AN ADAPTOR FOR INTERNALLY THREADED END MILLS

MODEL ENGINEER & WORKSHOP

EST. 1898

THE LEADING MAGAZINE FOR HOBBY ENGINEERS AND MODEL MAKERS

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Volume: 235, Issue: 4772, January 2026

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An LB&SCR Terrier

BRUCE BOLDNER SHARES HIS EXPERIENCE OF CONSTRUCTING THE CLASSIC MARTIN EVANS DESIGN

A Stand for Metric and Imperial Drill Sets

LAURIE LEONARD COMPLETES A FIFTY-YEAR PROJECT!

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Designer: Darren Hendley
Illustrator: Grahame Chambers
Publisher: Tim Hartley

By post: Model Engineer & Workshop, Kelsey Media Ltd, Media Centre, Morton Way, Horncastle, Lincs LN9 6JR.
Telephone: 01507 529589
Email: neil.wyatt@kelsey.com

ISSN: 0033-8923

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Email: sue.keily@kelsey.co.uk
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Advertising Sales
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PUBLISHING
Sales & Distribution Manager: Carl Smith
Publishing Director: Dan Savage
Published by: Kelsey Media Ltd, Media Centre, Morton Way, Horncastle, Lincs LN9 6JR

SUBSCRIPTIONS
Full subscription rates (see inside for offers): 12 months, 12 issues, inc. post & packing - UK £71.40. Export rates are also available, see www.classicmagazines.co.uk for more details. UK subscriptions are zero-rated for the purpose of Value Added Tax.

Enquiries: cs@kelsey.co.uk

PRINT AND DISTRIBUTION
Printed by: Acorn Web Offset Ltd, Normanton, West Yorkshire.
Distribution by: Frontline Distribution Solutions 2 East Poultry Avenue, London, EC1A 9PT

Just ask
This issue was published on:
21 December 2025
The next issue will be on sale:
23 January 2026

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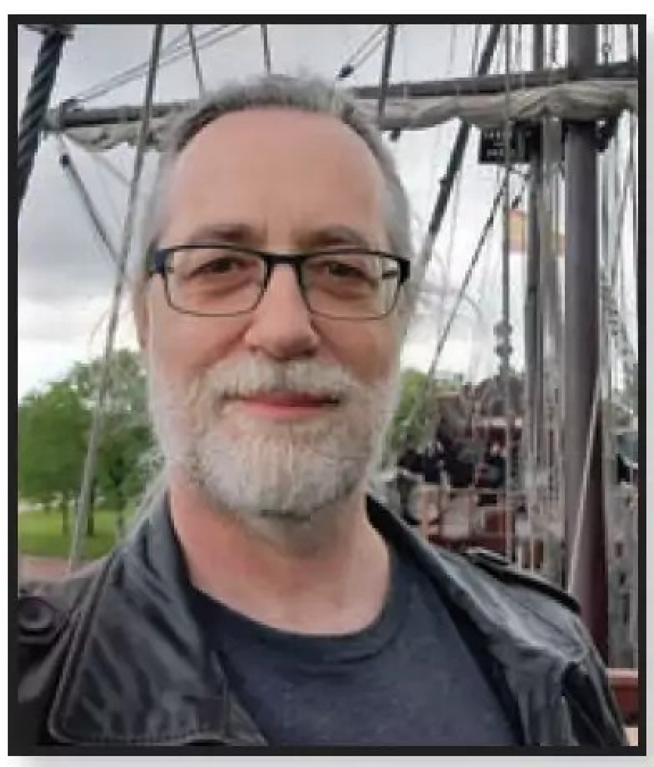
SMOKE RINGS

A BR MOGUL

I know it isn't model engineering, but I thought I'd share my BR Mogul. Rather smaller than Doug Hewson's 5" gauge design, it's my recently completed build of the Kitmaster Mogul in 00 gauge (also branded Airfix and Dapol in the past). With an interesting combination of nice scale details in some areas and gross simplification in others, it makes up into a handsome static model despite the tooling being a little older than I am! I won't apologise for my hand-painted lining, it looks passable from a couple of feet away!

NEW EMAIL ADDRESSES

It's now some time since Kelsey Media acquired Mortons and during November we've had an expected changeover from 'Mortons' email addresses to 'Kelsey' ones. Unfortunately, the process was not quite as straightforward as we hoped (are big IT changes ever straightforward?) and, although the old addresses should be forwarded to the new ones for the foreseeable future, there has been and will be the possibility of emails sent to the old addresses going astray. My apologies for any inconvenience that this causes, hopefully the new addresses will be more reliable.



Neil Wyatt
Editor

In particular, if you have sent emails, particularly ones with attachments, to me in the last month and are wondering why I've ignored you, please could you resend them to **neil.wyatt@kelsey.com**.

It also appears that some subscription enquiries, particularly some submitted via the website, have gone astray. The new customer service email is **cs@kelsey.com**.

The new system seems to be rather more suspicious of unexpected attachments and file sharing links. I usually get a notification of quarantined emails and can get them, 'released', but some, such as those from the Australian equivalent of WeTransfer disappear completely. If you suspect this may have affected you, please send a plain text email to my new address with no links or attachments, and I am sure we can get it sorted. Thanks for your patience, hopefully things will settle down as people get used to the new email addresses.

Neil

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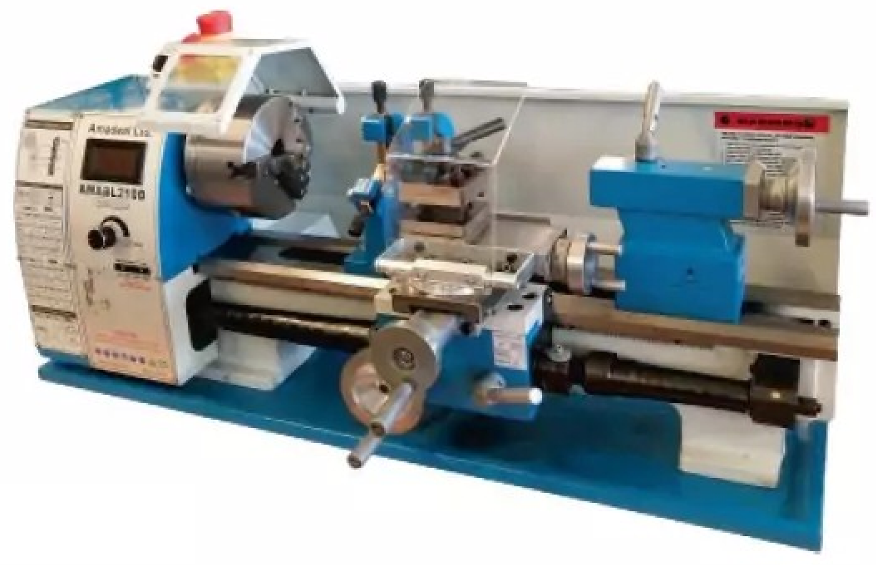
CJ18A Mini Lathe - 7x14 Machine with DRO & 4" Chuck

SPECIFICATION:
Distance between centers: 350mm
Taper of spindle bore: MT3
Spindle bore: 20mm
Spindle speed: 50-2500mm
Weight: 43Kg

Price: £585



AMABL210D BRUSHLESS MOTOR 8x16- LARGE 38mm spindle bore

SPECIFICATION:
Distance between centers: 400mm
Taper of spindle bore: MT5
Spindle bore: 38mm
Number of spindle speeds: Variable
Range of spindle speeds: 50~2500rpm
Weight: 65Kg

Price: £1,185

AMABL250E-550 - VARIABLE SPEED LATHE - 38mm SPINDLE BORE & ELECTRONIC CHANGE GEAR SYSTEM (ELS)

SPECIFICATION:
Distance between centers: 550mm
Taper of spindle bore: MT5
Spindle bore: 38mm
Number of spindle speeds: Variable
Range of spindle speeds: 50~2500rpm
Weight: 140Kg

Price: £1,925

VM25H R8 with Belt Drive & Brushless Motor - HIGH SPEED - 100-4000 rpm

SPECIFICATION:
Model No: AMA**VM25H** (R8)
Max. face milling capacity: 63mm
Table size: 700×180mm
Range of spindle speeds 100-4000 rpm
T-slot size: 12mm
Weight: 120Kg

Price: £1,488
W DRO – Price: £1,921
W DRO + Z & X PF - Price: £2,382

XJ12-300 with BELT DRIVE and BRUSH-LESS MOTOR

SPECIFICATION:

Gas Strut
Forward Reverse Function
750W BRUSHLESS Motor
Working table size: 460mm x 112mm
Gross Weight is 80Kg

Price: £725

VM18H High Speed - Milling Machine R8 with 3 Axis DRO

SPECIFICATION:
Model No: **VM18** R8
Max. face milling capacity: 50mm
Range of spindle speeds 100-4000 rpm
Table size: 500×140mm
T-slot size: 10mm
Weight: 80Kg

W 3 AXIS DRO - Price: £1,692

For more detailed information about these machines, please visit our website. If you have any questions or need further assistance, feel free to contact us.

MPV290F-Movable Mill Head Lathe &Mill & Drill Combination Machine with STAND

SPECIFICATION:
Distance between centers: 750mm
Taper of spindle bore: MT5
Taper of tailstock quill: MT3
Motor: 1.5kw
Weight: 280Kg

Price: £5,225

VM28H - High Speed - Ball Screw Type Milling Machines - R8
SPECIFICATION:
Model No: **VM28H** - R8
Max. face milling capacity: 63mm
Table size: 700×180mm
Range of spindle speeds 100-4000 rpm
T-slot size: 12mm
Weight: 120Kg

Price: £1,608
W DRO – Price: £2,142
W DRO + Z & X PF - Price: £2,734

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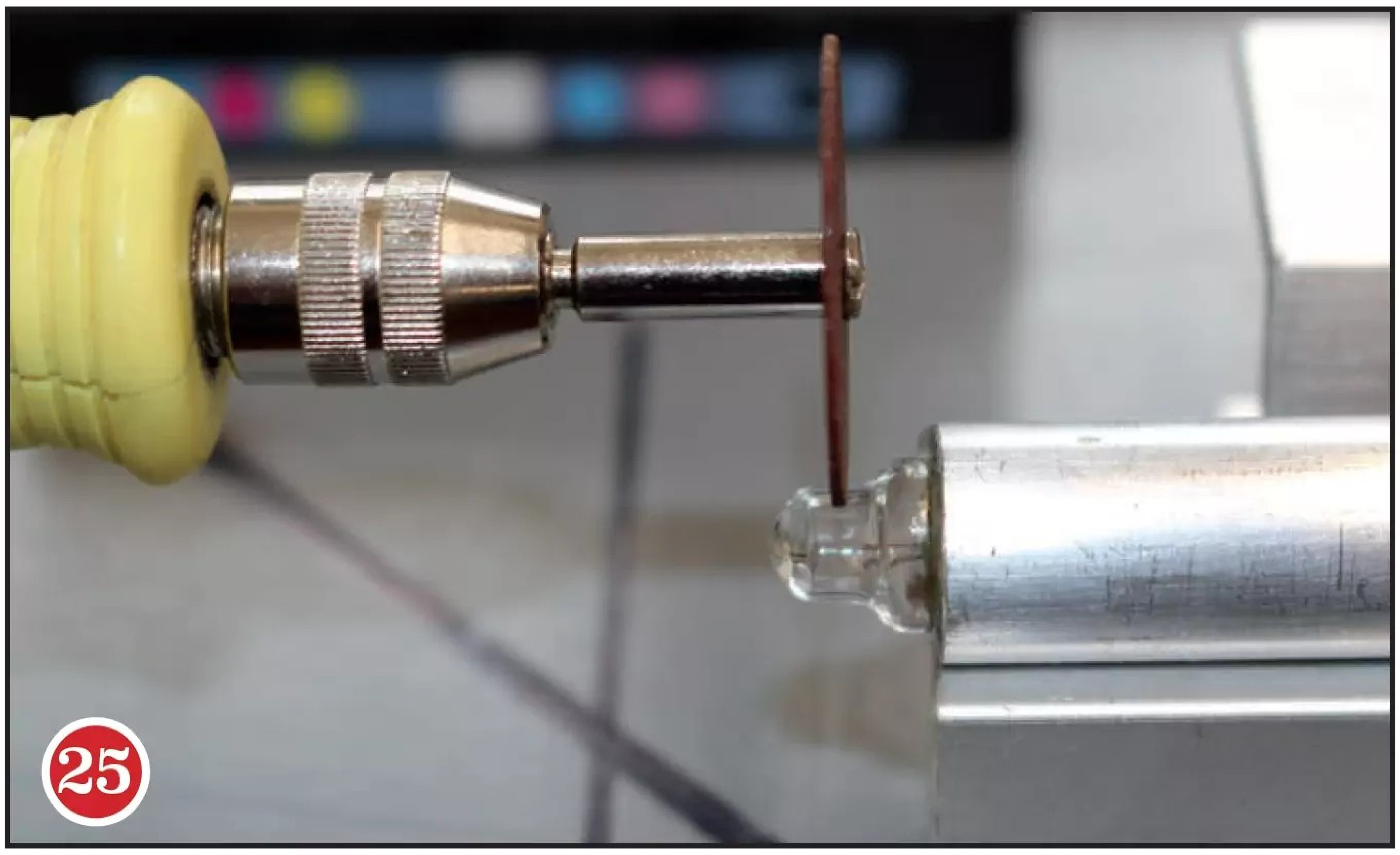
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Regulars

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Extra Content!

There's lots of extra content to be found online to support past articles in Model Engineer & Workshop. Find out more at: www.model-engineer.co.uk/forums

Visit the www.model-engineer.co.uk forum for extra content for this issue including:

3D printable STLs for making Alan Bryan's honing tool.

3d printable patterns for the Corliss Engine

Hot topics on the forum include:

Flat Surface started by COLIN MARTIN 2 - Discussing cost effective alternatives to a surface plate.

Security Screws started by Vic - Ways to get past some of those annoying screws with 'special' heads.

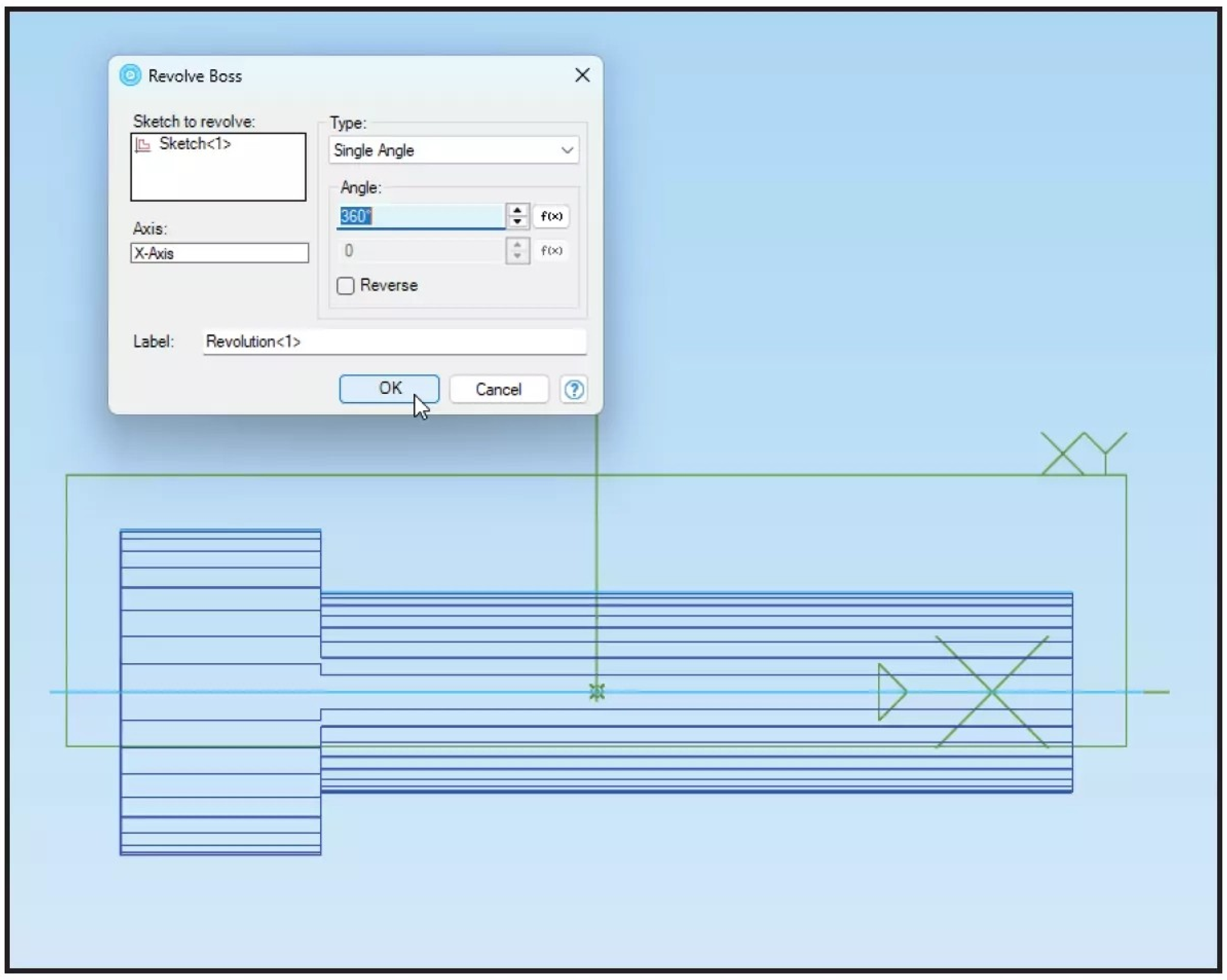
I'm thinking of getting a medium-sized shaper. Convince me out of it started by Duff Machinist - Is there still a place for a shaper in a modern workshop?

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 Bruce Boldner's excellent model of an LB&SCR 0-6-0 'Terrier' pannier tank, largely to Martin Evan's design. Read more about the building of this model from page 9 of this issue.

Next Issue



In our next issue, an introduction to Alibre Atom 3D with a free six-month trial for our readers.

An LB&SCR Terrier in 5" Gauge PART 1

Bruce Boldner describes some of his approaches to the construction of a London, Brighton and South Coast Railway A1 Class Locomotive in a brief series.

I've never ridden on the footplate of a full-size Terrier. Indeed, I've only viewed them in action once, during a visit to the Bluebell Railway in 2016. In fact, most of my information on them comes from books and an excellent DVD titled *A Day in the Life of a Terrier*. I learnt from the latter that drivers and firemen have mixed feelings about them.

Although having good power and feisty performance for their size (hence their nickname), they can apparently be finicky and difficult to keep in steam. With a firehole at floor level, a fireman's job can be rather back breaking from having to stoop so low, and with no provision to drop the ash pan, all the ashes and clinker have to be removed by shovel at the end of a day's run.

Some crews hated them, whilst others relished the challenge of driving them successfully and embraced the Terriers inconsistencies. To the public of course, untroubled by the necessity of driving the machine, they are cute. I am a member of this public. However, it is ironic that initial driving experiences with my model have shown me that I will have to learn to drive again in order this keep this quite small boiler on the boil. Why is it that beginners are commonly advised to start off with a small locomotive? The smaller they are, the harder they are to run. At my club, one beginner struggles to keep


Photo 1: Mainframes assembled on marking out table to ensure straight alignment.

Photo 2: Cutting eccentrics from steel blank with slitting saw.

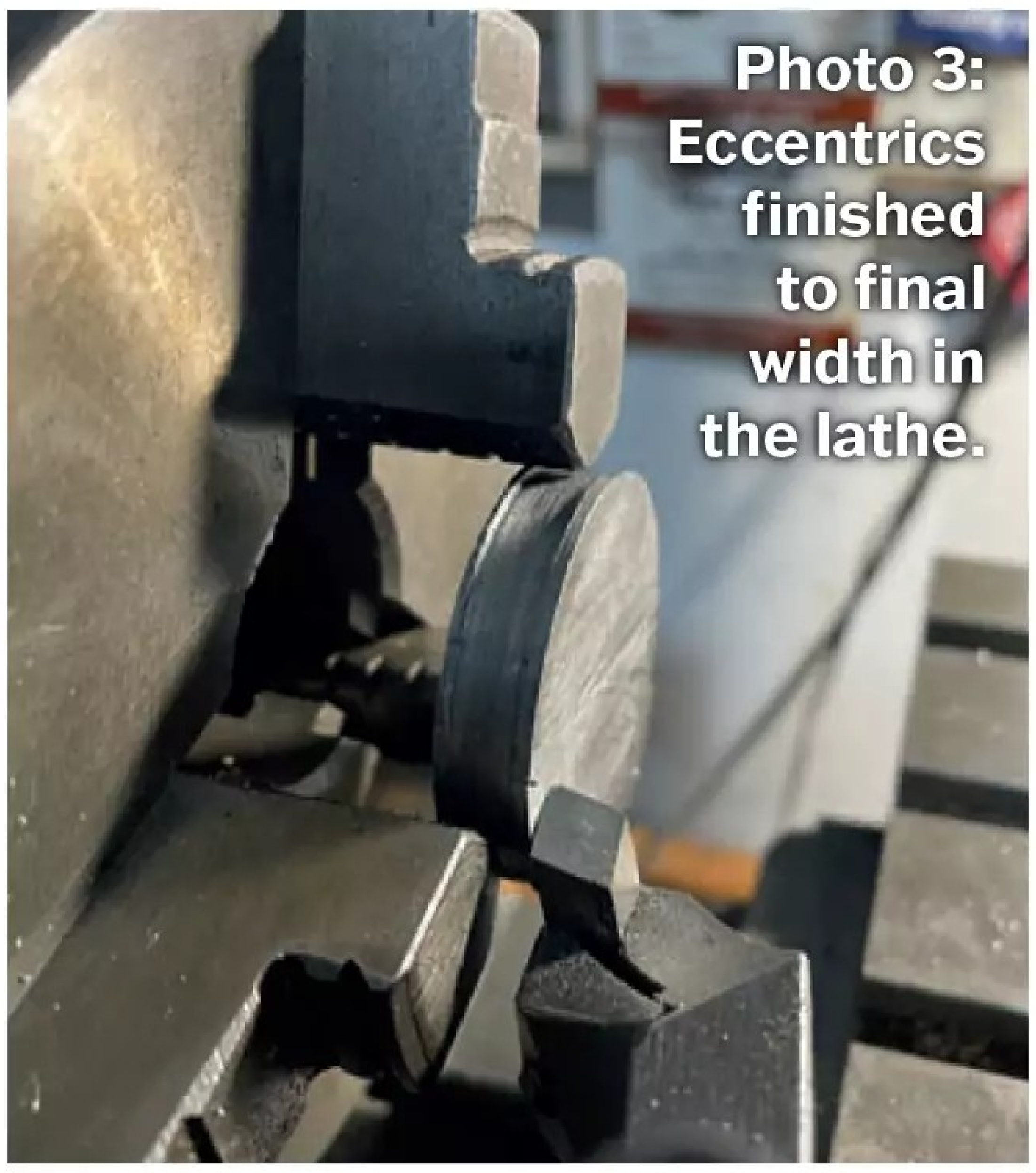


Photo 3: Eccentrics finished to final width in the lathe.

Photo 4: Eccentric held in jig whilst being drilled.

the fire going for one lap in his diminutive 0-4-0, whereas another beginner rockets around the track on his Chinese built Duchess pacific, with only infrequent attention to coal and water.

I commenced construction of my 5" gauge Terrier in October 2021. Although it was my third locomotive build (construction of my Midland single was published in *Engineering in Miniature* magazine in November 2019 and my Stirling single in July 2022) the Terrier was my first coupled locomotive. I hasten to add that it is not a fine scale model comparable to the excellent model Terrier by John Merrett that was featured in *Model Engineer* 4649, October 2020. However, I thought there may be some readers who would be interested in how I went about construction of this locomotive, drawing attention to some key steps in the process. You can see a video of the engine here: https://tinyurl.com/mva5ubv3

I commenced by purchasing a set of Martin Evans plans together with a set of castings and frames from Reeves. The frames were first bolted together on my marking out table, **photo 1**. To protect the rear axle and axle boxes from the ashes from the rear opening in the ash pan, the plans proposed that a shield be constructed over the axle. I later discarded this, as it became a hindrance to fitting piping, because of the minimal space available between frames and firebox.

ECCENTRICS

Four eccentrics are required to operate the Stephenson's valve gear. After machining a blank in mild steel sufficiently long to make all four eccentrics and milling channels in each to trap the eccentric straps, they were then separated from the blank with a slitting saw, **photo 2**. Each eccentric was then finished to final width in the lathe, **photo 3**.

Each eccentric was then placed in an octagonal jig held in the mill vice, so that the holes could be drilled for the central driving axle onto which they would be mounted. The eccentric was prevented from turning in the jig by brass screws (to prevent marring the edges of the steel eccentrics), **photo 4**.

Photo 5: Crank throws were machined in mill.

Photo 6: Brass spacers fitted between crank throws to maintain parallel positions when pushed onto the axle.


Photo 7: After machining, eccentric strap was sawn into two halves.

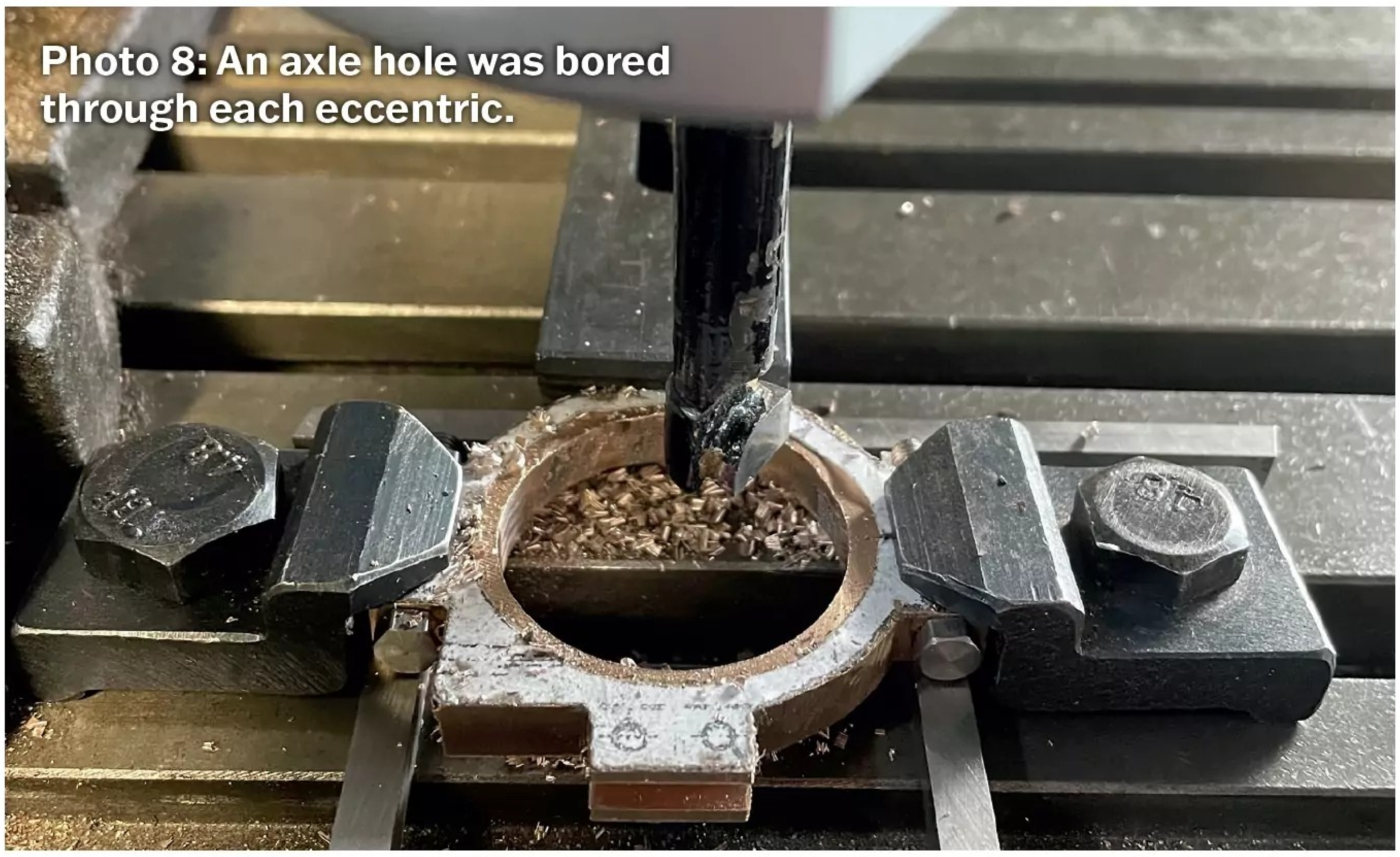


Photo 8: An axle hole was bored through each eccentric.

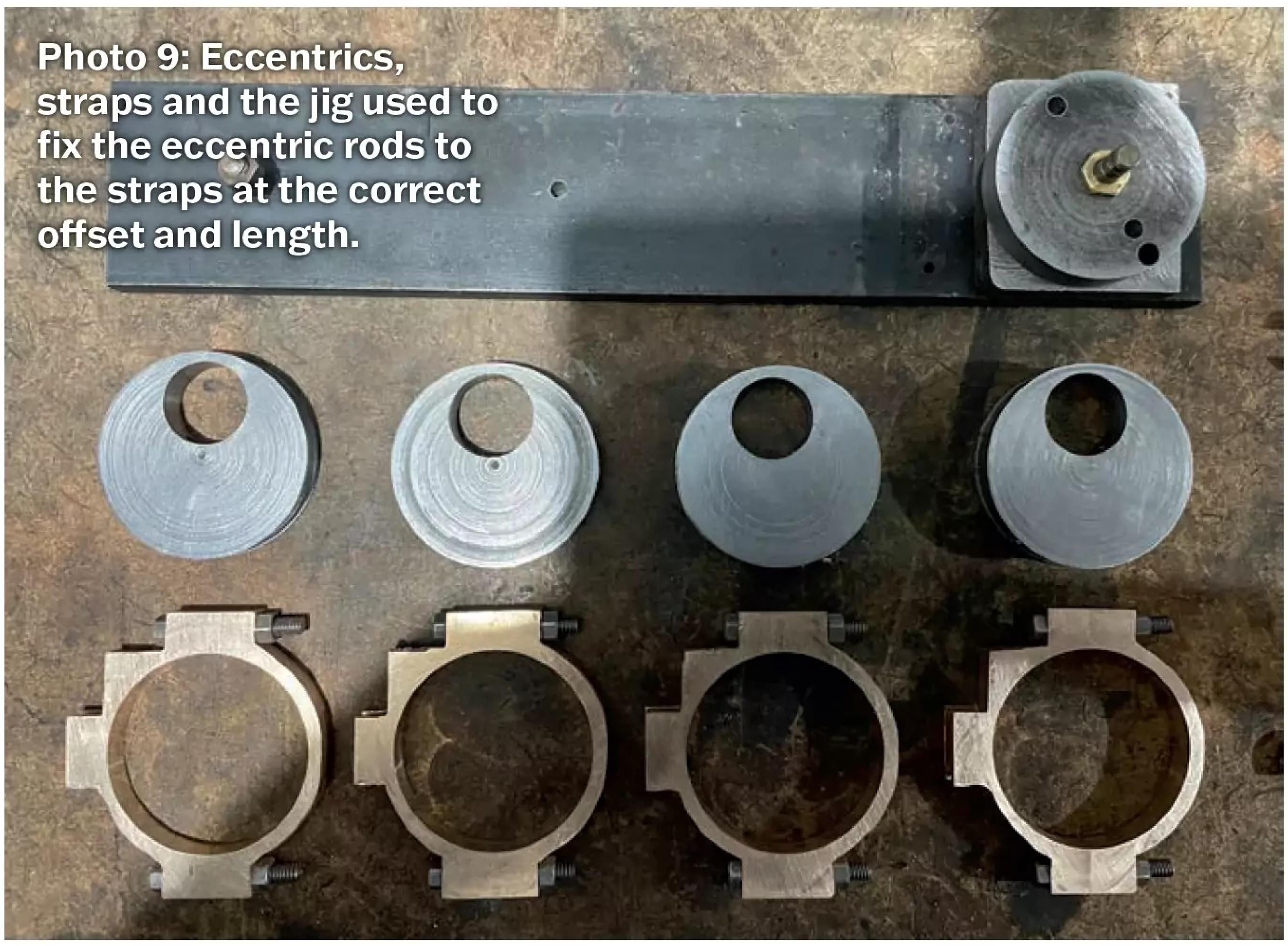


Photo 9: Eccentrics, straps and the jig used to fix the eccentric rods to the straps at the correct offset and length.

The crank throws were then machined from a steel blank held in the vertical mill, using a rotary vice to turn the rounded ends, **photo 5**.

Whilst fitting crank pins through one end of the throws, a temporary brass spacer was placed between the opposite ends, to ensure the throws remained parallel to each other whilst the crank pins were fitted and when they were subsequently pushed on to the axle, **photo 6**.

Eccentric straps were then made by pasting copies of the eccentric drawings on to the cast blanks from Reeves, which were then machined to shape. The straps were sawn into two halves, **photo 7**, before being bolted together so that the hole to accommodate the eccentric could be bored with a boring head, **photo 8.**

Photograph 9 shows the eccentrics, eccentric straps and the jig used to fix the eccentric rods to the straps at the correct offsets and correct and consistent lengths from eccentric to expansion link. **Photograph 10** shows the eccentric rods being machined from mild steel. **Photograph 11** Shows a complete eccentric, strap and rod assembled on the jig before riveting the rod to the eccentric strap. The jig ensures the lengths of all rods are equal.

The extra offset required for the reversing eccentrics, positioned further inboard on the driving axle, is illustrated in **photo 12**, and photo 13 shows the completed eccentric straps with rods attached. With the four eccentrics trapped between, the crank throws are then slid on to the axle, with the left and right hand throws precisely positioned at right


Photo 10: An eccentric rod being machined from mild steel.

Photo 11: An eccentric, strap and rod assembled on the jig before riveting the rod to the eccentric strap. The jig ensures the lengths of all rods are equal.

Photo 12: Extra offset required for the reversing eccentrics.

Photo 13: The completed eccentric straps with rods attached.

Photo 14: The left and right hand crank throws are precisely positioned at right angles to each other, then pinned and Loctited.

Photo 15: Using a laser to align a steam chest casting.

Photo 16: The cylinders being bored in the lathe.

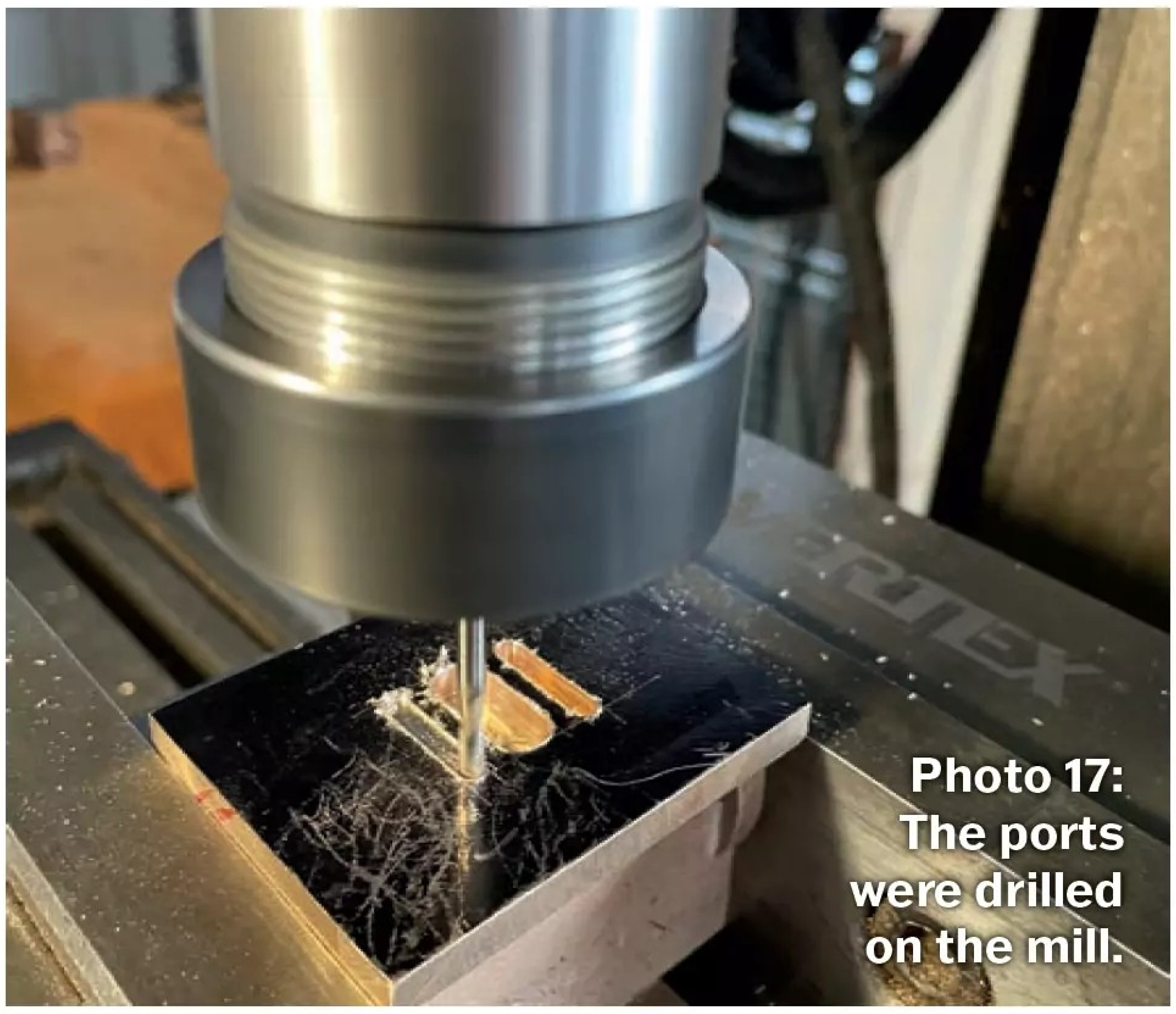


Photo 17: The ports were drilled on the mill.

Photo 18: Wheels were fitted to the driving axle with the crank pin on each wheel in line with its crank throw. The wheels were quartered to each other on the lathe.

Photo 19: A jig was used when drilling the connecting rods.

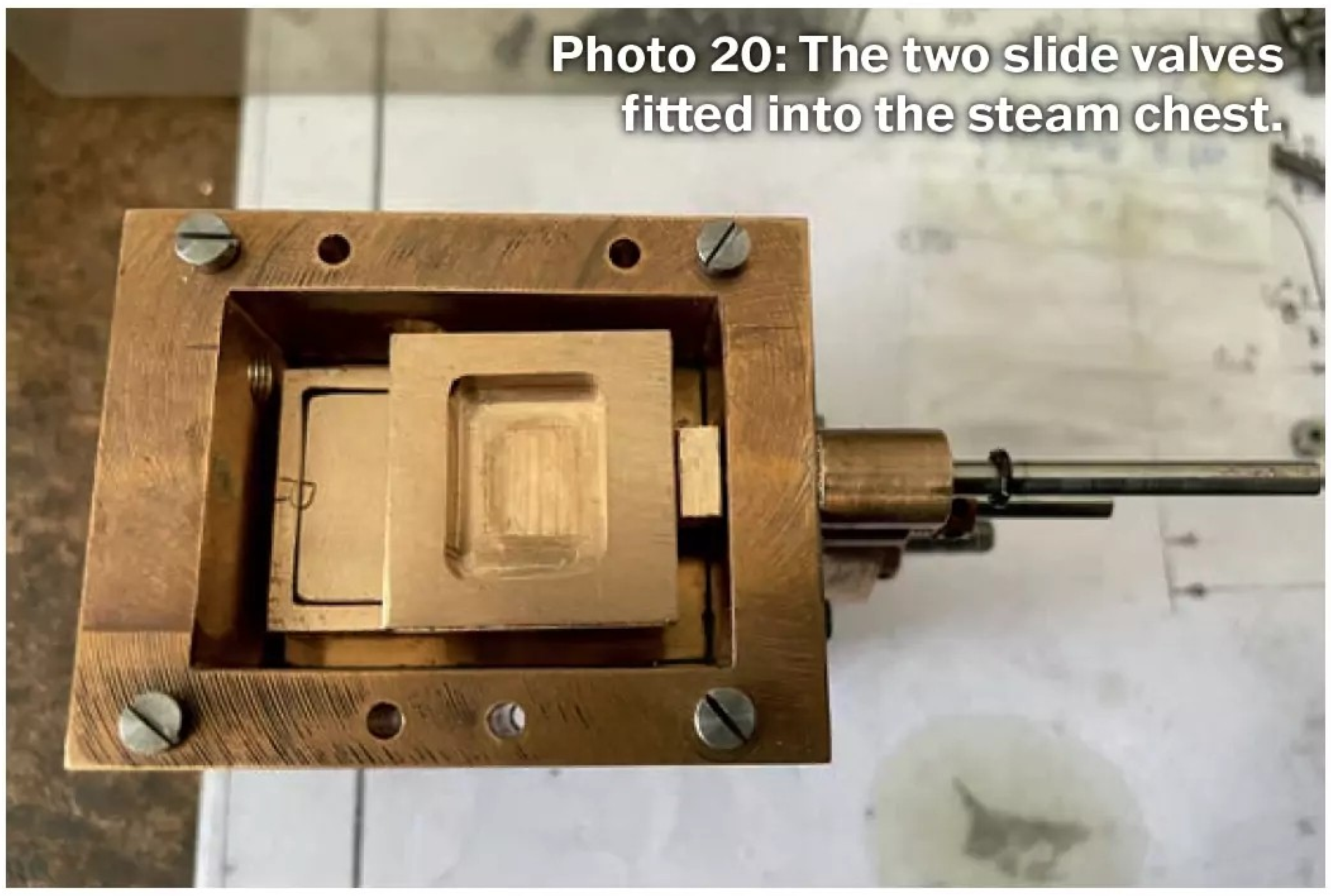


Photo 20: The two slide valves fitted into the steam chest.

Photo 21: Piston rods were machined from mild steel with bronze bearings.

Photo 22: The bearings were drilled out to fit the crank pins.

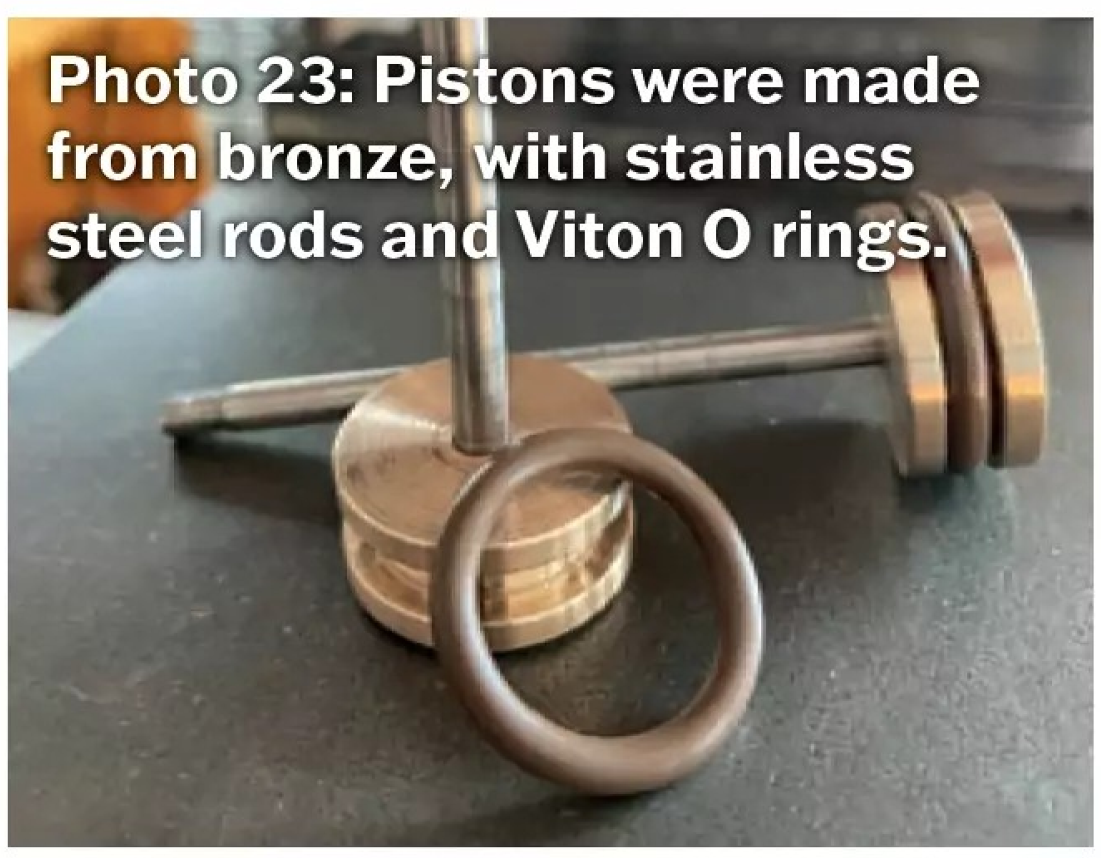


Photo 23: Pistons were made from bronze, with stainless steel rods and Viton O rings.

angles to each other. Being initially fixed with a Loctite retainer, **photo 14**, they are then pinned to the axle with 1/8" silver steel pins.

CYLINDERS

Photograph 15 shows the steam chest being machined. The laser assists in ensuring that the mounting bolts are drilled centrally within the casting side walls.

After establishing the centre point of each cylinder bore, (by temporarily installing mdf discs in the bores at each end and drawing crosshairs on them to line up with centres installed in the chuck and tailstock of the lathe), each cylinder was bored, held by the four jaw independent chuck, **photo 16**. The ports were then drilled on the mill, **photo 17**.

WHEEL QUARTERING AND CONNECTING RODS

The wheels were fitted to the driving axle with the crankpin on each wheel in line with its crank throw. The wheels were quartered to each other on the lathe. The left side wheel crank pin rested vertically against a steel block bolted to a faceplate on the lathe, with the right-side wheel crankpin resting horizontally against a parallel secured in the top slide, **photo 18**. A jig was used when drilling the connecting rods, to ensure that the holes lined up with the axle boxes positioned in the frames, **photo 19**.

VALVES AND PISTONS

Photograph 20 shows a slide valve fitted into its buckle in its steam chest, with a temporary steel spacer in place. Piston rods were machined from mild steel, with bronze bearings fitted, **photo 21**. The bearings were then drilled out to be fitted over the crank pins, **photo 22**.

Pistons were made from bronze, with stainless steel rods and Viton O rings, **photo 23**. The cylinders are mounted between the frames and the dual steam chest is mounted between the cylinders.

To Be Continued

POSTBAG

The Editor welcomes letters for these columns, but they must be brief. Photographs are invited which illustrate points of interest raised by the writer

PostBag is one of the most popular sections of the magazine - readers want to hear from you! Drop us a line sharing your advice, questions or opinions. Why not send us a picture of your latest workshop creation, or that strange tool you found in a boot sale? Email your contributions to neil.wyatt@kelsey.com.

SCREWCUTTING ON MODERN LATHES

Dear Neil, I was quite surprised to read in Brett Meacle's article Gearing Around, ME&W 4771 that modern lathes have very limited screw-cutting facilities. My first lathe was a 5" IXL model W3 and I now have a 3½" Birmel, of, I believe, WW2 vintage. Both these lathes are equipped with a forked banjo assembly and tumbler reverse. In spite of dating from the nineteen twenties or thirties the IXL came equipped with a 127-tooth change gear. Apart from a Myford I have not looked at other lathes of this size, and I naively assumed that as the forked banjo was simple and had apparently worked well for at least 100 years then all modern lathes with a lead screw would be similarly equipped.

The Birmel has a quarter inch pitch lead screw and came with 21 change wheels including three duplicates; it also has a separate power feed shaft so wear on my leadscrew is for all practical purposes nil. Some years ago I created a spreadsheet to allow me to find in the simplest manner the possible gear combinations for the range of metric threads giving a precise conversion. After reading Brett's the article I decided to spend a happy hour or so checking that all the combinations are actually practical.

The exercise proved to be much easier than I expected, in part because the 127 tooth wheel stays on the leadscrew and the only alterations from the original spreadsheet were on the three threads requiring the second stud where the 20/60 tooth pairing became 25/75 in order to provide clearance.

I don't ever expect to use this range of pitches. I think cutting an M34 thread might be too much for this lathe and the fine pitches would only be used if I decided to make something like a camera lens. The photos show the lathe set up for 3.5mm and 0.2mm pitches.

Chris Gardiner, by email

I think the main problem with modern lathes is they tend not to be supplied with an imperial/metric translation gear. Also, many have a single slot banjo that means a 127-tooth is usually too big. A 63 tooth gear fits better and works well - not as an approximation for half of 127, but because To cut 25.4 tpi on a 16 tpi leadscrew, we need a ratio of 16:25.4, this works out at 0.62992:1, or almost exactly 63:100. This means it can be used to cut most fractional sizes on a metric lathe and most metric sizes on an imperial lathe with a 1/16" or 1/8" pitch leadscrew – Neil.

MARTIN KYTE

Dear Neil, we were shocked to receive the sad news that Martin Kyte has died. Martin was currently a member of SMEE Council where he brought considerable thought to our existing ideas and to plans for development of the society. He also contributed articles to Model Engineer about our activities which led to some new recruits. Recently, he was a major part of our stand at the Midlands Model Engineering Exhibition giving up time for setting up, manning the stand for all four days and subsequent packing up. His Myford Cross-Slide improvements and his skeleton clock were important contributions of our display. He will be sorely missed.

Elliot Hirst, SMEE Chairman, London

CAN READERS HELP TRACK DOWN TWO LOCOS?

Hello Neil, my father Dr Eric Sherwood-Jones was a model steam train builder all his life as a hobby and finished two locos. Sadly his illness meant he could not paint them and he sold them. One loco was called Biddy after his grand-daughter and the other Lady Daphne after my mother!

I would love it if their great grandchildren could know where these locos are now and if they're being run in a public park? I don't know if your magazine can help me with this please. Thank you.

Iona Sherwood-Jones, by email

BERNARD LUNDBERG AND HIS CLAYTON STEAM WAGON

Dear Neil, Bernard Lundberg was my Dad and, having googled Model Engineer regarding the Clayton Steam Wagon he built, it seemed I should let you and your readers know that Dad died in February 2023. He had lived with us for a few years before going into care and the wagon had been in our house for many years. We made the decision just this week that as we, too, are getting older we need to sort our 'worldly goods'. None of our children want the wagon so it is with Harperfield Auctioneers and we anticipate it will be auctioned in April. Bernard wrote many articles for M.E. re the building of the Clayton wagon.

Veronica Potter (nee Lundberg), by email.

Several articles by Bernard Lundberg on various aspects of the 2" Clayon model appeared intermittently in Model Engineer between April 1986 and April 1992 – Neil.

AN UNFORTUNATE ACCIDENT

Dear Neil, I'm not sure whether you are aware of an accident which happened outside after the Midlands Model Engineering Exhibition? It involved my good friend John Billard, who was helping to load equipment from the SMEE stand on which he had been working as an exhibitor, into the back of a van to be taken back to London. He stepped back from the van, and a car hit him and knocked him to the ground. The upshot is that he has now had to have quite extensive reconstructive surgery on his leg with internal fixation using titanium plates and is only just getting back to being partially weight-bearing. He's nearly 80 and it's therefore going to be a long haul for him to get back to how he used to be.

John is a highly skilled model engineer and a member of the SMEE. He's also secretary of Reading Society of Model Engineers and writes their publication called Prospectus on a monthly basis. He is currently quite a long way through building a very fine 5" Great Eastern Claud Hamilton 4-4-0 from works drawings. We hope that he makes a full recovery and gets back into his workshop as soon as possible!

On a lighter note, I love the new format of the magazine and keep up the good work!

Dr Peter Venn, by email

I'm sure all readers will wish to join me in sending best wishes to John, a well-known figure in the hobby. We hope the driver involved comes forward soon – Neil.

ISSUE NUMBER ISSUES

Dear Neil, I note your reply to a letter in Post Bag in the current issue which says that most readers are now happy with the format.

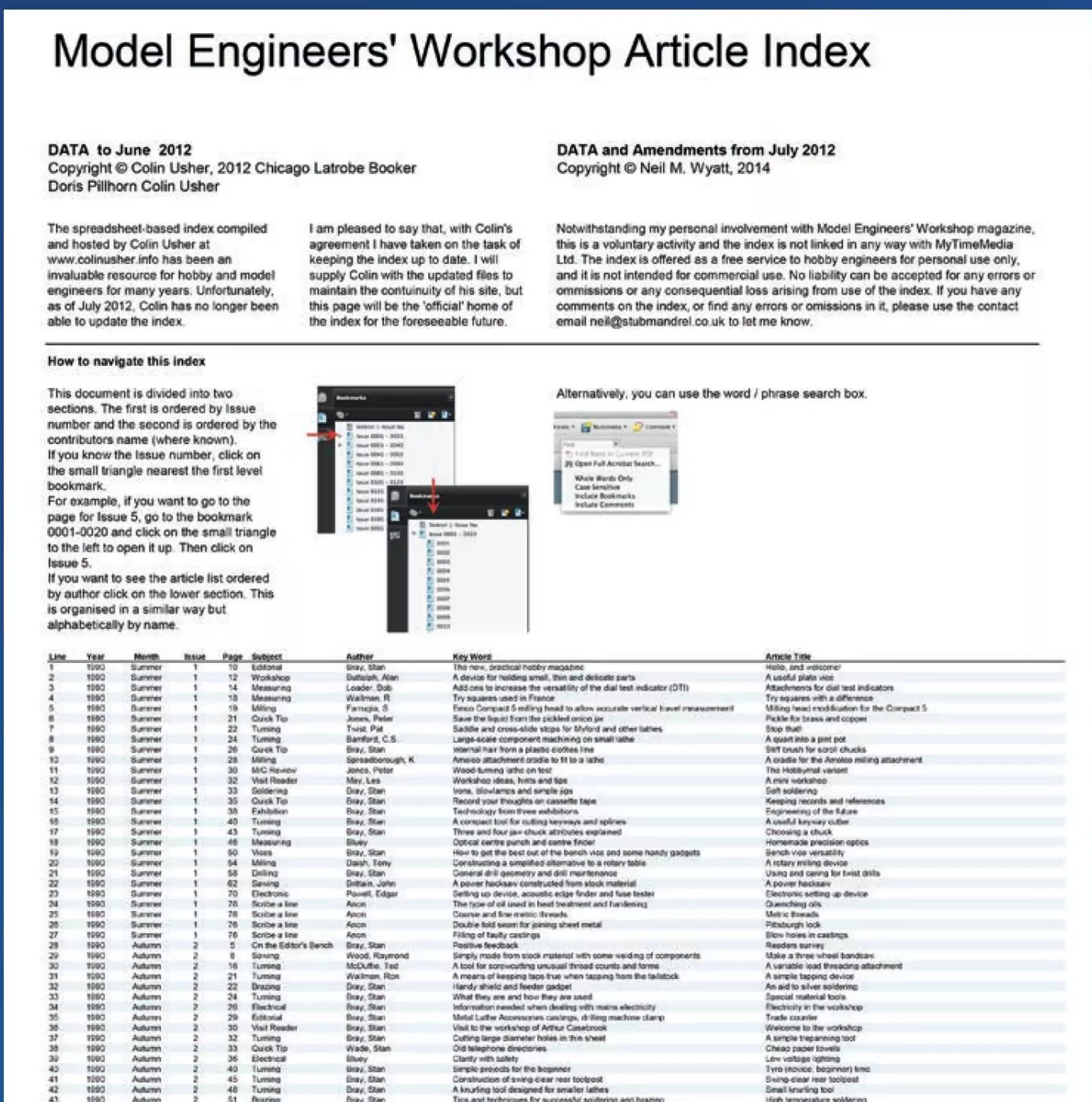
One thing that I do not like is the position and font size of the issue number.

To me, *Model Engineers' Workshop* built into a reference work accessed by the indexes. The MEW number was easy to see and in a good position, see photo, for easy reference the way I file them.

I admit I am still in mourning for MEW but one of the most significant items on the cover of a magazine should be the issue.

Laurie Leonard, by email.

I agree it's a shame, but the magazine is numbered to keep continuity with 127 years of *Model Engineer*, not MEW's 35 years. We had to choose one style or the other, and the longer tradition won. We once published a 'cut out and keep' number flash for MEW issue 211, after it was left off the cover! Perhaps we should sell sheets of MEW-numbered stickers to readers? – Neil.



Model Engineers' Workshop Article Index

DATA to June 2012
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DATA and Amendments from July 2012
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The spreadsheet-based index compiled and hosted by Colin Usher at www.colinusher.info has been an invaluable resource for hobby and model engineers for many years. Unfortunately, as of July 2012, Colin has no longer been able to update the index.

I am pleased to say that, with Colin's agreement I have taken on the task of keeping the index up to date. I will supply Colin with the updated files to maintain the continuity of his site, but this page will be the 'official' home of the index for the foreseeable future.

Notwithstanding my personal involvement with Model Engineers' Workshop magazine, this is a voluntary activity and the index is not linked in any way with MyTimeMedia Ltd. The index is offered as a free service to hobby engineers for personal use only, and it is not intended for commercial use. No liability can be accepted for any errors or ommissions or any consequential loss arising from use of the index. If you have any comments on the index, or find any errors or omissions in it, please use the contact email neil@stubmandrel.co.uk to let me know.

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ONLINE INDEXES

David Frith prepares the indexes for Model Engineer & Workshop. The latest copy can be downloaded on from the Forum at www.model-engineer.co.uk – just select Forums and then the Model Engineers' Workshop topic. Alternatively scan the adjacent QR code.

If you prefer the paper indexes, don't worry, David continues to produce these as well.

Batteries and Cells for Workshop Projects PART 1

The first instalment of a brief introduction to different battery chemistries and their applications.

It's easy to take batteries for granted, but it is frustrating wanting to get on with a project critical piece of equipment has lost power. It's worth understanding how they behave.

A single cell is a chemical device for making electricity, a battery is a combination of cells to give a higher voltage. Primary cells are single use, while secondary cells are rechargeable. If you rely on single use cells for any of your equipment the obviously precaution is always to keep a set of fresh spares in your kit. If you use rechargeable, make sure they are topped up before each session. The voltage each cell produces depends on its chemistry, while its capacity -the amount of electricity it can deliver – also depends on its size.

The capacity of a battery is measured in milliamp-hours, mAh, **photo 1**. In theory a 1000 mAh cell can provide 1 milliamp for a thousand hours (C1000) or 1 Amp for an hour (C1). In practice, capacity is often specified at a low discharge rate, usually over a ten hour period (C10), so a 1000mAh battery could be expected to supply about 100mA for 10 hours. At higher discharge rates, expect to get less, sometimes lots less, capacity. Most batteries will have an extended lifetime if they are not discharged below half their capacity.

To maximise battery life and minimise the chance of power suddenly disappearing a good rule of thumb is to ensure your batteries have well over twice the capacity required for your longest sessions.

All batteries behave as if they have a resistor in series with them, this causes their output voltage to drop under load, an effect particularly noticeable with button cells and zinc-carbon batteries. As cells discharge this resistance increases, causing their output voltage to drop. While this means batteries in demanding applications may need to be replaced earlier, it can also mean those batteries still have enough 'puff' left for a less demanding application.

Let's look at the cell chemistries we are most likely to encounter for astronomical equipment:

ZINC CARBON

Once the main type of disposable primary cell, these typically give a maximum of 1.5V. Notorious for 'leaking' corrosive zinc chloride, their main appeal is that they are very cheap to manufacture and they are best avoided for valuable equipment.

ALKALINE

Alkaline cells have a 'fresh' voltage of up to 1.65 which declines steadily over their discharge life, averaging about 1.5V. They have greater capacity, can deliver higher currents and are less likely to leak than zinc carbon. They now dominate the market for primary cells in larger sizes, **photo 2**. Most alkaline cells are not rechargeable, but there are now rechargeable variants available. An advantage of alkaline cells is that they can hold their charge for years, so even an out-of-date set in the bottom of a draw is likely to still be able to work. No names, but some popular brands have developed a reputation for leaking in recent years.

SILVER OXIDE

This is a primary cell alternative to alkaline that gives greater capacity and a voltage of about 1.55V, because it is expensive its use tends to be restricted to small 'button cells'.

Button cells with an AG or LR prefix usually have an alkaline chemistry look the same but have an annoying tendency to perform poorly in low temperatures – not ideal for use outdoors on cold winter nights or for measuring tools left in a cold workshop. Many button cell sizes are available in silver oxide variants which perform much better under such conditions, look for the 'SR' prefix (not 'Ag' which denotes an alkaline cell!)

LITHIUM

Lithium or lithium-metal batteries are primary cells with a voltage around 3V, available mostly as small button cells, **photo 3**, but also in larger sizes for high-current applications. They are ideal for long-life applications and can deliver small currents over a period of many years. They are often used as backup batteries to do jobs like keeping an electronic clock running when mains equipment is switched off. Other applications include low current applications like remote controls for colour light bulbs and digital calipers.

To Be Continued

Photo 1: AA NiMH cells with capacities from 1300mAh to 2500mAh.

Photo 2: Once a premium product, alkaline chemistry is now the default for most single-use cells.

Photo 3: CR2032 lithium button cell.

A Christmas Story – Old Friends

Mike Joseph continues a long standing Model Engineer tradition to tell a workshop tale during the long, dark winter evenings.

Brian P----- was a very good friend, about 15 years older than me. We went on a lot of jaunts together with him always wearing a sports jacket, tie and cloth cap. After giving up his car, I used to happily drive him about to traction engine rallies (he had had his own engine for a period and used to drive a steam roller at one time for work). He was very knowledgeable about many aspects of steam. Not only that but he had practical tool room experience and was a good teacher and absolutely merciless if anything that I did was not up to standard once I had been shown how to do it properly. This is not to say that he was severe, on the contrary he had a wicked sense of humour that punctured and flattened my excuses. There was no escape in anything resembling even slightly 'off' work. As I said, he was a good teacher.

