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Volume: 234, Issue: 4768, September 2025

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By post: Model Engineer & Workshop, Kelsey Media Ltd, Media Centre, Morton Way, Horncastle, Lincs LN9 6JR.
Telephone: 01507 529589
Email: meweditor@mortons.co.uk

ISSN: 0033-8923

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PUBLISHING
Sales & Distribution Manager: Carl Smith
Head of Marketing: Charlotte Park
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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: subscriptions@mortons.co.uk

PRINT AND DISTRIBUTION
Printed by: Acorn Web Offset Ltd, Normanton, West Yorkshire.
Distribution by: Seymour Distribution Limited, 2 East Poultry Avenue, London, EC1A 9PT
Telephone: 020 7429 4000

EDITORIAL CONTRIBUTIONS
Accepted photographs and articles will be paid for upon publication. Items we cannot use will be returned if accompanied by a stamped addressed envelope, and recorded delivery must clearly state so and enclose sufficient postage.
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This issue was published on:
13 August 2025
The next issue will be on sale:
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SMOKE RINGS

Neil has very kindly offered me Smoke Rings to reflect on my time as Editor and to say goodbye.

I joined Model Engineer and Model Engineers' Workshop in 2010 as deputy to David Clark, Editor of both titles, after his previous deputy left his post, and David and I, together with our brilliant designer, Yvette Green, produced three magazines a month (two M.E. and one M.E.W.) for several years. Upon David's departure I was asked to take on M.E. on my own and I agreed, on condition that someone else would take MEW. Producing both single-handed was, I considered, beyond any human being. My appointment was met with scepticism from some quarters *("A woman??!! What does she know?")* but I hope I managed to prove myself fairly quickly. Twenty-four issues a year was very demanding and, sadly the job did eventually take its toll when in 2017 illness forced a rethink. By some miracle, Martin Evans (the second!) then appeared to step seamlessly into the role of Editor and he and I worked together until his recent retirement.

I enjoyed the creative process of putting together each issue; the inclusion of a wide variety of subjects and selecting a good cover photo, which was often my starting point. Many great engineers made some outstanding contributions - amongst my favourites were Ashely Best's trams, Anthony Mount's stationary engines, Alan Crossfield's 5" gauge Patriot and Ian Couchman's threshing drum. For an editor, these articles were a dream to produce, being beautifully presented and photographed, and there are scores more I could recall. I was grateful, also, for the technical help I received from regular contributor, Stuart Hart.

I am not a model engineer but I am grateful for having been brought up with a deep appreciation of good workmanship and of the achievements of those who are not, and don't purport to be, master craftsmen but who love the hobby and are driven to produce *something*. I always hoped that ME was *their* magazine.

A real highlight for me was my involvement in the M.E. Exhibitions and being privileged to have seen some of the most exquisite examples of the model engineer's art; James Lauder's marine engine, George Punter's tractor, Cherry Hill's unique steam vehicles, Stephen Wessel's aero engine and the locomotives of Peter Fagg and Giancarlo Mastrini from Italy come to mind but, again, amongst so many others. To spend time with the gentlefolk of the model engineering world, often 'after hours' at those exhibitions, was a joy. It's such a shame that staging internationally renowned exhibitions is no long seen as viable.

To return briefly to my mention of MEW above - I had an idea about a likely candidate and one of the best decisions I made was to approach Neil Wyatt to ask him to consider editing MEW. He went on to produce a highly respected magazine for many years and so, upon its reuniting with M.E., Neil was the obvious candidate to take on the editor's role.

In some ways this is a sad day; I shall miss my colleagues and the process of watching a magazine come together. I won't be struggling to find something to do, however! My own nameplate business, various voluntary roles, dog walking, drawing, track days and rallying road steam vehicles will keep me fully occupied. I wish Neil, and *Model Engineer & Workshop* all the best and as much good luck as is needed. Farewell to all.

Diane Carney
Deputy Editor

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Download David Earnshaw's series on using Coventry Dieheads for precision thread cutting. https://tinyurl.com/yryx6msh

Smokeless cutting oil started by Chris 12
What's the best way to avoid fumes when machining?

Unusual Crow Bar Type Tool? Fire Brigade? Started by Martin King 2
Two examples of a mystery tool.

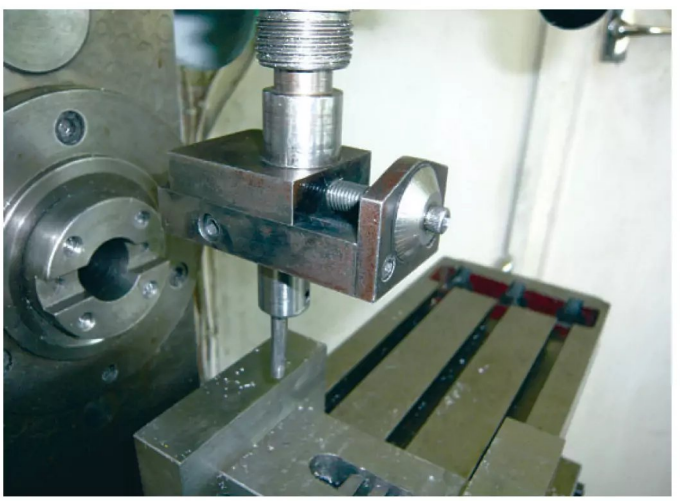
Plain bearing speeds started by zytoooh
What are safe maximum speeds for plain bearings, especially in the context of older lathes?

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 shows Roger Holland driving his A4 *Wild Swan* at the IMLEC 2025. The loco was built from Michael Breeze drawings, with modifications. The full results start on page 23.

Next Issue



In our next issue, Alan Jackson shares plans for making a boring head that doesn't require you to cut any dovetails.

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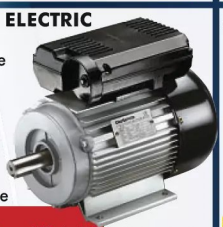

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Modifying a Large Fixed Steady

John Cuckson modifies a steady to fit a Colchester Chipmaster Lathe

Photo 1: Modified Chinese steady

Photo 2: Large steady in original form

The Colchester Chipmaster has a large following amongst home workshop enthusiasts and others. It is strongly built, powerful (with a 3 horsepower motor) and compact. When in production, it was an expensive machine supplied with few standard attachments, so second hand machines seldom come with a fixed steady. In recent years fixed steadies for small industrial lathes have become astonishingly expensive – certainly when compared with their "as new" prices. For example, a 1972 Colchester price list shows a new Chipmaster costing £910 while the fixed steady sold for £9 i.e. about 1% of the lathe itself. Now a fixed steady – for a hopeful seller – sells for 10% to 20% or even more of a used Chipmaster in reasonable condition.

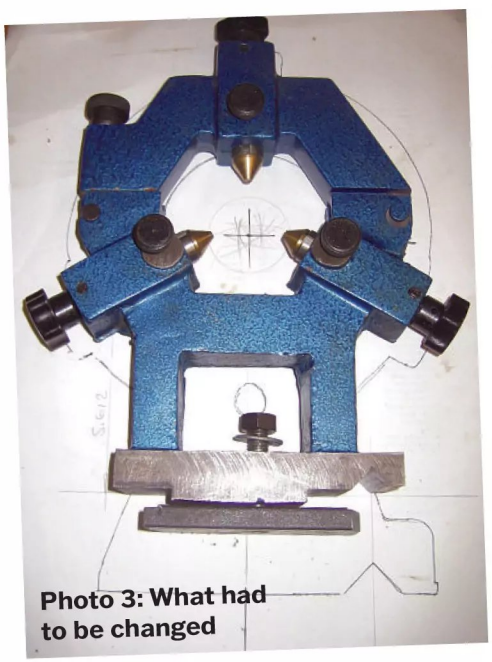


Photo 3: What had to be changed

My own ex industrial lathe came without a fixed steady and for some years I used a Chinese steady from a widely sold 6-inch centre height lathe that I had modified by milling off some of the foot casting and re machining the vee, **photo 1**. But this steady was not as robust as I would have liked (in particular, the rather flimsy hinge and cheek plates). When I was given a larger steady, **photo 2**, I thought to use this instead. The larger steady came from a 7 ½ inch centre height lathe so major surgery was needed to make it fit the 5 3/8-inch centre height of the Chipmaster. It was not a very sophisticated steady and had been modified for use on a woodworking copy lathe by fitting roller steady fingers but without any fine adjustment.

The first step was to make drawings of the existing and new steadies, **photo 3**, to make sure the foot of the steady would fit between the apron extensions because most jobs would involve getting the tool post close to the steady. There was also a need to add fine adjustment of the steady

Photo 4: Making the first cut of the steady on the bandsaw.

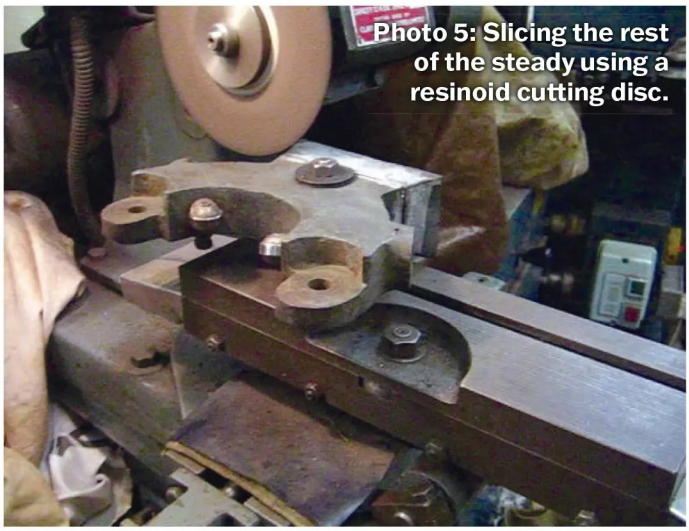


Photo 5: Slicing the rest of the steady using a resinoid cutting disc.

fingers, which was helped because there were already pairs of opposed threaded holes at the end of the finger guides that could be used to retain threaded adjustment sleeves (perhaps something similar had been there before). There is some discussion whether roller tips are better than bronze tips on metal cutting lathe steadies (because rollers may entrain cuttings - though this can be protected against) so while adding threaded extensions to the roller steady fingers I made a set of bronze tipped fingers should they prove better suited to the jobs in hand. This meant I could cut all six left-hand M10 threads (so the fingers advance when the screw is turned clockwise) in one session.

Having made the drawing of the steady, **fig. 1**, I had to cut a thick slice out of the casting. All seemed to be going well on the bandsaw (a standard 6 by 4 inch model), until I noticed penetration was painfully slow once the blade (a normal carbon steel one) reached the broad base of the cut – perhaps because of hard spots, **photo 4**. So, the first major cut was abandoned with only a few mm left to cut and the casting split by chisel (there was plenty of metal to be machined off both sides of the cut to get rid of any damage – of which there was hardly any). The next cut started well enough when cutting across the casting webs but again became too slow to continue. So, this was concluded by cutting on the Clarkson tool and cutter grinder using a resinoid slitting wheel, **photo 5**.

The base of the steady arms casting was then machined using a tungsten carbide tipped facing cutter in the horizontal spindle of the milling machine. Geometrical alignment was maintained by clamping the casting via the hinge holes on two equal height bushes while pushing against both tee bolts and clamping the webbed end down onto wedges positioned to accommodate the roughness of the casting, **photo 6**.

The foot of the casting with the vee guide was then rough machined to drawing dimensions with the part held in a machine vice with a 6mm roller to allow it to align properly with the vertical face of the fixed vice jaw, **photos 7** and **8**. The finish machining of the vee and establishing its level relative to the flat way then required a bit more thought and reflection.

Fortunately, my Eclipse vee blocks (model number 230) have a small

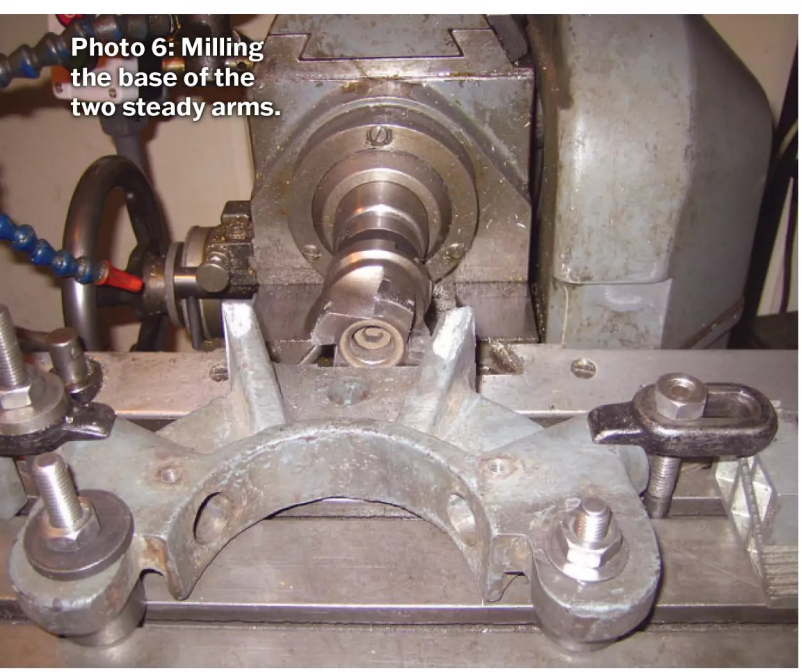
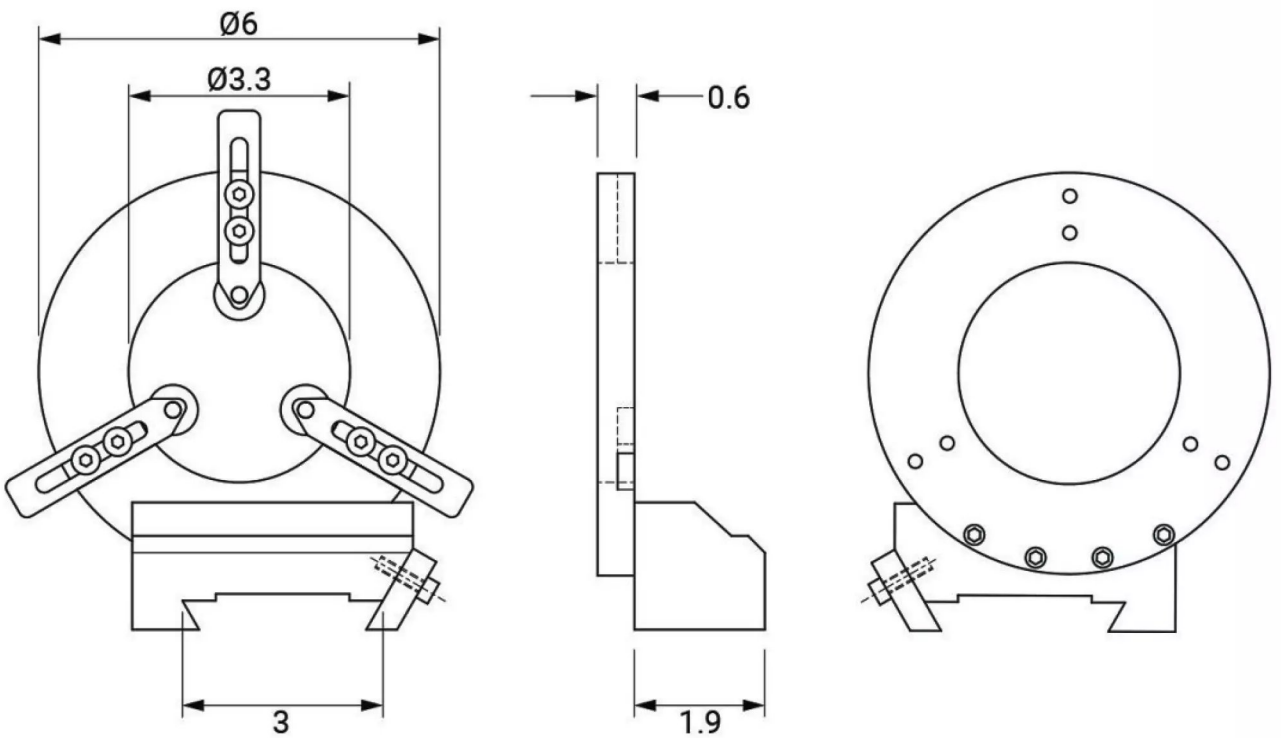


Photo 6: Milling the base of the two steady arms.

Photo 7: Milling the surface of the base of the steady

Fig 1



90-degree vee that fits on top of the rear vee for the Chipmaster tailstock without fouling the adjoining flat way, **photo 9**. The rear flat way is level with the front flat way used for clamping the steady. The problem was how to calculate the depth to which the vee on the base casting had to be machined relative to the flat way.

The first step was to measure the difference in height of the vee block when placed on the flat way and on the vee way, which came out to be 0.010 inches. The next step was to measure the size of the vee of the vee block by finding the radius of the roller that sits just level with the flat. I found precision Hoffman rollers (3/8-inch, 7/16 inch and ½ inch) would fit into the small vee of the vee block, **photo 10**. Measuring their protrusions above the block on a surface plate enabled the radius of the roller that just fitted into the vee to be found. Although two rollers would have been sufficient, I used all three to try to even out the inevitable measurement errors. r0 is the radius of the roller that fits into the vee block with zero protrusion. It is therefore equal to the constant in the fitted trend line of roller radius (r) to protrusion (e). inviting Excel to draw a graph, **fig. 2**, of roller radius against protrusion and to show the equation of the trend line determines the radius of roller (ie the constant in the equation) for which the protrusion is exactly zero.

Knowing the difference in height of the vee block when on the flat way and vee way and selecting a roller that would protrude a convenient distance from the machined vee way (eg 3/8 inch) provides the setting for milling the vee using a 45-degree horizontal

Fig 2

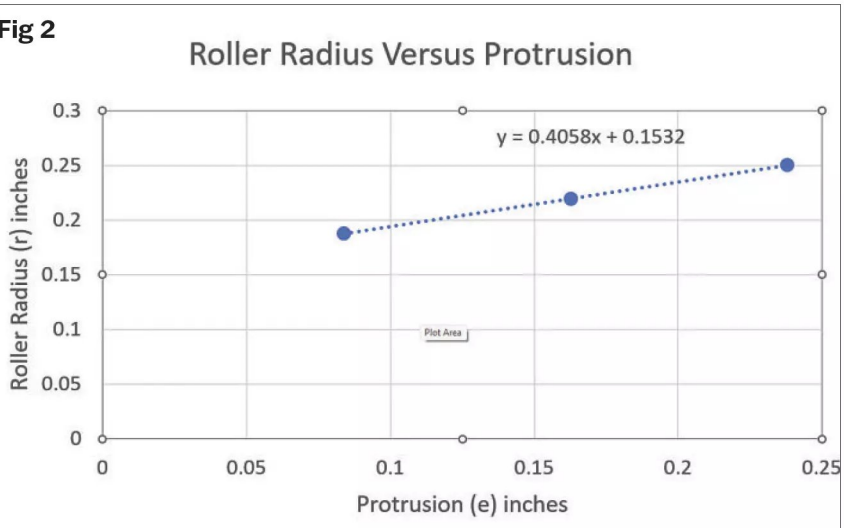


Photo 8: Milling the edges of the base of the steady.

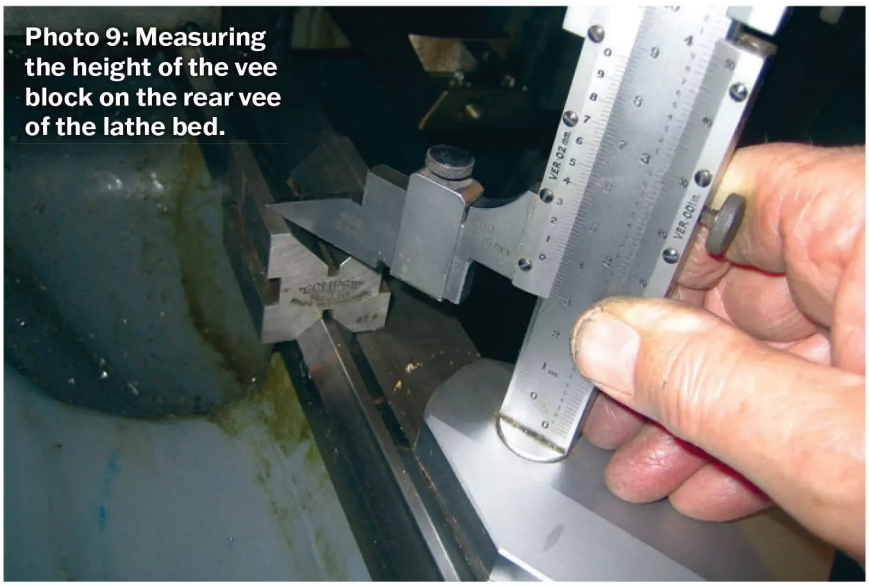


Photo 9: Measuring the height of the vee block on the rear vee of the lathe bed.

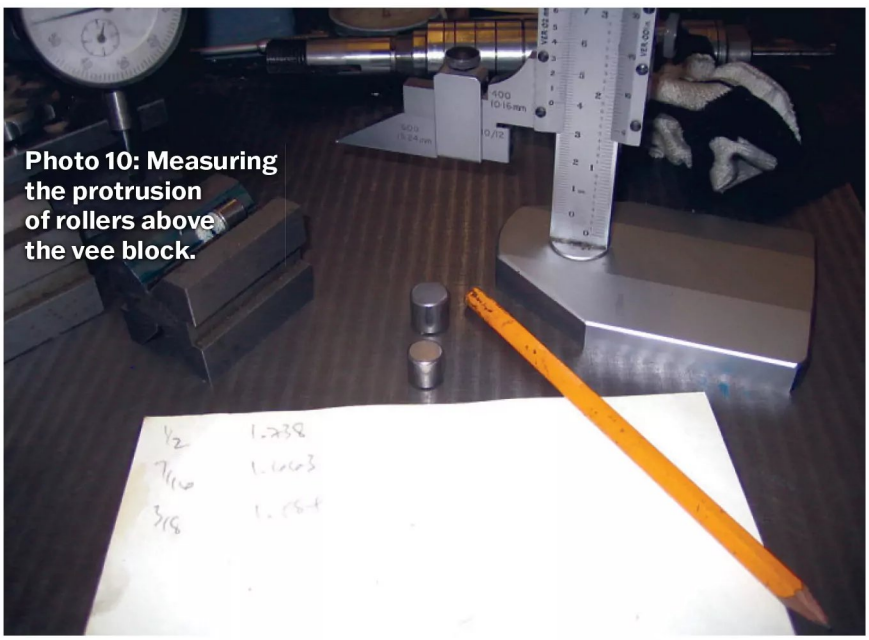


Photo 10: Measuring the protrusion of rollers above the vee block.

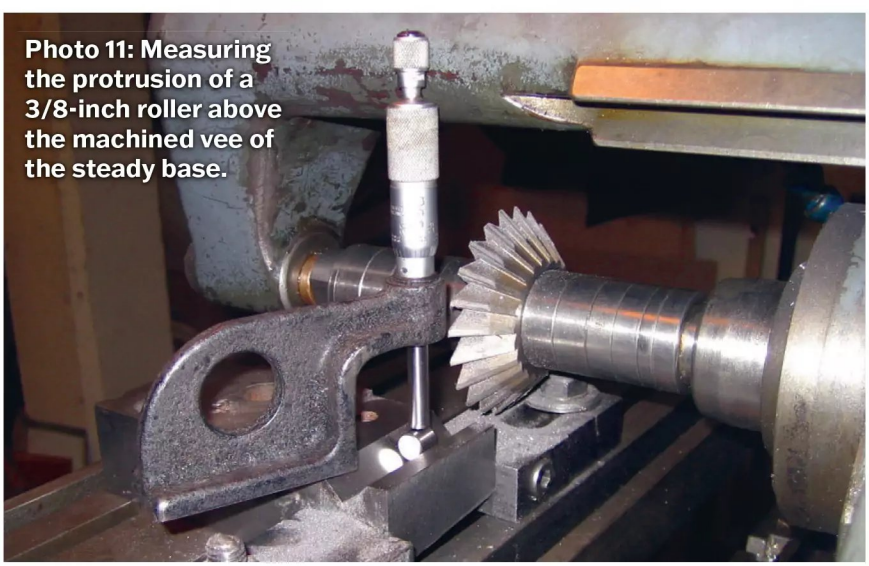


Photo 11: Measuring the protrusion of a 3/8-inch roller above the machined vee of the steady base.

cutter. In my case I found the vee had to be cut so a 3/8-inch roller would protrude 0.0728 inch above the flat clamping surface, figure 1 and **photo 11**.

The depth to which to machine the vee on the steady base is found from the following equation where r is the selected roller radius (in my case half of 3/8 inch) and e is the protrusion of the roller above the flat. The measure Δ is the difference in height of the vee block when placed on the lathe bed vee relative to the flat way

$e = (r - r_0) * (1 + \sqrt{2}) - \Delta$

in my case this gives

$e = (.375/2 - .1532) * 2.4142 - 0.01 = 0.0728$ inch

To cut the opposite side of the vee, the cutter and cutter rotation had to be reversed. The adjoining flat surface to the rear of the steady foot was then relieved (as on the tailstock) so swarf would not obstruct clamping.

The two halves of the steady were connected using M8 counterbored high tensile Allen bolts, **photo 12**. But I was concerned how to position the holes. On the one hand the threads must go into substantial parts of the upper casting to have strength and far enough apart for stability while on the other it is a pity if the counterbores mess up too much of the machined flat and vee. The result, **photo 13**, is a compromise but appears solid enough. I had considered TiG brazing the webs to the base casting but shied away because of the unpredictable nature of the castings, their very uneven thermal masses making shrinkage cracking likely and the risk of heat distortion.

The next job was to make the new bronze tipped fingers and prepare some left-handed threaded shafts to fit into the roller fingers. Despite having a metric Chipmaster, I have found when cutting several threads – even metric it is quicker to use a Coventry diehead. The only problem is that when working up to a shoulder,

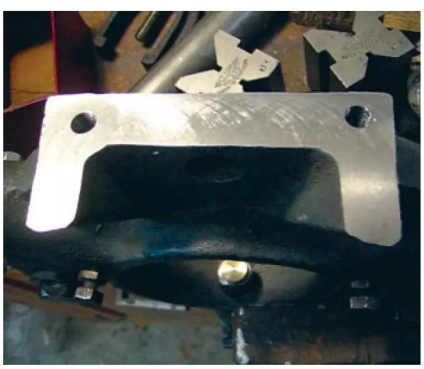


Photo 12: The position of the fixing bolts

Photo 13: The underneath of the base of the steady.

