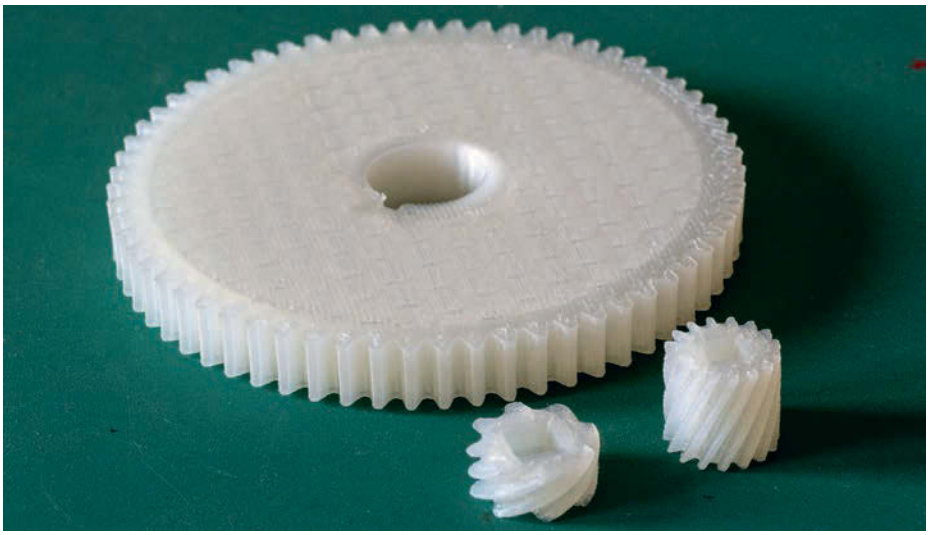


Photo 10: A 63T 20 DP gear and helical gears in Nylon.

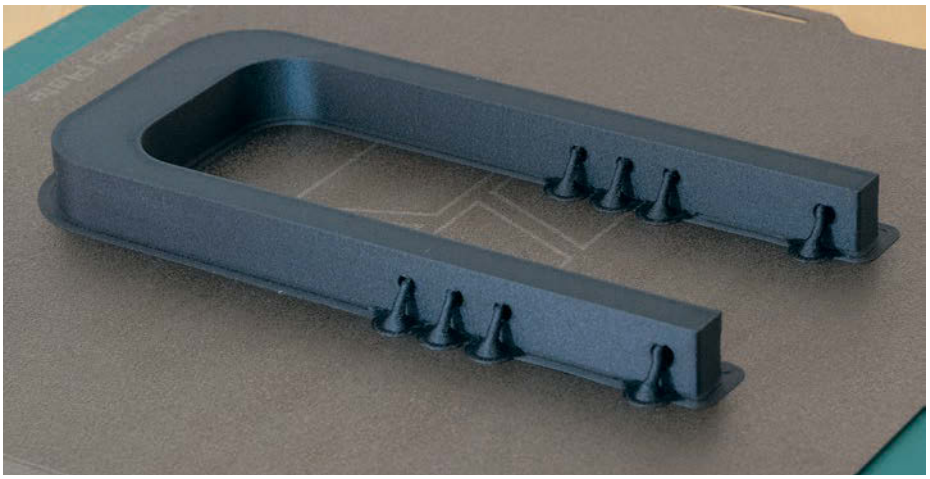


Photo 11: Guitar bridge clamp frame in carbon reinforced Nylon.



Photo 12: Stepper motor mount in PA6 CF and ABS support with priming tower.

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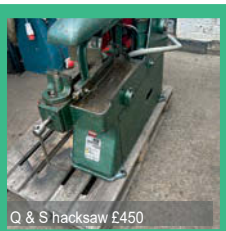
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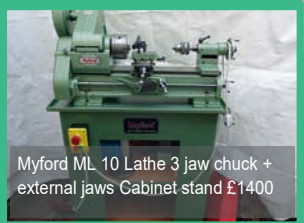
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The 2026 LittleLEC Competition

John Arrowsmith reports on the competition for smaller locomotives, sponsored by Model Engineer & Workshop



Photo 1: General view of the South Cheshire track site.

This annual efficiency competition for steam locomotives weighing up to 50 lbs. was held at the splendid track of the South Cheshire Model Engineering Society near Nantwich, **photo 1**, over the weekend of the 20th/21st June 2026. It has been a couple of years since I last visited, and the club have certainly put the work in developing their site with a new Gauge 1 railway system and extensive ground works to the area adjacent to the car park. Excellent weather greeted all the contestants and visitors with nine locomotives in total taking part. Saturday morning saw four runs taking place with another four being completed in the afternoon. Sunday had five locomotives in action, so it was a very busy weekend. The South Cheshire hosts had provided everything needed, **photo 2**, for a successful event and this is exactly how it turned out. The morning run featured four 3½" gauge *Rob Roys* from different parts



Photo 2: The steaming bay area as visitors arrive to prepare their locomotives.

of the country, who all chose to run on the longer outer track circuit of about 1600ft in length.

Run No 1. was with George Newton and his smart example of *Rob Roy*. His total train starting weight was 519.98 lbs. and he had plenty of steam as he made a good start to his run. Unfortunately he had to lose one passenger in order to complete his first circuit, after that he drove very well for seven laps in 23.66 minutes to achieve an efficiency of 0.344 % and an average speed of 4.3 mph, **photo 3**.

Run No 2. saw Peter Wardropper fire up his *Rob Roy* in 3 ½" gauge. Peter's train weight was 547.2 lbs. which enabled him to also complete seven laps in a time of 21.55 minutes. It was an uneventful effort with Peter and his engine taking the track in its stride. The results showed Peter had achieved an efficiency of 0.448 % at an average speed of 4.7 mph, **photo 4**.

Run No.3. was by Will Musselwhite with his *Rob Roy*. Will got away to a good start with his train weight of 237lbs, and he too completed seven laps in 23.18 minutes. Will again had no real problems with his run and achieved and overall efficiency of 0,23 % with his average speed 4.3 mph, **photo 5**. The difference in total train weight between Will and the other contestants was because he used his own passenger carriage instead of the one supplied by SCMES, and this was somewhat lighter.

Run No.4 was the final one of the morning session, with Steve Harrison and his *Rob Roy* taking to the track. He also completed seven laps in 17.81 minutes with a train weight of 560 lbs. This little engine really did operate very well on this testing circuit, achieving an efficiency of 0.492 %.at an average speed of 5.6 mph, **photo 6**.

The afternoon session continued in the same way with all the competitors having another chance with their



Photo 3: George Newton has plenty of help from his family as he prepares his loco.



Photo 4: Peter and his observer make a good start to their run.



Photo 5: Will Musselwhite approaches the starting line.



Photo 6: Steve Harrison makes a good start to his run.



Photo 7: William Powell preparing his 0-4-0 locomotive.



Photo 8: The superb example of *Jenny Lind* by Peter Wardropper sparkles in the sunshine.



Photo 9: Trevor is going well as he exits Peacock Halt.



Photo 10: Vanessa Powell gets under way for her first run.

second runs to improve their efficiency if they could. The running order was the same as the morning with George Newton starting things off.

Run 1. George Newton completed six laps in 23.66 minutes before retiring, but his average speed was down to 3.6 mph with his efficiency at 0.321%.

Run 2. Peter Wardropper increased his train weight to 659.2 lbs. He completed 8 laps this time in 24.38 minutes with an average speed of 4.7 mph giving him an efficiency of 0.56% a useful increase over his morning performance.

Run 3. Will Musselwhite ran again with his engine which did not perform quite as well as the morning with his efficiency dropping to 0.168% at an average speed of 2.8 mph.

Run 4. Steve Harrison's engine romped away this time with a better performance than the morning. He achieved an efficiency of 0.575% over his eight laps with a train weight of 625lbs at an average speed of 4.8 mph.

After the Saturday competition the leader board showed that Steve Harrison was in first place closely followed by Peter Wardropper, with George Newton in Third. Everyone was eagerly waiting for the Sunday sessions to see if Saturday's results would be surpassed.

Sunday dawned bright and cheerful and the site was soon filled with the sounds and sights of engines being prepared for the days running sessions. A completely new selection of locomotives was being prepared and this time there was a 2½" gauge loco taking part, which provided some speculation as to if it could cope with the task in front of it. However, running on the shorter inner track the driver and the locomotive handled the task admirably.

The first run of the day was William Powell and his freelance 5" gauge 0-4-0 tank locomotive, **photo 7**. He made an excellent start and completed six laps without any real difficulty. He registered an overall efficiency of 0.233% at an average speed of 3.9 mph with a total train weight of 342lbs.

Run No.2 was again Peter Wardropper who fired up his finely detailed 3½" gauge 2-2-2 locomotive *Jenny Lind*, **photo 8**. This little engine positively flew round the track to complete seven laps before being retired. His efficiency over the run was 0.206% at an average speed of 4.4 mph and a total train weight of 198.6lbs.

Run No.3 Featured Trevor Wotton with his 3½" gauge *Rob Roy*, Trevor made a brisk start to his run, **photo 9,** and lapped the track at a steady rate. He completed seven laps before retiring and achieved an overall efficiency, of 0.233% but his average speed was not recorded for some reason.



Photo 11: Freya going well during her time on the track.

The fourth run of this interesting competition was by Vanessa Powell who had entered her 3 ½" gauge 0-6-0 *Mona* tank engine, **photo 10.** A good start with the heaviest load of the day at 645.8lbs she travelled very well and completed nine laps to register an efficiency of 1.028% which was far and away the best result of the day so far at an average speed of 6.2 mph.

The afternoon session continued in the same vein with an additional driver entering the competition and using the shorter inner track, this was Freya Powell, the daughter of William and Vanessa, who was driving a 2 ½" gauge 4-4-2 Atlantic, *Ayesha*, **photo 11**. This young lady handled the engine with consummate ease and produced a remarkable efficiency for her engine of 0.674% with an average speed of 4.0 mph over 14 laps. All the contestants then started out on their second run of the afternoon.

Run No 1. For William Powell with his freelance 0-4-0 locomotive completed 6 laps at an average speed of 4mph, giving him an efficiency of 0.205% with a total train weight of 342lbs.

Run No 2. Was Peter Wardropper with *Jenny Lind* this diminutive engine was soon operating very well and completed seven laps at an average speed of 4.3mph for an efficiency of 0.149%, not quite as good as his first run.

Run No 3. Was again Trevor Wooton whose *Rob Roy* romped round the track at an average speed of 7 mph to give him an efficiency of 0.342% with a train weight of 260.2 lbs.

Run No. 4 Vanessa Powell driving *Mona* had a train weigh of 645.8lbs she completed 9 laps to produce an outstanding efficiency of 1.069% at an average speed of 5.8mph. This was marginally better than her first run.

Run No 5 was 12-year-old Freya Powell who drove her 2 ½ gauge 4-4-2 locomotive for 17 laps of the shorter track to achieve a remarkable efficiency of 0.868% at an average speed of 4.5 mph. This was a considerable achievement for the young lady who handled all the proceedings like a true professional.

OUTER TRACK

Run No.	Competitor	Loco	Gauge	Weight Loco Lbs	Train Wt Lbs	Total Wt Lbs	Laps of Track	Time Min	Coal Used Lbs	Work Done Ft/Lbs	Average Speed MPH	Average DBHP	Efficiency %	Place
Day 1:- 20th June 2026														
1	G. Newton	Rob Roy	3.5 inch	35.8	484.18	519.98	7	23.66	0.73	28430.9	4.1	0.036	0.344%	5
1	P.Wardropper	Rob Roy	3.5 inch	40.6	506.6	547.2	7	21.55	0.59	29919.3	4.5	0.042	0.448%	
1	W.Mussel-white	Rob Roy	3.5 inch	39.2	237	276.2	7	23.18	0.58	15101.8	4.2	0.020	0.230%	
1	S.Harrison	Rob Roy	3.5 inch	37.2	523.2	560.4	7	17.81	0.55	30641.0	5.5	0.052	0.492%	
2	G.Newton	Rob Roy	3.5 inch	35.8	484.18	519.98	6	23.66	0.67	24369.4	3.5	0.031	0.321%	Retired
2	P.Wardropper	Rob Roy	3.5 inch	40.6	618.6	659.2	8	24.38	0.65	41192.1	4.6	0.051	0.560%	4
2	W.Mussel-white	Rob Roy	3.5 inch	39.2	237	276.2	3	15.61	0.34	6472.2	2.7	0.013	0.168%	
2	S.Harrison	Rob Roy	3.5 inch	37.2	588.2	625.4	8	23.73	0.6	39080.0	4.7	0.050	0.575%	3
Day 2:- 21st June 2026														
1	W.Powell	Free-lance 0-4-0	5 inch	49	293	342	7	24.86	0.71	18699.5	3.9	0.023	0.233%	
1	P.Wardropper	Jenny Lind	3.5 inch	45	198.6	220.2	8	25.38	0.59	13759.9	4.4	0.016	0.206%	Retired
1	T. Wootton	Rob Roy	3.5 inch	39.2	221	260.2	7		0.54	14227.0			0.233%	Retired
1	V.Powell	Mona	3.5 inch	45.6	600.2	645.8	9	20.34	0.39	45399.1	6.2	0.068	1.028%	
2	W.Powell	Free-lance 0-4-0	5 inch	49	293	342	6	20.8	0.69	16028.2	4.0	0.023	0.205%	
2	P.Wardropper	Jenny Lind	3.5 inch	45	198.6	220.2	7	22.93	0.712	12039.9	4.3	0.016	0.149%	
2	T. Wootton	Rob Roy	3.5 inch	39.2	221	260.2	11	21.97	0.578	22356.6	7.0	0.031	0.342%	
2	V.Powell	Mona	3.5 inch	45.6	600.2	645.8	9	21.67	0.375	45399.1	5.8	0.063	1.069%	2
Coal Calorific Value 14500 BTU/Lb														
SCMES Outer Track Constant 7.811														

INNER TRACK

Run No.	Competitor	Loco	Gauge	Weight Loco Lbs	Train Wt Lbs	Total Wt Lbs	Laps of Track	Time Min	Coal Used Lbs	Work Done Ft/Lbs	Average Speed MPH	Average DBHP	Efficiency %	Place
1	F.Powell	Ayesha	2.5 inch	31.2	176	207.2	14	20.4	0.297	8635.7	4.0	0.013	0.674%	
2	F.Powell	Ayesha	2.5 inch	31.2	176	207.2	17	22.33	0.28	10486.2	4.5	0.014	0.868%	1
Coal Calorific Value 14500 BTU/Lb														
SCMES Outer Track Constant 2.977														



Photo 12: Freya receives the trophy and award from Chairman Ian Murray.