Some years after we first met and started to work together, or rather when I was being taught, he began to have mobility issues and trips out and about declined. He would still attend the monthly model engineering society meetings and even sometimes came out to play darts – he and I were usually put on as the 'rabbits' against a good pair. We would normally lose anyway and were more of a comedy act than anything else. Sometimes though, Brian playing a singles leg would have accidental success like the time he was 200 behind one of the best players in the league. This particular player was having 'double trouble' and could not finish, Brian was getting a regular 26 or 30 each throw and slowly caught up and hit the double in one! His opponent was seriously not happy. We had a lot of fun together.

Later on when he was not very mobile, I would visit him in his little, stifling hot lounge – the stove would always be burning, even in summer except for the very hottest of days. There I would make endless cups of tea for us, and we would talk of the projects that I had in hand or those that he was planning, even though we both knew that in reality they would never happen.

He died after a short period of illness three days before Christmas but to the end was proud of his family. They asked me to speak at his funeral to show something other than his family side and I related some of the above and finished by saying that I had promised him during his last illness that when he recovered, and went home, then the first thing that I would do would be to make him a cup of tea as before. Sadly, he came home but not in the way I had hoped. At his wake the first drink I had was a cup of tea.

A couple of years pass and I am working on the milling machine in my workshop. This was an old Naerok milling machine that Brian had bequeathed me and that I had reconditioned. As I often did when using that particular machine, I could almost feel Brian watching me to make sure that I was doing the job 'Brian Fashion' – no short cuts, no "That will do" attitude, just get it right to the very best that I could manage. As was often the case, psychologically I could feel his presence and would sometimes address him directly – "I hope that you approve" or "How do I do this?" followed by a pause before recommencing the task. Using other machines and tools, I could sometimes hear my father's voice but on the mill, I always had Brian's guidance.

On one particular occasion, the job was progressing well and all seemed good. Then, while lining up for the next cut, the mill would not start. I played around with the switch ('No Volt Release' – NVR that Brian insisted I fit to the mill), checked that the immediately accessible motor connections were all tight, plug fully pushed home, and that was when I noticed that the socket switch was not quite right, it felt 'wrong', a precursor of trouble. In a previous incarnation, as an electrician, anything like that was attended to immediately before worse happened. I killed the power at the consumer unit, checked that the socket was electrically dead and replaced the plate. All well and good. Power back on and check that the polarity was correct and ready to switch on again except that I don't. I can feel Brian's presence. I look carefully at what I am doing and realised, only a small thing, but the milling bit I had just fitted was the wrong one – it would have been a recoverable error but would have taken a long time. "Thank you, Brian," I muttered quietly.

Later on that year, there was an unusual occurrence which could almost have been a typical Brian thing. As I was looking for a lump of steel for a given job, a piece fell from a temporary rack I had built at the far end of the workshop, it was just over the size required and ideal. I also recalled the earlier instance and for a moment, the hairs on the back of my neck rose a little. Then, approaching the anniversary of his death, again on the mill, there was another Brian moment that was entirely my fault and could have caused catastrophic damage to it. Something happened, I forget quite what, but I instantly stopped what I was doing and thought about what I was about to do. I heard in my brain and so loudly that it was almost audible the tones of reproof from Brian. I realised my terrible error and again said somewhat louder "Thank you Brian".

A couple of weeks later, and I only realised the date afterwards, it was the anniversary of his death. I was again mangling metal in the workshop, with a large, full cup of tea – the essential lubricant – on an old saucer on the mill (to keep water off the table - Brian again). I was using – not abusing ("Thank you Brian") a hacksaw. I turned around suddenly because the hairs on my neck were tingling slightly and there, for a moment, by the mill was an indistinct figure with a cap, nodding gently with what looked like a smile – and was gone. Was it my imagination? And then I looked at the mug of tea – empty.

The Midlands Model Engineering Exhibition 2025

John Arrowsmith reports on the Display Classes and Club stands.

The display classes were a little disappointing in terms of numbers this year but nevertheless there were some outstanding models on show, worthy of being called superb model engineering. It was also good to see the large range of work presented by the Eastleigh Model Engineering club. All the young people are to be congratulated for their efforts and making a fascinating range of models, with some very unusual models and projects.

Probably the most eye-catching model on display was that by David Moore who spent the last thirty years creating his model. It is a 10¼" gauge, 1:5 scale model of a *Class 60* Diesel Electric CO-CO locomotive. Beautifully made it represented the full-size version totally, **photos 1** and **2**. Fitted with a Kubota D859B motor driving a Stamford alternator. A few more salient details will help bring this superb loco into focus. It reflects the full-size prototype with a double reduction gearbox and is air braked. A 24-volt starting and Auxiliary system includes electric air compressors and electric parking brakes, it also includes a Drivers Safety Device (DSD/ Deadmans Pedal) for each direction of travel. The traction control is 'fly by wire' control such that the electronic control takes the drivers inputs and actuates the electrical power equipment automatically. The locomotive is rated to run at a nominal 15mph, equivalent to a scale 75 mph and develops approximately 15HP at the drawbar and all speeds above 5 mph. I hope the little look at the workings of this locomotive demonstrates the amount of experimentation and work that has been done to create the model.

Moving onto some of the other entries in the display classes, the 1:8 scale model of a radio-controlled Galway Hooker sailing boat built and displayed by Tony Judd was another large model

Photo 1: The completed Class 60 locomotive.

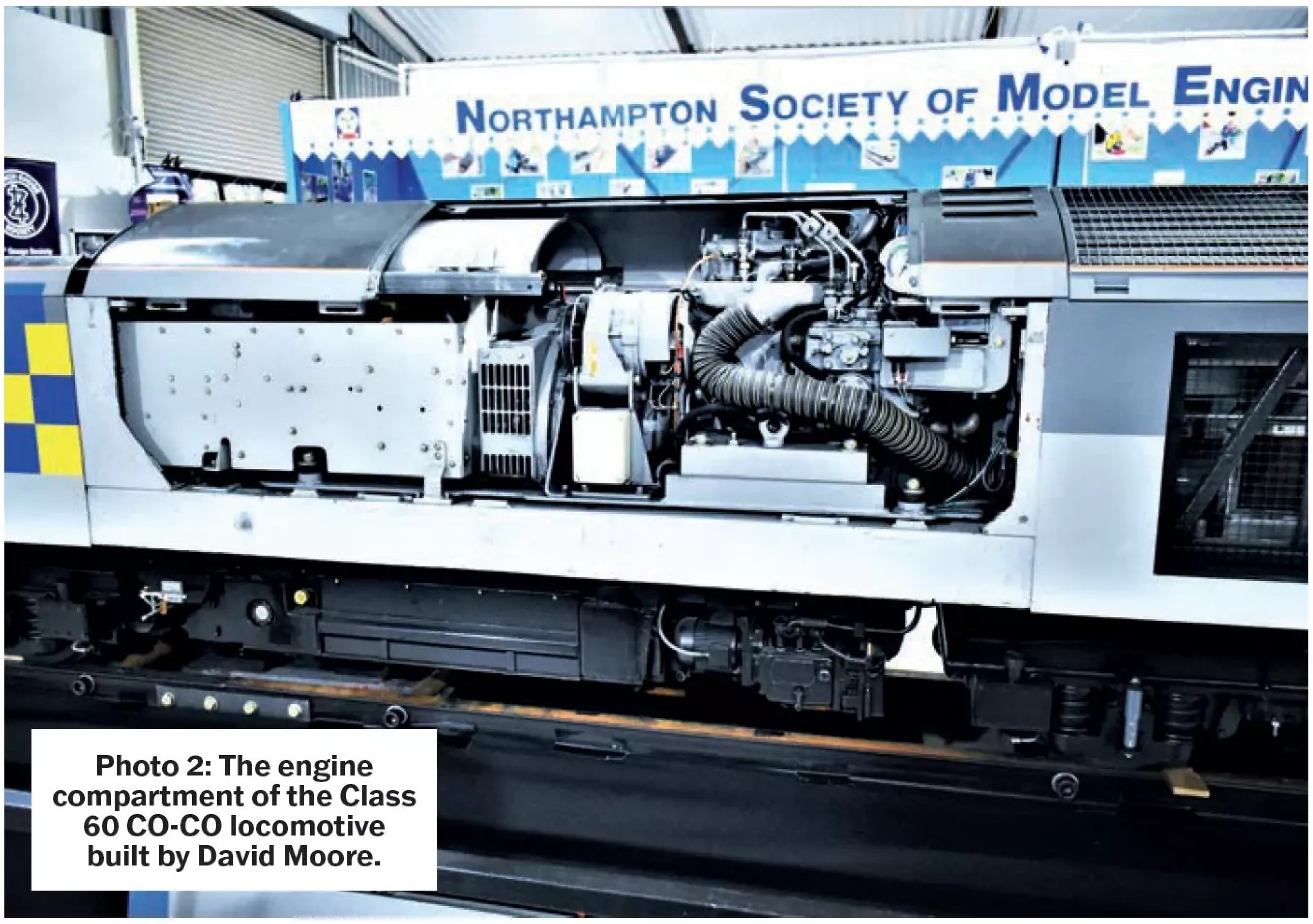


Photo 2: The engine compartment of the Class 60 CO-CO locomotive built by David Moore.

Photo 3: An r/c controlled 1:8 scale model of Galway Hooker Sailing Boat circa 1890.

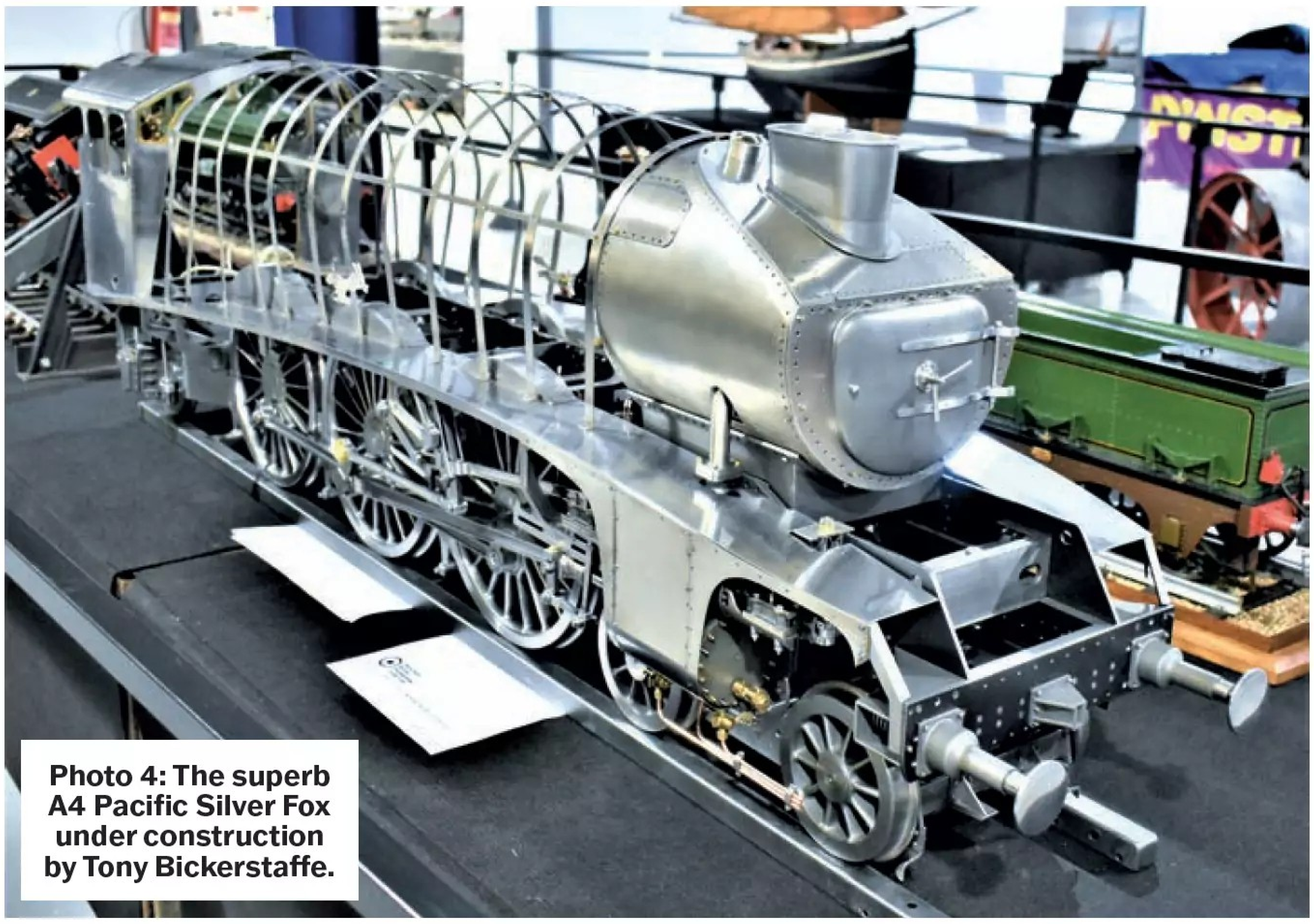


Photo 4: The superb A4 Pacific Silver Fox under construction by Tony Bickerstaffe.

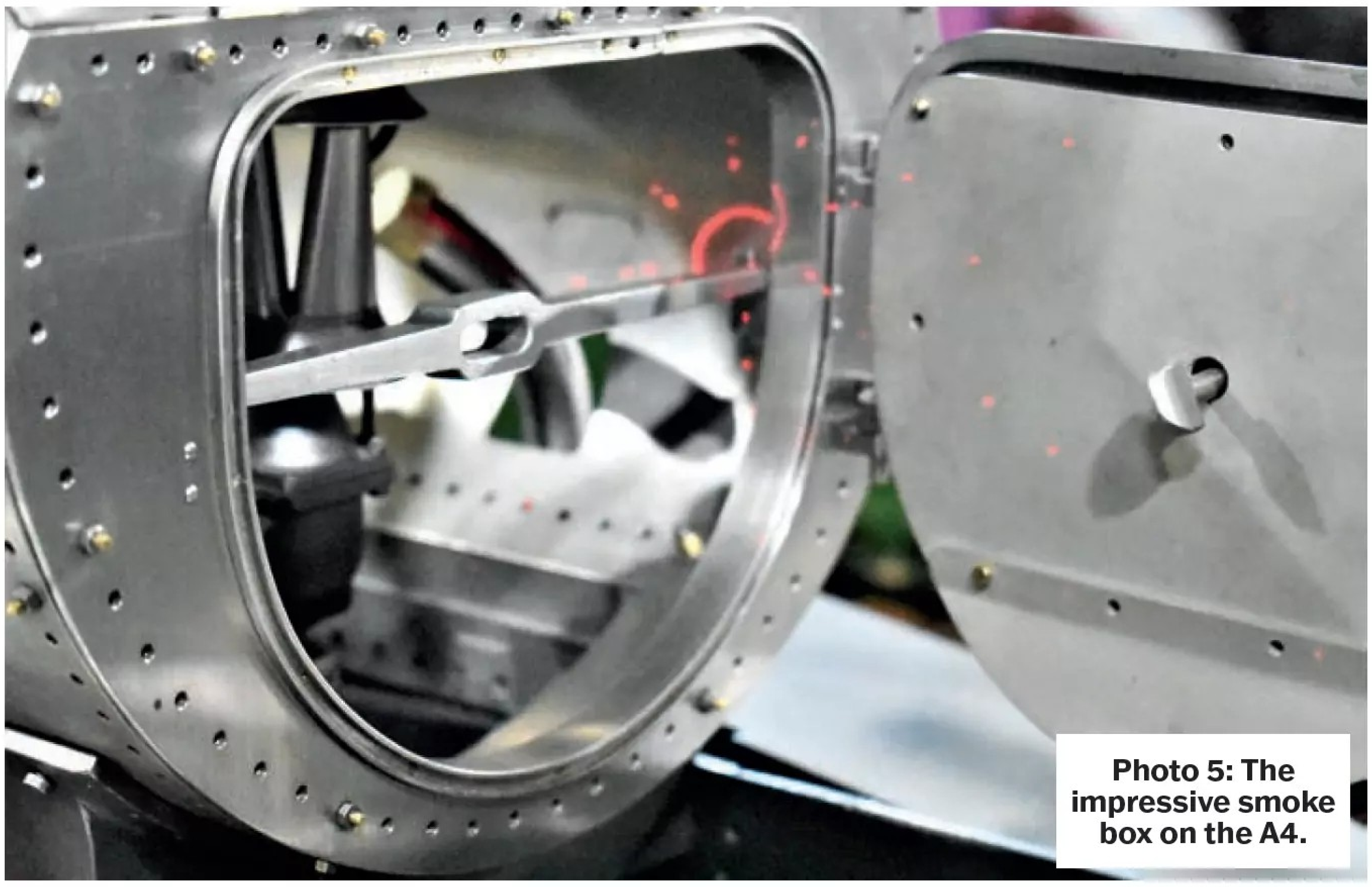


Photo 5: The impressive smoke box on the A4.

but a complete contrast to the Class 60 locomotive. Full of interesting details it was a fine example of model boatbuilding skill, **photo 3**. Two other large models were still under construction demonstrated excellent skills. The 7¼" gauge *A4* under construction by Tony Bickerstaffe really is a work of art. The superb workmanship and detail that is going into this engine is remarkable. Using works drawings and with access to a full size original, Tony is producing a model which when complete will certainly challenge in any competition. The curve of the running boards is perfect, as is the angle edging. The smoke box door is another superb detail, because unlike most other locomotives, these engines were fitted with a smokebox door flexible seal. The model has one and how this unique door shape has been machined indicates the builder's skill, **photo 4** and **5**. A 4" scale 10NHP *McLaren Road Locomotive* under construction by Adam Wells is also well on its way to becoming a first class model. Some fine workmanship on the valve gear and crankshaft was showing some excellent detail, **photos 6** and **7**.

A well finished example of a Western Region *15XX* 0-6-0 locomotive displayed by Roger Froud was again showing some excellent details and workmanship. Displayed on a robust rotating stand all aspects of the model could be examined.

Photo 6: The under construction 4" scale McLaren Road Locomotive by Adam Wells.

Photo 7: The Gearbox end of the McLaren Road Locomotive.

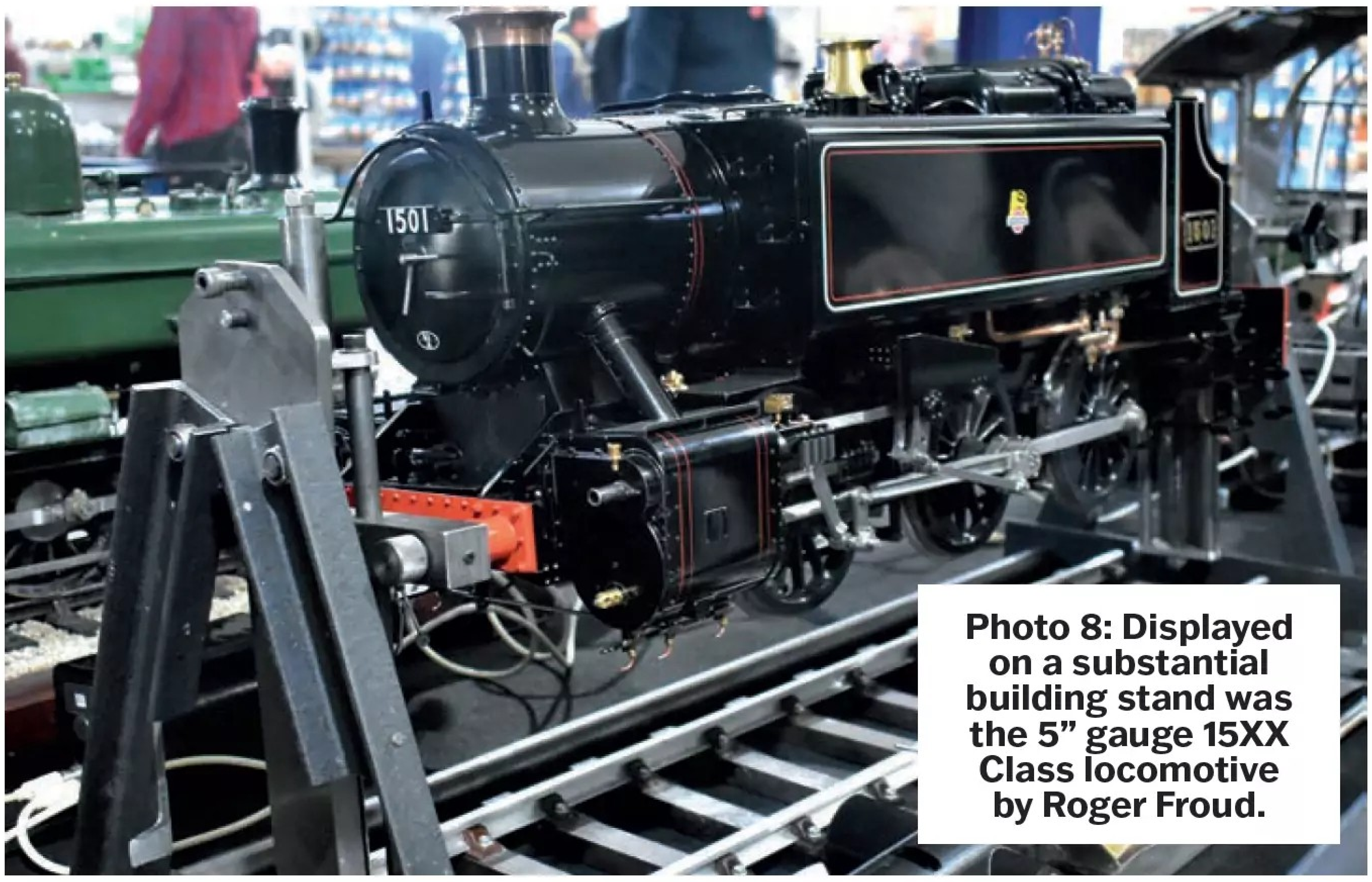


Photo 8: Displayed on a substantial building stand was the 5" gauge 15XX Class locomotive by Roger Froud.

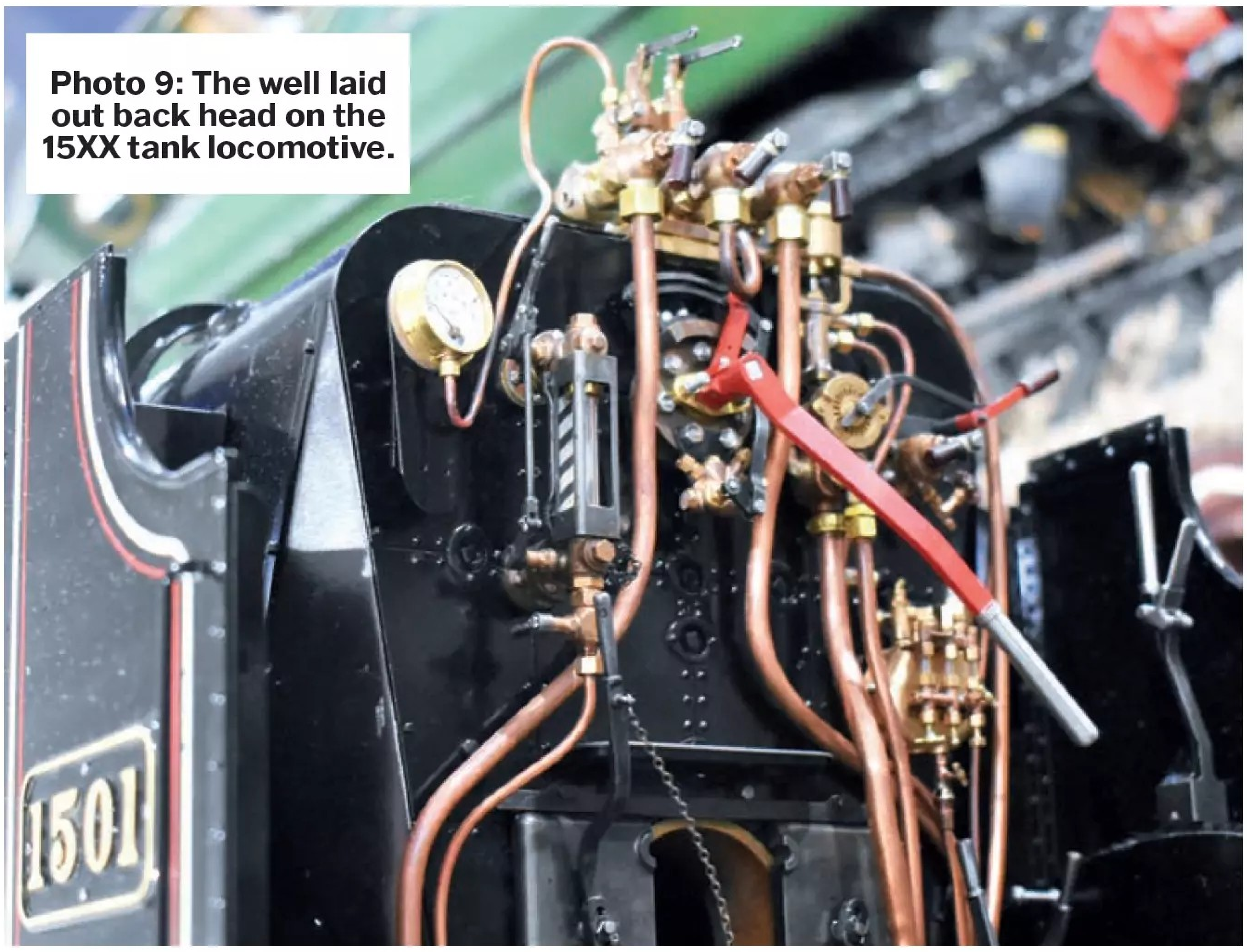


Photo 9: The well laid out back head on the 15XX tank locomotive.

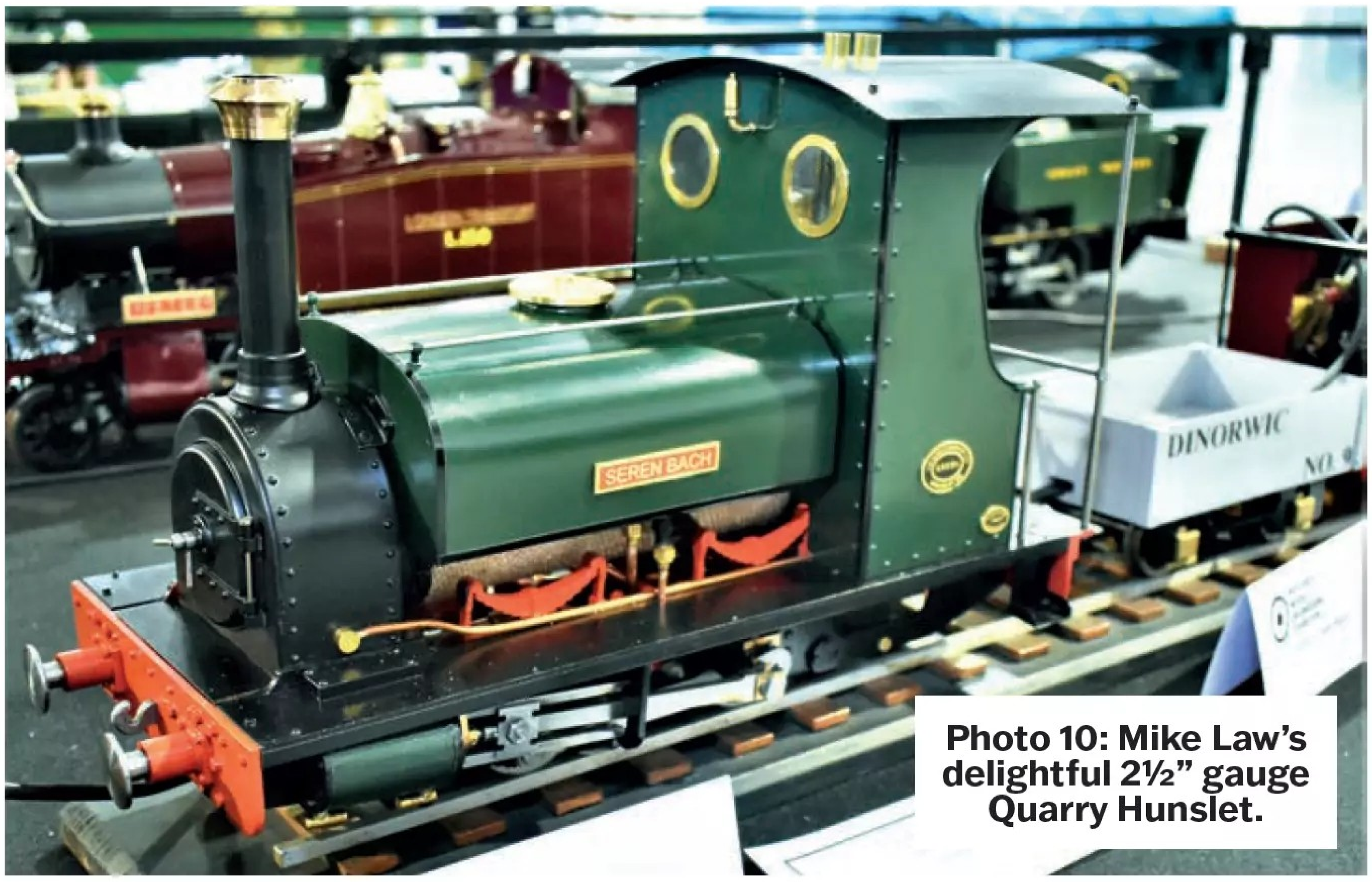


Photo 10: Mike Law's delightful 2½" gauge Quarry Hunslet.

An impressive back head included a three-glass lubricator and some excellent pipework, **photos 8** and **9**.

A little group of smaller gauge locomotives also provided some interesting details. In Class 2 Mike Law presented a beautifully made *Quarry Hunslet* Locomotive in 2½" gauge, **photo 10**. The details and finish were excellent, and it captured the full-size engine profile very well. Another *Quarry Hunslet* in 2½" gauge was displayed by Steve Eaton and represented the open cab version of these locomotives. Finished in an authentic red livery with a distinctive name plate it was a most attractive model, **photo 11**.

The 3½" gauge *GWR 2-6-2 Prairie Tank* locomotive presented by Christopher Basset was another fine model with lots of authentic detail and finished in London Transport Maroon livery it was a good example of the prototype, **photo 12**. A 3½" gauge *Tich* locomotive, also by Christopher Basset, had been modified to include a tender and a most distinctive model it made. Fitted with outside Walchaerts valve gear and finished in an attractive blue livery, it looked a solid little model I'm sure LBSC would have liked to have seen, **photo 13**.

Also on display was an excellent model of a London Chatham & Dover Railway 2-4-0 *Asia*. Displayed by Stuart Leslie Saxby the originals were designed by William Martley for the LC & D Railway in 1873, and this model really captured the look of these elegant locomotives, **photo 14**.

The Display section also included some superb examples of stationary engines. John Wing is a regular supporter of the exhibition, and he displayed a fine example of a Typical Mill Engine circa 1895, **photo 15**, which showed some quality workmanship. Three superb examples of impressive mill engines were displayed by Mick Keenan. Previous exhibition prize winners, these engines demonstrated the excellent building skills of the builder.

The Holmes Mill *Clayton and Goodfellow Cross Compound* steam engine was exceptional and won First prize in last year's exhibition, **photo 16**, together with the Chris Deith Trophy for the Best model in the exhibition His *Wasp Mill Corliss Tandem* steam engine, **photo 17**, and the *H. Berry and Co Ltd* double tandem compound hydraulic pumping engine were both exception engines and truly represented the motive power of the times.

That concludes my review of the Display classes what the classes lacked in quantity, they certainly made up for with quality. My final review will look at the club stands and outside activities which showed off the continued strength of the model engineering world in the UK.

To be continued

Photo 11: Another delightful 2½" gauge Quarry Hunslet by Steve Eaton.

Photo 12: The London Transport livery looks good on the 3½" gauge GWR Prairie by Christopher Bassett.

Photo 13: This 3½" gauge "Tich" by Christopher Bassett looks fine as a tender engine.

Photo 14: LC&DR 2-4-0 Asia, displayed by Stuart Leslie Saxby.

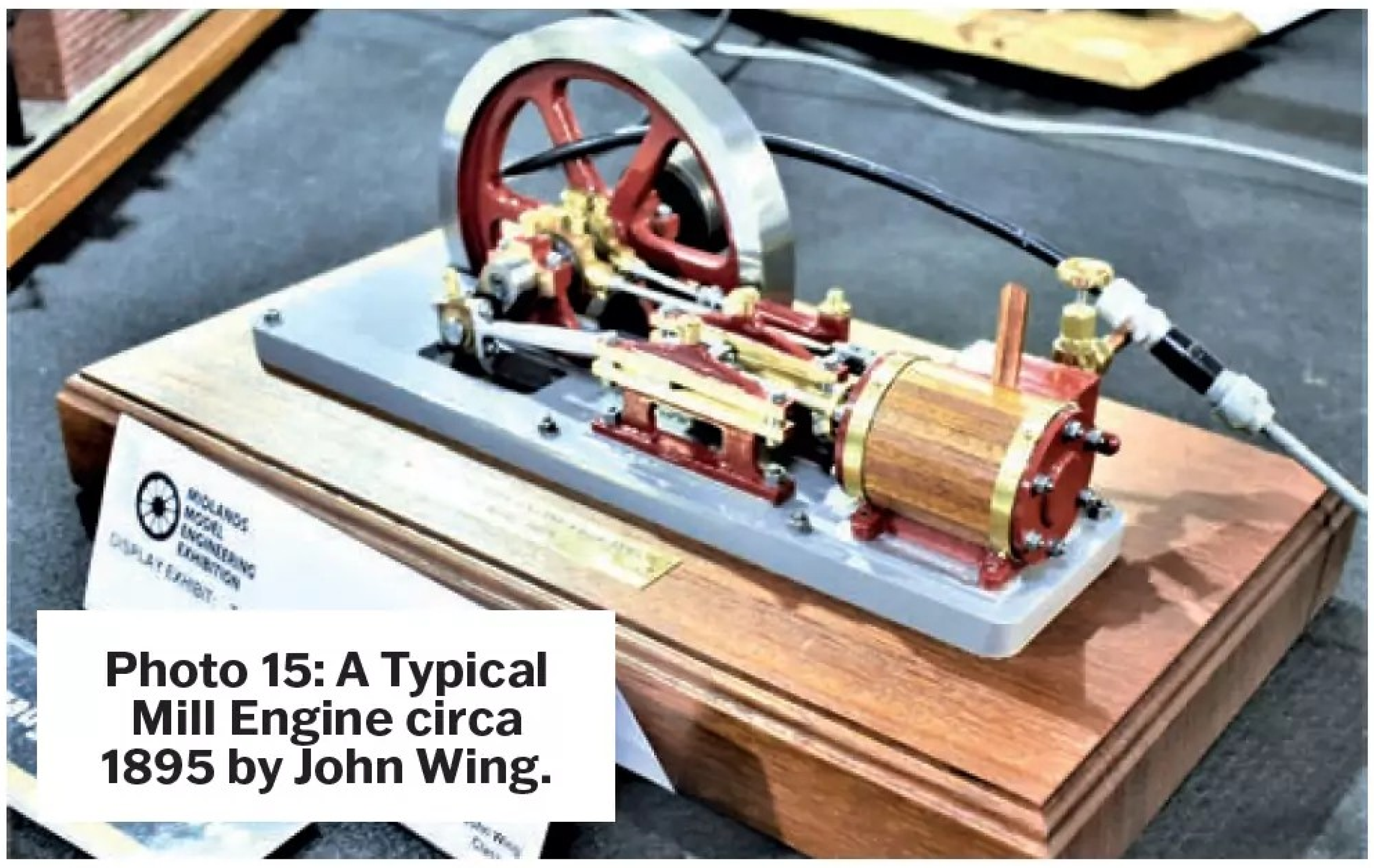


Photo 15: A Typical Mill Engine circa 1895 by John Wing.

Photo 16: The Holmes Mill Clayton & Goodfellow Cross Compound Steam Engine by Mick Keenan.

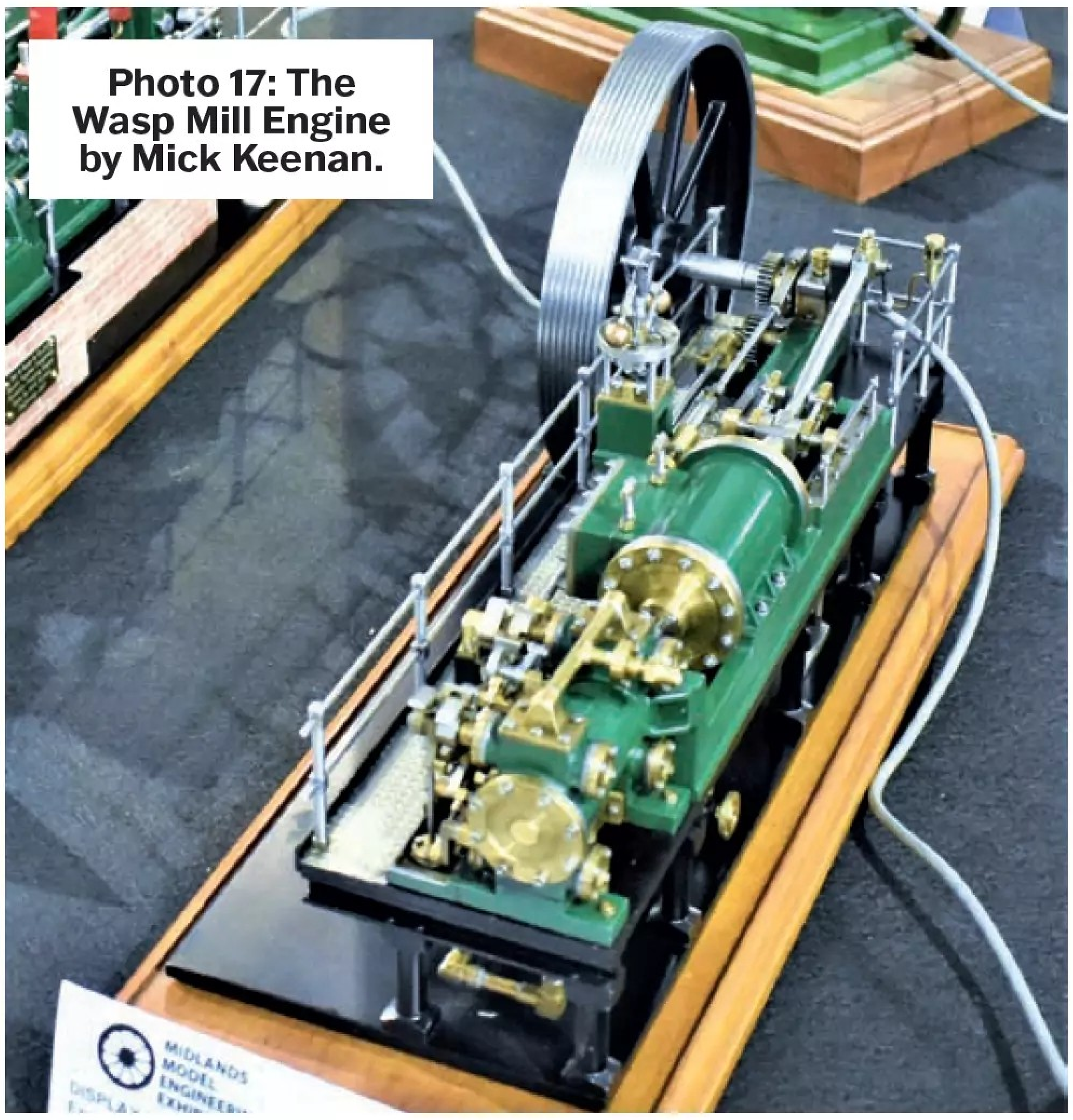


Photo 17: The Wasp Mill Engine by Mick Keenan.

These articles by Geometer (Ian Bradley) were written 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 practised in the past.

SIMPLE MACHINE ADJUSTMENTS

EXPERIENCE indicates that unless design has arranged for it to be unnecessary, lack of suitable means of adjustment can be a handicap in producing good work on a machine, or set a limit to the useful life of certain of its parts.

Consequently, commencing with the simplest lathe, various means of adjustment are common to a wide variety of machine tools-to ensure accurate fitting, smooth and rigid working, correct alignment, to accommodate wear or take end-thrust loads.

One of the simplest means of adjustment of journal bearings is as *A*, a slit at one side through which the bore can be closed slightly to provide the desired degree of fit of the spindle, or take up wear. This may be used for the spindle of a drilling machine, the mandrel bearings of a small lathe, and on occasion is employed on the tailstock of a lathe for clamping the barrel-with a handle instead of nuts on the stud.

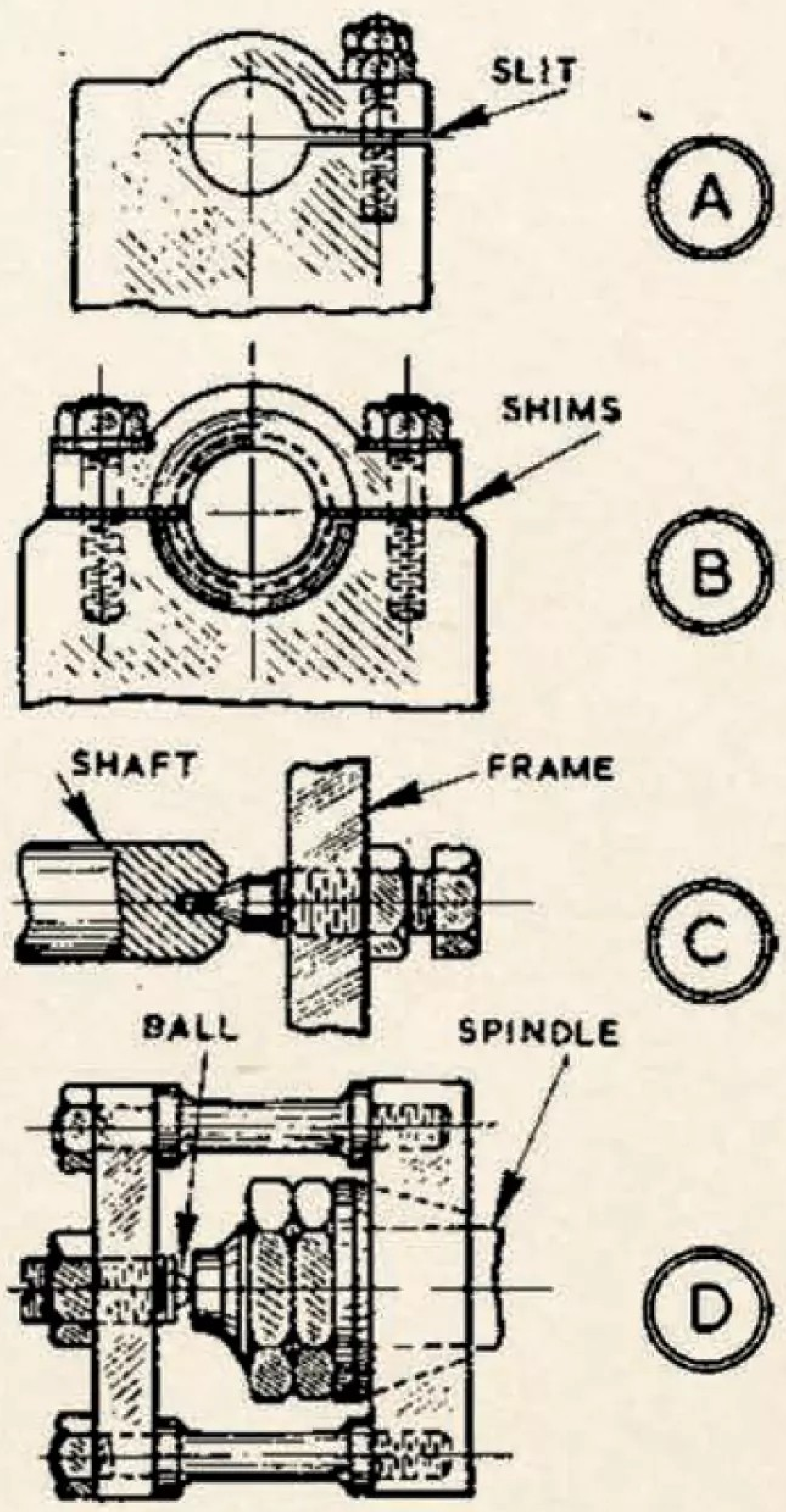
Fitting shims

A normal split bearing with a cap and liners or brasses is as *B*. Several thin shiis each side, or one thick one, may be the means of adjustment-a thin shim or shims being extracted, and the thick ones rubbed down as necessary on a smooth file or sheet of abrasive cloth on a flat surface.

If, after rubbing down thick shims, the spindle is gripped too tightly, a thin metal shim or strip of paper of suitable thickness can be inserted, since the caps of such bearings should be pulled tight to the housings or body portions. Thus, with a little trouble, bearing adjustment can be regulated to a nicety, as is necessary for smooth running of a drilling machine spindle or production of chatter-free work on a lathe.

A simple bearing for light duty, and with the advantage of taking both journal and thrust loads, is the coned type, C, which is employed for countershafts, overhead shafts and treadles, mostly of older lathes.

Each end of the shaft has a normal countersink, or is fitted with a hardened disc contaimng the countersink. The hardened pointed screw passes through the machine frame and is held by a locknut. In amateur workshops bearings of this type can last literally



a lifetime, with occasional lubrication and slight adjustment.

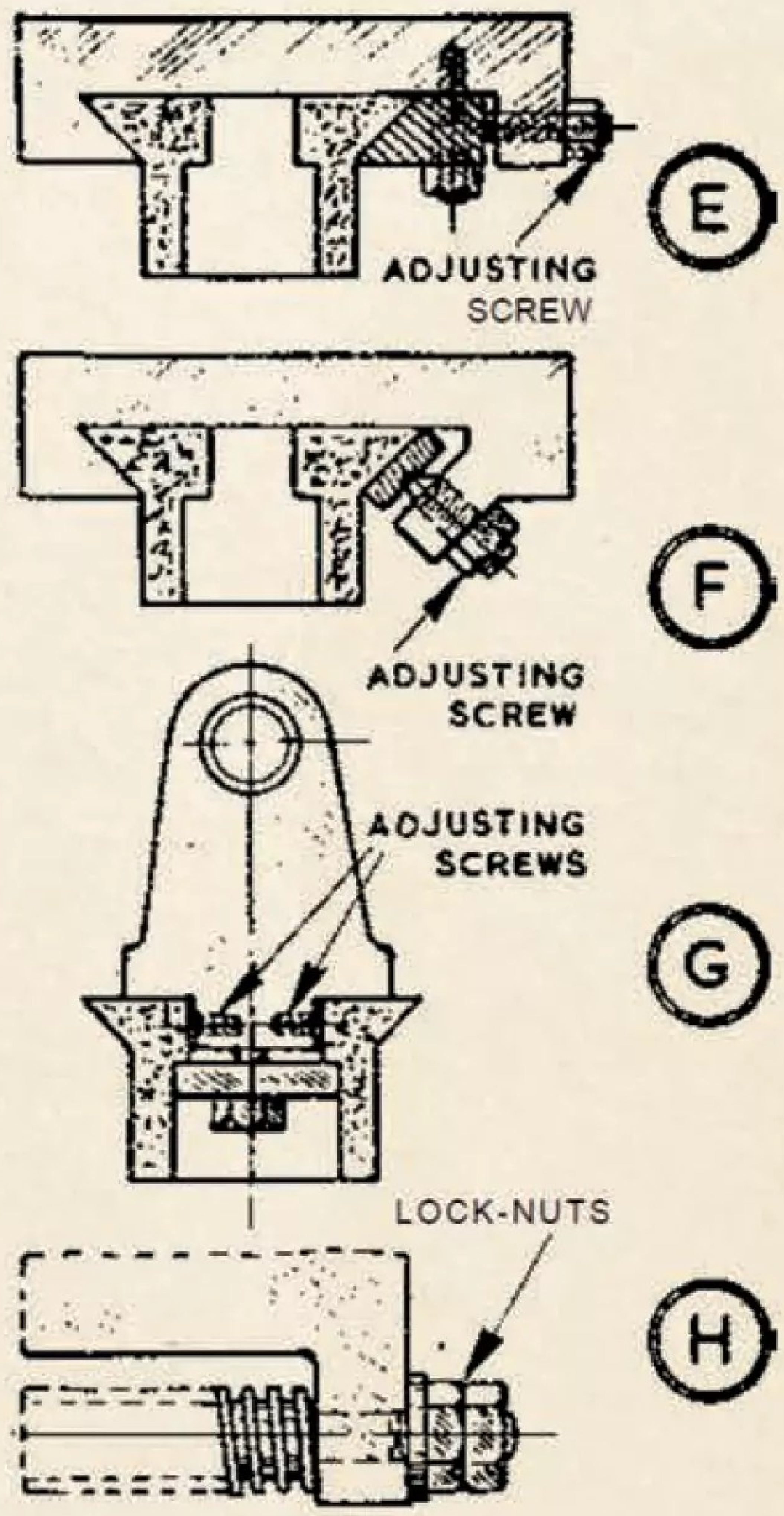
For thrust loads only, as on a drilling machine, or a lathe with a solid spindle a ball may be employed in a hardened screw. This type of thrust is used on old-type lathes with opposed cone journal bearings. These bearings can be adjusted for play by locknuts on the spindle at the far end from the chuck, but the ball thrust is essential or the bearing nearest the chuck will, run tight or seize under the thrust of cutting. The principle is as *D*.

SLIDE ADJUSTMENTS

No less important than adjustment of spindles is that of carriages and slides. For slides on the normal flat-topped guide or lathebed, adjustment is normally made through an angled strip or gib piece, *E*, which can be adjusted to the vee by a number of screws, then held by setscrews or studs-these, of course, have to be slightly loosened to make adjustment. Actuated by its screw or feed, the slide should move reasonably freely, and without shake.

A simpler fitting on some small machines and lathes is as *F*, where instead of being angled the strip is parallel and adjusted to the vee by a number of pointed screws which serve to locate and hold it. This means of adjustment is less effective than the other for controlling play and vibration in cutting.

Some lathes with flat-topped beds and headstocks located from central guide faces have a means of head-



stock lateral adjustment as at G. The tongue portion of the headstock fits with slight clearance between the guide faces, and has two adjusting screws each end which can be turned outwards to wedge between the faces. Thus, by regulating the screws, the headstock can be trued laterally to produce true turning or boring in the chuck.

On feedscrews, locknuts and a washer are normal means of effecting adjustment and taking thrust, H. ❑

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.com** 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 and they will win **£30 in gift vouchers from Chester Machine Tools**. Visit **www.chesterhobbystore.com** to plan how to spend yours!

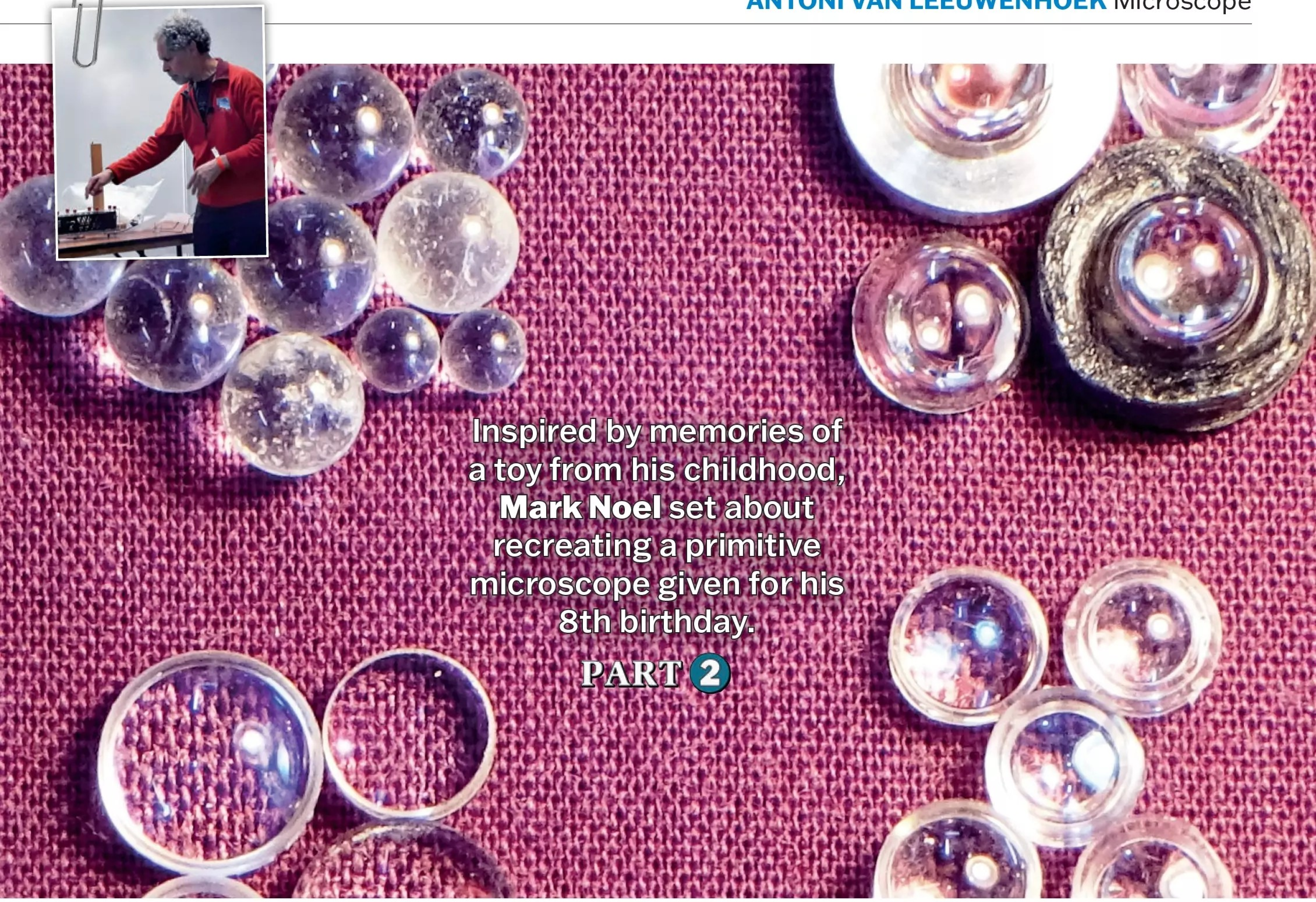
BETTER CONTROL OF A LIFTING DRILL TABLE

Our tip winner this month is John Crammond, who wants to help readers preserve their knuckles:

Those of us with floor mounted pedestal drilling machines, especially if they are located close to a wall, will like me have scraped knuckles on brickwork manipulating the rack and pinion mechanism that heightens or lowers the table assembly. My table is large, 18″ by 16″ and has a large compound table with vice that will probably weigh well in excess of 50 kg. The difficulty in using the elevating arrangement is caused by the very short crank attached to the pinion which in my case is less than three inches.

It doesn't require rocket science or precision engineering to graft a reversible socket wrench to the pinion spindle. In my case I had an old surplus 1/2″ square wrench and a converter with a matching female square hole, while on the other end was a male 3/4″ square (intended to enable 3/4″ sockets to be used). This was drilled to fit the pinion spindle and clamped to it with a grub screw, (socket head set screw to any pedants). There is no reason why a 3/8″ or even a 1/4″ ratchet could not be used. They can be plugged into the spindle and operated either in forward or reverse. The much-increased leverage of a longer handle makes changing table height a doddle, and of course the ratchet can be removed and used for its original purpose if it's the only one you have.

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.



Inspired by memories of a toy from his childhood, **Mark Noel** set about recreating a primitive microscope given for his 8th birthday.

PART 2

Re-imagining the Antoni van Leeuwenhoek Microscope

Photo 18: An array of lenses salvaged from various sources. Top left: Glass balls from disposable soap and perfume dispensers. One of the 5mm ones was used in the microscope. Top right: Lenses cut from MES torch bulbs with 2 ring-mounted in aluminium or carbon fibre. Lower right: Lenses salvaged from DVD and CD players. Lower left: Examples salvaged from scanners. These are have the best optical quality but with the lowest magnification.

Photo 19: Four lens modules salvaged from paper scanners. These usually contain two coated lenses one of which is bi-convex and suitable for use in the microscope.

A cluster of the salvaged glass balls for lenses, mentioned in the previous issue, is shown in **photo 18**. My search for other potential lenses continued…

The recycling shelves at our local amenity site often have old paper scanners discarded for having parallel rather than USB ports. Dismantling these is both fun and educational while yielding useful components. These include stepper motors, toothed belts, optical encoders, linear guides, surface-silvered mirrors, plate glass and a multi-element coated lens module such as the examples in **photo 19**. Some hold the lenses in a threaded ring, while others simply clip the lens in place with plastic fingers, e.g. **photo 20**. Either way they are easy to remove, and some are shown in photo 18.

A third source of quality lenses can be found in discarded CD or DVD player-recorders. Their optical

Photo 20: Close up of a scanner module showing how the lens is held with plastic fingers that are easily bent back to release the lens. The blue cast demonstrates that it has an anti-reflection coating.

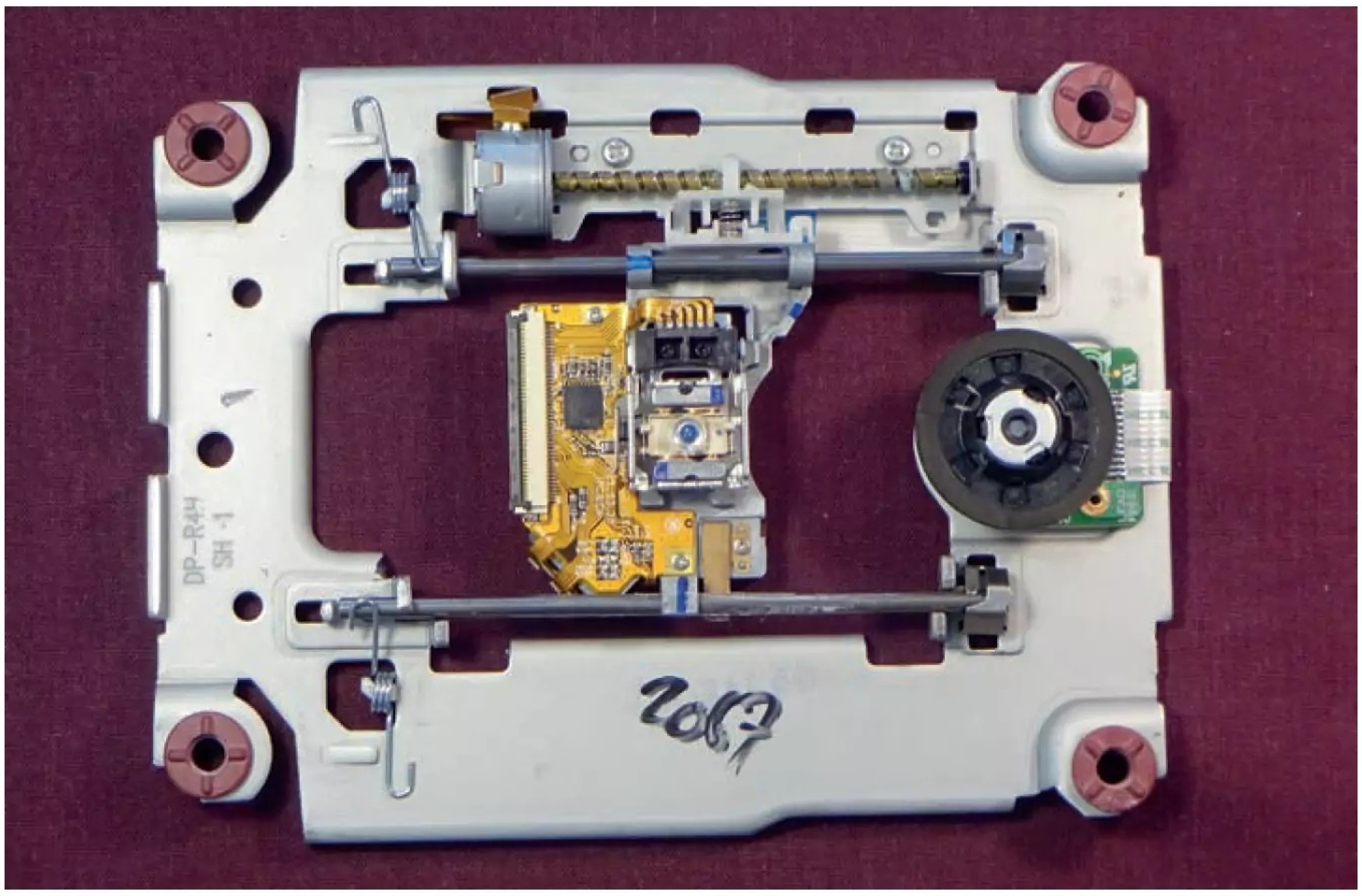


Photo 21: Core components of a DVD player. A miniature stepper motor, screw and linear rails transport the read head which comprises a small lens and sensor that can be moved up and down via a coil-magnetic array. This enables the unit to focus on either of the two layers of pits inside the disc.

quality is extremely high owing to the demands of reading and writing microscopic pits on the recording medium. Within DVD players there is a need for a precisely controlled mechanism to move the lens up and down to focus on either of the two data layers within the disc. All this and more electro-mechanical trickery happens unseen and at speed and is a marvel to explore when the innards of a drive are exposed as shown **photo 21**. Some drives have two lenses, one for reading, the other for writing, and are often anti-reflection coated, but in all cases, they are easily removed by springing plastic clips or dislodging specks of glue. Examples of these lenses are seen in photo 18.

Finally, there is an older type of torch bulb, called the Micro Edison Screw bulb, moulded to incorporate a

Photo 22: A pair of old MES lensed torch bulbs found in my scrap collection. New copies are still available and appear to be identical, with the exception that the threads are chrome plated.