Photo 16: Complete set of pieces.

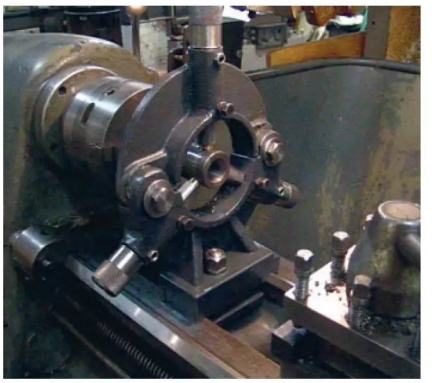


Photo 17: The steady in use

Photo 14: The badly cut and properly cut left hand threads.

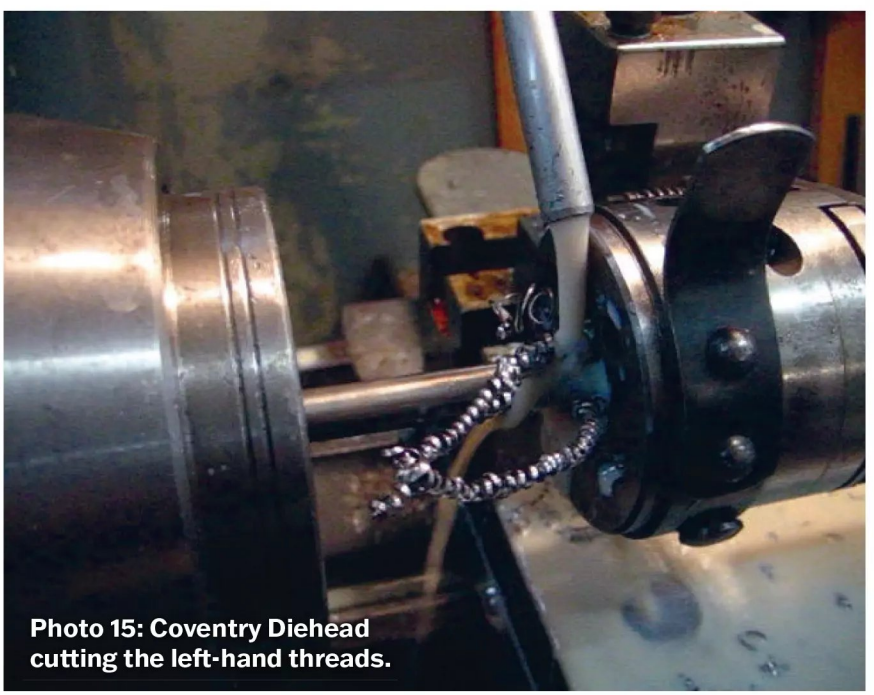


Photo 15: Coventry Diehead cutting the left-hand threads.

threads need to be finished off with a standard hand die because of the shallow throat angle of Coventry dies. I have a left-hand die set for my ½ inch Alfred Herbert Coventry Diehead but not using it very often, I forgot whether left hand dies were loaded clockwise or anti-clockwise. According to the handbook (number 25), both right hand and left-hand dies should be loaded clockwise. But the results indicated otherwise, **photo 14**. Inserting the left hand dies anticlockwise solved the problem, as also shown in photo 14, with the diehead in action shown in **photo 15**.

The rest of the jobs were straightforward: turning, knurling and threading the adjustment sleeves, turning the new phosphor bronze tipped steady fingers, the clamping plate, the M14 fixing stud and nut and tidying up the rear hinge so the top half of the steady could be swung up to clear the workpiece. The final set of pieces is shown in photo 16 and the steady in use in **photo 17**.

All in all, a satisfying low-cost project costing perhaps 1% of what I paid for the lathe plus recycling an unappreciated steady to one distinctly better than its predecessor. But if my time was costed then I have certainly exceeded 20% of the price of the lathe – but that is not really the point is it?

Jeremy Buck introduces a powerful meter-gauge locomotive and Basil Ryder's 5" gauge model.

5 inch Gauge East African Railways Class 28 "*Mvita*"

In a series of articles, published in *Model Engineer* in 2019, on the subject of my 5-inch gauge LNER locomotive stud, I mentioned, in passing, an enthusiasm for the East African Railways (EAR). This had derived from a very enjoyable period of working in Kenya during 1976/77 at a time when steam was still the predominant motive power on what was then a well maintained and busy metre gauge network. At that time there were three classes, designated 55, 59 and 60, of 4-8-2+2-8-4 Garratt locomotives, two classes, 30 and 31, of 2-8-4, one class, 29, of 2-8-2, one class, 24, of 4-8-0 and one class, 13, of 4-8-2T locomotives, all to be seen in varying degrees of intensive service on the main line and in the yards between Mombasa and Nairobi and beyond.

Unknown to me at the time, six 2-8-2 locomotives, Class 28, of similar size and capacity to the LNER P1 and BR 9F, had operated on the same metals from 1928 until withdrawal in the 1960s.

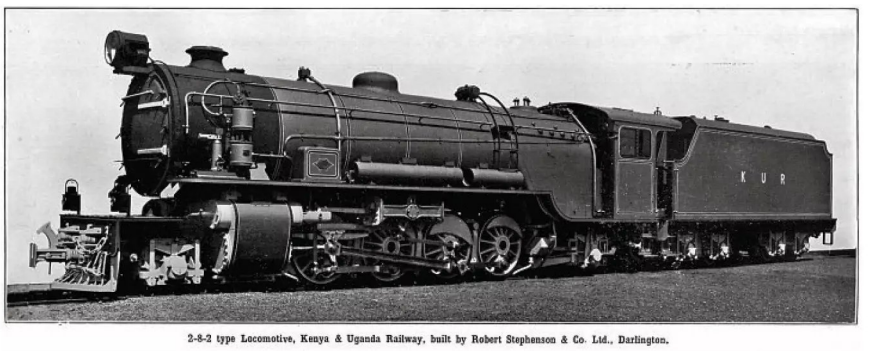
It is a one-eighth scale, 5-inch gauge, model of one of these Class 28 locomotives that is the subject of this article. The model is illustrated in **photos 1** and **2**.

Photo 1: One eighth scale model of EAR No 2801 *Mvita*. Right hand side photographed shortly after completion of refurbishment. The new power reverser can be seen towards the rear of the foot platform and behind the air reservoir. The turbo generator is prominent on top of the boiler.

THE PROTOTYPE

In 1928 the Kenya Uganda Railway (KUR) took delivery of six 2-8-2 tender locomotives from Robert Stephenson Ltd. With 4' 3" diameter coupled wheels, two 21 ¼ x 28 inch cylinders and a boiler pressure of 180psi delivering a tractive effort of nearly 38,000lb these were, at the time, of massive

Photo 2: The left-hand side of the model showing the Westinghouse air compressor mounted on the side of the smokebox. As modelled in post 1948 condition it should have two such compressors; otherwise it is an accurate representation of the prototype after rebuilding.



2-8-2 type Locomotive, Kenya & Uganda Railway, built by Robert Stephenson & Co. Ltd., Darlington.

Photo 3: The prototype KUR No 1 / EAR No. 2801 *Mvita* as outshopped by Robert Stephenson Ltd. in 1928 and before it had been given its name and original number. Mvita is a district of Mombasa, the Kenya sea port. The other five locomotives of the class were also named after places on the Kenya coast.

proportions for the metre gauge. The 6' 2" diameter boiler with a grate area of 40.5 square feet was fully commensurate with the task of providing steam. The weight in working order was 90 tons and the eight wheel bogie tender contributed a further 65 tons. Overall length over the MCA 'chopper' couplers was 72 feet 4¼ inches.

Designated as Class EA, numbered 1 to 6 and finished in the KUR's standard graphite livery, they were given names of places along the Kenya coast. With 17.5 ton axle load, they were at the time of delivery too heavy for the main line between Mombasa and Nairobi and were confined to shunting duties in the marshalling yards at Kilindini Harbour, Mombasa. In 1926, these yards had been relaid with 80lb rail in anticipation of a class of heavy 2-8-2T shunting locomotives that never materialised. It was not until 1932 that relaying of the main line with 80lb rail was completed, thereby allowing the locomotives to take up their intended duties on the mail (passenger) trains between Mombasa and Nairobi, 330 route miles and over 5,000 feet difference in altitude. Each locomotive was allocated to two selected drivers. The norm for each locomotive was ten round trips a month, a distance of 6,600 miles and in this way each of the EA's had completed over a million miles by 1948.

Originally designed for oil fuel they were converted to coal burners in 1929 and remained so equipped until 1948 when EAR, which had been formed in that year by the amalgamation of KUR and Tanganyika Railways (TR), converted them back to oil burners. A number of other modifications included the introduction of power reversing gear and Timken roller bearing axleboxes. Turned out in the maroon TR livery that was adopted as standard by EAR, the locomotives were redesignated Class 28, renumbered 2801 to 2806 and were put to work on heavy freight trains. On these duties they did not fare so well, possibly because they had become common user locomotives and by the mid 1960's they had all been laid up and were ultimately scrapped.

Sadly, I have been able to find very few photographs of these magnificent locomotives, especially when pulling trains, but **photos 3** and **4** showing No. 2804 *Kilifi* in post 1948 condition are among the principal reference points for the model in its current form. For more information see **ref. 1**.

THE MODEL

The model was described in ME by the late Bill Hughes in two articles in 1969, **ref. 1**, and 1974, **ref. 2**, during its construction by Basil Ryder who, prior to his retirement had been in the employ of EAR. Mr. Ryder had already built a 5-inch gauge EAR Class 10 2-6-4T which he had started while still resident in Kenya. The Class 28, however, was started after he retired to the UK and took up residence in Cornwall. According to Mr. Hughes, it was completed when Mr. Ryder was in his eightieth year – no mean achievement given the size of the model.

Mr. Hughes also noted that the design and construction benefitted from access to EAR drawings of the prototype. However, it quickly became apparent to me that the finished model exhibited a mixture of features that both predated and postdated the rebuilding of the prototype that took place from 1948, but which did not exist together. When stripping it down I found clear evidence that the model had at one time been painted in the KUR graphite livery, but it is clearly in maroon livery in photographs, purporting to show the newly completed model, in Mr. Hughes' second article.

It appears that the model had considerable use between completion and an unknown date in the 1980s when Mr. Ryder, then well into his eighties died. It then languished unused in his son's garage for over 30 years until Simon Hudson bought it with the intention of restoring it at the Steam Workshop. With no prospect of making a start on it in the near future he decided to put it up for sale in 'barn find' condition and, unable to resist the opportunity to have an East African locomotive, I bought it.

In subsequent articles I hope to describe some of the more interesting aspects of the restoration.

References

Reference 1: *Gari La Moshi – Steam Locomotives of the East African Railways.* R Ramaer. 2009. Stenvalls.
Reference 2: *East Africa in the West Country.* W.J. Hughes. ME3363 21 February 1969 p173.
Reference 3: *East Africa in the West Country*. W.J. Hughes. ME3499 18 October 1974 p 1005.

Photo 4: No. 2804 *Kilifi* photographed at the official EAR photographer's favourite location outside Nairobi MPD (Motive Power Depot), probably around 1948.

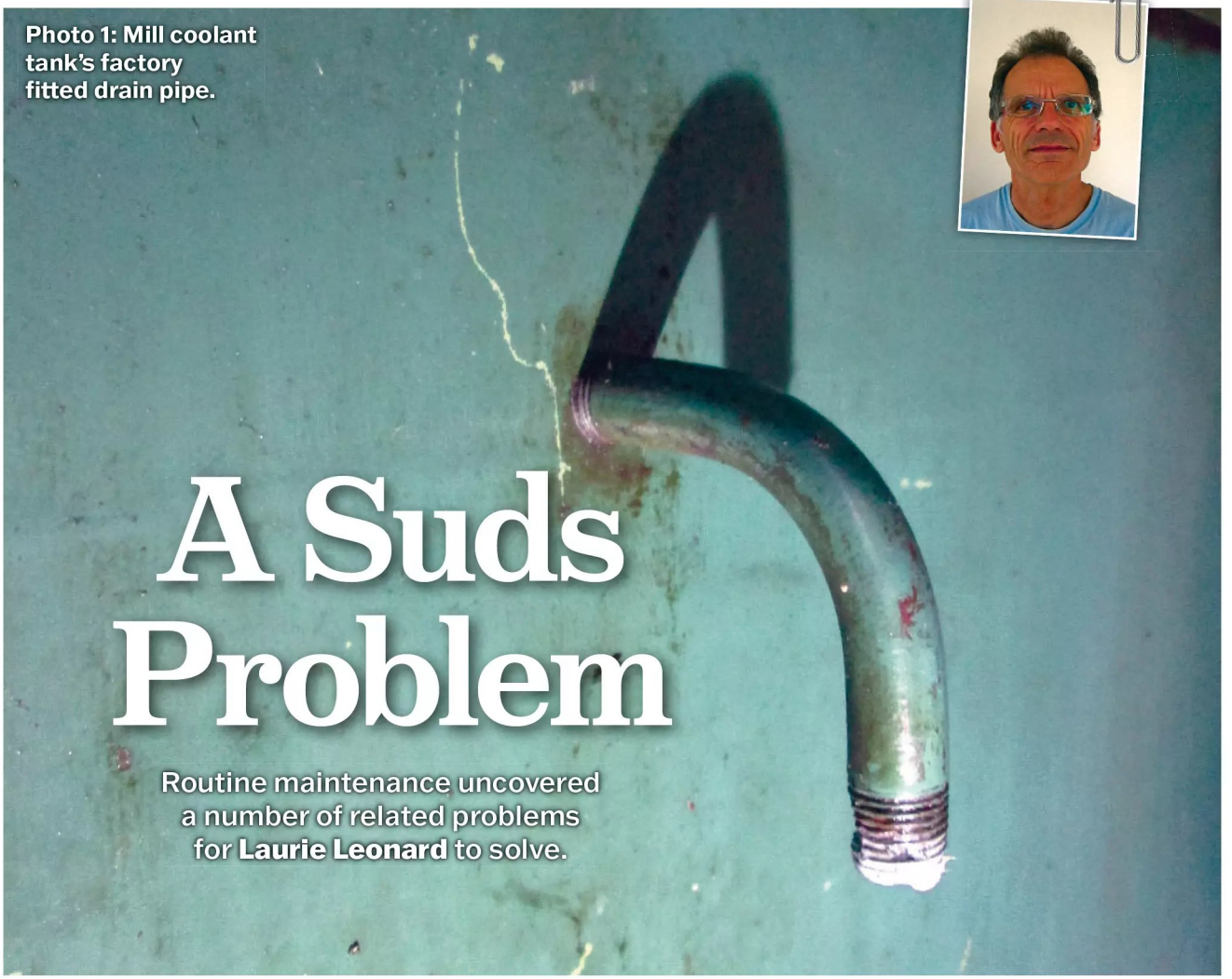


Photo 1: Mill coolant tank's factory fitted drain pipe.

A Suds Problem

Routine maintenance uncovered a number of related problems for **Laurie Leonard** to solve.

I use suds, soluble cutting oil, on both my Myford 7 and my Tom Senior Mill. My workshop is basically a concrete sectional garage but with a personel door not a garage door. I have fitted an insulated roof, **ref. 1-**, and double-glazed draught proofed windows but the walls are plain concrete. The consequence of this is that periodically we get a bad winter, and the suds separate out into oil and water that do not want to remix. They have to be changed. The mill, due to its elevated large base area, seems to be the worst affected and suffered last winter: time for a suds change. This is a straight-forward job done many times before. This time things did not go to plan and then one thing led to another and then another.

Photo 2: The offcut of pipe, showing the hole, alongside the brass cap.

CHANGING THE COOLANT

As stated above this is a straight-forward job. The suds tank is integral with the base and stand of the mill. A pipe is factory fitted to drain the tank into a suitable container. **Photograph 1** shows the drain pipe with the rather nice brass cap removed. The white is PTFE tape used as a seal with the cap. The coolant was reluctant to come out but the crud preventing it was removed with a piece of wire and the tank was drained into a bucket. The cap was replaced with fresh tape and some water was added to the tank to check for leaks. It leaked! Nip it up. It still leaked. The cap was removed for a detailed inspection. It was found that there was a hole in the pipe that was not completely covered by the cap. I had never had trouble with this before or ever noticed the hole. Was the hole original so that as the cap was unscrewed the drain flow could be controlled? Anyway it leaked and had to be sorted. Two solutions came to mind: cut more external thread on the pipe so that the cap had a chance of covering the hole (it probably would not as the pipe would bottom in the cap so some of the thread would have to be cut off the bottom) or remove the threaded portion and thus the hole and tap the inside of the pipe for a screwed plug. I opted for the latter and cut the end of the pipe off. Not an easy job due to access but the removed piece and the cap can be seen in **photo 2**. What do you make of the hole? Having filed the drunken end of the pipe (I blame the bad cut on bad access) and tapped the pipe, a plug was made from a bolt, and a fibre washer was used as a seal, **photo 3**.

Photo 3: The manufactured pipe plug fitted.

THE SUDS PUMP

If I come to use the mill after a period of non use, I find that the suds pump has lost prime. The mill is quite old and parts of it show signs of wear. The suds pump is one of those parts. I have had the pump apart on several occasions and played with this and that but after spending a while on changing the coolant I thought that I would try and sort the whole system.

The suction pipe of the pump has a ball in the base acting as a non return valve and is thus supposed to keep the pump full when the mill drive is off, **photo 5**. This ball is prevented from getting carried up the tube and into the rest of the system by a screw fixed across the tube blocking its path. Just visible is the fibre washer used to seal the screw so that the pump does not lose prime by leaking coolant past the thread. The ball not seating could be a reason for the pump losing prime, so I cleaned the area, checked the seating and replaced the ball. A 'blow' test down the pipe proved the seating.

In support of my bad access argument **photo 4** shows the access and surrounds (as well as evidence of a spill). As an aside, part of the chipboard over-floor can be seen. The workshop was erected on a concrete base as per the instructions. Over time several of my machines were mounted on castors which tried to dig into the concrete and the concrete tended to dust. Floor paint failed to cure the problem. I eventually decided to fit damp resistant flooring panels to the accessible areas (the levelled mill and levelled lathe were not moved and still rest on the concrete via adjustable feet) of the concrete base and it has made a world of difference to the movement of machines and the hygiene of the floor. Anyway the tank was refilled and the mill ready for service. Well, not exactly.

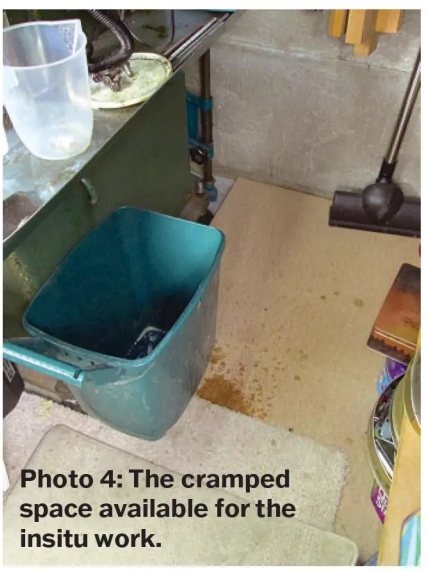


Photo 4: The cramped space available for the insitu work.

Photo 5: The components of the suds pump suction pipe.

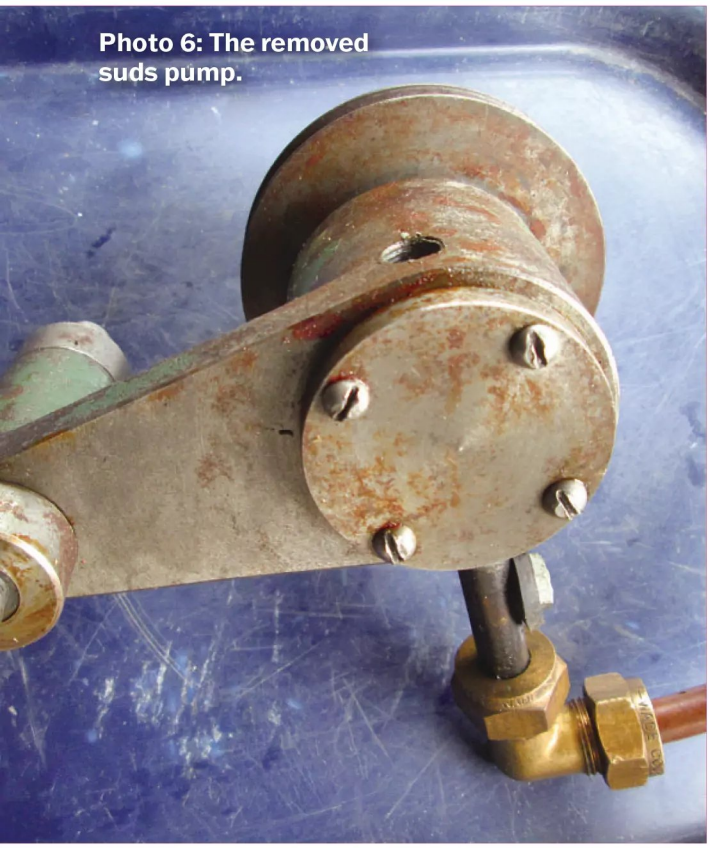


Photo 6: The removed suds pump.

Photo 7: Opposite side of the pump.

Two views of the removed pump are shown in **photos 6** and **7**. I had already carried out some modification to the delivery system which was a flexible polythene tube that led from the pump into the main column casting then to the control valve/cock at the top of the mill. The pipe kept leaking and filling the base of the column with suds hence the "gas fittings" on show in the photograph. An internal view of the column is shown later in photo 19; the reason for its inclusion will be covered later. **Photograph 8** shows the internals of the pump, the cover having been removed. The pump is of the vane type. The rotor spins eccentrically in the housing. The two vanes are free to move in the slot and in operation are kept in contact with the periphery of the chamber by the spring. When operating, the vanes trap spaces that initially enlarge sucking in the fluid and then

Photo 8: Internals of the suds pump, cover removed.

Photo9: Wear pattern on the new vanes.

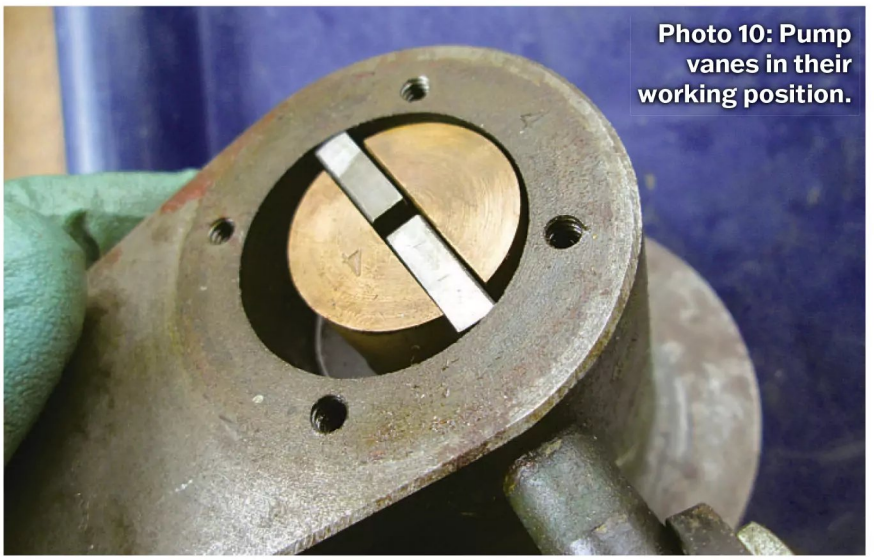


Photo 10: Pump vanes in their working position.

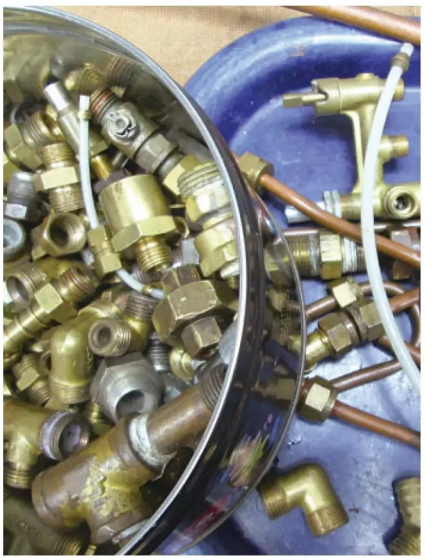


Photo 13: Collection of small bore plumbing fittings.

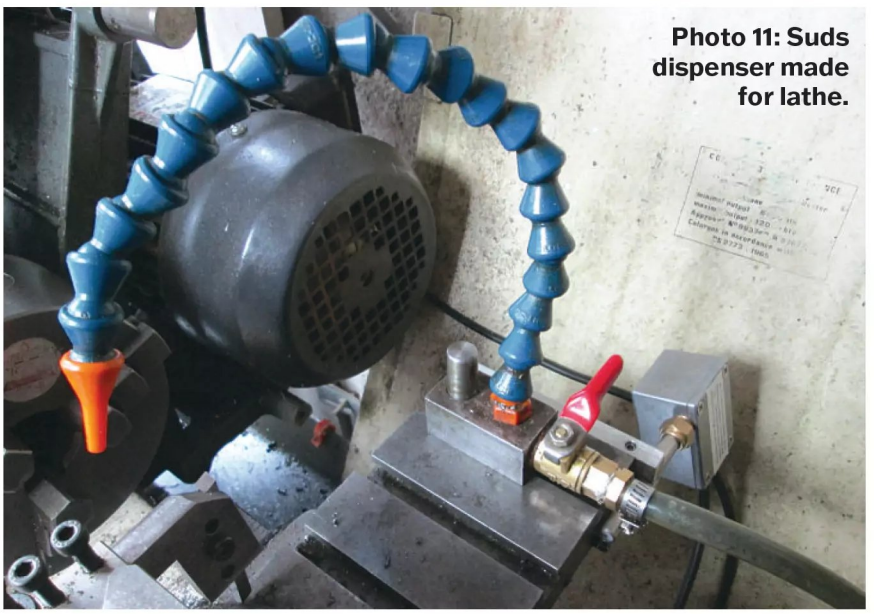


Photo 11: Suds dispenser made for lathe.

reduce forcing the fluid out of the discharge system of the pump. The vanes are home-made replacements, a previous attempt to get the pump to self prime as I thought that they had worn badly. A wear pattern on the 'new' vanes can be seen in **photo 9**. The vanes in their working position can be seen in **photo 10** which also shows large clearance between the vane and the rotor. This is probably due to wear in the rotor and/or my use of stock material for the replacements when made.