Photo 13: Delighted faces as Vanessa Powell receives her Second place award.

After due consideration the judges decided that the overall winner of the competition should be Freya Powell, **photo 12**, with her mother Vanessa in second position, **photo 13**. The third place went to Steve Harrison from the Saturday running day. Last year, the winner was William Powell, so whichever way you look at it, the competition was kept within the family. The decision was made to award the trophy to Freya as a tribute to her calm approach to the competition and to encourage her as she was only just behind her mother's result, and for a 12-year-old to do that was considered to be an outstanding result. I am sure all the other contestants would agree that young people like Freya should be encouraged as much as possible.

The presentations were made in the club house by Chairman Ian Murray to the acclaim of the members and visitors attending. He explained the reasons for the awards and thought overall they were quite remarkable. The first two prizes are sponsored by *Model Engineer & Workshop* magazine, and the Third prize was provided by the South Cheshire Club itself. Ian then presented his award of the Golden Spike to Peter Wardropper, **photo 14,** for his *Jenny Lind*, because of the performance and presentation.

Peter also thanked the Society for their hospitality and warm welcome, which I also would like to endorse and to thank the ladies of the Society for all their hard work in the clubhouse providing tea, coffee and sustenance for everyone attending, all with a smile and suitable banter, **photo 15**. It was much appreciated. It really was an excellent weekend and all the members of the Society should be proud of their approach to the competition and the processing of the results.

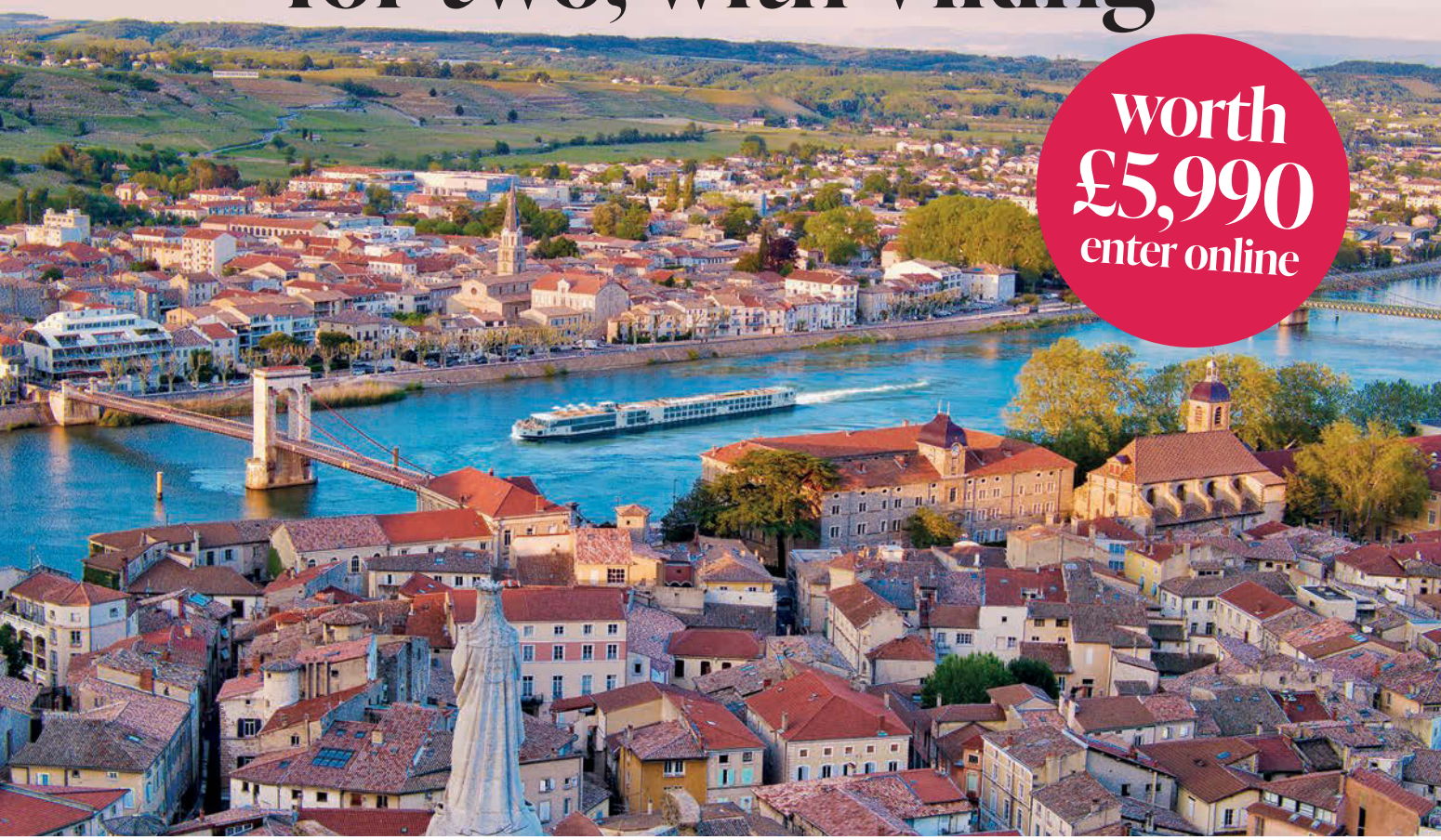


Photo 14: Peter Wardropper receives the Golden Spike for his performance and presentation of his locomotive.



Photo 15: Two of the team who kept everyone fed and watered.

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POSTBAG

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3D PRINTING

Dear Neil, I'm finding the articles on 3D printing by Alan Bryan quite interesting and informative. I assume there is to be a suite of articles from him, I have read the first two. Because I've had to travel interstate (Melbourne) and be away from home for five weeks, it will be late October before I get to see the next instalment. I have some questions that may be covered in subsequent articles while I'm away from home.

Alan's first two articles show some of the uses in the workshop 3D printing can be used for, one that I hadn't given much thought to was storage for cutters, drills etc, in the second article printed in *ME&W* 4479. I thought that was a great idea, food for thought!

I've been aware of 3D printing abilities for a few years, While I was still working, an engineer customer wanted a quote for something made from 'plastic'. I can't remember now what it was, but we quoted to make from solid 'plastic' by turning and cnc milling. He phoned back, thanking us for the quote but he had it 3D printed in Melbourne and air freighted to Tasmania for a fraction of our cost and time.

I can also see the possibilities for the garden railway enthusiast, printing period buildings complete with slate roofs for UK buildings, corrugated iron for Australian country stations and the like and also quite detailed rolling stock bodies.

For me, I see it being used for the making of patterns to cast locomotive wheels, horn blocks and cylinders just to mention a few and as Alan says it all can be set up to print overnight.

But what I would like to know is, how do you get started? Assuming you have created the 3D model using a programme such as Alibre recently featured in these pages - I use Autodesk Inventor. You have splashed the cash and got a 3D printer and probably downloaded the software to run it and done the conversion file. Now what? When we want to machine a piece of metal we either firmly fix it into the 3/4 jaw or collet chucks on the lathe or clamp it either in the vice or directly onto the table of the milling machine and away you go!

What stops the 3D printed object from moving on the printer table/platen? Is there a base stabilising layer of a particular filament printed first and then the main 3D object is printed on that? I would also like to know what filament is to be used where, I assume not all filaments are equal and that some are better at a particular task than others. I think an article showing each stage of the printing process similar to the series on the Alibre 3D software may be more informative.

Tony Reeve, Tasmania

Hi Tony,3D printing has certainly become an established art of our hobby in the last ten years. I will give some thought to a beginner's series, with the focus firmly on how 3D printing can complement traditional machining skills and equipment – Neil.

MELBOURNE IN EDITORIALS

Dear Neil, here are scans of the editorials mentioning the Melbourne SMEE you asked for in *ME&W* 4781.
Nick Farr, by email.

Many thanks Nick; I see that in *Smoke Rings* from April 28, 1927, Percival Marshall reported getting one of the first messages 'to come through to London by the newly inaugurated beam wireless service from Australia' saying "Melbourne Society Model Engineers use beam send greetings self and model-makers overseas". I'm looking forward to returning the good wishes in person on behalf of readers past and present – Neil.



The MODEL ENGINEER
Edited by
PERCIVAL MARSHALL, C.I.Mech.E.

Vol. 56. No. 1355. APRIL 28, 1927. 4d.

SMOKE RINGS

ONE of the first messages to come through to London by the newly inaugurated beam wireless service from Australia was addressed to me in the following terms: "Melbourne Society Model Engineers use beam send greetings self and model-makers overseas." Now that is not only a very kindly thought on the part of the Melbourne members, but a piece of real enterprise to make use of this new wonderful wireless service directly it became available. I hereby broadcast this friendly greeting to my readers, and on behalf of all of us, I thank the Melbourne Society most cordially, and wish them every success in their work both collectively and individually. Three cheers for Melbourne!

I spent a very enjoyable morning last week at the Annual Exhibition of the Model Railway Club, at Ringsway Hall. Things are certainly humming in the model railway world; there was a splendid show of work, and the model public rolled up in their hundreds to admire, discuss, and ask questions. The work on view was certainly on a higher level all round than in previous years, and there was more of it. This was perhaps only to be expected in view of the rate at which the club membership is growing, but it indicates a very healthy state of affairs. I was especially pleased to note the realistic finish on many of the models, particularly on the architectural work of the station buildings, and on the coaches and rolling stock generally. Captain Layland-Barratt and Captain Sparkes showed some exceptionally good G.W.R. coach and wagon modelling, with a quality of painting and lining not often seen on amateur work. Model railway engineering is exceptionally fascinating as a hobby because of the many angles of interest it presents. It affords scope for the civil engineer, the scenic artist, the machinist, the electrician, the woodworker, the painter and decorator, and the signal expert. It involves the working of materials of great variety, and it enables its devotee to specialise if he so desires in one or other of several very varied kinds of craftsmanship, without making his occupation too restricted or monotonous in character. For instance, some model railway men have a special fondness for building rolling-stock, others for permanent-way laying and signalling, others for locomotive building. But there is always something else to do on a model railway, and so one gets a change of thought and occupation which keeps the hobby ever fresh. Mr. G. P. Keen, the President of the Club, exhibited a delightful piece of miniature work in a freight train having two special trucks, one carrying a small traction engine and the other a farm roller. I believe these are the work of Mr. K. F. Stonham, and are intended for the "K" lines, a wonderful model railway system which Mr. Keen has installed at home. Colonel Hervey was represented by a narrow-gauge train, excellently modelled, and outstanding as an attractive departure from orthodox British practice. Mr. H. G. Kerr gained an award for a most attractive 00-gauge electric layout to a 4-mm. scale, operated, partly by the overhead system and partly by the third rail. The Poplar Station by Mr. H. R. Norman, the two interlocking signal frames by Mr. L. G. Brampton, and the gauge 0 goods wagon by Mr. A. Knock also deservedly received recognition, and there was much other excellent work to delight the enthusiastic crowds who thronged the show during the week. A novel feature was the collection of historical models. This showed very emphatically the progress which model engineering has

THE SILVER CREST BR CLASS 1500

Dear Neil, congratulations to Mark Thatcher on the assembly of this engine so well described. It shows how much thought has gone into this by Silver Crest and Mark.

No 1501 has an interesting history being built at Swindon in 1949 and going new to Old Oak Common no doubt taking empty stock to and from Paddington. But after a year it had been transferred to Southall where it stayed till it was sold to the Coal Board and thence to eventual preservation.

If it were mine, I would have made up the correct head code as shown in the picture of 1504 15 August 1962 at Paddington, with the target duty number included. (Though it would have been plain black in 1949). I think it's good to have these details right. And no polished handrails, never seen on working engines like this! A dab of black paint here would make a tremendous difference to its authenticity.