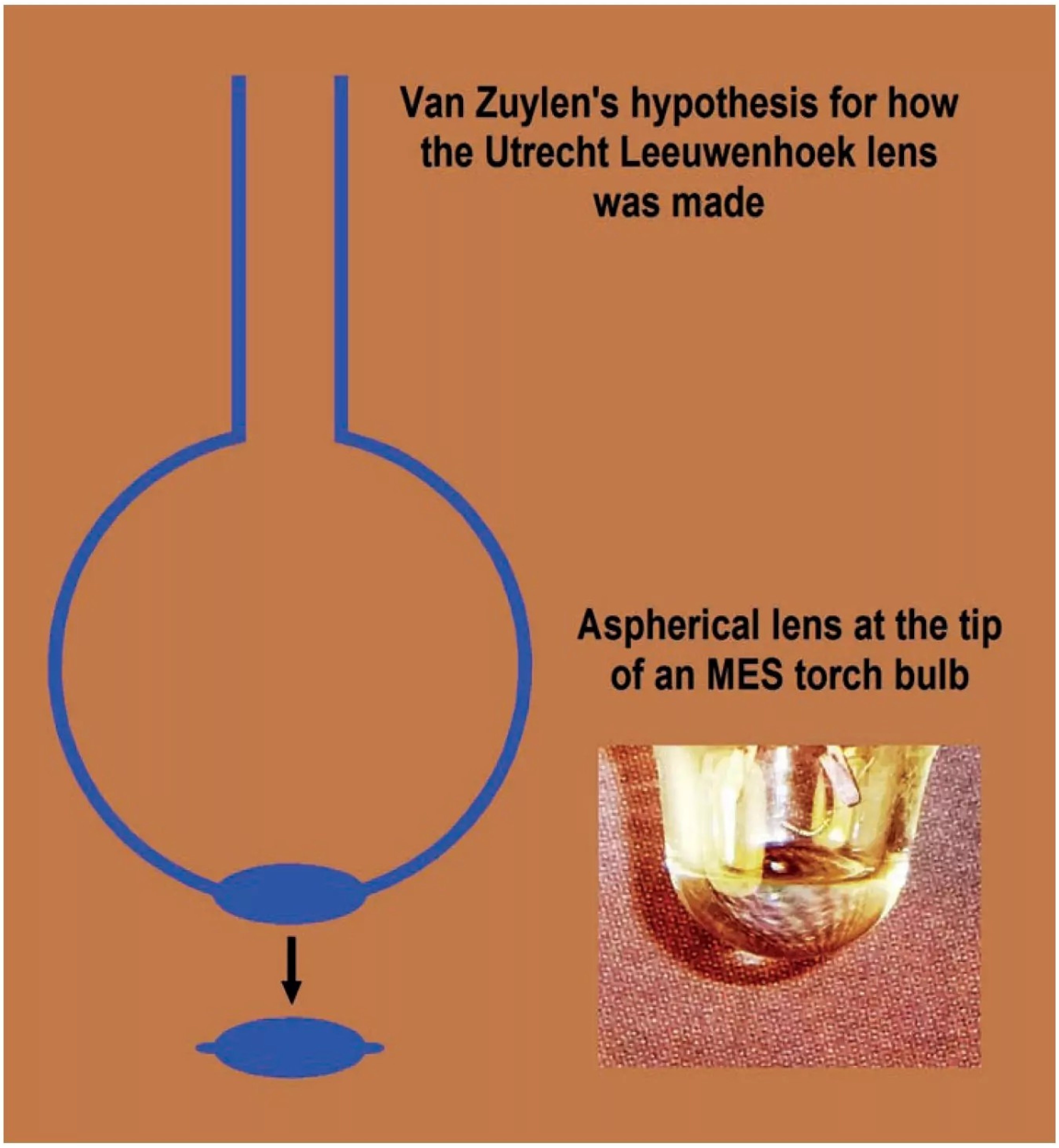


Photo 23: Suggested way by which Van Leeuwenhoek made the aspherical lens fitted to the Utrecht Museum's microscope. A close-up photograph of an MES bulb shows the similar shape of the lens in the tip.

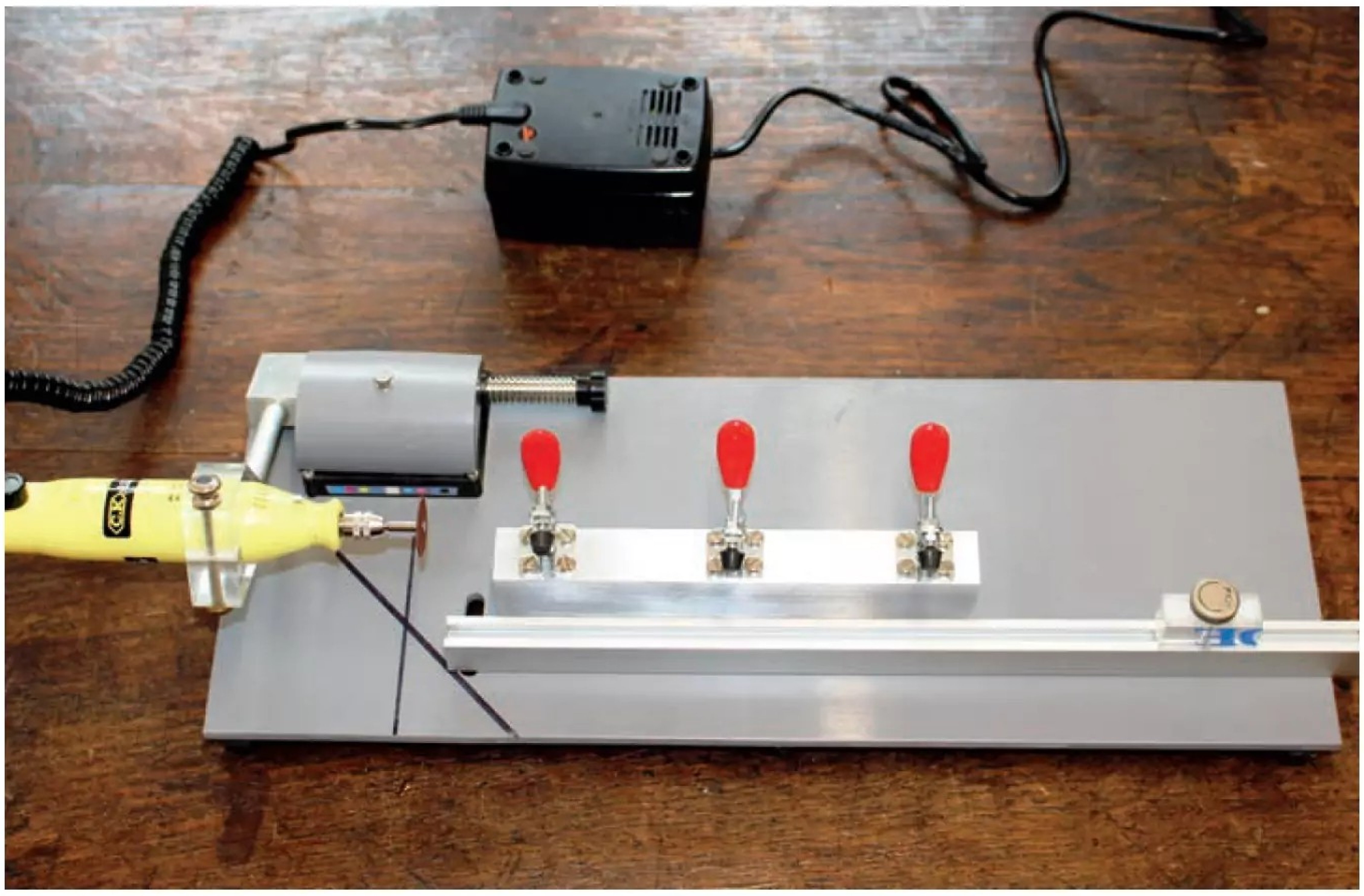


Photo 24: Miniature chop saw made using parts recycled from an inkjet printer and TV aerial. The Dremel-type cutter is held in a Perspex mount cut from a shoe shop display.

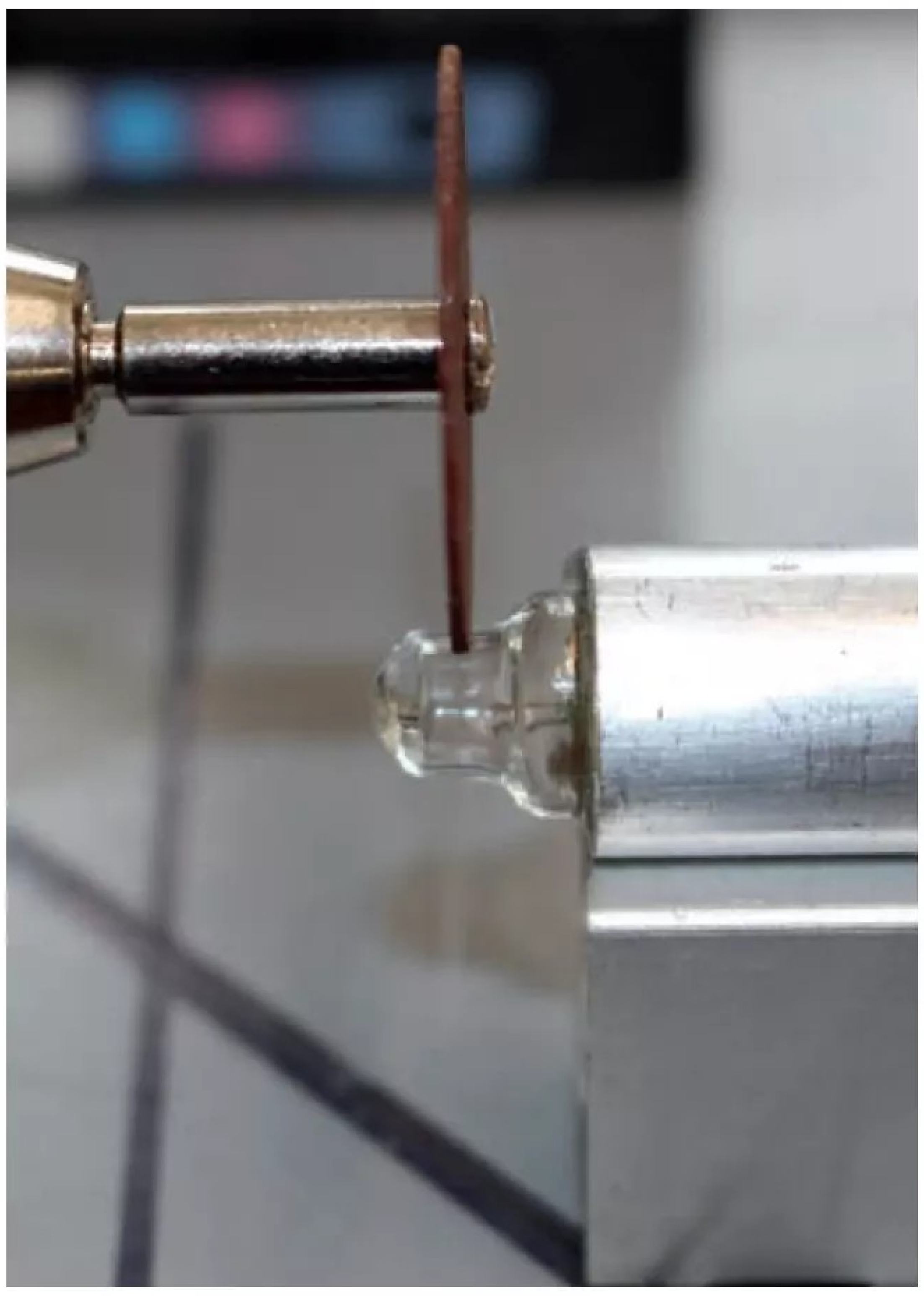


Photo 25: Initial attempt to slice the lens from an MES bulb.

biconvex lens at the tip, **photo 22** (my dad sold these and always called them 'pre-focus' bulbs). These MES bulbs aim to produce a nice conical light beam from the filament and hence good optical properties are essential. The envelope is made by blowing molten glass into a hot die and then pausing to create a lens-pool, before cooling to freeze the shape. The process is similar to how it is thought the Utrecht Museum's Leeuwenhoek lens was made, **photo 23**. It seems he blew a glass tube into a bulb, then allowed the glass to pool to form a lens. A lens made in this way is aspherical, providing high magnification with much less distortion than seen through a glass ball. This encouraged me to try and extract a lens from an MES bulb.

Using my miniature chop saw, **photo 24**, I tried to cut the end from an MES bulb only for it to burst when only part way through, as seen in **photos 25** and **26**. This is because rapid cooling of the glass during manufacture locks in stresses that are released during cutting, shattering the glass. The solution was to bond a metal collar to the bulb above the lens that constrains these stresses, ensuring that the lens could be released intact, **photos 27** and **28**.

To me it's surprising that Van Leeuwenhoek didn't save himself a lot of trouble by simply salvaging lenses from old CD-DVD players, scanners and torch bulbs.

BUILDING THE MICROSCOPE

Most of the parts for my replica microscope were made by 3D printing in silver filament material to resemble a period piece. All the components are shown in **photo 29**. My aim was to bring Van Leeuwenhoek's concept up to date with changeable lenses and with specimen holders that can also be changed. In common with the 17th Century design the instrument body comprises two baseplates, but these are not bonded together but spaced apart 3mm with thin flexure wings on the lens plate side to allow focussing towards and away from the sample. Specimen holders are of a fixed design with an oval body, while lenses are also held in oval bodies but of various lengths and recesses depending on the specific lens. In both cases the oval bodies drop into oval receptacles and are securely locked in place by a simple 90° rotation as seen in **photo 30**. This type of engineering

Photo 26: The MES bulb shattered when the cutter was only part way through owing to stress being unlocked in the glass envelope.

Photo 27: The solution to the bulb shattering was to bond a metal ring to the bulb before cutting to restrain the glass stresses.

Photo 28: Intact MES bulb lens in the metal mount after successfully cutting from the glass envelope.

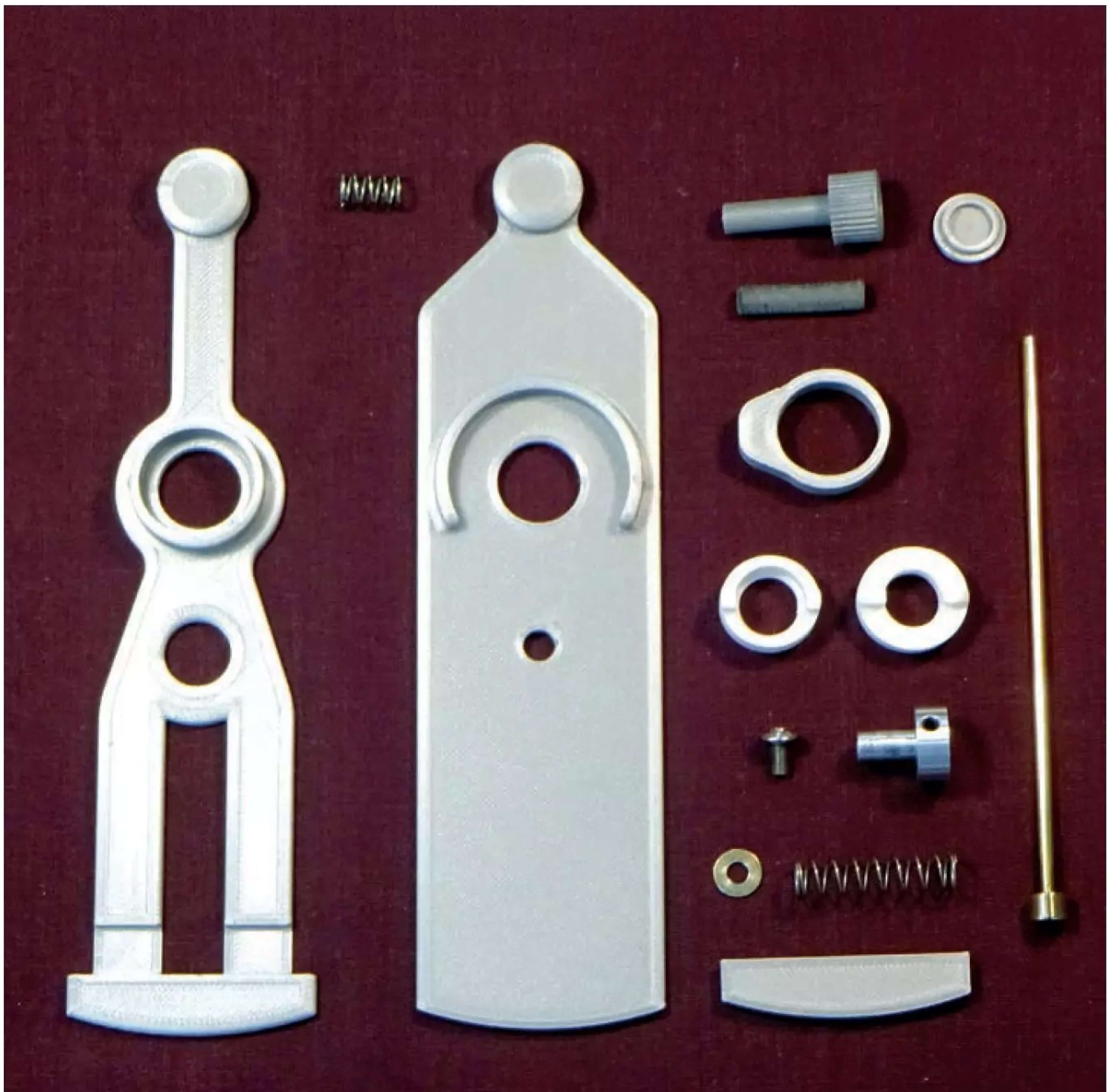


Photo 29: Components of my 're-imagined' Van Leeuwenhoek microscope. The two white parts represent a specimen holder and a lens holder.

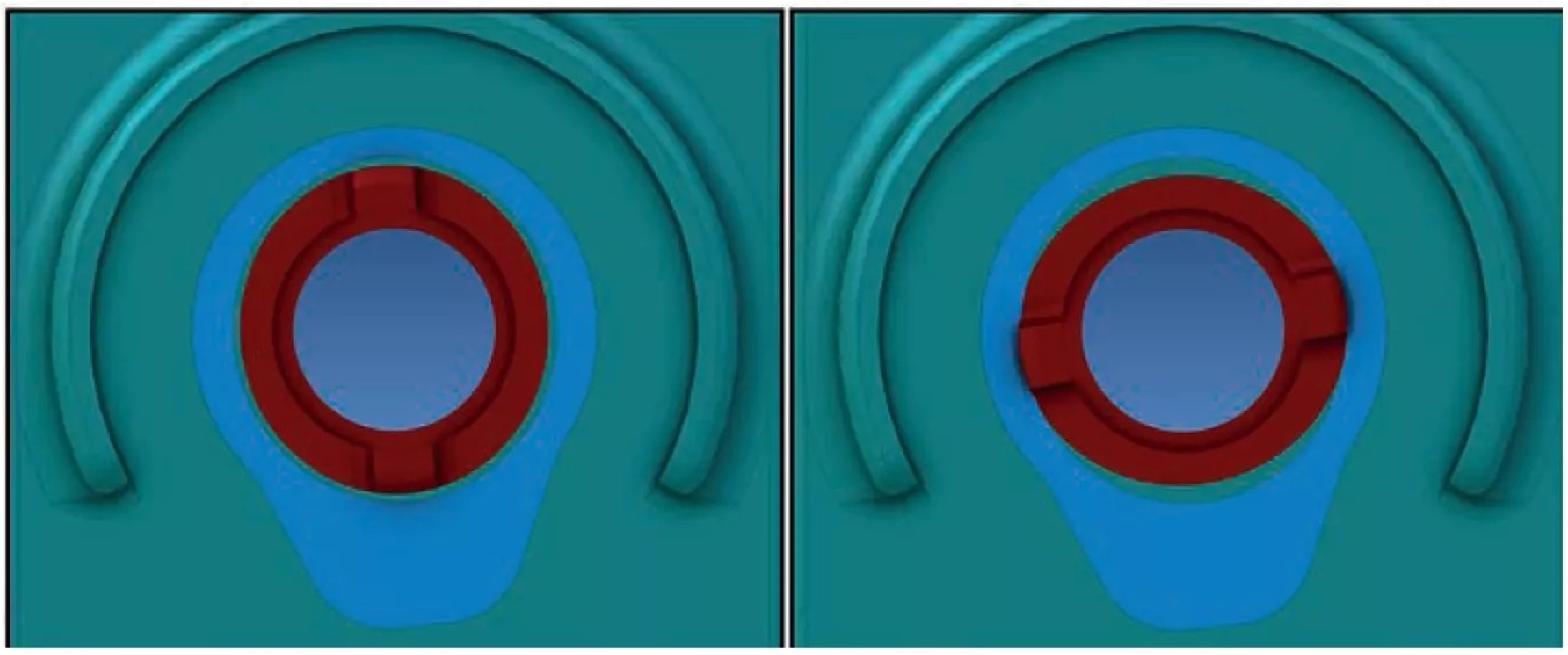


Photo 30: 3D Alibre model showing how an oval specimen holder enters, *left*, and is locked into place with a 90º rotation, *right*. The same locking method is used to mount oval lens holders.

is trivial using 3D modelling and printing but would be more challenging by CNC machining.
Also novel is the ability to move the specimen holder in two dimensions using the beam and rotor device shown in **photo 31**. Specimen holders drop into the oval socket (right) and swing in the X direction about the aluminium spindle that pivots in the baseplate. Fine control of the X movement is achieved by rotating the knurled knob that rolls over the end of the baseplate. A Helliman rubber over this knob provides the grip as seen in photo 1. Movement of the specimen in the Y direction is achieved by simply pushing the shaft back and forth.
The combination of a variable focus with X and Y movement enables the user to explore microscopic features laterally and through the depth of the specimen. Such precise functions were not possible with the modest engineering available in the 17th Century.
All the lenses I salvaged have different diameters and focal lengths and hence custom holders were designed for each. Focal lengths were measured using the simple rig shown in **photo 32**, which features a V-shaped lens holder and a screen of frosted Grafix sheet, both made, of course, by 3D printing! Ideally, to obtain an exact focal length requires the target object to be a point source located at infinity, but I did not have time to travel to infinity or even part the way there, so settled instead for the view of a tree 30m away. **Photograph 33** shows the image of this tree focussed onto the screen using one of the scanner lenses, giving a measured focal length of 18mm.

PREPARING SPECIMENS AND USING THE INSTRUMENT

In traditional microscopy the sample is entombed in a 'mountant compound' between a glass slide and thin cover slip which ensures optical continuity and prevents drying out of biological materials. Van Leeuwenhoek simply stuck his samples onto the tip of his microscope's pin where they had to be quickly examined before drying out. Instead I have used three methods for preparing permanent specimens, **photo 34**:
Air Mounting for naturally dry objects such as insect wings, feathers, snippets of photo slides and newsprint. These are simply fitted to the base of the specimen holder with dabs of nail varnish.
PVA or Varnish Mounting for objects that are fragile and need to be sealed. The sample is gently stirred into the liquid before thinly spreading over the Perspex slide. This has been quite successful for mounting pollen and sand grains.
Using Mountant Compound for pond and seawater, algae, mushroom gills and blood, for example. The mountant is warmed until soft whereupon the object is immersed and covered with a clear slip, then allowed to cool and harden. Of all the processes and sample types this has provided the best results.
Finally, **photo 35** shows the 're-imagined' instrument in use. With the lens held to the eye, one hand controls the focus while the other moves the sample back and forth. A quick lens change allows either a wider field of view or smaller features to be explored in great detail under high magnification. With experience I have found that most use has been made of a scanner lens

Photo 31: The beam and rotor assembly that allows movement of the specimen holder, right, in both the X and Y directions. Specimens are held in the rotor right and the brass beam slides through, and pivots in, the baseplate on the aluminium bush. The knob, left, is sheathed in a Helliman rubber and rolls over the baseplate to provide fine movement.

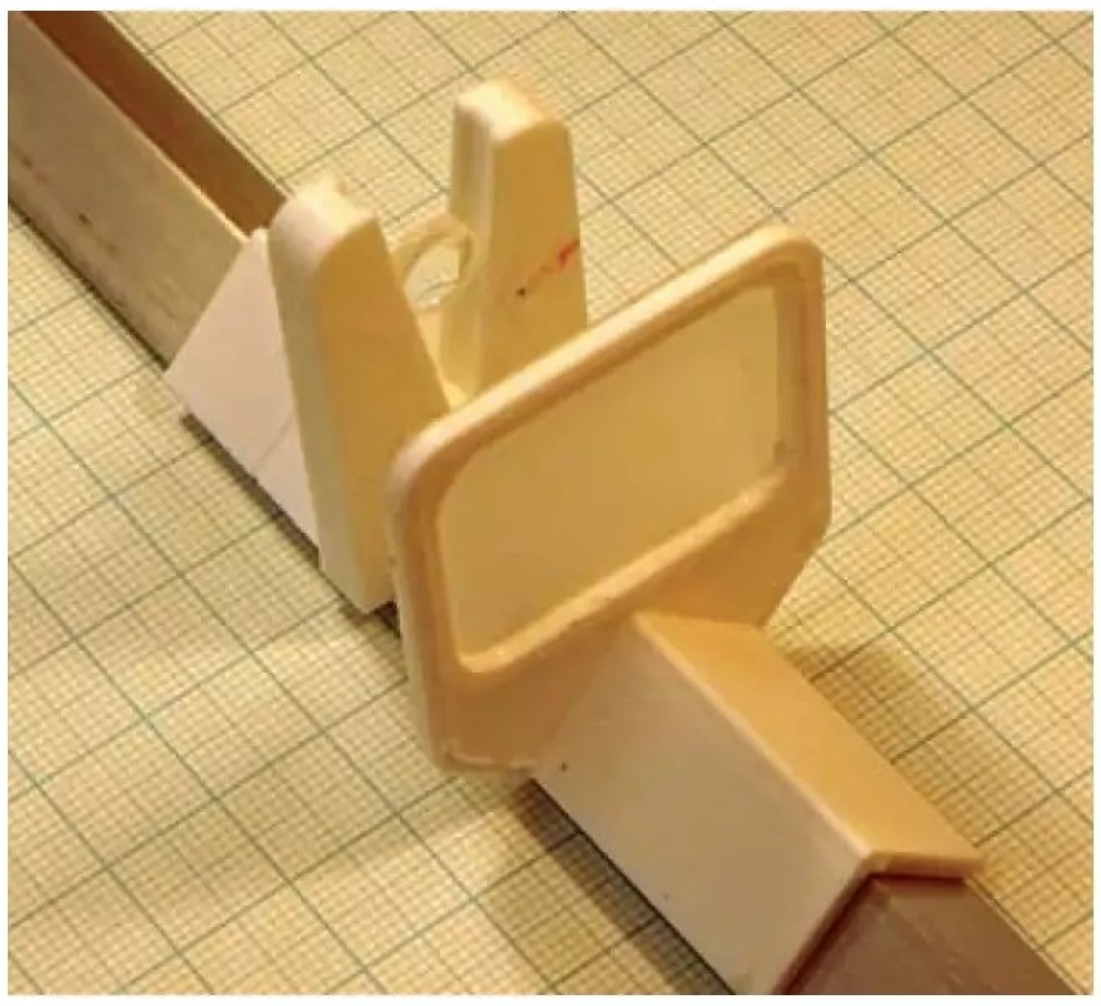


Photo 32: Simple rig for measuring the focal lengths of lenses which are held in the V-slot. An image of a distant object is cast onto the frosted screen.

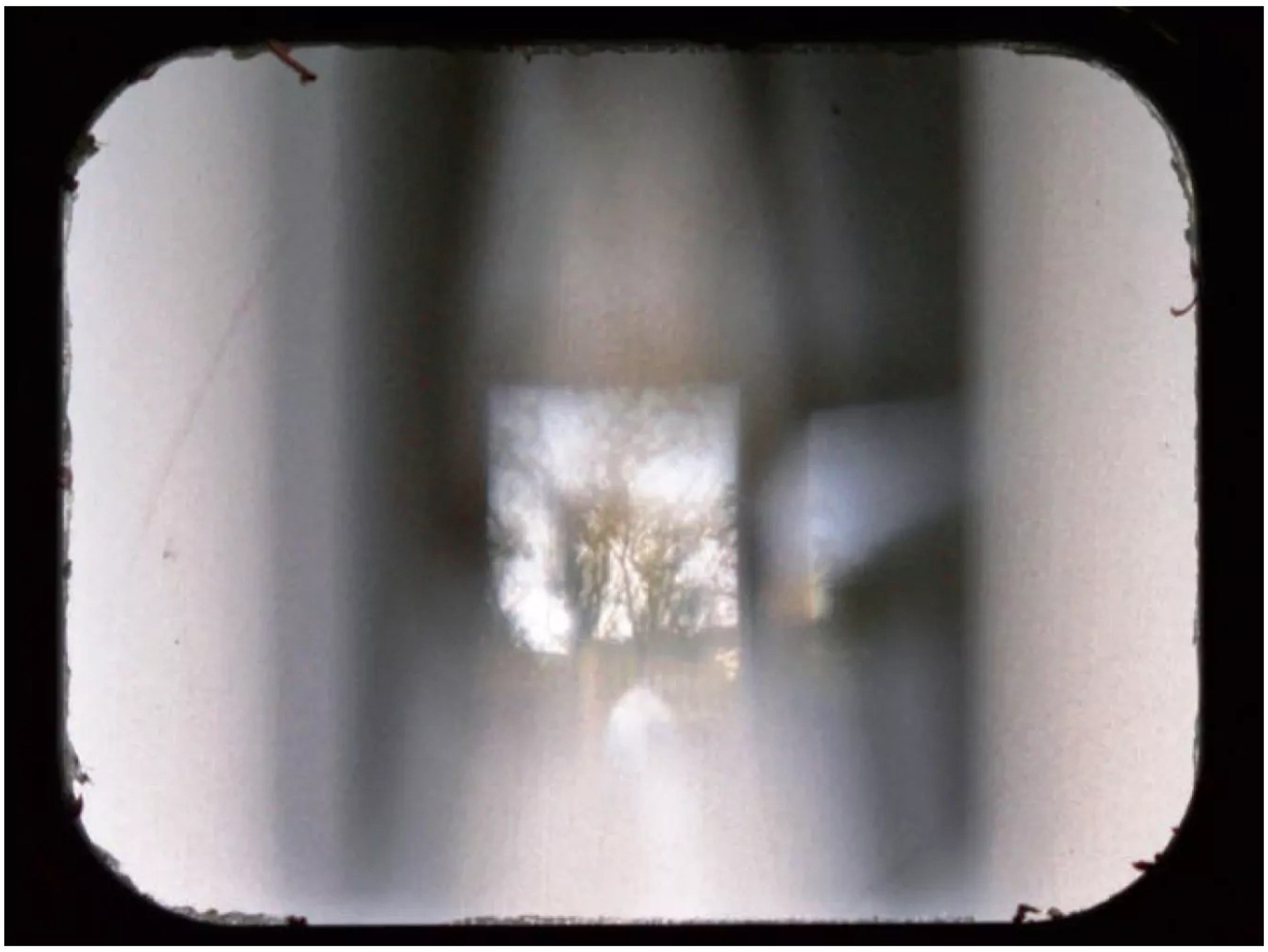


Photo 33: Example of an image on the screen of a tree about 30m away using a scanner lens.

Photo 34: Fluids for mounting specimens: PVA glue, clear nail varnish and professional mountant media from Brunel Microscopes. At the front are three completed specimen holders containing bees' wings and pollen.

Photo 35: The microscope in use: the pair of fingers on the left hand is adjusting the focus, while the right hand is moving the roller knob and beam to move the sample in the X and Y directions.

for wide-field, medium magnification, and an MES lens for narrow-field very high magnification.

Although initially conceived as a straightforward project with limited scope, it soon expanded to include fascinating historical and optical research, 3D design and printing. Along the way I have seen the microscopic hair-like structures on bees' wings called microtrichia, and the astonishing micro-life in ditch water. This is only the start - there is clearly much more to explore.

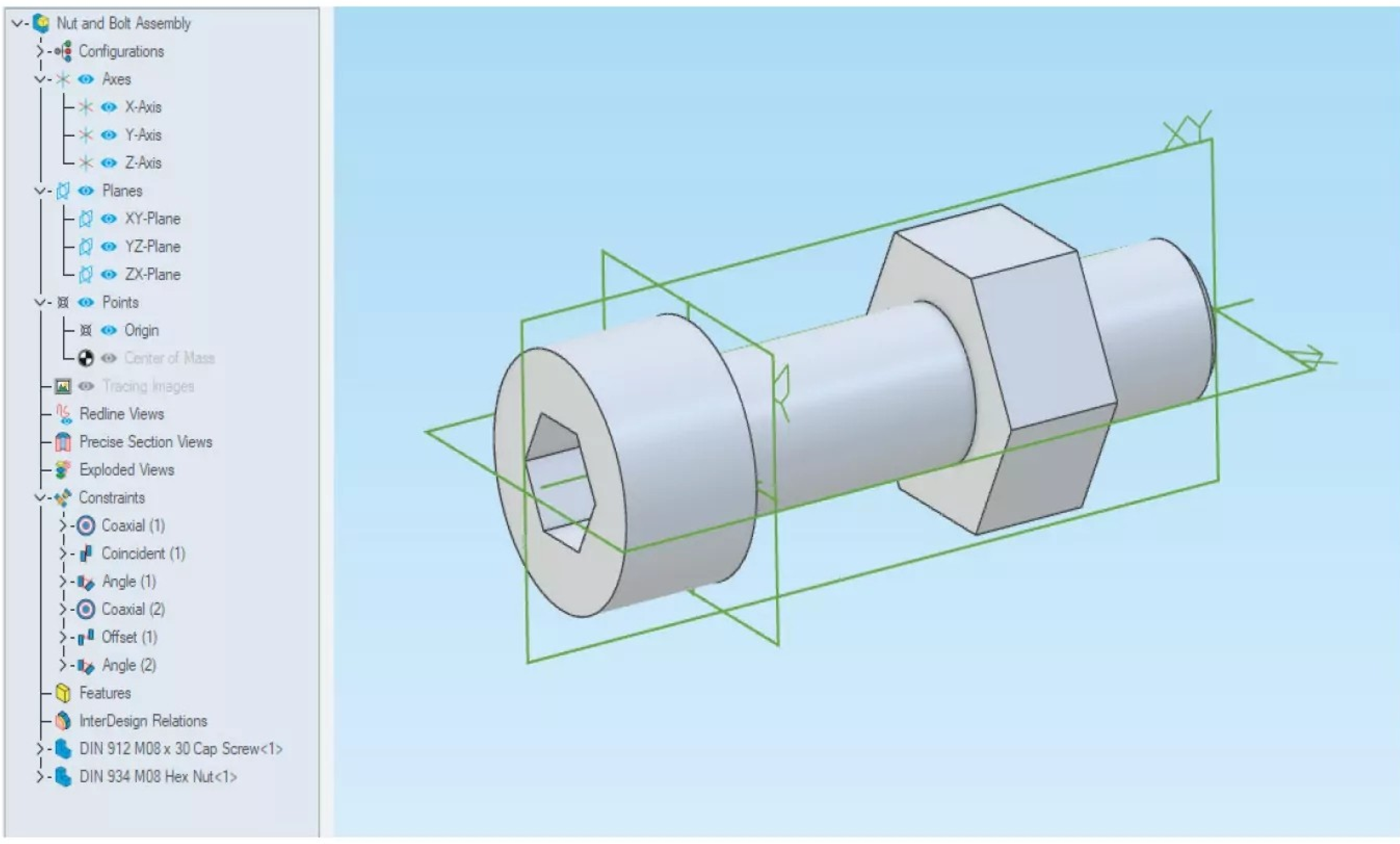
Resources

Alibre 3D Design software: https://www.mintronics.co.uk/alibre-design-overview

Gedeo Crystal Resin, available from 4D Model Shop: https://modelshop.co.uk/Shop/Item/Gedeo-Crystal-resin-300ml/ITM1164

Mountant media for preparing specimens, available from Brunel Microscopes Ltd: http://www.brunelmicroscopes.co.uk/microscope-mountants.html

Six Month Free Trial of Alibre Atom3D for Readers



Our next issue will include an introduction to working with Alibre Atom3D by Robert Footitt. To support this, Alibre have partnered with Model Engineers Workshop to provide a 6-month free license of Alibre Atom 3D for readers.
The February issue of *ME&W* will include a special activation code that will allow you to download and activate Alibre Atom 3D for six months, free of charge.
If you have had a free trial of Alibre in the past, this may not work, but we will include instructions on how ME&W readers can activate the trial.
The article will also include a special code giving readers 50% off online Alibre Atom 3D tutorials.

Bradford Model Engineering Society Event

Bradford Industrial Museum 23-24 May

Bradford Industrial Museum are delighted to host the Bradford Model Engineering Society, who will exhibit their members' models, ranging from railway locomotives, boats and stationary engines to Meccano, which will attract parents and children to talk about the models, their origins and principles of motive power and engineering.
A selection of the exhibits will be running, some powered by steam, others electricity, emulating the full-size exhibits that will be running during the day.
For even more fun, visitors can ride on the Society's portable railway and pilot radio-controlled boats on a small pond. We hope that other like-minded societies will join us for the weekend.
Tap into the decades of knowledge & experience of the members, who will also explain the other activities that the society is involved in such as the miniature railway at Northcliff Woods and the model boating at Wibsey Lake. Perhaps even consider becoming a member and enjoy the monthly socials, speakers, group projects and running days.
So come along to the museum on the 23rd or 24th May, from 11:00am to 3:00pm for a fun and educational day out for parents and children alike.

Bradford Cup

In our reader vote, Gerald Martyn won the Bradford Cup for the best article or series in Model Engineer in 2024, for his series on A GWR Pannier Tank in 3 ½" Gauge. Gerald was unable to attend MMEX to receive the Bradford Cup, but editor, Neil Wyatt, was able to meet him for a coffee in Narberth, Pembrokeshire. A pleasant hour was spent in a bakery café (highly recommended, it's called Oh Crumbs!) discussing various aspects of the hobby and the magazine, along with Gerald's fascinating experiences of working on fatigue-related wear in helicopters with Westland. Congratulations again to Gerald.

Help REMAP Engineer Joy this Christmas

As we enter the Christmas season, REMAP are launching their Engineering Joy appeal — and are asking for your support to help create life-changing bespoke equipment for disabled people across the UK.

Every day, disabled people contact REMAP because standard equipment doesn't meet their needs. Their skilled volunteers design and build custom solutions that restore independence, enable hobbies, support families, and open doors to activities many thought they'd lost — all completely free of charge.

SIMON'S STORY

Simon has a C4 spinal cord injury, resulting in quadriplegia and complete paralysis from the shoulders down. He has a lifelong passion for racing remote control cars but, after his accident, he struggled to continue with this hobby or find another activity he could share with his family in the same way.

He reached out to REMAP for help. Working closely with him, one of their skilled engineers developed a mouth-operated, hands-free control system that allows him to race his RC cars independently once again.

In Simon's words: "This project not only gave me something mentally to focus on, I can go out with the family again, and we've got this activity that we can all do together. This project has really changed my new life."

This is what Engineering Joy looks like — restoring independence, purpose, and shared moments with loved ones.

Your support this Christmas can help create more solutions like Simon's:

• £25 – Covers materials to adapt a toy or basic piece of equipment.

• £50 – Helps design and build a bespoke solution that gives someone greater independence.

• £125 – Funds an entire project, giving someone access to a life-changing piece of equipment tailored just for them.

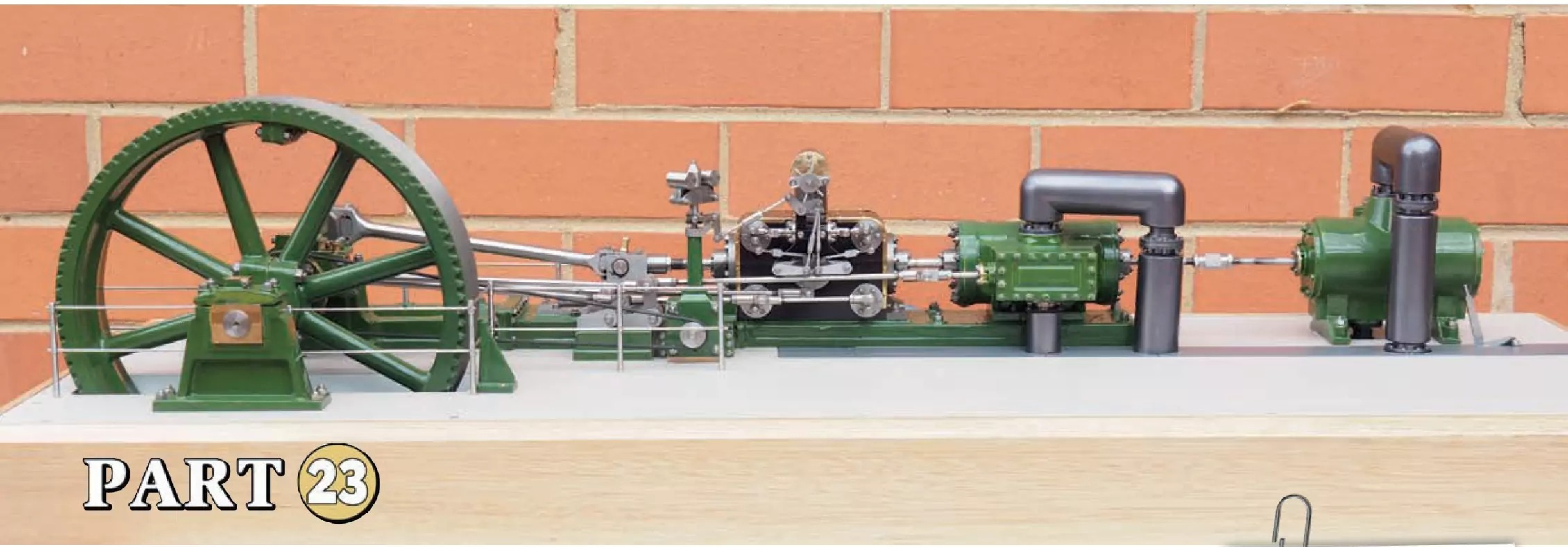
https://remap.org.uk/get-involved/donations/

Midlands Garden Rail Show

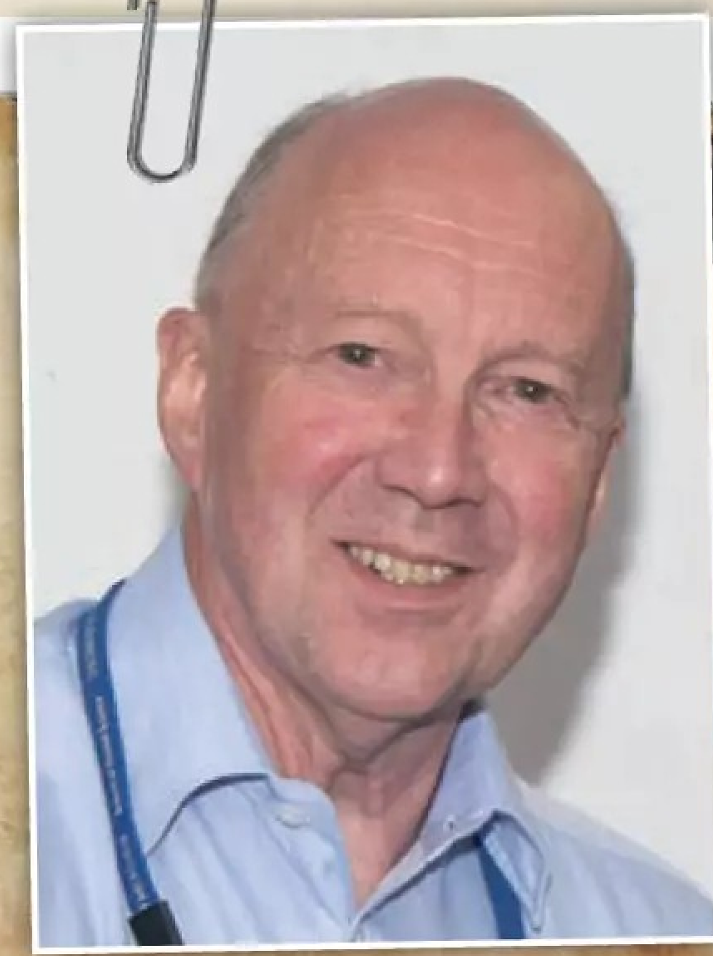
A reminder to readers that the Midlands Garden Rail Show will return to the Warwickshire Event Centre, Leamington Spa, on Saturday 28 February and Sunday 1 March 2026. First established in 2002, the show has grown into one of the UK's premier exhibitions dedicated to garden railways. Each year it attracts enthusiasts from across the country, offering a unique opportunity to explore an impressive range of layouts in the larger gauges and scales, including Gauge 1, O Gauge, G Scale, and more. Visitors can enjoy more than 15 layouts, clubs, and societies, showcasing creativity, craftsmanship, and technical skill. For those feeling inspired to start or expand their own projects, almost 40 specialist suppliers will be on hand, offering expert advice and guidance to help hobbyists choose the right products.

The event is open 10am – 4pm Daily (last admission one hour before closing). Admission Prices are: Adult £13.00; Senior Citizen £12.00; Child (5-14) £5.00.

Tickets are available now via the website www.midlandsgardenrailshow.co.uk or they can be purchased on the day of your visit from the ticket office.



A Tandem Compound Mill Engine



David Thomas completes the construction of his compound Corliss Mill Engine to Arnold Throp's design.

In the era when engines like the tandem compound were in use there wasn't much attention paid to keeping people safe from machinery. Access to the engine room was restricted to those with good reason to be there and the most dangerous moving parts were, to some degree, guarded by the handrails I'm going to describe in this part. On the model the handrails are 1/16" stainless steel rod and the supporting stanchions from the same material at 5/32" diameter. The colour of the stainless isn't quite right for the period, but I don't have a 1/16th scale engine tender to go around polishing them and the resistance to rusting should greatly reduce cleaning in the future.

The stanchions, **fig. 56**, were formed on the end of a length of rod held in a collet starting with centre drilling the end, **photo 368**, then pulling out sufficient length to turn in the taper, **photo 369**, the tool was removed so the whole part can be seen. With the stanchion still firmly held it was a good time to polish the surface, another time when Garryflex blocks showed just how good they are. On the flywheel stanchions the stock was pulled further out to turn in the upper taper then the piece was parted off, **photo 370**.

Drilling the holes for the rails requires a simple jig, **photo 371**, made from a length of ½" square stock with 1/16" holes drilled at the correct heights and two grub screws located where needed to clamp each of the two lengths of stanchion. Arnold Throp showed the stanchions at the ends of a run of rail with the holes only part way through, but I reduced the number of different parts (and simplified assembly) by drilling all the holes all the way through. **Photograph 372** shows the crank corner of the railings with the oil pot mounted on its post and the oil splasher clipped to the rail; **photo 373** shows the same corner on the 1902 J & W McNaught engine in the

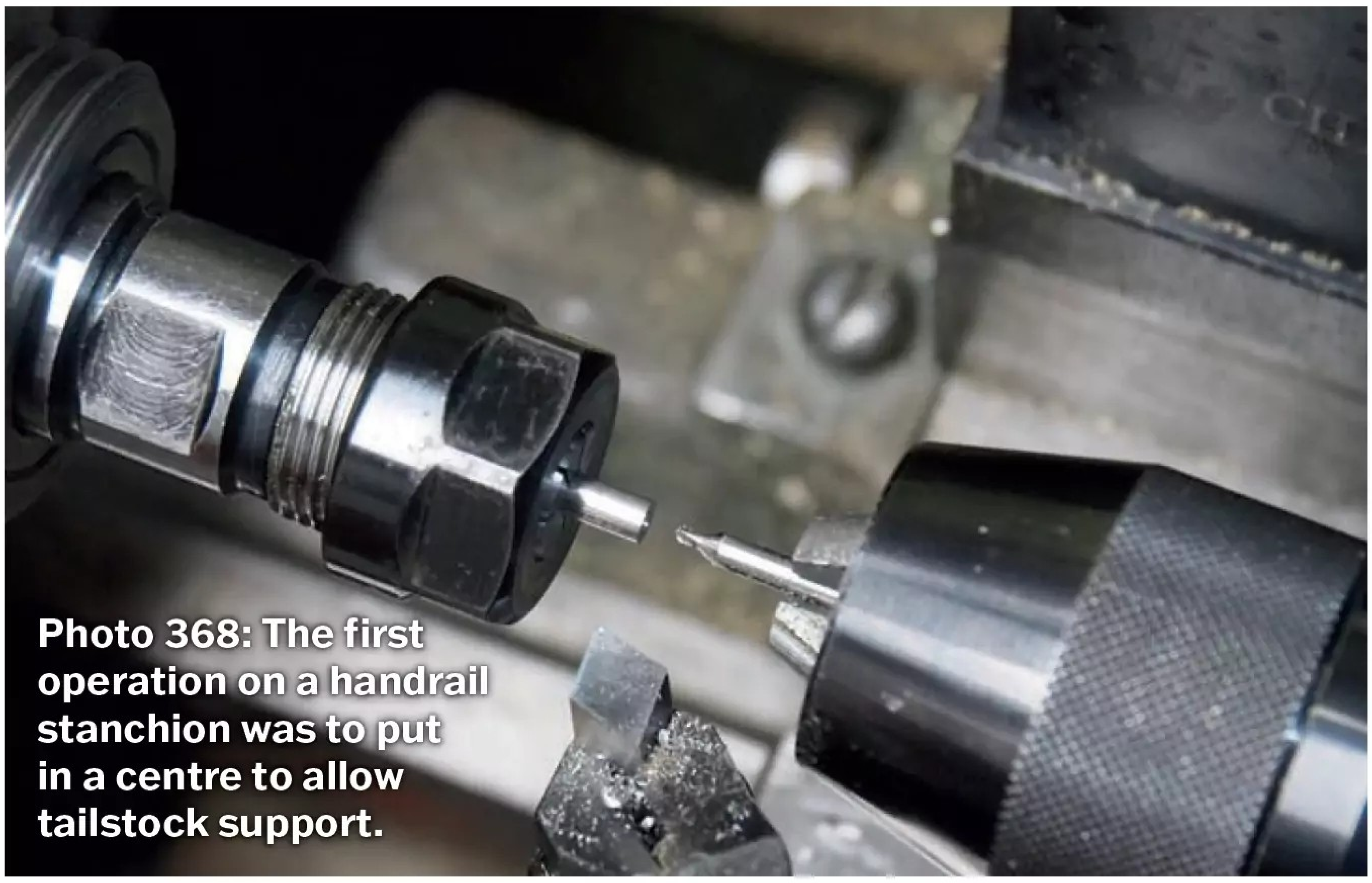


Photo 368: The first operation on a handrail stanchion was to put in a centre to allow tailstock support.

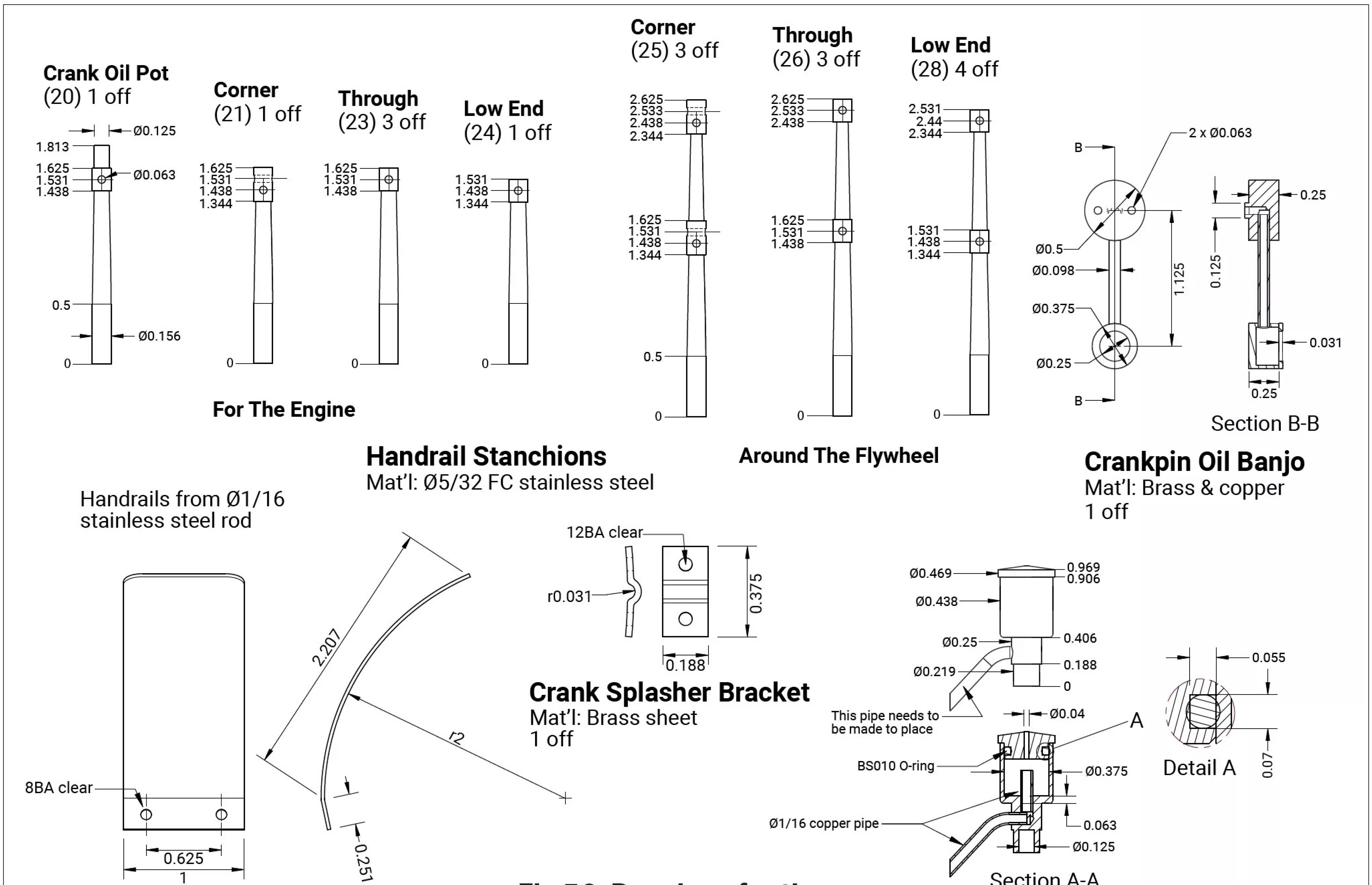


Fig 56: Drawings for the handrail stanchions and crankpin oiler.

Bolton Steam Museum. This picture also shows two alternative styles of stanchion; there are many more styles to choose from in the full-size world if you want something different. If you ever get the chance to visit the Bolton museum you should do so, the collection is impressive and the volunteer staff knowledgeable and helpful.

The little brass clip that secures the crank oil splasher to the rails needed to have a neat arch formed to grip the rail and I made a form tool for this. **Photograph 374** shows this being made on a bit of rectangular stock. A 1/16" hole was drilled and then slightly more than half the diameter milled away. A bit of rod was used as a tool to force the thin brass sheet into the depression. The holes in the splasher were drilled with it still in the flat, **photo 375**, then it was bent around a piece of 2" round bar held in the vice. These bits are drawn out in **fig. 56** and their positions diagrammed on **fig. 57**. The numbers used to identify each stanchion are those used on the original drawings.

The crankpin oiler is a collection of little bits of brass and copper, **photo 376**, also on fig. 56, all of which are easy enough to make except the bent feed pipe which caused a lot of muttering until I got it pointing into the right place. I didn't look for a thinner pipe to use here but it would make life a lot easier, as long as you could bend it without closing it up completely. If you look back to **photo 373** you can see how thin the real pipes were relative to their length. **Photograph 377** is of a display of full-size banjos on a wall at the Bolton Steam Museum.

Photo 369: A shallow taper was turned on the stanchion and it was polished with Garryflex blocks...

Just about the last bits needed for the engine are the steam and exhaust pipes. Here there are a few decisions to make:

- Is the engine ever going to run on steam or only on compressed air?
- Are you going to model prototypical pipe trenches or hide a lot of the pipework inside the base?
- How are you going to represent the pipe lagging?
- How are you going to represent the many 8-bolt flanges?

If you decide to use only air, then pipe joints can be sealed with adhesives (medium strength Loctite or epoxy) which makes small adjustments to spacing easier. **Figure 58** shows the pipe runs and flanges as drawn by Arnold Throp and originally made with separate lengths of pipe with flanges soldered on. The flange dimensions are all correct, but any pipe lengths given are indicative only and if you go that way some careful measurements will be needed. For running on steam this approach might be necessary although JB Weld might also resist the temperatures.

Some pipes could be hidden below the base which reduces the amount of work, but you still need to finish the appearance of the pipes that are visible. From historical pictures of full-size engines (George Watkins' books are good sources) pipe lagging came in several forms, painted plaster (asbestos?), wound layers of fabric, or what looks like cotton waste clad in steel. All types stop short each side of the flanged joints to allow the bolts to be inserted. Metal flanges are really needed for connections to the cylinders but those on the pipe runs can be dummies and this was my approach. I drew up a dummy flange pair, one half with bolt heads and the other half with the nuts and a bit of bolt showing, and 3D printed these in PLA,

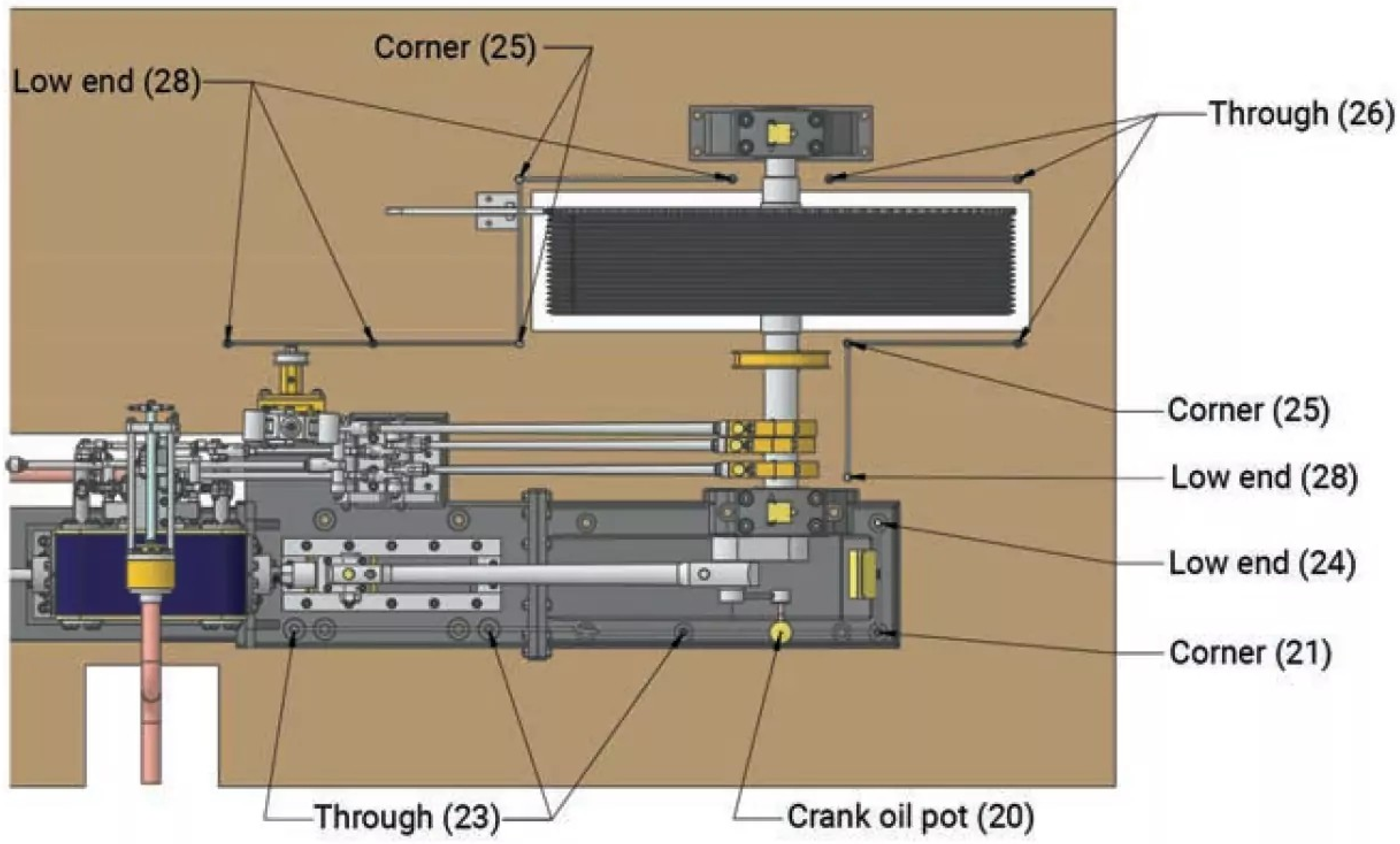


Fig 57: Handrail layout.