I had found that the original dispensing system to the cutter to be very hit and miss when trying to direct the coolant at the job, so I made a dispenser similar to the one made for the lathe, **photo 11**, that sat on the mill table and was carried in a tee-slot. A much shorter discharge pipe with minimum wobble was fitted but at the

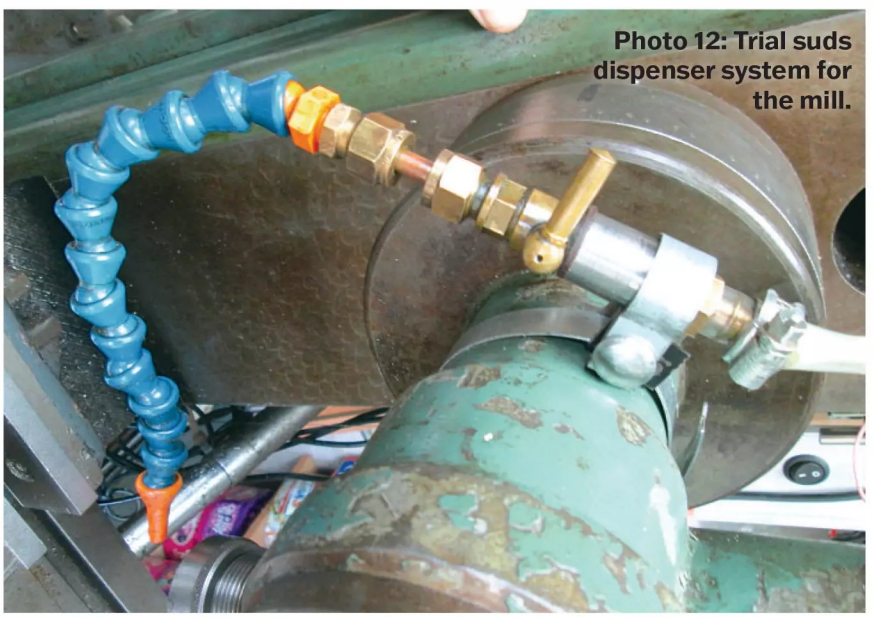
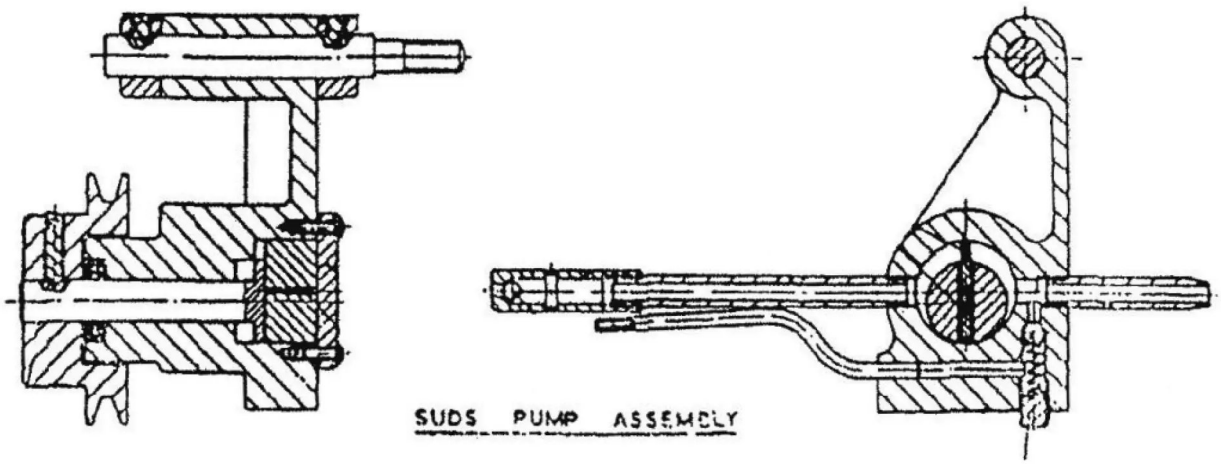


Photo 12: Trial suds dispenser system for the mill.

Photo 14: Fabricated relief valve.

Fig 1: Suds pump relief valve.



time I was not in thinking mode. In use, when the job was moved via the table the coolant nozzle moved thus missing the cutter and spraying the floor. A trial system was set up, **photo 12** which still utilised a flexible pipe but had the dispensing nozzle fixed much nearer the job however in use the flexible pipe kinked. This had to be rectified.

As it was found that the discharge pipe drained when the mill was not in service the system was investigated, and a hole was found in the discharge pipe adjacent to the pump. This was plugged with a bolt and fibre washer as shown in photo 8. It then dawned on me that this was a 'positive displacement pump' i.e. an amount of liquid was forced out of the pump each revolution. This liquid had to go somewhere. The pump revolves when the mill runs so if the coolant cock is throttled/shut the liquid has to go somewhere hence the hole in the discharge pipe. I did have trouble getting the flexible pipe clips to seal, but I think that the wear in the pump was taking care of the pumped fluid with nowhere to go. This wear was also probably the reason there was trouble priming the pump because the wear was preventing the pump from being self priming.

With discharge pipe hole plugged the pump was staying primed but I had to solve the flexible pipe problem mentioned above. It was time to replace the bulk of the flexible pipe with copper, put the control cock back on top of the column and purchase a more robust discharge pipe.

I was also still not happy with relying on wear to take the output of the pump when throttled or with the coolant cock off – always consider the possible consequences of any modification. What was called for was a pressure relief system on the pump discharge. I had managed to get some drawings of the mill from the internet and wondered if the crude hole in the discharge pipe was shown in case there was something missing on my mill. One drawing shows the suds pump and a closer look at it showed that, at the time of the drawing, the body of the pump incorporated a relief valve, **fig. 1**. I set about designing and making a relief valve to be incorporated in the discharge of the pump.

Over the years working on various projects I have amassed a collection of plumbing fittings. A sample of the small-bore components is shown in **photo 13**. With a fair selection of components in the range normally used for plumbing systems with LPG in caravans etc I went for this range. The size also suited the application. I made a relief valve from brass rod, **fig. 2**, which can be seen in **photo 14** complete with the vent pipe to return the bled coolant back to the tank. A close up is shown in **photo 15**. The principle of operation is simply a vent held closed by a spring-loaded ball. As it appeared that

Photo 15: Another view of the valve, made from rod.

Fig 2: The fabricated relief valve cross section of body.

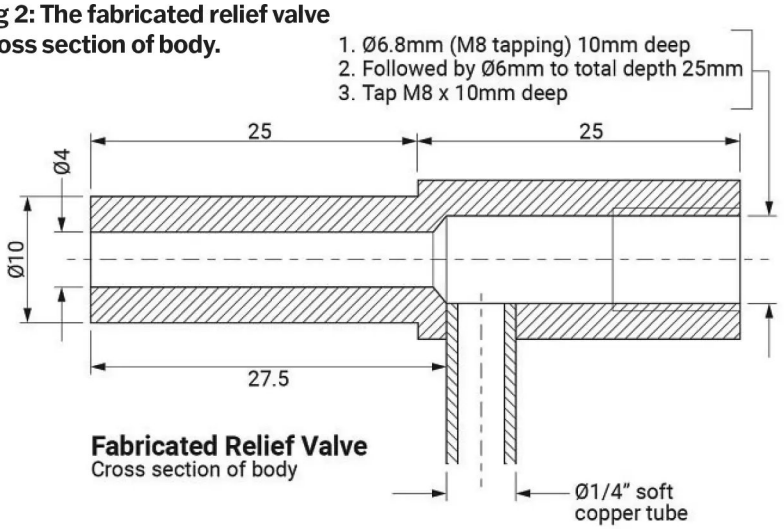


Photo 16: Suds pump remounted showing relief valve and return pipe.

Photo 17: Large hole in the top of the mill main casting.

Photo 18: M16 pipe locating bolts.

Photo 19: Copper pipe routing in the man column.

Photo 20: M16 locating bolt in situ, short length of flexible pipe.

Photo 21: Shop made tool for rolling groove in pipe.

Photo22: New discharge pipe to cutter.

the crude hole in the discharge pipe was deemed adequate to pass the necessary flow, a pipe of similar dimension was used. Without trying to calculate pressures and areas I argued the design had to have adjustment available for the blow off pressure. This was provided by a screw loading the spring that retained the ball in the closed position. What spring? I have collected springs over the years and even purchased a bag of various sizes. The one that came to hand had just been removed from a glasses cleaner spray bottle. It appeared to be made of stainless steel: I do not really trust the inhibitors that are supposed to be included in the makeup of suds. During testing the screw had to be backed right off meaning that adjustment was not required with the set up, but this was not known at the manufacturing stages of the valve. The pump remounted on the mill is shown in **photo 16** where the valve and relief pipe can be seen.

The final stage of the project was to sort out the delivery pipe work to the discharge pipe. The original flexible pipe passed from the pump into the main column casting via a large hole and then to the regulating cock on top of mill which was located in a similar large hole in the top of the column casting as seen in **photo 17**. I chose to run 3/8" diameter soft copper piping through the column casting. A means of locating it in the large (5/8 ins) holes was needed. This was accomplished utilising two M16 bolts, **photo 18**, I drilled clearance holes axially for the copper pipe and radially through the head for M5 Allen screws to 'fix' the pipe. I say fix but the screws would be landing on soft copper so minimum nip up was applied just to hold the pipe. The routing of the pipe in the column is shown in **photo 19**. One of the locating M16 bolts can be seen in **photo 20** together with a short piece of flexible pipe from the pump to the fixed copper pipe. This flexible pipe is needed, as the weight of the pivoted pump is used to tension its drive belt which creates a tendency to jump.

I did have some 3/8 copper to flexible pipe nozzles but they seemed to be too big and cumbersome for the job, so I rolled a groove on the 3/8 copper to provide a key for an hose clip to grip the flexible pipe to the copper pipe. The 'shop made tool used for this is shown in **photo 21**. The tool was to hand having been made for another job. A view of the suds pipe discharge to the milling cutter is shown in **photo 22**. What started off as a simple routine job has ended up with major work but has finally sorted several niggles with the coolant system on the mill.

References

1 *Raising the Roof*, Laurie Leonard, MEW 248

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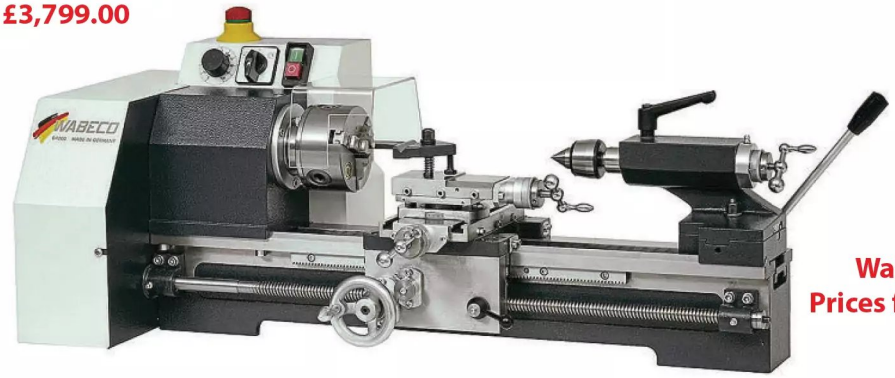

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We bring you the results of this year's International Model Locomotive Competition.

IMLEC 2025 The Results

Ben Paviour on his winning run, Courtenay Fourder.

This year's competition, hosted by Fareham and District Society of Model Engineers, was held at their excellent site in Titchfield, Hampshire. The elevated track has a run of 1,582 feet with two particularly challenging gradient of around 1:100 and 1:70, which took their toll on the entrants. Out of twenty-eighteen competitors, there were sixteen finishers and twelve retirements (not all retirements are shown in the table) - See page 24.

On the final day there was some unexpected drama when Kevan Ayling's recently completed *Vortigern*, a model of a proposed BR 2-8-2 locomotive, had been running well, until on his final lap it derailed coming over the bridge and came right off the track, landing on its side. Fortunately there were no injuries and the prompt reaction of the marshals ensured it was safely dealt with. The locomotive appeared to suffer mostly cosmetic damage, although some of the valve gear was bent. We send our best wishes to Kevan and hope this magnificent loco is back on the tracks soon.

The accident damaged the coupling on the dynamometer car, so a (calibrated) substitute was used for the last five runs. In a cruel twist, last year's winner, Steve Eaton, suffered a less dramatic derailment due to a problem with the new dynamometer car's coupling not suiting 3.5" gauge. The coupling was modified and Steve restarted, but the delay led to his ashpan clogging and he had to retire.

The final results were:

Ben Paviour received the Martin Evans Trophy, Courtenay Fourder.

First Place 5" Gauge Locomotives – Ben Paviour, Southport Model Engineering Club

Ben, who has won IMLEC twice in previous years, drove his LNER Q5 based on LBSC's *Netta*. He pulled five adults, one of the largest loads in the competition, while carefully keeping his coal use down to 1.175lbs to achieve an efficiency of 1.589%.

Load of adults is number the run finished with NOT counting the driver AND Observer.

IMLEC 2025 Results

Run No	Driver	Society	Gauge	Locomotive	Wheel Arrangement	Load Adults	Coal Used	Run Time	Distance Run	Actual Work Done	Average DB Hp	Specific Fuel Consumption	Efficiency	Final Position.
			in				lb	min	ft	ft lb	Hp	lb/hp/hr	%	
17	Ben Pavier	Southport	5	LNER Q5	0-8-0	5	1.175	28.05	14320	210580	0.227	11.048	**1.589**	1
22	Danny Hayward	Southport	5	Pannier Tank	0-6-0	3	1.006	28	14330	152850	0.165	13.035	**1.347**	2
11	Alasdair Croft	Leyland	5	Kestrel A4	4-6-2	4	1.844	32	17510	276810	0.262	13.188	**1.331**	3
12	Glyn Winsall	Rugby	5	U Class Mogul	2-6-0	3	1.594	31.5	19090	204380	0.197	15.440	**1.137**	4
20	Marcus Peel	Southport	5	LMS Mogul	2-6-0	0	0.994	31.09	10820	121810	0.119	16.153	**1.087**	5
13	David Mayall	Bracknell	5	Speedy	0-6-0	4	1.544	29.62	13530	174660	0.179	17.500	**1.003**	6
26	Roger Holland	Chesterfield	5	A4 Wild Swan	4-6-2	5	1.438	28.56	12939	162351	0.172	17.531	**1.001**	7
16	Craig Weatherley	Chichester	5	B1 Springbok	4-6-0	4	2.844	31.04	17490	273310	0.267	20.602	**0.852**	8
1	Peter Wardropper	SMEE	3.5	River Darenth	2-6-0	0	0.988	31.38	13360	93595	0.090	20.891	**0.840**	9
8	Glen Davies	Bracknell	5	Janine	0-6-0	5	2.444	32	17480	210500	0.199	22.986	**0.764**	10
24	Andrew Pope	Warrington	5	Sir Mador de la Porte	4-6-0	1	1.338	30.14	13042	113911	0.115	23.248	**0.755**	11
18	Luke Bridges	Maidstone	5	Marjorie Evelyn	2-6-0	1	2.131	30.28	14310	114250	0.114	36.935	**0.475**	12
4	William Powell	Bournemouth	3.5	Mona	0-6-2	0	0.938	25.66	6390	46505	0.055	39.915	**0.440**	13
21	Sam Ashing	Frimley	5	Sweet Pea	0-4-0	1	1.75	30.05	10770	73170	0.074	47.355	**0.371**	14
27	Tom Petch	Southampton	5	SR Q1	0-6-0	1	3.025	26.31	12479	107466	0.124	55.734	**0.315**	15
6	Nigel Way	Wimborne	5	Hunslet	0-4-0	3	3.513	33.66	11410	116800	0.105	59.544	**0.295**	16
9	Ed Hocking	Coventry	5	B1 Oliver Bury	4-6-0	0	3.806	49.8	7370	64120	0.039	117.535	**0.149**	17

NR Indicates data not recorded as run had retired.

Retired

2	Andy Nash	Romney Marsh	3.5	Spitfire	4-6-2	NR	0.75	NR	3350	16200	NR	NR	**0.191**	Retired
3	John Williams	Southport	3.5	Hielen Lassie	4-6-2	NR	1.063	NR	11050	58945	NR	NR	**0.492**	Retired
5	Callum Christie	Drumawhey NI	3.5	MGWR 50	0-6-0	NR	NR	14.6	2670	5700	0.012	NR	**0.000**	Retired
7	David Shepheard	Bracknell	5	Polly 3	0-6-0	4	1.575	21	4800	56500	0.082	55.195	**0.318**	Retired
10	Bruno Taylor	Bristol	5	Babycastle	0-6-0	3	0.938	NR	1640	16500	NR	NR	**0.156**	Retired
14	Andrew Giffen	Grimsby	3.5	SAR 15F	4-8-2	1	3.944	34.5	12250	165000	0.145	47.325	**0.371**	Retired
15	Bruce Hope	Harlington	3.5	Garratt	4-8-2+2-8-4	8	2.275	18.83	3970	67045	0.108	67.186	**0.261**	Retired
19	Simon Holland	Chesterfield	5	UP Switcher	0-6-0	NR	1.569	NR	14510	198600	NR	NR	**1.122**	Retired
23	Kevan Ayling	Worthing	5	Vortigern	2-8-2	5	2	31	9599	171900	0.168	23.037	**0.762**	Retired
25	Sean Pritchard Frankaham	Harlington	5	Gemsbok	4-6-0	2	2.819	NR	3346	38750	NR	NR	**0.122**	Retired
28	Steve Eaton	Chesterfield	3.5	WD Brittania	4-6-2	3	0.681	NR	3661	28322	NR	NR	**0.369**	Retired

Danny Haward was placed second, Courtenay Fourder.

Above: **Second Place 5" Gauge Locomotives Danny Hayward, Southport Model Engineering Club**
A substitution in the running, Danny ran his GWR 57XX pannier tank with three passengers. His final efficiency was 1.347%.

Neil Wyatt congratulates Alasdair Croft on his third place, Courtenay Fourder.

Peter Wardropper, winner of the 3 ½" gauge competition is congratulated by Peter Holland, Chair of Fareham & District SME, Courtenay Fourder.

Above: **Third Place 5" Gauge Locomotives – Alasdair Croft, Leyland Society of Model Engineers**
Alasdair was running one of two LNER A4 locomotives in the competition, *Kestrel* in striking blue livery, built around 1948 by A. McLukie. He hauled four passengers with the greatest amount of work done, 276,810 foot-pounds – for an efficiency of 1.331%.

Left and below: **First Place 3 ½" Gauge Locomotives – Peter Wardropper, Society of Model and Experimental Engineers**
Peter ran his *River Darenth* to LBSC's *Betty* design light with no passengers and the second lowest coal use of any finisher, and achieved an efficiency of 0.84%.

Peter Wardropper on his winning 3 ½" gauge run, Courtenay Fourder.

Nigel Way receives the Arthur Bellamy Tankard from Judith Bellamy and Fareham & District President, Mike Chrisp, Courtenay Fourder.

Nigel Way and his 5" gauge Hunslet, Courtenay Fourder.

Above: **Arthur Bellamy Tankard – Nigel Way, Wimborne District Society of Model Engineers**
In memory of her father, the late Arthur Bellamy, his daughter Judith presented her award (tankard and whisky) to Nigel Way who came last-but-one because she claims it's fairly easy to come last but much more difficult to be second-to-last.

Glyn Winsall and his Mogul, Mike Chrisp.

Craig Weatherley and Springbok, Mike Chrisp.

Other notable achievements included: Above left: **Greatest distance run:** Glyn Winsall, U Class Mogul Rugby Model Engineering Society. Above right: **Highest average drawbar HP**: Craig Weatherley, B1 Springbok, Chichester District Society of Model Engineers. **Least coal used by a finisher:** William Powell, Mona, Bournemouth & District Society of Model Engineers. Our congratulations go to all of the competitors, and our thanks to the Fareham Society and all their volunteers for making this a truly memorable event.

Photo 163: Reaming a cylinder cover for the piston rod.

Doug Hewson continues with the cylinders of his BR Standard Class 4. 155 of these locomotives, known as Moguls, were built for British Railways.

PART 19

Continued from Model Engineer & Workshop issue 4767

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

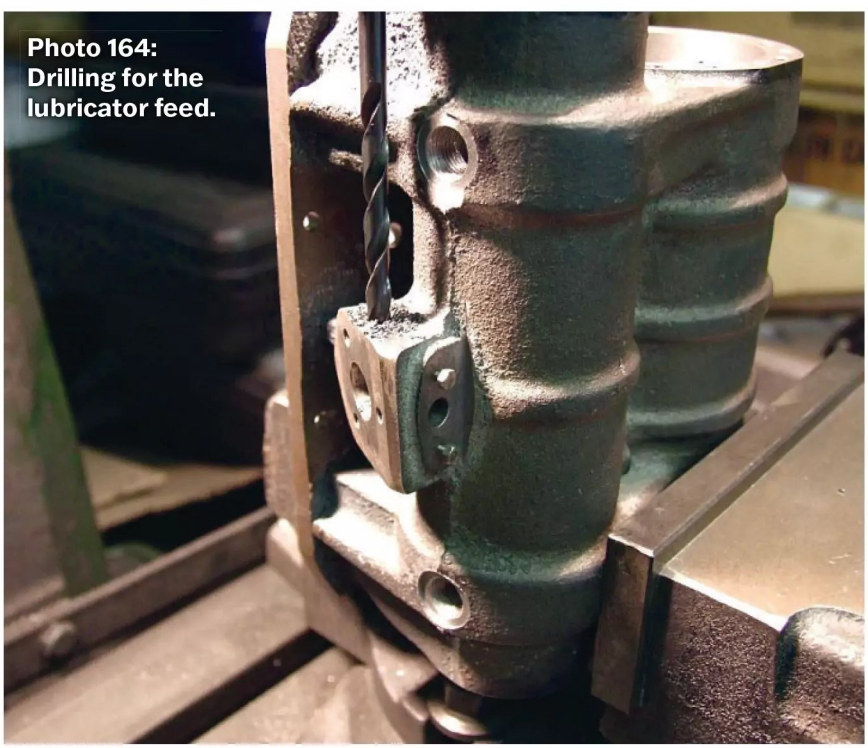
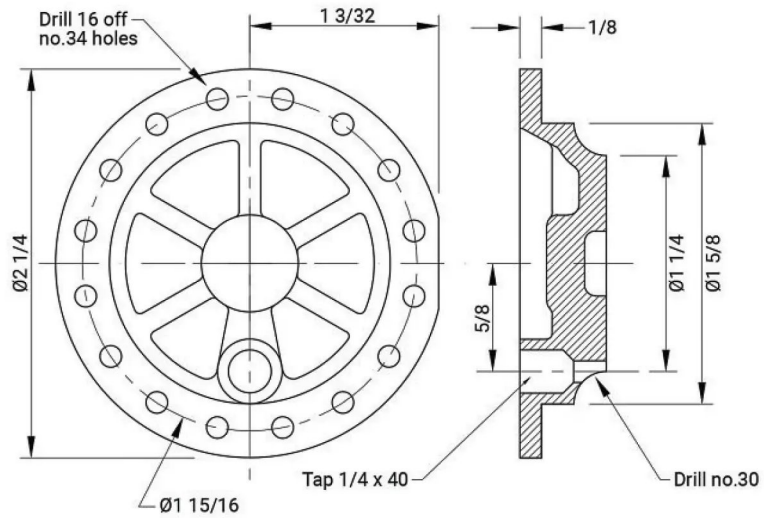


Photo 164: Drilling for the lubricator feed.

To continue with the cylinders etc. we will start this time with the cylinder end covers, **figs 66** and **67** and **photo 163**. This photo shows Geoff reaming the end cover for the piston rod. These are not quite the same as the end covers for our 76000 but I am sure you will get the idea. You will get a better picture later as I have a photo that shows my 4MT being assembled with the slide bars similar to the 76000 which has similar valve gear to the 4MT; identical, in fact, to my 4MT. **Photograph 164** shows Geoff's set up for drilling a hole for the tube from the lubricator. If you are fitting atomisers, however, you can omit this as the atomisers will do the job for you. **Photograph 165** does show my 4MT and this illustrates the oil inlet to the valve rod and, a little lower down, you will also see an oil pipe going to the piston rod. I drilled holes for both of these oil pipes, drilling them through the end covers just in case that might work and, to my amazement, both of them worked. Eddy says that there is always a trace of oil on both valve and piston rods. All they have are

Front cylinder cover **Fig: 66**



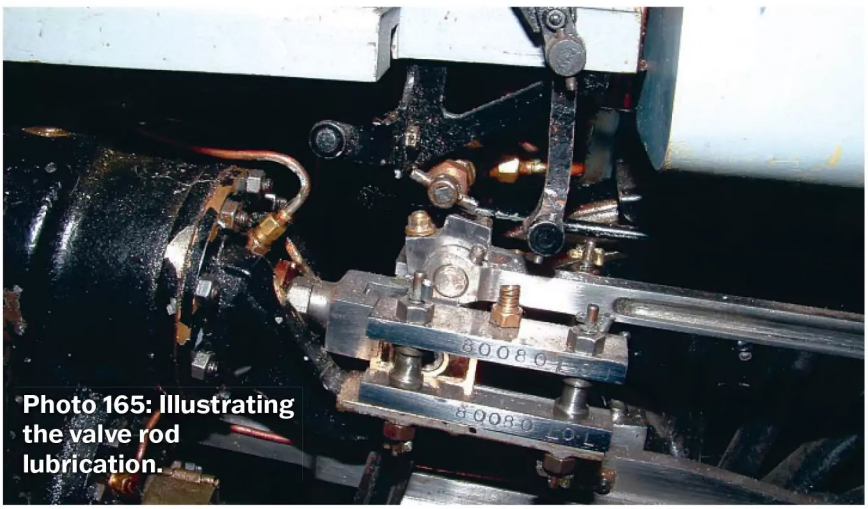


Photo 165: Illustrating the valve rod lubrication.

0.054 diameter copper tubes going to them from the atomisers which I found quite amazing. We will come to the oil piping shortly.

Photograph 166 shows a cylinder relief valve fitted and, for that matter, there is also one of my castings for a steam operated cylinder cock which we will come to later.

We will now look at the cleading of the cylinders, **figs 68** and **69** and **photo 167** shows it all fixed with 12BA hexagon headed set screws so beware as you will need several hundred of these for fixing the cab and platforms. They will need 2mm heads. **Photograph 168** shows how Geoff built up the end covers for the cylinders. The remainder of the **photos, 169** to **172** show some general shots of the cylinder cleading.

We will next come on to a little more machining and that will be the valve end covers.