But I wish nothing to take away Mark's achievement. Perhaps when he has run it for a while he may find some very basic workshop skills useful to keep it in good working order.
John Billard, by email



A CAREER IN ENGINEERING

Dear Neil, Having collected my latest issue of *Model Engineer & Workshop* from my local Newsagent today, I was very interested to read the article by Mick Knights regarding City and Guilds 193, Mechanical Engineering. I left school at the end of the summer term in 1962 without taking-any GCE 'O' level exams as they were then, on the 20th of August (Monday) the day after my 15th birthday I started my first job. To learn a trade I was paid 2/6p an hour for a forty-two-hour week and this gave me £5/5shillings a week, after stoppages. Unlike Mick I took the 193 course by doing three nights a week from the age of sixteen or so I studied part 1 at the City College for further education in Bunhill Row just off of Finsbury Square in London. After 2 years I took the part 1 exam and got a 2nd class pass, I then went on to Hackney Technical college next door to Hackney Downs station for a further two years and took the part 2 exam in which I got A pass with distinction. Then a further year for the supplementary certificate in machining processes, this I got a pass with credit. My employers paid the course fee, but I had to provide my own text books etc. which I still have today. I then did a further two years and took the part 1 of the 293 Mech. Eng. Technicians' course which I passed with credit.
As Mick says, both working in engineering and studying at the same time I learnt a lot about the practical side of engineering, being at first a machine operator, I then learnt how to set and operate the smaller capstan lathes, centre lathes, drilling machines and milling machines. I've also done a bit of precision surface grinding, bench fitting and assembly, inspection etc. I also served from 1974-1980 in the British Army in REME as an armoured fighting vehicle gun fitter on chieftain tanks and also the scorpion and scimitar light armoured recce vehicles. This was in the then Federal Republic of West Germany, including trips to Canada and Norway. When I left the Army, I was 33 years old. I did intend to go back into tool making, which I did before I went into the army. However while doing my resettlement course in toolmaking in the skill centre at Twickenham, I saw an advert for a workshop technician in the Stationers Company school in the London borough of Haringey north. I applied and was short listed and appointed to start at the beginning of the spring term in 1981. For the next 27 years or so I worked as a workshop technician in schools and colleges. I took early retirement from my local co-ed secondary school (Stoke Newington School) when I reached the age of 60 and will be 79 this August. Like Mick I went into something I liked - I used to like doing the carpentry and metalwork classes at secondary school. I would say that unfortunately there are not the opportunities today for people like myself to do this sort of work, yes I did find the going hard especially the related studies i.e. calculations. Yes, I also remember using log books - logs and antilogs etc. What I found quite funny in a way was when I went to the school of electrical and mechanical engineering at Borden in Hampshire, I had my initial interview with ASM (W.0.1) Farminer, and showed him my certificates, he said your more qualified than some of the instructors so I didn't have to do the fitting & turning training. W.0.1 and ASM titles are Warrant Officer Class 1 the highest non-commissioned rank in the army and ASK is Artificer Sergeant Major who is in the trade as opposed to regimental branch of the Army. Very often ASMs go on in REME to take a late entry commission and become officers.
Hopefully it is not too late to reverse the decline in industry and encourage a new generation of both young men and women to enter the engineering profession and step into the shoes when we retire and carry on as engineers.
J. E. Kirby, Stoke Newington

RADIO CONTROLLED LAND ROVER

Dear Mr Wyatt, many years ago, 1950's era, my father had some copies of *Model Engineer*. I remembered an article on building a Series 1 Land Rover and I'm not sure if it was radiod controlled or not. I'm not sure of the exact year, late 1940s or 50s?
Is it possible to know of the year and Dates that the article was published?
Hoping you can help.
David Honeysett, by email

Hi David, there's nothing in the indexes for that period, however I found the a series by Ray Stuart in 1994, *Model Engineer*, odd numbered issues 3967 to 3975, on '*Apache*. A battery powered miniature Land Rover'. This was a 'ride in' model suitable for younger children, you can see some readers' builds on the forum at tinyurl.com/ME-Apache or use the QR code. Do readers know of another series? – Neil.

DIESEL DRAWINGS SOUGHT

Hi Neil, I'm looking for drawings for a 5" gauge class 37 or 40 diesel, also drawings for a Class 08 shunter. Can anyone help?
Sandy Carson, by email.



WILESCO TRACTION ENGINE REBUILD

Hello Neil, My name is Harry Talbot and I'm 15 years old. A few weeks ago, a friend of mine contacted me to say that one of the writers for The *Model Engineer* magazine had asked if he could include my completed rebuild of a Wilesco traction Engine in a round up of club news in the magazine, after seeing it in print in the Steam Apprentice Club magazine. For some reason I have been having trouble getting back to him due to my emails going into his spam folder. So, I thought I might contact you to let you know that I would be more than happy! I would also like to mention that as of a couple of months, I am the creator of the YouTube channel Harry's Steam - YouTube, If you could please include this then that would be great.
Harry Talbot, by email.

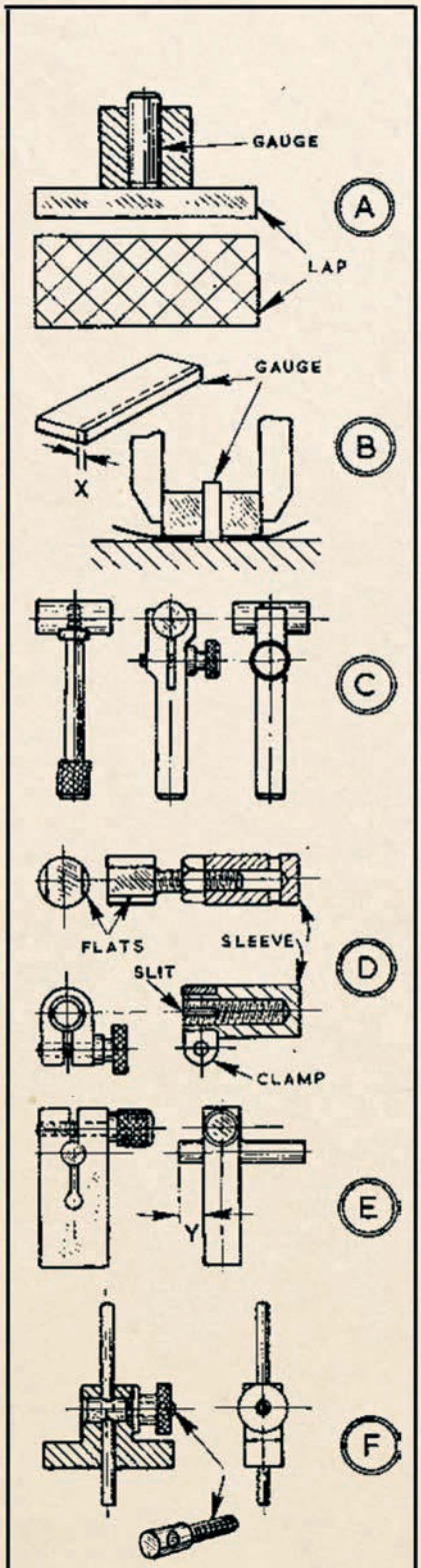
Hi Harry, I passed your message on to Geoff Theasby for Club News. I recommend Harry's video channel to readers, a short link is tinyurl.com/2a9cubku or use the QR code. Harry has also shared the article on his restoration, I hope to use it in the magazine soon.



These articles by Geometer (Ian Bradley) were written about seventy years ago. While they contain much good advice, they also contain references to things that may be out of date or describe practices or materials that we would not use today either because much better ways are available of for safety reasons. These articles are offered for their historic interest and because they may inspire more modern approaches as well as reminding us how our hobby was practiced in the past.

Simple gauge construction

By GEOMETER



Various types of gauge that can be readily made in the workshop

In the last article was described the principle of obtaining accurate lengths in lathe work. For the most part, the gauges suggested were standard-size objects such as drills, silver-steel rod, ground tool shanks which are convenient in the sizes they cover. Larger sizes, however, require specially-made gauges, which for simple length dimensions can be in round or flat material.

A micrometer or vernier caliper is desirable for measuring gauges, though the fact that the instrument may have a fixed limit of 1 in. does not debar its use in making longer gauges. For example, to obtain a 2 in. dimension, two 1 in. gauges can be made and placed end to end for a careful check by ordinary calipers to make a single 2 in. gauge. The same applies to fractions? such as 1 3/4 in., when one of the possible combinations would be a 1 in. gauge and a 3/4 in. one placed end to end.

In fact, with no other measuring devices than a steel rule and ordinary calipers quite accurate gauges can be made on the above principle. Several gauges are made which all measure as near as possible alike on the calipers,. and which together total a given dimension on the rule-when the total error will be divided between the gauges.

Silver steel is best

For end gauges, material 1/4in. to 3/8 in. dia. is convenient. For occasional use, it can be left soft, though hardening and tempering are desirable if permanent or durable equipment is the aim. Silver steel is ideal in this respect. Pieces to make gauges should be faced over-length in the lathe, then if they are to be hardened and tempered these processes follow.

Finishing accurately to length is by lapping, as at *A*. The process requires a guide bush or block for the gauge guide block -having been drilled (preferably also reamed) and faced at a single setting in the lathe, for the end to be square with the bore.

The lap is a piece of flat material, such as cast aluminium, brass or cast iron, and may have some file grooves across its face. For convenience, it is held in the vice, its face charged with fine grinding paste, then the block and gauge rubbed on it. Very small controlled amounts can be removed from gauge faces by this means, and the faces maintained or brought square. Cleaning can be in parahin.

For a plate gauge, as at B, where a few thou, X have to be removed from one edge, the principle is similar. A wide block is clamped each side with the assembly stood on a flat surface, the wide blocks being packed up by strips of paper to leave the edge of the plate gauge slightly protruding.

Clamp-type holder

In making a long end gauge from several in line, they can be placed in a piece of tubing, or joined in pairs by sleeves with grubscrews. For individual handling, either of the means at C can be employed. Using a screw-m handle for a set of gauges, each must be drilled and tapped in making before hardening and tempering. With a clamp-type. holder, however, as can be made from flat stock, the gauges are simply pushed in and gripped. As shown, the jaws should allow the side of the gauge to lie on the work, to ensure accuracy in setting tools.

Numerous gauges can be avoided by employing adjustment, as at ***D***. The screw portion is made from round stock, its thread kept square by tailstock die-holder, and flats are filed to hold in the vice. The tapped sleeve piece is drilled cross-wise for a bar and set by locknut. Alternatively the end of the sleeve can be turned down, slit lengthwise, and a clamp fitted. Accurate adjustments are then more easily made.

Diagrams ***E*** and ***F*** show how adjustable depth gauges can be furnished with plain clamping or a cross-drilled screw and nut. Depth Y is set from rule or gauge block. ❑

Adventures with a Bench top CNC Mill

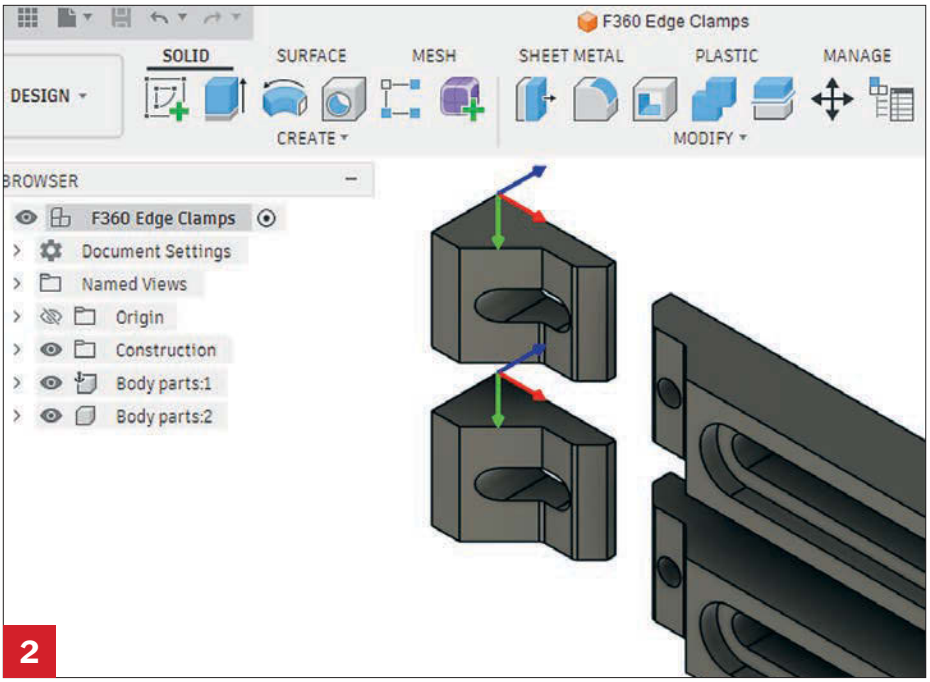
PART 2

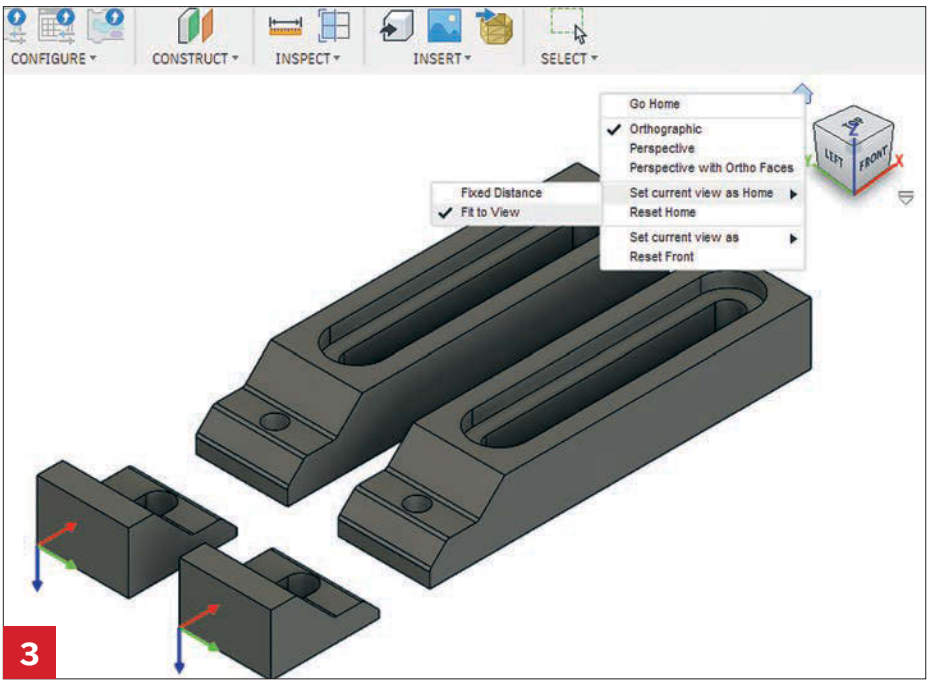
Jason Bellamy continues the article introduced last month by **John Hinckley** with a guide to using Fusion 360 for running a CNC mill.

As you may have seen on the forum as well as in John's introduction, I offered to guide him through the CAM for these edge clamps using the free hobby user version of Fusion 360 (F360). I will break the set up and each tool path down into separate headings to make it a bit easier to follow.