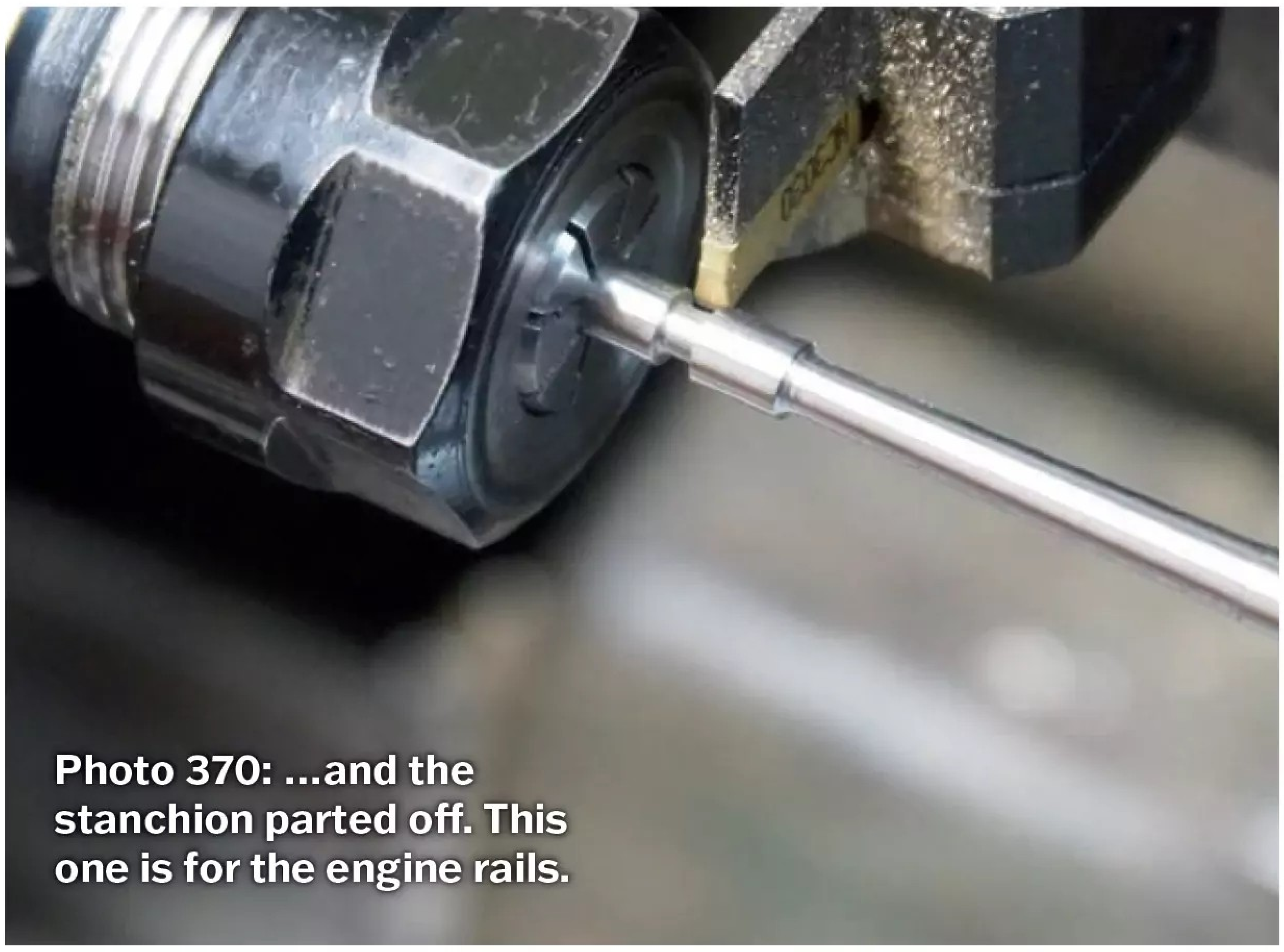


Photo 370: ...and the stanchion parted off. This one is for the engine rails.

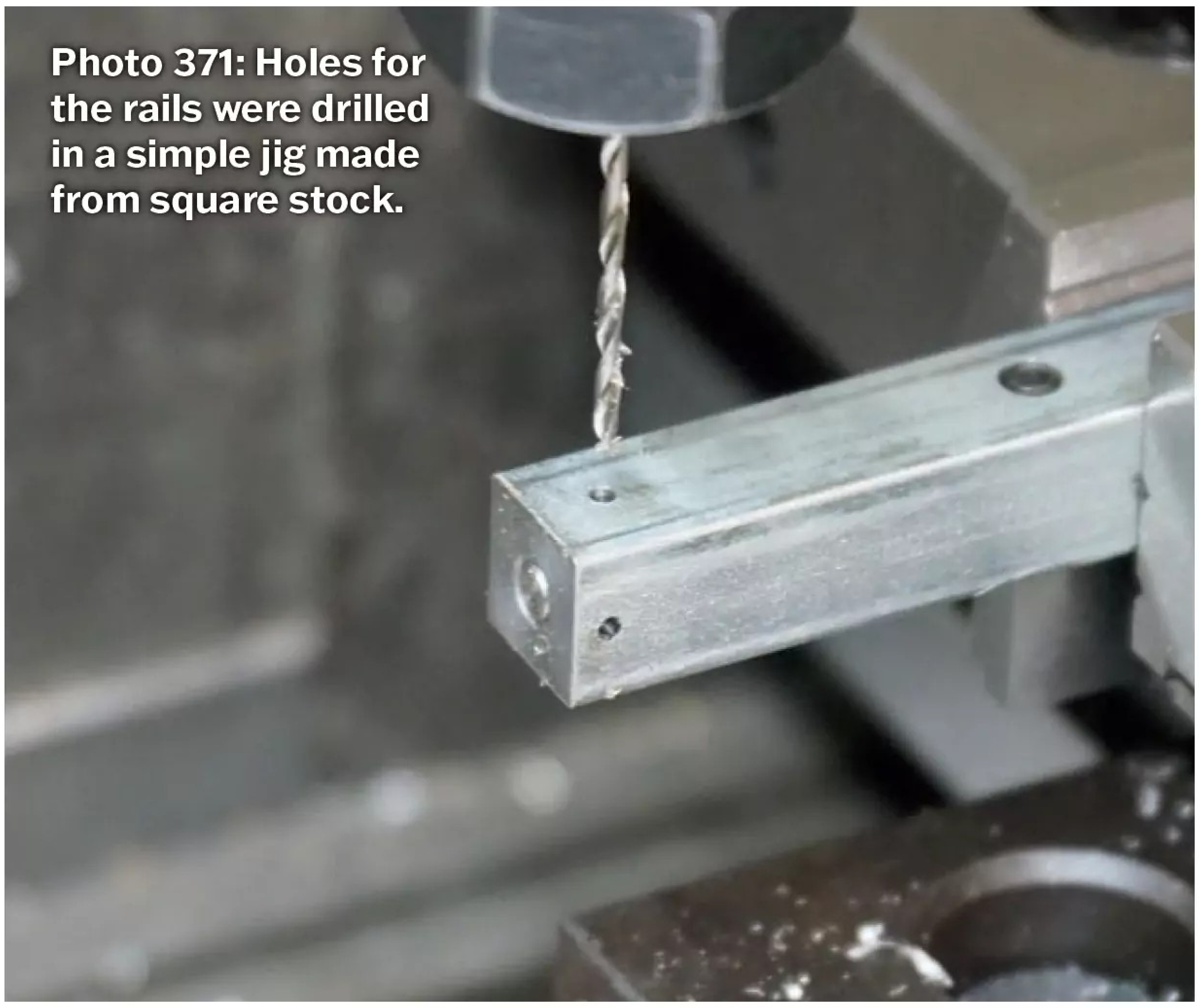


Photo 371: Holes for the rails were drilled in a simple jig made from square stock.

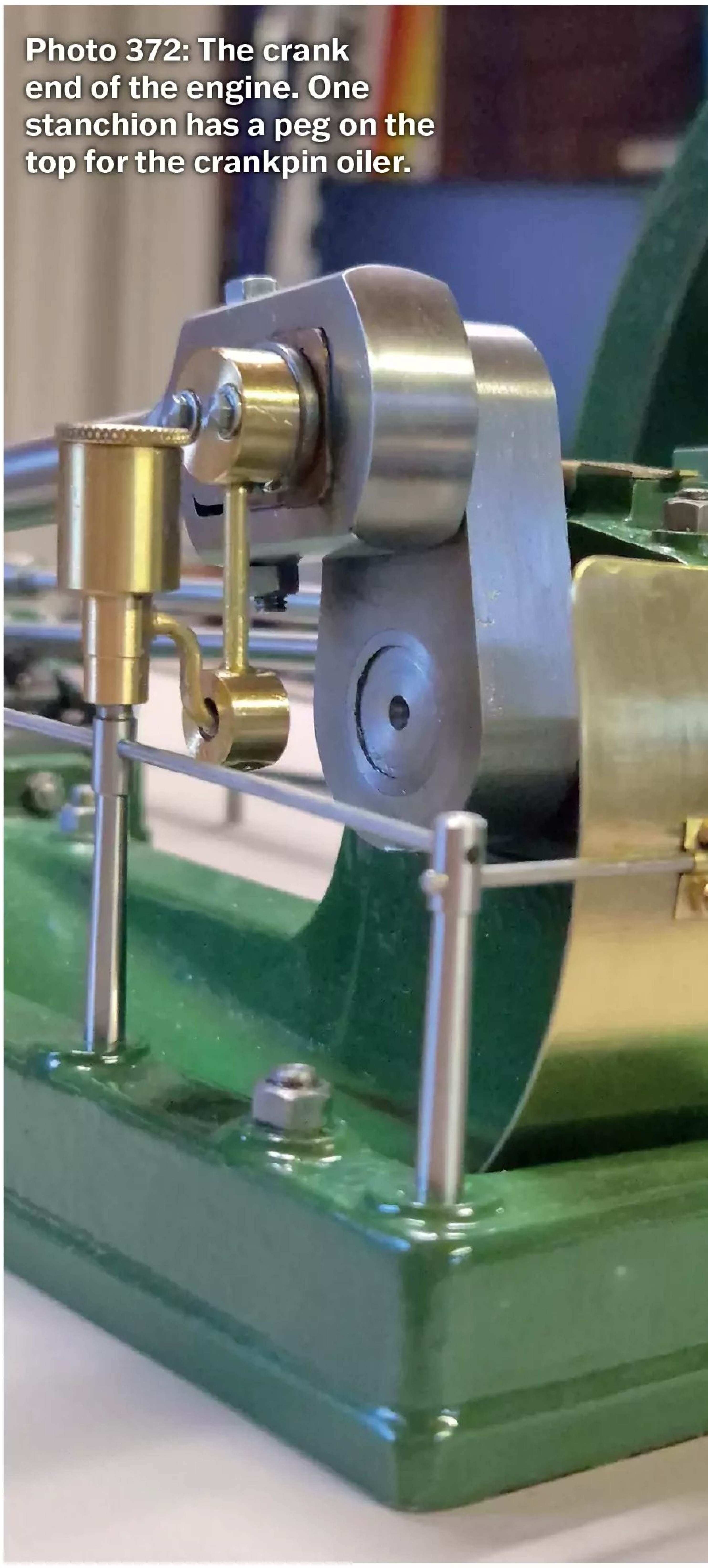


Photo 372: The crank end of the engine. One stanchion has a peg on the top for the crankpin oiler.

Photo 373: The same view as Photo 372 but of the 1902 J&W McNaught tandem compound in the Bolton Steam Museum. Two alternative styles of stanchions are visible.

Photo 374: A very simple tool was made to form the little clamp that hold the crank oil splasher to the handrail. Just a 1/16" hole with slightly more than half the diameter milled away.

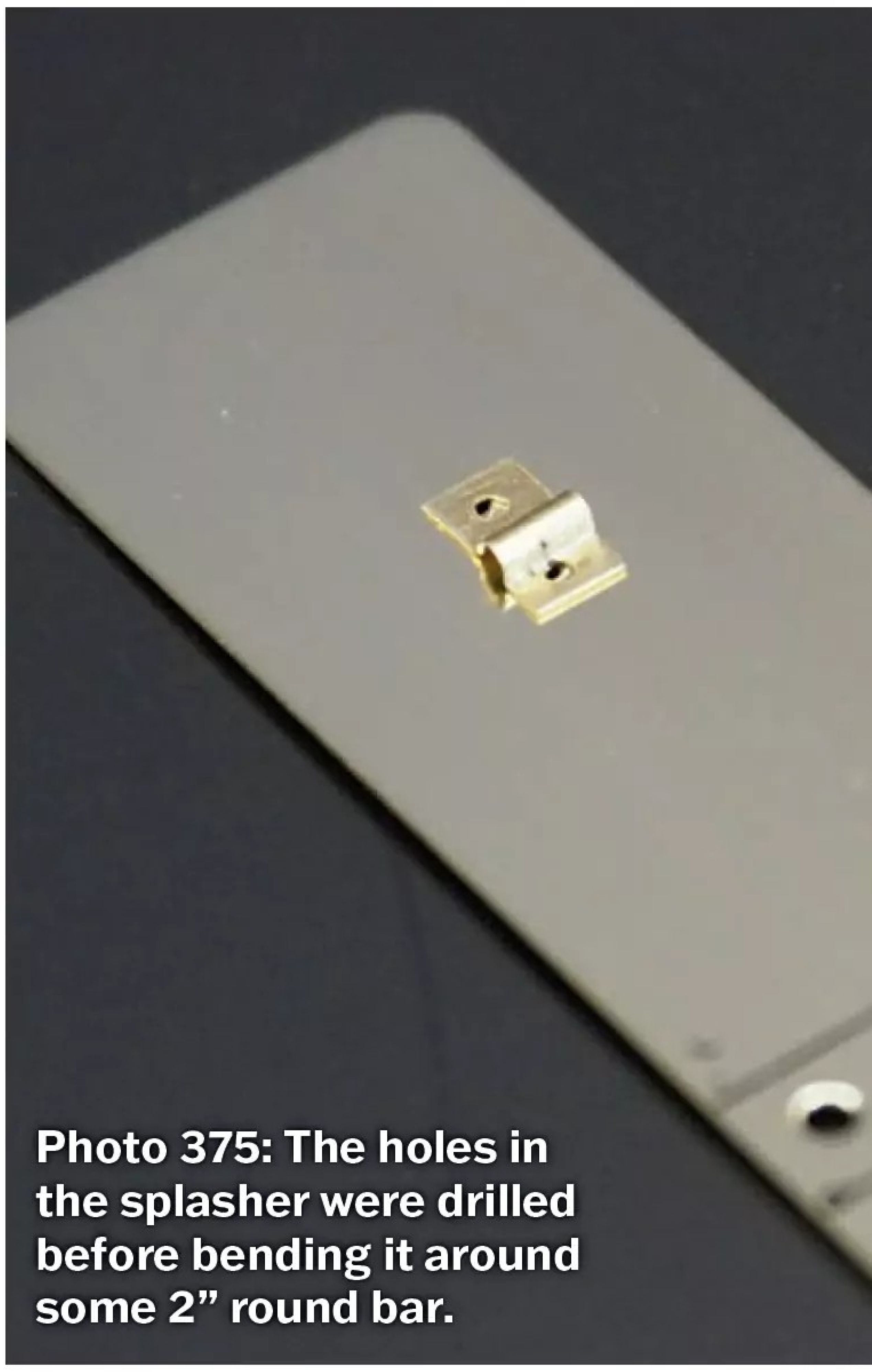


Photo 375: The holes in the splasher were drilled before bending it around some 2" round bar.

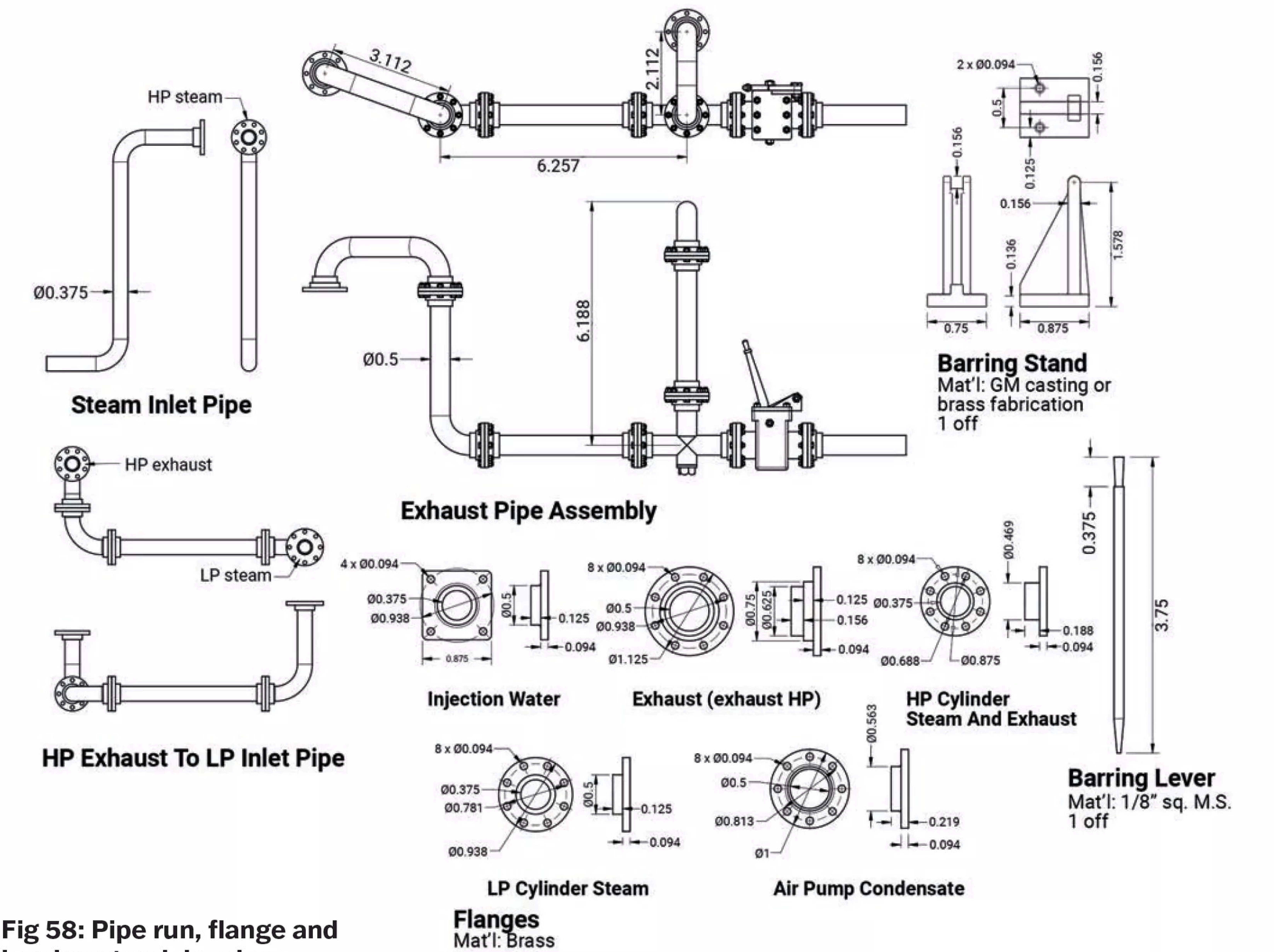


Fig 58: Pipe run, flange and barring stand drawings.

photo 378, these look better after some primer. Still better appearance would come from finer resolution prints from a resin printer, but I don't have access to one. The lagging was 3D printed in halves, **photo 379**, then, after slipping on the dummy flanges, super-glued together around the pipes. The pipe runs from the HP to the LP cylinders and from the LP cylinder to the air pump are shown in **photos 380** and **381** respectively. After I dropped the part on the workshop floor the internal detail in **photo 381** became visible; this was a good chance to get a picture of the insides. The stl files for the flanges and pipe cladding are available on the ME&W website, tinyurl.com/4hc4kx9w.

That concludes the construction of my model, in the final parts of this series I will explain how to adjust and run the engine, not a trivial exercise when dealing with the complexities of Corliss valve gear.

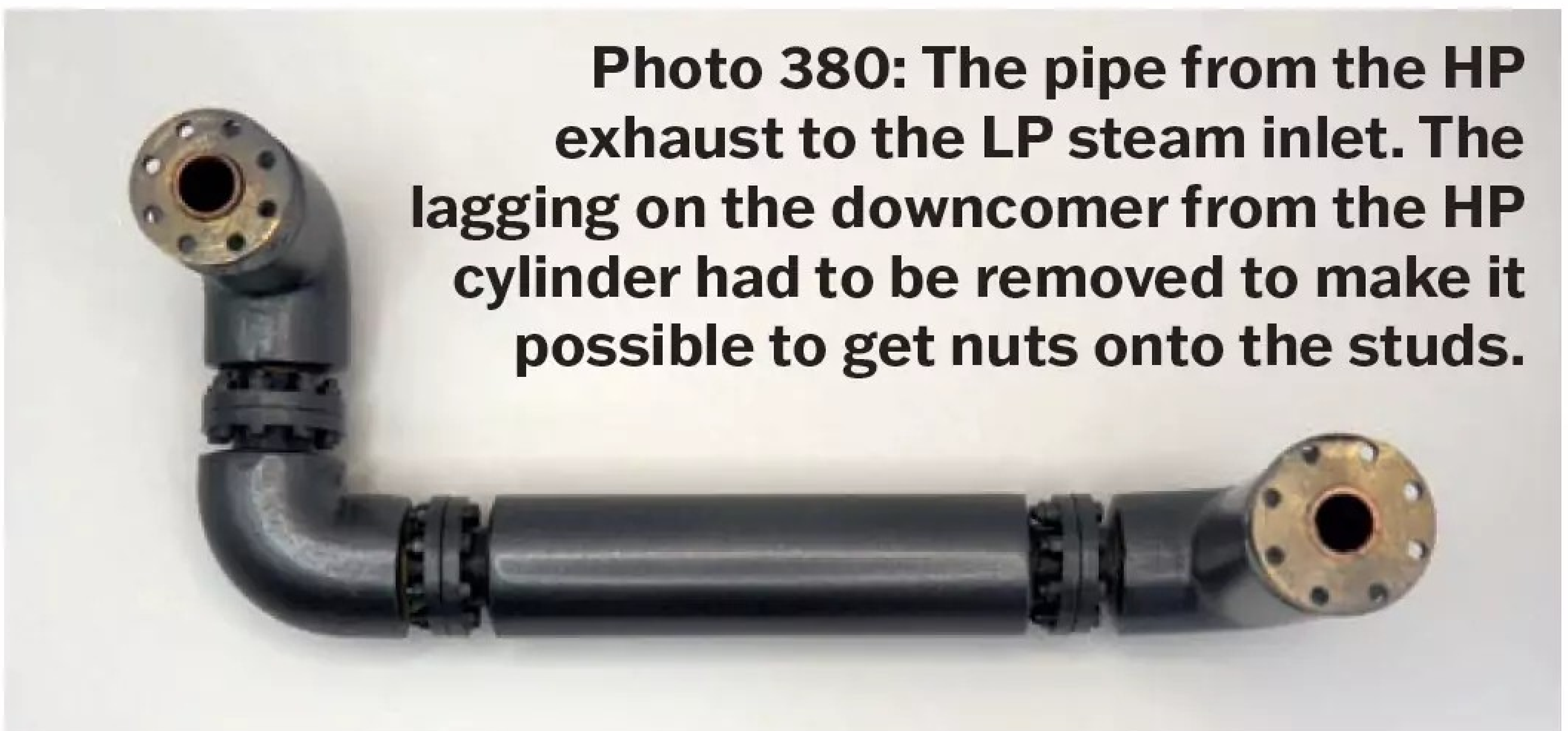
To be continued

Right - Photo 377: A selection of full size banjos in the Bolton Steam Museum.

Photo 376: The parts for the crankpin oil pot and the banjo that carried the oil in.

Photo 378: The two halves of a dummy flange joint.

Photo 380: The pipe from the HP exhaust to the LP steam inlet. The lagging on the downcomer from the HP cylinder had to be removed to make it possible to get nuts onto the studs.



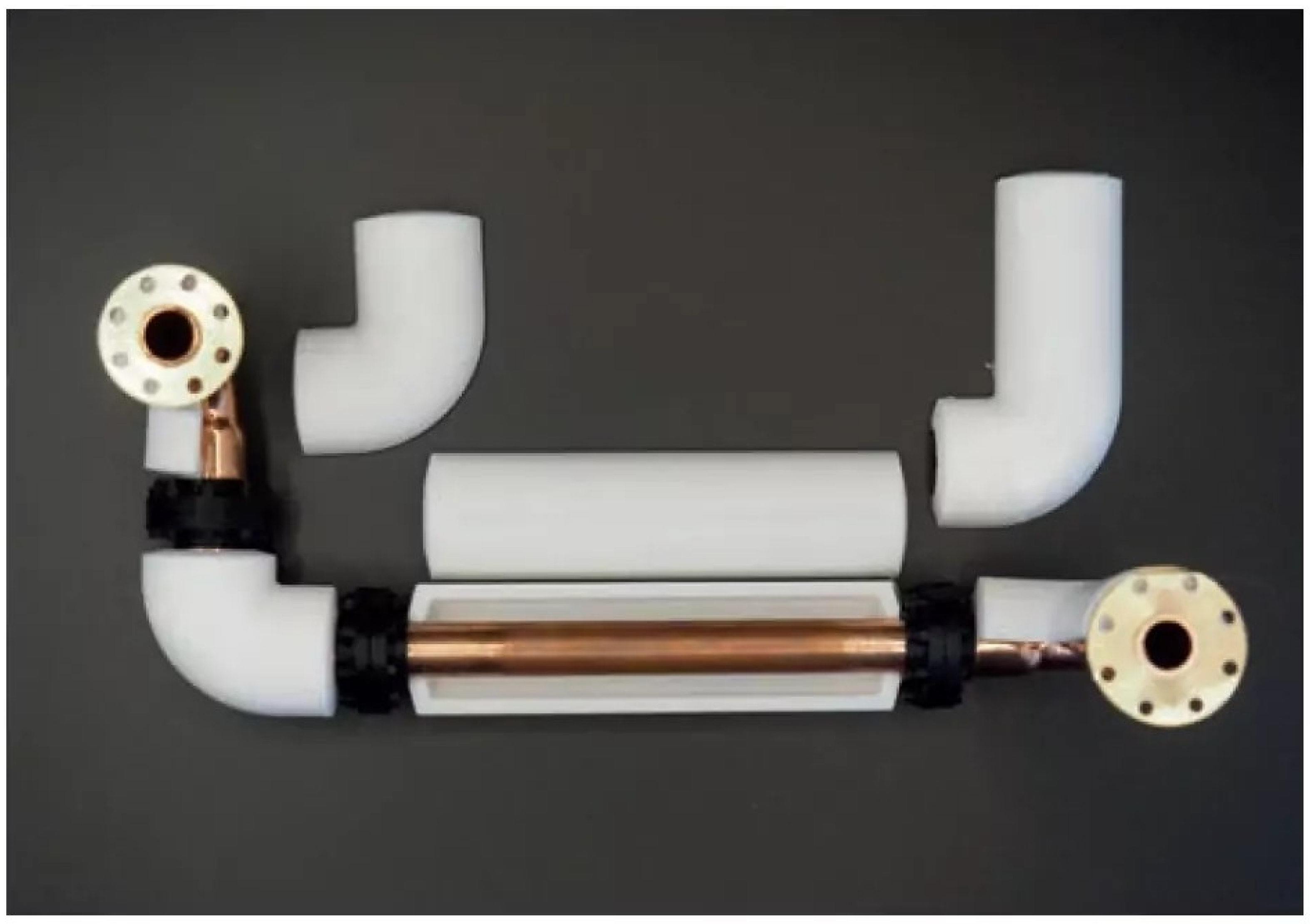
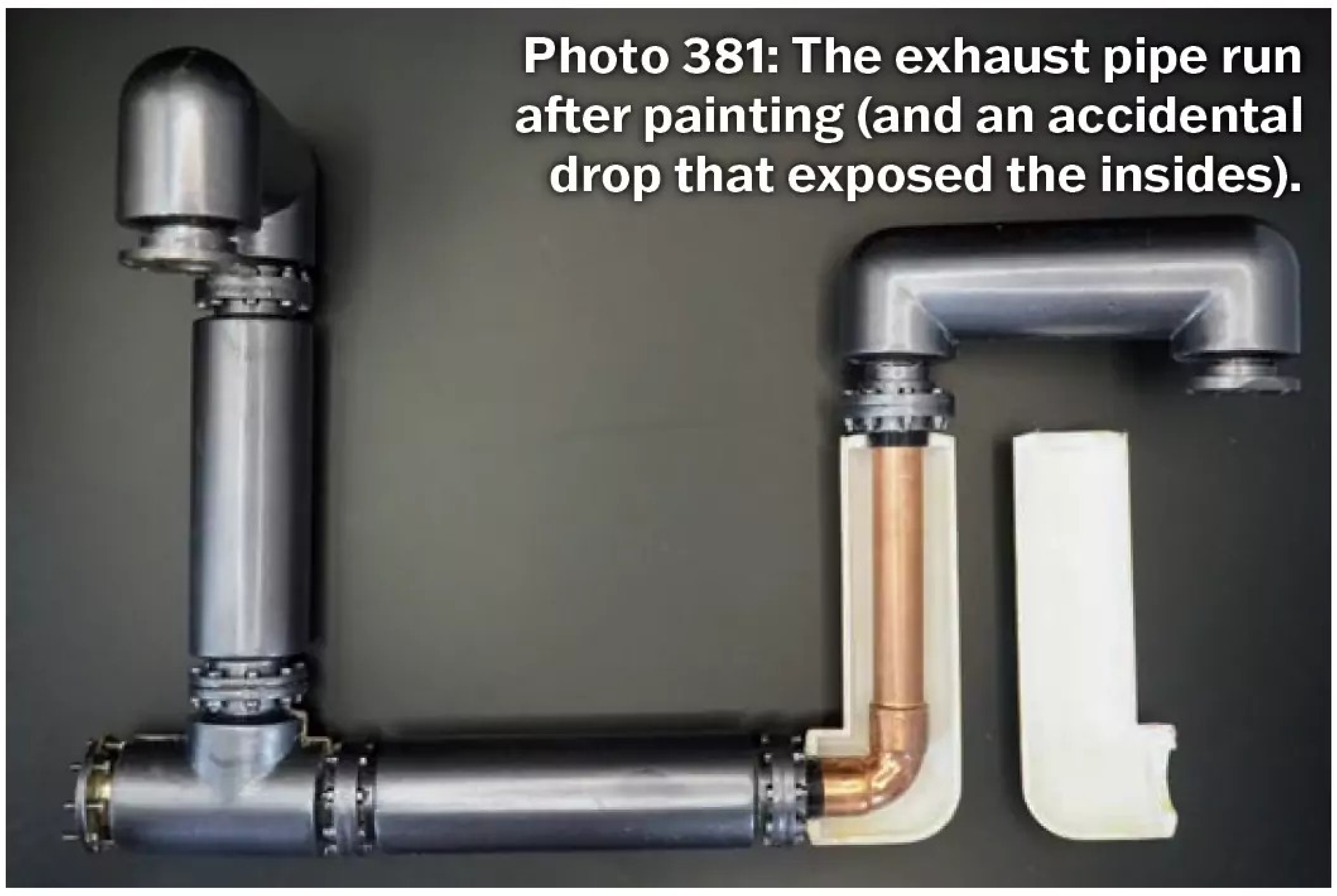


Photo 379: The pipe run from the HP to LP cylinders under construction. The dummy flanges have been slipped onto the pipe before making the joints and the 3D printed pipe lagging is ready to glue together.

Photo 381: The exhaust pipe run after painting (and an accidental drop that exposed the insides).



Jason Ballamy uses a range of new approaches in the workshop.

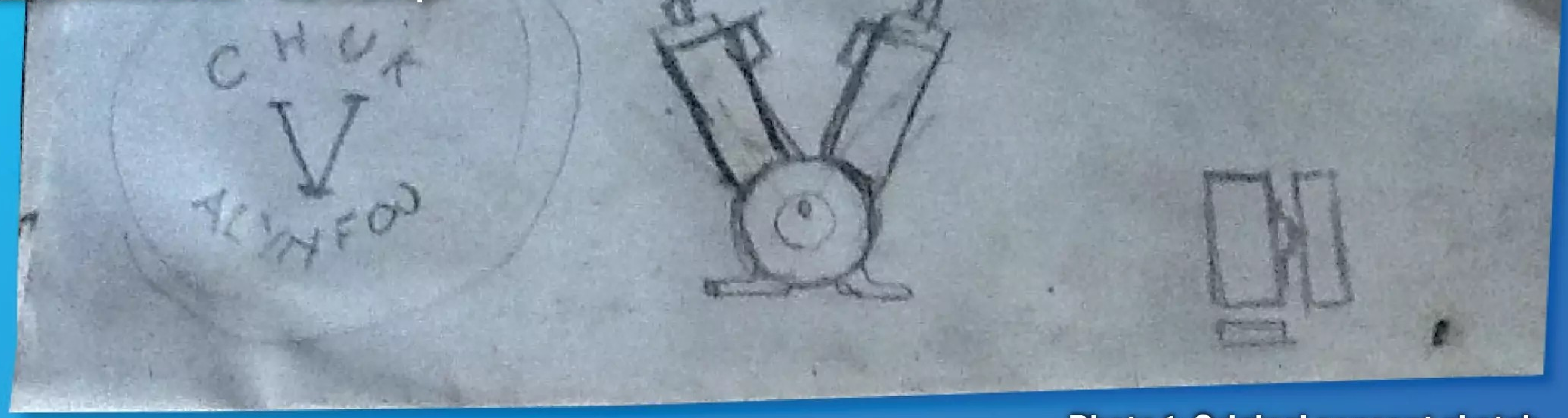


Photo 1: Original concept sketch

Embracing New Technologies - From Concept to Completion

Unlike the previous example, which was a freelance design, many of the items that are likely to be made in the home workshop are copies or scale renditions of something that already exists, such as a worn or missing part that needs replacing or an engine to be modelled. In these cases, use can be made of reference material that can be found in archives or with some trawling of the internet, the following are some examples.

HISTORIC PATENT DRAWINGS

These can be a good basis for recreating something in miniature as they tend to have most of the important parts shown and are invariably square on elevations, plans and sections. The first thing to do is download a copy of the patent and then make an image file such as a .jpg of that which can be imported into a suitable CAD program. A scale can then be decided upon or as is often the case the size of a certain part will dictate a scale for example you may want to use a flywheel or cylinder bore of a certain diameter, sizing the rest to suit. The imported image can then be scaled so that the component is actually your chosen size which allows further dimensions to be taken from the patent and the 3D model built up as an assembly overlaid on the original image.

Photograph 17 shows such a patent for a Denny Improved Rider Ericsson engine where the bore was set to 40mm diameter and then all the other sizes taken off, to save clutter there were four such sets of measurements taken each for various aspects of the engine. As the individual parts were 3D modelled, they were

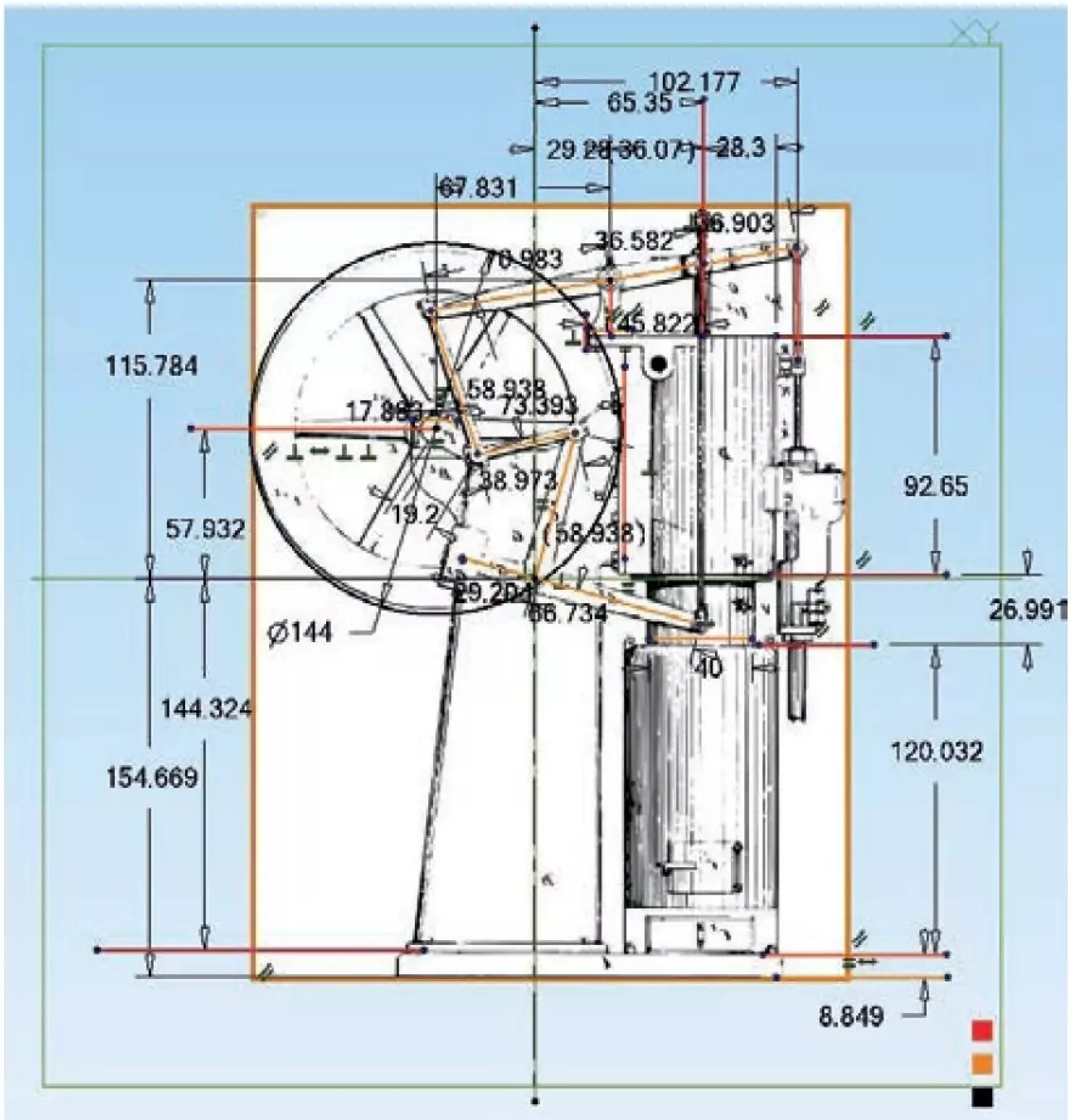


Photo 17: Scaled Patent drawing with derived CAD dimensions

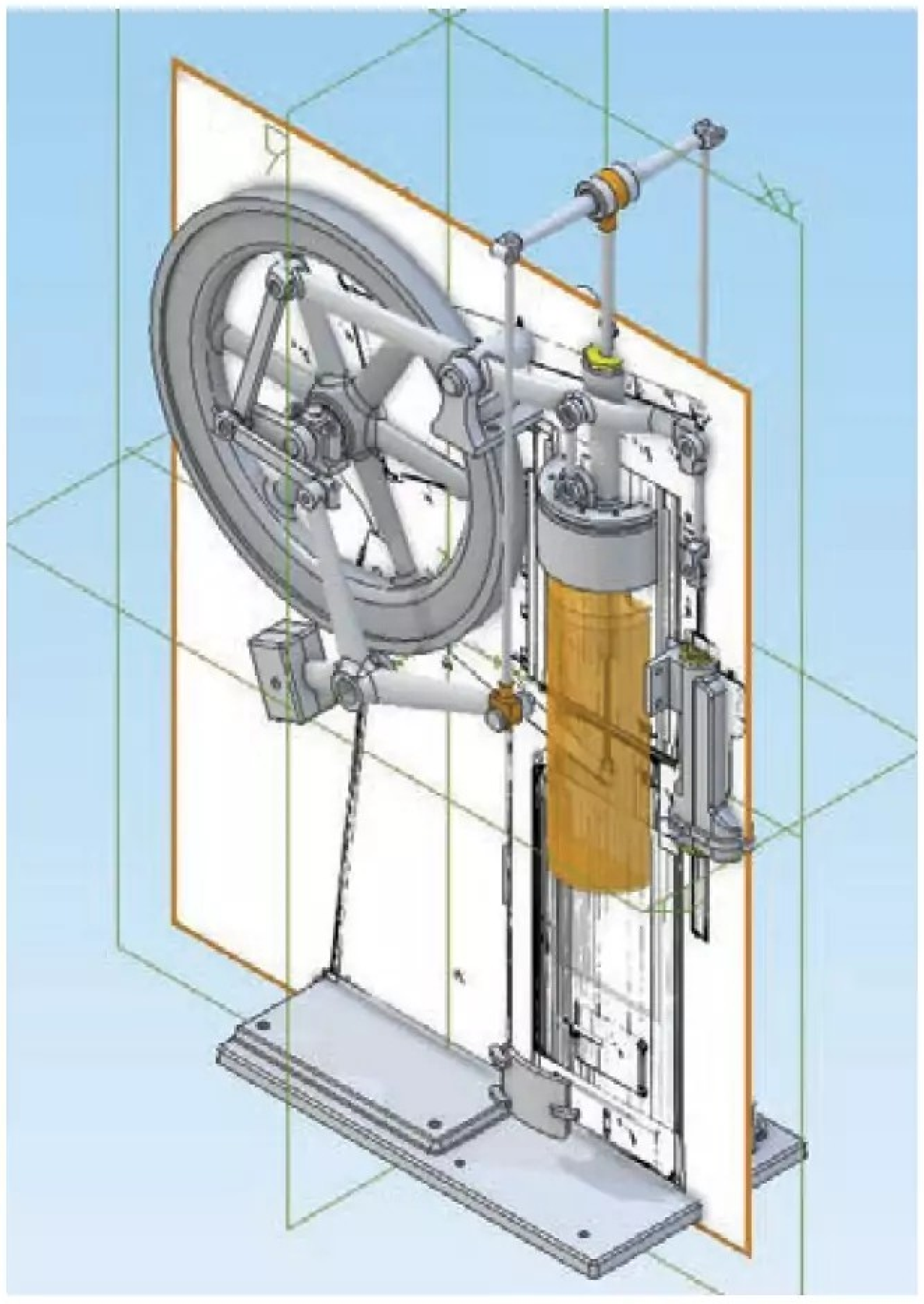


Photo 18: Part section overlaid on Patent

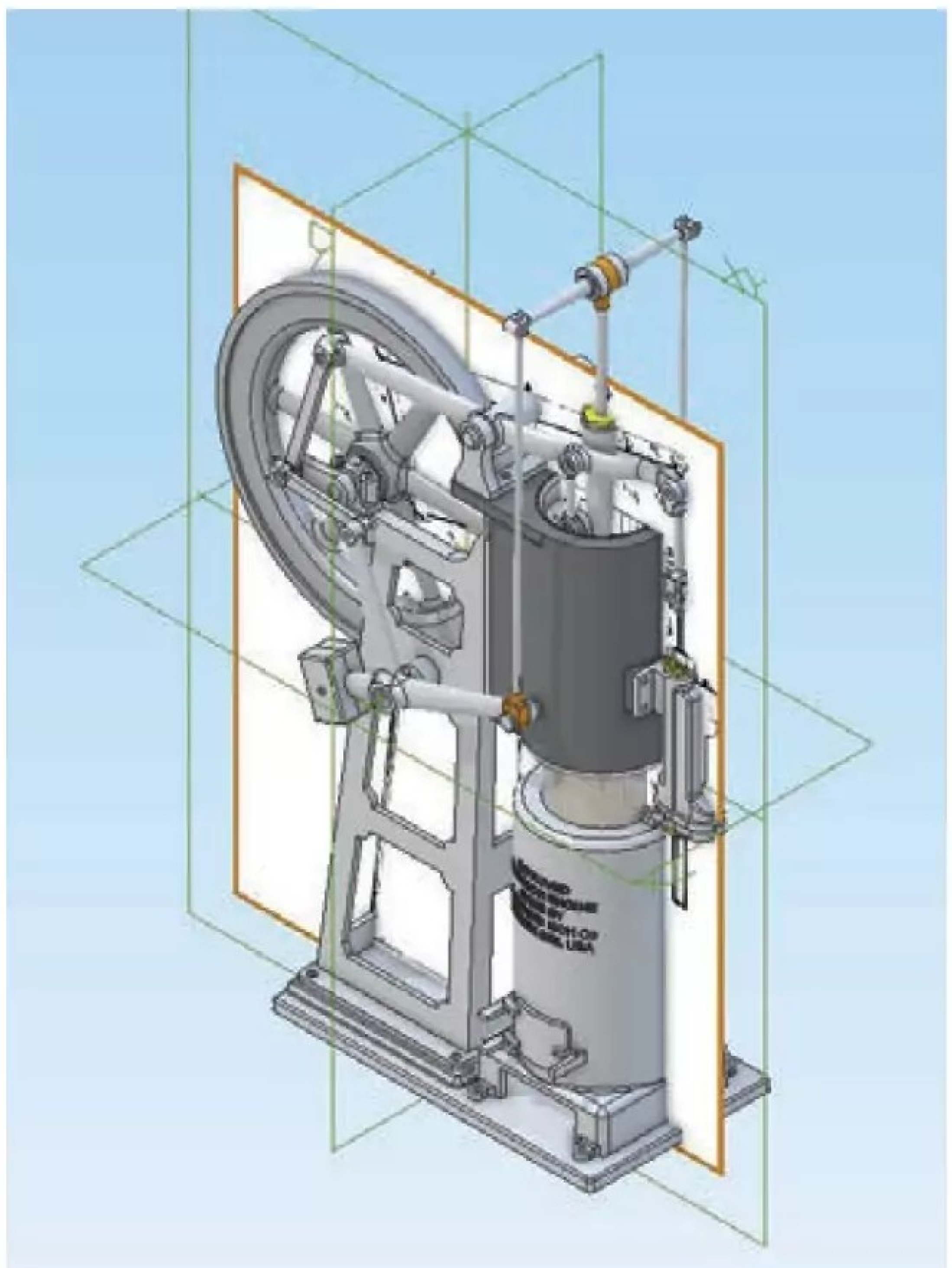


Photo 19: Completed design overlaid on Patent

added to an assembly and again using the imported image of the patent overlaid on that to check that they looked correct, **photo 18**. It is also possible to section individual parts or any selection within an assembly which again enables their details to be checked, **photo 19**. Finally if all has been assembled correctly the mouse can be held down on a chosen part to allow you to drag or rotate it and all the other moving parts will (hopefully) move with it in their intended directions.

PLANS AND DRAWINGS

Another source of reference material may be an old drawing, be that of a full size subject or some long out of production model. These are often easier as they are dimensioned

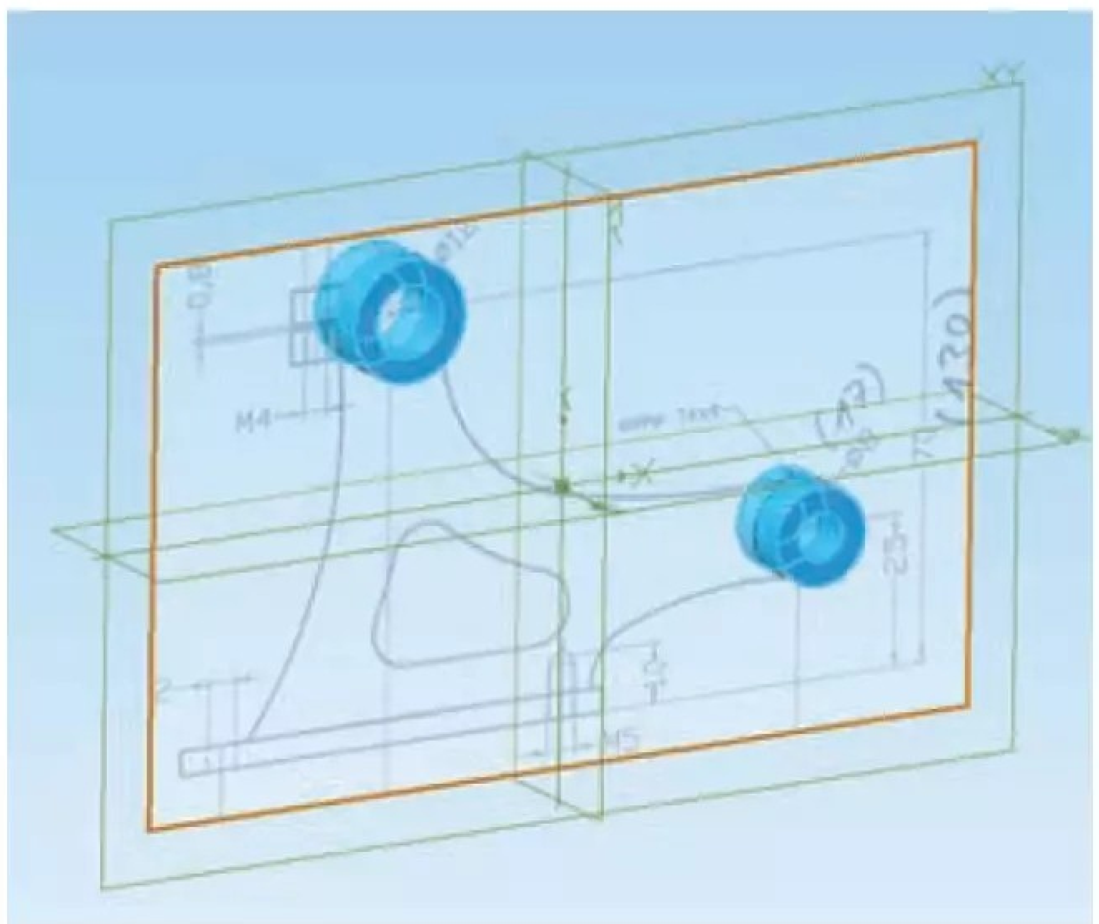


Photo 20: Dimensioned features added first

but, in most cases, where castings were used it will only be the machined surfaces and features that are dimensioned and the actual cast surfaces will be what needs to be determined.

The drawing can be scanned and then, like the patent, be imported and resized within the CAD software. Any dimensioned features should be modelled first and then the undimensioned ones built up around those.

Photograph 20 shows an imported drawing where two dimensioned bosses have been positioned relative to the bottom of the casting. The next stage was to draw the profile of the various features, **photo 21**, and extrude them as solids gradually building up the part until complete, **photo 22**.

PHOTOS AND ENGRAVINGS

These are another item that can be imported and used to create the 3D parts from, ideally a good square

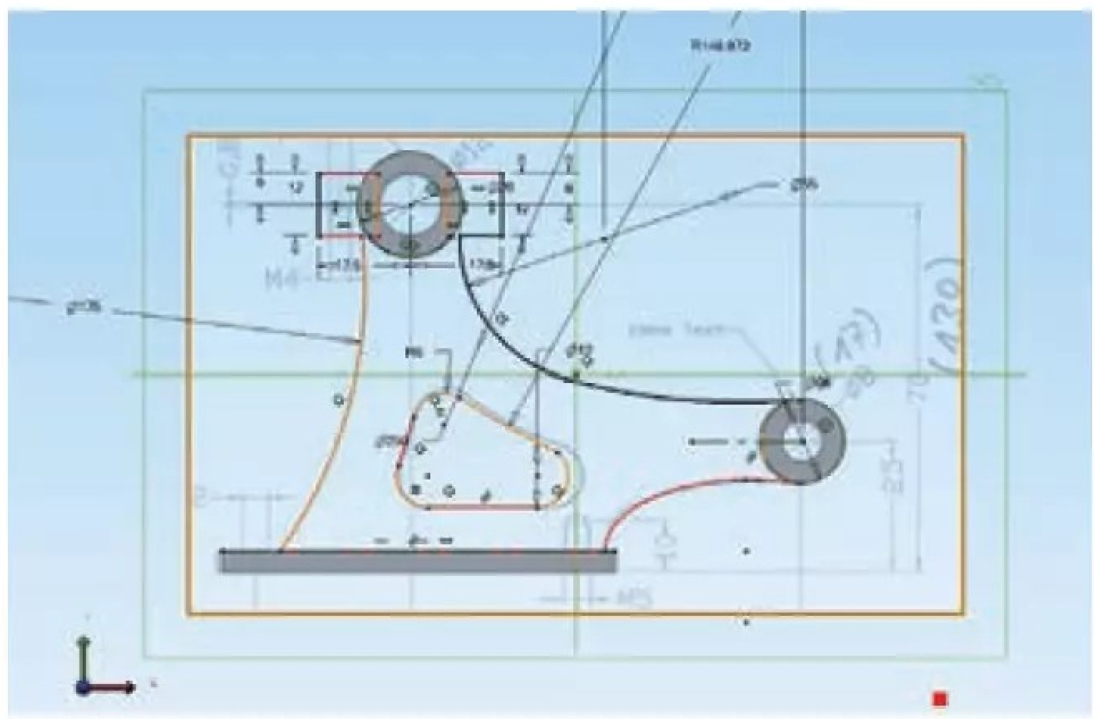


Photo 21: Undefined "cast" surfaces traced

on image is the best to start with, though often it will have been taken or drawn at an angle so allowances will have to be made.

Photograph 23 shows such as photo after scaling, overlaid with a series of lines to give the main dimensions of the various parts that make up the engine, **photo 24**.

MEASURING EXISTING PARTS

There are other cases where the physical part may exist, in which case most of us will take a series of dimensions from that to use as the basis for the 3D CAD model. With the advent of quick and easy communication it is now possible to find someone with the part who is in another part of the world and have them send you dimensions and photos of it. This is a method I have used in the past to recreate missing parts from full size engines, then sending full size drawings that can be cut out and checked against the engine that has the missing part before committing to making the part or pattern.