Beginning at the front of the engine we will make a start on the on the front valve covers, **fig 70**. The front covers are just a plain turning job, but the rear ones, **fig 71** are a different story and need a bit of thinking about; hopefully my photos will help. I began the ones for my 4MT by holding them in the four jaw with a spacer in one jaw consisting of a piece of 3/4" square box section. **Photograph 173** shows my rig for doing the machining. I then used an extended pin drill (if you can find one nowadays!). The extension was a length of ¼" rod. I tapped all of my pin drills in the rear end with a 2BA thread so that I could extend them and very useful they are too. **Photograph 174** shows it in action for drilling and reaming the hole for the valve rod. On top of the cover, as shown, I drilled out

Rear cylinder cover

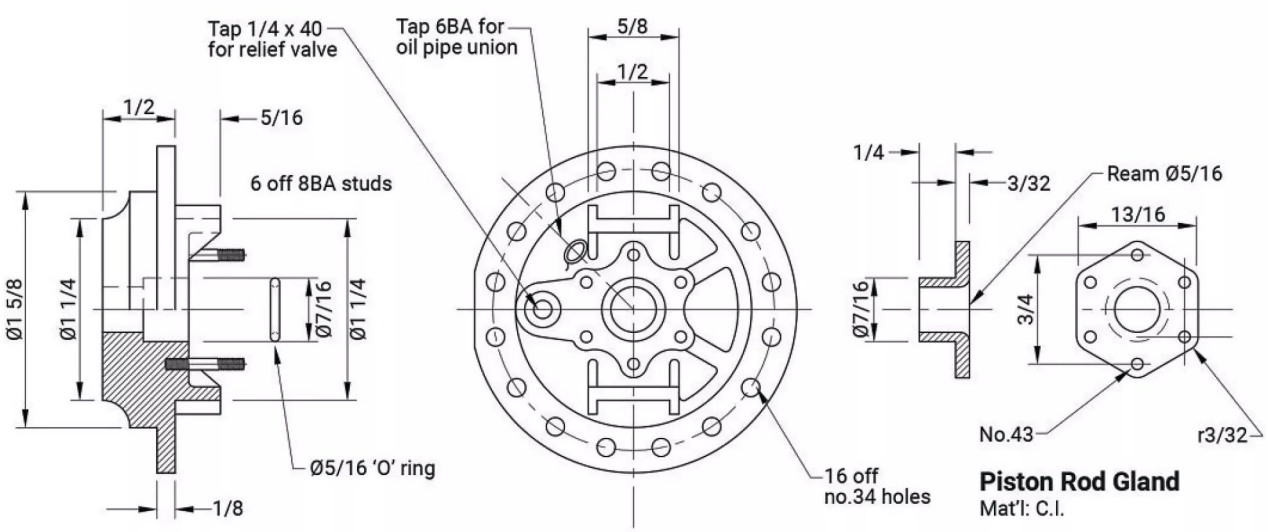
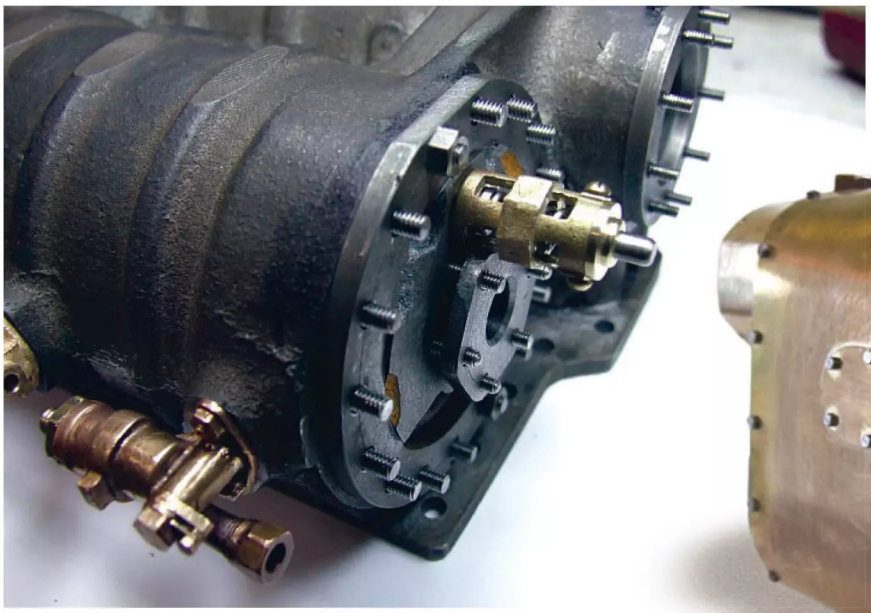
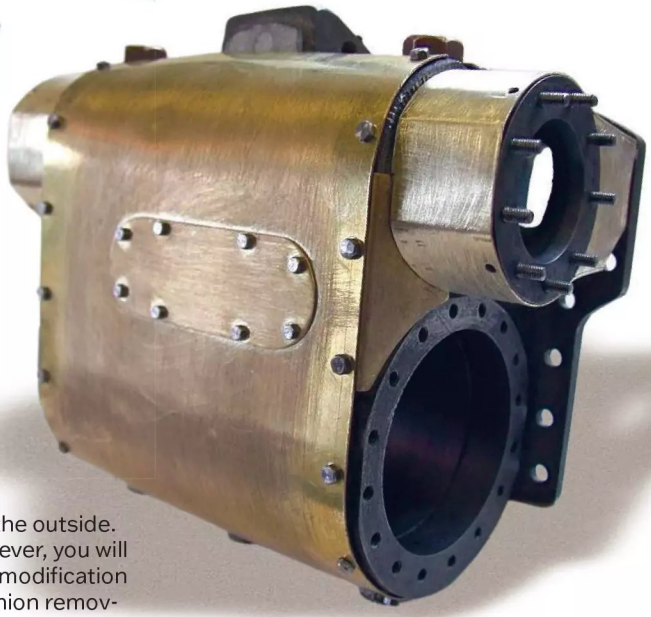


Fig: 67





LEFT, Photo 166: Cylinder relief valve. BELOW, Photo 167: Cylinder cleading - some of the many 12BA fastenings.

the oil inlet for a 6BA union and then extended it into the valve rod passage, not thinking that it would ever work, and connected it with a 0.054 copper tube to the atomiser and - as mentioned above - it all works very nicely. **Photograph 175** shows the finished set of rear covers for the steam chests and a brief view of the valve liners, which we will come to very shortly, and **photo 176** shows the rear covers all finished off but just be careful where you put the bolts! You will also see a single swab box in this photo and that provides a drip feed on to the piston. This is fixed with a 20 SWG bracket bolted on with the two outer studs of the six on the outside. Before you mount it, however, you will need to carry out a small modification to the box. It needs the union removing from the underside, and a new one fitting so that it will point to the rear with a new 5BA union on there and fit a 1/16" pipe on it with a 90 degree bend in it. It would also be very nice if you file the end of the pipe to a 60 degree slope facing outwards.

If you have bored your cylinders correctly, with the over boring by 1/32" in the ends (see photo 153 last time) then you will need to account for this when making your end covers as they will need to be a very good fit in the ends of the cylinders. As mentioned previously, if ever the cylinders require a re-bore it means that it can be done without affecting the end covers. This is how the full size engines were turned out as they often needed re-boring several times during their lifetimes, but hopefully your engine will never need such treatment, unless of course you are intending using it seven days a week (with a boiler wash-out every ten days or so!). **Photograph 177** shows the rear of the bracket and the modification

Photo 168: Embryo cylinder end cover cleading.

Photo 169: Valve front cleading.

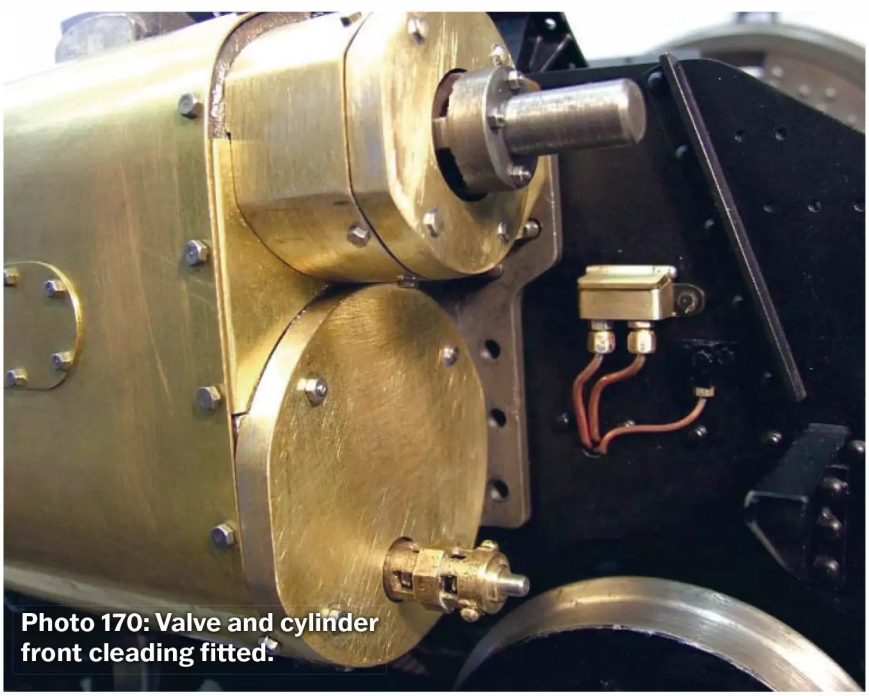
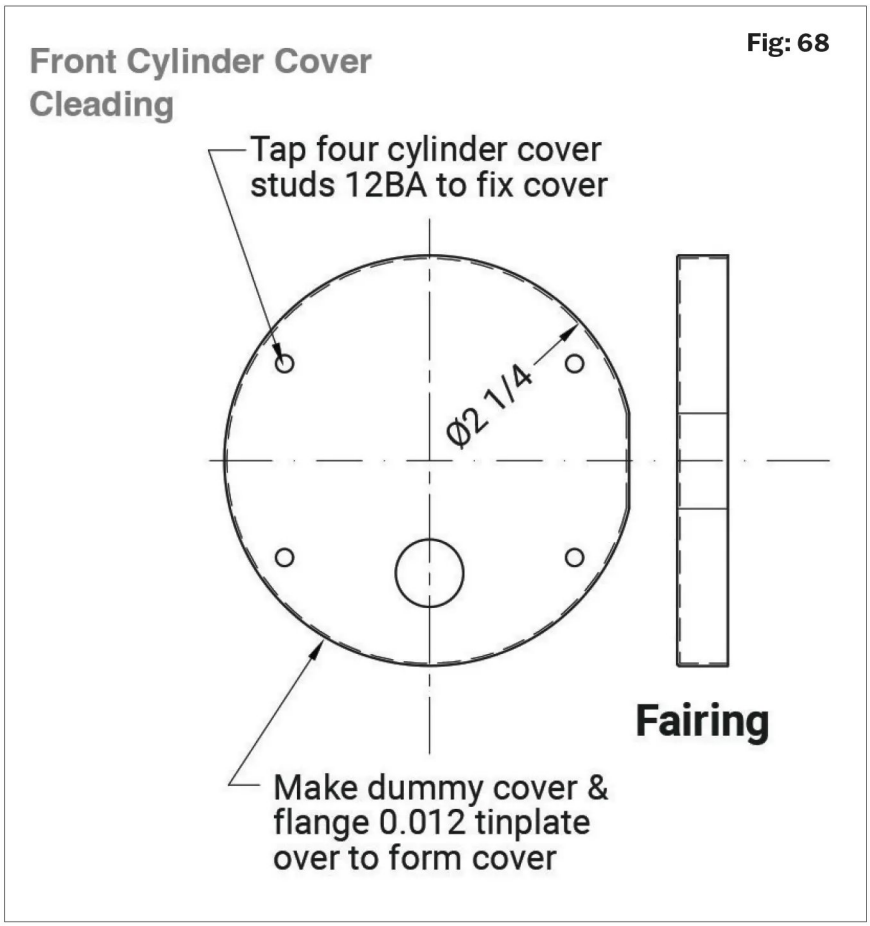


Photo 170: Valve and cylinder front cleading fitted.

Fig: 68



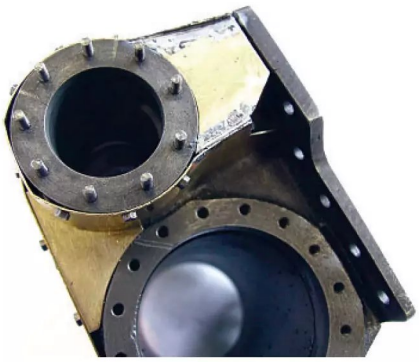


Photo 171: A shaped cleading piece.

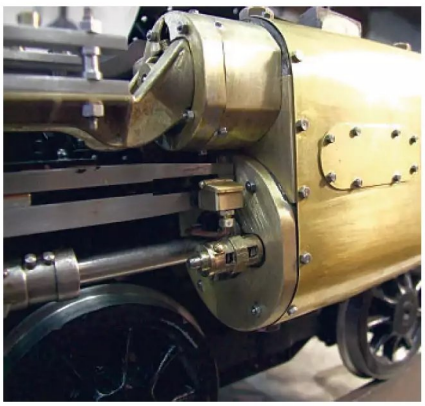


Photo 172: Cylinder cleading viewed from the back.

Fig: 69

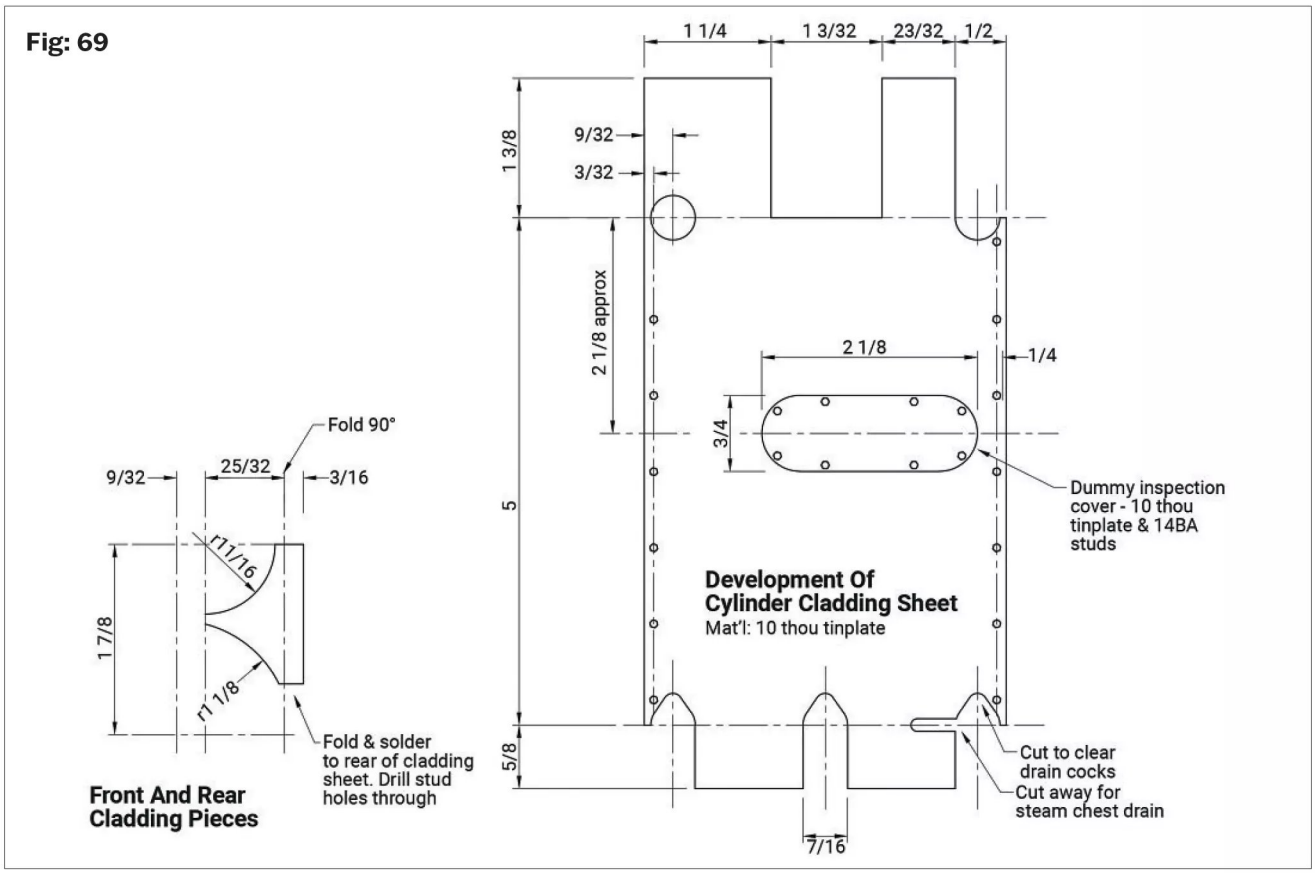


Photo 173: My set up for machining a rear cover.

Photo 174: My extended pin drill in action.

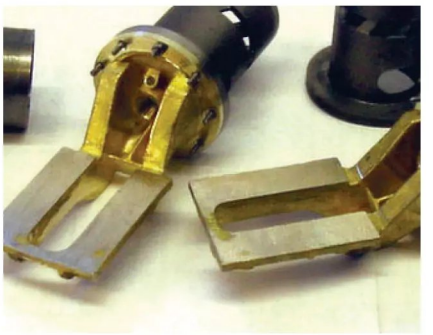


Photo 175: The finished set of front and rear covers.

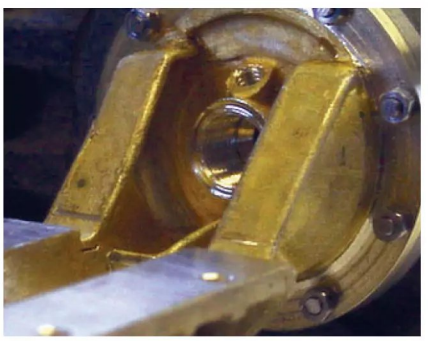


Photo 176: The rear valve cover *in situ*.

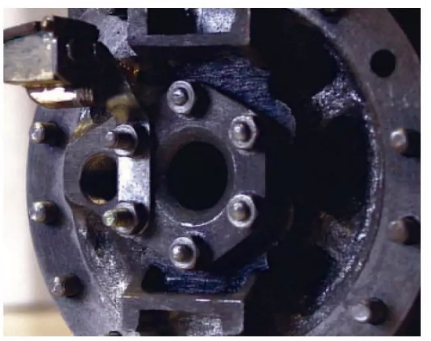


Photo 177: Showing the modified swab box.

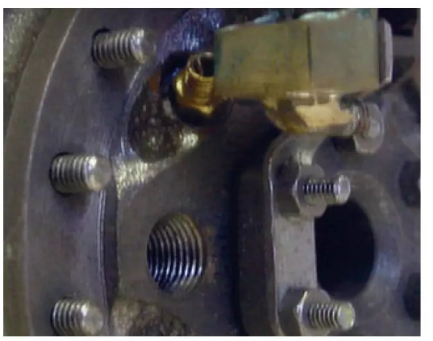
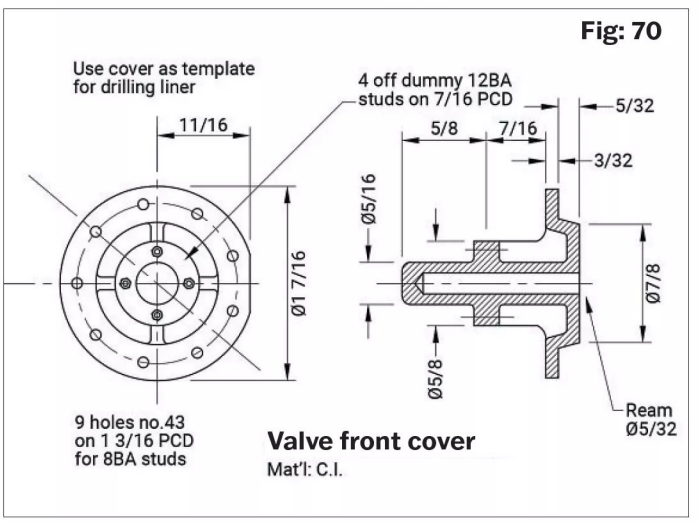
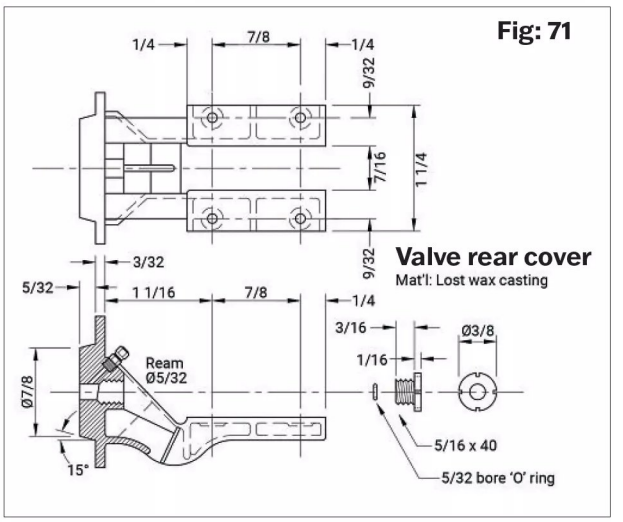


Photo 178: An end cover fitted.





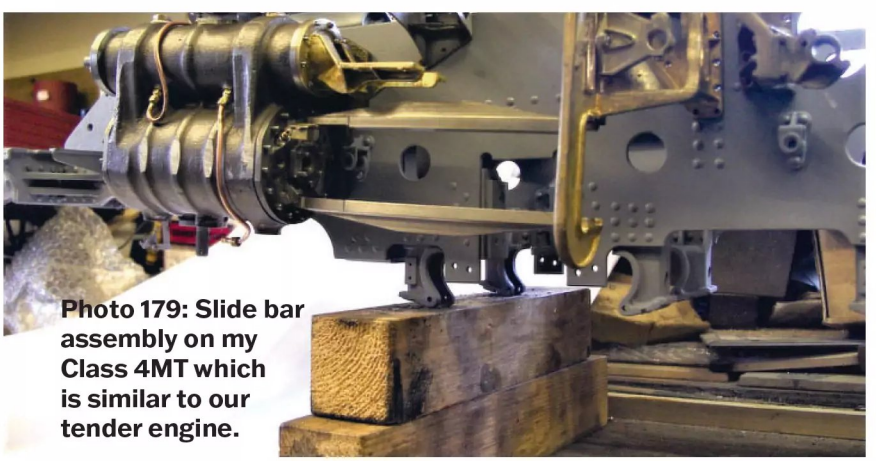


Photo 179: Slide bar assembly on my Class 4MT which is similar to our tender engine.

which I carried out to the single swab box to point the outlet in the correct direction. It is amazing how these little touches work properly. They need topping up with SAE 30 oil twice in a day, but make sure you use a piece of rag to wipe up any surplus, especially if you are a regular at Gilling East! **Photograph 178** shows the box from the outside and note also the 6BA atomiser connection almost hidden behind the swab box. This is also one of the bores I drilled out to meet the piston rod hole, not expecting it to work of course but, once again, it did. Finally, **photo 179** is the aforementioned photo of my 4MT being assembled with the slide bars similar to the 76000. TBC

Photo: *Wavebreakmedia/Getty*

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.

SPOT and FACING CUTTERS

By GEOMETER

TO SEAT FIRMLY, without imposing bending strains, a bolt or nut requires a surface which is flat and at right angles to the axis of the hole. At times, of course, the essential flatness and alignment follow naturally when flanges or lugs are turned, milled or planed in the normal course of machining. But at other times when surfaces are tapered or in the " as cast " condition, it is essential to provide spot faced seatings.

In addition, even if machining of lugs or flanges is possible, there can be said for spot-faced seatings that the component is not weakened by their presence to the same extent as could occur with over-all machining.

Diagram A (top) shows what would be the effect of tightening a nut on to a sloping or untrue surface-bending of the shank of the bolt or stud, giving rise to severe strain and leading possibly to breakage. With a spot-faced seating, however-taken down just sufficiently to bring the surface true-the nut seats squarely (bottom).

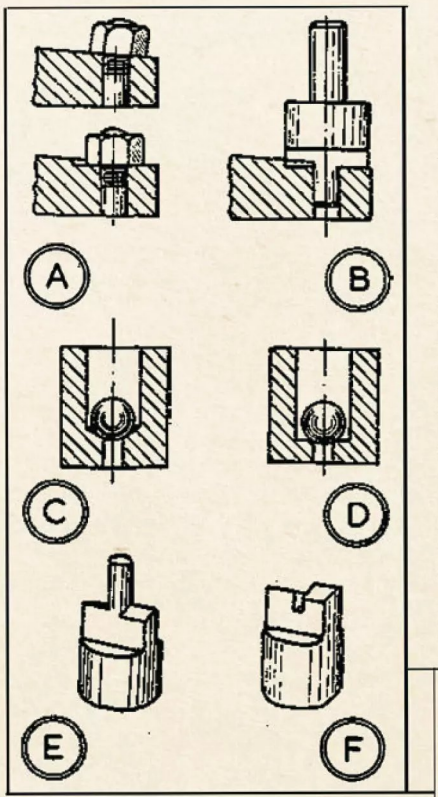
Where there are several lugs and their thickness varies spot-facing ensures uniformity, seatings in thick lugs being faced down to the level of those in thin ones. Following which, lengths of studs and projection through nuts are then everywhere the same.

The operation is performed as, *B,* using a cutter with a spigot to guide it in the hole. A hand-operated drilling machine, a bench drilling machine, or on occasion a lathe can be used. Speed of rotation should be slow and the feed light, or just sufficient pressure applied to ensure smooth cutting.

An operation of a similar kind is to face or square out the bottom of a hole which has been drilled to the angle of a normal twist drill; and it is particularly important this should be done if the seating is for a ball valve.

Depending on relative sizes of the ball and the hole it covers, a seating may occur partly up the conical surface left by the twist drill, C, in which case the valve will not be leak-proof. If, however, the seating is squared out, *D,* the ball can be lightly tapped to seal perfectly on the square edge.

Cutters for either operation can be made from silver steel rod to shapes



E and *F.* The spot-facing cutter requires a lathe to turn the spigot, to enter the hole comfortably. Near the spigot the rod is flattened each side by filing; then the tongue so produced is carefully backed off each side on the end to form cutting edges.

For the ball-seating tool no spigot is necessary, as it obtains its guide from the drilled hole. The end of the rod is flattened each side, then a hacksaw run centrally across the tongue and the faces backed off each side to form cutting edges. Both tools may also be backed off on the sides to clear themselves if used at a depth.