Carvera, the manufacturer offer a tool library with cutting speeds and feed rates for a number of their cutters that can be downloaded into F360 but I do not know the size (depth and width) of cut that his new machine is capable of so will not go too deeply into that as it is something John will need to enter but the different types of tool paths will be much the same. This would apply to any other machine where a few practice cuts would be advisable before making actual parts to find out what the machine is happy cutting.

If you want to follow along the following link should take you to the F360 file where you can see first-hand what is in the various screenshots that accompany this article: tinyurl.com/F360-EXAMPLE





PARTS NOT ORIENTATED AS EXPECTED IN F360

One item John mentioned on the forum is that when first imported into F360 parts can be orientated in odd ways. This can be quite a common problem as it depends how the original item was created and what surface was placed on the XY plane which is typically the flat plane in F360 much like a flat milling table. **Photograph 2** shows how an imported part may look when first opened.

Although it does not really matter how it looks on the screen, I find it a lot more user friendly if the part is shown as it would be when on the mill when you hit the 'home' icon. Don't worry about the machining axis for now, just get the home position right.

So, the first thing is to manipulate the image, so things look as you want. I tend to have the long edge running bottom left to top right of the screen and the top surface facing up. To do this you can either pull the navigation cube about while holding the left mouse button down, click different corners of the cube or use orbit to just drag the image about.

When you have it where you want right click the small house shaped 'Home' icon near the navigation cube, move the cursor down to 'Set current view as Home' and then along to 'fit to

view' and left click that, **photo 3.** You can now quickly return to this view by just clicking the icon.

AMENDMENTS

This is a good time to make any alterations to an imported file, which can be done under the 'Design' tab top left. I noticed that some of the internal fillets were missing on the smaller clamp heads so used the measure tool to see what radius the others were and then the fillet tool to add the missing radii, **photo 4.**

Another reason you may want to make alterations is that the CAM sometimes wants to send a cutter down a hole that you may not want it to so they can be filled with a solid cylinder.

SETUP

We can now move onto the actual CAM which in F360 is accessed by selecting 'Manufacture' from the drop down arrow next to 'design' which is the default for newly imported parts.

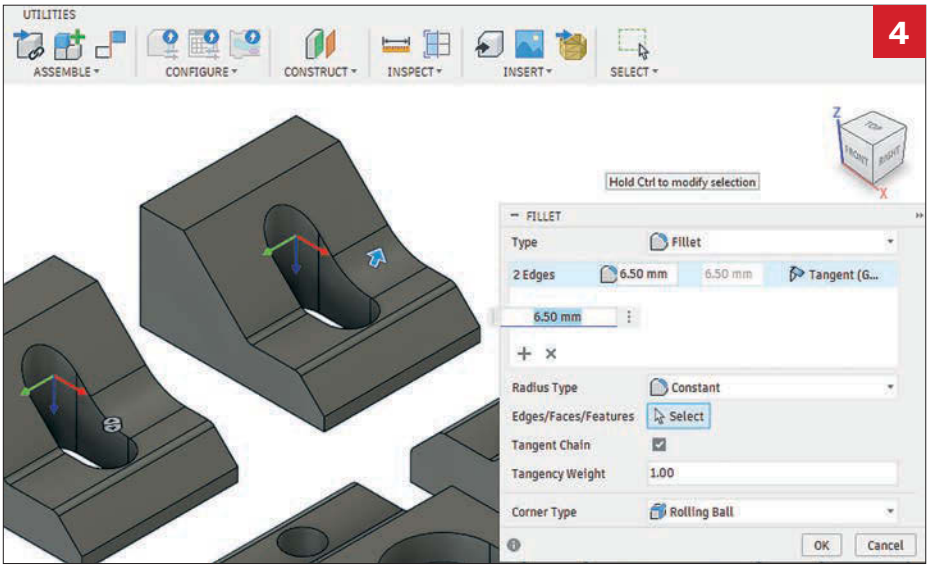
When you enter 'Manufacture' the options and icons along the top will change. Towards the left is a 'Setup' icon, click that and the part(s) will appear with a transparent box (or cylinder) around them which represents the stock with the default machining allowances. You also get a dialogue box for the setup.

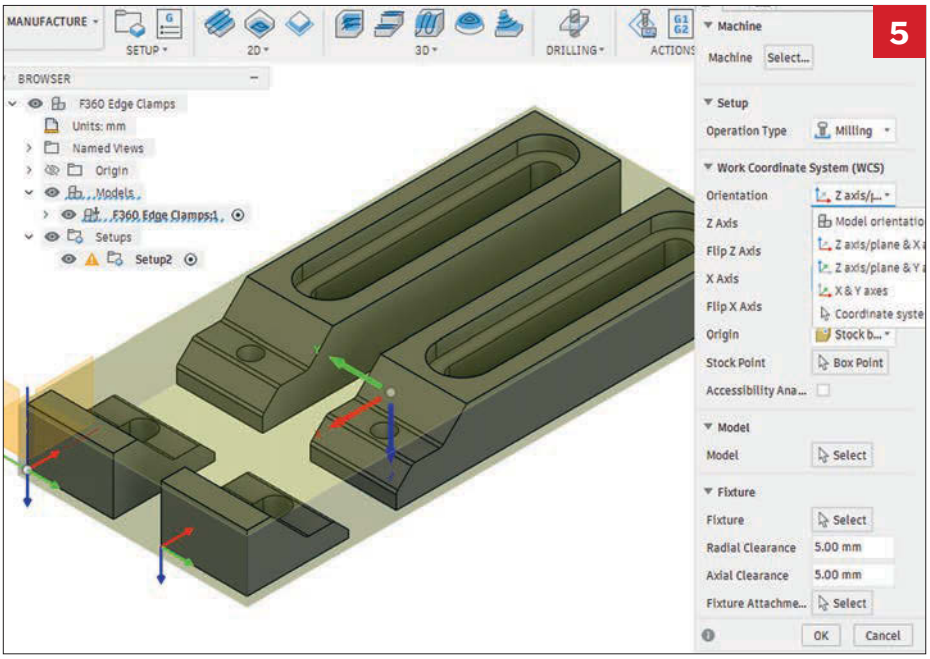
It depends to some extent what the part and stock are like as to whether you enter the details of the stock or the machine set up first. I this case I will start with the machine setup which is basically getting the X,Y and Z axis facing where you want. In **photo 5,** Z is out to the side but we want the mill spindle vertical. Part way down the dialogue box is 'Orientation' click this and you get a drop down of options, 95% of the time the first one is best 'Z plane/axis and X axis' so click that.

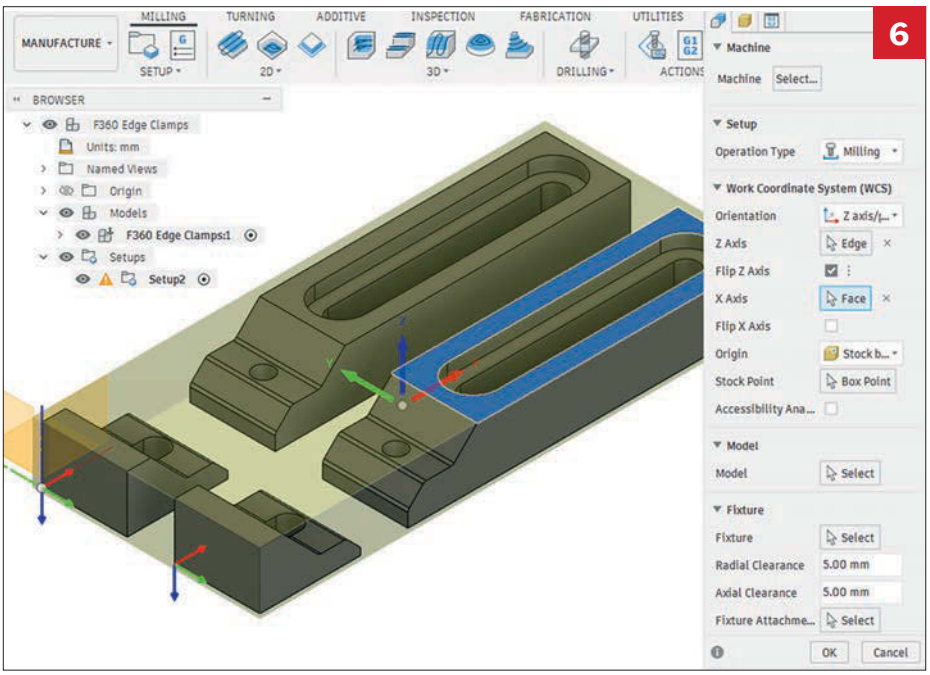
The first one to set is the Z plane which is a horizontal surface. The top is usually the best to choose and by clicking that you can see that the Z arrow is now pointing upwards not sideways. Occasionally the arrow may point in the opposite direction, this is changed by clicking 'Flip', **photo 6.**

In this case X is pointing along the longer length of the work which is normally how I like it but if it is not, click an edge that runs in the right direction. If the arrow points the opposite way just click flip again to change direction, **photo 7.**

With multiple parts you quite often need to tell the machine which ones you want to work on so a bit further







down the box is 'Model'. Click 'select' and then click each part you want to machine, in this case all four have turned blue to show they have been selected, **photo 8.**

Next the details of the stock you are cutting from need to be entered, so click the next icon along the top of the dialogue box. F360 defaults to a relative size piece of stock with 1mm machining allowance on all sides and the top.

John has a piece of 12mm plate that is 100mm x 150mm. Change the top option to 'Fixed Size Box', then work down entering the dimensions of the material. The default is to place the work in the centre of each dimension but looking at the Carvera site it seems they make use of an 'L' shaped bracket at bottom left as a datum, and this also has some screws to clamp the work. I have allowed 5mm to clear the screws plus 4mm for the cutter so have entered the offsets as 9mm, **photo 9.** This places the stock towards the front left corner to reduce waste.

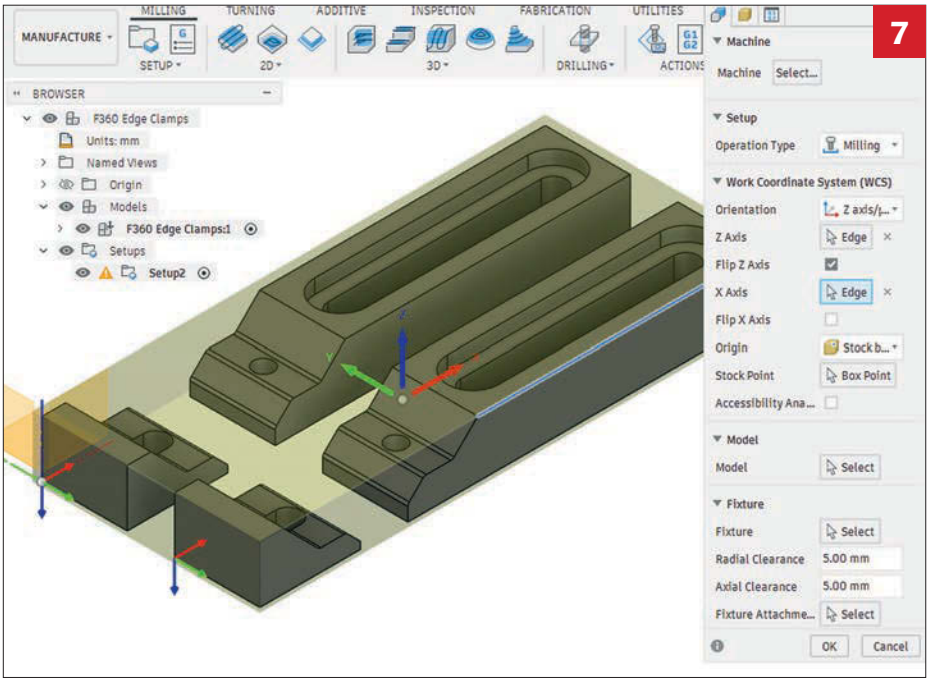
The last thing to do is set the Zero datum, as mentioned it seems Carvera use the front left so going back to the machine tab and coming down the list to 'origin' select 'stock point' and then you will see some small round nodes at the corners and centre of the stock, click the one in the front left corner that is on the top of the stock, **photo 10.** That should be all the setup for now. Click OK.