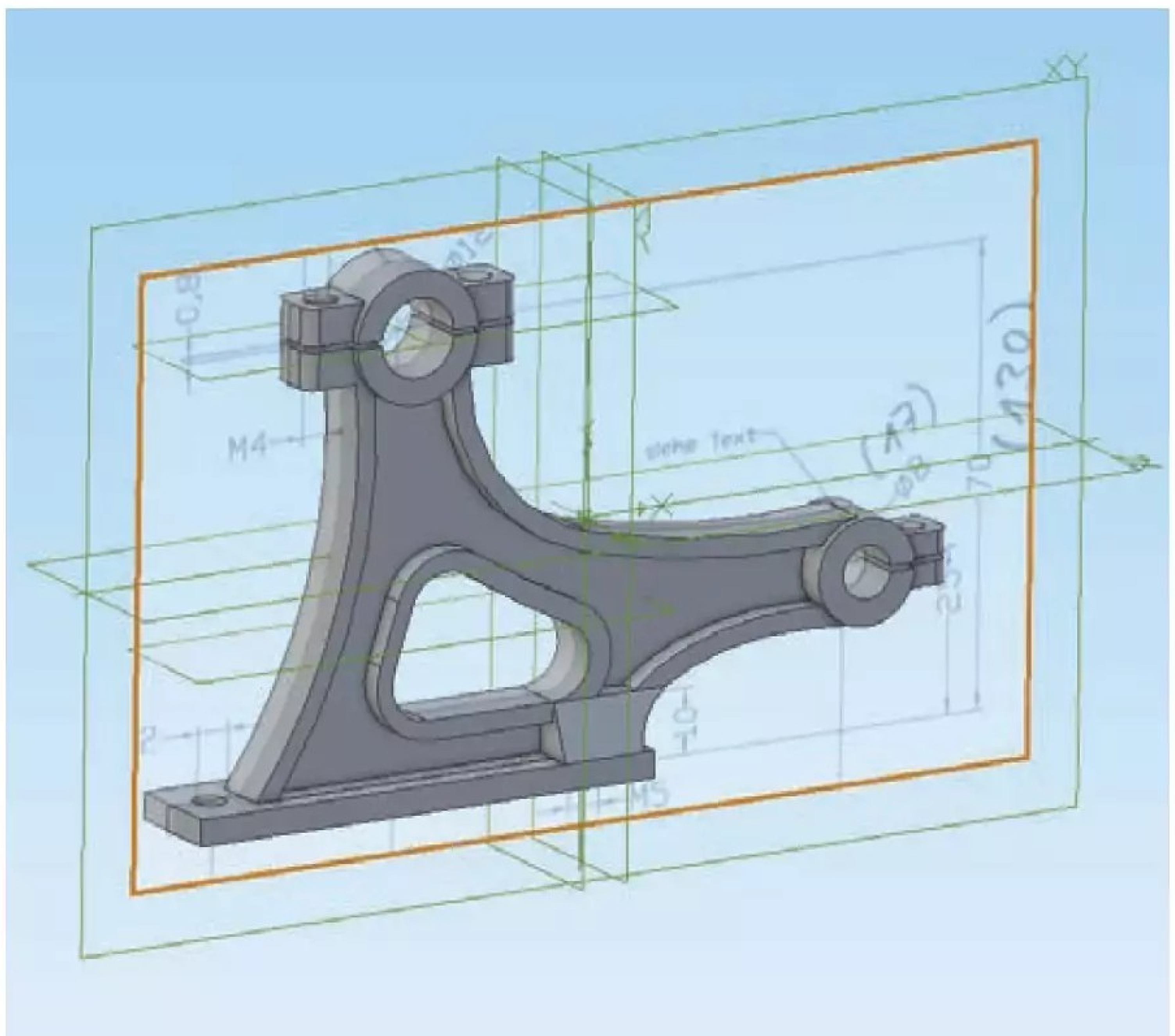


Photo 22: Completed 3D part overlaid on imported drawing

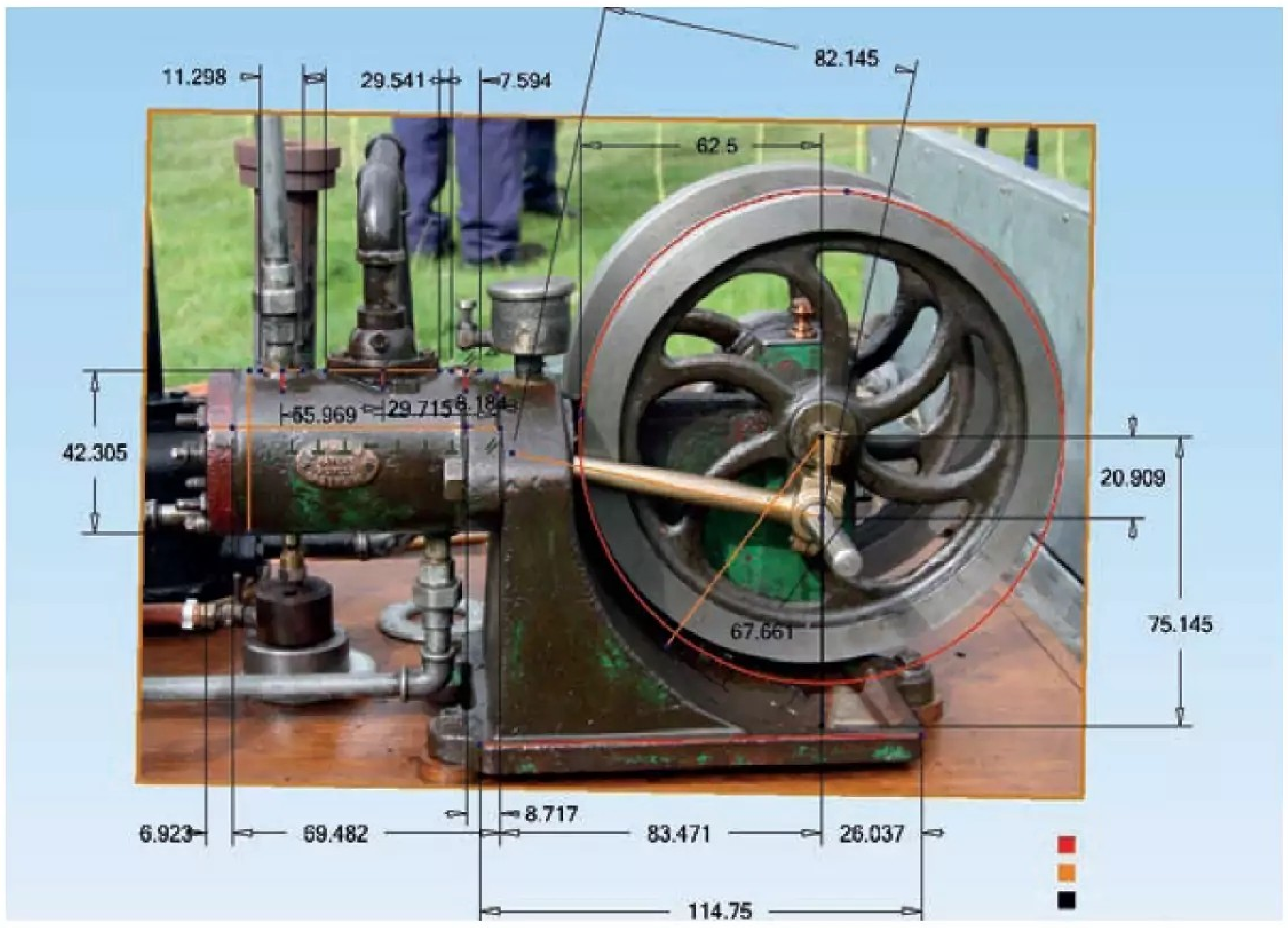


Photo 23: Scaled imported photo and derived dimensions

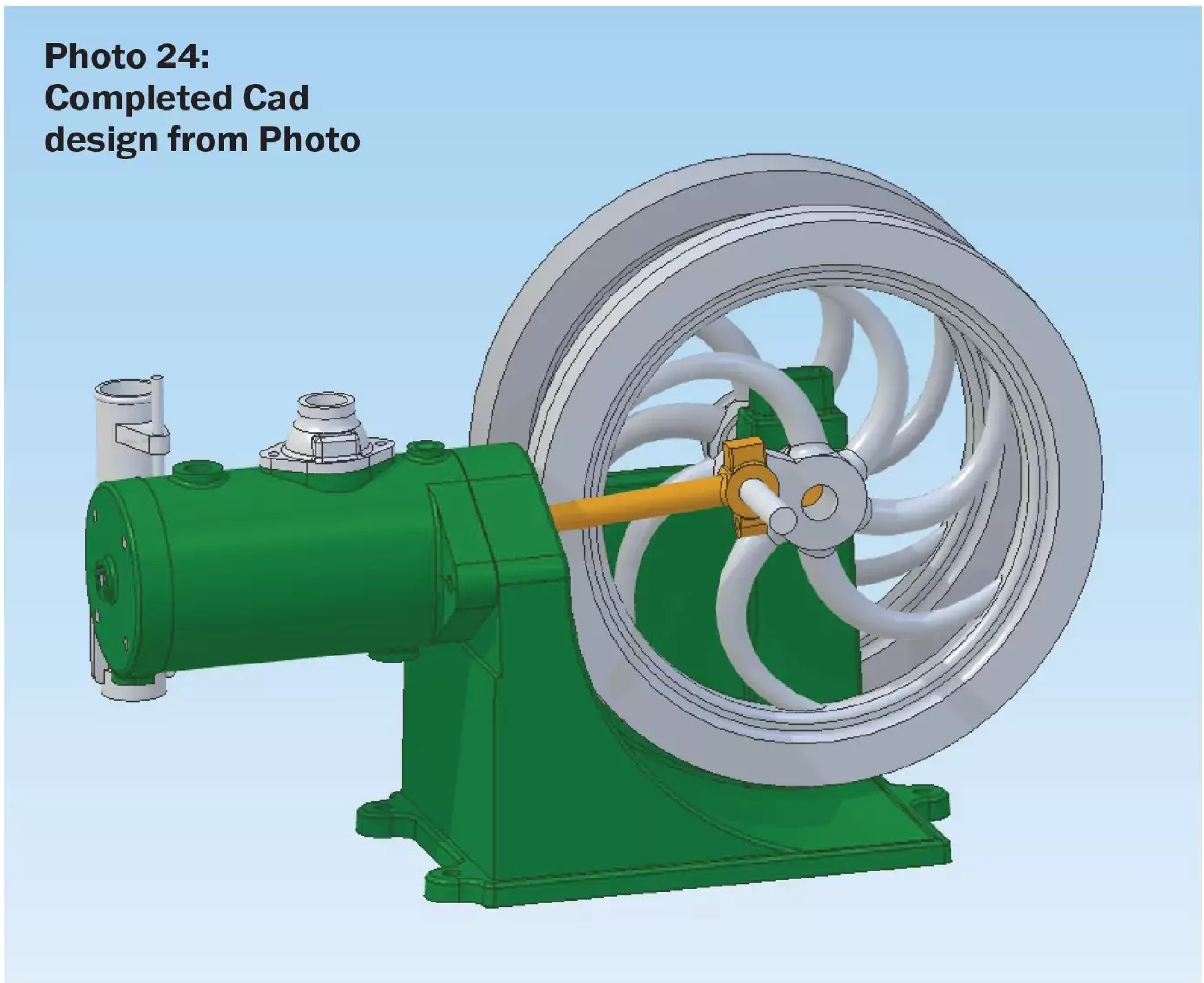


Photo 24: Completed Cad design from Photo

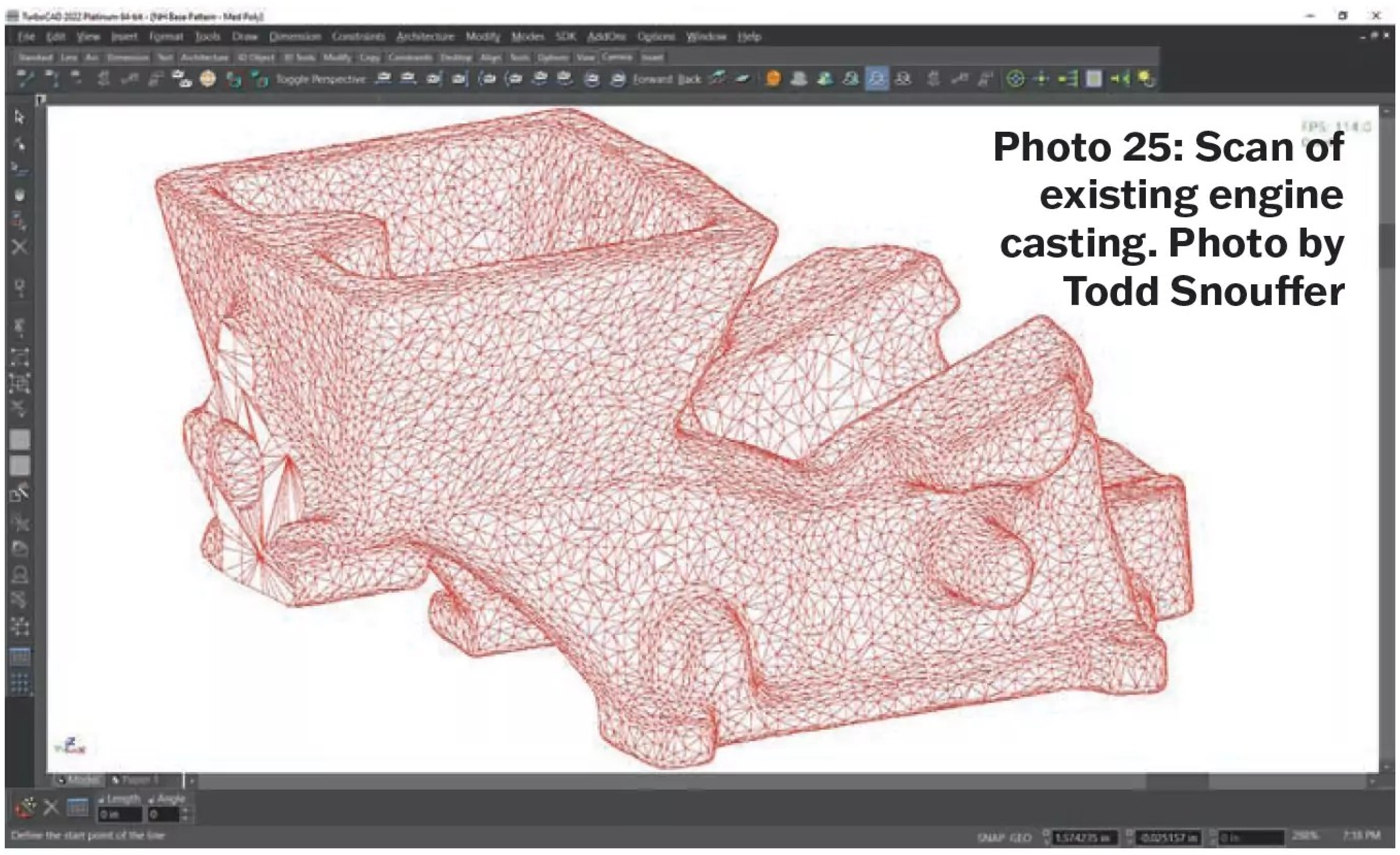


Photo 25: Scan of existing engine casting. Photo by Todd Snouffer

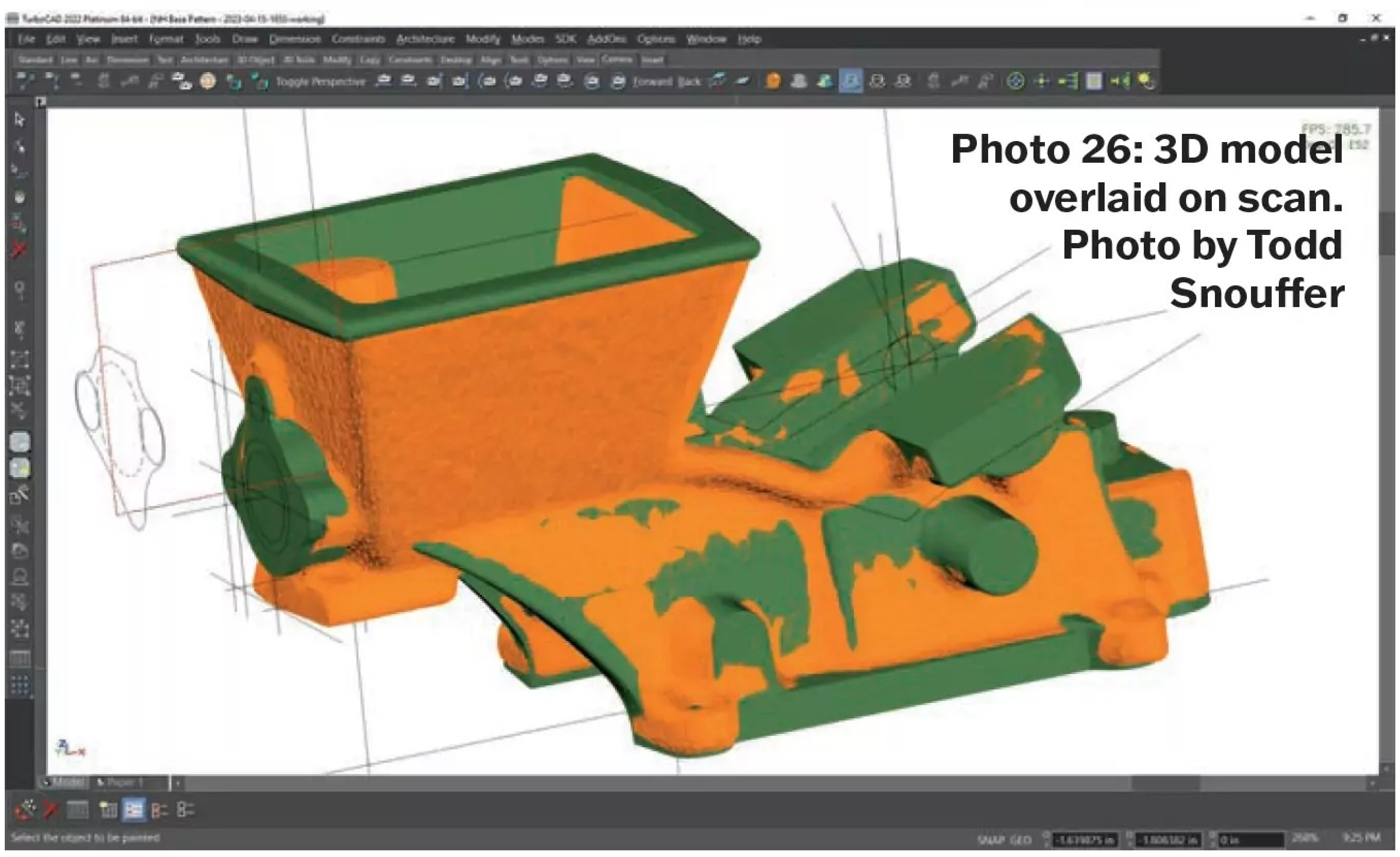


Photo 26: 3D model overlaid on scan. Photo by Todd Snouffer

3D SCANNING EXISTING PARTS

The more organic the shape of a part, the harder it can be to measure, but in this case 3D scanning can come to our aid. The following images were provided by Todd Snouffer of Littlelocos and illustrate his work in getting an old casting kit back into production. He manages to purchase the rights along with some patterns and inventory but the pattern for the main engine frame was missing, although there were a number of raw castings among the inventory. His approach was to 3D scan the casting and then import that into his CAD package and use that as his reference material.

Photograph 25 shows the mesh of the scan which it is possible to section through any chosen plane to check things like cores and wall thicknesses. As the new 3D modelling is done the old and new can be combined on the screen to show how they compare as per **photo 26**. Finally, the 3D model is separated ready for use to produce patterns, 2D construction drawings and lastly renderings. In this case the engine frame will be cast in a bronze alloy as the original kits were, though I doubt many builders will polish them up as much, **photograph 27**. More details are on Littlelocos' Facebook page.

MAKING THE PARTS

The example I worked through last month used the long-established pattern and casting approach to getting the desired part but as technology has moved on there are now other options.

CNC

The same process that was used for the earlier patterns is used to take the 3D designed part to g-code that CNC can make use of, with the only difference being the final material and specifying the cuts to suit.

Using one of the parts shown earlier that was created from an old patent, **photo 28** shows the top beam which has been imported into the CAM package that I use. The light brown is where I have specified the raw stock and positioned the part within the stock. **Photograph 29** shows the effects of the first adaptive cut and the remaining stock in green. The yellow, red and blue lines indicate the path that the end of the cutter has followed. The finished part after all the CNC work and the clamping blocks removed is shown in **photo 30**.

Even if you do not have CNC there are companies that provide an online service where a file can be uploaded and an instant quote obtained, in some cases this is not a lot different from the cost of a similar cast item. For lighter work then some of the small routers are a good way into finding out what CNC can do without excessive expense, or if you are that way inclined then the conversion of a manual machine is often cheaper than buying an outright CNC one.

3D PRINTING

Although the common PLA filament can be used for some parts it is not going to be as strong as metal, so its uses are limited. However, the current crop of 3D printers on the market are able to produce parts from a range of different plastics and even reinforced ones that open up further possibilities.

In a similar way that laser, waterjet and more recently CNC parts are available from various online suppliers it is now also possible to get parts 3D printed in various metals making the process more useful for actual models than the usual use of plastic parts for jigs and fixtures. Price is usually based on overall size but can still be comparable to castings particularly in the sort of size that may fit on your hand. **Photograph 31** shows the crankcase for a model two-stroke engine which is a better subject to relate to than the assorted toys that are often shown as what a 3D printer can produce. This was printed in aluminium using the SLM method where successive layers of metal powder are melted by laser to build up the part. The casting of an engine crankcase like this is approximately the same as you would expect to pay for an aluminium casting from one of the usual model engineering kit suppliers.

If you are curious about costings then an instant quote can be obtained after uploading a suitable CAD file, the crankcase shown was printed by PCBWay.

CASTINGS WITH ALTERNATIVE PATTERNS

Where multiple parts are required the CNC or 3D metal printing route can work out more expensive than using castings. However those castings do not have to be made in the traditional way. As shown earlier, CNC can be used to make patterns from many materials, even production patterns which would have been

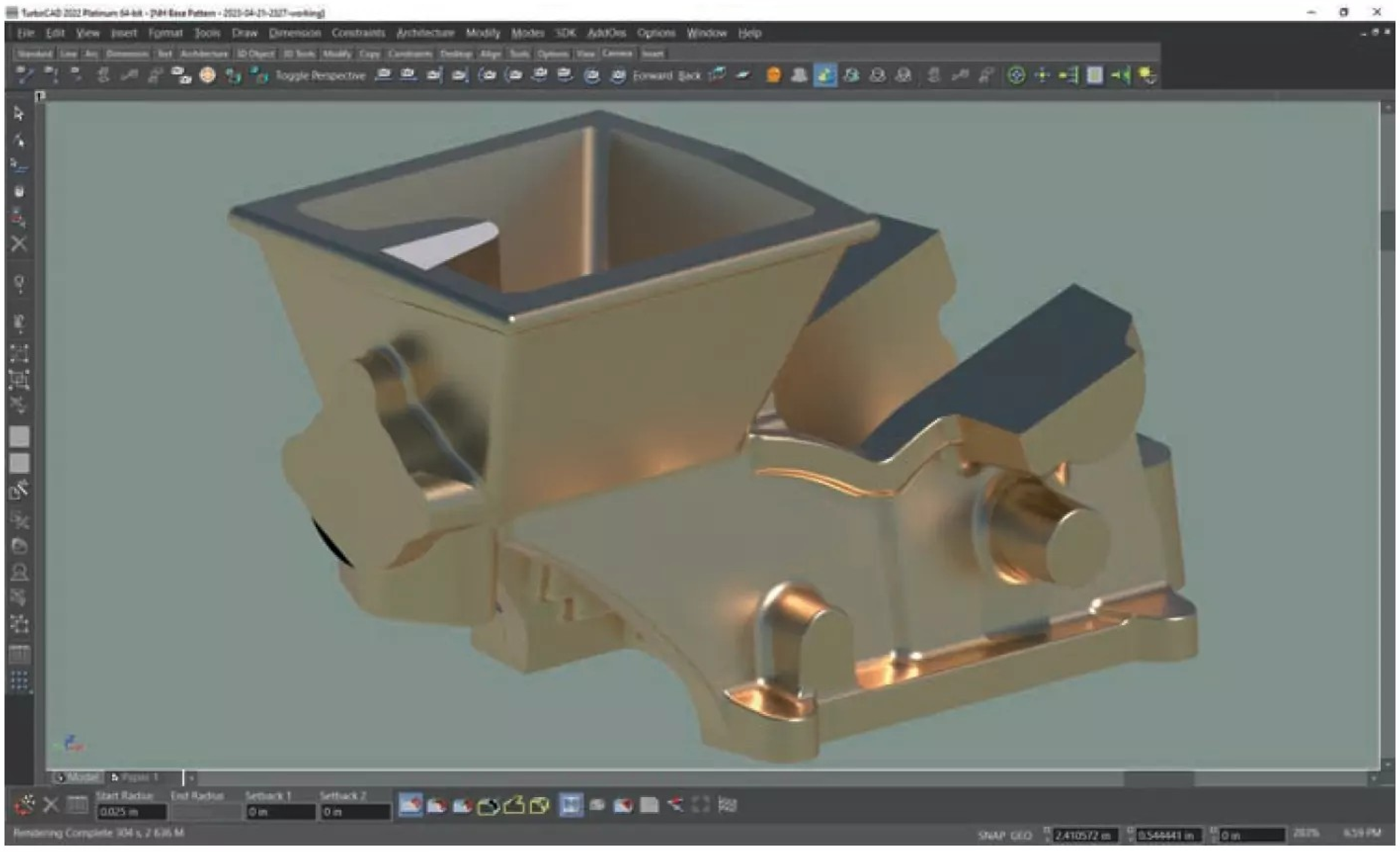


Photo 27: 3D rendered bronze casting Photo by Todd Snouffer

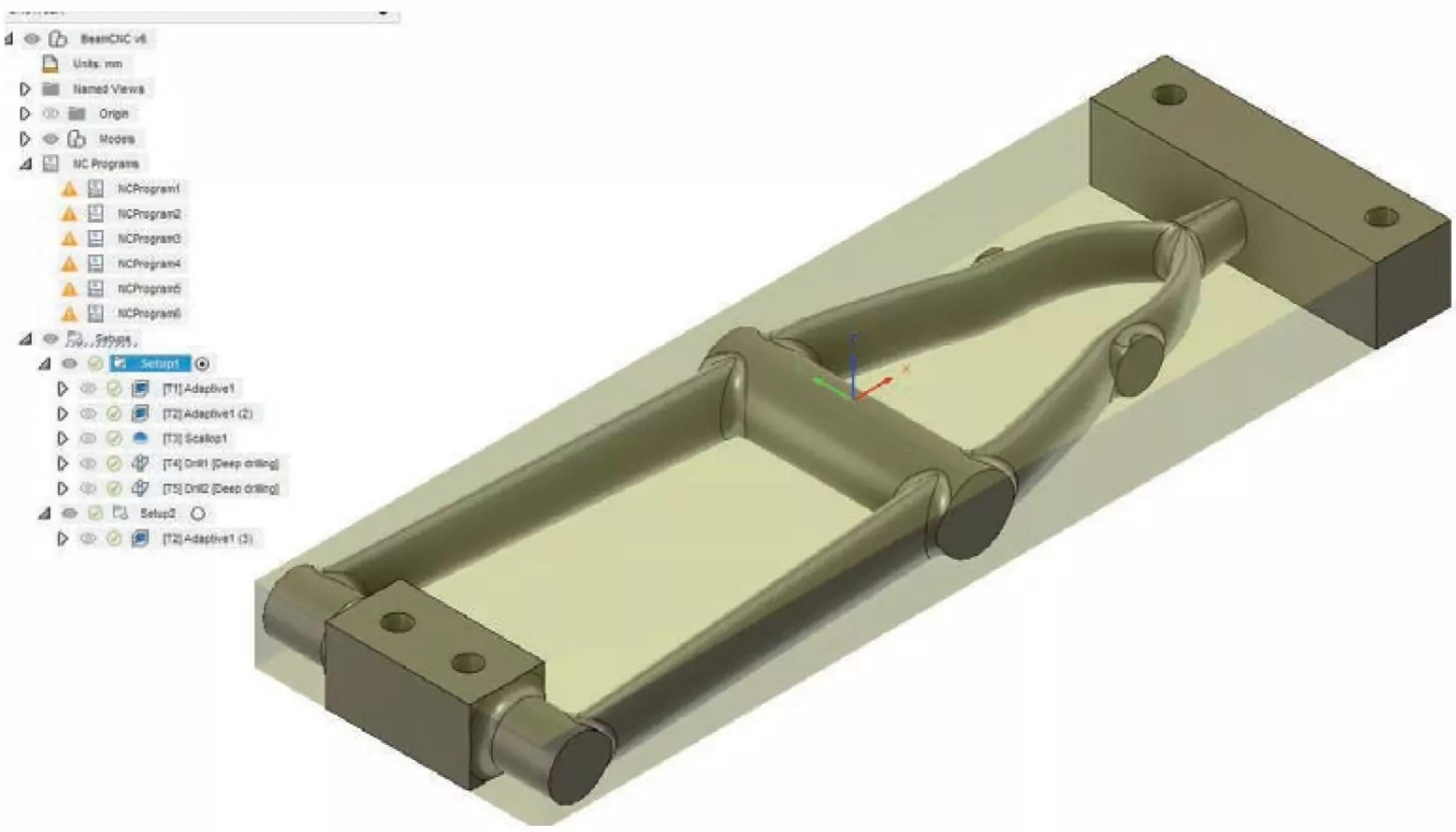


Photo 28: Part positioned within CAM stock material

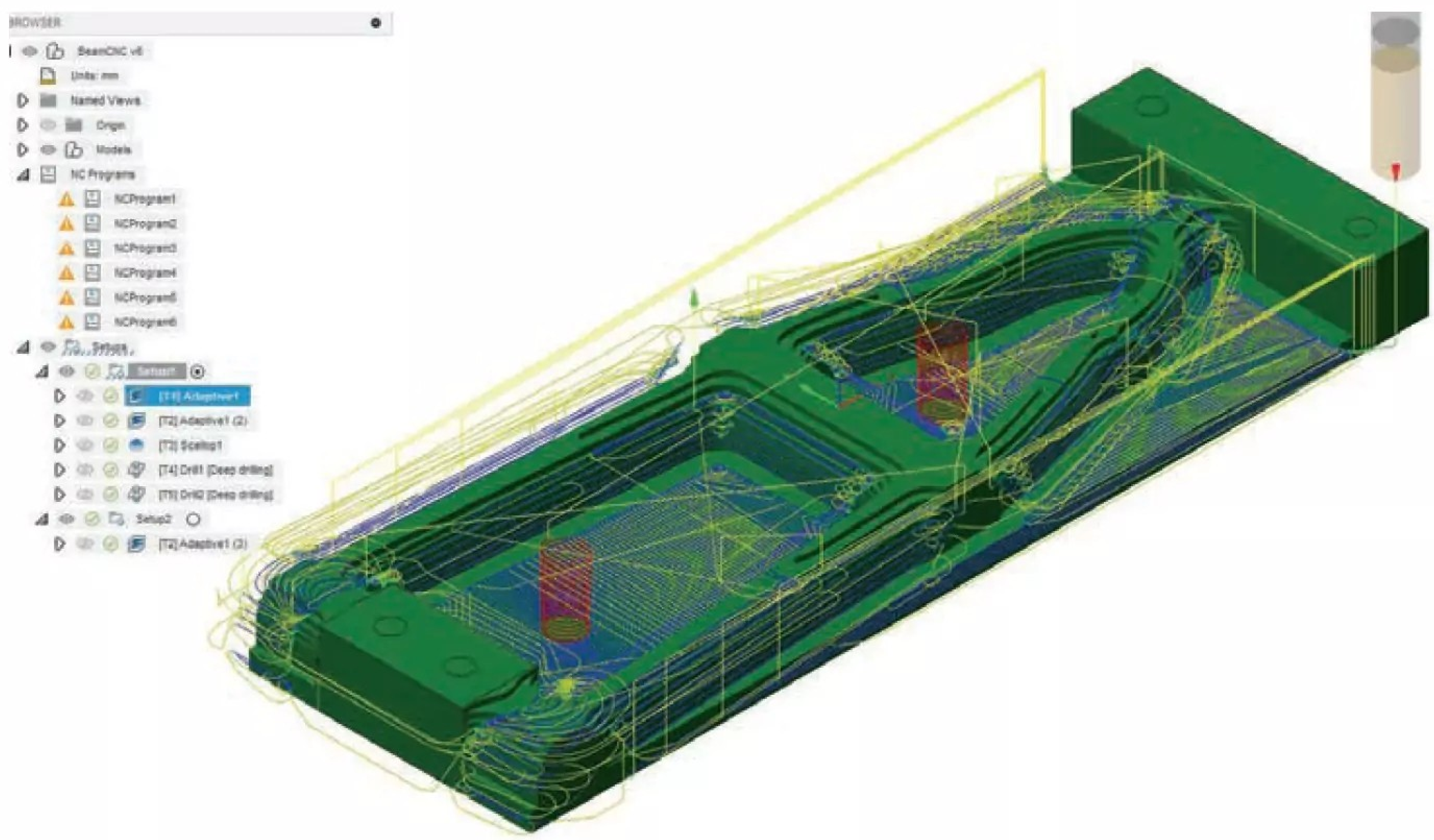


Photo 29: Initial Adaptive (roughing) toolpath simulation

Photo 30: Completed CNC machined part

cast in aluminium from oversize wooden masters can be CNC cut straight from aluminium or cast from hard PU resins using 3D printed masters and moulds. **Photograph 32** shows a match board with cast resin patterns complete with gates and runners that were cast in rubber moulds taken from 3D printed plastic masters.

3D printed patterns can also be used, though the printing software does need to be set to give a thick outer wall and high percentage of fill if they are to withstand the moulding process, more so if using a commercial foundry than home casting. Any core boxes can also be created in CAD and produced with CNC or 3D printing.

CONCLUSION

Although we are still some way from the traditional casting kit being replaced by a set of CNC or 3D printed metal 'castings' some suppliers are making use of these methods, even if it may not be obvious from the supplied items. We are certainly seeing drawings supplied that have been produced using CAD, some of which contain 3D images and views so not just the older 2D CAD. Others are now supplying certain parts as partially CNC machined items that previously may have been cast or stamped/pressed and as per the examples shown here other suppliers are grasping the whole range of modern processes to put out parts and casting kits.

Hopefully this has given an insight into how modern tech can actually be put to use either by our suppliers or the end user who may want something that is not readily available off the shelf.

Links

https://www.facebook.com/littlelocos
https://www.pcbway.com/rapid-proto-typing/manufacture/?type=2&reffer-code=TOP

Photo 31: SLM 3D printed aluminium crankcase Photo by F2cf1g

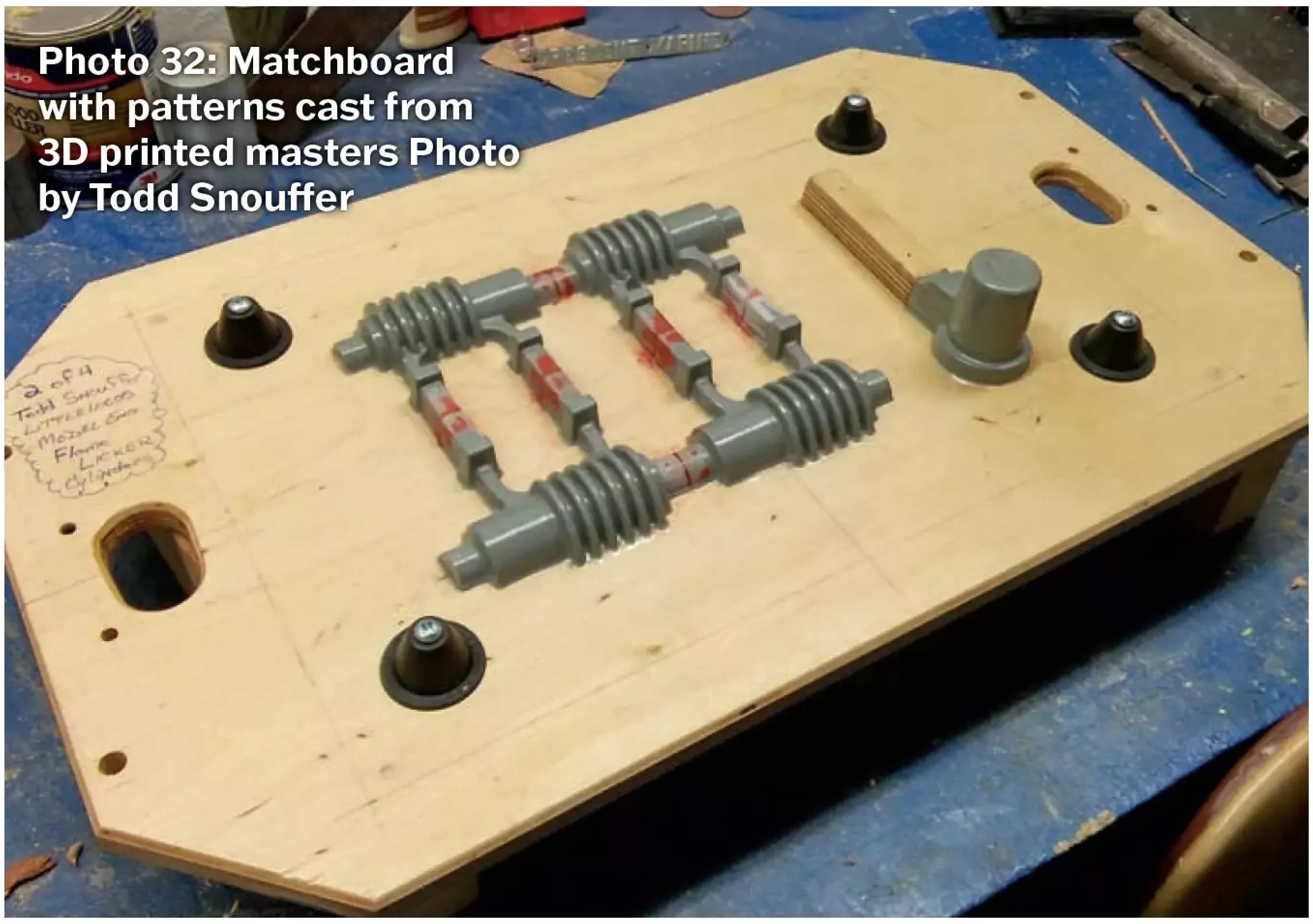
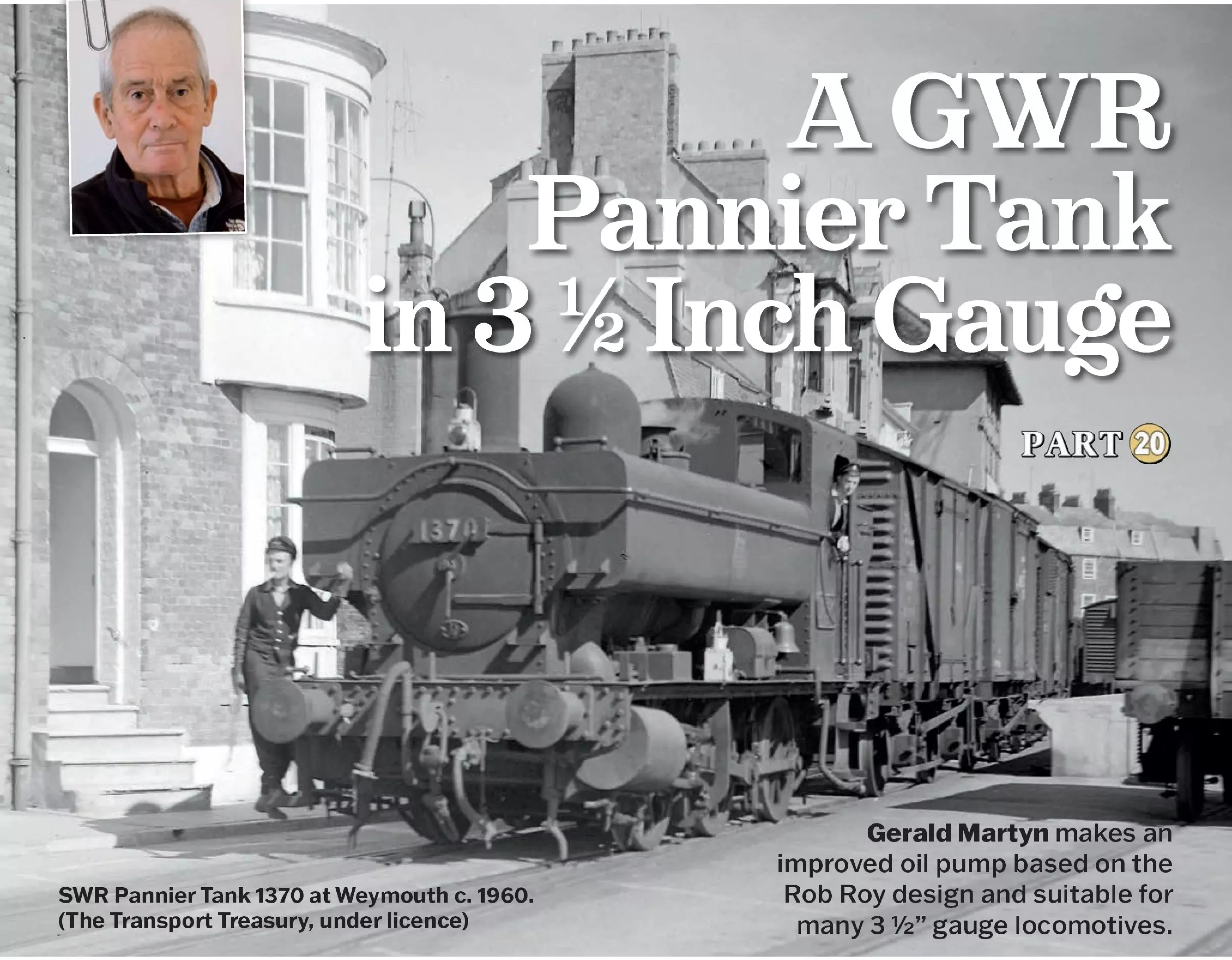


Photo 32: Matchboard with patterns cast from 3D printed masters Photo by Todd Snouffer



A GWR Pannier Tank in 3 ½ Inch Gauge

PART 20

Gerald Martyn makes an improved oil pump based on the Rob Roy design and suitable for many 3 ½" gauge locomotives.

SWR Pannier Tank 1370 at Weymouth c. 1960. (The Transport Treasury, under licence)

The Rob Roy oil pump design was never fully drawn, but those working from the descriptions most likely produced something that had (has) a reputation for delivering rather too much oil. What I would call a good fault, so long as you don't mind getting covered in black oily spots. There are various ways to reduce the oil flow, one of which is to shorten the piston so as to have less piston stroke below the inlet port. Having done this I realised that there was no need for such a large eccentric so for my next model I developed a small simple design which I've used in various forms ever since. Simple designs with low parts count are quicker to make and there's less to go wrong (that's arguably the most important 'law of reliability').

The assembly drawing for the pump and drive is **fig. 71**. The pump itself has a 5/16" cam with a simple folded sheet metal stirrup follower. A short lever and two roller clutches provide a simple drive for the shaft. The lever is actuated by a remote bellcrank

Photo 163; Oil pump piston & stirrup. Ready for soldering (left) and finished (right).

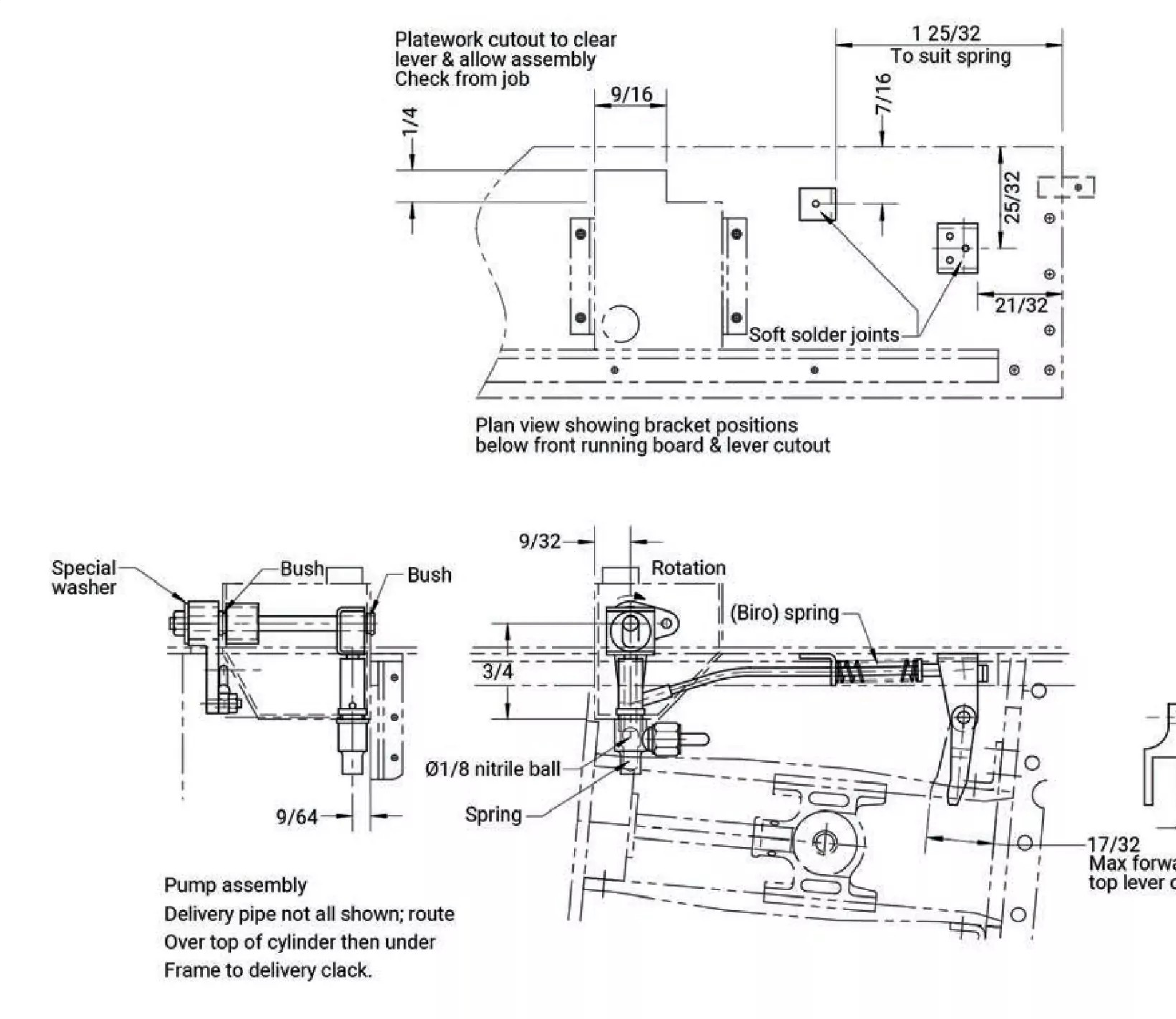


Fig 71: Cylinder Oil Pump and Drive Assembly.

pushed at just the end of the cross-head travel, and the drive transferred by a rod with a return spring. This minimises the visual impact of this non-prototypical device and is a technique I've used previously.

The oil tank is one of the sand boxes, so start by drilling the holes and fitting two tiny bushes, which can be soft soldered in place. The pump cylinder, piston and lower fitting are shown in **fig. 72**. The pump body is a simple turning job, but before starting it's important to check that the reamer or D-bit to be used cuts a hole which is a close fit to the 3/32" piston, so test it in a piece of bar first. The cam follower stirrup is just a piece of steel sheet folded over some 5/16" bar then marked out, cut out and drilled. Pop a piece of 3/32" silver steel through and solder carefully and frugally at one hole only, then cut away the top piece before cleaning up, **photo 163**. is a composite view showing the parts before soldering and after finishing. When fitted the top hole gives access to the cam grub screw, and the back face with slot keeps it orientated and acts as a stop to prevent the shaft falling out of the back of the tank. Below the cylinder is a simple (but small) fitting to contain the non-return ball

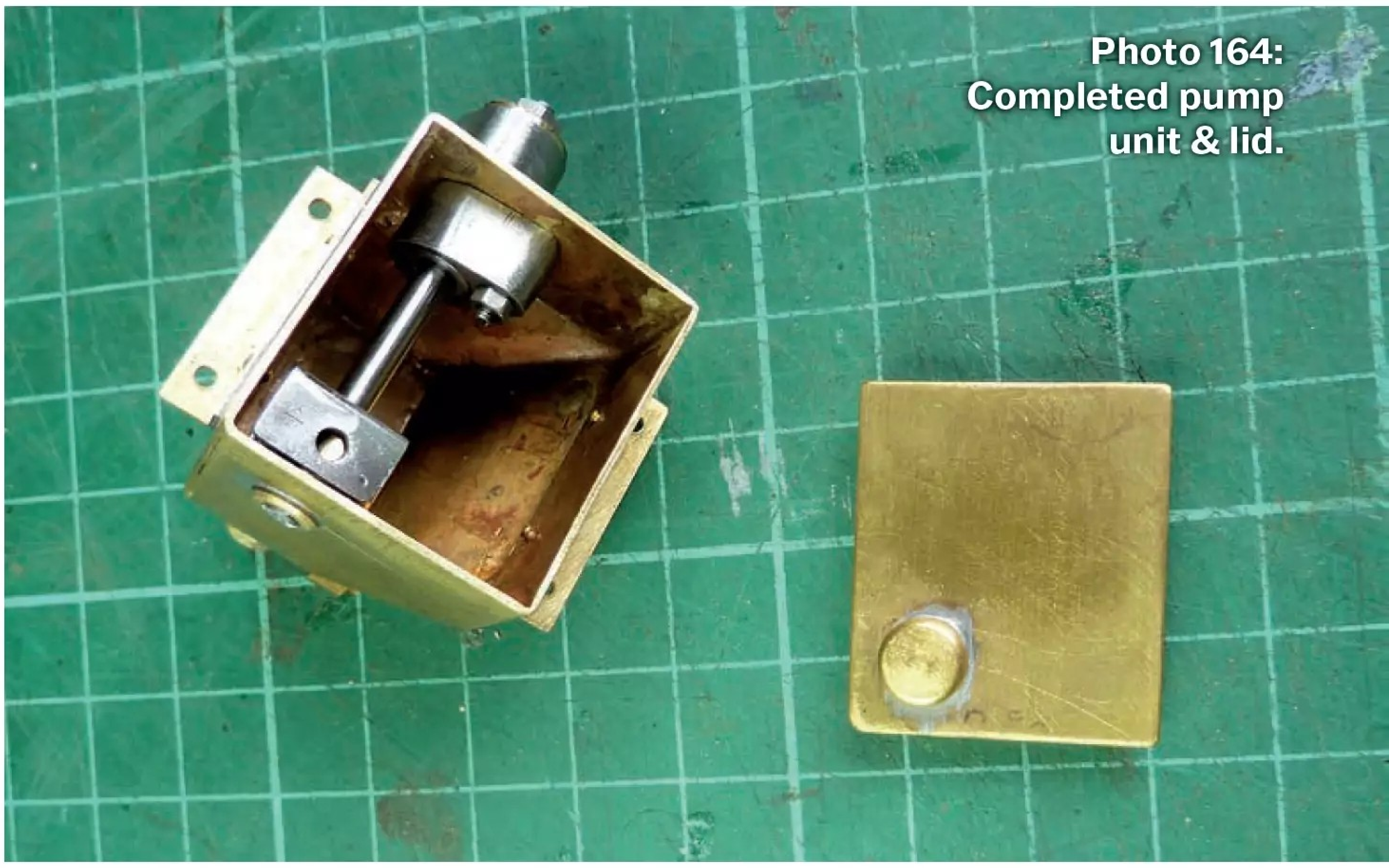


Photo 164: Completed pump unit & lid.

and spring and provide an attachment for the delivery pipe. Having got this far with the project then this poses no new problems.

The pump levers and shaft parts are illustrated in **fig. 73**. The shaft is made from silver steel and has a slot in the end so that a small screwdriver can be used to twirl it for priming and testing. Rather than use a traditional ratchet wheel and pawls drive I use the two clutches method. These are still available, in metric sizes at any rate, though shopping around may be necessary. This simple solution avoids the need to make tiny pawls which if drawn in CAD would, because of their complex shape, take as long as many parts ten times bigger! I would expect a roller clutch to be installed

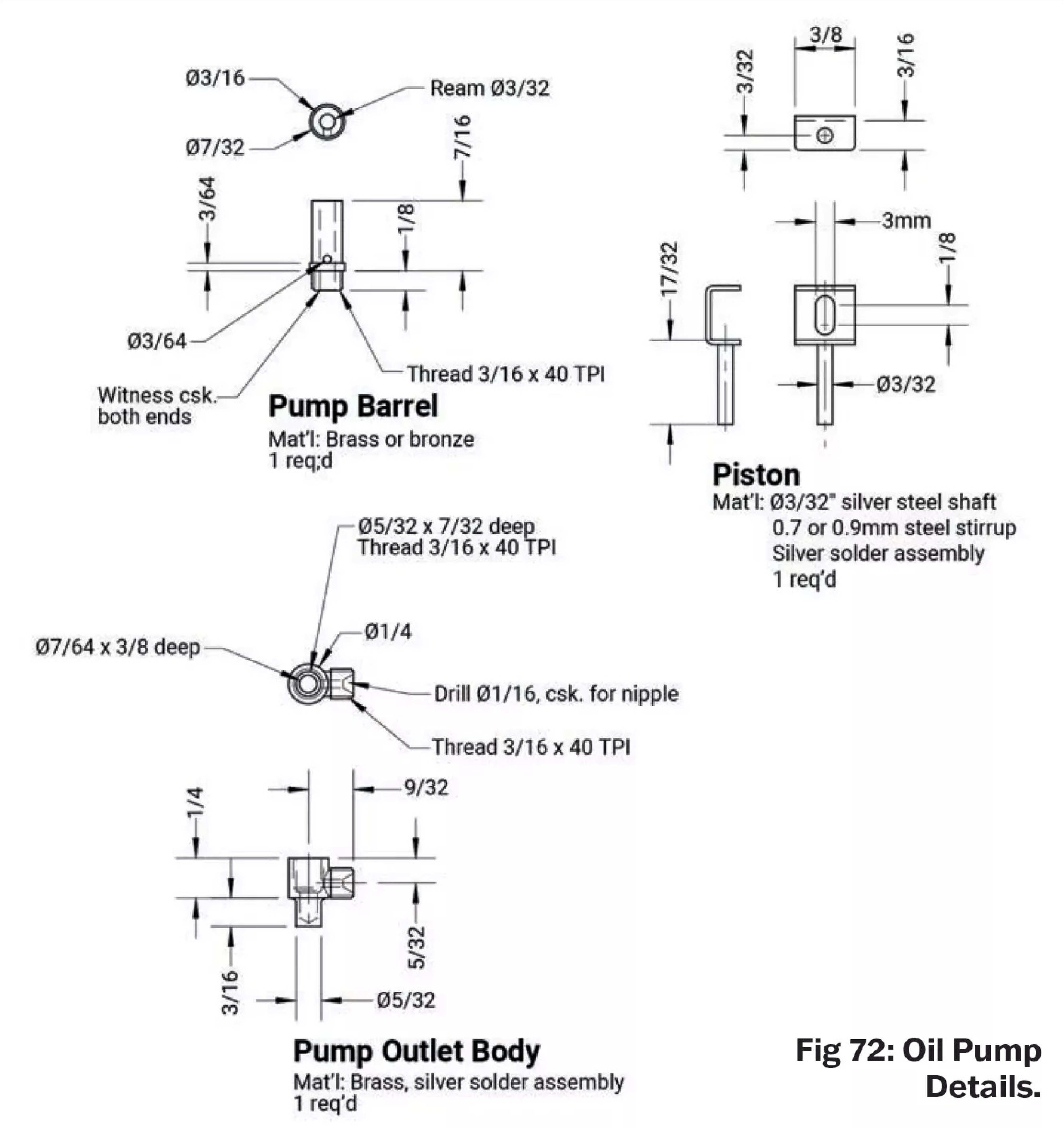


Fig 72: Oil Pump Details.

into its housing with an interference fit, the problem was finding out what it should be. My clutches measured 6.54 mm diameter which for a nominal 6.5 mm part does not fit any known size in 'limits and fits' tables. Finding out what the interference should be was a real problem and the best I could find on the internet, and from a different manufacturer, was that it should be H6 J7, which is a hybrid in my set of tables. I suggest an interference of about 0.0005" would be about right. I achieved this by opening the holes by pushing sideways on the 6.5mm drill and carefully measuring the result. If all this sounds complicated then just open the holes out and use Loctite, being very careful not to get any in the clutch bore. Rotation should be clockwise looking at the outer end of the shaft, so the cross-head and not the spring does the work.

For the pin on the lever here and for some other later bits I use 1/16" steel with a 10BA thread. It's simple but the thread will be just a bit truncated. As the load is negligible this is not a problem. The finished pump unit is shown in **photo 164** and the last job is checking that it works by putting some steam oil in the tank and turning the shaft a few times while watching the delivery nipple.

The drive mechanism parts are

Photo 165: Upside-down view of oil pump drive mechanism.

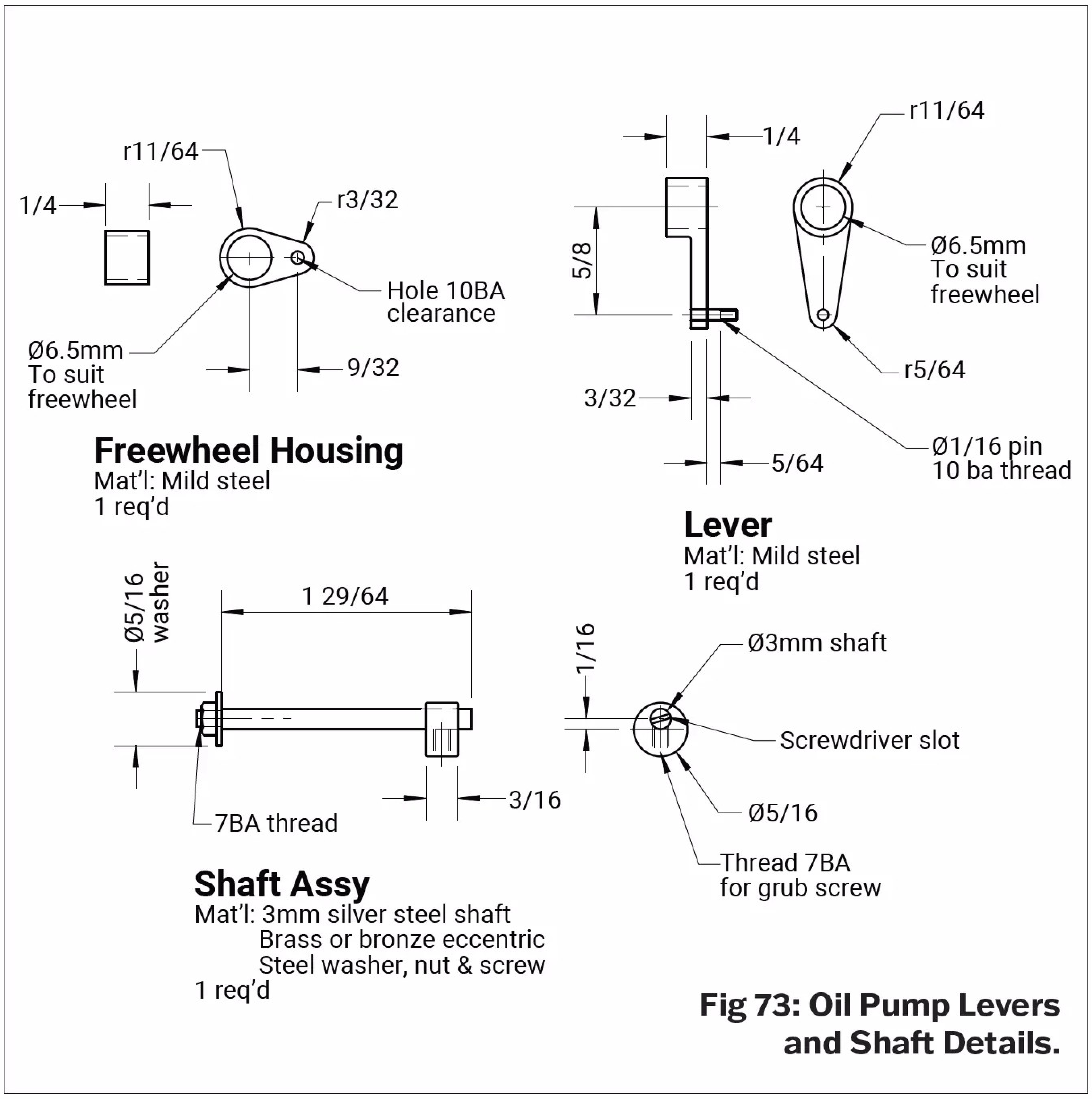


Fig 73: Oil Pump Levers and Shaft Details.

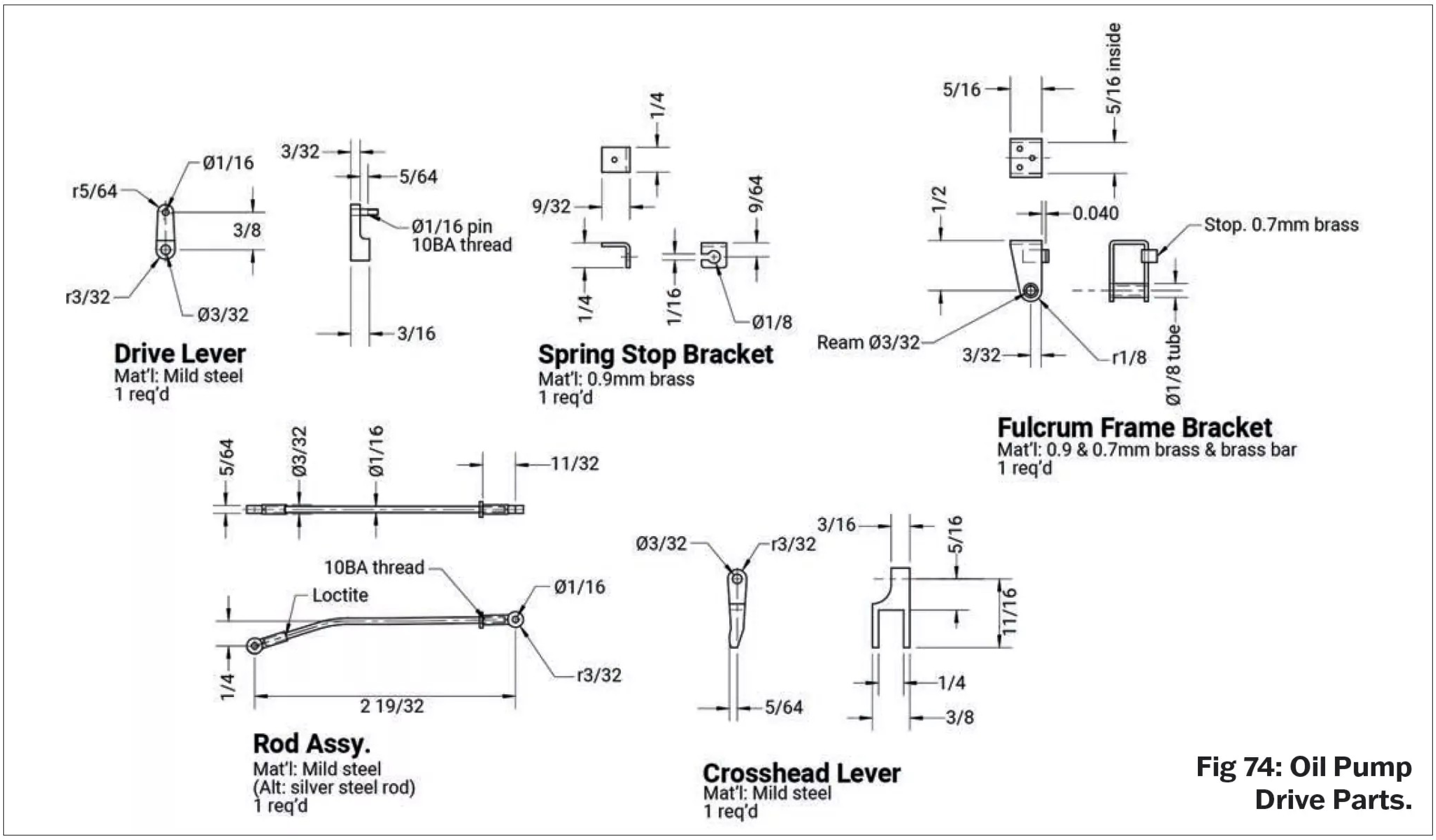


Fig 74: Oil Pump Drive Parts.

shown in **fig. 74**. There's not much to say about them really. My spring came from one of those throwaway biros and was shortened a bit to fit as it should just return the lever with a minimum addition to the drive force. The rod end attachment to the pump lever can only be made by loosening the cam grub screw and moving the shaft assembly inboard a bit, and the nut is tricky to start on the thread. The mechanism gives one drop of oil for about twenty turns of the driving wheels. The whole assembly can be made up under the front section of running board and then bolted into place on the engine. An upside-down view is **photo 165**. The oil delivery pipe should be 3/32" copper and routed over the top of the cylinder, **photo 166**, then under the front of the main frame. On final assembly use the screwdriver slot to prime the pump, then attach the pipe and pump it full of oil before finally attaching to the cylinder feed check valve.

To be continued

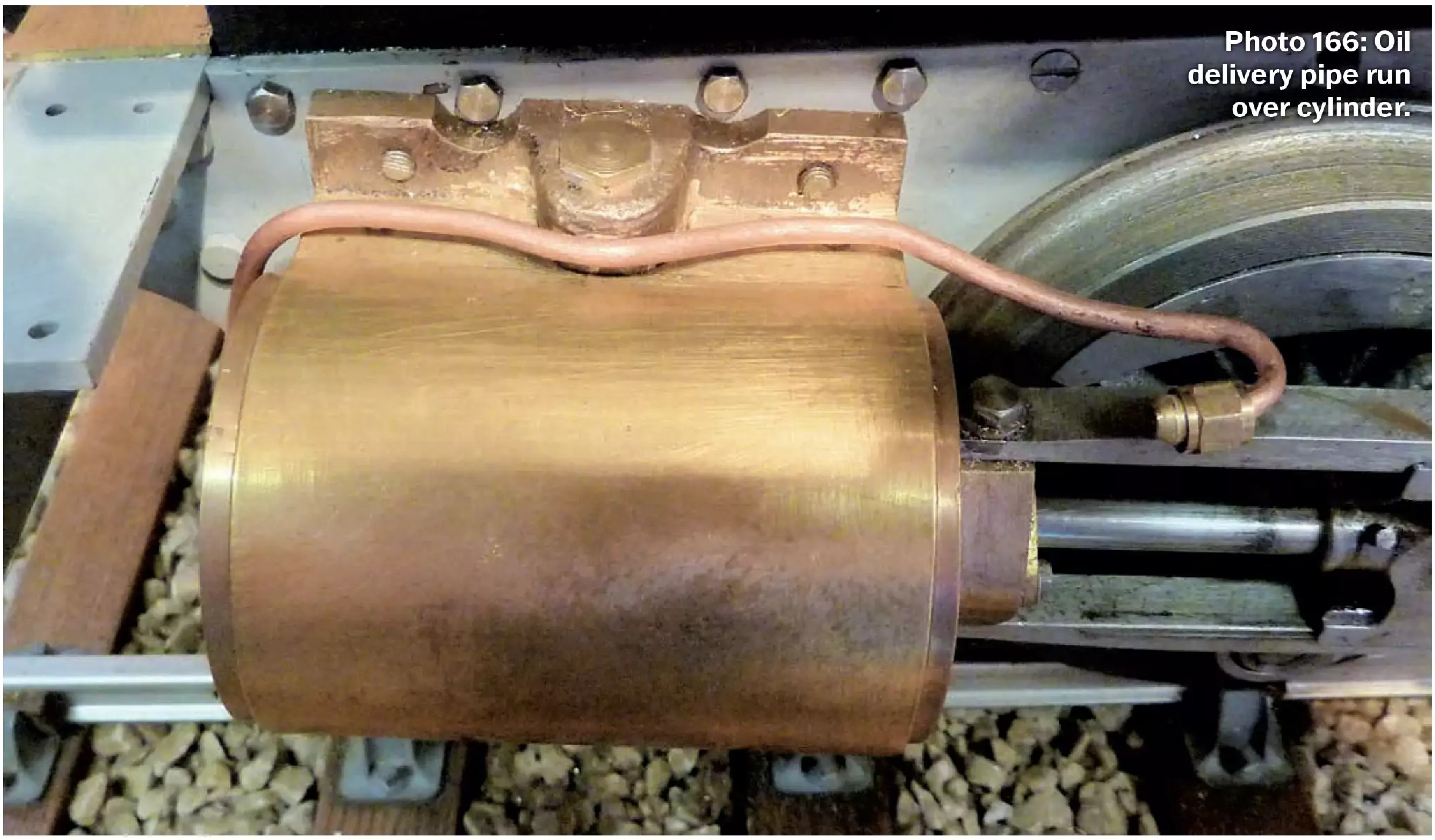


Photo 166: Oil delivery pipe run over cylinder.

Club Diary

Please send your events for Club Diary to meweditor@mortons.co.uk

2025

DECEMBER

29 Stafford & District MES
Steam up, County Showground, Stafford, 10:00 am. See www.sdmes.co.uk or Facebook.

2026

EVERY SUNDAY

Warrington MES
Running day. Contact : contact@wdmes.org.uk

Wakefield SMEE
Public running day. Contact Denis Halstead 01924 457690

JANUARY

17 Gauge 1 Yorkshire Group
Running day at Drax Power Station social club, 9:30 - 15:30. Contact secretary@gauge1north.org.uk

18 Stafford & District MES
Steam up, County Showground, Stafford, 10:00 am. See www.sdmes.co.uk or Facebook.

FEBRUARY

15 Stafford & District MES
Steam up, County Showground, Stafford, 10:00 am. See www.sdmes.co.uk or Facebook.

21 Gauge 1 Yorkshire Group
Running day at Drax Power Station social club, 9:30 - 15:30. Contact secretary@gauge1north.org.uk

MARCH

21 Gauge 1 Yorkshire Group
Running day at Drax Power Station social club, 9:30 - 15:30. Contact secretary@gauge1north.org.uk

22 Stafford & District MES
Steam up, County Showground, Stafford, 10:00 am. See www.sdmes.co.uk or Facebook.

APRIL

19 Stafford & District MES
Steam up, County Showground, Stafford, 10:00 am. See www.sdmes.co.uk or Facebook.

19 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.