Inserted-blade cutters

For larger work, such as facing bosses, cutters with mild steel shanks and inserted blades can be used, the latter filed to shape, then hardened and tempered like complete tools.

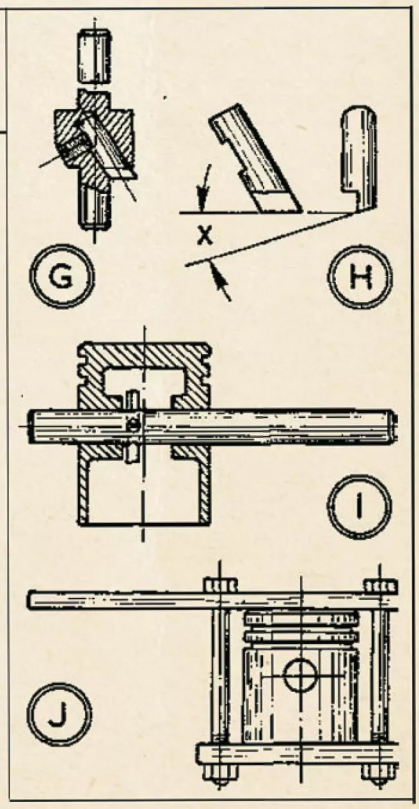
For a single-blade cutter, G? the mild steel holder is turned wtth a spigot and a reduced shank for holding, leaving an enlarged boss into which the cutter is inserted at an. angle and held by a grubscrew from the side.

To hold firmly, the grubscrew should seat on a filed flat or into a countersink. The end face of the cutter should be filed square-checking with a square from the spigot- or machined in the lathe with light cuts. Backing off to angle X, *H,* should be about 8 deg.

On a double-edged cutter; as can be used for facing piston bosses, *I,* the cutter goes right through and is provided with cutting edges each side. Preferably, when the ' grubscrew has been fitted, the same as the other, the holder should be run in the lathe and the tool faced each side for the cutting edges to spin in the same plane. Filing and backing off are as before

For'use, the cutter is inserted when the mandrel is through the bosses. Holding the piston, which can be a problem, can be as J, clamping a piece of hardwood top and bottom with bolts-but not if the piston is a split-skirt type.

B



COMPETITIONS UPDATE

THE CURLY BOWL

Lillian 'Curly' Lawrence, better known by his pen-name of LBSC, was one of the most prolific designers of model steam engines, writing over two and half thousand articles for *Model Engineer* alone. The Curly Bowl is a competition for locomotives built to any of his many passenger hauling designs.

This year's competition for model locomotives to LBSC's designs is to be hosted by the North West Leicestershire Society of Model Engineers at Hermitage Recreation Ground, Whitwick, Leicestershire LE67 on Sunday 7th September. The competition is open to any LBSC locomotives of 2 1/2",3 1/2" and 5" gauge that have not won before.

Entries are now invited on a first come first served basis, please send your application to eatons182@gmail.com

LITTLELEC 2025

Little Locomotive Efficiency Competition is the version of IMLEC for small locos (up to 50lb dry weight). This year's event is taking place at the Tiverton and District Model Engineering Society on 13th and 14th September. Apparently there is still capacity for a few more entries, if you have an eligible locomotive, please contact bryanfinch@ntlworld.com.

ROB ROY ENGINE RALLY 2025

For more than a decade fans of the Rob Roy 3.5" gauge design have had an annual gathering, first at Andover, and in recent years at the Bromsgrove Society of Model Engineers. This year it will be held on 20 September, other 3.5" gauge locomotives are welcome too. If you are interested in attending contact Ian Horsfield on 01386 792628.

THE BRADFORD CUP AND STEVENSON TROPHY 2025

I would like to remind readers of these two competitions. Full details and competition rules were published in issue 4766; I have only received a few nominations so far for The Bradford Cup, which is awarded to the author of the best article or series in *Model Engineer/Model Engineer & Workshop* during the previous year, in this case 2024, so I'm extending the deadline. To make a nomination, please send the name of the author and the article in question to meweditor@mortons.co.uk by **25 August 2025**. Entries to the Stevenson Trophy are now closed.

Details of the entries for both competitions and a link to the online votes will appear in the October issue (out in mid-September) so that the trophies can be awarded at the Midlands Model Engineering Exhibition.

TO ORGANISERS OF OTHER COMPETITIONS OR MODEL ENGINEERING SHOWS

We are keen give publicity to your events, especially as the impact of the Coronavirus pandemic has had such a lasting effect on the number of events supporting the hobby. Please give us as much notice as possible and we will endeavour to bring them to the attention of our readers. Club event organisers, don't forget to send brief details of events open to other model engineers or the general public for our Club Diary – we will soon be publicising 2026 events so it's never too early to get in touch.

Pete Wardropper's LBSC *Betty*

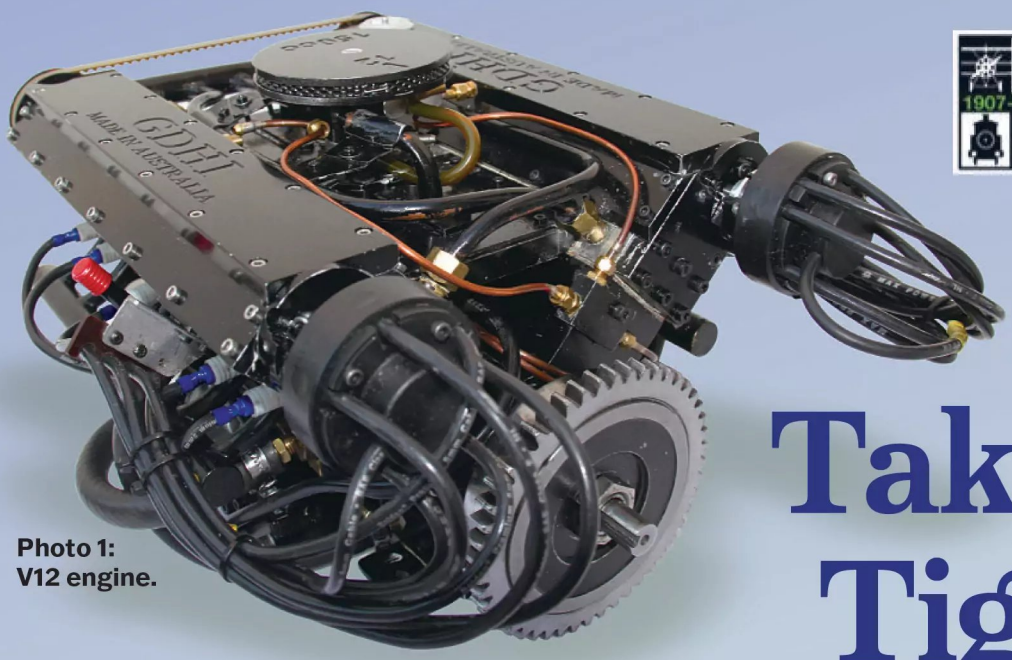


Photo 1:
V12 engine.

Taking a Tiger to the Model Engineer Exhibition

In 2013, Gerard Dean brought his quarter-ton model tank half-way around the world.

Like most things, it seemed like a good idea at the time - ship my 1/5 scale German Tiger tank to display at the 2013 Model Engineer Exhibition - how easy could it be! I originally chose to make the Tiger over the British Churchill, American Sherman and Russian T34 for one simple reason; it was entirely constructed of flat plate which meant it was a simple job to design on Solid Works and cut the panels on our CNC laser cutter at work. Give me a year and it would be done – yeah right.

That was back in 2003. It ended up taking ten years to design and build the Tiger including the 150cc V12 engine, **photo 1**, an eight-speed gearbox, **photo 2** and a sixteen-gear transmission, **photo 3**, and then a year to get it running properly.

Finally Tiger 141 hit the front line during the bitter Battle of Ballaratograd at the WWII training airbase at Ballarat, **photo 4**. 'Tis said that there is no more miserable place on earth than Ballarat (Australia's fourth-largest city) in midwinter!

When it featured on the front cover of this august publication in November 2013, there was no turning back – Tiger 141 was on its way to enemy territory – the United Kingdom! **photo 5**.

At 260Kg weight and sporting a 150CC V12 petrol engine, Tiger 141 was deemed as Dangerous Goods Class 9, requiring a documented pre-flight safety clearance.

Fortunately in a previous life I had spent days hunkered down in warships working on gunnery radar systems during sea trials and then sitting in Leopard tanks testing laser gun sights at the Australian Army base in Puckapunyal. The Tiger Tank Air Freight Procedure was loosely based on the Royal Australian Navy procedures for handling fuels on board ship. It essentially made sure petrol and oil was drained, batteries removed, and no flammable items, explosive materials or soil was included in the shipment.

Incidentally, the documentation came in very handy the following year when Tiger 141 was invited to the Deutsches Panzer Museum for their display week at the German armoured base in Munster, **photo 6**. German border control deemed the Tiger to be a real tank rather than a model due to its size and V12 engine.

A Euro 16,000 bond was paid and the Tiger and documentation was officially inspected at Frankfurt Air Freight centre before it was released, **photo 7**. Fun times indeed!

But where to ship it? At 358Kg weight the crate had to be unloaded with a forklift… so an email was sent to an old mate of mine in the UK, one Mike Parry who was Managing Director of a high technology measurement company in Telford, further on up the road from Birmingham (UK, not Alabama). It just so happened I was also the Managing Director of an Australian manufacturer of high technology measurement systems in exactly the same industry. In fact we both exported our products to the same customers in the USA, Europe and Japan.

Despite battling it out in the global can market, Mike graciously allowed me to ship Tiger 141 to his factory where I prepared it for the exhibition. He also took me to a footy match between his team, Manchester United and a team wearing black and white

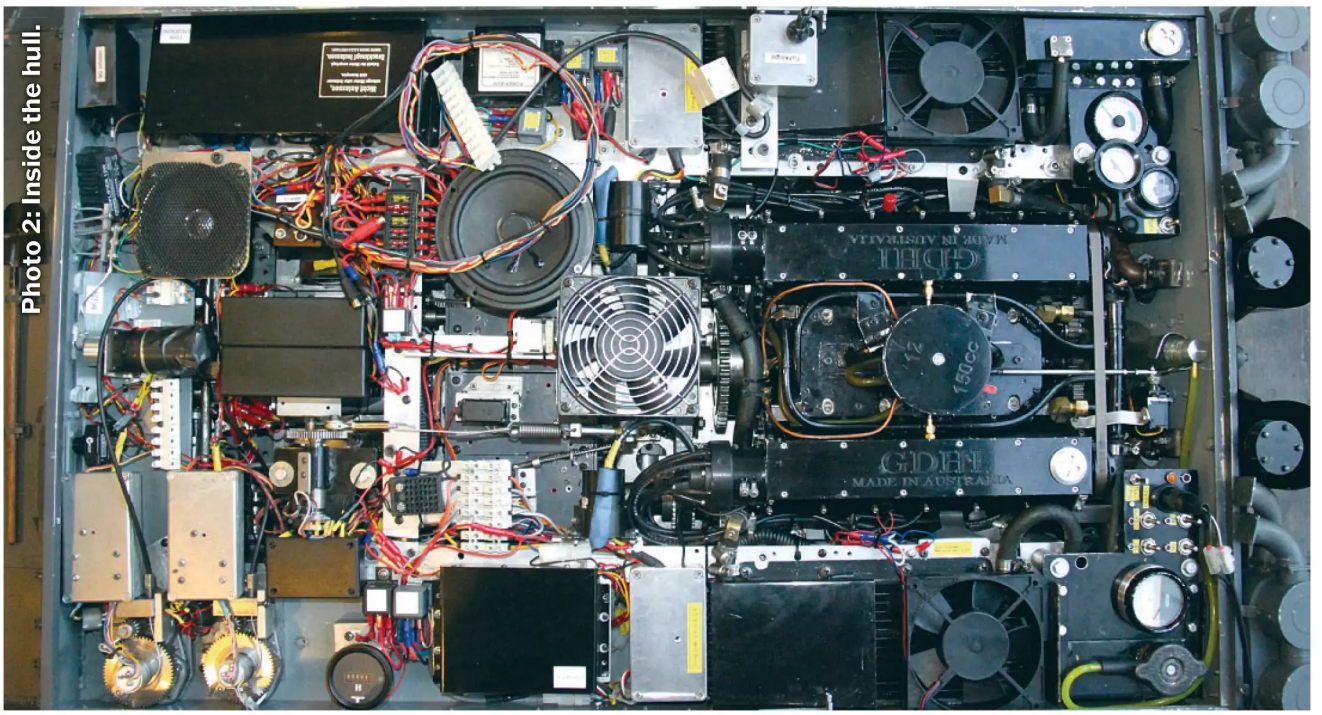


Photo 2: Inside the hull.

jumpers who weren't the Collingwood Magpies, **photo 8**. I gotta say it was the strangest game I've ever seen. Firstly, Mike called it football but most of the players can't touch the ball in play with their hands, whereas Aussie Rules football players use their hands to mark (catch) and kick the ball as it should be. Secondly, the ball was the wrong shape – round like a tennis ball and it bounced in a straight line – very odd indeed. Still, I did enjoy the day out with my old mate Mike.

On the road heading south out of Alabama, sorry, Shropshire, I passed a sight not often seen on Australian roads - a semi-trailer carrying a couple of tanks, **photo 9**. Not sure what they are - hopefully a reader will bring me up to speed (these look like Scimitar RVs to me – Ed.)

Finally I made it to 2013 Model Engineer Exhibition and was blown away by every aspect of the show – the standard and quantity of models on display, the range of models from steam engines, aeroplane engines, fairground rides, helicopters and loudest of all – operational jet turbines. I know they were loud because when I drove the Tiger outside, the turbines lit up and boy did they make a racket when they hit 100,000 RPM.

A highlight was meeting the Model Engineering team, from Ivan Law through to Martin Evans and the stunning Diane Carney – how good was this show! (I think he's confusing me with Yvette! - Dep Ed)

Settling in to a very enjoyable show the Tiger ran well allowing me to wander the halls to see the work on display. A standout was meeting Mike Sayers and seeing his outstanding Bentley scale motor in operation, **photo 10**.

The product range on the trader's stands was mind blowing, **photo 11**.

I saw a little of Australia's industrial heritage in the form of a model of the Sunshine Harvester built by Brian Young, **photo 12**. Invented by Hugh McKay and manufactured in Sunshine, Melbourne, it transformed harvesting of wheat, oats and barley on the wide Australian plains. That's my Grandfather Bill Schaefer on the harvester behind his team of Clydesdale horses on the farm north of Dimboola in the Wimmera region back in 1926, **photo 13**.

Then a young lady introduced herself – of course she didn't need an introduction because she was royalty herself, Ms Cherry Hill, the master of model engineering, **photo 14**. She was wonderful to talk too and at the conclusion of our discussion she asked if I would like to see some of her models. I smiled and she wrote me a note of introduction to the Institution of Mechanical Engineers in London (UK, not Ontario). You will have to wait until after the show to learn the

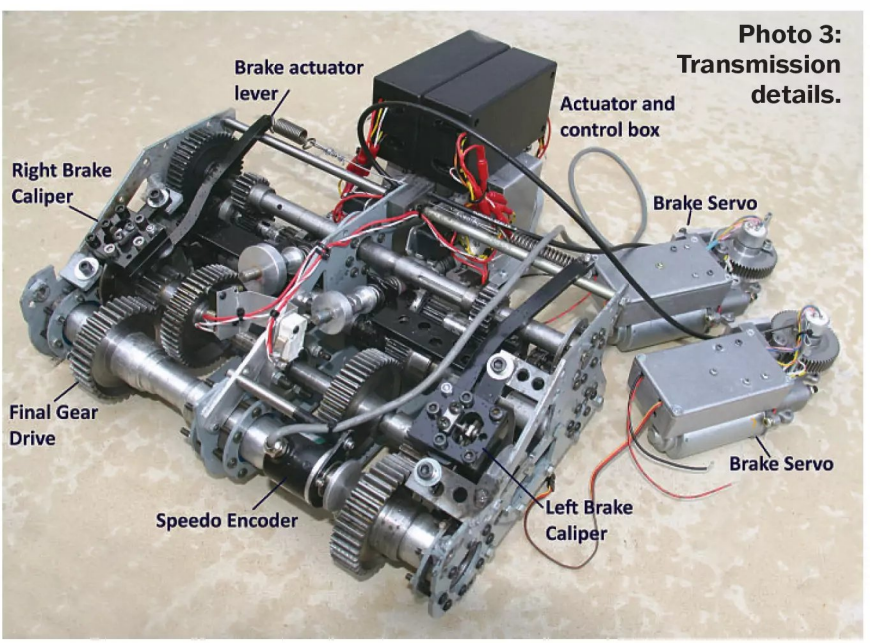


Photo 3: Transmission details.

Photo 4: The model at Ballarat training airbase – photo Shea Murray.

Photo 5: Tiger 141 on the front cover of Model Engineer – photo by Steve Roberts.

significance of that note.

Come Sunday, the public address system announced the winners of medals and their categories and I was stunned to hear my name called out as winner of the Internal Combustion Gold Medal. Was I dreaming?

Naturally, in good Aussie fashion I was chesting out – and that should have been a warning because a few minutes later the Tiger gave a huge clunk and started rattling itself to pieces. It still ran, but very poorly with a lot of mechanical noise and little power. Quickly collecting my thoughts, I announced to onlookers that in an effort to ensure modelling realism, Tiger 141 had broken down to emulate the real Tigers on the Eastern Front when bogged in mud.

The following day I fronted up at the organiser's desk and spied Ivan Law and explained that I could not fix the Tiger 141 for the rest of the exhibition, and in that knowledge, did he want the Gold Medal back. He laughed and said, 'Gerard, keep it. We really gave you the gold medal because you travelled so far to display the Tiger!' British humour at its best – thanks Ivan.

After the show and before heading north out of Tallahassee, sorry, London bound for Birmingham I dropped by the Institute of Mechanical Engineers to see Cherry's models. When I handed the lady on reception the note she gasped and said, 'You must be very important for Cherry to write you this note'. She smiled and asked me to follow her into a round room with spotlights shining on magnificent steam traction engines of all types. It was humbling to see such superb engineering, modelling and finishing, **photo 15**.

Photo 6: At the Deutsches Panzer Museum.

Photo 7: Packaging information.

Photo 8: At Old Trafford.

Photo 9: Two 'tanks'.

Photo 10: With Mike Sayers at MEX.

Photo 11: Trade stands at MEX 2013.

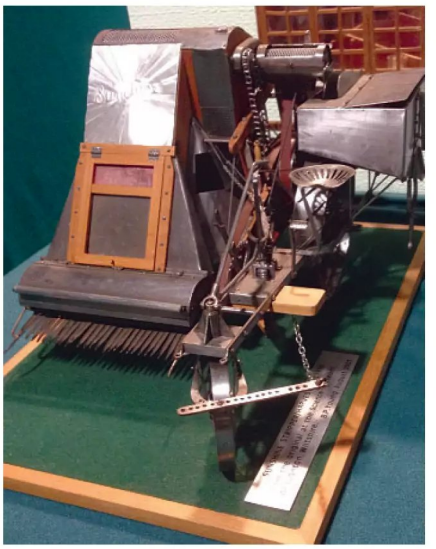


Photo 12: Brian Young's Sunshine Harvester.

LEFT - Photo 13: Clydesdale horse team pulling a Sunshine Harvester at Dimboola – Evelyn Schaefer, my Grandmother.

Photo 14: Meeting Cherry Hill.

Eventually Tiger 141 made it home to Melbourne, (Victoria not Florida) and the motor was torn down to find what grenaded at the exhibition. There it was – the crankshaft was broken on the 4th cylinder. That explained why the motor could run on the remaining 8 cylinders albeit with lots of noise and not much power, **photo 16**.

The original crankshaft was made using 19 pieces of steel expertly arc welded together as per my proven engineering maxim – Rough Enough Is Good Enough. Sadly, it looked like it wasn't quite good enough in the case of a V12 crankshaft. So I made a three-piece crankshaft which amazingly has not shattered till this day – touch wood.

So looking back I would like to thank the wonderful people who helped me during this very memorable trip – Sean Fleming for shipping the impossible, Mike Parry for receiving the shipment, the staff at the Model Engineer Magazine – Ivan Law, Diane Carney, Martin Evans, the queen of model engineering, the late Cherry Hill and the people of Britain who have created and nurtured the wonderful hobby of model engineering since its beginning.

Photo 15: Cherry's Burrel showman's engine at the IME.

Photo 16: The broken crankshaft.

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 meweditor@mortons.co.uk.

ANTIPODEAN TANK

Dear Neil, On opening MEW No. 4763 a couple of weeks ago, there, in Smoke Rings, was mention of a World War 1 German A7v tank. That set off a lightning flash of 'that seems familiar to me... I know something about that... I think it is here in Australia'. A little bit of Google refreshed my memory. During a push back of German troops by Australian troops at Villers-Bretonneux in April 1918, the German A7v tank, named *Mephisto* by the Germans, came into Australian possession and was eventually shipped to Brisbane where it is on display. There is a replica A7v named *Wotan* in Munster, Germany, that was built in 1988 based on *Mephisto*.
On another topic, I know it is early days of the amalgamation of the two magazines, and there is probably some tweaking still to be done, but I noticed that some of the - what appeared to be quite detailed - drawings that accompanied Gerald Martyn's article in MEW No. 4763 were virtually unreadable, they were too small. I think if a contributor goes to the considerable effort to produce detailed drawings that they should be able to be read easily, especially if someone is using said drawings from the magazine to construct a model of Gerald's Pannier Tank. Stewart Hart's article in the same edition also suffered from the same problem.
Regards,
Tony Reeve, Tasmania

READERS OLD *AND* NEW

Hi Neil, I read with interest the results of your readers survey. As the chair of a large membership body for a technical hobby I have an interest in member attraction and retention. If you substitute reader for member we face essentially the same challenges. The approach that you have taken is to understand the needs of your current readership. That is a valid approach, but is time limited because of the age profile of the current readership and rate of attraction of new interest to the model engineering hobby.
The problem you face as an editor is to retain existing readers but at the same time to appeal to and attract potential new entrants. I would suggest that they tend to be interested in more modern approaches, materials and technologies and, as a result of the introspective approach used, will tend towards the bottom of published interest list.
It is, of course, a difficult problem balancing the new with the old, but is one that all the engineering and technical hobbies are independently grappling with and must solve to keep them viable.
Best regards
Dr Stewart Bryant

NEW TRICKS

Dear Neil, Even at an advanced age, I found an interesting selection of tricks of the trade, which I had not seen before, in the article by Brian Wood (Issue 4767). The section on drilling pilot holes reminded me of lectures and a couple of films shown to us as Rolls Royce apprentices in 1963. One film described measurements of the axial force applied to a large drill, and showed that by drilling a pilot hole, the axial force was reduced by around 50%. In other words, half the load was required just to push the chisel edge. This technique can be useful in the home workshop where we often want to do jobs that our domestic scale machines will struggle with.
Another benefit of the pilot hole is that the following drill will be less likely to cut oversize, especially if it has been inaccurately sharpened with unequal lips.
Another RR film encouraged the use of safety glasses when using a machine tool, and followed the progress of an unfortunate young lad at a lathe who got a sliver of brass in one eye. The action moved to the hospital where, since brass is non magnetic, the sliver had to be removed by careful application of tweezers. The entire procedure was shown magnified, close up on a large screen, and usually resulted in at least one member of the audience fainting. It did, however, get the point across.
Best regards
Dave Fenner

A CAUTIONARY TALE

Dear Neil. For family reasons, my wife and I are moving from Pickering to Hereford. Having found a buyer for our old house - and located a suitable property with a (potential) workshop - my wife and I are at the business end of the move. The removal firm arrives tomorrow!
Included in the workshop part of our move are a mill and lathe, both, as you would expect, very heavy and requiring a vehicle with a significant tail lift. Yesterday I was getting the lathe, a Colchester Bantam, onto bogies so I could prepare it for its move. I have done this many times over the years but previously without incident. This time though, in my haste to move the lathe, I stupidly pushed it hard from the top - and not from the base as I usually do. Well, the inevitable happened and it toppled onto its front. Fortunately I was not in front of it when it happened. It doesn't bear thinking about the consequences had that not been the case. Initial attempts to right the machine by myself were futile; it might as well have been part of the floor. However I was able to call on the help of my friends in PEEMS, primarily Doug and Paul who dropped everything and came round to apply lots of brain, a little brawn, jacks and blocks of wood. In a couple of hours the lathe was back on its feet and we were able to survey the damage. Happily the important bits still seem to work, the under drawer has a bit of a dent and one of the speed selector levers is bent but otherwise, it seems okay, although I will have a refurbishment and testing project on my hands when I get moved in.
Two lessons were learnt that could be shared. Firstly, moving heavy machinery is fraught with risk and should not be undertaken in haste. Secondly, being a member of, and participating in running, a good club has many rewards, not all of them apparent at the time of joining! Huge thanks to Doug and Paul - and whilst I'm sad to be leaving Pickering, I am looking forward to joining Hereford MES! Best regards
David Proctor

ANTIPODEAN CODES

Dear Neil, I was more than a little surprised to see a new boiler design by Gerald Martyn in ME&W 4767 which specifies soft soldered inner firebox stays, where the solder was the only means of fixation. I would have thought even threaded and nutted soft soldered stays went out with the Ark, but at least they are mechanically sound. Gerald also made some false statements about the AMBSC copper boiler code, implying that cadmium-containing brazing alloys were somehow mandated. I would be interested to know also which aspects of the code are not acceptable in the UK. Further, oxy-propane is not welding gear, it is brazing gear and just the thing for silver brazing stays inside the firebox. It is possible to use propane only, and an excellent article by Alan Crossfield in ME 4354, p 744, showed how, with a 5" gauge Bulldog boiler. I have noted in many articles a tendency to consider heating equipment with resentment, as some sort of expensive imposition. It is as essential as the lathe for building steam locomotives and the single biggest problem beginners have is seriously underestimating how much heat is necessary. I cannot find a reference for a Sievert 5325 burner used by Gerald; the largest cyclone burner currently available being 25mm diameter and only about 10kW. In comparison, a 2944 is 86kW and the 2943 half that. The latter is the smallest I would consider for a 3 1/2" gauge boiler and only then with good insulation, but in practice I would use my 2944. You can't have too much heat, only too little. Getting up to temperature quickly also minimises flux exhaustion, an important consideration.

Simon Collier, Sydney.