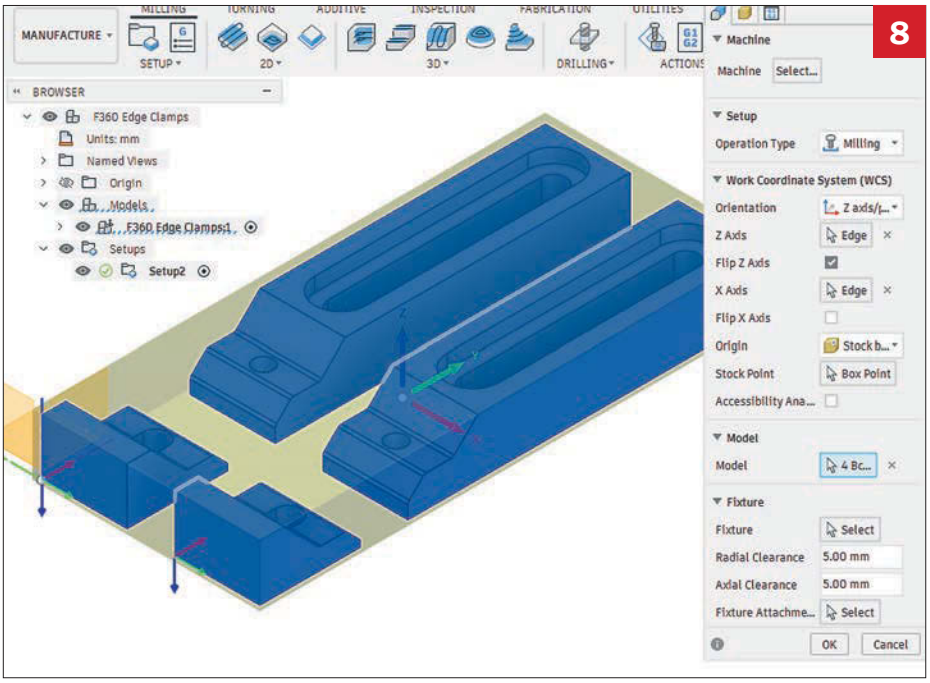
CONTOUR 1

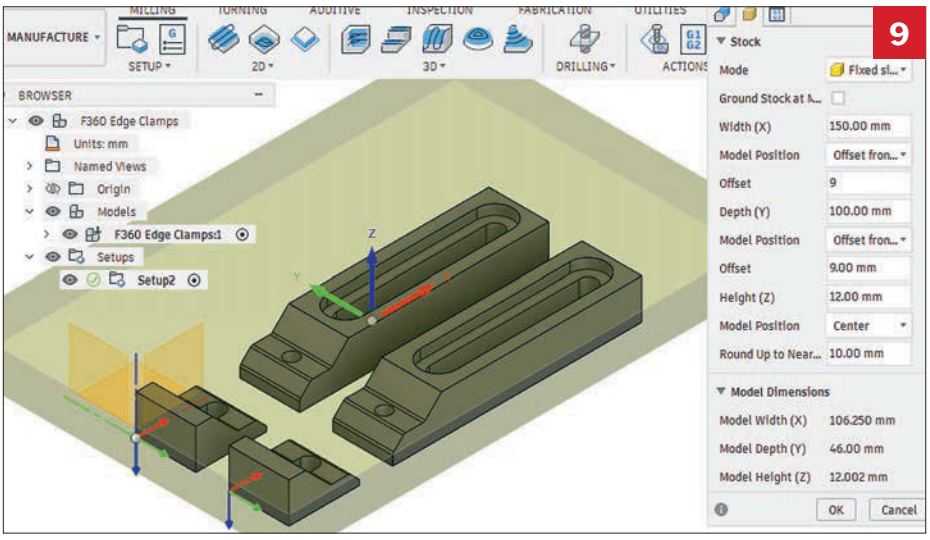
On a job like this where the parts will end up being held by just small tabs it is best to do as much machining as possible while the stock is fairly solid. So the first item I would do are the four slots that pass right through the parts.

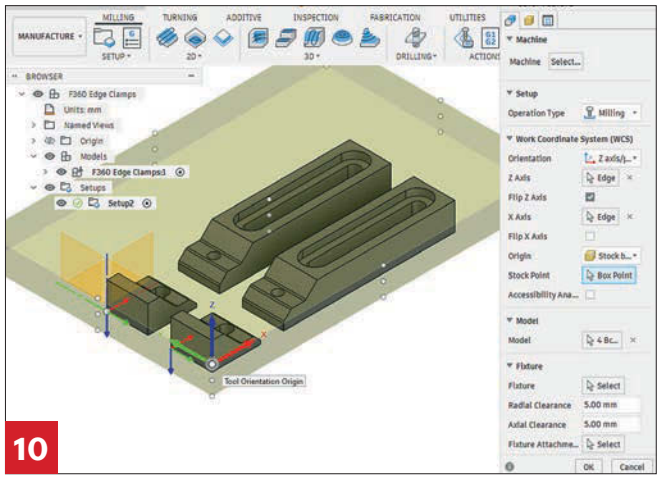
From the 2D list of paths select '2D Contour' which brings up a dialogue box '2D contour', this opens on the first tab which is where you select the tool and set its speeds and feeds. As I said earlier John will have to see with some test cuts what his machine can be expected to do. Here after clicking 'Tool Select' at the top of the dropdown I have selected 'flat end mill' from the right-hand filter column and 'Milling tools (metric) from the libraries on the left. That brings up a list of different size cutters, and I selected 4mm which is what John says he has. After clicking that some feeds and speeds are listed below of which I went with Aluminium slotting as most of the width of the cutter will be getting used.

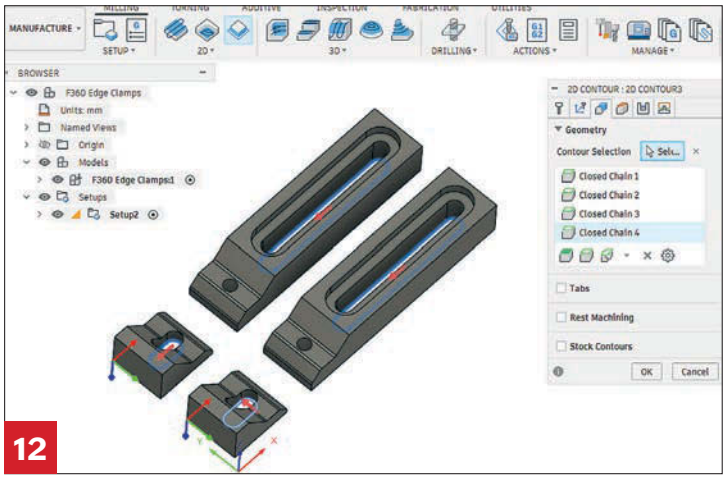
Spindle speed can be altered but I think Johns should run to that, feed rate I would suggest reducing to start with maybe half to a third of that shown, some others will change to













suit, the rest can stay as is. If not using coolant, click disable, **photo 11.**

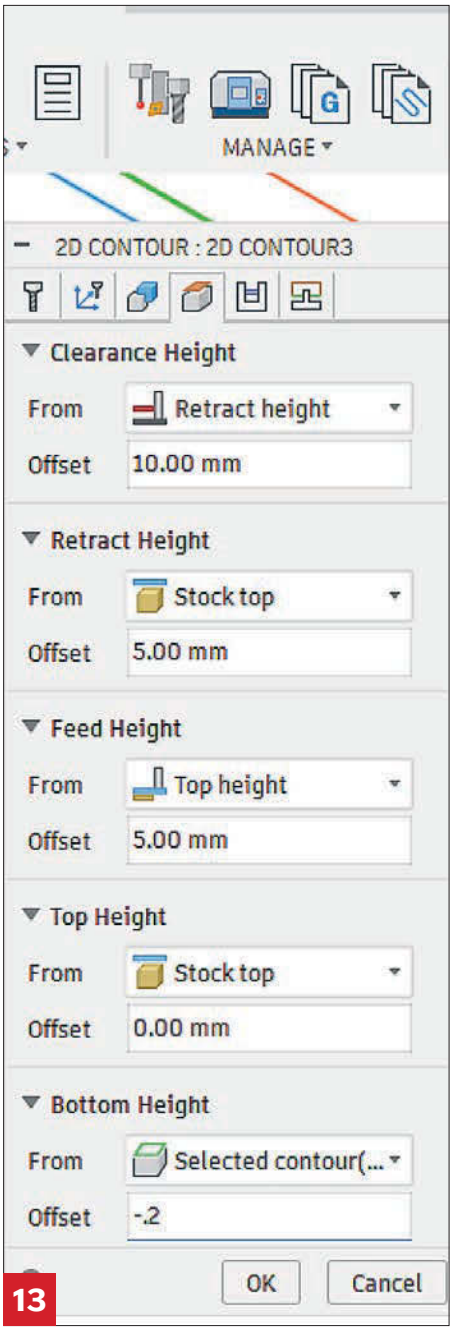
The next tab on the dropdown can be ignored. After that the tab for 'Geometry' can be clicked. For contours you need to select the edge of the contour, it can be top or bottom and in this case, I went with bottom as they are all at the same height. The image on screen will need to be moved about so you can see what you are clicking but just one click on each bottom edge of the slot will give the four 'Chains' that are the boundary of the cut, **photo 12.**

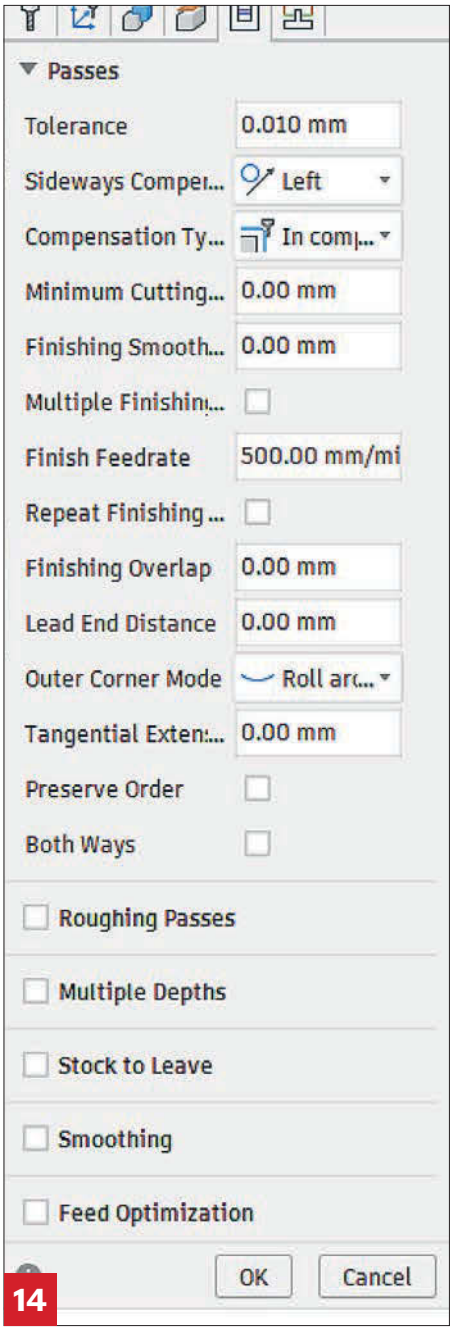
The next tab along sets the heights. Most can stay the same but as the small machine will not be able to ramp down that quickly the feed height can be reduced from the default 5mm to say 3mm.

The other height that needs to be set is how deep to go which is the 'Bottom Height' ideally the stock will have been mounted with a sacrificial layer under it to save cutting into the mill table. It does not need to be that thick, a bit of cornflake packet will do in which case enter a bottom height of -0.2mm below the selected contours which will see the cutter break through the bottom but not go too far, **photo 13**.

The next tab is 'passes' For this particular job I think that can be left as is. There are options for doing full depth finish cuts etc. but I'm not sure if the machine will do those and if it did what feeds and DOC would suit, **photo 14.**

To be continued





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The BR Standard 2-6-0 Class 4 Tender Engine



Doug Hewson completes the cab of his British Rail Mogul.

PART 33



76077 working a freight train at Fir Tree House Junction, Wigan, just south of Springs Branch shed in the mid-1960s.

We will continue with the cab and this time I want to deal with the cab assembly and mainly the reverser gearbox. From the photos you will see that the cab was built in situ so the chaps building up 76077 obviously had a plan! For a start, I made all of my hinges by silver soldering a length of 1/16 copper tube to the edge of a steel strip, but you need to make sure one side is flat. I then used a stout boring bar with a 1/16 x 2" slitting saw on it and set the depth stops on the lathe saddle. I had already worked out the width of a hinge so from then on, it was plain sailing. I just got a slot from the edge to the depth stop and cut more slots down to the stops until I had half a hinge and then separated it from the parent strip with another saw cut, dead easy. Just another twenty-four to go, that is if you want to make enough for your tender as well! **Photograph 327** shows making hinges at my lathe. I worked out where the cuts needed to beforehand and then set up the embryo strip in the tool holder to make the cuts. However, this is quite a delicate process so using a 15 thou slitting saw I was able to do the job without a problem. Once set up I had all the hinge parts made in about just over an hour. **Photograph 328** shows part of my production line, warts and all. **Photograph 329** shows the driver's seat box on 76077 partly installed.

Photograph 330 shows the cab during the building with some of the floor plates in place and on the extreme left is the stand for the gearbox. Now, you will need to make the rear angle in three pieces to accommodate the slide out piece so that you can get in to drive your engine! I have made the cutout to the minimum size possible so when the pressure gauge is in its correct place it can be read with no problem. The size is identical to my 4MT and that is no problem. However, when 80 is on shed, Eddie and Joe always leave the engine with roof on, so the engine all looks complete which I really like and then if anyone wishes to take photos of your engine, the same applies.

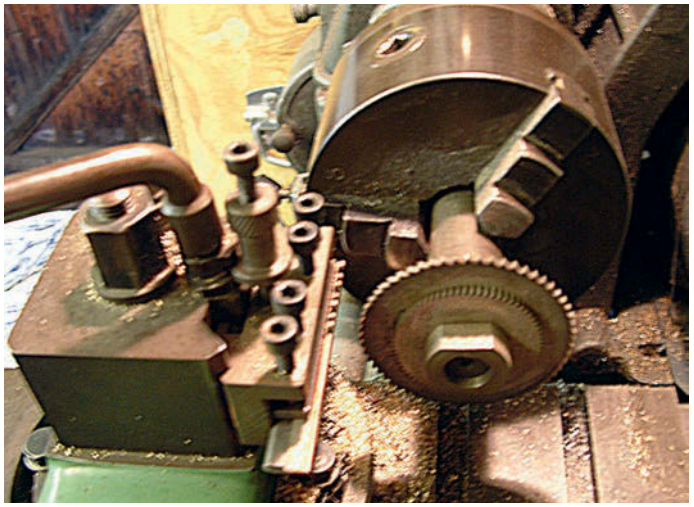


Photo 327: Slotting a hinge.