MAY

17 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.

23-24 Bradford Model Engineering Society
Event at Bradford Industrial Museum

JUNE

5-7 Cardiff Model Engineering Society
34th Welsh Locomotive Rally Heath Park, rally@cardiffmes.com.

15-14 Rugby Model Engineering Society.
Sweet Pea Rally, To be held at Rainsbrook Valley Railway.

20-21 South Cheshire Model Engineering Society
LittleLEC annual locomotive efficiency competition, Willaston, near Nantwich. littleLEC@gmes.org.uk.

21 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.

JULY

19 Gauge 1 North
Live steam on the Ridings track, traders and society stands North, Agriculture and Business Centre, Bakewell. Contact: secretary@gauge1north.org.uk

19 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.

AUGUST

16 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.

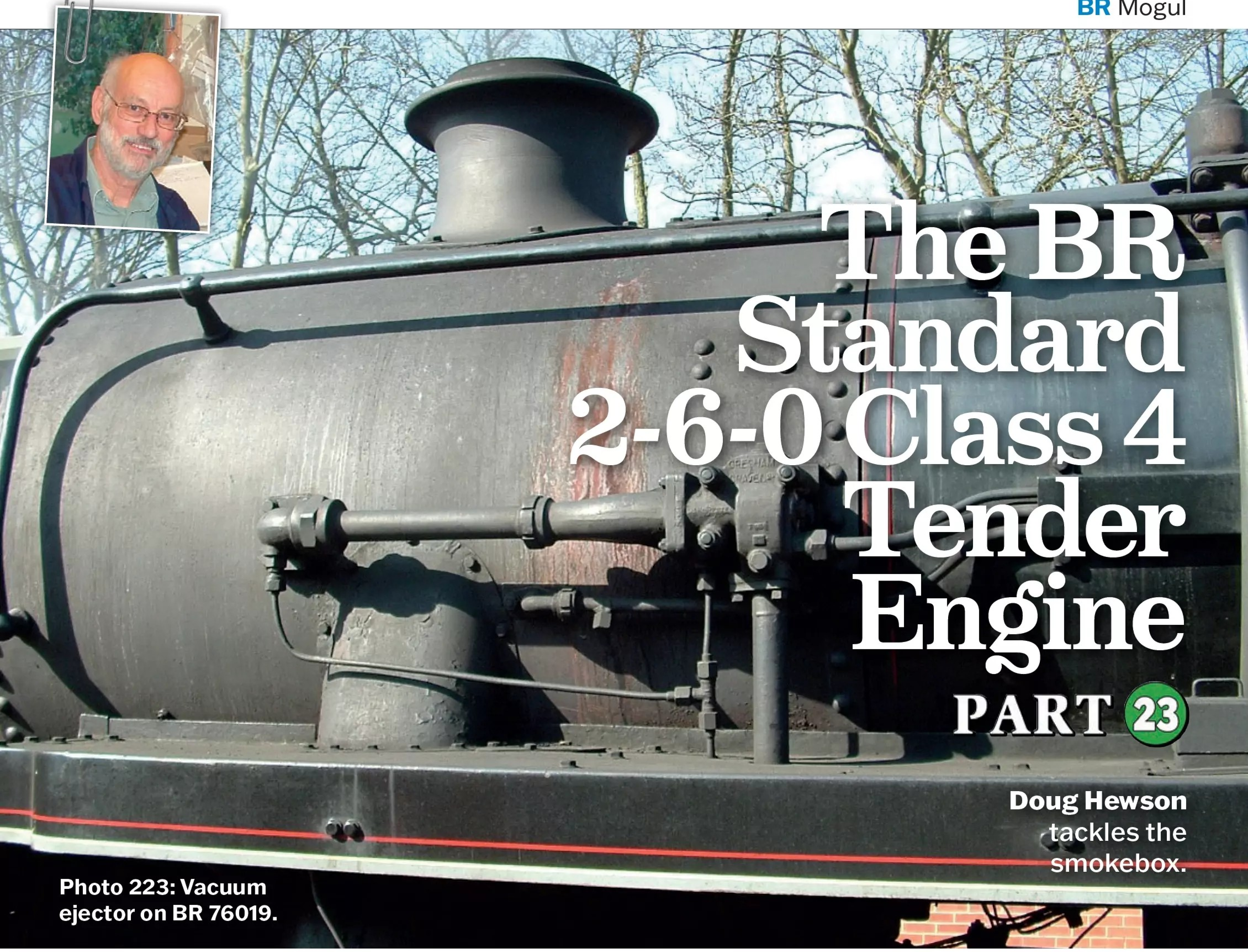
SEPTEMBER

13 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.

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.

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.



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

PART 23

Doug Hewson tackles the smokebox.

Photo 223: Vacuum ejector on BR 76019.

We can now get on with the smoke box. I have shown the plate to roll into the barrel although you need to be aware of what is on the left-hand side as I have only drawn one side (we don't have drawings for the wrapper and door yet, they will appear as soon as we have them). All there is on the right-hand side are the usual handrail holes and a nice little steam lance valve. I am not sure whether anyone has tried it yet but mine all works. On the left-hand side is the vacuum brake ejector with all that entails. I have seen various arrangements on the preserved locos and if you want to have a look at an unadulterated one then I would have a look at 76017, so this is the one I have shown on my drawings. This engine was bought directly from BR, so I am taking this one as being correct. There are others of course, but once again I knew that the one on 80080 was originally bought from South Africa and originally this worked the wrong was round. It was push for 'brake on'. Anyway, I think that this has now been altered and anyway again we are not talking about the ejector but the smokebox.

I took the flat plate and put it in the bending rolls, formed it and then welded it. I ground the weld down flush with my angle grinder but then put it back in the rolls and gave it several more twirls to try and get it as round as I possibly could. If yours is a few thou up or down I wouldn't worry too much about it. There does

Photo 224: That on BR 76079.

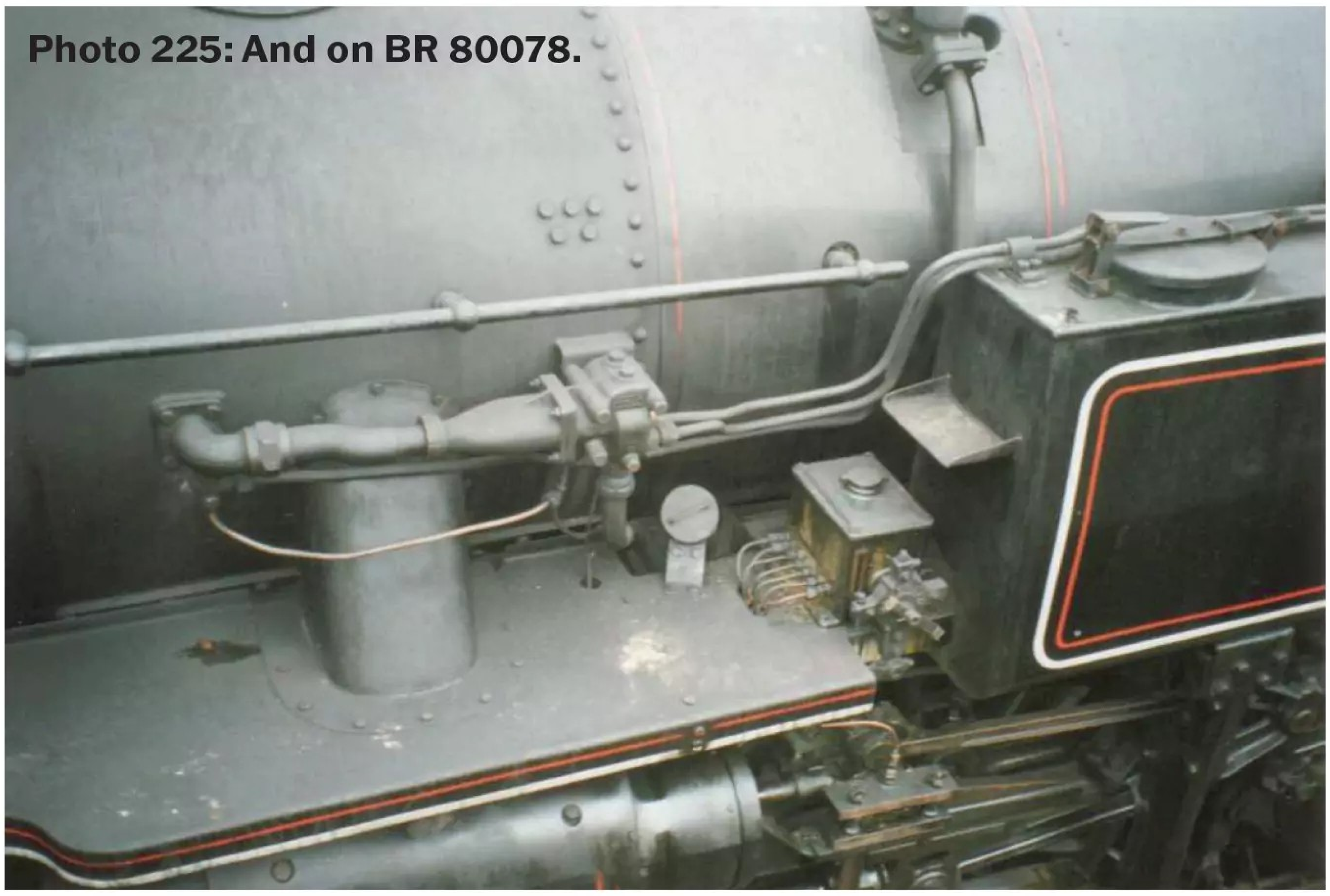


Photo 225: And on BR 80078.

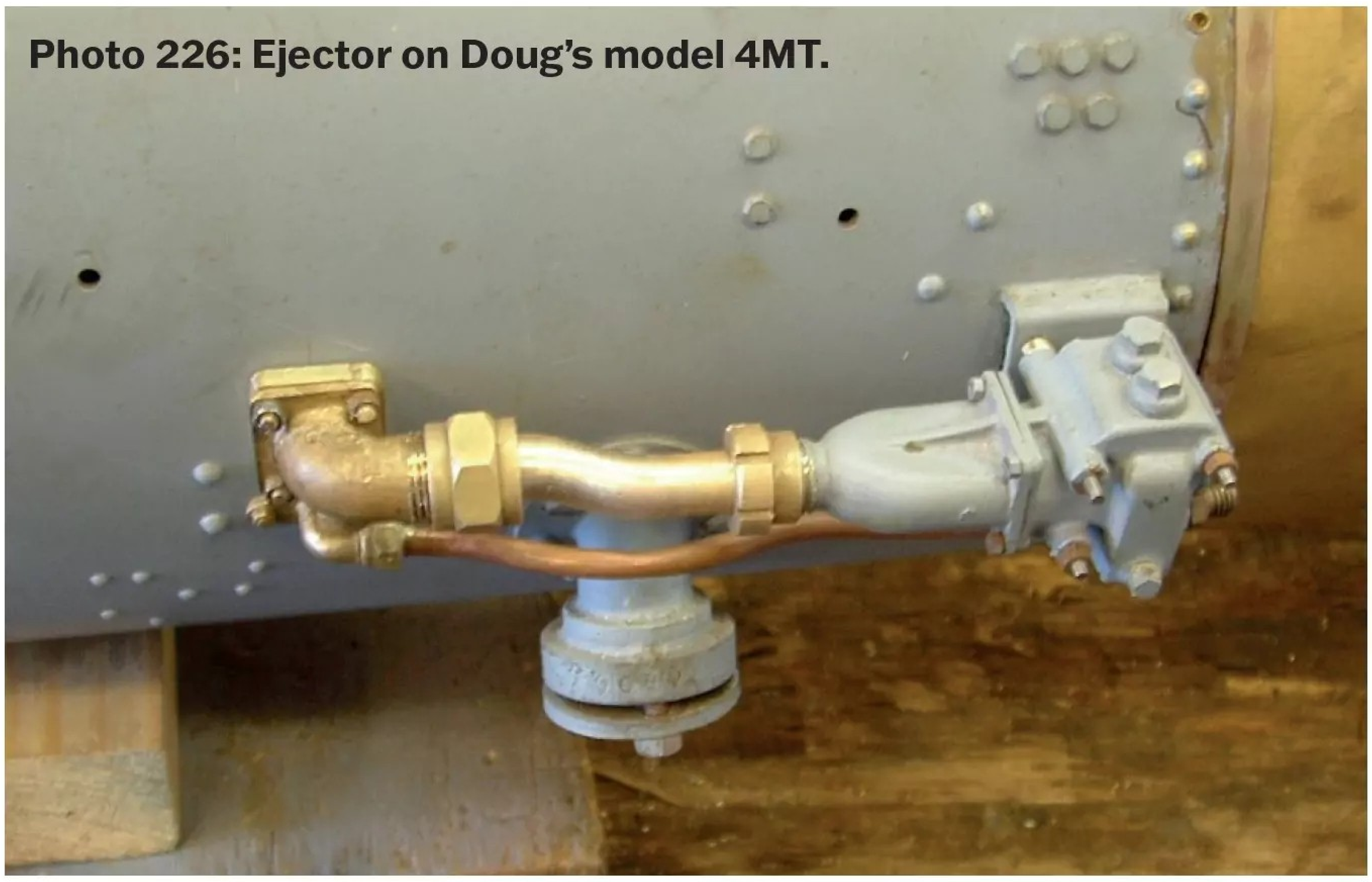


Photo 226: Ejector on Doug's model 4MT.

Photo 227: Right hand side of Mogul smokebox.

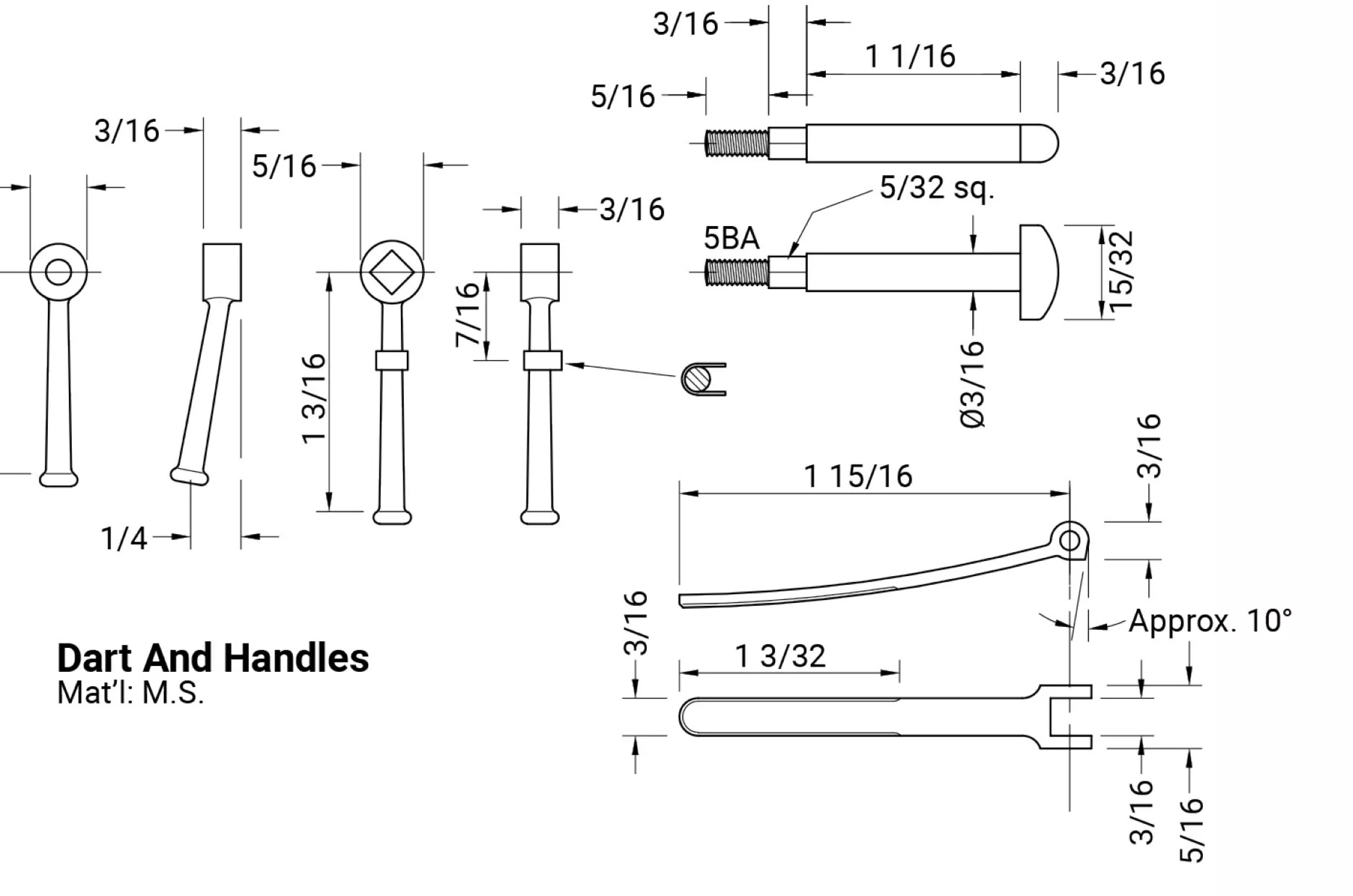
not appear to be a steam lance valve on the Moguls, so we will omit that. One thing you will need to do is to cut the holes for the steam inlet pipes to the cylinders and to make your covers. I have supplied a development of the plate and that fitted very nicely on my 4MT. I have included a photo of the vacuum ejector on 76019 as this one came straight out of BR and it has a union fitting as seen in **photo 223** and it does appear there is not only a kink in the vacuum exhaust pipe, but it also an enlarged pipe entering the vacuum exhaust elbow on the left-hand end. **Photograph 224** shows the vacuum exhaust on 76079 and it has a triangular plate fitting and that pipe does not appear to have a kink in the pipe at all and no enlargement. **Photograph 225** shows 80078 and it has the kink in the pipe, **photo 226** shows my 4MT with the kink in the pipe and note the union nut to fit a "C" spanner. I think that means that the kinks have it! You will also need to silver solder a small bracket on left side of the barrel on which to mount the ejector. **Photograph 227** is to confirm that there is nothing on the right-hand side of the smokebox.

Photographs 228 and **229** show my way of machining the "C" nuts for the pipework from a bar in my vertical slide using a piece of hexagon bar to divide the angles.

I then turned me attention to making the steam pipe covers and **photo 230** shows how my development worked out. **Photo 231** shows the first stage in the silver soldering and **photo 232** shows the cover just needing a bit of TLC to tidy it up a little. **Photograph 233** is the cover in place ready for painting all now complete. I think it took a whole morning to get this job done. We now come to fitting the chimney, and I am pleased to say that the casting sat nicely on the smokebox with very little cleaning up to do, **photo 234**. I have had it cast with a chucking spigot on the top, so if you set that up to run truly, probably in the 4-Jaw, you can bore it out at 4°. The full-size chimney castings are cored out to make them double walled, and on the top of the casting are some core prints. I have left some imprints of there in my casting, but they need drilling out a little, without breaking into the inside of the chimney of course, to make them just deep enough for you not to be able to see down those holes. This is just to give an illusion that there would have been a core in there!

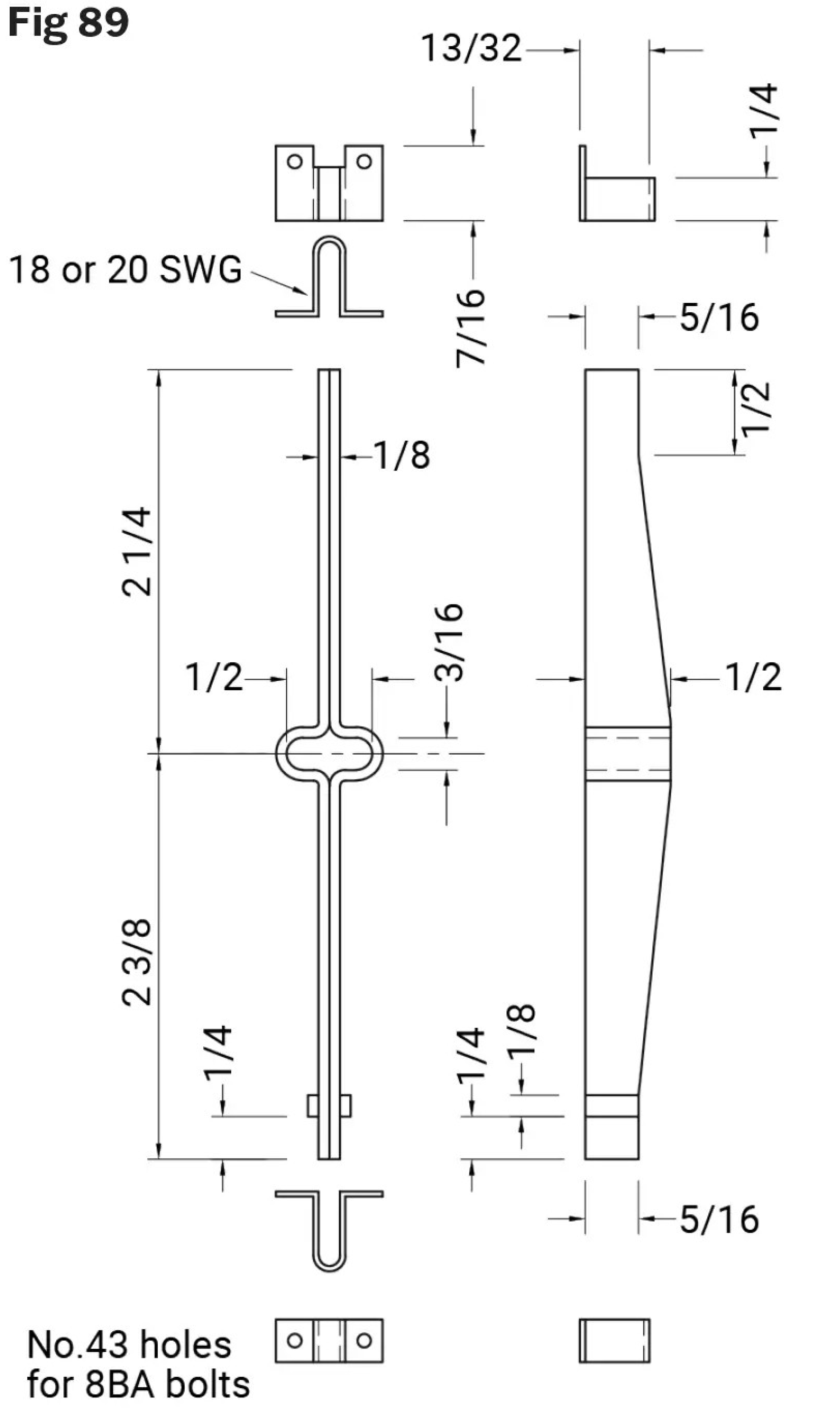
We can now turn our attention to the petticoat pipe. It will need boring to a good fit in the chimney base and

Fig 88



Dart And Handles
Mat'l: M.S.

Fig 89



Crossbar And Brackets

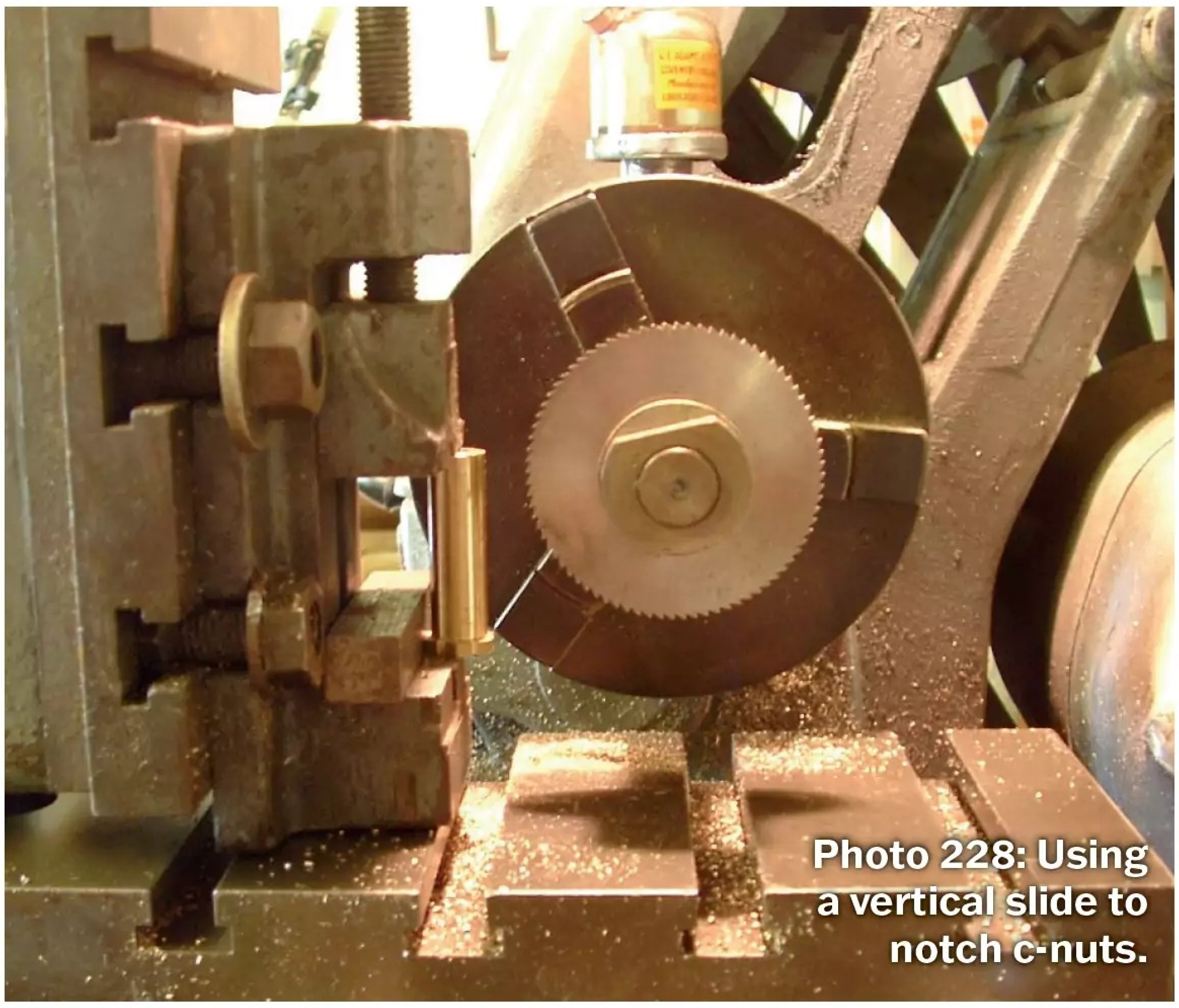


Photo 228: Using a vertical slide to notch c-nuts.

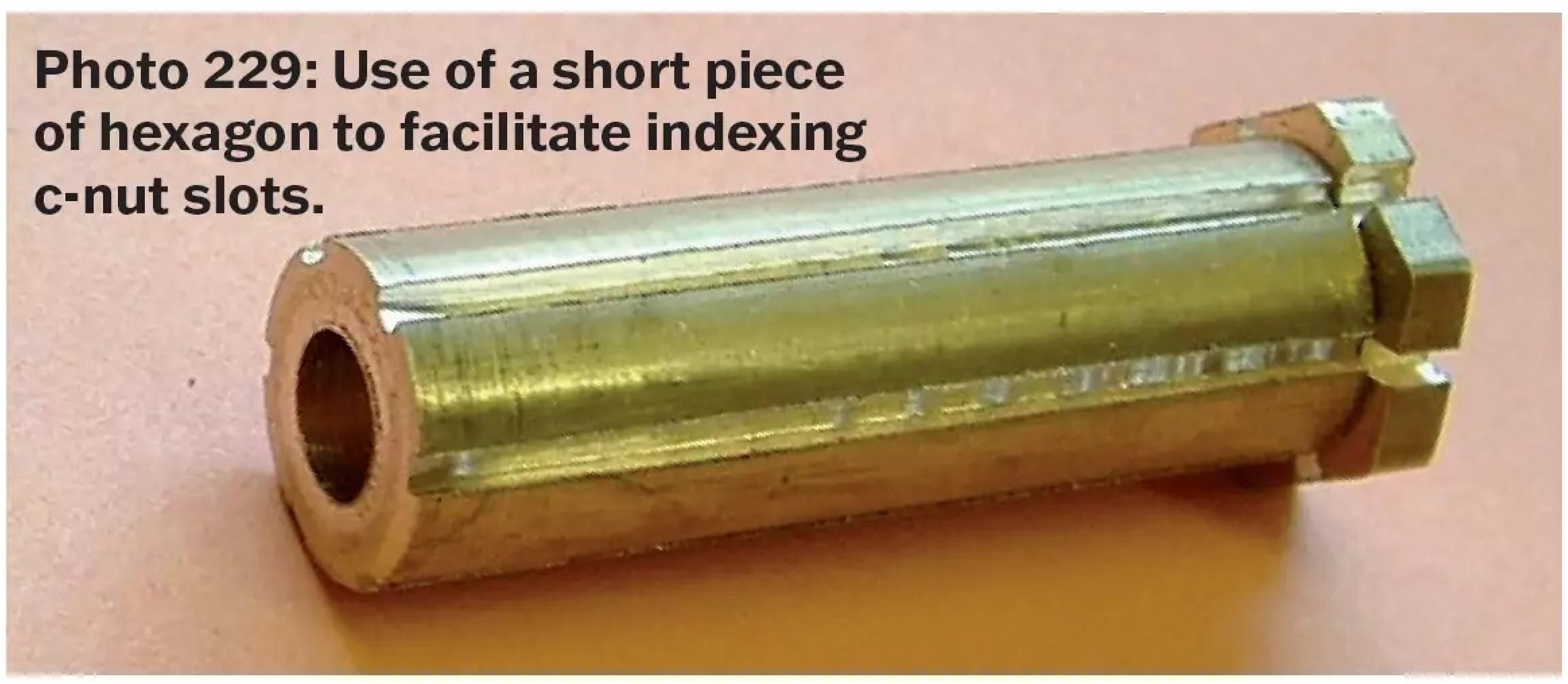


Photo 229: Use of a short piece of hexagon to facilitate indexing c-nut slots.

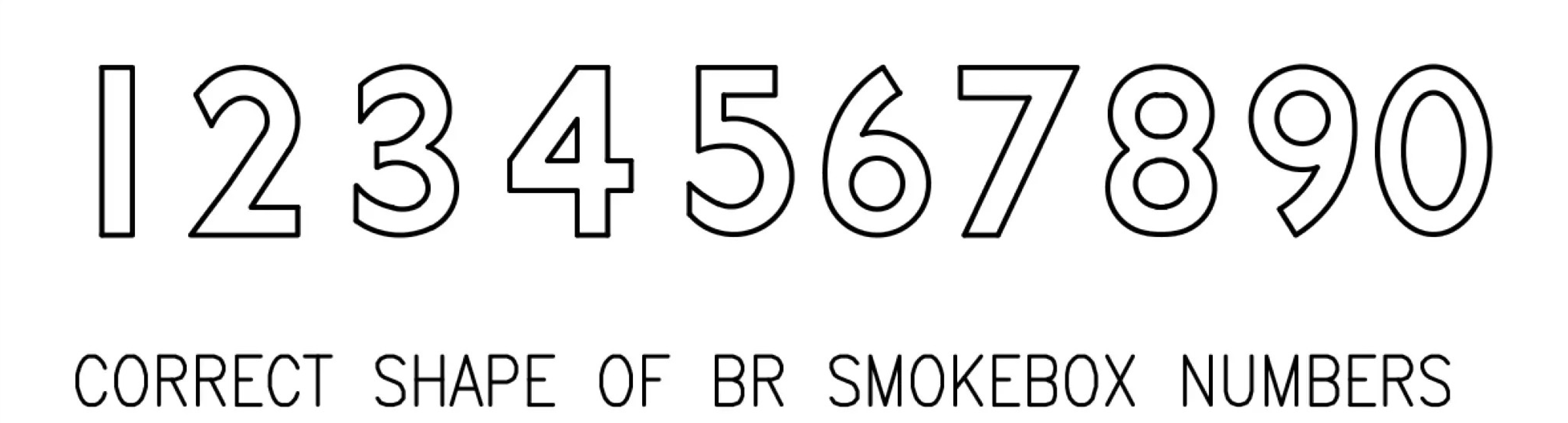


Fig 90

Photo 230: Steam pipe cover before silver soldering.

Photo 231: First joint made.

Photo 232: Flange added.

on the inside, it needs a very smooth transition inside the chimney, in fact you shouldn't be able to see the join, as Eric once used to say to Ernie. Once the boring has been competed you can deal with the 'vacuum exhaust ring'. This needs converting into an upturned channel section, but it needs to be 'L' shaped for a start. You can then drill through into the embryo exhaust ring at a good angle upwards No. 50 and then you can then turn a small angular ring to silver solder inside the chimney to finish off the box section. When you turn on the large ejector when the train has been standing at a station you will hear that lovely hollow roar from the chimney as the train sets off.

Photograph 235 is another photo sent to me by John Billard, and it shows 76015 on Weymouth shed on 31st July 1962. This one has the BR2 tender but behind that is another loco of the same class with a BR1B tender.

I have had the front and rear smoke-box rings cast as one piece so you will need to part them off so that you can then work on them separately. I always make the front ring of the smoke box a good fit in the barrels and then you can pull it out as a piece, complete with dart, crossbar and the lot. I put dummy rivets in around the periphery so that I could do that. It means that the whole smoke box can be swept

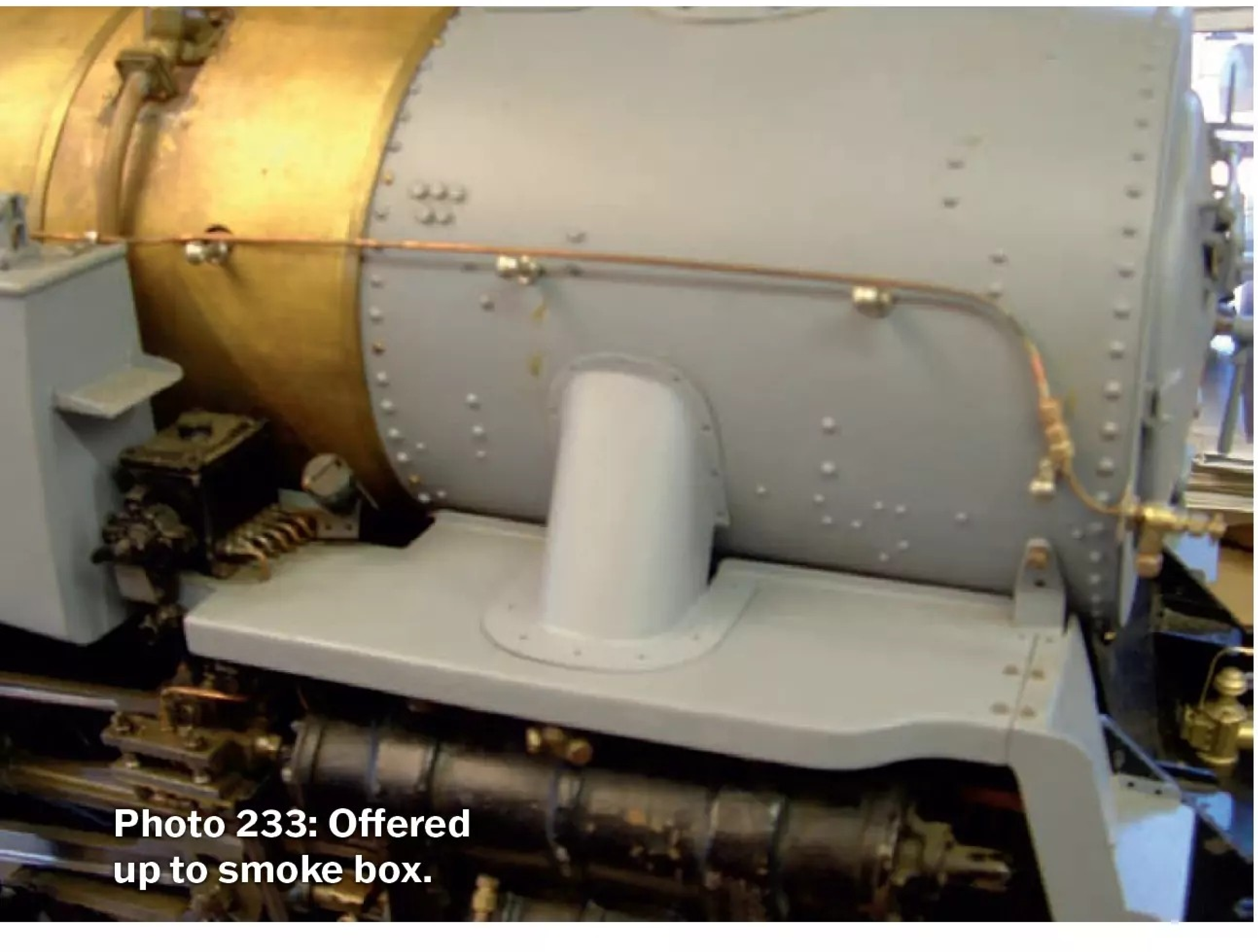


Photo 233: Offered up to smoke box.

Photo 234: Chimney casting fitted, note 'core holes' on rim.

Photo 235: BR 76015 with BR2 tender.

Photo 236: Smokebox door parts.

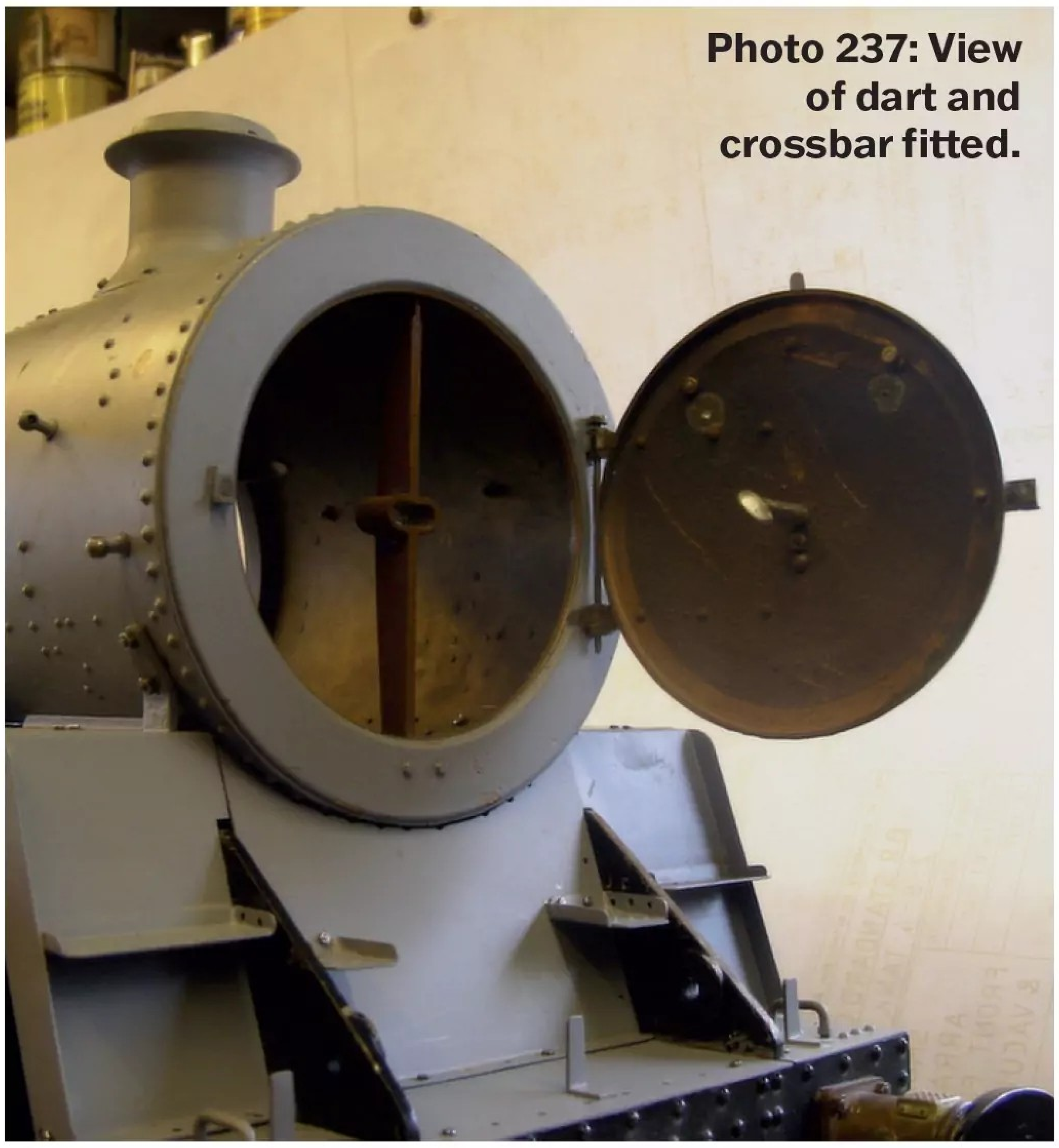


Photo 237: View of dart and crossbar fitted.

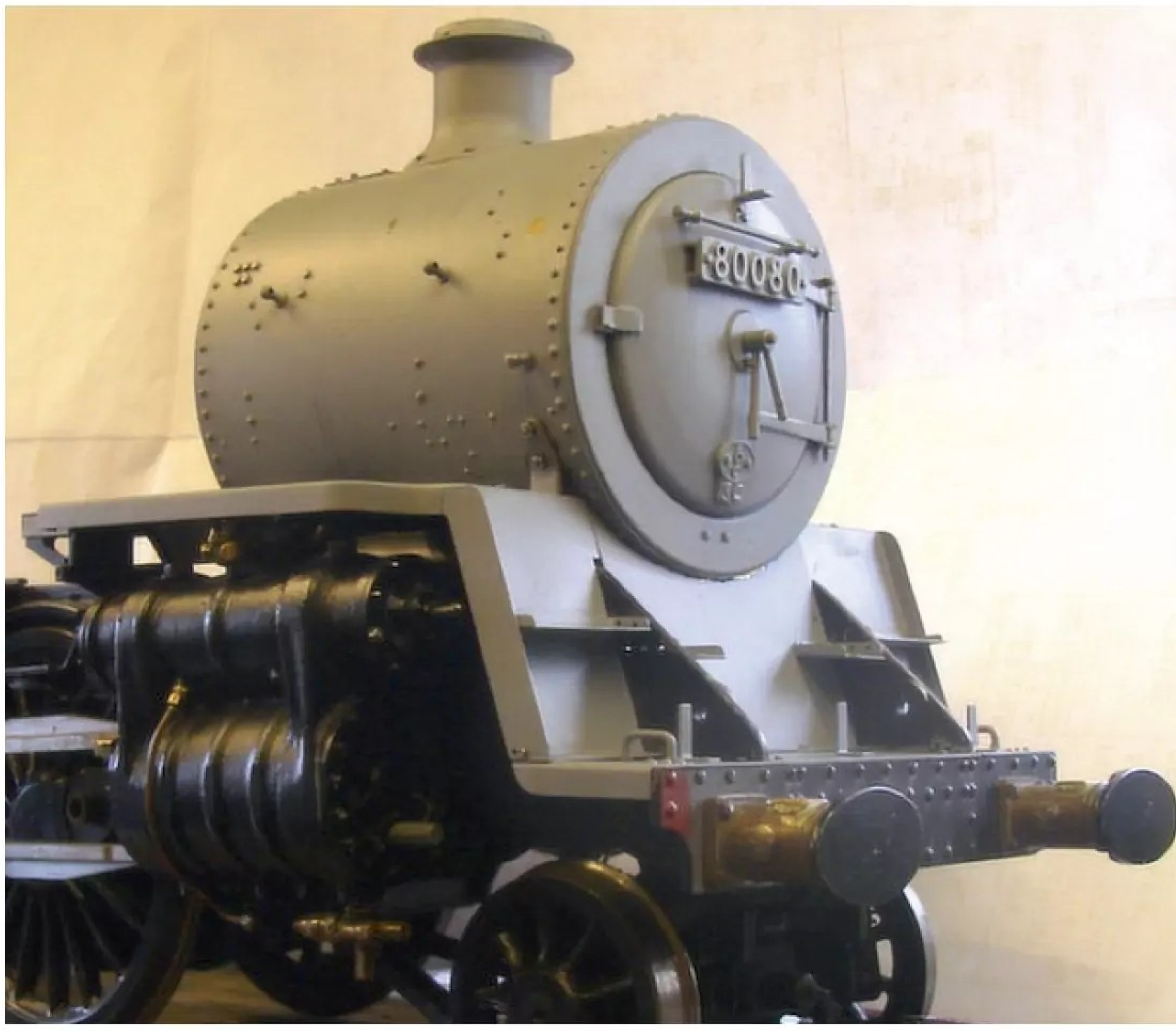


Photo 238: Smokebox door closed. Note that this is Doug's model of a BT 4MT, the very similar tank engine version of the BR Mogul.

out leaving it clean. The other thing is that you can get at all the tubes quite easily. Once again, I use photos from my 4MT to illustrate the smoke box and **photo 236** shows the bits and pieces which go to make up the door, **figs 88** and **89**.

For all of my locos I have built up the number plate by cutting the numbers out with a piercing saw, which I can use fairly well, and filing the figures out with a bit of draw on them as I need them to look as if they have been cast, fig. **90**. The reason I don't like the commercial ones is that I never think that the figures look deep enough, hence my figures are cut from 16swg brass plate. They are then riveted to the backing plate with 1/32 brass rivets. This is not a very long job, so it is well worth having a go at. The darts are just simple turning jobs. Now what I did come a cropper on was the fact the I had forgotten about the steam lance valve which is attached to my smoke box ring. What did I do but pulled the door out to clean the smoke box out and promptly ripped out the lance valve out with a couple of inches of pipework, after all the trouble I went to, to make it work! **Photograph 237** shows the door with the vertical cross bar and **photo 238** shows the finished job, except it wasn't. I had forgotten to silver solder the tab on to mount steam lance valve on. It was a good job that it wasn't all riveted in.

To be continued

A Drill Stand

Laurie Leonard took half a century to make this handy storage device.

Photo 1: Part machined drill base blank.

As part of my student apprenticeship I attended a Workshop Course at Derby Technical College. The course was practically based and involved making various items and tools that would be useful in a workshop. Several of these I still have and use. One item, a drill stand, was not completed due to running out of time but the part machined blank was taken home at the end of the course.

Photograph 1 shows the blank that has been kicking about in my shed for the last 50 odd years. The "157" written on it was my "works" number at the college.

I have various sets of drill bits. One set for general everyday usage and several boxed sets taking account of imperial and metric sizes. Some are classed as "best" for accurate work. As the impact of metrication took hold, I bought another set of metric bits for general use with 1/2mm sizes. The plastic case was not up to much and anyway I wanted easy access to the set without rummaging in the drawer under the bench. A drill stand was needed. Now where did I put that blank?

MARKING OUT AND MANUFACTURE

I seem to remember that the original plan was for the drill bits to be in a spiral but that was then. A simple circle was chosen and provision was to be made to take a set of imperial drill bits whose case had seen better days. This resulted in the drill bits being accommodated in a double circle. What should the diameters of these circles be? The length required for the set was calculated using a quick spread sheet that also gave the step distances from the centre of one hole to the next. **Table 1** shows the sheet for the metric drill bits.

Arc length required for drills	102.79	*Arc length required for spaces*	63.00	*Total arc length required*
	10.00	5.00	3.50	
	9.50	4.75	3.50	13.25
	9.00	4.50	3.50	12.75
	8.50	4.25	3.50	12.25
	8.00	4.00	3.50	11.75
	7.50	3.75	3.50	11.25
	7.00	3.50	3.50	10.75
	6.50	3.25	3.50	10.25
	6.00	3.00	3.50	9.75
	5.50	2.75	3.50	9.25
	5.00	2.50	3.50	8.75
	4.50	2.25	3.50	8.25
	4.00	2.00	3.50	7.75
	3.50	1.75	3.50	7.25
	3.00	1.50	3.50	6.75
	2.50	1.25	3.50	6.25
	2.00	1.00	3.50	5.75
	1.50	0.75	3.50	5.25

Table 1: Drill stand centre distances spreadsheet

Photo 2: Part drilled marked out drill stand.

Another sheet was produced for the imperial set. The full size of the blank was utilised, so the circles were spaced to give easy access to the inner drill bits. The final dimensions were: blank diameter = 4 inches, inner circle diameter = 53mm and the outer circle diameter = 81mm. **Photograph 2** shows the marked out blank being drilled. The marked out blank had the hole centres centre punched and a suitable pilot hole drilled before being drilled final size. The drills needed to be a reasonable sliding fit in the hole and it was found that using the actual drill bit for the for the drilling gave reasonable results. It should be noted that inaccurate results are likely if the drill bit has jammed whilst drilling a hole in the past which has thrown up a burr as in **photo 3**. No doubt readers are aware of this problem, but I thought that it was worth mentioning. The burr can usually be removed using a smooth file. The burr would also stop the drill bit entering fully into the new hole even if it was only slight. **Photograph 4** shows the completed stand. The drill sizes were marked on the stand using an engraver freehand.

It may have taken 50 years to complete but it is a useful everyday item that was worth the time to finish.

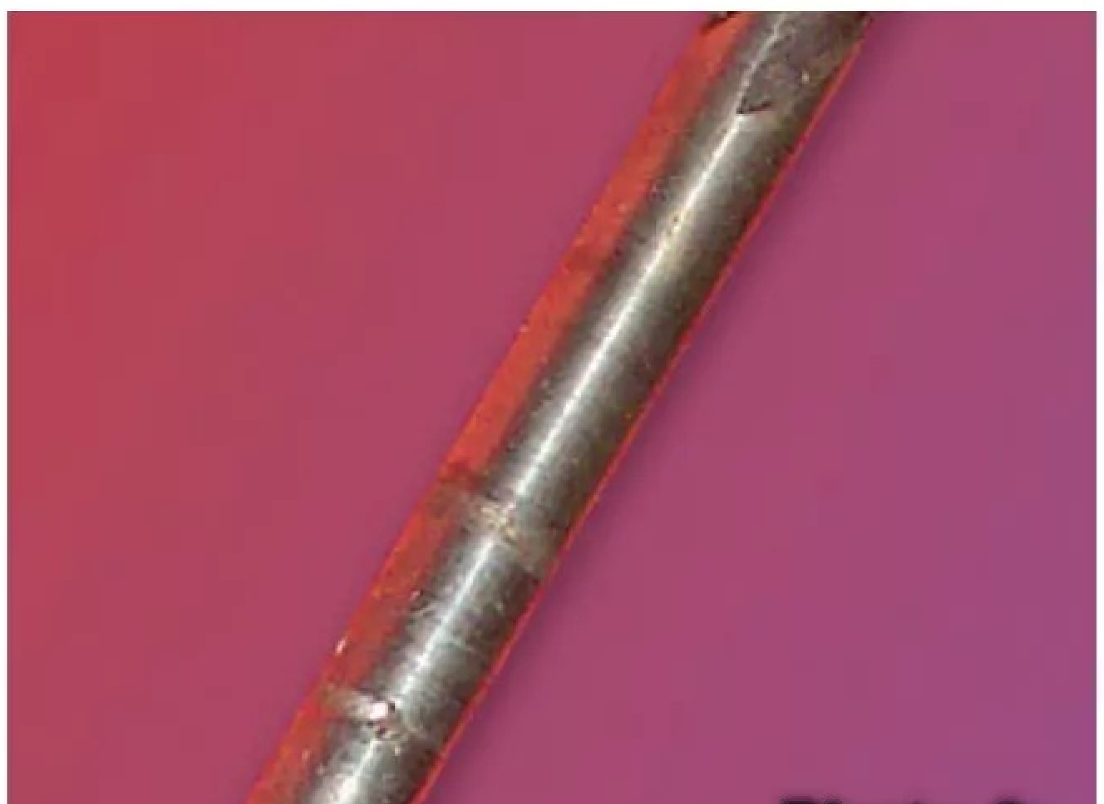


Photo 3: Burr on drill bit shank.

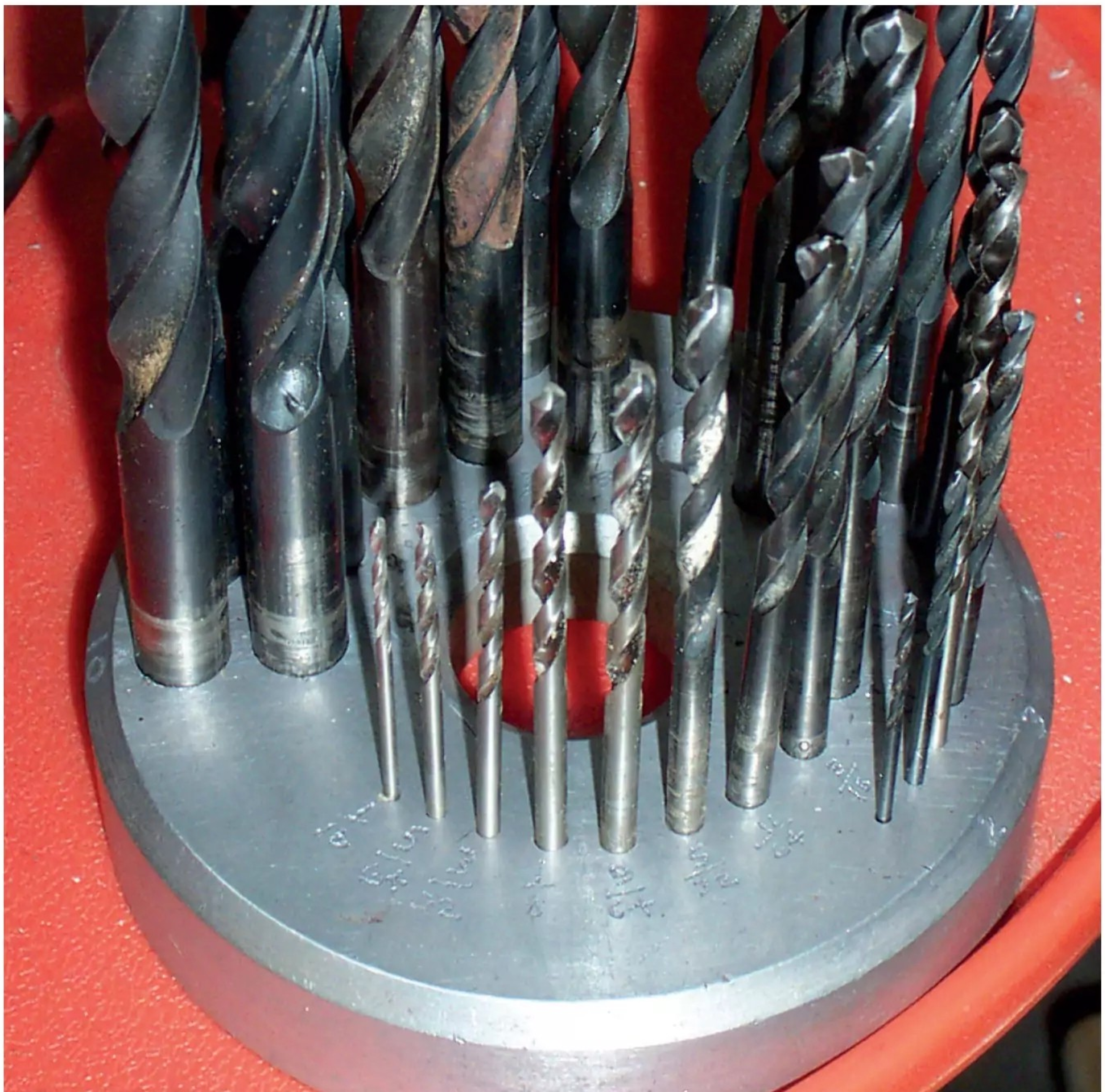


Photo 4: The finished drill stand.

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Jacques Maurel offers some advice on using internally threaded milling cutters with an adaptor.

Using Threaded Bore End Mills

Some end mills have a threaded bore, with or without a centring register. It's not easy to tighten and untighten them from the holding shaft. This usually requires using a lathe carrier, with the tool edges protected by a soft metal strip wrapped around it. This is not easy for dovetail cutters as the risk of breaking the sharp teeth is great. **Photograph 1** shows a 30mm diameter dovetail cutter with a M10 bore.

It is convenient to use a special spacer, **photo 2**. Here the number 2 morse taper part is made from 22mm hex CRS (cold rolled steel), the spacer is from 17mm hex CRS. This ensures it's easy to tighten/untighten the end mill using two spanners. In **figure 1**, the hexagon is 19mm across flats, this is the minimum possible value for turning an MT2 shank.

The cylindrical part between the cutter and the hex part of the spacer is to ease the sharpening process by giving some clearance for a grinding wheel.

The cutters with no centring register must be sharpened after setting on the holding shaft as the concentricity is not good enough between the cutting teeth and the threaded bore.

Photo 1: Internally threaded dovetail cutter.

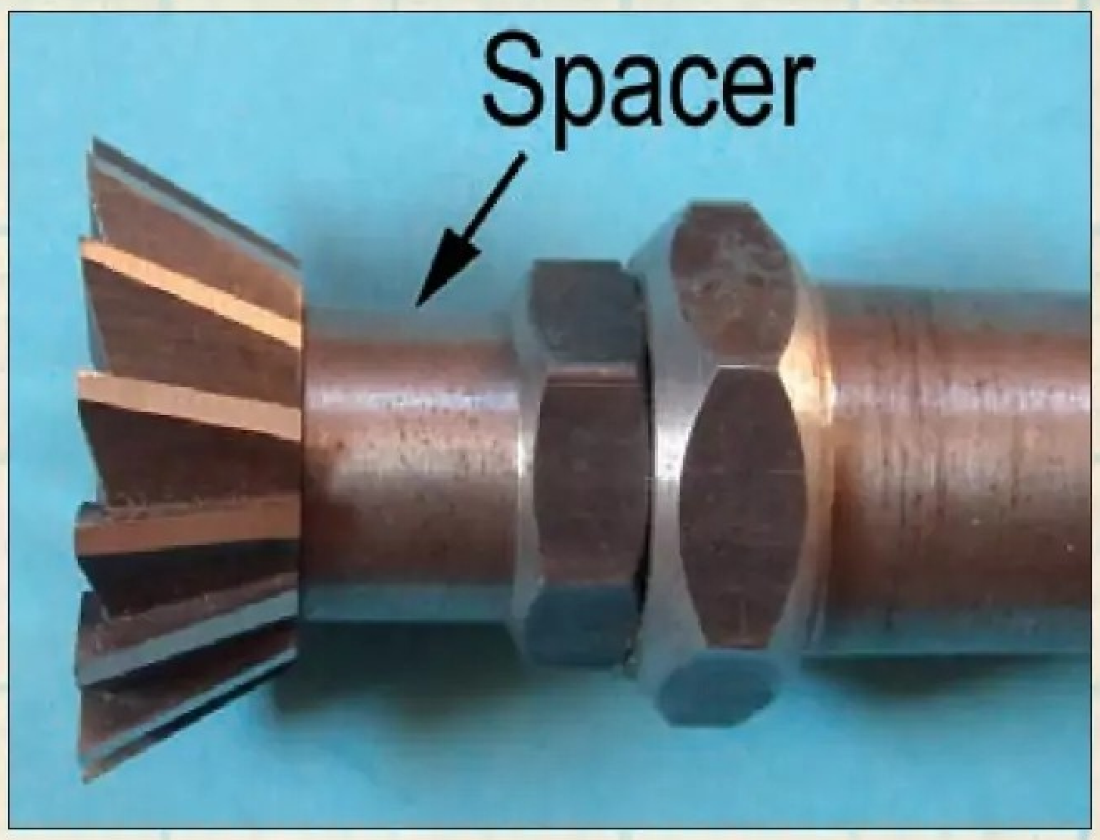


Photo 2: Cutter mounted on MT2 holder.