The Editor replies:

Thanks for your letter. I'm always struck by the difference of perspective between the UK and Australia on these issues. As for burner sizes, I imagine Gerald meant the 3352. I know a lot of people use a cyclone with background heating, as the flame wraps round and gives much more efficient heating with less fuel. I don't think cost is an issue, as the 33XX cyclone burners are several times more costly than the flame 29XX series, which are normally used for background heat. I'm sure your letter will fuel some interesting debate.

YIELD POINT METHOD

Dear Neil, In response to the two recent articles on use of the yield point method in copper boiler design, I thought I might 'chip in', particularly as the latest one, by Mark de Barr, followed immediately after my pannier tank boiler article in the August issue of ME&W. I also note that he recommends the Australian boiler code, just after I've said 'it's not for us'. There's nothing like a good debate to sell a few more magazines!

I fully agree that allowable stresses based on the use of arbitrary large factors on ultimate strength is not too logical, but use of a value based on yield strength is not an entirely new concept. I mentioned my use of that other measure of yield, the proof stress, in my letter in M.E. 31st May 2024. Why use proof stress? Well, the yield point can be rather difficult to determine. When does a straight line just start to curve? A small percentage permanent set is more easily identified. There's not a lot of choice in which value to use, whether it be 0.1%, 0.2% or 0.5%; you use what data is available, but for most metals it's unlikely you will find a reliable value for yield. It is almost universal in aircraft engineering to use the 0.2% proof stress and as I have some values for copper, that's what I use.

Looking now at the UK boiler code. This is titled 'Boiler Test Code' and the clue is in the name. The acceptance of a boiler in this country is, essentially, based on a test which is at twice working pressure. So why do we need any calculations? I can't speak for the authors of our code but when taken for testing it's nice to know (and for the inspector to know) that your new design boiler is likely to pass without any unacceptable distortion. Minor deformation is acceptable under the code and other things may be found to be wrong - leaks and suchlike - which can be repaired, but if your boiler were to visibly grow and/or show significant distortion then all the work would be for nothing, even if it still holds the pressure. Unlike most engineering structural metals which have relatively high proof strengths when compared to ultimate, annealed copper (its weakest normal state) is very ductile and has an ultimate tensile strength around three to four times the proof strength (depending on the form; sheet, bar etc.) Elongation at failure is around 50% so your 4" boiler would expand to 6" and we don't want to be anywhere near that! This quite sensibly leads to use of a proof strength in any calculation, rather than something based on ultimate, and we should design for zero or near zero distortion under test. Because the highest pressure the boiler will ever see is the test pressure then there is no need to consider temperature effects either. At our normal pressures the test more than adequately covers any proof strength reduction due to temperature. Having had a career in the aircraft industry I also observe aircraft safety factors, so I throw in a 1.125 proof factor to give a little margin (note, civil and military airworthiness codes may differ).

What to do if you don't have the knowledge and/or confidence to do a few calculations? The Boiler Code has a way ahead for you at para 5.1 which allows design verification '... either by calculation or by well proven example.' So the simplest way is to pick an existing design similar to yours and just copy as much as possible. If in doubt then simply add metal.

The other thing worth considering when carrying out calculations is the manufacturing process. This involves multiple cycles of heating and oxidation followed by stripping it all clean in acid. Up to ten thou' may be removed from some parts and this means that designing to bare minimum sizes should be avoided. Because of this, and the care taken by past designers, then in my own experience the critical area is more likely to be the stays (if copper is used) and surrounding flat plate rather than the barrel.

I will mention, also, that these comments only apply to tensile and bending stress. Where tube is in overall compression, such as a boiler tube or a marine firebox, then collapse due to instability is the likely failure mode. Here it is the stiffness of the material which is important. Beyond the yield stress, the apparent stiffness (tangent modulus) will be significantly reduced and this must be considered in any calculation. This calculation, if done from first principles, is extremely complex and most people would use the ESDU data sheets if they were lucky enough to have access, or will find help in books.

Finally, on the Australian code; as mentioned in my article, I'm not that keen. Over and above what I said then, I consider it highly prescriptive and, in my view, it will stifle innovation. So far as I know there is no evidence that our simpler UK code is unsafe so use the Australian one as a guide, if you wish, but let's not get carried away. Best regards,

Gerald Martyn

Club Diary

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

2025

EVERY SUNDAY

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

Wakefield SMEE Public running day. Contact Denis Halstead 01924 457690

AUGUST

15 Rochdale SMEE Auction Night. Castleton Community Centre, 19:00. See www.facebook.com/RochdaleModelEngineers

17 Guildford MES Public open day, Stoke Park. Contact: Mike Sleigh, pr@gmes.org.uk or see www.gmes.org.uk

17 Bradford MES Running Day, public from 1:30 pm to 16:00, Northcliff. Contact: Russ Coppin, 07815 048999.

17 Tiverton & District MES Running day at Worthy Moor Track. www.tiverton-modelengineering.org.uk/contact

17 Rugby Model Engineering Society Public Running, refreshments, free parking - 13.00 to 16.00 - rugbymes.co.uk.

19 Nottingham SMEE Evening Run and BBQ. nsmee.org.uk/events/

23 Saffron Walden & District SME Public running day Down Farm Stud, Elsenham Road, Stansted, 10:30.

24/25 Cardiff MES Public Running Day, Heath Park, 13:00-17:00.

27 Rugby Model Engineering Society Public Running, refreshments, free parking - 13.00 to 16.00 - rugbymes.co.uk.

27/28 St Albans & District MES Club Exhibition at Townsend School St. Albans.

28 Guildford MES Public open day, Stoke Park. Contact: Mike Sleigh, pr@gmes.org.uk or see www.gmes.org.uk

SEPTEMBER

6 Bromsgrove SME Open Day. All gauges welcomed 5", 3.5", 2.5", G1 and 16mm. www.bromsgrovesme.co.uk. Contact Doug Collins 07585 524836

6 Tiverton & District MES Running day at Worthy Moor Track. www.tiverton-modelengineering.org.uk/contact

13 L&NWR Society & Stafford & District MES Annual Steam Up. The County Showground, Weston Road, Stafford, 10:00.

13/14 Tiverton & District MES LittleLEC at Worthy Moor Track. www.littlelec.co.uk

14 Cardiff MES Public Running Day, Heath Park, 13:00-17:00.

19 Rochdale SMEE Bits and pieces/personal project ideas. Castleton Community Centre, 19:00. See www.facebook.com/RochdaleModelEngineers

20 Bromsgrove SME Hosting the Rob Roy Rally And 3.5"gauge friends. www.bromsgrovesme.co.uk. Contact Doug Collins 07585 524836

21 Guildford MES Charity and Heritage Day, Stoke Park. Contact: Mike Sleigh, pr@gmes.org.uk or see www.gmes.org.uk

21 Tiverton & District MES Running day at Worthy Moor Track. www.tiverton-modelengineering.org.uk/contact

21 Rugby Model Engineering Society Public Running, refreshments, free parking - 13.00 to 16.00 - rugbymes.co.uk.

27 Bradford MES Visitors Day – BMES welcomes members and their locomotives from other societies to Northcliff for breakfast & lunchtime butties. Let Russ Coppin, 07815 048999 know in advance, please.

27 Urmston & District MES Polly Owners Group Rally.

OCTOBER

4 Tiverton & District MES Running day at Worthy Moor Track. www.tiverton-modelengineering.org.uk/contact

5 Guildford MES Small Model Steam Engine Group meeting, 14:00-17:00, Stoke Park. Contact: Mike Sleigh, pr@gmes.org.uk or see www.gmes.org.uk

5 Bradford MES Running Day, public from 1:30 pm to 16:00, Northcliff. Contact: Russ Coppin, 07815 048999.

12 Cardiff MES Public Running Day, Heath Park, 13:00-17:00.

17 Rochdale SMEE Annual General Meeting. Castleton Community Centre, 19:00. See www.facebook.com/RochdaleModelEngineers

19 Guildford MES Public open day, Stoke Park. Contact: Mike Sleigh, pr@gmes.org.uk or see www.gmes.org.uk

19 Tiverton & District MES Running day at Worthy Moor Track. www.tiverton-modelengineering.org.uk/contact

21 Nottingham SMEE Bits and Pieces Evening. nsmee.org.uk/events/

21 Rugby Model Engineering Society Public Running, refreshments, free parking - 13.00 to 16.00 - rugbymes.co.uk.

29 Rugby Model Engineering Society Public Running, refreshments, free parking - 13.00 to 16.00 - rugbymes.co.uk.

30 Guildford MES Public open day, Stoke Park. Contact: Mike Sleigh, pr@gmes.org.uk or see www.gmes.org.uk

NOVEMBER

1 Bradford MES BMES Annual Exhibition & Competition, 12.30 pm - 4:00 pm, St James' Church, Baildon, BD17 6HH. Adrian Shuttleworth, 07767 375648

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

1 Tiverton & District MES Running day at Worthy Moor Track. www.tiverton-modelengineering.org.uk/contact

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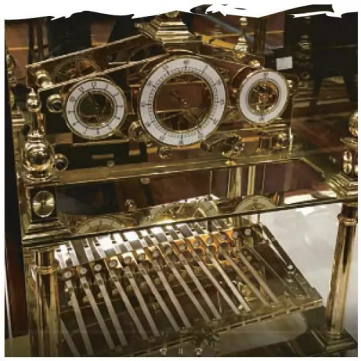
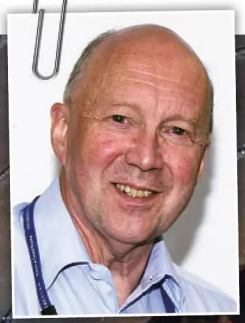
To keep up to date with further information, visit our website or Model Engineer & Workshop's website





PART 19

A Tandem Compound Mill Engine

David Thomas builds Arnold Throp's model of a Corliss mill engine. Continued from Model Engineer & Workshop issue 4767.

Photo 314: After milling the four larger sides, the chest could be held to turn the gland boss...

To finish off the low-pressure cylinder we need the valve chest, valve and the bits that drive the valve, **fig. 48**. After finishing the cylinder, we also have to work out how to fit it to the assembled engine. The steam chest casting was in gunmetal and this machined very nicely but there wasn't enough metal to finish the part to drawing dimensions without leaving some surfaces rough. Fortunately, the two surfaces that have to seal against steam pressure cleaned up properly, but compromises had to be made on both the outside and the inside of the other faces. With the four long faces milled smooth, the part was juggled into the four-jaw chuck to turn the end face and the gland boss, **photo 314**. **Photograph 315** shows the O-ring recess being bored out using a re-purposed end mill. A casting was supplied for the steam chest cover but rather than machining that all over I used a bit of brass plate. To relieve the otherwise very plain

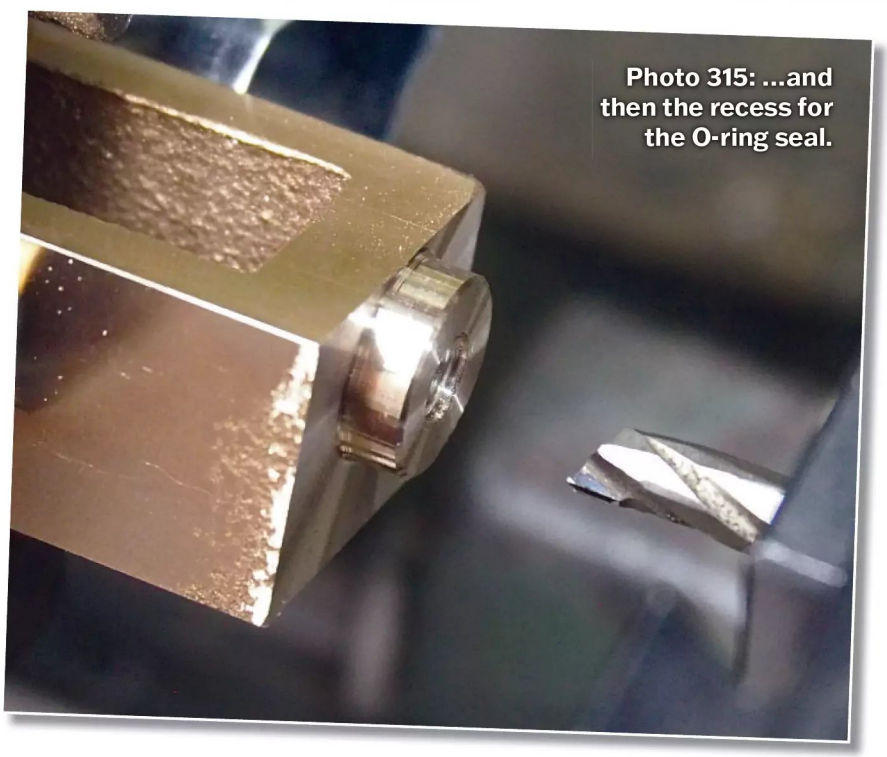


Photo 315: ...and then the recess for the O-ring seal.

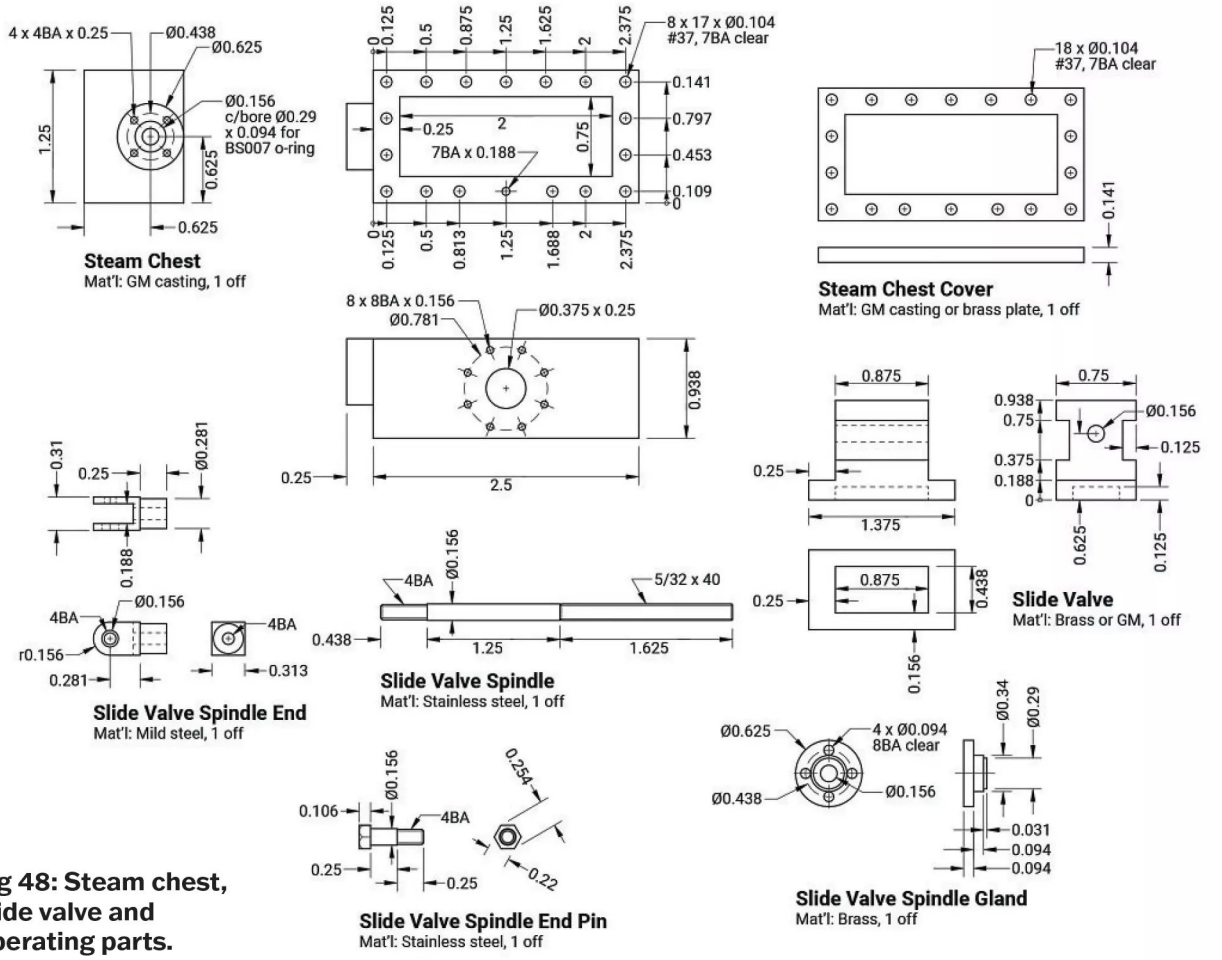


Fig 48: Steam chest, slide valve and operating parts.

appearance I used a ball-nosed end mill, **photo 316**. This could be the place for a maker's mark if you have a way to engrave the letters. The edges were brought to size then the cover and chest were fixed together in the mill to drill the stud holes, **photo 317**. As the photo shows, I had to drill out the holes in order to fit brass plugs to rescue the steam chest casting.

The valve is a rectangular block with grooves milled into all sides so it could be made from almost any lump of brass or gunmetal. Round brass bar might not be the obvious choice but by using a dividing head to guarantee the right-angles, it is one good way to go. With a DRO to set out lengths, you don't really need to mark anything out, but it does make a useful sanity check, **photo 318** and the stock can then be set up in the mill, **photo 319**. The upper and lower surfaces locate and guide the valve in the longitudinal direction and need to be a close sliding fit in the steam chest, **photo 320**. The slot in the lower surface allows steam to enter the steam chest and the matching slot in the upper one provides extra area for the steam to move through to the ports, **photo 321**. The thickness of the valve from the port face to the steam chest cover was drawn as a close sliding fit to that cover and I have left it like that. One consequence of this is that, in the event of an hydraulic lock in the cylinder, the valve cannot lift off the port face to relieve the pressure. If the engine is

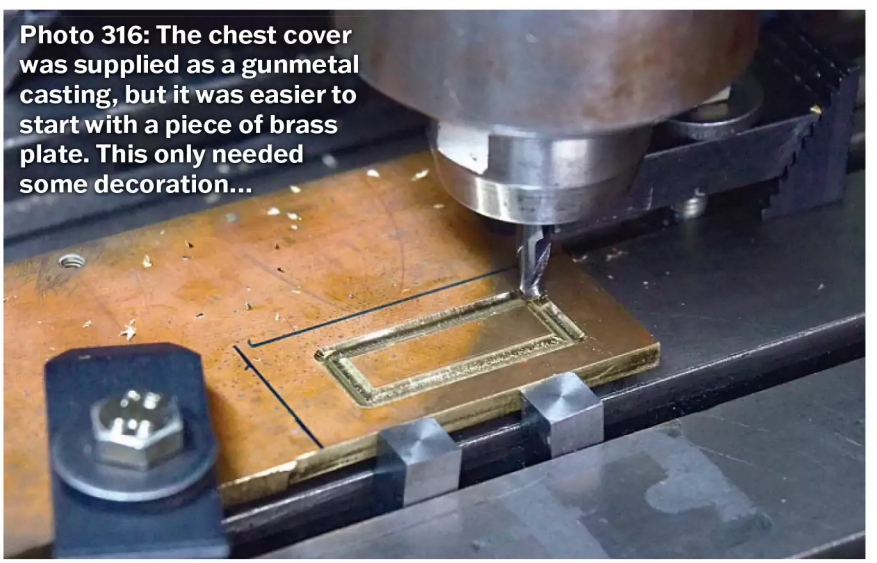


Photo 316: The chest cover was supplied as a gunmetal casting, but it was easier to start with a piece of brass plate. This only needed some decoration...

run on air this shouldn't happen but if running on steam, then pressure relief valves will have to be fitted in the ¼ x 40 ME threaded ports provided. With four faces finished, the valve has to be parted off from the stock to clean up the ends to drawing; drill the hole for the valve spindle and cut the pocket in the port face, **photo 322**.

For running on air the material for the pistons might well be nylon or Delrin but for steam, gunmetal or cast iron are needed. As it was, I didn't have any gunmetal so used cast iron, **photo 323**. The piston rod needs a flat pocket for location. For all the O-ring grooves and recesses in the model I've used the dimensions recommended by Tubal Cain in his *Model Engineer's Handbook*.

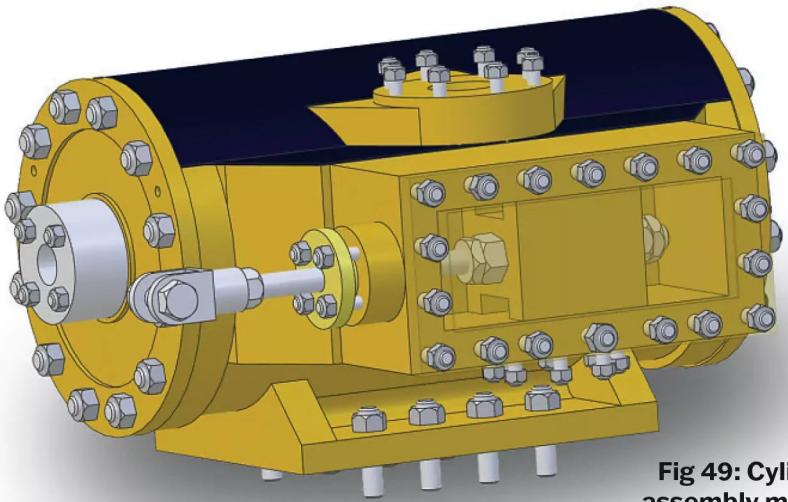


Fig 49: Cylinder assembly model.

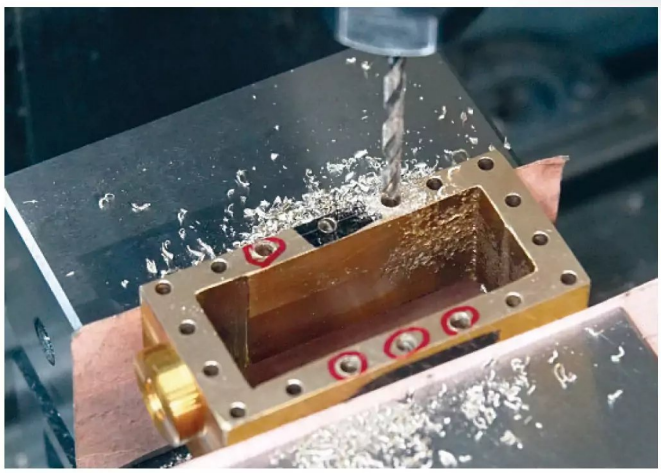


Photo 317: The subtle difference in the hole spacing between top and bottom of the steam chest provided an opportunity for error and, of course, I took it. Here the holes are marked for drilling out and plugging.

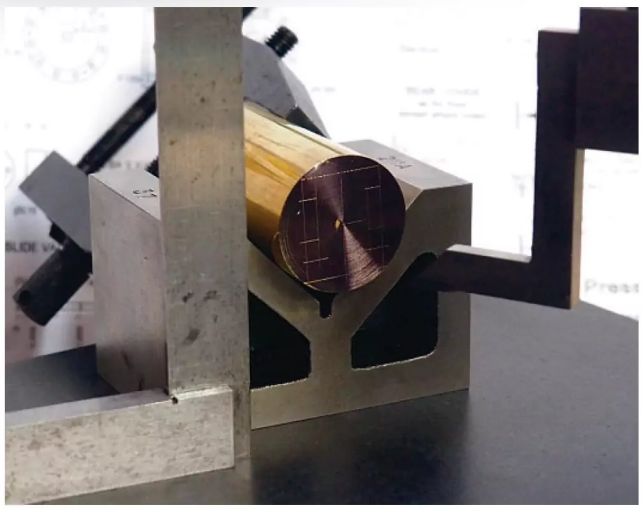


Photo 318: Using a dividing head is one way to get accurate 90 degree angles so I chose to make the valve from brass bar.

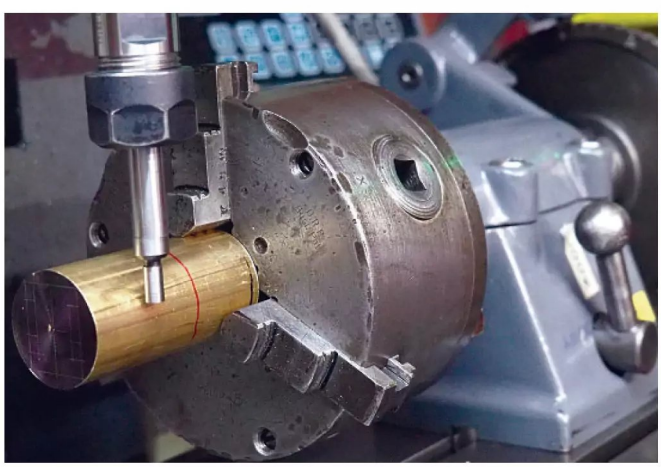


Photo 319: This three-jaw chuck came with the mill; all the nicks and bumps came with it! Using a direct dividing plate for angular orientation and the edge finder to set the zeros and the DRO made sure of the stock's location.

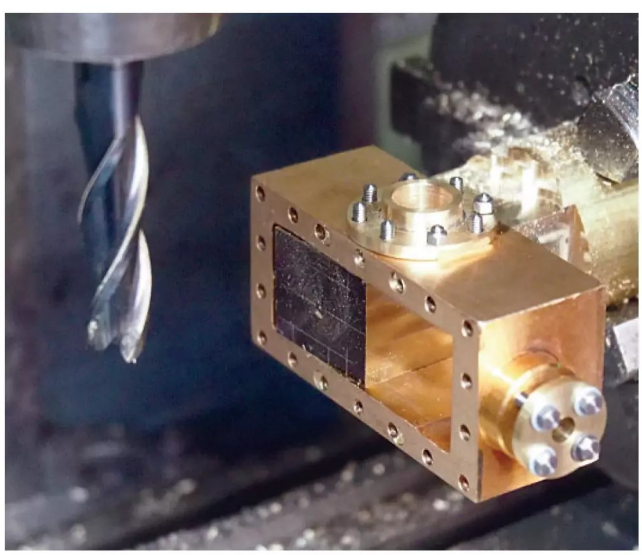


Photo 320: The sides were brought to width using the steam chest as a gauge.

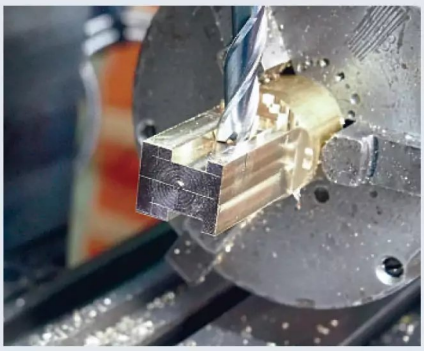


Photo 321: The deep grooves down the sides allow steam to pass from the inlet to the ports and from the exhaust port to the pipework.