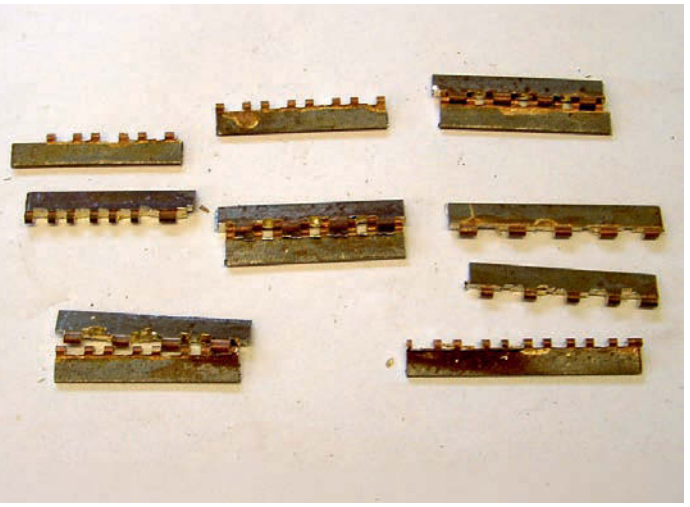


Photo 328: Various hinge parts.



Photo 329: The driver's seat.



Photo 330: Progress with the cab.

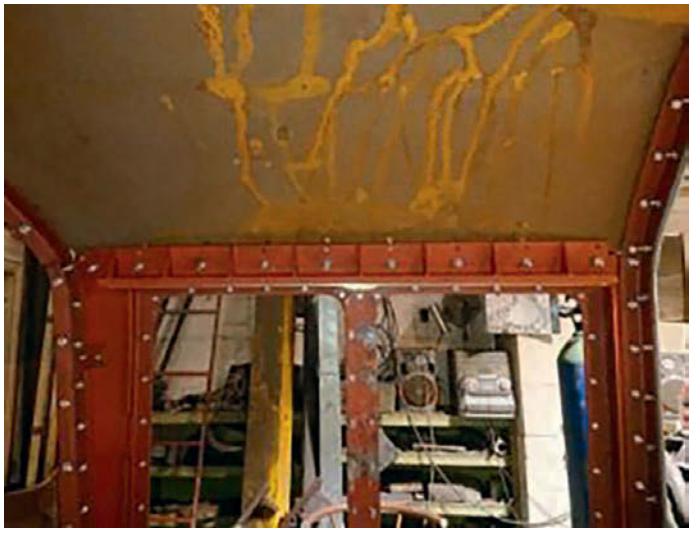


Photo 331: Underside of roof.



Photo 332: Fitting beading around window frames.

The top window slide, complete with all the stiffeners welded in, and the top curved inwards to suit the roof profile of the roof is shown in **photo 331**. The roof is bolted to this upstand of course and **photo 332** shows the beading being fixed around the window frames. It is well worth spending some time on this as the half round beading is exactly what it says on the box, it is half round which is of little use to the likes of people like us. It is normally used for making split pins of course. I used some temporary rivets to fix my beading and soldered it in place where possible and then I filed it all down to half its thickness and then restored the radius very carefully. The full-size beading is 1¼ x 5/16 so that was what I was aiming for. **Photographs 333** and **334** show some of my beading around the cab roof opening held on with 1/32 rivets and the completed job. Now, have you tried bending beading on



Photo 333: Rivets in place.



Photo 334: Rivets filed flush.



Photo 335: Beading bending jig.



Photo 336: Full size cab restoration.



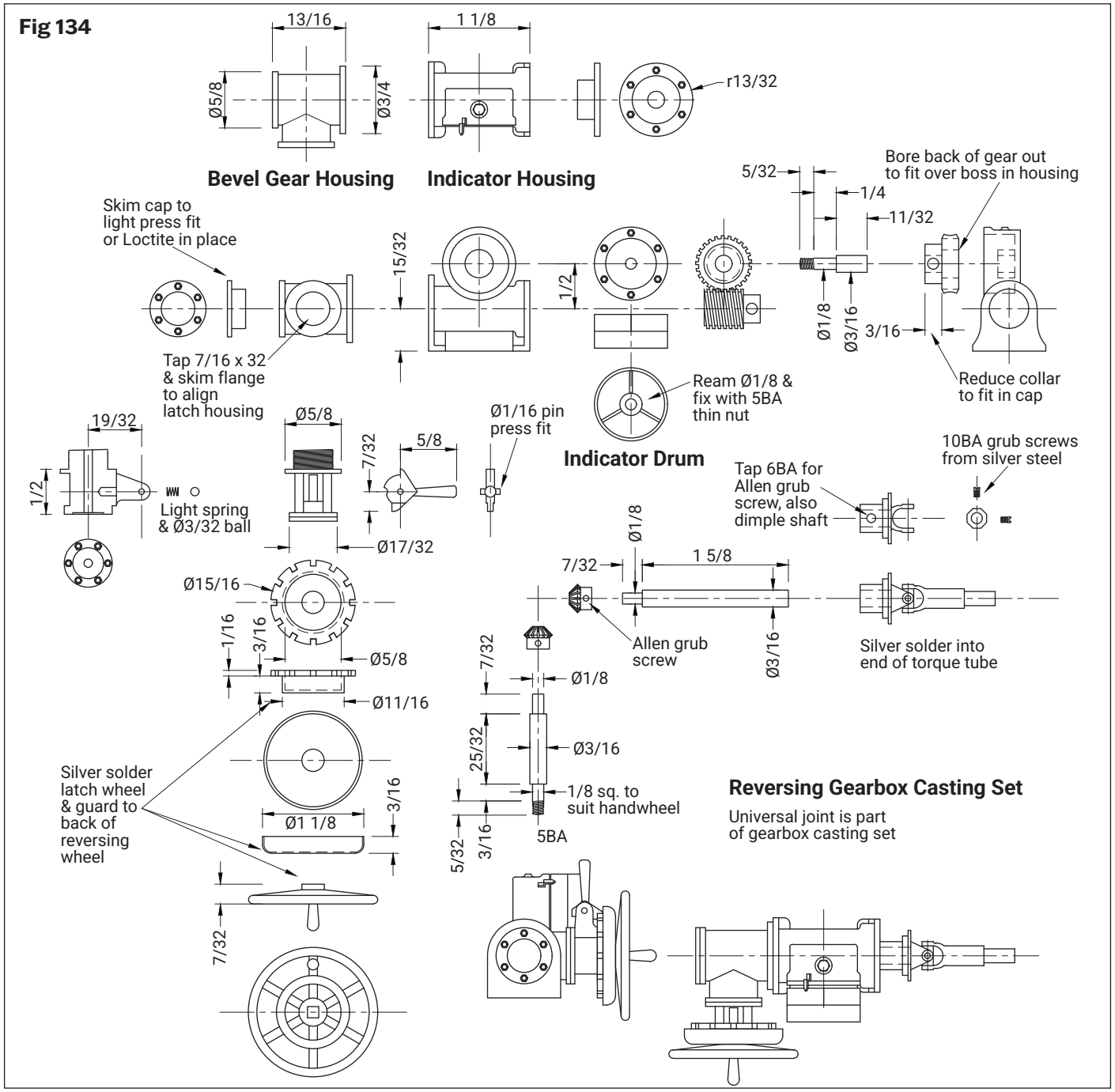
Photo 337: Ian Crowder works on the cab of 76077.

edge and have you had problems doing it? I made a couple of very small jigs especially for the job, if you make a very close fitting jig, it suddenly becomes dead easy. When I say close fitting that is exactly what I mean. The beading needs to just slide in edgewise and if you anneal it similarly to copper you can quite easily form the 3/16" radius on your beading without a care in the world. The BR beading needs to be riveted on with 1/32 rivets and then soft soldered on making sure there are no dry joints. **Photograph 335** shows the jig which I made for bending the corners of the tops and bottoms of the beading for the window surrounds. They need root radii of 3/32" at the bottom and 3/16" at the top.

Ian Crowder has been working on the full-size cab of 76077 and **photo 336** shows his work building up the front corner of the cab with the front window waiting to be cut out. There are other holes which have already been cut out which you will see on my drawing. **Photograph 337** shows Ian hard at work on the rear left-hand corner of the cab just doing a bit of trimming behind the driver's seat. Ian has supplied quite a few of the photos I have used in my articles.

As for the gear box I was a little bit over generous at the pattern making stage and left the various flanges rather too thick. I am afraid that you will need to thin them down a little. The overall width should be slightly under 2" if you can manage that. If you use a thread of 40TPI it means that it will screw in 25 thou with one revolution, so you should be able to adjust your thread depth to suit w here you need to be, like when you are needing to get your latch housing dead vertical. I hope this makes

Fig 134



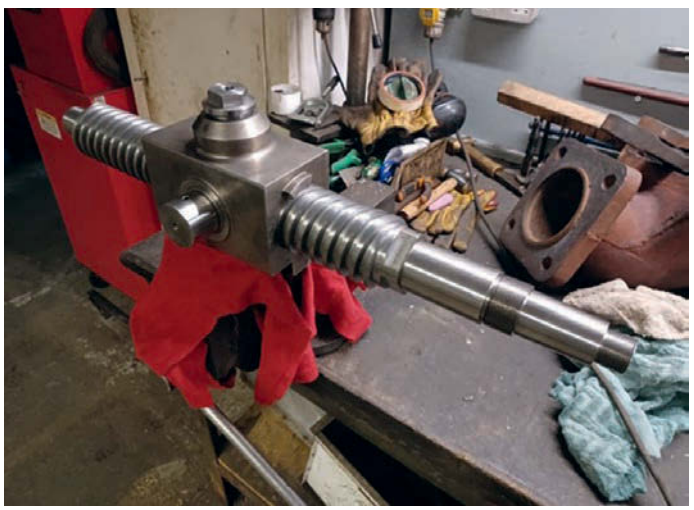


Photo 338: Reversing screw.



Photo 339: Internals of the full size reverser gearbox.

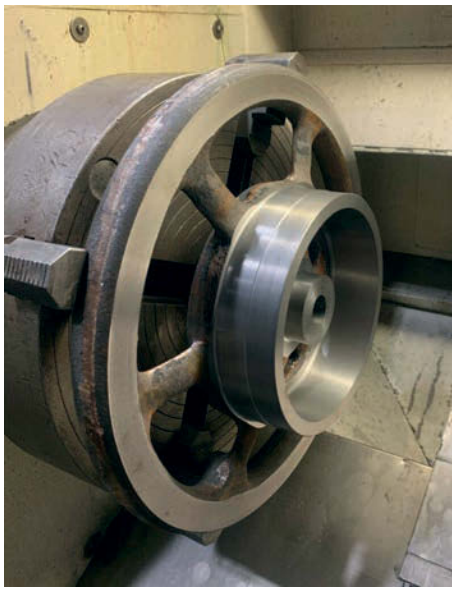


Photo 340: Reverser handle.



Photo 341: 76077 looking rather scruffy beside a BR Standard 20-ton goods brake van.

sense to you! There will be several places where this will be needed, **photo 338** shows the full size reversing screw which has a 12tpi left hand square thread on it. When I was running the business, I used to keep a stock of these, including the nuts, but I do hope that someone has kept up with that tradition as all the BR Standard engines need one. **Photograph 339** shows the compete gear box in bits which is very nice, and I must say that it is well worth fitting the spring and ball under the latch as it gives a positive feel to the latch. I used the spring out of a discarded cigarette lighter when we were building reversers for our customers. If you make the reversers exactly as per the drawings the cut off indicator will work properly. **Photograph 440** shows the reversing handwheel being machined, from the rear, I think that this one of Ian's photos. **Photographs 341** and the **heard photo** of the full-size engine have been supplied by the Toddington Standard Locomotive Limited. I will start the next article with the side platforms.

To be continued

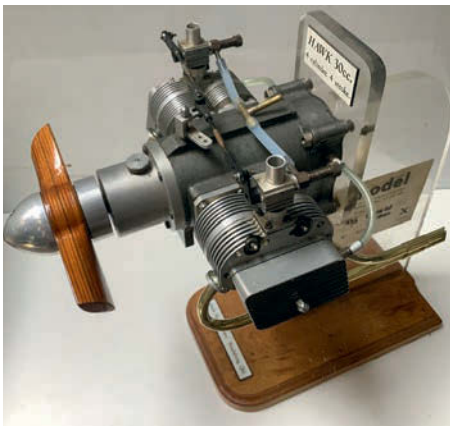
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Number 4783 December 2026

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Detailed Plans to build George Punter's Hawk 30 IC Engine.



Chris Gill explains his reusable jig for setting accurate centre distances.



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34th Welsh Locomotive Rally

Ross Hopkins reports on another successful event held in Cardiff.



This June, Cardiff Model Engineering Society proudly hosted its **34th Welsh Locomotive Rally**, welcoming model engineering enthusiasts from across the UK for a memorable weekend of steam, friendship and fantastic engineering.

Old friends reunited while new friendships were formed, creating the welcoming atmosphere that has become synonymous with our annual rally. Although the ever-predictable Welsh weather interrupted proceedings on Saturday, it certainly didn't dampen spirits. Our dedicated engineers kept the steam flowing and visitors continued to enjoy everything the site had to offer.

This year's event saw Lewis and I working hard to attract visitors from across the country. We were delighted to welcome guests from as far afield as Mid Cheshire and South Devon, all of whom enjoyed the warm hospitality and friendly welcome that Cardiff Model Engineering Society is proud to offer

The rally featured an impressive 27 steam locomotives, five electric and petrol locomotives, two 4-inch scale traction engines, and 1 live steam workshop display, **photos 1 and 2.** Over the three-day event, just shy of 1,000 laps were recorded on our ground-level track, keeping both drivers and spectators entertained throughout the weekend, **photo 3.**



The evenings were just as enjoyable as the daytime activities. Friday night saw our popular quiz bring members together, while Saturday evening's bingo, expertly hosted by Lewis, proved to be another highlight with plenty of laughs and friendly competition.

We were delighted to welcome Julia and Matthew from Polly Engineering, whose trade stand offered visitors an excellent opportunity to browse and purchase products from one of the hobby's most respected suppliers.

The success of the rally would not have been possible without the incredible dedication of our volunteers. Their hard work before, during and after the event ensured everything ran smoothly, while many visitors commented on our beautifully maintained gardens





and the warm, friendly atmosphere around the site.