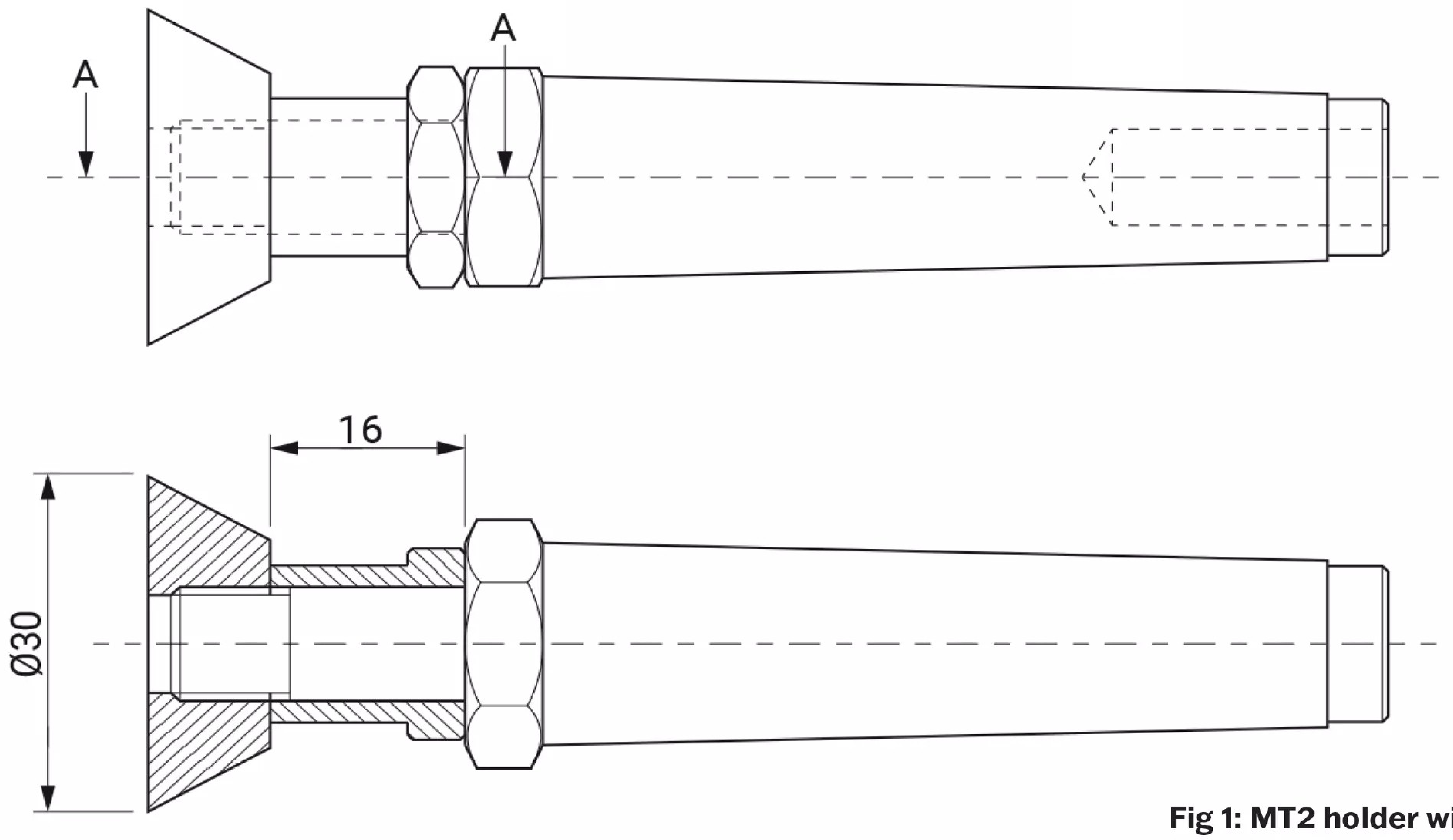


Fig 1: MT2 holder with special locking nut.

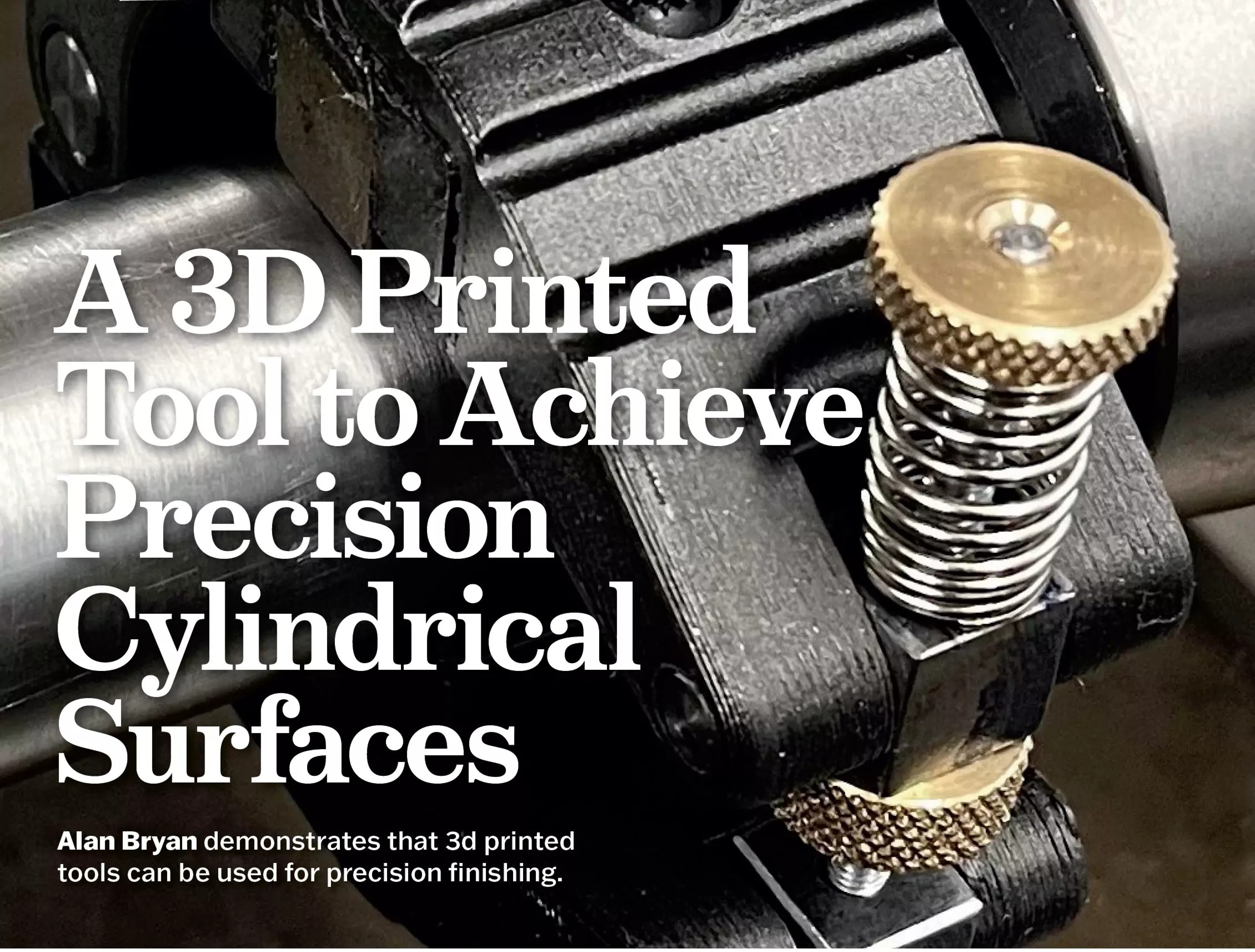


Photo 1: The 3D printed Hone Tool

A 3D Printed Tool to Achieve Precision Cylindrical Surfaces

Alan Bryan demonstrates that 3d printed tools can be used for precision finishing.

Sometime around 1990, I purchased a set of castings for the *Quorn* Mk1 Universal Tool and Cutter Grinder from the now defunct Model Engineering Services company. Having already completed a Dore Westbury Mk1 milling machine kit from the same source, I was confident that it wouldn't take long before I was able to commence building the machine. I estimated that it would probably take me around a year to build it. How wrong I was. My work in the Automotive Industry changed and took me travelling to many overseas destinations which meant long absences from home. I was able to "tickle around the castings" during periods when I was working back in the UK, but I spoiled two castings and the project was put away 'beneath the bench' to be resurrected at a later date.

Time marched on and 34 years later, retirement beckoned and I finally got around to resurrecting it. I began by replacing the two castings that I'd machined incorrectly. I also decided to first model the whole machine and its accessories in 3D using CAD. That was a wise decision because it has since enabled me to run simulations for the machining set ups that are necessary to produce the parts. Indeed, I cannot emphasise sufficiently just how advantageous that decision has proved to be. I spent over 30 years working as a

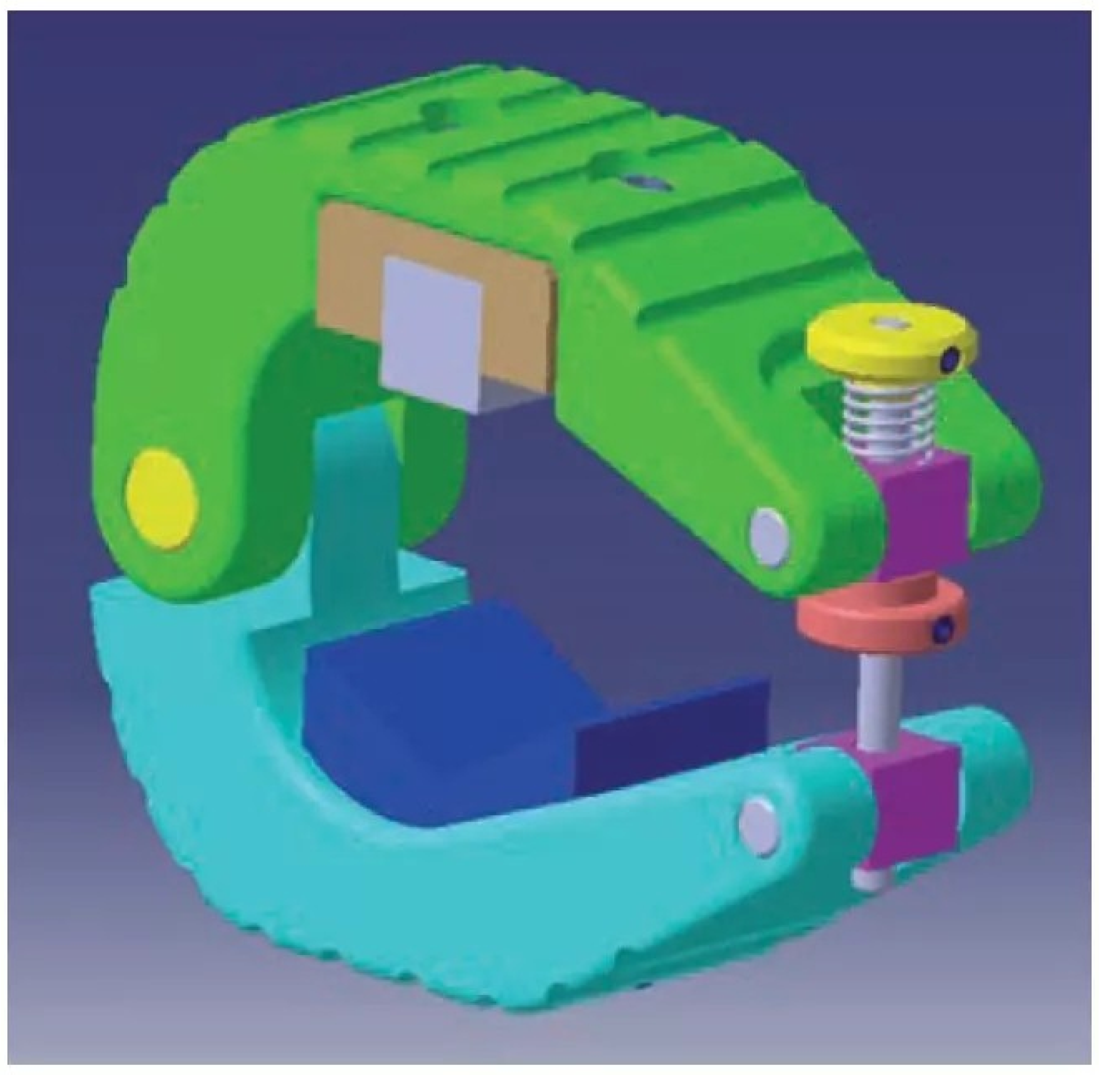
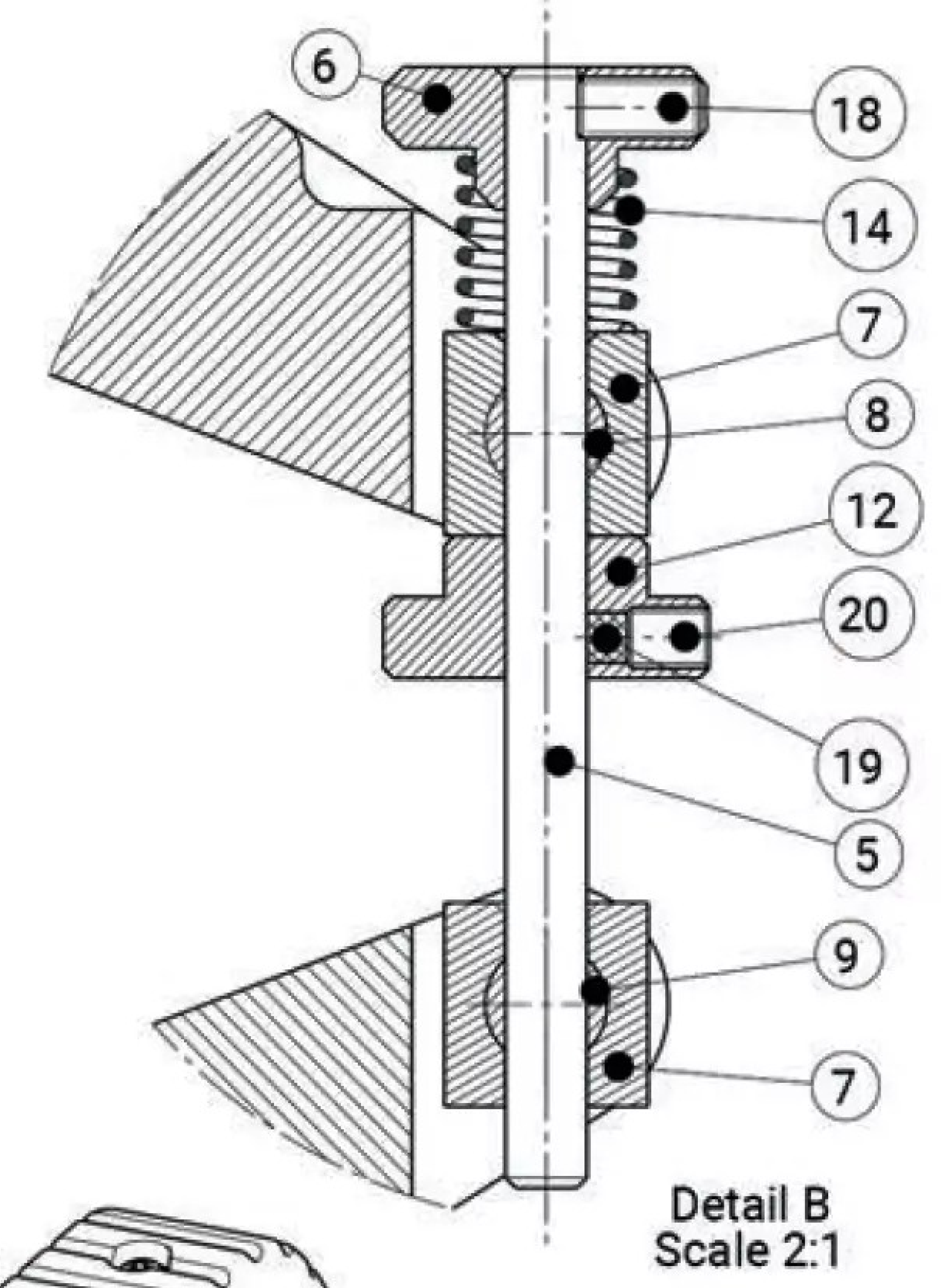
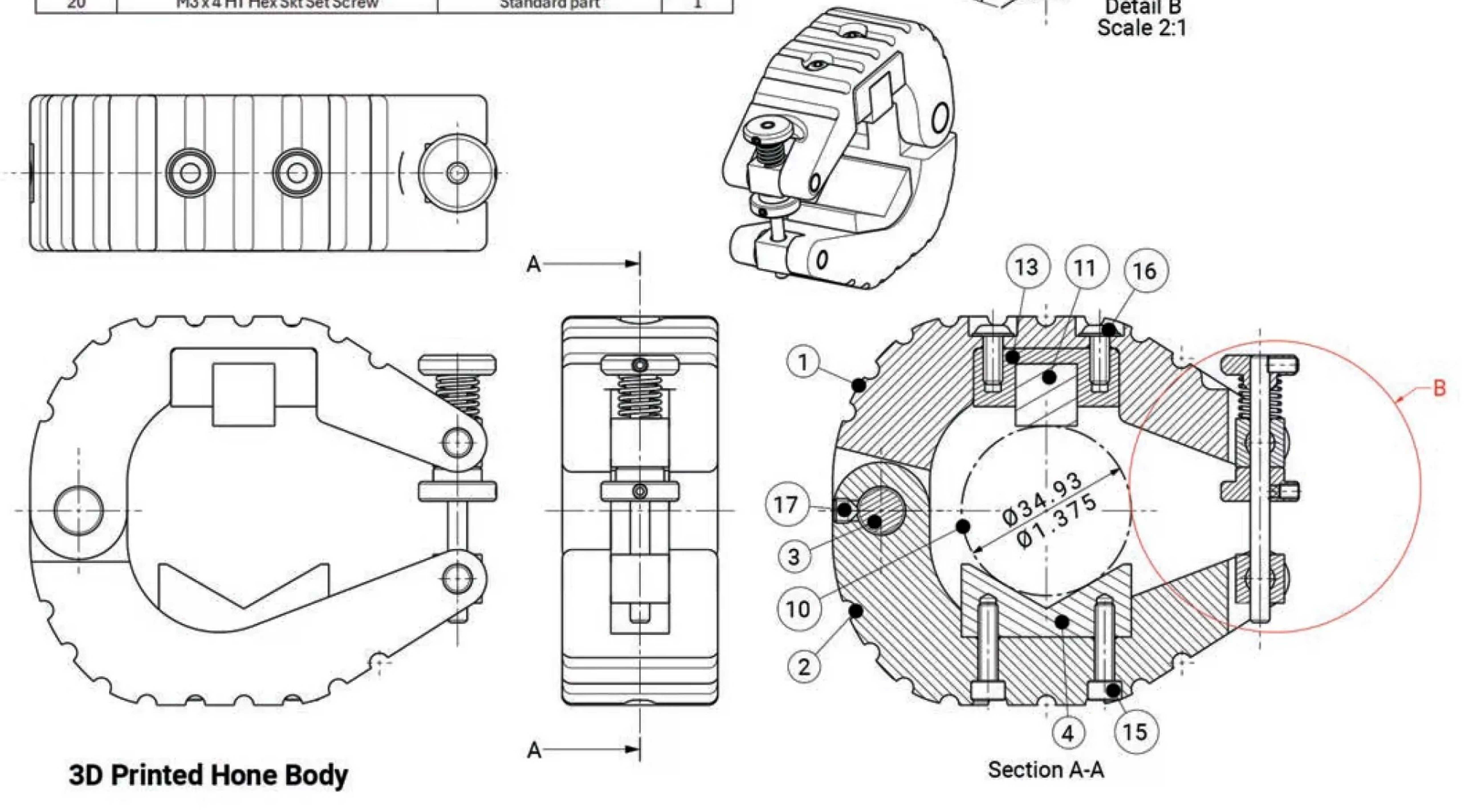


Photo 2: 3D render of the various parts.

Bill of Material: Assy-Exterior Hone			
Item	Part Name	Material	Qty
1	Exterior-Hone-Part 1	PLA-CF	1
2	Exterior Hone Part 2	PLA-CF	1
3	Pivot pin	Silver Steel (Drill rod)	1
4	Anvil	PLA-CF	1
5	Adjuster Screw	M4 Studding (Allthread)	1
6	Adjuster Knob	Brass	1
7	Adjuster Screw Anchor	Mild Steel	2
8	Plain Axle	Silver Steel (Drill rod)	1
9	Threaded Axle	Silver Steel (Drill rod)	1
10	Workpiece	Not Shown	1
11	Abrasive Stick	Cut from carborundam stone	1
12	Limit Stop Knob	Brass	1
13	Abrasive Carrier	PLA-CF	1
14	Compression Spring	To suit	1
15	M4 x 16-Skt Hd Cap Screw	Standard part	2
16	4mm x 12 flanged button head ST screws	Standard part	2
17	M5 x 5-Hex Skt Cone Head Grub Screw	Standard part	1
18	M3 x 6 Hex Skt Set Screw	Standard part	1
19	Friction Slug	Length of PLA Filament	1
20	M3 x 4 HT Hex Skt Set Screw	Standard part	1





design engineer, using advanced 3D modelling programs and working on a screen to produce designs. Since retirement I have found it natural to follow the practice of simulating processes in a comparable manner to the way that I did in automotive design and build processes. I followed the book written by Professor Chaddock, who designed the Quorn, regarding set-up procedures for castings or parts, but he only used a lathe for everything, whereas I also have a milling machine. Despite having a mill, part and casting set ups can take several hours to achieve whereas the machining operation only takes 20 minutes to complete. Having the ability to manipulate and simulate virtually, that set up can be investigated digitally and achieved much faster, saving many hours overall. The production of the Quorn is now progressing slowly but steadily. Many of the Quorn parts are shafts and need to be produced with finely finished and accurately sized cylindrical surfaces. I have lost count of the number of times that I've considered just how useful a precision cylindrical grinder would be in the workshop. Sadly though, I don't have the room for one, nor can I justify the purchase of one to the ultimate authority. It's often said that when building the Quorn one comes to realise just how useful it will prove to be when finished, because one needs the machine during the build-time to produce the tools and cutters necessary to machine it and in some cases to finish the parts to the required degree of accuracy. How true that is.

THE GERM OF AN IDEA

Then I remembered a talk I had attended many years before, delivered by none other than the late Professor Dennis Chaddock. He had spoken then about honing as a method of producing finely finished and perfectly parallel cylindrical surfaces. To prove the value of the process, he demonstrated a cylinder which I think was about 1.5-inches diameter and 2 inches length with a ¾-inch diameter hole through. The hole had been finished with an internal hone, and it slid onto a ¾-inch diameter shaft of about 6 inches in length that had been finished externally by honing it. When the shaft was stood vertically on its end the larger cylinder began to slide down under the influence of

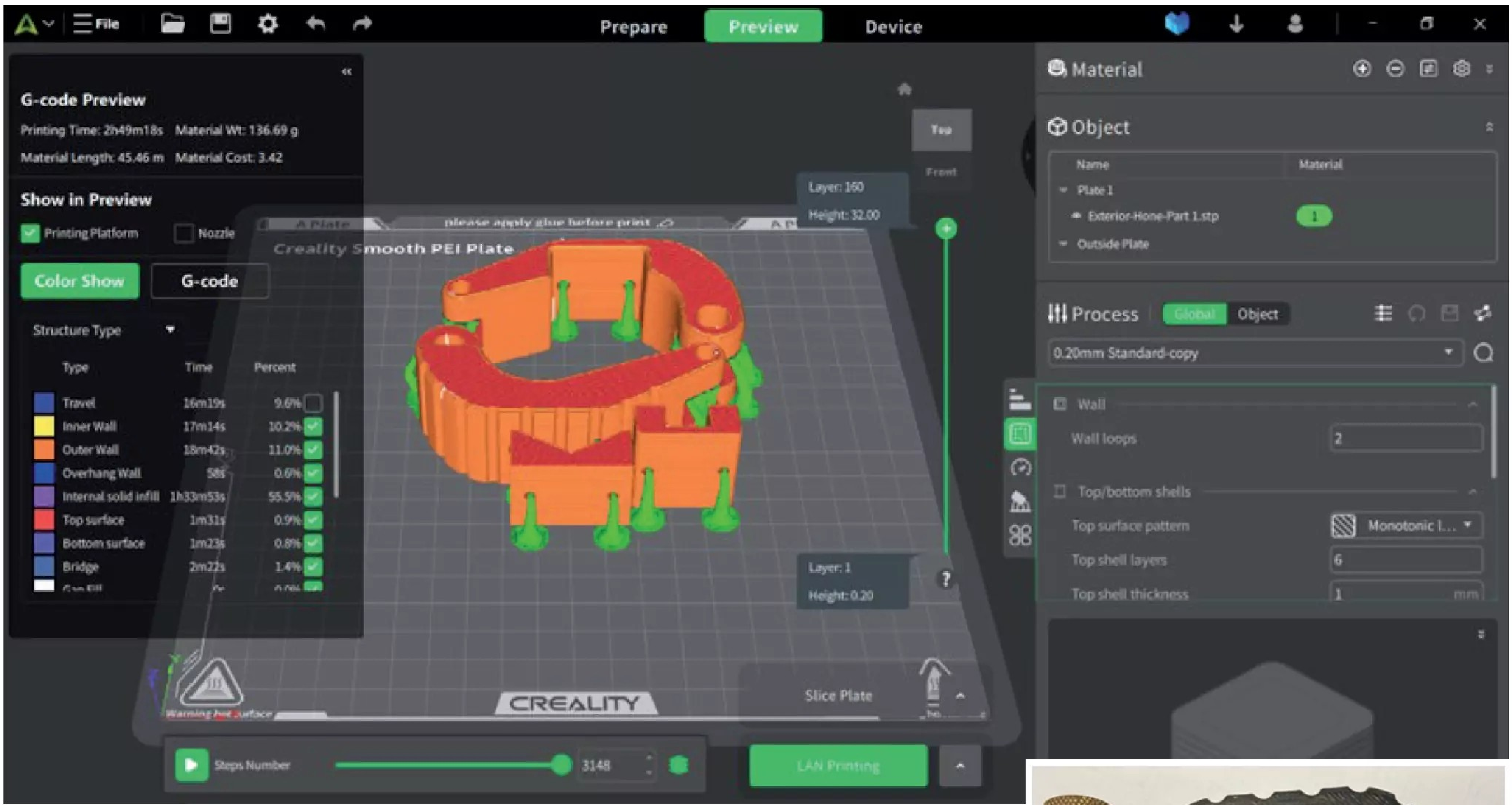


Photo 3: Part files arranged in the slicer ready for printing.

gravity. The fit and finish imparted on both mating surfaces was so accurate and well done that it took several minutes to slide the length of the shaft onto the tabletop which it had been placed upon. There was nothing to impede the cylinder's progress. Only the accuracies of both the bore and shaft, enabling the tight but free moving mating fit, permitted the slow movement.
OK I thought, now I know how I'm going to do it.

INVESTIGATING ALTERNATIVES

Researching honing on the internet I came across www.thebloughs.net. Tom Blough had built a Quorn, and its construction is documented on that site. He, like me, had seen the need to produce finely finished and accurately sized surfaces and had come to the same conclusion. Therefore, he set about making a set of honing tools based on the Delapena pattern hones. It appears that Delapena still exists as a business but no longer make those tools. He also mentions that MEW carried an article in the June/July 1997 issue describing a kit built Delapena Hone clone, but as far as he was able to ascertain, that kit is also no longer available. Therefore he set about making a set for himself and documented the build on his website. He machined his from aluminium and brass, so doing as I always do first, I set about modelling a honing tool, based on his dimensions. **Photograph 2** shows what I produced.

HOW TO MAKE IT - INITIAL THOUGHTS

Well, actually it wasn't what I modelled at first, because initially I modelled it to be machined out of two chunks of solid aluminium, with brass and aluminium inserts to function as the blue anvil and the beige carrier for the abrasive stone, respectively. The three shafts use silver steel (drill rod) and the purple adjuster screw anchors are made from mild steel. I purposed a cut length of M4 studding (all-thread) for the screw and designed the two knurled knobs to be turned from brass. The spring is a commercially available one which I had in stock along with some of the other materials. The other bits, such as the aluminium bar and the 6mm diameter and 10mm diameter silver steel, I was able to source at reasonable prices online.
I then considered the machining process. Tom documents that photographically on his website and provides a downloadable process sheet detailing every step. I have all the necessary equipment to machine the parts, and I considered the time required. After all, although being retired theoretically allows one more time to devote to one's hobbies, there are still other things to do that make demands on the time available. Could I do it otherwise

Photo 4: The finished tool.

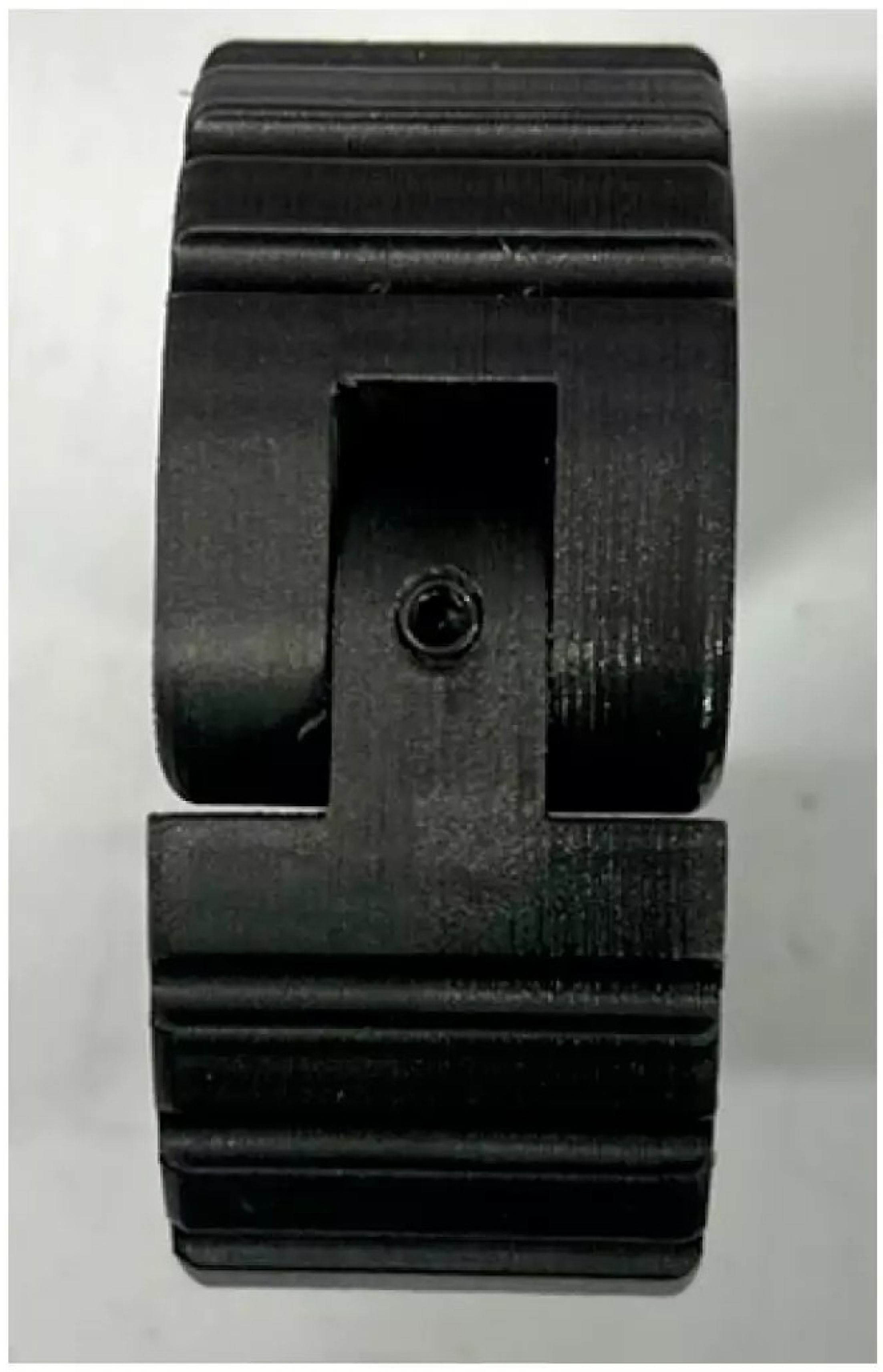


Photo 5: Hinge detail.

to use less of my available time?
I had invested in a Creality K1C-3D printer some time ago and it has since proved to be invaluable, enabling me to produce a variety of objects for the workshop. The list includes DTI holders that mount directly onto the Dickson quick change tool posts on my Myford Super 7 and Colchester Master 2500 lathes, storage blocks for milling cutters, spanners and torx drivers. Also, magnetically retained soft jaws for my two bench vises. When I designed and manufactured a new mounting system for the switchgear on my Elliott 10M shaper, it required something to enclose all the electrical connections between the electrical components plus a rocker switch for the machine light.
That meant sourcing two custom housings. Therefore, I designed and modelled both mouldings in CAD and 3D printed both in PLA. They both function perfectly, fit where they were designed to and cost a couple of UK pounds in material. It truly is a useful machine and I'm sure that it will continue to earn its keep for years to come. I have drafted another article about its use in my workshop and most of the parts mentioned here are covered in it. In time, more will be revealed. Naturally, my thoughts logically then turned towards manufacturing the hone by 3D printing as a way to conserve my time.

WAYS TO SAVE TIME

Firstly I researched it a bit further. Had anyone else done it? Will the tool produced prove to be sufficiently rigid? How much of it can I produce by 3D printing? I found on YouTube that someone had designed, printed and used a single-sized-hone from PLA that relied on abrasive cloth as the 'cutting medium'. Indeed the G-Code file to print it was available to download free of charge. The originator praised the performance of the tool, so I got a fair assessment of its performance, but I didn't want to go that way. I wanted a tool that was adjustable over a range of sizes so that it would have uses on future projects.
Therefore I returned to the Delapena principle and considered producing the two halves of the hone body from carbon reinforced PLA (PLA-CF) and to use brass and aluminium to produce the anvil and the abrasive stone carrier. The axles would be silver steel and the screw made from a piece cut from a length of M4 steel studding. I also intended to use mild steel and brass for the other parts of the adjustment mechanism.

THE DECISION MADE

I modelled it in CAD. I changed a few features from the design that Tom had produced and published but the concept and overall dimensions are still virtually the same. I then reconsidered using aluminium and brass for the stone carrier and the anvil respectively having seen that the PLA, one-sized hone was reported as wearing well where it had rubbed against the rotating workpieces. I therefore changed both of those parts to using the PLA-CF as well. Then after consideration I saved all four printed components as individual STP files. I then loaded all four components into the Creality Print App, set up the print specification, sliced the lot as one file and saved it as G-Code, **Photo 3**.

FROM VIRTUAL TO REALITY

I took the plunge and printed it all. Then three hours later I had all the main components. I would have been more that several days if I'd machined them from aluminium bar.
Some fitting was necessary to achieve the mating standards that I required. I had to put a reamer through each of the 6mm and 10mm holes to allow the silver steel shafts to run freely. I had specified 3mm thick walls though for all surfaces to allow for that. I therefore finished with an assembly which fitted well together yet articulated fairly freely.
The 10mm diameter axle is retained within the body of the lower part with an M5 grub screw. I ran an M5 tap into the 3D printed hole which I'd printed at nominal tapping size to accommodate that. I had to first pass a 4.2mm diameter drill through it to correct the miss-shaped printed hole, but it produced a thread.
The anvil was fitted into its printed receptacle in the bottom half of the body by adjusting the printed surfaces with a file. It is retained by two 4mm flanged button-headed self-tapping screws. In use, the load on the anvil is compressive, so the screws are not under any stress.
The stone carrier is a similar fit into the top half of the body, so I gently relieved the carrier by filling to get it to fit. I used two M4 cap-screws into M4 threads tapped into the carrier to retain it. Again, the carrier is loaded compressively in use. The carrier is restrained laterally by its fit into the body so there is no operating load on those screws either.
The grit stone is held into the carrier with Araldite. I have no idea of the exact grade; any print had long disappeared from the stone. It is a length of ½ inch square, fine grit stone that I had to hand. I used a tile cutting disc in a Dremel tool to slice it up and it easily cut through the stone.

MORE TRADITIONAL MANUFACTURING METHODS

The rest of the adjustment parts are simple turning and milling. The top thumbwheel is retained onto the threaded shaft with Loctite retainer.
The spring is a commercially available one that I had in stock which suited the application. In the design that Tom produced, the lower thumbwheel stop is graduated, although I didn't bother. Like Tom's version though I tapped it through M4 and cross-drilled M3 for a grubscrew which loads a short length of PLA filament to bear against the threaded shaft. That prevents the stop from moving around the shaft due to the vibration and changing the setting.
Thus, providing an adjustable stop to produce a constant diameter on the workpiece being honed.
Making all those parts took a few more hours and, after leaving the Araldite to set overnight, I had a tool to try out, **photos 4, 5** and **6**.

CRUNCH TIME

Having got to the trying out stage, would it work? I decided to use it to bring the grinding-wheel spindle housing for the Quorn to size. The outside diameter of 1.375 inches is supposed to be a close sliding fit within the bore of the wheel-head bracket. I had bored the hole in the bracket to size or as best as I could measure it. I had cleaned out any machining marks remaining from the boring process on the milling machine by using a spring-loaded cylinder bore hone in the drill chuck with the spindle accurately centred over the bore. I then checked the bore for parallelism again with a telescopic gauge and found it to be very good and consistent.
I had turned the outside diameter of the spindle housing approximately 0.002 inch over-sized on the diameter. It did have a reasonable surface finish and measured to be parallel over its length.
I also had rough bored it ready for finish machining and internal threading. I intend to do that after the outside diameter was finally sized so I also machined a short 60-degree chamfer into each end of the rough machined bore.

Photo 6: Top view.

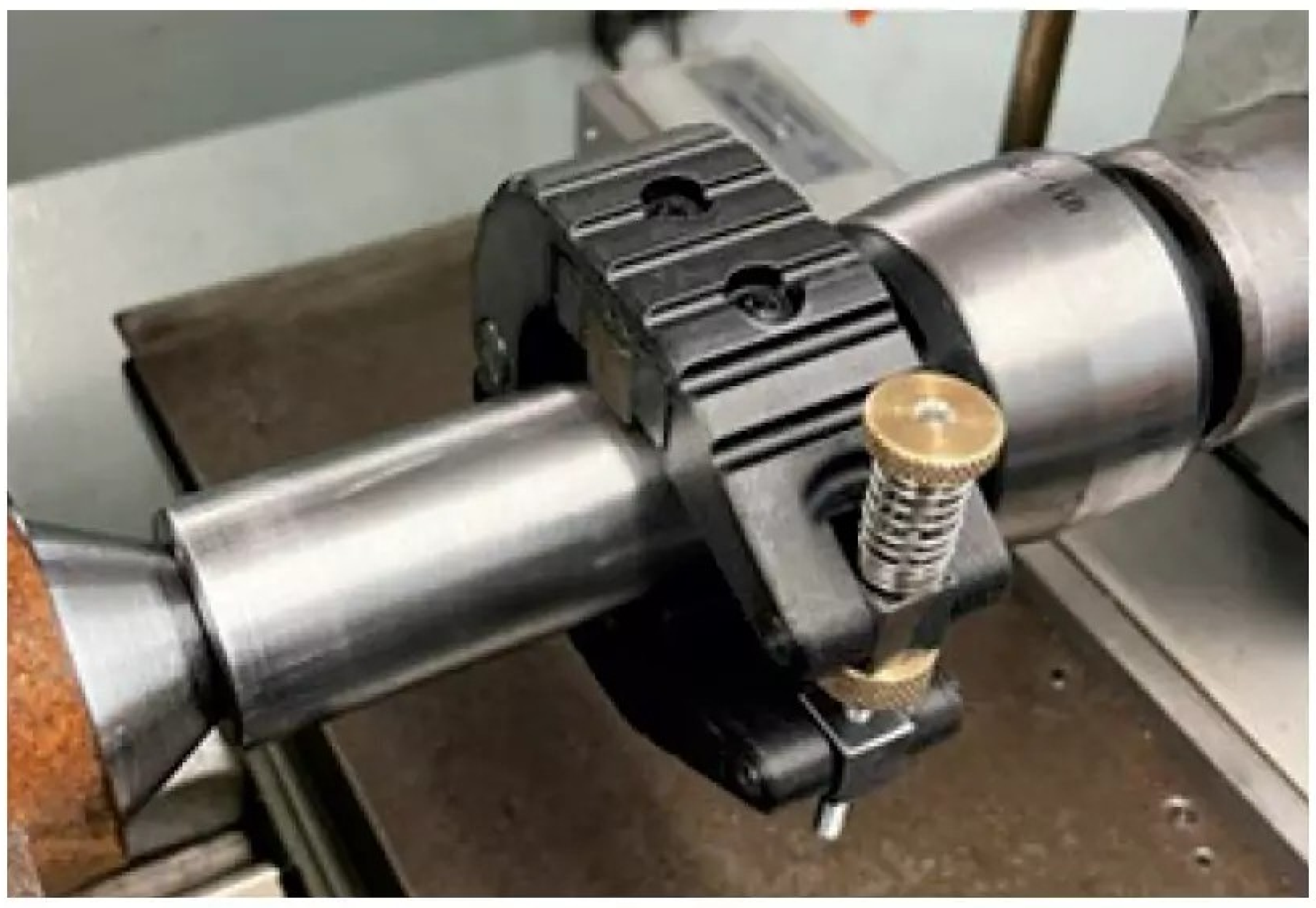


Photo 7: Turned in place centre for the spindle carrier.

Photo 8: A clearer view of how the stone is held against the work.

PREPARATION FOR USING IT

The live centre for my Colchester lathe just registered into the chamfer on one end of the bore of the spindle housing but the available dead centres that I had for the lathe headstock just rattled around in the bore on the other end. I therefore chucked a short length of scrap 50mm diameter mild steel in the chuck and machined a short 60-degree included angle onto the end of it. The spindle housing was then gripped between the two centres with the hone positioned onto it as in **photo 7**. The load imparted axially by the tailstock onto the soft headstock centre was sufficient to prevent the drive from slipping. I set the rotational speed to 155 rpm.

THE TEST

I oiled the stone and the length of the shaft to be honed then gripped the hone in one hand. The lathe clutch was then engaged using the saddle mounted control lever. I had set the thumbwheel stop on the hone hard against the top half of the hone when the hone was gripped tight onto the shaft and I ran it up and down the length of the spindle housing without letting the stone or the anvil overlap the edge of the shaft at either end of the housing. I let the lathe rotate for several minutes at that setting, running the hone backwards and forwards along the shaft, before switching off. I then removed everything from the lathe and took the hone off the shaft. All traces of abrasive were cleaned from the shaft, and it was tried into the wheel head bracket. Its finish was improved compared to before starting but it didn't fit the bore. I took measurements along the housing to ensure that it wasn't going out of parallel then set it all up again on the lathe. This time I rotated the stop on the threaded shaft in the hone by approximately one twelfth of a turn to permit it to close up by a fraction over 0.002 inch. Then, after oiling the stone and shaft I proceeded to run it up and down as before, **photo 8**

I stopped periodically, cleaning it, checking it for size along its length and returning it to the lathe. My repeated measuring meant that I had been able to keep it reasonably parallel. Checking regularly enabled me to find the sections which hadn't reduced uniformly so I could concentrate more attention on them to reduce the diameter where it was required to do so. I then continued to hone along the shaft's length under power until I had a good sliding fit that felt consistent along its length within the bore of the bracket. It took less than an hour to do it.

TAKING STOCK. WAS IT WORTH IT?

I was satisfied with the outcome of that process and considered it a success. I examined the hone closely to see how it had stood up to the loads imposed on it during the operation and was pleased to find almost no sign of wear. The highest abraded 3D printed part in use was probably the anvil due to the continual contact between the shaft and the vee surfaces plus the transfer of grinding grit onto it. I examined both vee surfaces closely and they showed virtually no wear, which considering their exposure to the abrasive as well was encouraging. The body of the hone remained rigid during use and the bores for the shafts in the printed bodies showed no signs of elongation either. The tool is ready to use again if and when the need arises. Not bad for a tool that took less than three hours to print using 137g of filament costing less than £2.00, instead of a several days spent machining chunks of aluminium that cost at least five times that.

WORKPIECES THAT CAN BE ACCOMMODATED

The range is approximately between 30mm and 50mm diameter using the anvil that I first produced. By using different depth anvils the shaft diameter that it will accept can be increased or decreased above or below those values. I have since made another anvil to accommodate a 12mm diameter shaft and finish honed a part to that diameter. The tool functioned perfectly at that diameter also, removing excess metal to produce a perfectly finished and functioning part. I am well pleased with the adaptability of the tool.

DATA AVAILABILITY

If anyone is interested in producing this tool for their own use by 3D Printing, I have provided the files for download from the *Model Engineer Forum* at www.tinyurl.com/at7tm57p. Since most of the slicing programs appear to accept STP or STL Files, you can import them directly into your slicing program, process them and save them as G-Code to print from. Also you will be able to import the file into your CAD program, should you wish to use it as a basis for a variation of the design.

Disclaimer

Use of my models to print directly from is at your own risk and I am unable to take responsibility if you do not achieve your desired results. There are many different variations that it's possible to make to the concept during the slicing stage. It is your responsibility if you choose to amend the design, change the material or if your slicing program uses different parameters to those which I printed from. I made mine from PLA-CF filament and I haven't tried any other materials. I chose that material due to its supposed improved durability, but it may perform slightly differently if made from another filament.

2025 Cardiff Rally

Ross Hopkins reports from South Wales.


Photo 3

In early June, the Cardiff Model Engineering Society hosted its 33rd Welsh Locomotive Rally—a firm favourite in many enthusiasts' calendars. It was a wonderful opportunity to catch up with old friends and celebrate our shared passion for fine-scale steam and traction models.

This year's event was the first under new Rally Secretary, Ross Hopkins, who has taken the reins from our chairman Mike Williams. I worked hard to organise and promote the event, and am glad to report this year's rally was a resounding success.

We welcomed several new faces bringing an exciting array of locomotives, **photos 1** and **2**; members and visitors alike remarked on the extraordinary craftsmanship on display. We were also delighted to host Julia and Matthew from Polly Engineering, who generously shared their expertise in precision fittings and parts.

A special thank-you goes to Kimio, representing our Japanese branch, for flying in once again to attend the rally. Here, **photo 3**, he is shown receiving a plaque of recognition from Chairman Mike Williams.

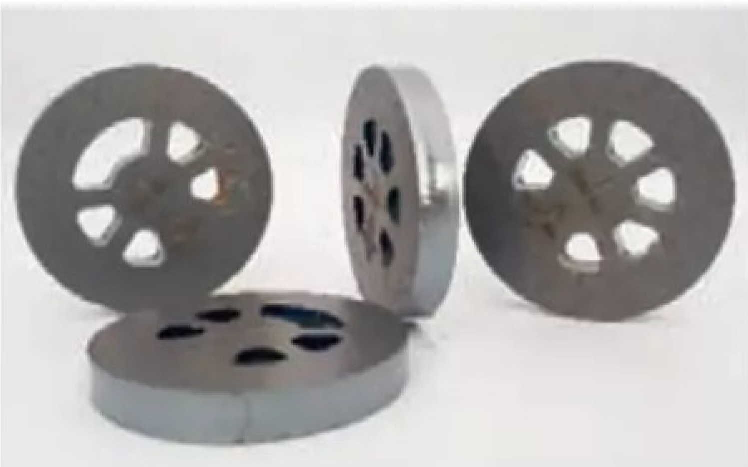
Thanks to the dedication of many volunteers, the weekend ran flawlessly. In particular, I extend my heartfelt gratitude to:

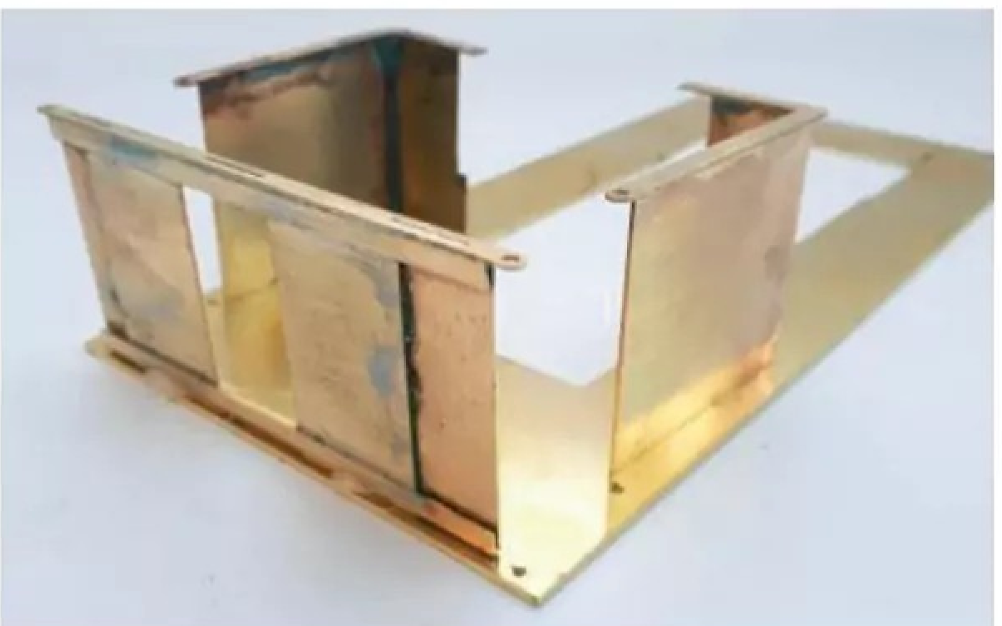
- Our Pullman and BBQ ladies, for providing refreshments throughout the event
- Hywel, Lewis, and Ben H.—whose efforts were truly outstanding

Mark your calendars for next year's rally, our 34th, taking place on 5–7 June 2026. To join the mailing list and receive early updates, please email us at rally@cardiffmes.com.


Photo 1


Photo 2






WHISTLE
SLOW


GBRf

Brett Meacle made some advanced modifications to his lathes to increase the range of screws he could cut and give a better choice of fine feed rates.

Gearing Around

PART 2

Photo 11: Split collet holding gear.

As promised, I will now detail how I modify gears. When it came to the smaller gears sizes that were hard to hold, split collets were made to secure and centre the gears in a 4-jaw chuck, **photo 11**.

A piece of gear stock fitted in the split collet in **photo 12** is in the process of being turned into a wide gear. When it came to the larger gears, **photo 13**, the chuck jaws were reversed in the 4-jaw, some copper strip was used to protect the teeth from damage, with the gear tapped back against the chuck jaw face to ensure it ran true.

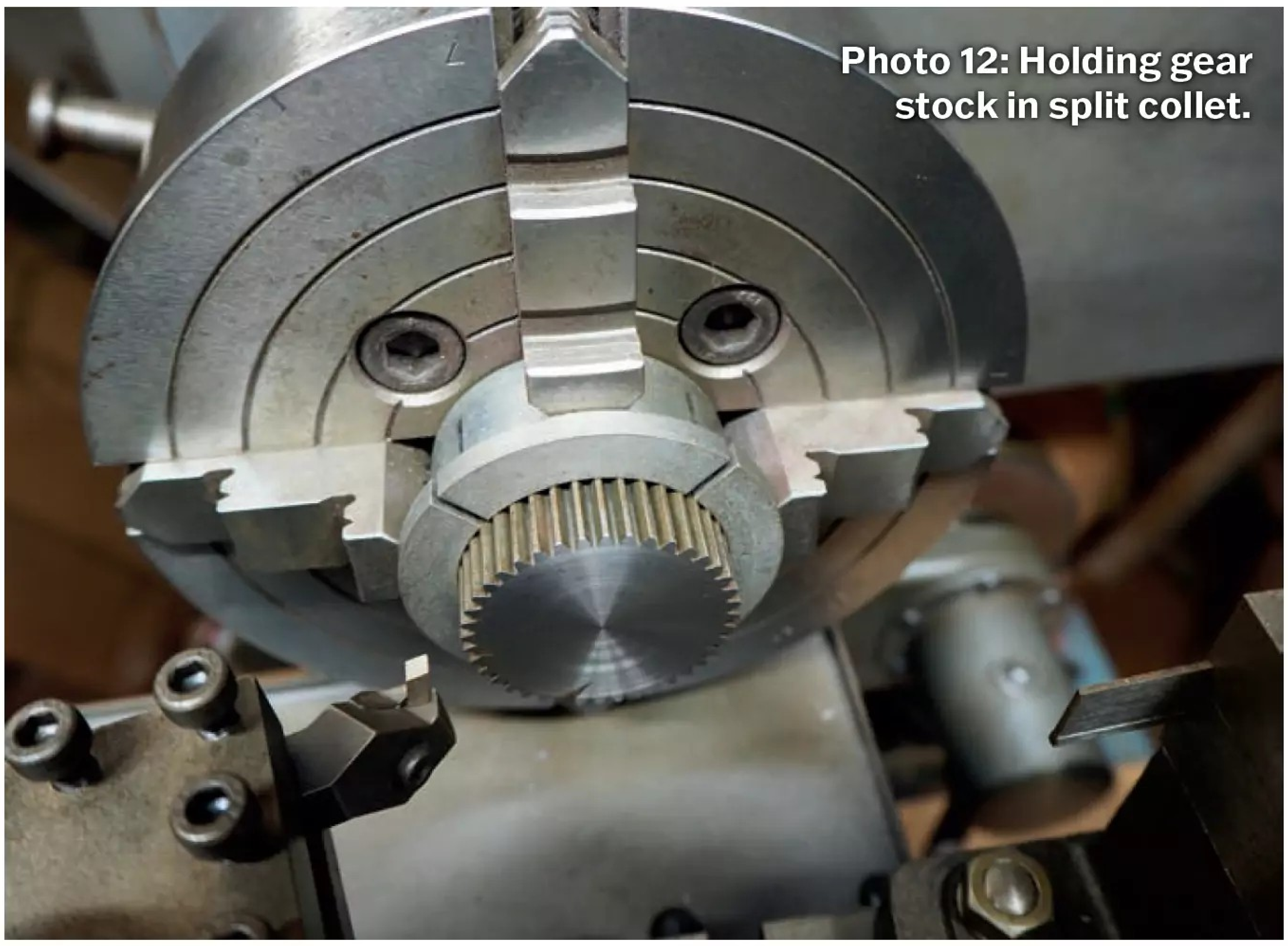


Photo 12: Holding gear stock in split collet.

To set up the gear to run accurately, a dial indicator can be used in the bore if it is a good quality gear. Gear stock does not have a bore to set up off, and some gears are not made accurately with the circular pitch of the teeth not concentric to either the bore or the outside diameter. In those cases, I decided to set up the gear by fitting a pointed spindle extension on the dial indicator, inserting it into the vee of the gear teeth, **photo 14**. It is a slow method with you having to work carefully lifting the spindle to clear the chuck jaws then seating it into a gear tooth. Working from one side to the other, to centre the gear, you are not checking every tooth but only 4 spaced equally on the diameter. With care the gears were set up accurately enough to overcome the errors. When you start the chuck rotating, you get a good indication of how accurate you are. You would be surprised at how a small amount of runout can be seen.

Once you have the gear running true, face this side, bore the hole and chamfer the edges of the teeth. If it is part of a compound reduction gear, machine

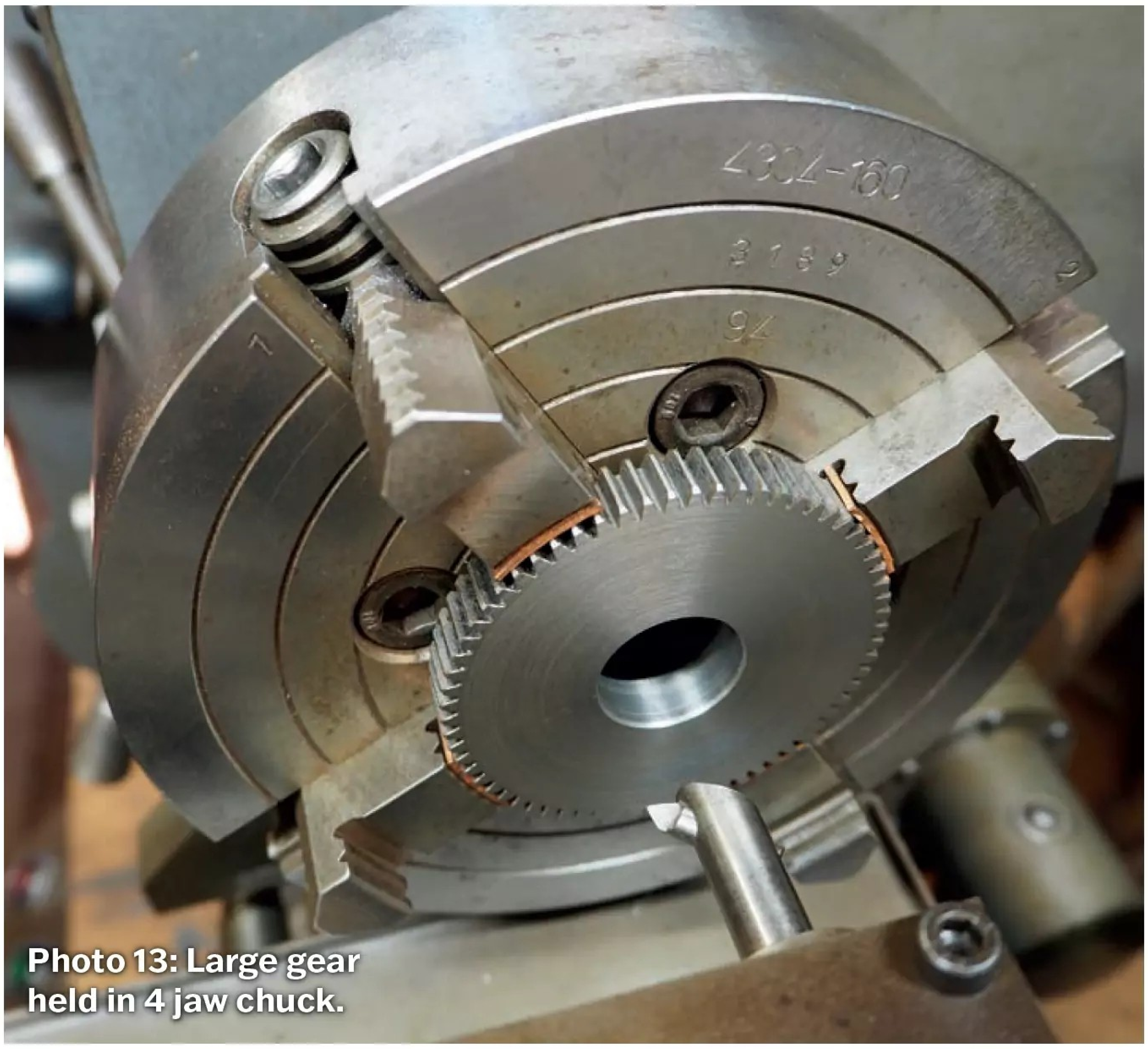


Photo 13: Large gear held in 4 jaw chuck.

Photo 14: Setting up gear using pointed extension fitted to dial indicator.

a spigot, **photo 15**, in preparation to fit the second gear.

The bores need to be accurately sized, the best way to get the bore right is with a plug gauge to test the size. I find using a plug gauge to size the bore first then machining the shaft to the fit required, gives more consistent results. The plug gauge is turned to the dimension you require with a short section at the end reduced in diameter to give an indication of how close you are to size.

If you only have single thickness gears, joining them together to create compound gears is still possible. **Photograph 16** shows a thick-walled bush being made for joining two gears together, each gear is then assembled onto the cylinder, one at a time.

I use shrink fits when joining the gears, this requires accurate bore and shaft sizes to get a good result. The method to assemble the gears is a choice up to you, a shrink fit method of 1 thou per 1 inch interference fit gives a permanent join but you could use liquid adhesive, fitting a pin on the join line or even screwing or riveting them together.

When you get the tolerances right, the reward in having the two parts slip together then lock as one is satisfying. Not that I can claim perfect results 100 percent of the time, it sometimes goes wrong, and you have to rescue the job if possible or even start from scratch again.

To finish the gear, either a single gear or compound set, an expanding arbor was fitted in the master chuck, allowing the bores to be used to complete the machining.

The time taken to make the expanding arbor, **photo 17**, was saved many times over as all the gears on the lathe have a 14mm bore, allowing it to be reused many times. Whenever it is inserted into the master chuck, it will be as true as when it was first machined. Once assembled on the arbor, **photo 18**, face to the thickness needed, true up the outside diameter if it is eccentric to the gear teeth, a recess cut if necessary and chamfer the edges of the teeth. To finish it off a change gear, a keyway needs to be cut or broached to match the keyed bushes, with most of the other gears fitted with 10-14mm sintered bronze bushes for long running life on the attachments.

The machining operations create a burr on the teeth so after you remove the gear from the chuck, run a file over the edges of the teeth to remove the burrs, also as part of normal fitting practice, deburr any sharp edges and chamfer bores on items as you make them, in particular ensuring a good chamfer to clear any tooling radius left on the mating component when joining two items together. **Photograph 19** shows some completed compound gears fitted with the sintered bushes ready to fit to the fine feed plate.

MOUNTING PLATES

When it comes to the different attachments, both the tumbler reverse and screwcutting clutch use a mounting plate that is only 6mm thick, while the fine feed attachments use 12mm plates. As a result of the difference in thickness, the mounting methods used to attach the idler shafts is different. **Figure 2** shows how the

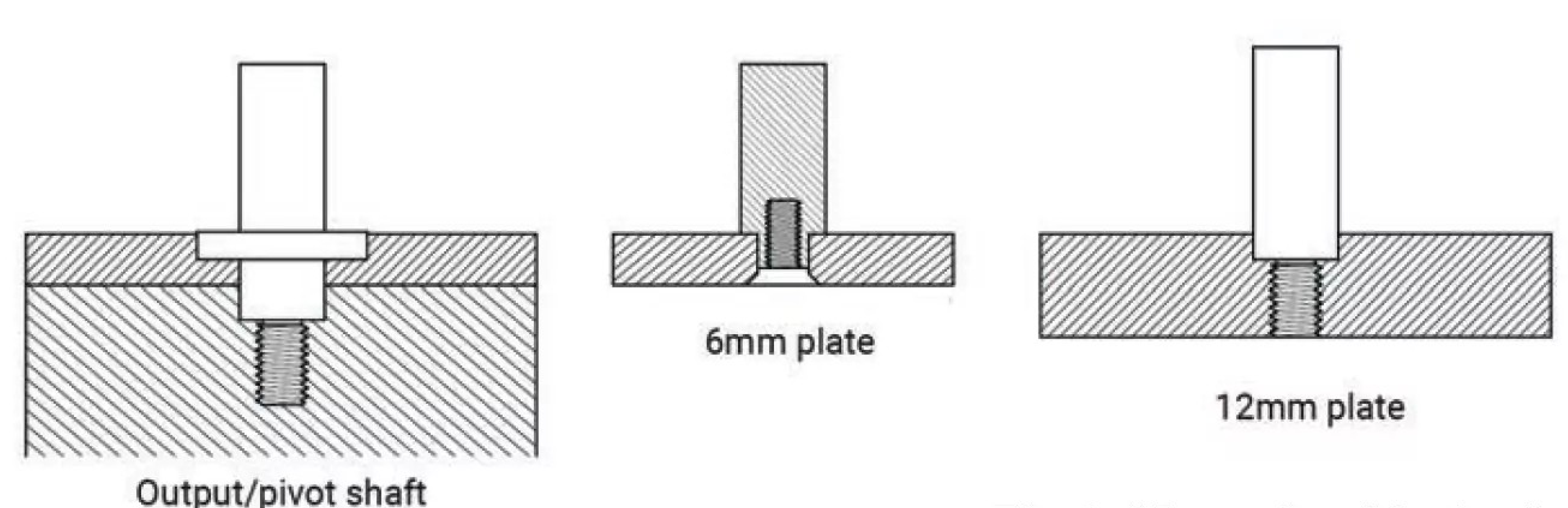


Fig 2: Mounting Methods

Photo 15: Gear bored with turned spigot to make a compound gear.