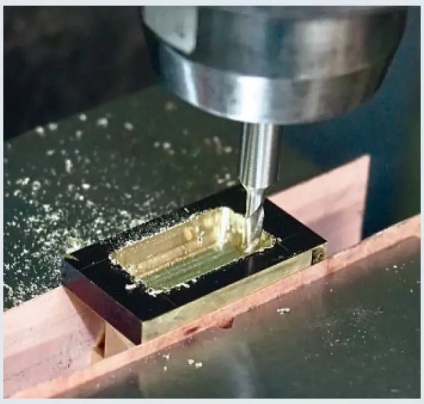


Photo 322: The final act on the valve was to mill out the steam cavity.

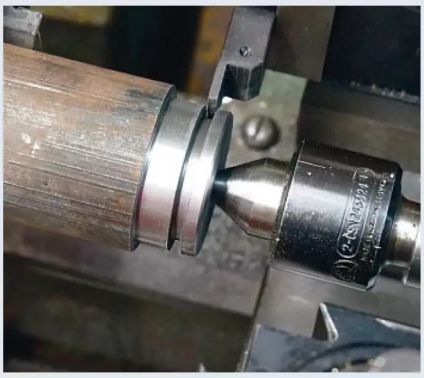


Photo 323: After first facing the end and turning to diameter, I put in the groove for the O-ring packing.

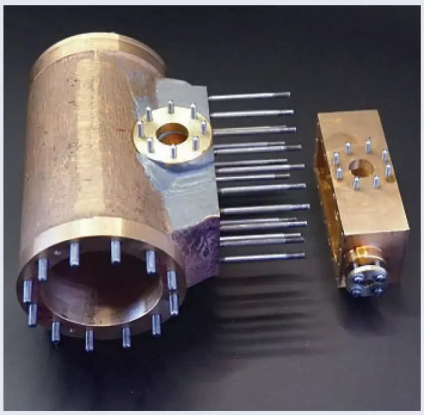


Photo 324: There are 70+ studs altogether in the LP cylinder assembly. A small capstan lathe might be a great addition to the workshop!

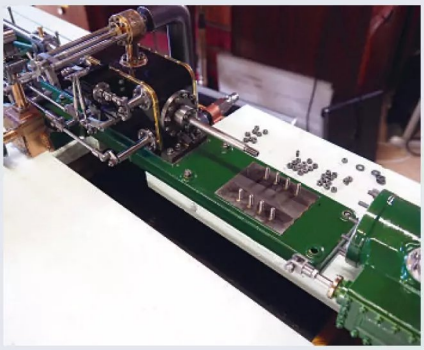


Photo 325: Fitting the LP cylinder to the engine turned out to be tricky. If the piston is on the piston rod, then the studs prevent the cylinder from sliding forward. The cylinder has to be fitted a bit at a time.

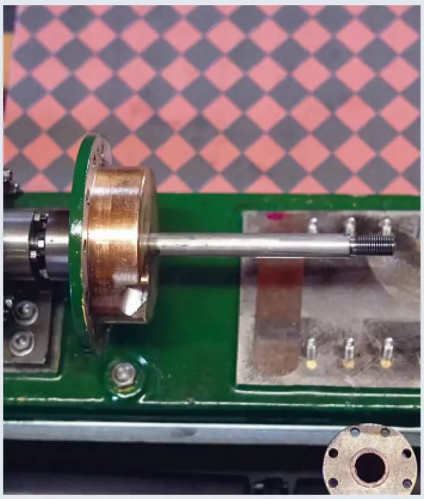


Photo 326: First the front cylinder cover goes onto the piston rod...

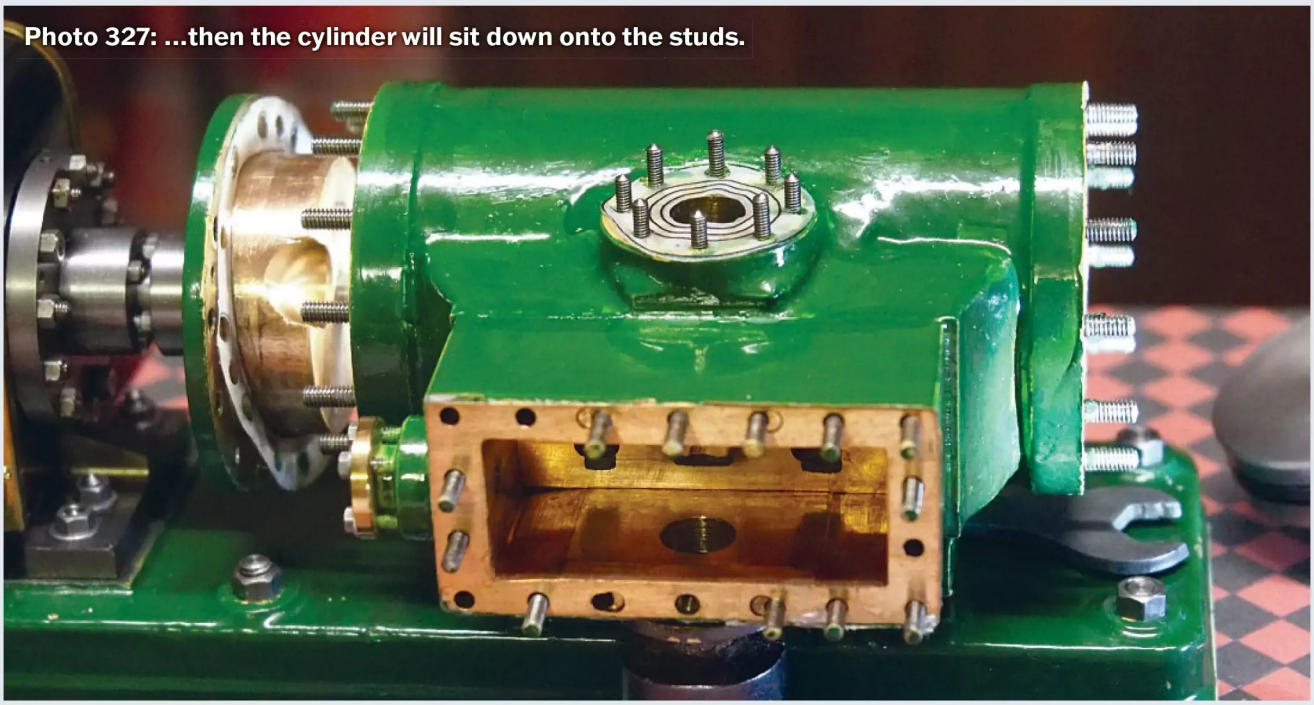


Photo 327: ...then the cylinder will sit down onto the studs.

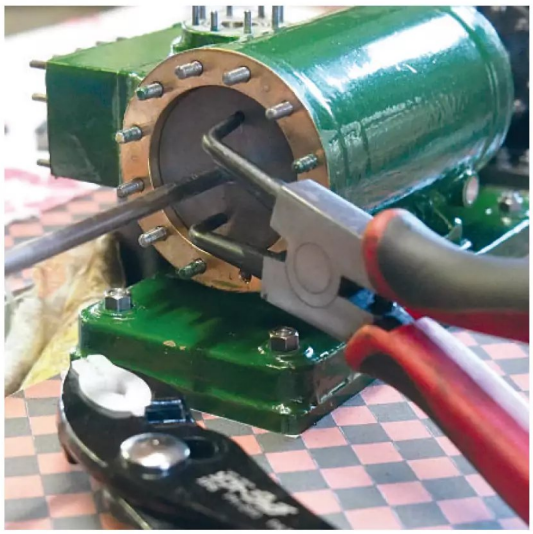


Photo 328: Two blind holes were drilled in the back of the piston to accept the circlip pliers and the piston rod extension used to align the LP rod with the threaded hole in the piston. The soft-jaw pliers were used to grip the rod and the piston screwed on tightly...

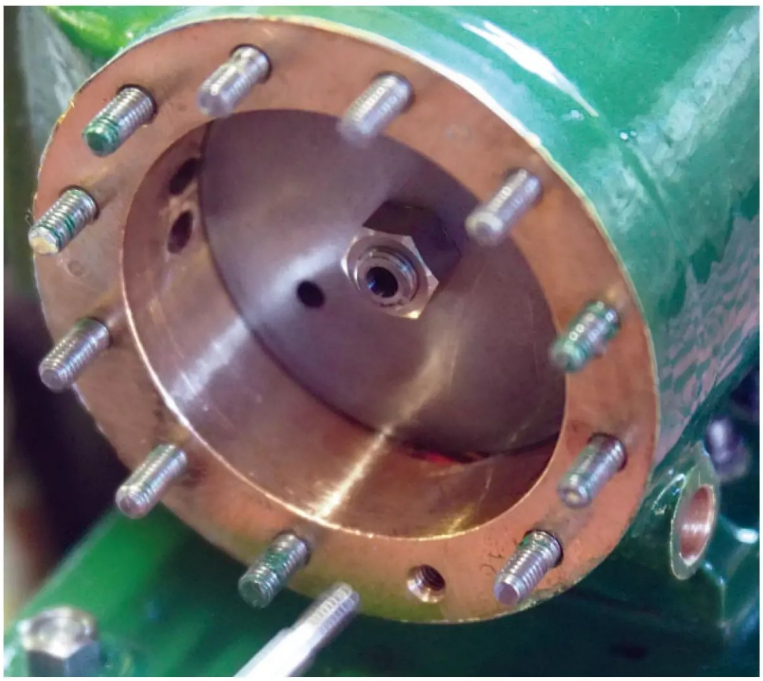


Photo 329: ...and a locking nut fitted.

Photograph 324 shows a lot of the 70 or so studs in the cylinder and other bits (note that the steam chest is upside down in this picture) and **fig. 49** gives a picture of how it all fits together. The cylinder has to be assembled to the rest of the engine a bit at a time if you are starting as I did, **photo 325**. With the pressure relaxed on the front O-ring seal, the front cover was slid along the piston rod, **photo 326** then the cylinder fitted over the studs, **photo 327**. The piston was prepared with two shallow holes for the tips of some circlip pliers and screwed on to the piston rod, **photo 328**, the soft-jaw pliers allowed the rod to be gripped without marking it. In **photo 328** the rear piston rod section is being used to locate the end of the LP rod into the piston to get the thread started. The locknut was then fitted and tightened firmly, **photo 329**.

The last act is to get the slide valve timing set, which is easily done with the steam chest cover open, **photo 330**. Note the cranked LP valve rod in this photo; this may not be strictly needed but with the original straight one the clearances from the HP valve gear were paper thin (two sheets of paper, actually). An alternative solution would be to modify the valve spindle end to lower the hole for the clevis.

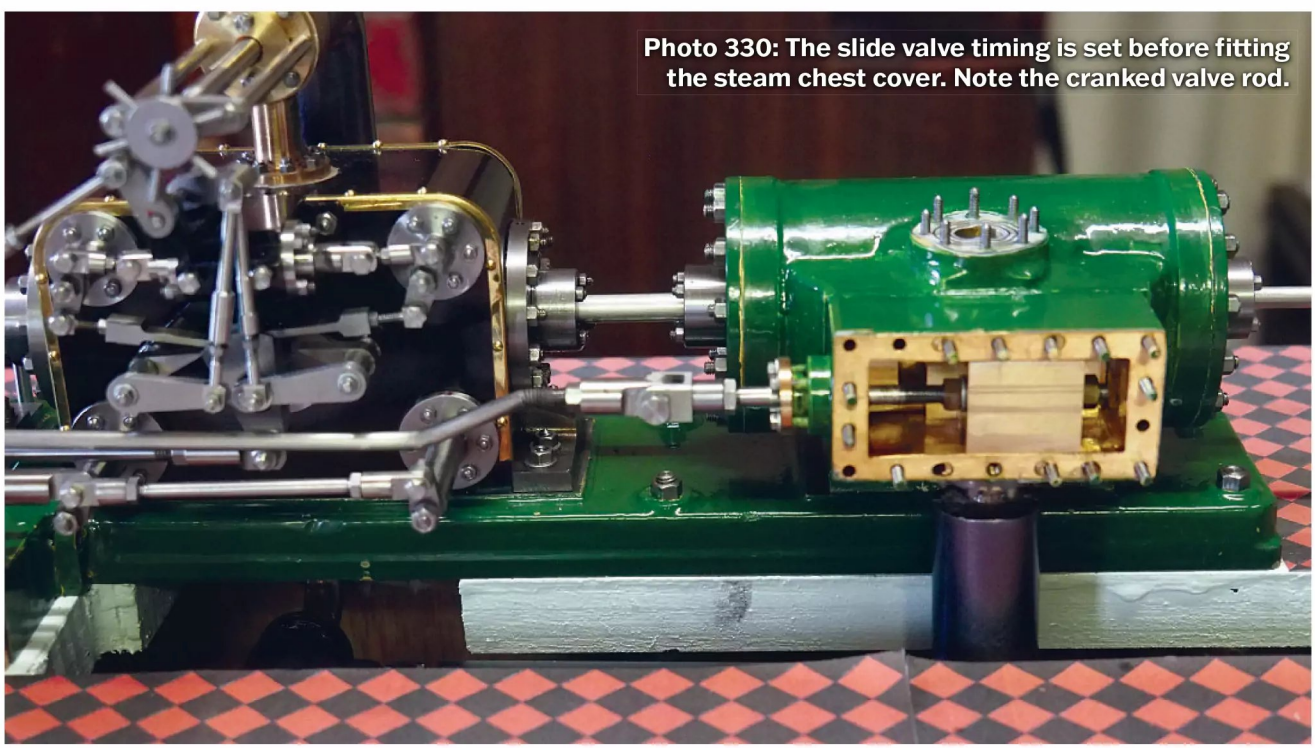


Photo 330: The slide valve timing is set before fitting the steam chest cover. Note the cranked valve rod.

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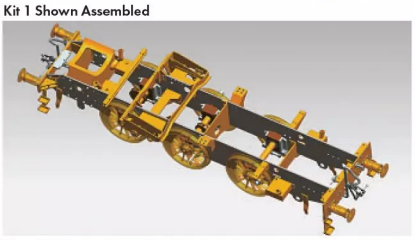
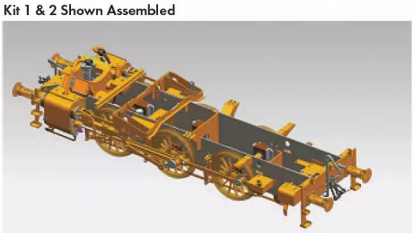
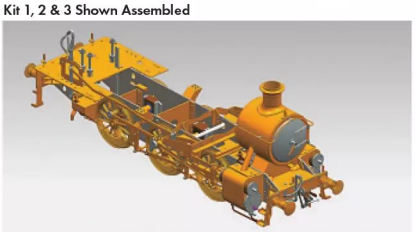
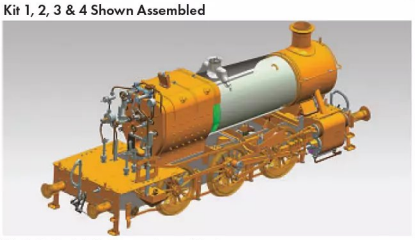
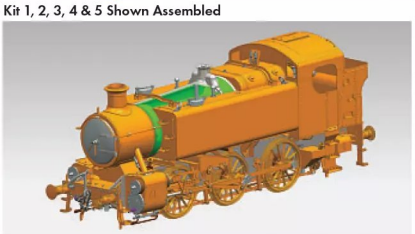

Kit 1 & 2 Shown Assembled


Kit 1, 2 & 3 Shown Assembled


Kit 1, 2, 3 & 4 Shown Assembled


Kit 1, 2, 3, 4 & 5 Shown Assembled


Kit 1, 2, 3, 4, 5, & 6 Shown Assembled

Summary Specification

- 5" Gauge, coal-fired, live steam
- 2 outside cylinders
- Outside Walschaerts valve gear
- Stainless steel motion
- Silver soldered copper boiler
- Boiler feed by axle pump, injector and hand-pump
- Multi-element superheater
- Drain cocks
- Safety valve
- Etched brass body
- Choice of liveries
- Mechanical lubricator
- Reverser

Approximate Dimensions

- Length 35"
- Width 10"
- Height 14"
- Weight 51kg


15xx model in BR Black livery

The GWR 15xx Class

All ten locomotives of the class were constructed in 1949 at Swindon and entered service on the Western Region of British Railways. They were employed on heavy shunting duties at London Paddington. Numbers 1501/2/9 were later sold to the National Coal Board for use in collieries. The 15xx was turned out in different liveries including lined black and NCB maroon.

The 15xx Model

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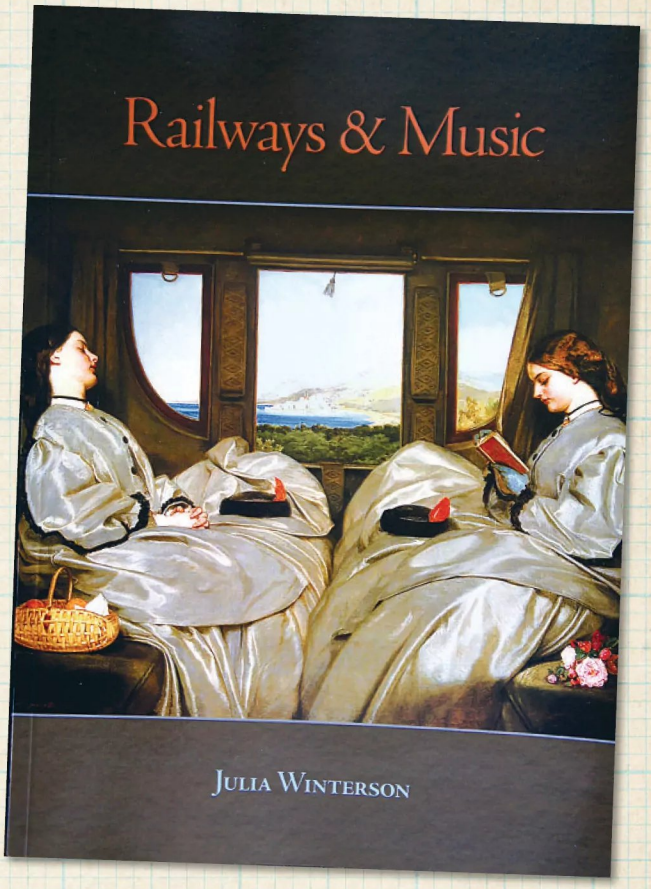
Book Review

Railways and music by Julia Winterson



Something distinctively original among railway books, and not as well publicised as it should be. I discovered this book only through a review in the United States journal *Railroad History* and it has plenty of American interest.

If this seems an unusual book to review in *Model Engineer,* many engineers have keen musical interests. At least two members of York Model Engineers sing in choirs and two play in brass bands. Another played in a 1960s pop group. Among many SMEE members with musical interest one is noted Wagnerian. The civil engineer George Grove was also an organiser of musical concerts, a writer of programme notes, music critic and, in 1873, accepted an invitation from Macmillan Publishers to create his celebrated *Dictionary of Music and Musicians*. After many editions it remains the music standard reference work.

Railways and music have been long associated. The earliest broadside ballads like *Bold English Navvy* date from 1839, and the author has located dozens of others including *Pennyworth of Fun or opening the Oxford Railway* from 1852, *Glasgow is Improving Daily* from the 1860s though the song *Shillibeers Original Omnibus versus the Greenwich Railway* dates from 1838. Several songs feature railway accidents such as *Lines on the Railway Collision at Burscough Junction* from 1880. Those Victorians knew how to enjoy themselves!

Social changes did not escape music hall writers and performers. The author lists fifty music hall songs but there must be more. That old standby of unimaginative politicians *The Railway Station Sandwich* was sung by Will Evans in 1902. Marie Lloyd is best known. Who could forget *Oh Mr Porter?* George Robey was *The Lost Luggage man*, and Will Fyfe *The Railway Guard*. With music hall in relative decline the last listed was the 1929 song also sung by Will Fyfe, *The Train that's Taking you Home*.

Music hall artists formed their own association, gaining over 5,000 members, to campaign and negotiate for better travel rates. They then joined with other organisations to form a trade union.

Railway companies encouraged music making, hence many railway brass bands. There were choirs too like the Great Eastern Choral Society. Several of their histories are described and fifty listed; the author is fond of listing music in nice round numbers and mentions ten bands currently performing, including York's own *Railway Institute Band*.

Savoyards won't be disappointed. There are references to railways in Gilbert and Sullivan, including the less well-known *Junction Song* from the lost operetta *Thespis*. The words are reprinted here but the music is sadly lost though the author has suggested a rhythm.

As railways spread across Europe many railway-related compositions followed. The Strauss family managed at least ten pieces, like Eduard Strauss's fast polka *Ohne Bremse* (Without Brakes). Less well-known was the Dane Hans Christian Lumbye and his *Copenhagen Steam Railway Gallop*, duly detailed.

In France, the romantic composer, Hector Berlioz was commissioned by the city of Lille to write *Le Chant des Chemin de Fer,* a cantata for tenor, choir and orchestra to celebrate the opening of the Paris -Lille railway, a piece now rarely performed.

20th Century composers did even more. Benjamin Britten and W.H. Auden's collaboration on *Night Mail*, is well known but less so their piece to celebrate the electrification of the Portsmouth line. Vivian Ellis's *Coronation Scot* remains deservedly popular. Arthur Honegger managed the best of all with *Pacific 231*, and Jacques Ibert was inspired by the Paris Metro, a piece analysed by the author among several others. Even Kurt Weill gets a mention.

In the postwar USA Ernst Krenek managed to set the Santa Fe timetable for an unaccompanied chorus. Many other tunes and orchestral pieces feature, some experimental in nature, including the bizarre, to put it charitably, *Il Treno di John Cage* performed, or rather formed on a train.

Less esoteric, American railroads influenced folk songs, going back to the 1870s, these were often hobo songs and linked to the blues like those by Robert Johnson. Several gospel songs like *This Train is Bound for Glory* were popular from the 1920s; other songs featured heroes like Casey Jones and baddies like Railroad Bill, a Robin Hood figure. Train accidents had their own songs like *Wreck of the Old '97.*

Some of the best (and best known) like *Wabash Cannonball* and *Rock Island Line* are detailed. We have boogie woogie and jazz pieces too. Duke Ellington wrote ten train related pieces; could there be more? And Glenn Miller added to the repertoire with the immortal *Chattanooga Choo Choo*. The book ends with British popular songs, including of course, Flanders and Swann's ever memorable *Slow Train*.

There are surprising omissions among modern folk artists. There is no Dave Goulder, the former locomotive fireman whose *Pinwherry Dip* remains a personal favourite. Nor is there the classic *City of New Orleans,* a surprising gap. Given the author's listing of railroad accident songs, it's surprising there is no reference to that printed catalogue of misery *Scalded to Death by the Steam*.

Despite gaps, this is an absorbing narrative, maybe a revised edition can feature more? Thanks to the author for compiling an excellent book on a complex subject. There is a bibliography and an index of songs. It deserves to sell well.

Roger Backhouse

University of Huddersfield Press. 2022. Paperback. 328pages. £25. ISBN 978-1- 86218-202-8

Coventry Die Head Grinding Gauges

Peter King describes a gauge for use when jig grinding the 'throat' and top face of Coventry die head chasers (the cutting inserts used to form threads).

PART 1

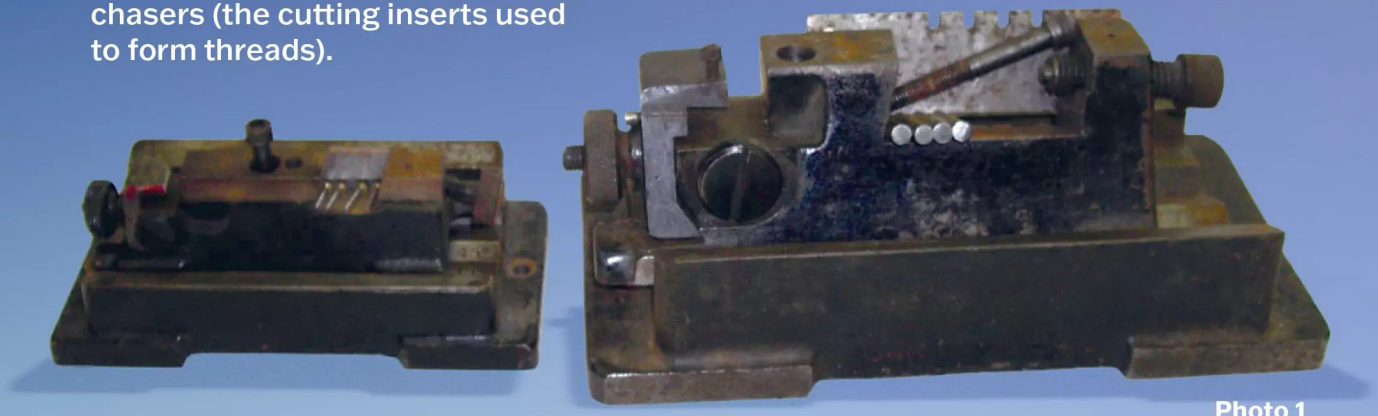


Photo 1

PART 2

Using Coventry Dieheads

David Earnshaw explains his interest in these industrial attachments.

In this article I have shared my personal experience of using these fascinating tools in my own workshop and I offer a design for an adapter.

Continued from p.461 (M.E. 4569, 15 September 2017)

Three variations of Coventry Dieheads.

Stop pin

This is simply a short length of ⅛ inch diameter mild steel rod. The short thread needs to be cut true and it may be a good idea to start it off by screwcutting and finish with a die. The material is then parted off to length and the two flats formed either by milling or by filing. The flats could be replaced by a simple slot for a screwdriver if preferred. With the benefit of hindsight, it would be possible to reduce the diameter of this component to ⅛ inch but the width of the slot in the main body should be reduced to match.

Assembly

When the individual components are finished (**photo 17**) assembly is very simple; the body slides on the shank and the stop pin is screwed through the slot in the body into one of the tapped holes in the shank. The body should slide easily along the shank without any shake or stiffness and it may be necessary to ease the sides of the slot with a fine file to achieve the easy fit. The diehead can then be pushed into the body and clamped in place by fitting a 2BA cap head screw inserted into the clamping screw hole and tightened. The adaptor is then ready for use.

Examples of use

As stated previously, Coventry dieheads are intended to be used when batches of threaded components are required and it is not worth setting the unit up for one-off threaded parts.