A special thank you goes to our ladies, who kept everyone well fed throughout the weekend. From Friday evening's fish and chips to Saturday night's hog roast, alongside refreshments served throughout the event, their efforts were greatly appreciated by members and visitors alike.

Our organising team, Mike, Hywel, Lewis, Ben H, Nick and Owen, once again worked tirelessly behind the scenes to deliver another successful rally. Months of planning, preparation and teamwork resulted in an event that everyone could enjoy, and their commitment deserves sincere recognition.

Finally, we'd like to thank every exhibitor, trader, volunteer, visitor and member who supported this year's rally. Your enthusiasm and continued support are what make this event such a success year after year.

We are already looking forward to welcoming everyone back for our 35th Welsh Locomotive Rally, taking place on 11–13 June 2027. If you would like to receive updates and information about next year's event, please join our mailing list by emailing rally@cardiffmes.com.

We look forward to seeing everyone next year.

Club Diary

We are now looking for information on events in 2027. Please send your events for Club Diary to neil.wyatt@kelsey.co.uk

2026

EVERY SUNDAY

Urmston & District MES
Public Running every Sunday Contact: secretary@udmes.co.uk
Warrington MES
Running day. Contact : contact@wdmes.org.uk
Wakefield SMEE.
Public running day. Contact Denis Halstead 01924 457690

SEPTEMBER

20 Guildford Model Engineering Society
Public running days at Stoke Park Railway. Info and times see www.gmes.org.uk.
26 Brighton & Hove SM&LE
Hove Park Railway public open day. www.hovepark.com
26-27 St Albans and District Model Engineering Society
The BIG St Albans Model Show.

OCTOBER

3 (TBC) Bradford Model Engineering Society
Visitors Day. BMES welcomes members and their locomotives from other societies to Northcliff for breakfast & lunchtime butties. Let Russell know in advance, please: Russ Coppin, 07815 048999.
10, 24 Brighton & Hove SM&LE
Hove Park Railway public open day. www.hovepark.com
11 Chichester Model Engineers
Public running at Blackberry Lane, Chichester PO19 7FS. 13:00.
11 Bradford Model Engineering Society
Public running day. Members from 11:30 am, public from 1:30 pm to 16:00, whatever the weather, Northcliff. Contact: Russ Coppin, 07815 048999.
14, 18, 25 Bristol SMEE
Public Running day, Ashton.
17 Gauge 1 Yorkshire Group
Running day at Drax Power Station social club, 9:30 to 15:30. Bar open for drinks, breakfasts and lunch. All welcome.
18 Stafford Model Engineering Society
Running day at County Showground, Stafford. 10:00-14:00. Further information via www.sdmes.co.uk.
18, 29 Guildford Model Engineering Society
Public running days at Stoke Park Railway. Info and times see www.gmes.org.uk.
18, 31 Saint Albans Model Engineering Society
Running sessions at Puffing Field. 1pm start, weather dependent.

NOVEMBER

14 Gauge 1 Yorkshire Group
Bonfire Night Bash at Drax Power Station social club.
14 Stafford Model Engineering Society
Running day at County Showground, Stafford. 10:00-14:00. (Weather permitting, check Facebook page). Further information via www.sdmes.co.uk.

DECEMBER

5 Gauge 1 Yorkshire Group
Christmas Bash at Drax Power Station social club, 9:30 to 15:30. Bar open for drinks, breakfasts and lunch. All welcome.

Readers' Tips

CHESTER MACHINE TOOLS

We have £30 in gift vouchers courtesy of engineering suppliers Chester Machine Tools for each month's 'Top Tip'. Email your workshop tips to **neil.wyatt@kelsey.co.uk** marking them 'Readers Tips', and you could be a winner. Try to keep your tip to no more than 400 words and a picture or drawing. Don't forget to include your address! Every month we'll choose a winner for the *Tip of the Month* will win **£30 in gift vouchers from Chester Machine Tools**. Visit **www.chesterhobbystore.com** to plan how to spend yours!

AN ALL-IN-ONE CHUCK KEY SET

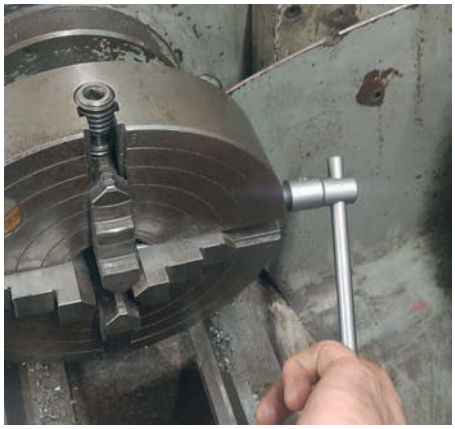
Our tip winner this month is Mike Worth, who has rationalised his collection of chuck keys.





Got a bunch of chuck keys lying about the place? Keep picking up the wrong one or forgetting where you put it down? A set of sump plug socket bits is pretty cheap and includes a wide range of metric and imperial square drives, as well as hex (and others). You can pick out the ones that match your various chucks and then buy a T-handle and extension to create an adaptable all-in-one key set. As well as reducing the number of things to put down somewhere, the sliding handle and swap-in shaft length can allow for adjusting jaws in positions that would otherwise be awkward or impossible.

I've pictured mine, complete with heads for the camlock spindle plus 3-jaw and 4-jaw, on a custom backsplash hanger but it could easily be kept in a cutout tray kept on the headstock or in a drawer if you don't have a 3D printer.





Please note that the first prize of Chester Vouchers is **only available to UK readers**. You can make multiple entries, but we reserve the right not to award repeat prizes to the same person in order to encourage new entrants. All prizes are at the discretion of the Editor. General terms and conditions are at www.kelsey.co.uk/terms-conditions.



Club News

Geoff Theasby reports on the latest news from Model Engineering Clubs. To be included, please send stories from your Club and copies of your newsletters to geofftheasby@gmail.com.



Photo 1: Steam Railmotor in Gauge 3 (Photo courtesy of Ted Sadler)

Momentous News! My miniature locomotive and ancillary trailer now rest on all five axles, ten wheels, on the same piece of track at the same time, which a friend of mine suggests might be a better record than BR at the moment. Another form of transport is headline news, a major fire broke out at Dalton Mills, Keighley, threatening to engulf the well-known Keighley Bus Museum. However, damage was confined to the roof, but it was a hairy moment. Interestingly, this is the sixth major fire in this property. Do you think someone is trying to tell us something? Well, have I got Club News for you? Ten club newsletters to report on, I am rich! Starting with **Bradford Model Engineering Society**'s, *Monthly Bulletin*, for August and September, wherein Dominic Scholes tells a tale of a rounded nut. In essence, he had problems with a Whitworth nut, of which the hexagon was changed to match the spanner size of a British Standard Fine fastener. Dominic also reported his take on the visit to Keighley MES. Jim Jennings relates how he became interested in model steam engines. www.bradfordmes.uk The **Newcomen Society**, an organisation I wholeheartedly endorse, has organised a visit to a seal manufacturing company in Rotherham. I look forward to this visit, as they are always interesting. Also from this October, meetings will be held in the Royal Victoria Hotel. www.newcomen.com **Auckland Society of Model Engineers** sent their newsletters, after a hiatus due to the previous editor becoming unable to continue. Roger van Rijn has assumed the position and sent news about NZ activities. The 159th meeting was held at Mike Jacks' house, where Michael Cryns presented a bracket clock from about 1690-1790. Christopher Ratcliffe presented a flash-proof lamp, from the armaments section of a destroyer, probably Falklands era. It is very heavy! Brian Baker had two woodworkers' scribers, one old and inlaid with brass, the other modern and featureless, whilst Jonathan Feist brought an 'M6 predictor'. No, I don't know either, it is thought to be associated with naval artillery. Cameron Webb makes exquisite spinning tops, the one he showed was made from German silver (a copper, nickel, zinc alloy, invented in Germany in the 18th Century), titanium and a ruby point. A selection of Murray Lane's paintings closed this interesting missive.
The 160th meeting was informed of the sad death of Graeme Quayle (two fine stationary engines designed by Graeme were serialised in ME – Ed.). His family thank all ASES members for their friendship. Steve Watson is constructing an enormous oscillating cylinder to his own design which is very and is very solid. Mike Jack repaired his home-made chopping board. Cameron Webb showed the starter of a Jumo 004 engine as used on the Me 262, circa 1944. Michael Cryns brought a Lesie motor from an organ, that gave it the distinct wavering note. A friend of mine built a wholly electronic fairground organ and used a rotating polythene washing up bowl with a segment removed, to emulate the Leslie sound. The owners and builders of traditional fair organs were totally mystified as to how his organ works. It is fed from Z-fold 'books' just like the real fair organs but has a strip light shining through the holes onto photo cells to switch the oscillators on and off, instead of probes 'feeling' the gaps or air blown through them. asme.org.nz **Sydney Live Steam Locomotive Society** sends their August newsletter,



Photo 2: Spark filtration? (Photo Martyn Redfearn)

I had received the May issue, but it was lost in my system. That issue said that running days were highly successful, and that there had been no problems. Ross Bishop has had injector problems on his MacLaren traction engine. A small notice briefly covered the ME series of threads and how it originated. The August issue has Editor, John Lyon, explaining that the rebuilt raised track was almost finished, and Brian Kilgour was building replacements for the red set of carriages. www.slsls.asn.au **St Albans & DMES** shows the portal of a tunnel on their track. Mike Collins contemplates alleged laziness in the workshop, considering whether time saved, for instance, is really saved by not putting away frequently used tools, in the knowledge that they will be needed again shortly. To people like him this is laziness. I can relate to this. In my satcoms employment, I had an obnoxious colleague who made life difficult for all. I was hauled before the 'big cheese', accused of 'looking at the floor', when I should have been working. "Now's your chance, Theasby", I thought, and I said, "I was thinking, you should try it sometime". One up to Geoff, I thought, as the big cheese barely suppressed a smile. Tony Mason repeated a section from the then-entitled *Gazette* about a violent thug which was destroying club assets and property. Worse still was that he could not reason with this ne-er-do-well footpad as the culprit does not speak English, and Tony didn't speak swan. Guy Keen, in *Workshop Matters*, concerns himself with a piercing, or jewellers' saw. www.stalbansmes.com Meanwhile back at the ranch, I recently built a workbench in the garage, using wood left over for the rebuilding the back patio. My wife asked if it was strictly necessary, so I explained that to date I have been grovelling about on the floor working on my electric locomotive and its trailer cars. I also have a 'ready use' tray for frequently used tools as Guy stated above, but as yet I haven't found the best place to keep it. It is currently on the floor. next to my workshop chair, "The floor is not a storage area...."

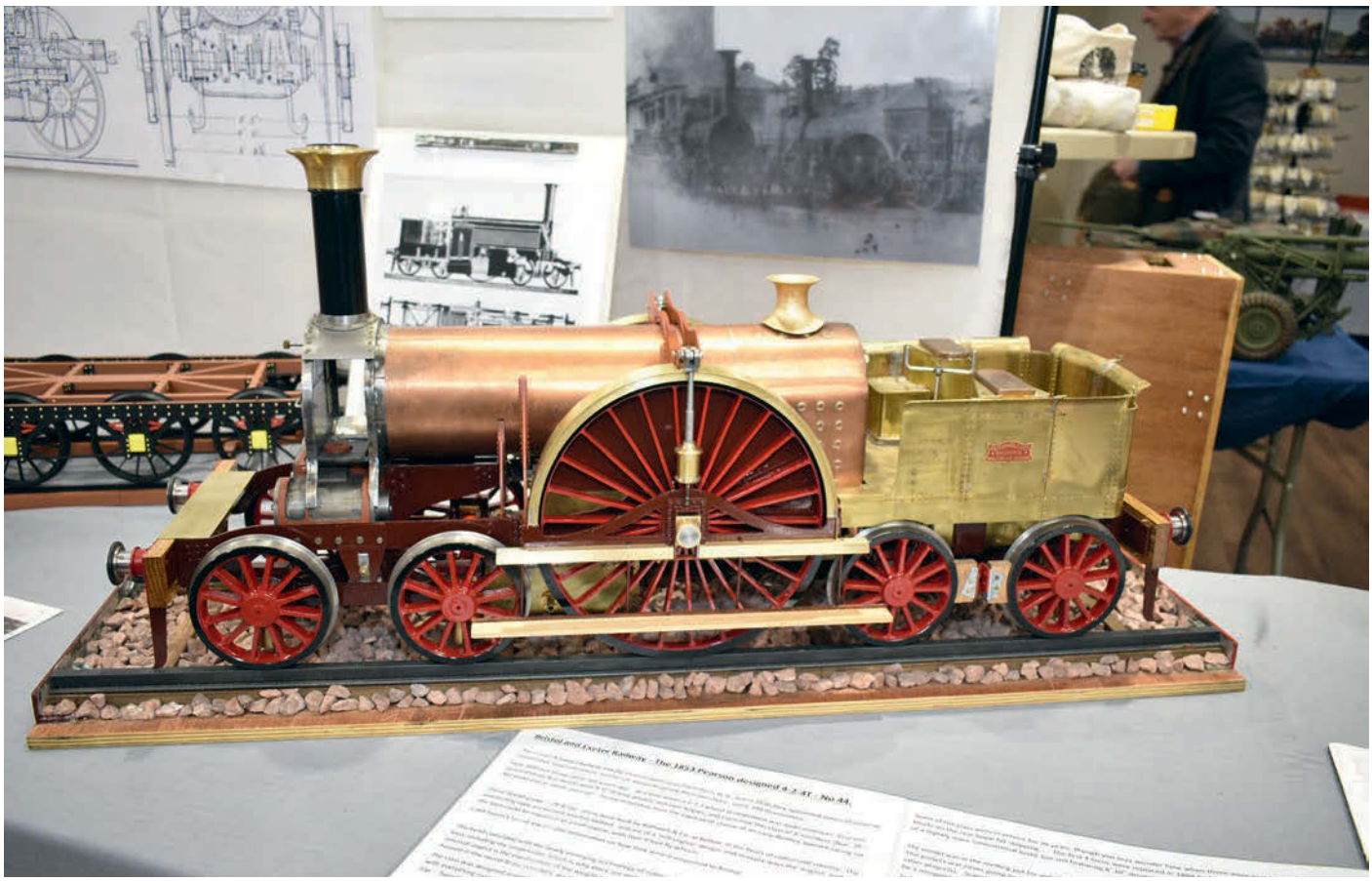


Photo 3: 1853 Broad Gauge locomotive by James Pearson (Photo John Arrowsmith).