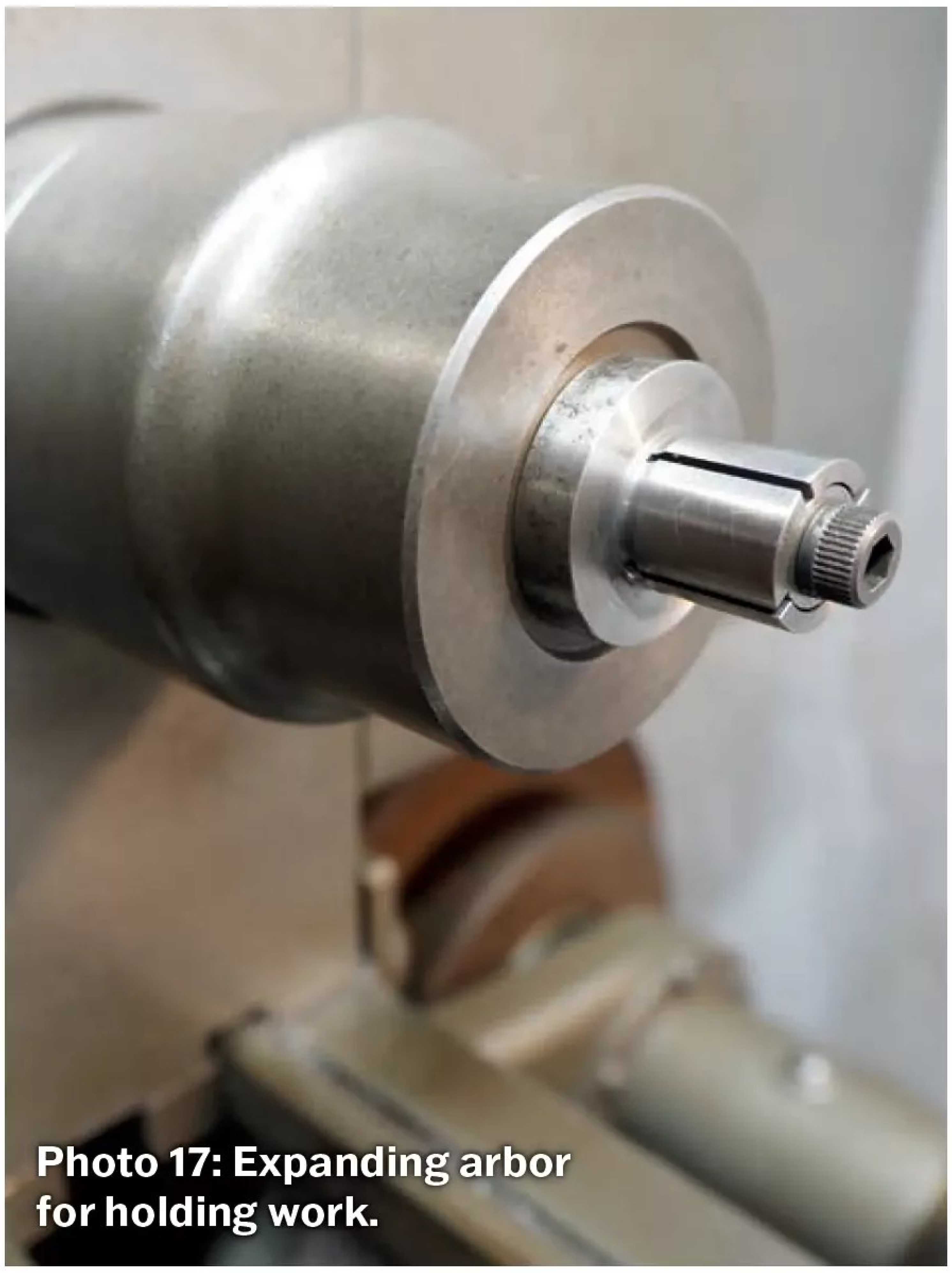


Photo 17: Expanding arbor for holding work.

Photo 16: Thick walled bush for joining single gears.

shafts are mounted, the shafts for the thin plates are secured with a 4mm countersunk screw from the rear with a 6mm spigot on the shaft locating into the plate. The gear mounting shafts on the thick plates are recessed into the plate with a 10mm x 3mm recess for secure location to ensure the gear centres remain accurate when the shafts are removed and re-installed, a M6 thread holds the shaft to the plate.

Theoretically the gear centres can be accurately marked out or drilled using coordinate measurements, you could also use toolmakers buttons to locate the gear, toolmakers buttons are short accurate bushes that are initially secured to the job with a smaller diameter screw. The button is then accurately positioned and secured. The workpiece transferred to the lathe or mill, with the button then accurately centred for finishing off the hole location. The toolmakers button method although more accurate, involves lots of setting up and removing the work from machines when doing multiple holes. A low-tech method I have used, is to first mount one gear, then have the second gear rotating on a stationary shaft held in the drill chuck or milling collet, move the gears together until they mesh with a slip of thin paper between them to get some clearance. Clamp the plate in position, remove the paper and see how smoothly they run together. Remove the shaft from

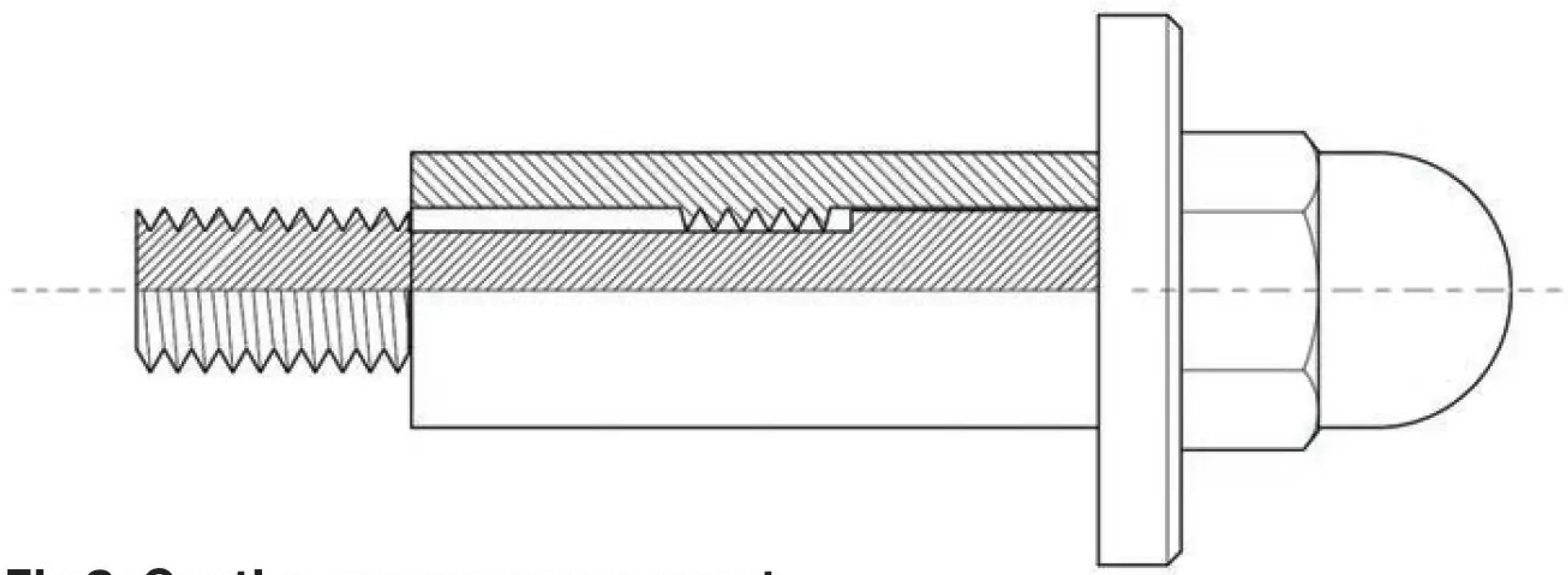


Fig 3: Captive screw arrangement

Photo 18: Finishing gear mounted on expanding arbor.

the chuck and replace with tooling to finish the hole.

You may have some runout in your chuck, collet, and shaft so to lessen the effect. Using a dial indicator on the shaft, work out the high and low points, mark a spot halfway between them and position this mark to face the gear you are going to mesh with. This will even out any runout while machining the hole.

TUMBLER AND SCREW-CUTTING CLUTCH

Mark out the material keeping in mind how you are going to hold it during the machining operations, leaving it oversized to allow it to be clamped in the lathe and on the drill press or mill table.

The first job is to create a counterbored hole for the output/pivot shaft which holds the plate onto the headstock. When completed later, the mounting hole in the headstock for the pivot shaft is cut to a depth, so the shaft just tightens up, but still allows the plate to rotate from one locking position to another.

The work being thin and odd shaped was attached to a flat block of cast iron held in a 4-jaw chuck. The cast iron block is tapped with holes as needed to attach each job. **Photograph 20** shows the finished plate clamped to the block to show the method of using a sub plate to attach hard to hold objects. When the plate was originally machined would have been attached with countersunk screws drilled into surplus material left on the plate for workholding purposes with the material removed while doing the final shaping.

A faceplate on the lathe could also be used to hold and machine the plate. Fit the pivot shaft and output gear onto the plate, clamp on a mill or drill press table so you can mesh the closest tumbler gear, then drill and ream its position.

The idler shafts have a spigot that fits into the plate and are secured with M4 countersunk screws from the rear. When making the idler shafts, you could incorporate a little eccentricity into the spigot to fine tune the meshing of the gears. Once that shaft and gear is attached to the plate and checked it is running smoothly with the other gear, do the second idler gear repeating the process of meshing and reaming the hole.

If you have left enough clearance between the plate and the table, a grub screw fitted to the idler shaft can be used to secure the gear shafts onto the plate using a nut, with the countersinking for the flat countersunk screws completed at a later time, once all the gear centres are positioned.

After you have finished fitting the gears, you can then shape the plate to its final form including finishing the latching arrangements to suit your lathe.

FINE FEED ATTACHMENT PLATES

Work out the basic shape and mark out, again planning on how you are going to hold it during the machining operations. The fine feed plate was long and too big to allow it to swing in the lathe. As a result, the hole to mount it onto the leadscrew bracket was machined to size using a boring head in the mill, **photo 21**.

A dummy shaft is required to mount

Photo 19: Finished gears with sintered bushes fitted.

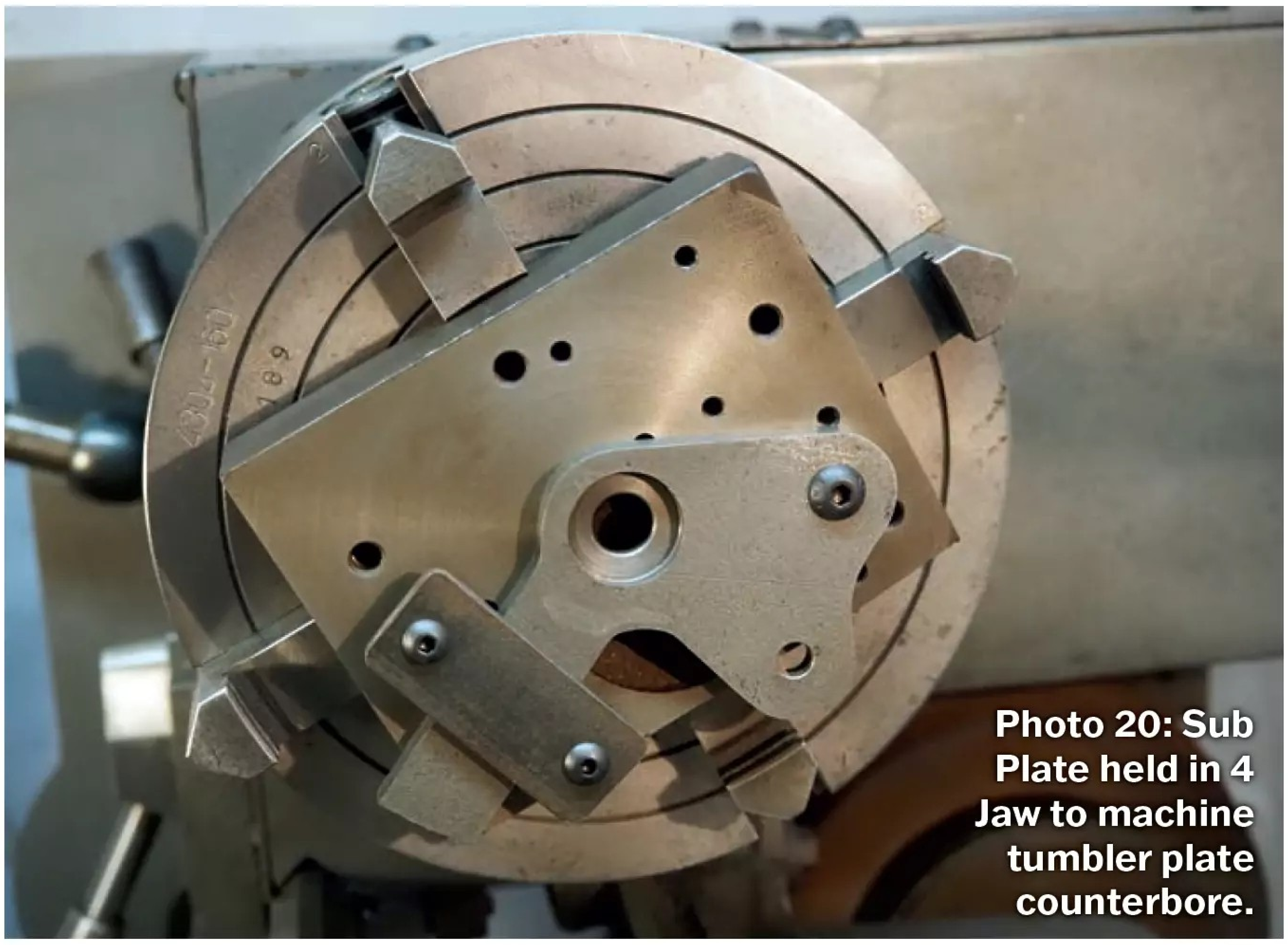


Photo 20: Sub Plate held in 4 Jaw to machine tumbler plate counterbore.

Photo 21: Boring mounting hole in fine feed plate.

the 100 tooth leadscrew gear onto the plate while setting up the other gears, so before the job is started, a small job is to machine a dummy shaft, it serves two purposes, one as a gauge to size the hole in the plate during the boring operation, and then clamped into the plate to locate the leadscrew gear in position. Once that part is done, drill and tap for the clamp bolt before using a slitting saw to open up the bore to allow it to tighten onto the lead screw bracket, **photo 22**.

Clamp the plate to the mill table with the dummy shaft fitted in place and the lead screw gear mounted, you can start to mesh the gears together, starting at the leadscrew gear. When they are running smoothly together, replace the shaft in the chuck with a M6 tapping drill, then open up the hole to almost 10mm but only 3mm deep and finish with a 10mm slot drill to produce a flat bottom counterbore to locate the idler shaft. Tap the hole M6, keeping the tap aligned with the hole, deburr any edges and test fit that pair of gears, then repeat for the next set working towards gear 1, mount and repeat until you have the gear train completed.

When it comes to the second version of fine feed attachment fitted with the four idler gears, having gears 1, 3, and the leadscrew fixed in position. You can first mount gears 1 and 3 onto the plate independently by marking out. This time you are fitting a gear set between two already mounted compound gears, not once but twice for each position.

Again, mesh the gears using a short shaft fitted in the spindle, **photo 23**, making sure the gears run freely with a small amount of backlash. Drill, counterbore and tap for the shaft, mount that set of gears to test for smoothness. Remove those gears and repeat the sequence with the second set of reduction gears for that position, e.g. gear 4 position 50/95T first then 25/95T. **Photograph 24** shows how you will finish up with two mounting holes in those spots on the plate.

ANCILLARY PARTS

These are being described last but need to be completed along with the gears before the plates are started. Small jobs include several washers to hold the gears onto the shafts as well as spacers to line the gears up, these may need tweaking later to fine tune the clearance between layers of gears.

I initially used shafts made from silver steel with a threaded portion on each end, this allowed them to screw into the plate and for a washer and acorn nut to hold the gears. This worked well on the first feed plate with the tumbler reverse as only Gear 1 was changed.

I soon found a problem when changing from one feed rate to another on the second fine feed attachment. Trying to slide the compound gear into engagement between the two fixed gears while trying to insert the threaded shaft, lining up gear, spacer and hole all at once was not easy.

Replacing the threaded shaft with a cylindrical bush and stud was the

Photo 22: Slitting saw to open up bore.

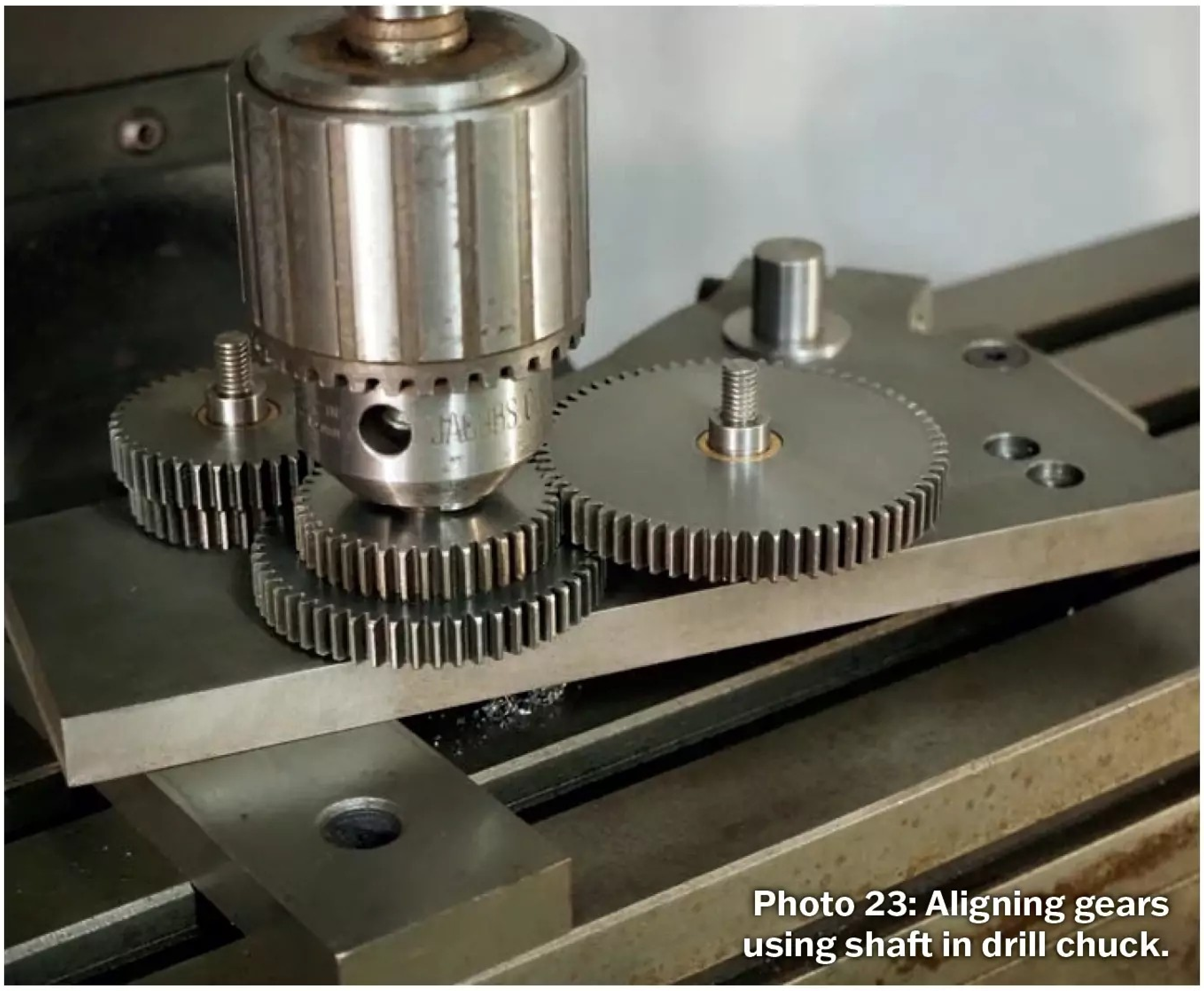


Photo 23: Aligning gears using shaft in drill chuck.

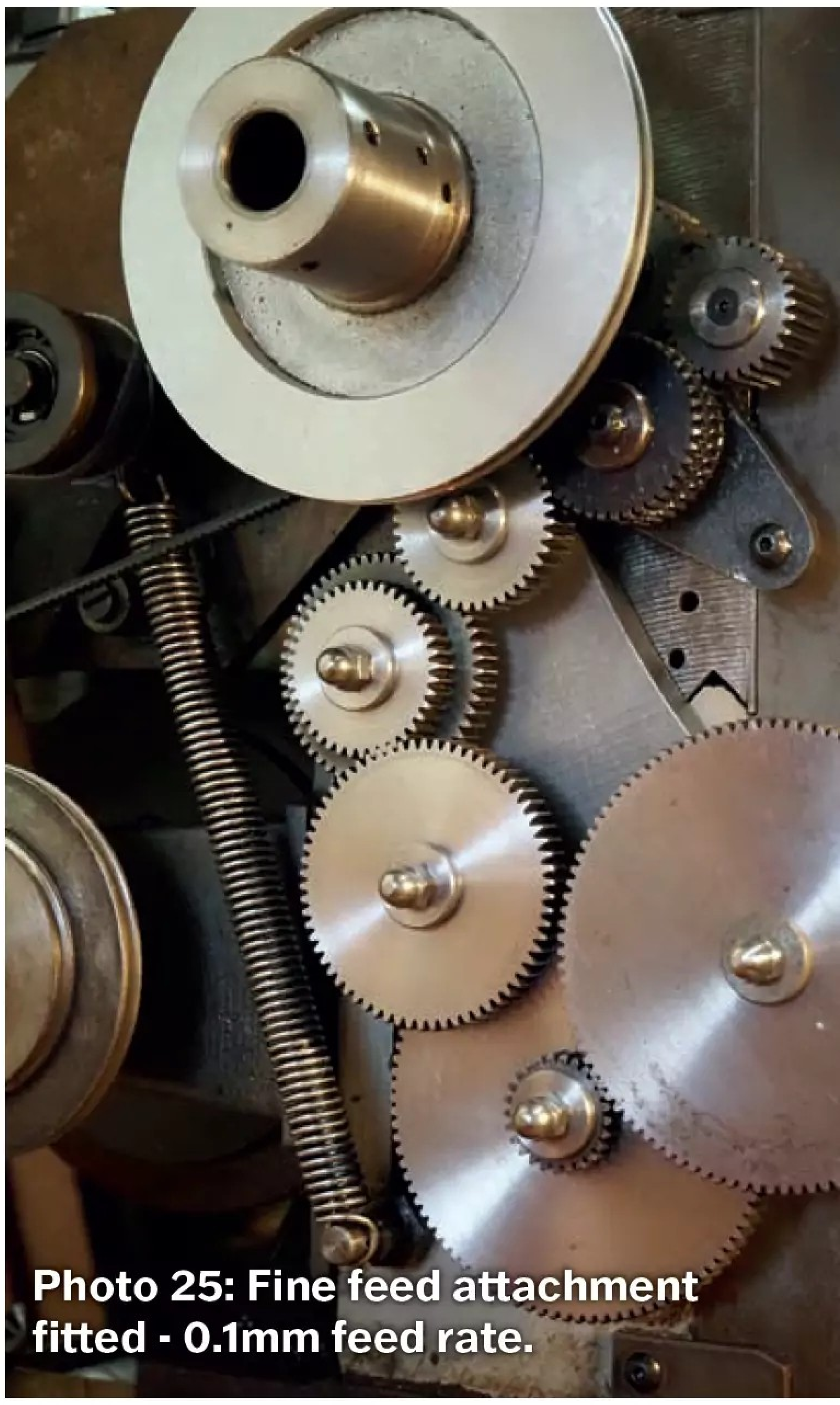


Photo 25: Fine feed attachment fitted - 0.1mm feed rate.

Photo 24: Fine feed plate with components to hold gears.

next step. The bush arrangement is easier to make and the hardening and tempering is a more straightforward operation as the chances of cracking at the smaller threaded section is removed.

Assembly worked well but I then found removing the bush was troublesome, I needed a positive method to withdraw the bush when changing feeds. The solution was a captive stud which is threaded into the bush but has a reduced shank section to allow the stud to slide in the bush, and screw in and out of the mounting plate freely.

After unscrewing the stud from the thread in the plate, you can then grab the washer and acorn nut to pull the bush out in the one go.

Figure 3 shows an exaggerated version of the arrangement, in practice the undercut section and thread engagement don't need to be so different. The fixed gears can use a simple bush and stud arrangement to simplify the making of those shafts.

CONCLUSION

Machining using the surfacing feeds is now much easier to set up and change between the different rates, used in conjunction with the screwcutting clutch, the indexing stops and the fixed bed stop, surfacing and making multiple components is a more streamlined affair, **photo 25**. The fine feed attachment resides on the lathe a majority of the time but is easily swapped to the forked banjo to complete threading jobs with as much ease, when they appear. Making the attachments utilised skills of design, planning and problem solving to methodically work through a job, accurately setting up, modifying, and joining gears to create the compound gears. Aligning them for good meshing with quiet running. I was able to turn some badly made gears with runout problems, into useable more accurate ones to create useful attachments.

In use over several years, the time saved in reducing gear changing was well worth the effort. Each one of these modifications was a journey in improving the experience of using the lathe, while gaining skills and confidence as you complete each part to move on to the next job.

LOWMEX 2025

Martin Evans, former editor of Model Engineer, visits the Halesworth club's excellent exhibition in Lowestoft.

For me, the arrival of November heralded my annual pilgrimage to LOWMEX, the Halesworth club's excellent model engineering exhibition, held at the East Coast College, Lowestoft. This was my seventh visit and the tenth occasion for the show.

This show simply gets bigger, better and brighter year after year and if you live anywhere near East Anglia then you should make sure it gets added to your diary. If only Lowestoft were more centrally located in England, rather than holding the distinction of being Britain's most easterly point, LOWMEX would easily earn the status of being a national, rather than a regional, show. This year's show was, as always, brilliantly organised by Kevin Rackham and his team and the variety, high quality and sheer number of the models on display was quite staggering.

A notable feature of the show is the enormous range of interests covered, from locomotives and traction engines, stationary engines, boats and aeroplanes, through to model railways, Lego, plastic kits and radio-controlled trucks – something for everyone. If you tired of all that, you could have a go on the college's marine simulator and attempt to steer a massive freighter out of the harbour into the North Sea without demolishing either the harbour wall or the many offshore wind turbines and oil rigs.

One of the first tasks for me was to go and check out progress on Charlie Lovett's Cowans Sheldon 75 ton steam crane, which has been gradually growing over the last few years, **photo 1**. It now appears to be substantially complete, and I gather the last item to be added is the crane's steam engine, the construction of which has already been begun. I look forward to perhaps seeing the completed crane next year.

Those of us of a certain age (the 'baby

Photo 1: Charlie Lovett's Cowan Sheldon 75 ton steam crane, now almost complete.

Photo 2: The Hornby Dublo three-rail model railway.

Photo 3: A three inch scale Foden C type steam lorry.

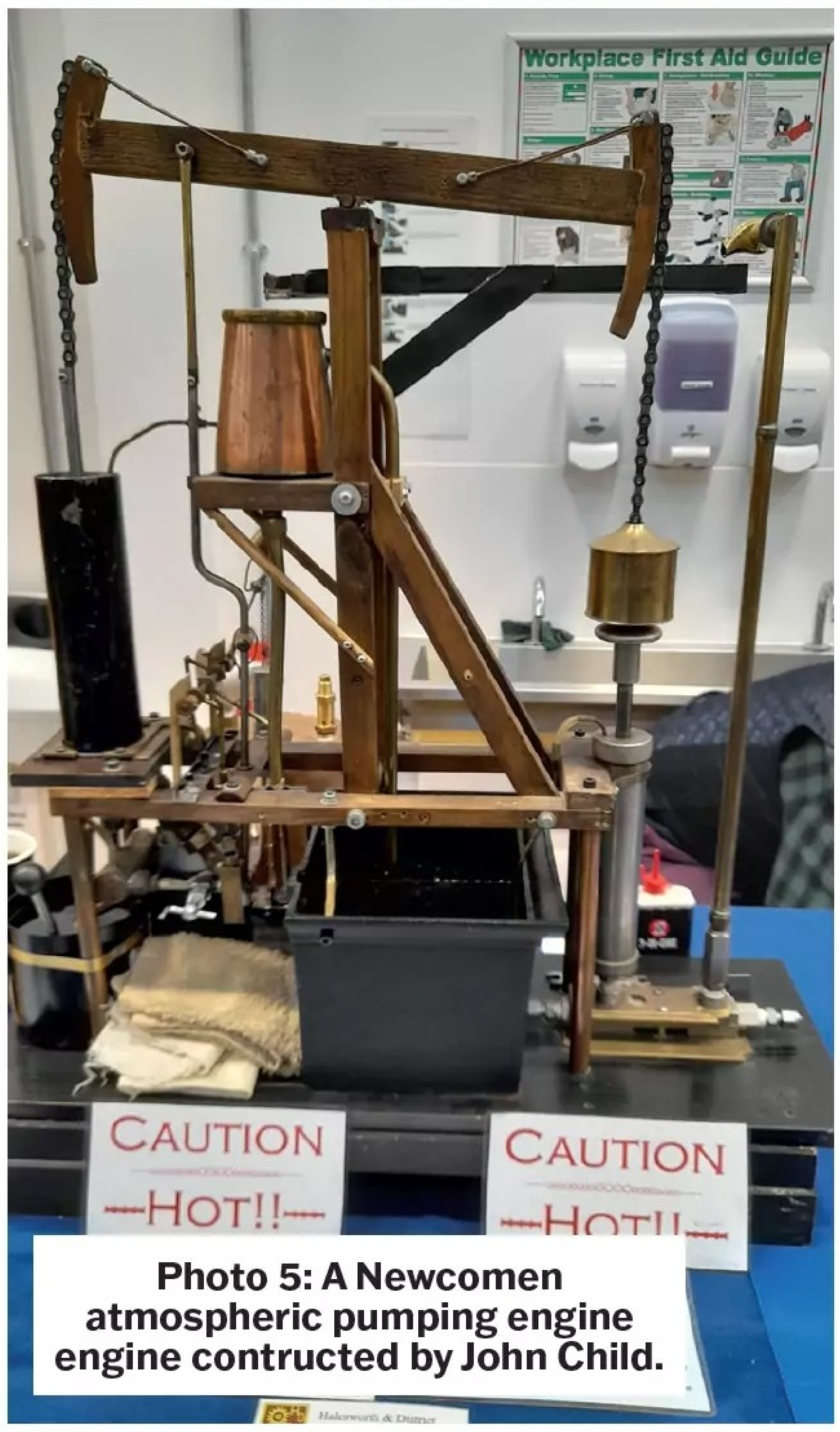


Photo 5: A Newcomen atmospheric pumping engine engine contructed by John Child.

Photo 4: 4-4-0 Adams Express locomotive in five inch gauge by Peter Williams.

Photo 6: Hospital ship Makano exhibited by the Great Yarmouth Model Boat and Truck Club.

Photo 7: George Witheridge's 7¼ inch gauge 2F dock tank and short goods train.

Photo 8: A Galloway hit and miss engine by Reg Harding.

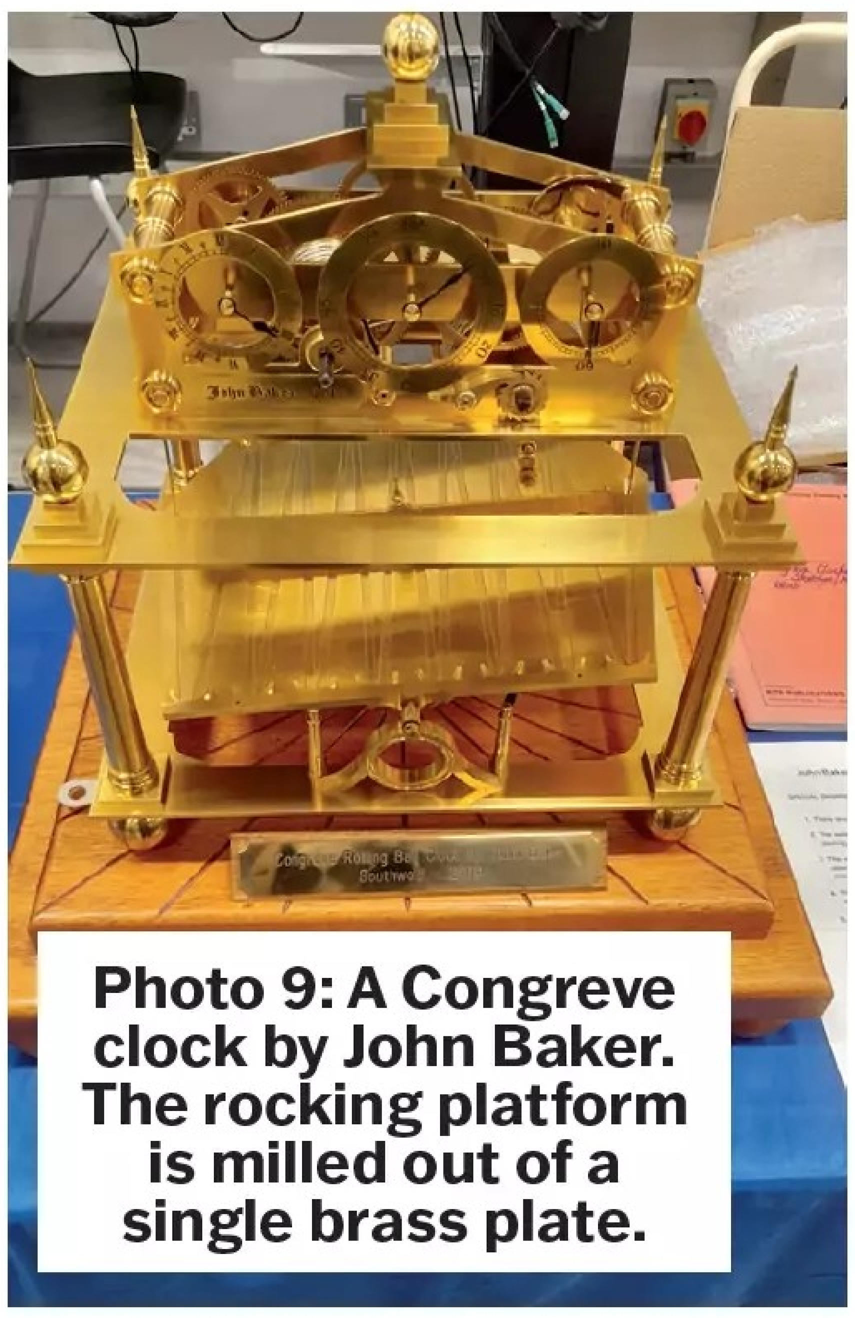


Photo 9: A Congreve clock by John Baker. The rocking platform is milled out of a single brass plate.

boomers') will have experienced a tingle of nostalgia at the sight of the Hornby Dublo three-rail model railway, the various cream, orange and green buildings – station, locomotive shed, goods shed and signal boxes – giving the layout the distinctive Hornby Dublo look, **photo 2**.

One of the most impressive exhibits was the Foden C type steam lorry in three-inch scale, constructed over a period of 35 years by mechanical engineer John Dickinson, in between times while running his own engineering business, and currently owned by Brian Baker (**photo 3**). The lorry won the Bradford-Barling cup in 2019 at the Midlands model engineering show. Brian claims it is too good to steam, for fear of getting it dirty.

For me, though, the main attraction was the many locomotives on show, many of them constructed to a very high standard. One that stood out for me was Peter Williams's 5 inch gauge 4-4-0 Adams Express (yes – NOT Great Western!), **photo 4**.

Industrial archaeology is another interest of mine, so it was good to see the start of the steam age represented by a Newcomen atmospheric pumping engine, constructed mostly from scrap by John Child, **photo 5**.

I hope you will be inspired to make sure that you get to see this show next year, if you can – it really is not to be missed. A more comprehensive report on this year's show will appear in a later issue of this magazine.

Club News

Geoff Theasby reports on the latest news from the clubs.

For those of my readers who attach significance to numbers, this issue of *ME&W* pays homage to the loco-motive, Flying Scotsman in one of its anagrams. Numagrams?

In this issue, Florence Nightingale's mistake, another young driver, a free e-book, tiny engines and John Barry.

Happily bumbling along, minding my own agendum, I was struck, some say, by a stray cosmic ray from deep space, as it encountered a neuron which fired a synapse. Some time ago, oh weeks, Deborah visited her No 2 daughter, who works at an independent cinema in Leeds, which suits her well, as her degree is in Film Studies. Anyway on Debs' return, I was given a number of pictures from behind the scenes, and in the projection booth there are preserved old projectors as well as other more modern examples. Leeds featured highly in the history of cinematography, and many cinemas possessed projectors made by Gaumont Kalee (A Kershaw & Co.). The name was derived from 'K-A-LEEds' and they boasted their projectors were in 75% of UK cinemas, **photo 1**. Gaumont owned vast numbers of cinemas, so it was, perhaps, inevitable that they would combine. Today, her cinema is the only remaining gaslit cinema in the world. Leeds has other connections with the cinema world. It was from a window in a property near Leeds Bridge that Louis Le Prince first made a cine film of moving images, which caused consternation when released.

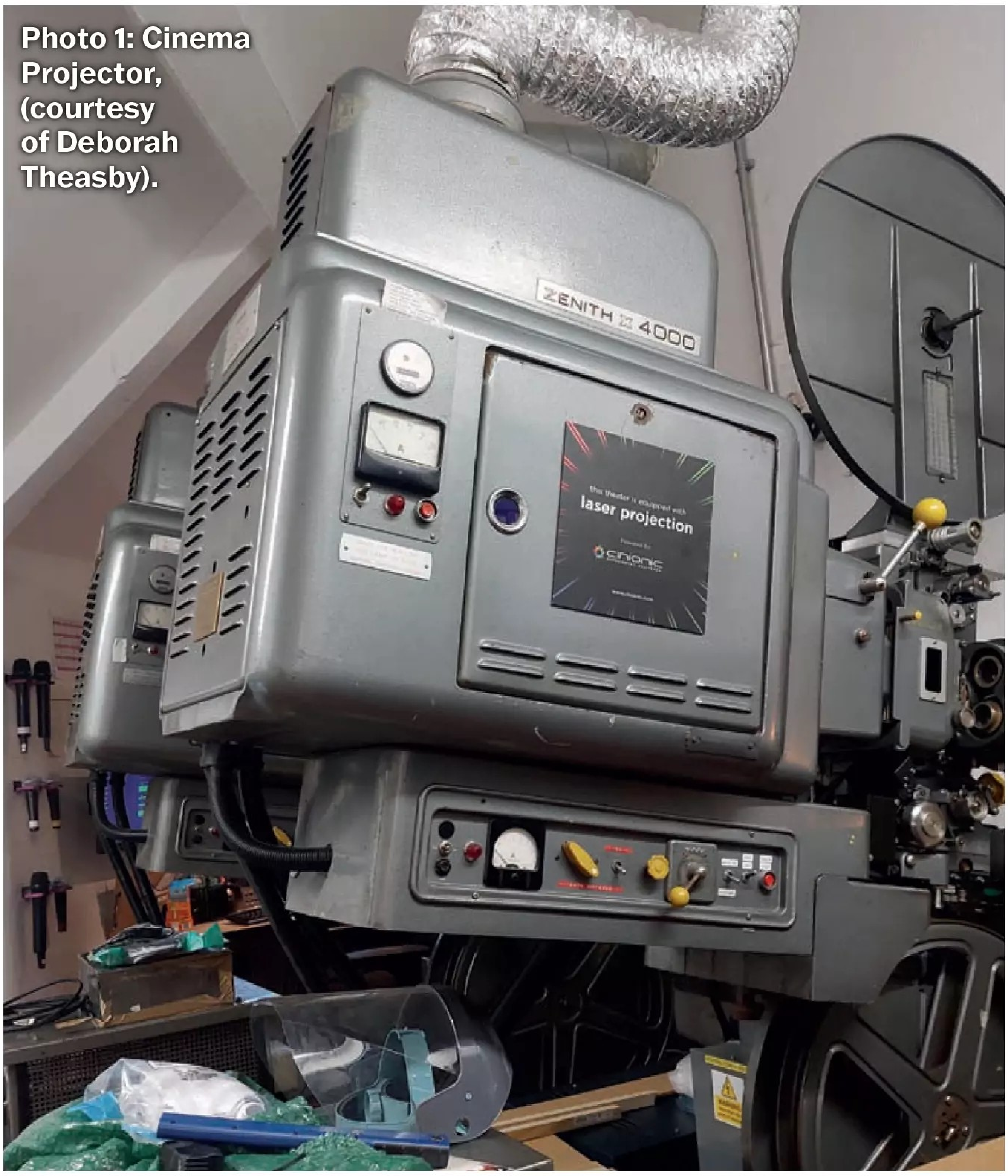


Photo 1: Cinema Projector, (courtesy of Deborah Theasby).


Photo 2: Otago MES Volvo loader (courtesy of Jim Woods).

Sheffield & District Society of Model and Experimental Engineers

Steam Whistle, September, arrives. Editor, Mick Savage, Track Superintendent, makes the point about unnecessary machining. If it is required that parts should fit closely together, that is accuracy, If 'OTOH' several examples are made, all different from each other, but needed to be carefully located, that is precision (Ahem, as with some published yet uncorrected model plans - Geoff). Mick goes on to guide us through tapping a small hole without tears. John Collins found a copy of a parody of W H Auden's *Night Mail*. Mick appears again, this time continuing his 'Stuart 4A' build. Joel Finch is SSMEE's latest Junior Member to pass his driver's test, and is photographed on his first run with passengers. Later, the October issue is clamouring for attention. Editor, Mick tells us that the first large scale model, the 15-inch gauge, *Pearl,* made by Peter Brotherhood in 1861 is now at Kings College, London. Mr B. initially worked for Maudslay, Son and Field. Years later, his company, Peter Brotherhood Ltd, made cars in Lambeth, then moved to Tinsley, Sheffield. (You can see where this is

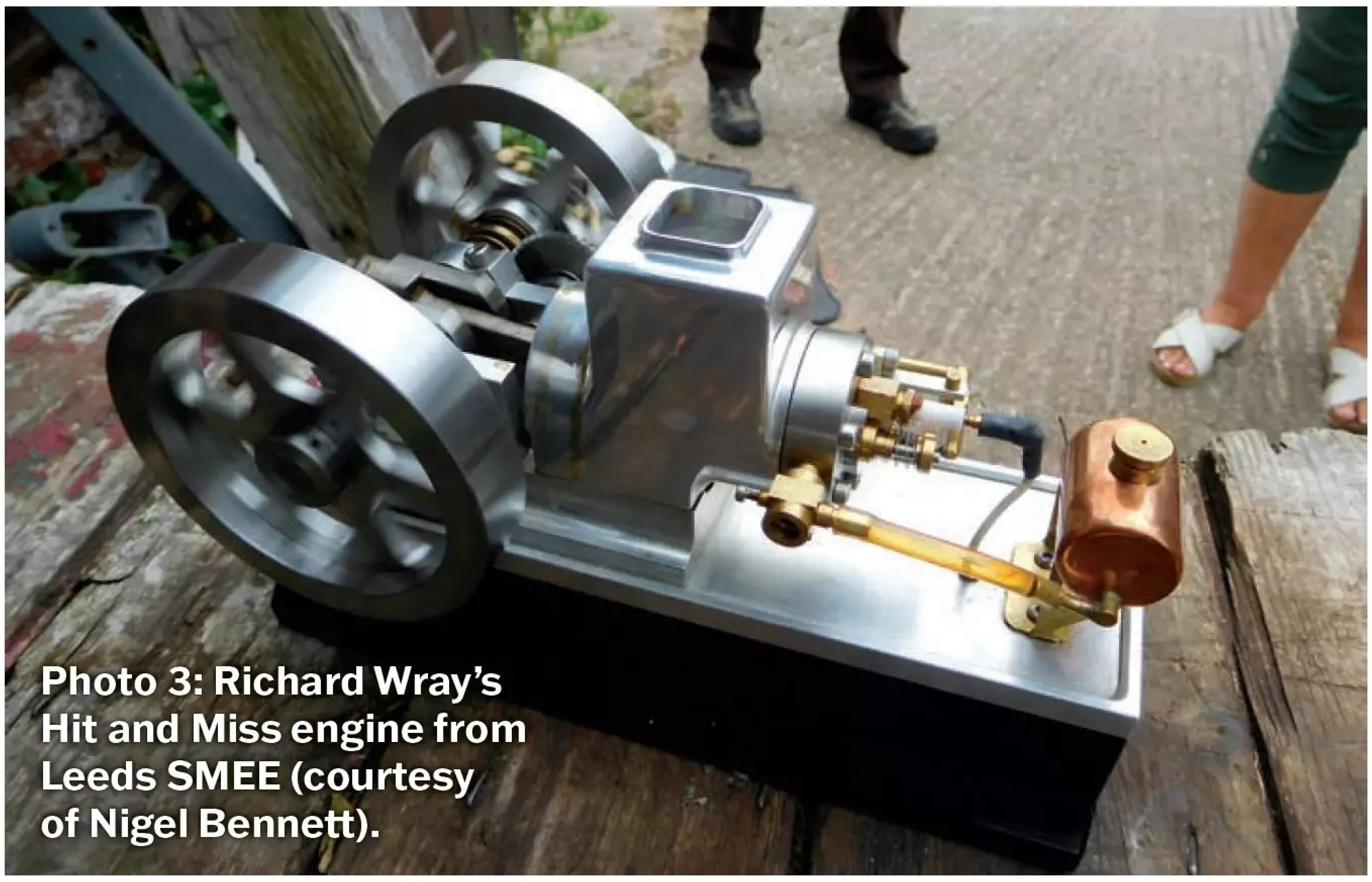


Photo 3: Richard Wray's Hit and Miss engine from Leeds SMEE (courtesy of Nigel Bennett).

going, can't you? - Geoff) PB's financial backer, Earl Fitzwilliam, (He of that immense pile, Wentworth Woodhouse) who later took over the company, named the car, 'Sheffield-Simplex'. An example, by now very rare, is in Kelham Island museum, Sheffield. A regular Model Engineering Exhibition was first held in 1930, although the magazine, *Model Engineer & Workshop* website says 1928. The original *Model Engineer*-backed exhibition was held in 1907 and sporadically thereafter, until then. The Historic England Research magazine, has a special 84-page issue on the second centenary of railways, which can be downloaded from https://tinyurl.com/jd54zxph free of charge. Bob Potter has loaned a book to the Society, *Railway Ribaldry* by W. Heath Robinson. W. www.sheffieldmodelengineers.com.

Model & Experimental Engineers, Auckland sends the October newsletter, in which there is much discussion on castings made with the aid of 3D printing. The material used is compared and other difficulties are mentioned. No UK foundry will attempt to make castings, so Mike Jack is investigating. This could develop into a profitable business. Murray Lane continues his story of the Vickers *Wildebeeste.* Graham Quayle showed some of his tiny steam engines. One used a thimble for a boiler, and has a 0.0625 inch bore and stroke

The Bristol Model, Autumn, from **Bristol Society of Model & Experimental Engineers**, arrives. The continuing short history of Meccano is written by Editor, Richard Lunn. The BRIMLEC model efficiency competition was won by Norman Rogers and his 3 ½ inch gauge William, with an efficiency of 0.87 %. Rob Speare made a model of Exmoor Junction engine shed, which, after several vicissitudes will finally be shown at the South West exhibition next May. Norman writes an update on the *Ellie* project. Intended for the young engineers, it was a great success, and the JM got a sense of purpose and satisfaction in contributing. W. www.bristolmodelengineers.co.uk

Otago Model Engineering Society's *Conrod*, refers to the bi-centenary of railways. Firstly, President, the late Len Boyce built a model of the *Penydarren* locomotive in the 1950/60s. A celebration of 'Twilight Running' found favour with all concerned, with decorations, Christmas lights etc. It was enjoyed by all and raised about NZ$1500 for club funds. Ivan has built a radio-controlled Volvo H120 loader, using 3D printing. Even the 'drivers' movements are so animated, **photo 2**. Brent has designed a 3D printed boat, which he has turned into a kit sold all over the world. Murray Grimwood has bought, at an auction, a model of NZ's first navy ship, the cadet training vessel TSAmokura. Formerly HMS Sparrow, it was decommissioned in 1922.W. www.omes.org.nz.

The Prospectus, September, from **Reading Society of Model Engineers** discusses the sometime controversial aspect of railways, and the claim of the steam speed record. Did Mallard really reach 126 mph in 1938? Other attempts on the record are planned, but no locomotives are yet to appear in order to wrest that record from Mallard, but don't hold your breath. US railways are said to be working on plans for a 140-mph locomotive. The October issue begins with Alec Bray writing about GWR knuckle joints, and Robert Jameson is restoring a Merlin aero engine for use in a car. Alec updates corridor tenders as designed by Nigel Gresley, (there were more such tenders than you may think – Geoff). Mallard was of the LNER, and their great rival, the LMS, therefore had to have some as well, and BR also had one for their mobile gas turbine analysis plant. Editor, John Billard has announced

Photo 4: Jaecoo SUV.

his retirement from the post, and is hoping a volunteer will arise, preferably not 10 pressed men. W. www.rsme.uk

On Track, from **Richmond Hill Live Steamers**, October issue, has a smidgin of a mere thought, fleetingly brief, of a passing cosmic ray's impact upon a neuron, (see intro, above) over 900 people visited the 'Open Doors' event, and the Society were glad of the assistance of York Police to control the crowds. The gift of a Dart 2-4-0 from the Mullins family is appreciated. W. www. https://richmond-hill-live-steamers.tripod.com/

Leeds Lines, from **Leeds Society of Model and Experimental Engineers**, has a picture of Richard Wray's 'hit and miss' engines (which Treasurer, Nigel Bennett's young sister used to refer to as 'sneezy' engines' at rallies) this one duly sneezed to order, so honour was satisfied. Richard carved his machine from a block of aluminium, there being no commercial castings available. This type of machine reminds me of musician, John Barry, and the *Juke Box Jury* theme, **photo 3**. W. www.leedsmodelengineers.org.uk

St Albans & District Model Engineers Society *Newsletter* begins with Chairman Mike Collins congratulating all who made the Model Show such a success. 2354 visitors enjoyed it too, except maybe the five-year-old who had a meltdown on the reception floor because he didn't want to go home… Lots of good photographs, especially of the Tamiya layout. W. www.stalbansmes.com.

Blastpipe, **Hutt Valley and Maidstone Model Engineering Society**'s joint newsletter, begins with David Grant-Taylor showing some of his sets of collets. There are a number of reasons to choose one over another, and the wide variety of the range of shapes covered. Square, hex, splined, threaded, and you thought they were only for round items? A good picture of a Britannia receiving close attention shows, typically, in such cases, one person doing the work and a large audience, all offering expert advice no doubt. W. www.hvmes.com.

Some years ago, on here, I referred to a miniature railway at Gwyrch Castle, near Abergele, in North Wales. At the time I couldn't find out much about it. The castle resembles a medieval edifice, but dates only from the 1820s. It is now a Grade 1 listed building. When a child in the 1950s, on holiday in the area, I became interested in the railway, which was part of a greater amusement park offered by the castle and its extensive grounds. Maybe this was the start of my interest. The building is derelict now, 70 years later, but there are plans to rebuild it, but these are only the latest since the end of WWII. There were six locomotives in all, built by Ernest Dove, of Nottingham. Two of these still exist. The railway gauge of 10 ¼ inches was later regauged to 15 inches. See the following:

- www.facebook.com/groups/rtDisusedMiniatureRailways/posts/680790698950938/
- www.tapatalk.com/groups/mrw_forums/gwyrch-castle-railway-t4500.html
- minorrailways.co.uk/pdfs/dove.pdf (166 pages)

An update of progress on my locomotive saw it introduced to the Sheffield SMEE club track. Once we had sorted out how to attach the battery trailer to the engine, it was moved on to the open track. I got fifty meters before it derailed. This resulted in my decision to rebuild the thing, as it wasn't substantial enough. After a couple of days in the running shed (the garage) the battery trailer seemed to be OK. However, the transmission resumed throwing the chain off the sprockets, which I thought I had cured some time ago. I modified the chain drive, including careful alignment of the sprockets – this is very important in all chain drives. A plywood bulkhead, with three substantial woodscrews at 120° made it more rigid, and the body was clad in five-ply as the resulting superstructure is rather wider than before. Time for some more spray painting.

Some news from China makes me feel sad. It is particularly relevant to the state of Britain today. An electric bus system had been set up in ZouZhou city operating driverless, trackless buses following a line of dotted lines painted on the road surface. Train lengths can be adjusted according to traffic with no worries about being too long for the platform, and ordinary vehicles can cross the lanes, which need no rails, reserved tracks, or 'guided busways' etc. Britain has just celebrated the 200th anniversary of UK railways, during which period this innovative design and manufacture would have taken place here. Now in the time that it takes us to fund, design and build such a system, the Chinese would be on the second or third iteration. Part of the reason, of course, is that the Chinese Politburo is comprised almost entirely of engineers. www.nextshark.com/china-unveils-driverless-tram-travels-following-lines-road. One thought that springs to mind is the humorous possibilities it offers. Think of the Roadrunner/Wile E. Coyote cartoons; paint a tunnel face on a wall, repaint new dotted lines, to divert the bus through it, paint over the 'tunnel mouth' to hide it, and demand a ransom of the 'We have got your tram' nature.

More prosaic was the Range Rover style car I saw, by Jaecoo. (A Chinese car manufacturer. M'Lud). Wikipedia, informs us that it is part of Chery Motors. This vehicle is said to be Britains top selling SUV, **photo 4**.

Next month will include details of a visit to the Midlands Air Museum, An engineering item not often seen or appreciated is this huge disc brake, **photo 5**.

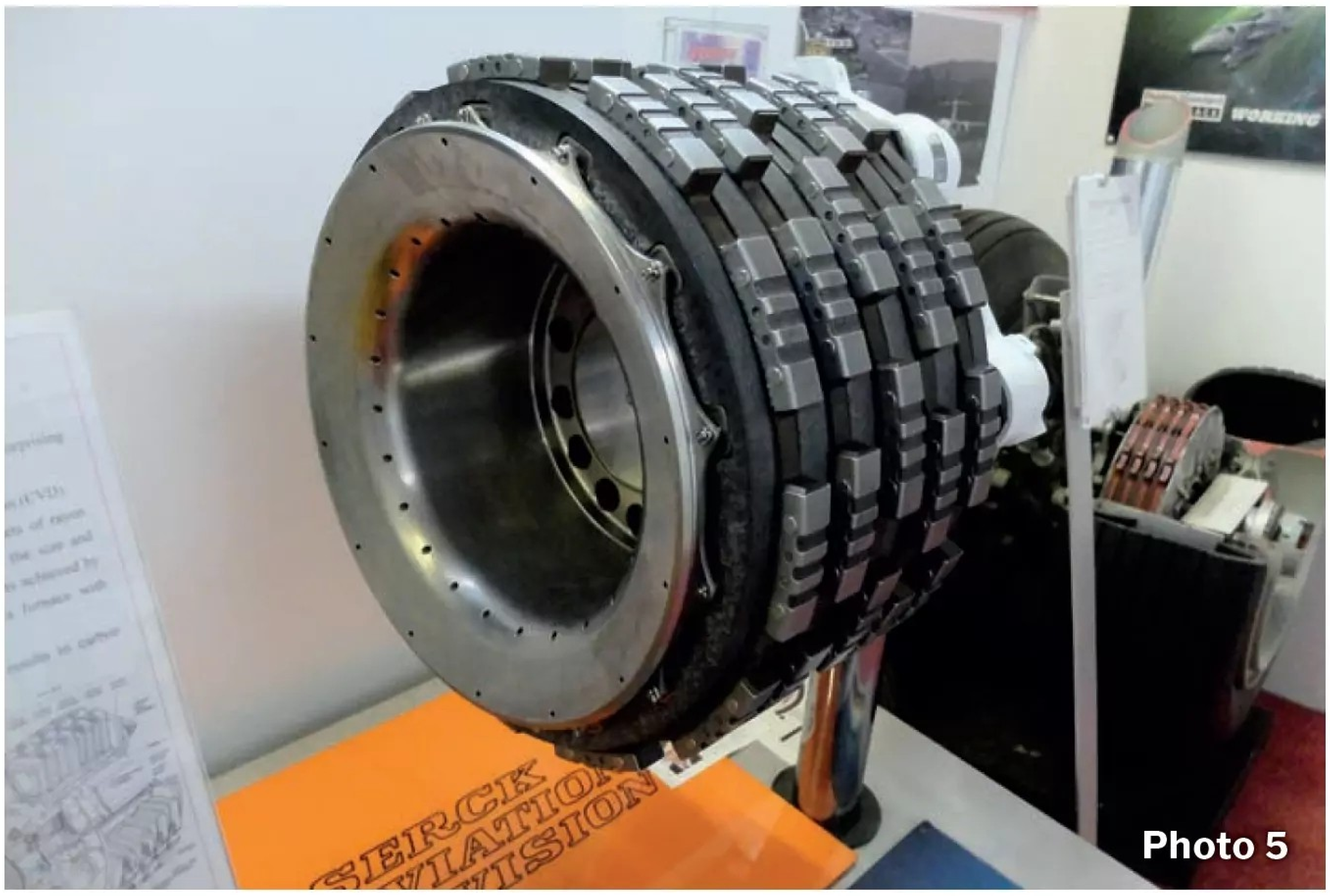


Photo 5

and finally, (to the tune of Old McDonald had a farm…)
An old astronomer had a space;
Io, Europa, Ganymede, Callisto
or, Old Bill Gates had a
computer; AI, AI, AI,
or, an old Yorkshireman; Aye, Aye,
or sailor; Aye Aye, Cap'n

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TOOLS AND MACHINERY

Myford ML7 with gearbox on Myford stand, also Myford stand complete with Dewhurst switch. Also, Capco surface grinder with 24″ x 8″ table. **Tel. 01743 363234, Shrewsbury.**

Dore Westbury, Mk 1 Miller on a stand, £250. Clark horizontal bandsaw 6″, 3 speed, £75. **Tel. 01246 277357. Chesterfield.**

Sharp H/V milling machine, 2, 3 phase motors working through variable speed inverter ER25 milling chuck, vice purchased over 2 years ago and never reassembled or used, on wooden stand, clean machine, buyer collects offers. **Tel. 07759 578688. Manchester.**

I have a Starret 75-100mm micrometer which is in mint condition. It is in the original wooden box and is complete with a 75mm setting stick. £30. **Tel: 07754 799803 . Email: mwhiley10@hotmail.co.uk. Norwich .**

Myford ML10 lathe 3.25″ x 13″. Later model with taper roller spindle bearings. S/N V155306 English Electric ½ HP Single-phase motor Tumbler reverser Spindle clutch, as described in MEW 5 Rack operated tailstock attachment Leadscrew dog clutch £500. **Email: mjalletson@gmail.com. Oswestry, Shropshire.**

SPECTRACOLOR layout marking pen - refillable. SPECTRACOLOR layout marking pen. Extra wide felt nib 15mm Easily removed with methylated spirits. Price includes postage to UK & Ireland £10. **Email: andrewschofield57@gmail.com.**

Matrix Micro-maag bore micrometer.. Range, 0.493″ to 1.048″. Depth from minimal to about 5 " when with the extensions. It is positive in use. Resolution 0.00005 There's an article here (not mine) in the forums Coventry Gauge Micro Maag £100. **Email: sadlergp@gmail.com. Sheffield.**

MODELS

5″ Gauge Y4 in current hydraulic test. Great club loco or GL5 loco. Selling as not getting used and have other locos. Comes with travel box and happy to ship if needed £3650. **Email: marc2citroen@yahoo.co.uk. Heathfield, East Sussex.**

5″ gauge Metro locomotive. This truly is one of the nicest Metros out there. It runs like a Swiss watch. Unfortunately the boiler has a weep on the superheater tube which could be repaired, however, I have a new Western Steam Boiler to go with it. Happy to arrange a courier if needed £3000. **Email: marc2citroen@yahoo.co.uk. Heathfield, East Sussex.**

New Tailstock Suitable For Rotary Tables 3″ & 4″. Single Bolt Tailstock Suitable For Rotary Tables 3″ & 4″ Can post at extra cost. **Email: andrewschofield57@gmail.com. Newtownards.**

PARTS AND MATERIALS

One pair of unused laser cut frames for G1 Jubilee 2-6-4. **Tel. 07836 534 338. Newport, Gwent.**

3 ½″ gauge City of Truro loco and tender: rolling chassis, machined cylinders, good workmanship. Photos available, new set of drawings. £250. **Email chrisandjillw@btinternet.com. Tel. 07770 863256. Basingstoke.**

Job Lot Machine Parts 108 Items comprising 6mm 8mm 10mm Bore Steel Collars, M6 & M10 Steel Thumb Screws, M6 Brass Dome Nuts, M8 Knurled Brass Nuts with washers. List available. £28, Freepost UK. Email oldmanssecret@gmail.com. Tel. 01274 872679. Cleckheaton.

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