At a Sheffield auction in September, a number of live steam models fell under the hammer, from a non-operational engine for a few pounds, to a 5 inch gauge Pacific, asking £1,500, together with the usual boxed '00' locomotives and trains. There were also a few Keil Kraft balsa wood unmade kits, (oh, that takes me back, control line aircraft which I and my fellow kids would go to watch every Sunday morning - Geoff) plus the engines to propel them, 'Frog' was one I believe. Now they are rare. I have only seen one since, on a market stall.
In *The Gauge Three Society* Autumn newsletter, Jon Gluyas updates the building of his garden railway in Co Durham. Progress was curtailed when he fell and broke a leg in three places. John Branch grew up thinking that basically, all engines are the same underneath, until he got one, and found that there are not many places to house AA batteries and control equipment. He also had fun making stairs for his tram, which he solved by constructing the treads and risers origami style. The onset of night called for 34 small LEDs in groups of four, under-run to get a yellow hue. He considers though, that the vehicle is hideously overpowered, and currently still in the 'to-do' box. His next model will *not* be a streetcar. Mike Palner has a notion that a series on 'Locomotive Portraits' i.e. good quality photographs before a well-designed backdrop might be well received, and editor Nick Baines invites further such contributions. Tim Gleed spent thirteen years building a Garden Railway which featured in *Ilkeston Life.* Ted Sadler took several photos during Tim's first GTG and wrote them up for the Newsletter.
I like this neat railmotor, by Paul Leech, **photo 1.** www.gauge3.org.uk
In the Theasby communications empire, the domestic telephone system was way down the list for attention. That is, until we upgraded our satellite cable tv system whereupon, in the words of the Rolls-Royce spokesman "it ceased to function'. The system grew, and it became a wired system with radio-linked extensions as it expanded over the years; the soldered joints in the junction boxes, not solid core wire causing some confusion in the mind of the Virgin Media engineer who fixed the tv. I suspect that this was due to it being installed by Geoff. There is one trailing wire left over, but all the phones work as they should so I shall allow it to remain suspended in a corner of the workshop as a reminder of my fallibility, like Damocles.

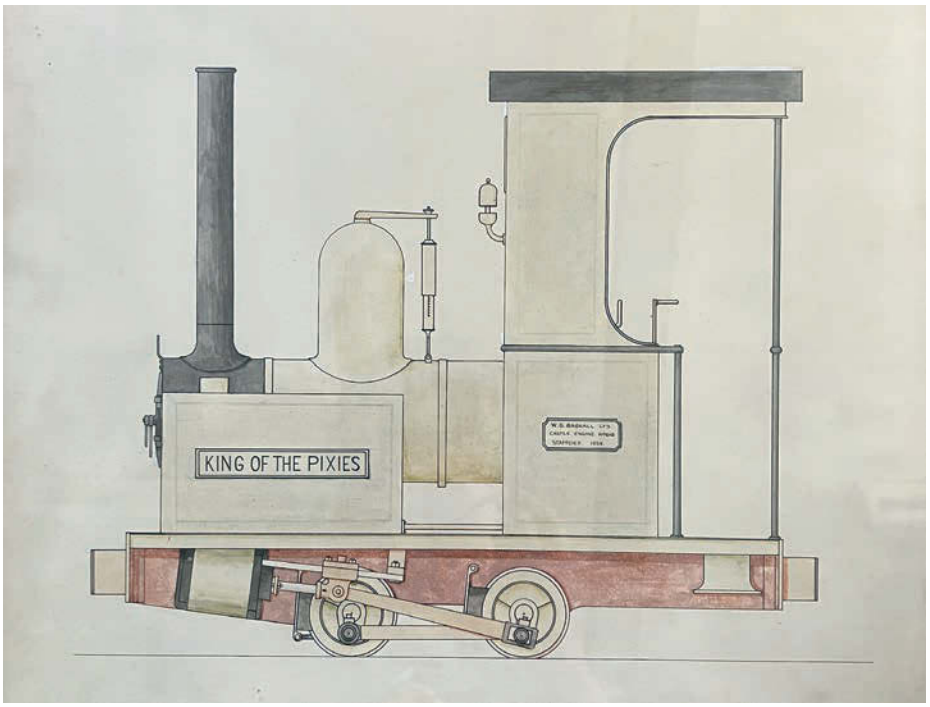


Photo 4: King of the Pixies by Mr Hatherill the elder.

The Gowrie Locomotive Trust sent their newsletter, *The Gowrie*, its 44 pages stuffed with items of interest. Editor Ian Freebury claimed a significant milestone has been reached; a series of pictures follow, showing the machining of the cylinder covers etc. The boiler fund stands at half of that which is required. Marion Allen lists items for sponsorship depending on how deep your pockets are, from a Safety valve base nut at £35 to the coupling rod blank at £1,700. It is anticipated that the cost of copper piping alone will amount to about £15,000. It is said that some of the locomotives were painted different colours as some of their crews could not read or write. Finally, there is a large stock of merchandise enabling you to show your allegiance to the society. www.gowrielocomotivetrust.com
7 ¼ Inch Gauge News, Autumn, from the namesake society**,** introduces Paul Edmonds, from Surrey Society of Model Engineers, who is building a Rio Grande *Challlenger* 4-6-6-4, it will be twelve feet long. He is planning to finalise the build towards the end of this year, so its public appearance may be in 2027. We wait with bated breath. The proficiency scheme has awarded thirteen Bronze and three Silver awards and several people took their tests at the Statfold Model Railway Exhibition. Dave Lewis, President, of Newport MES explains the signalling scheme in use at their home track. This was assisted by the donation of 2,000 metres of the correct cable and eight actuators, which formed the basis of the system. Martin Redfearn had a kit-built *Flyer* which machine he likened to a powered tipper wagon. He began to feel that driving around in a vehicle with nothing up front left him vulnerable (but he would always be the first to know in the event of a collision…) Then he became aware of an Emett- style locomotive and it caught his interest, **photo 2.** It was revealed at the Mid-Cheshire '*Scamp*' event and driven by Martin wearing a baseball cap with a propellor on top. This was powered with an electric motor built in. There were those who asked, "who is this mad bloke?" Bob Bramson spent twenty years and 7,500 hours building a C2 Atlantic, 4457. Ian Coleby updated the Charlton Light Railway, the station was modelled on Ronaldsway Halt on the IoM steam railway.
The first South West ME Exhibition was organised by Newton Abbott & District MES. Notable was the Bulleid Builders stall, their display was described as 'superb', by Chris Elliott (John Arrowsmith reviewed this exhibition in *ME&W* 4780). Bristol SMEE showed a rare collection of tethered cars.
A Broad Gauge 4-2-4 was designed by James Pearson, **photo 3.** David Hatherill recalled previous AGM's; when he worked on the Talyllyn Railway, he began to design a Bagnall-type loco, to be called *King of the Pixies* it was said to be "too tall". Looking at design drawings, though, shows that they are correct to the original, **photo 4**. At that time there were no 7 1/4 inch narrow gauge locomotives. www.sevenandaquarter.org

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Warco wm20 milling machine for sale, single phase. R8 tolling works great and accurate no wear to speak of, has had a repair to the bed as it was an ex-college machine at one point I believe. I can deliver on a trailer for agreed cost, you will need mean to lift from trailer your end £2100. **Email: bazz192000@yahoo.co.uk. Bedford.**

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6" Pratt Burnerd 4 jaw independent chuck. It is in very good condition and has the Myford mount £80. **Tel: 07808 721232. Email: davew77@hotmail.co.uk. Prestatyn, N. Wales.**

Myford ML7 Lathe. Good condition. Lever action tailstock, faceplate, 2 x 3 jaw and 1 x 4 jaw chuck. 2 steadies. Fine feed tumbler gear. All change gears including 127 tooth. Change-gear cover removed for pics. Easy access, help with loading. £700. **Email: doug.dmclaren@gmail.com. South Shields.**



PARTS AND MATERIALS

Peter Heimann Month Going Regulator clock. Plates roughed out, wheels, pillars, barrels made. All ballraces, drawings and instructions included. Not enough time to complete this project. Weight 8kg. £225 ono. **Tel. 01525 872675 or 0788 740 9805. Email: rogers.accountants@gmail.co. Toddington, Bedfordshire.**

Grasshopper Beam Engine-Brunel Models. Unfinished project. The set appears complete and includes the full set of three drawings. Collection only. Free. **Tel: 07912 317588. Email: hg@allthemunros.com. Purley, Surrey.**

Part-built 3½" gauge Rob Roy loco, boiler, castings, drawings. Basic chassis with suspension, wheels and axles fitted but not yet quartered. Eccentrics and straps not set. Coupling rods, gunmetal castings, stainless grate, and commercial safety valves Commercial TIG-welded boiler with x2 certificate Collection only. £675. **Tel: 07922266801. Email: bryanfinch@ntlworld.com. Guildford, Surrey.**

MISCELLANEOUS

10-drawer storage cabinet. Full width top tray 3 full width drawers 6 half width drawers 1 deep narrow drawer All trays are lined with green baize Hinged lifting handles Approximate dimension: Width 660 mm Depth 240 mm Height 400 mm £60 or nearest offer £60. **Email: andrewisnice4@gmail.com. Wokingham.**

MAGAZINES, BOOKS AND PLANS

A fairly large collection of magazines inherited from my father and I would like it to go to a new home. I am giving it away to someone who would appreciate the collection as much as my father did. **Tel. 07714 744806. Email tm03aaa@gmail.com. Westbury, Wiltshire or Andover.**

Kit for the Mk 1 Quorn tool and cutter grinder100. Includes Parvalux motor, capacitor, castings, spiral machined column, small parts (bearings, springs), 5 wheels. 4 drawings and the Chaddock book. Lacks one bed bar, belt and wheel guard castings. Collection only. £100. **Tel: 07912317588. Email: hg@allthemunros.com. Purley.**

WANTED

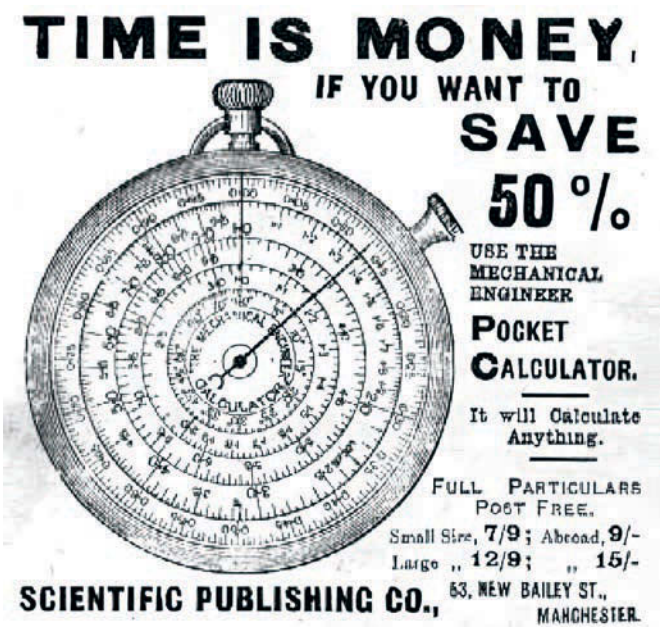
Drawings for 5" gauge class 37 or 40 diesel also drawings for class 0 8 shunter. **Email: Sandyandcelia70@virginmedia.com.**

EMCO BS2 Bandsaw rip fence. Does anyone have a rip fence for



the EMCO BS2 bandsaw either under their bench or attached to a scrap machine that they would be prepared to sell? I really would like to spare myself the effort of making one! **Tel: 07917335700. Email: richardmstuart@outlook.com. Corsham, Wiltshire.**

Driving car for raised track. I am looking for a driving car for 5-inch garage raised track. Must have the following coal and water on board and braked. Thanks. **Email: michaelcallaghan440@gmail.com.**



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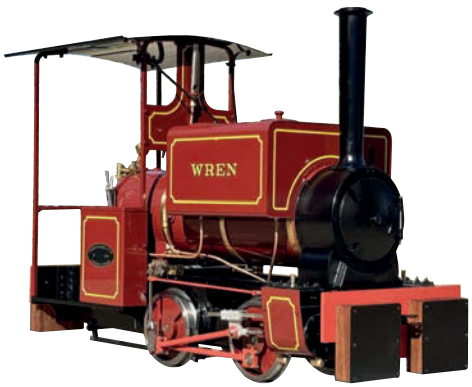
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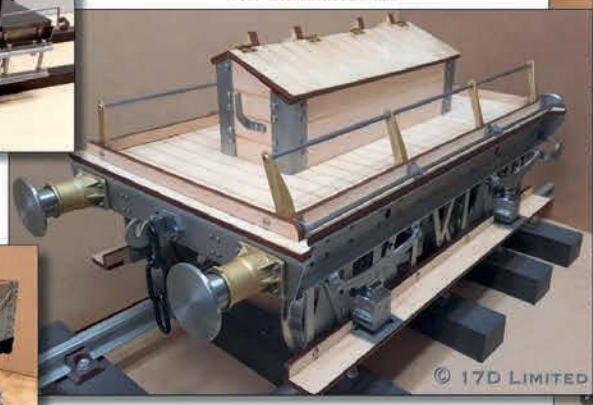
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