A few years ago I was, again, boiler building. This time it was a couple of large 5 inch gauge locomotive boilers. Most of the construction was done without the help of an assistant so fixing parts together prior to silver soldering was problematic. The usual method is to rivet the parts together using copper rivets, not too tightly, and then silver solder the joint. Riveting something of the size I was building without assistance was going to prove to be difficult and supporting rivet sets/snaps just did not seem feasible so I decided to use countersunk screws in tapped holes. Obviously steel screws were not acceptable and neither are brass ones in boiler construction so I needed quite a large quantity of 6BA countersunk head bronze screws about ⅝ inch long. In total, I think that I made well in excess of 250 of these screws in three batches of about 80 or more each. For making these on a centre lathe, the setting up requirements are as follows: a front and a rear toolpost, a saddle stop, a tailstock stop and a Coventry diehead with a set of 6BA dies. Assuming that front and rear toolposts are available, it may be necessary to produce the two stops. In my case, the saddle stop is simply a length of ⅜ inch diameter mild steel rod reduced at one end to ⅝ inch diameter for about ⅛ inch long and threaded ⅛ inch BSF. This screws into a tapped hole, which was in the lathe from new, in the left hand front edge of the apron on my Myford (power cross feed apron). The other end of the rod is drilled and tapped ¼ inch BSW for about one inch deep, into which is fitted a cap head Allen screw with locknut (**photo 18**). In use, this stop is adjusted by the length of the cap head screw which abuts up against the end of the screwcutting gearbox to bring the saddle to rest (manual feed!). It is a

17

Finished parts awaiting assembly.

18

Front saddle 'stop'.

A long description and a longer article for a job! Firstly the 'why and how', I have owned a ½" OSC 'Coventry' Die Head for quite a few years. This tool is a very handy one for producing short runs of external threading with consistent length of thread. The series in *Model Engineer* by David Earnshaw gives an excellent explanation of these tools and an idea of what can be produced using one. *ME*. 4657, 4659, 4611 (you can download these from the Model Engineer forum at https://tinyurl.com/yryx6msh or use the QRcode).

For those who have not come into contact with these die heads, I will digress for a while. They come in several sizes – smallest is ¼" size and would fit in your pocket, the largest (Heavy Industrial) is apparently 5 ½" size, somewhat over a foot in diameter and requires a small crane to move it. The smallest die head uses a range of little chasers cutting all threads from small B.A. up to ¼" / 6mm diameter range of other pitches. The next larger die heads that have been made (sizes 5/16", 3/8", 7/16", ½") cover from about <1/8" / 3mm to the designated size of the 'Head' – but, for very fine threads most die heads can cut to a slightly larger size than the head size indicates. For my ½" head, perhaps 9/16" / 14mm - if you can get the chasers!

As most of my threading is for 'one-offs' using Manual or simple tailstock mounted die holders or 'lathe threading', my Coventry unit does not get heavy work. But even with that minimal use, eventually chasers wear, and remedial action is needed. The sundry handbooks all make it quite clear that 'off-hand' sharpening of the chasers

is futile and that 'factory' jigs must be used. I have made sundry attempts over many years to acquire a sharpening jig, searching second-hand tool (junk) shops, 'swap meets' and the internet, all to no avail.

I found the occasional unit on the internet but was always either too late or outbid. I have acquired a number of remnants of handbooks and one complete print-out of edition 25 of *The Handbook* from the internet but that was all.

A major problem is that every Chinese equipment manufacturer seems to put Coventry die head and all variants in their websites as a 'teaser'. This wastes a lot of time as they have not got the items.

I had only seen the associated gauges in the handbooks. These are used for ascertaining the need for and degree of, grinding of the upper 'cutting' face of the chasers. As I was noting the very slight evidence of wear on the chasers I had, I was getting a greater and greater need for one of the jigs suitable for ½" die head chasers. The nearest contractor I could find for re-grinding chasers is in Auckland – 1217km (756 miles) away with a sea voyage in the middle! With freight and grinding charges it is nearly the cost of a new set of chasers and at least a fortnight's turnaround.

Eventually in October 2017, when idly and unsuccessfully scanning eBay for something else, I spotted a Mark 2 jig - this has a more complex separate angle base than a Mark 1, this is to accommodate several different angles for the 'Throat Angle' for 1" die head chasers and this was at a very low price. I bought it as a pattern for a project to scale down for ½" chasers. The angles on all the jigs are the same, just the relative size varies.

As is inevitable, a couple of days later I spotted three of the old Mk. 2 type of jig for sale in UK (see **photo 1** for smallest and largest). These three jigs plus the first cater for all the sizes ¼" to ¾" for RH threading chasers only. Even better was that it included one of the gauges for finding out how much re-grinding is needed – but this is marked for 1" die chasers. My bid was successful and as the vendors did not want the trouble of overseas mail, I arranged with a friend in Scotland (David Fenner, ex-Editor of *MEW*) to act as a mail drop and forward the goods.

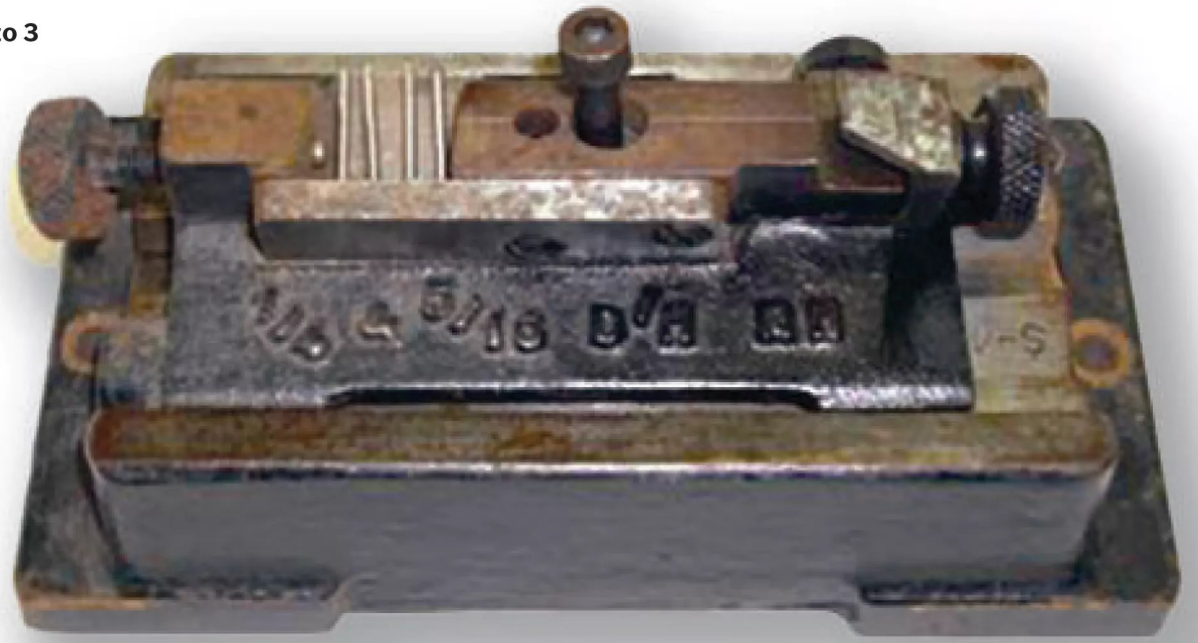
The package was eagerly awaited and eventually a 12.5kg parcel arrived at my local main post office mail box centre – the postie made a show of staggering out with the parcel. Examination showed them to be in good order apart from some patchy light surface rust but as they are perhaps about 80+ years old, that is not surprising. I started with the ½" chaser jig as that is the size of my die head. An exploratory light rub with an oily kitchen green scrubber removed some of the light rust and a 10-minute session at 50°C in an Allendale ultrasonic cleaning bath with a solvent for removing oxides at a 1:15 mix with water made them look really good. After the upper part of the jig was cleaned, the water was a sort of 'blackish-green' and, after the base plate, was very black. The sundry screws, pins etc. were put in a small plastic pill tub with some of the fluid and given a five-minute blast submerged in the tank, also at 50°C. The sundry locking screws with knurled tops looked like new. The other three were dealt with over the next couple of months. Doing this meant I discovered that under the base of the smallest unit was secured the adaptor plate for sharpening ¼" chasers on the ¼" / 3/8" jig.

A tip if doing this, when the parts are taken out of the bath, they need to be air blasted dry very quickly and then a spray of rust proofing light oil applied. Even in the two or three minutes it took me to do this a very pale-yellow tinge of rust on the super-clean surface appeared. An oily rag afterwards removed this easily. A fresh coat of black paint on the painted bits completed the restoration of the ½" unit, **photos 2, 3** and **4**. One small part of the base in **photo 2a** was just too bad to clean up fully but does not affect its use. The bath is a recent purchase, as my very small forty-two-year-old unit for cleaning 'tech pens' and other small objects only, was getting sad. It's now retired to jewellery cleaning duty with the office girls. A larger one was needed to cater for the workshop… well, that's my excuse.

With the second purchase there was also part of an original Alfred Herbert handbook – covering sharpening (and a chart for the last and latest type of jig which is interesting) and, as I mentioned above a gauge for ascertaining the degree of grinding required to the top of the chaser cutting edges after re-sharpening the taper 'throat', **photo 5**. This gauge was checked against some of my chasers and I quickly ascertained that it was for checking chasers for a small range of die-heads, **photo 6**. It is marked from 1" 'CH' type die heads to 3 ½ FT. (The last being for a *Fine Thread* unit, a similar but different sort of die head). The check being done by placing a solitary new and unused ¾" or 1" die head chaser (marked '75') in the gauge and checking where the chaser cutting point stopped against the scale engraved on it - right on the '75' mark as per 'the book'. That '75', however, is in the first third of the scale which goes to '125' so the gauge probably covers down to some 1/2" head chasers and up to some larger. I guessed there is a range of setting numbers for different thread depth chasers, it just happened that the

Photo 2a

Photo 3



one I picked up was '75'. The gauge will easily cover some ¾" chasers as the lowest number is greater than '60' – the lowest number on the scale. Besides my sets of chasers for the ½" die head, I have a number of lonely solitary chasers used for tidying after screw-cutting in the lathe. Alfred Herbert, who apparently invented both the die heads and the sharpening jigs etc. circa 1904, was a clever craftsman.

However the 'gauge' numbers on the chasers have defeated any simple analysis: - for ¼" die head chasers I have seen gauge numbers: - 25, 49 & 51. For 5/16" die head: – 34, 35, 36 & 51, for 3/8": - 51 & 56, for ½": - 51, 56, 58 & 60, for ¾": - 51, 65, for 1": - 72, 75. These 'number' settings dramatically change the position of the cutting edge in relation to a line radial to the centre of a job when in the die head. Clearly, I am missing something. I also noticed however that quite a lot of small pitch metric chasers irrespective of die head size, have '51' on them; perhaps someone will know the answer?

Whilst waiting for the jigs to arrive I had been asked if I could undertake some resharpening of smaller chasers, when I was organised. I would therefore require a gauge to accommodate ¼" up to ½" die head chasers (25 to 60 on the gauge?) I figured that as this was the first physical gauge I had ever seen apart from a couple or so in illustrations about 20+ years older than I am (ancient), it was exceedingly unlikely I would find one. The illustrations in the handbook remnants show gauges other than mine; one starts at '25' and another at '70' and another started at '100' – as mentioned above, mine starts at '60' and the gauge is marked for 1" die head chasers.

A swift search on the Internet for a gauge came up blank – none of the several manufacturers of chasers list them - so I would have to make one. I was daunted at first but started casually putting the workshop 6" steel pocket rule against parts of the gauge. I quickly discovered that the angled scale was engraved in exact 1/16" divisions in groups of five, also that at the low end, immediately below the first division – marked '60' – this was roughly

Photo 4

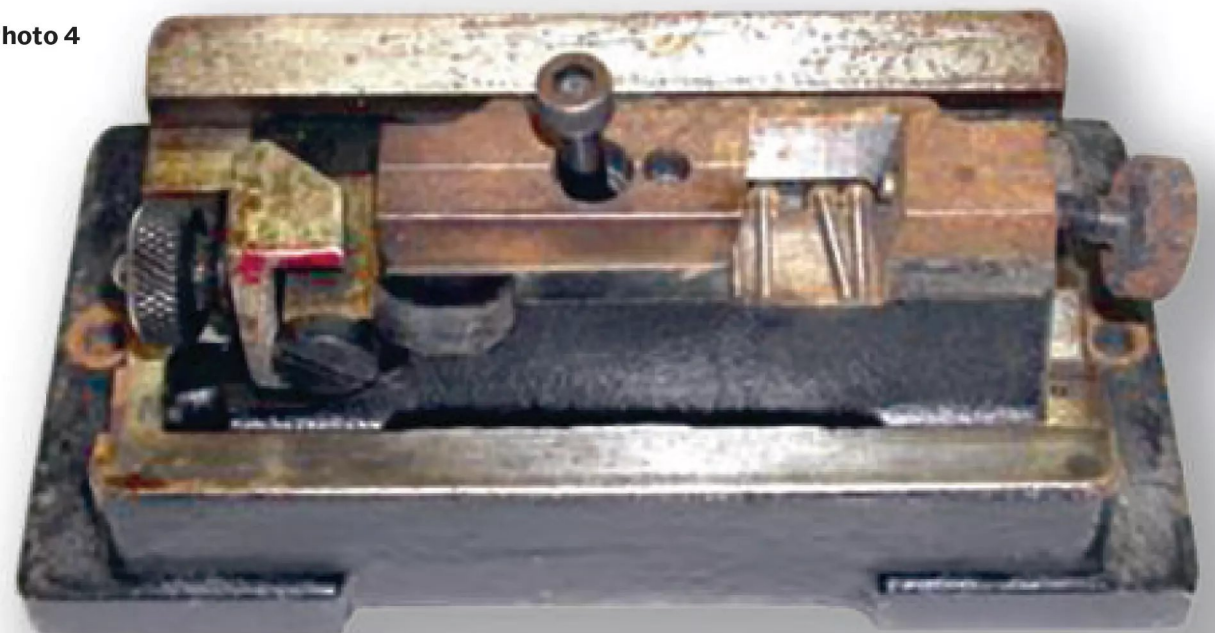
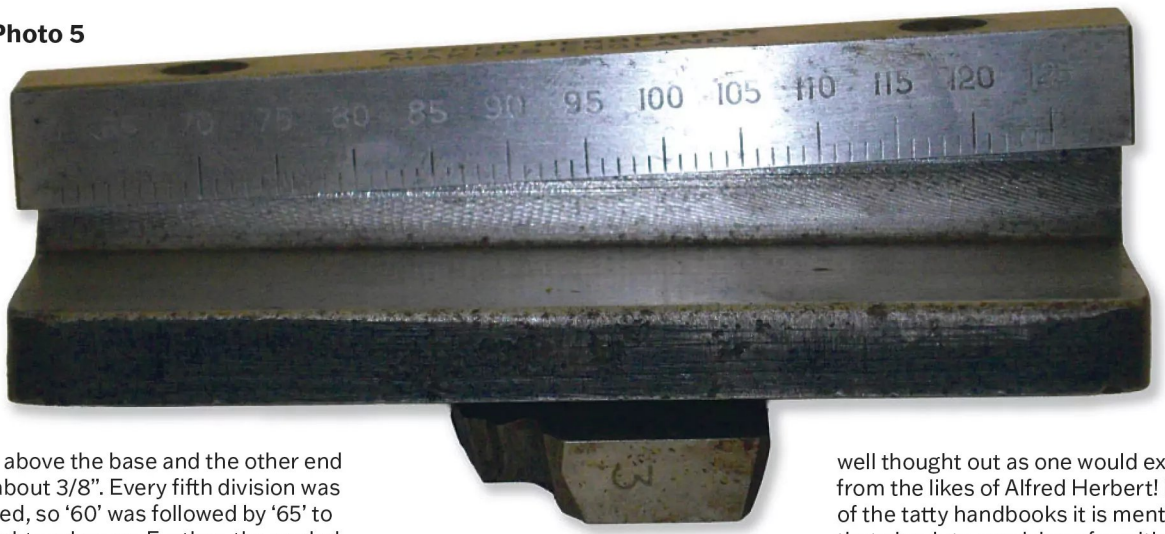


Photo 5



3/16" above the base and the other end was about 3/8". Every fifth division was marked, so '60' was followed by '65' to the right and so on. Further, the angled scale (screwed to the base) is roughly ½" square ground hardened steel bar. The base is about 5" long and 2" wide cast iron of some hard high-grade sort – at first, I thought it was cast steel as it had that sort of appearance. However, there is a distinct 'cast' recess similar to an iron casting underneath, and closer examination suggested cast iron. My wife, who has a degree in Metallurgy, told me that some of the 'old' cast iron is of superlative quality, almost 'steely' – I was vaguely aware only that cast iron has a finer grain the older it gets.

Visually the vertical seating with an angled top for the gauge scale is just over 3/8" wide under the ½" bar. The bar, therefore, overhangs the 'flat' of the gauge so that threads on a chaser will fit under the scale while the chaser is resting on the base. This should only overhang enough as to locate the chaser threads so that the base of fine threads is still visible. The bar on mine is not parallel to the upright on the base. This initially puzzled me – it is either a rough job or that the smallest chasers cutting very fine threads only having very small teeth and if the bar overhung by about 0.0625" all along, the teeth would be out of sight. A rough (very) check then on the main angle of the gauge bar was that it was about 2 - 3 degrees. The angle the other way can wait until final assembly.

For those who do not have access to the Coventry literature, in use a chaser is placed on the flat base with the cutting edge against the upright seating and slid along to the left with the tip under the scale overhang until it stops because it is too big for further movement due to the taper of the scale. The scale at the appropriate gauging 'point' of the chaser is noted – this is just to the right of the left-hand edge of the chaser on a new one, this being at the intersection of an imaginary line along the base of the chaser teeth that meets the point on the 'throat' where the chaser starts to cut a thread.

This is very much an 'eye-ometer' situation. A sharp, new ½" chaser (marked '60') stopped with that 'point' a fraction above '60', on the scale. That is eyeballed as about 60.2, the cutting edge is about 0.0006" higher than the number stamped on it.

A worn one that has had the throat re-sharpened, but not the top face, would maybe place that 'point' 1 division more – '61', whilst still stopping with the left-hand edge of the chaser in the same position. This must be borne in mind.

The handbook advises how much to grind off the top cutting face depending on the stopping point. This figure being 0.003" per division, so if the scale reads '62' then 0.006" needs to be taken off the top face. Only then does the chaser move further to the left before stopping – as that 'point' is now against the same gauge reading as stamped on it. It's very well thought out as one would expect from the likes of Alfred Herbert! In one of the tatty handbooks it is mentioned that absolute precision of position is not required – visual positioning is adequate, i.e. a few 10ths either way do not matter - a practical engineers solution.

Now get out *ME* 4567 and David Earnshaw's article at page 317 (or download it, see above), and then look at illustrations 5 and 6 (reproduced here as **fig. 1**). The reason that the above works is clear when the chasers are examined The top face is angled so that most of it is above thread axis. This part of each chaser will therefore not cut and acts together with the others as a 'nut' and follows the thread cut at the throat, After regrinding the throat a lot (the only bit that does the cutting of threads), the cutting edge at the 'throat' of each chaser eventually gets to be above that axis height and will not cut. Grinding the top face down allows the chaser to slide further along that tapered gauge and when it is correct, that number stamped on it will be the one that the 'point' on the throat of the chaser stops at! All must be ground the same; the chasers will now cut again. The chasers thus have three interacting angles:

1. Rake of the cutting edge
2. Angle of the throat, this is where all the thread cutting action takes place.
3. The angle of the cutting face and of the cutting edge.

The one thing that is thoroughly pointed out in handbooks is that 'off-hand' re-sharpening of the throat will not work – the set must be re-sharpened together in a jig – their order in the jig for this operation is irrelevant – it is only when replaced in the die head that they must be replaced in the numbered order clockwise, because the threads on a set are ground to form a spiral. However you can start in any slot! If you get it wrong, you will ruin the chasers and your job! The jigs I now have also allow for grinding the top 'cutting face' on each chaser individually, when clamped on a surface inclined at 2.5 degrees. The later Mk 3 - a more complex jig - does all four in one

Photo 6

pass in a different arrangement of the jig.

The sundry handbooks have many suggestions on techniques to vary the above procedure to counter things like wear in the die head. There must have been many of these handbooks produced, my complete one is 'Edition 25' (but no printing date) and David's is given in references as 'Edition 16'. The sharpening is not as precise as the procedure seems, as a slight variation does not seem to affect the end result. When I checked all of a set, they were the same, however when several of my sundry new chaser sets were checked against the gauge, I noted that there was about a ¼ division spread in the positioning between 'sets', or up to 0.00075" variance in height of a set compared to another set. I eventually found a reference to that variation factor in a very old, tatty and grubby remnant of a handbook. I guess Alfred Herbert made allowance for variation in skill of operators when re-sharpening chasers so there is a built-in degree of tolerance.

At this point I began furiously to think – what facilities did I have and could a gauge to go down to '20' be made in the workshop (just below the lowest number I had seen stamped on a chaser). An examination of my steel stock produced a 600mm length of 20mm x 60mm mild steel bar, the 'sundries' store produced a ground ½" sq. 10" length of key steel. Tooling was next, my CNC vertical mill or my Taylor Hobson engraver maybe could do the engraving on the scale and my turret mill would produce the step on the base and plus my sine table the angled face on the base – finishing this on my surface grinder. Two machine screws from stock would secure the scale. It began to look possible. The original scale is probably case hardened and then ground, but I figured that the ground key steel is probably accurate and hard enough for my needs.

Here ends the first part of this saga.

Now comes the 'how and why' of actually making the gauge and what cannot be done – in some detail as it is all too easy to forget something:

Minimum tools and machinery required: A vertical mill; a sharp 0.375" HSS end mill; a 'split point' twist drill for a tapping size of about a 3/16"; 5mm; a small engraving cutter; a 5" or similar sine table; a set of gauge blocks (shop quality is good enough); a smooth grade file; selection of toolmaker's clamps; a sharp scriber; a sharp scribing height gauge; a small set square (3" is good enough); a couple of Coventry chasers of very different sizes (to check top and bottom of scale range).

The job is much easier with a digital read-out on the mill; a surface grinder (you may have a friend with one); a jeweller's loupe and lots of patience!

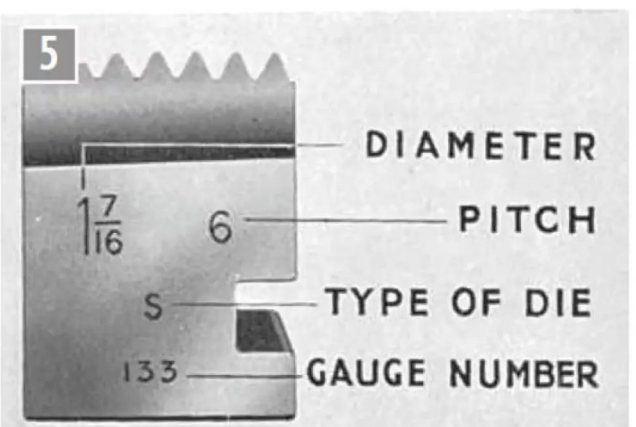
The first need was get some ideas on manufacture – my first thoughts were to accurately ascertain the height of the scale above the base at each end of the scale. With my gauge blocks I needed to carefully measure those two spaces of maybe 3/16" and 3/8" to ascertain if my eyeballing of the ruler was accurate – it wasn't. By thus using gauge blocks to ascertain the vertical distance from underside of gauge bar to the base from a scale division at each end of the angled scale, I could determine the angle of that gauge face. The length of the marked scale is exactly 4.0625" – 13 blocks of 5 x 0.0625" divisions, bearing numbers 60 to 120 on the main divisions rising by five for each main division. These numbers matching the numbers on Coventry chasers – as mentioned a new ½" die head chaser I have is marked '60'. But no action was taken at this time.

At about this stage in proceedings I found a very obscure reference in another of the old grubby and tattered Coventry handbooks – the angle of the gauge is stated there to be 2.5°, which of course must also be the angle of the upper edge of the chasers. This saved a whole lot of brainstorming, dropping gauge blocks and distance calculation – all that I had to do now was look up a table of angles for my sine block and assemble the gauge blocks. As far as I know this is the only reference to that angle in the sundry Herbert publications, as I cannot find it in any others – so far. It also appears just once in a 1950s(?) Firth Brown tooling handbook I have.

Examination of the illustrations 5 and 6 in David's article – show that this figure, which appears in all the handbooks I have seen, some probably nearly – or over – 100 years old does not mention it. The angle can also be calculated from the scale at 0.003" rise per 1/16" along the scale. This is a 0.195" rise in the 4.0625" of the scale but this starts at 0.174" above the base at the low end, so my guess of 3/8" at the upper end was not too bad as it is 0.365".

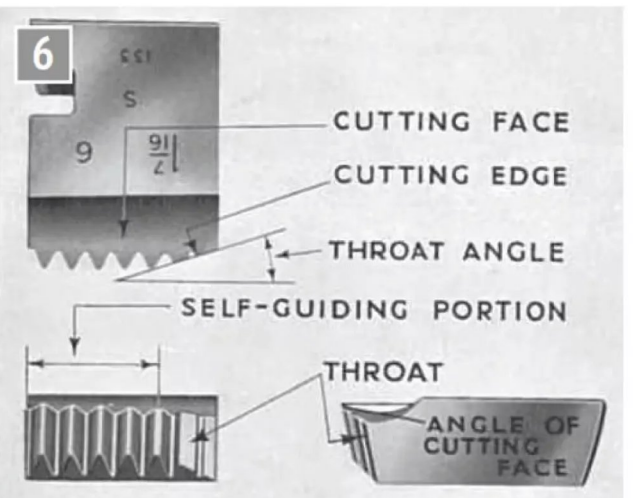
Having done all the above I then needed to have a method of getting the scale into the right position for accurate measurement. As many of us have done, I woke-up in the night with 'the method' in mind – and got up and wrote it down!

Having ascertained the height of the scale above the base on the original at, say, division '60' by the use of gauge blocks – the rest was simple. When all is machined and ground, all I have to do is put a gauge block or chaser for the '60' vertical dimension on the base (or blocks for any other convenient number (I also used a '75' chaser set-up for checking as I had an unused chaser with that number) and with the scale block held on its mount, slide each until '60' (or '75') was where the blocks stopped. Then



Enlarged view of a single chaser.

Fig 1



Details of cutting edges.

clamp the scale in place and spot the mounting screw holes into the base with the transfer punch – drill, tap and fit screws. Much easier than some of the contortions I had figured would be necessary. I now needed to see if this would work. The original mounting screws are quite ordinary, being a pair of ordinary machine screws with countersunk heads crosscut for a screwdriver. Like most model engineers, I have a selection.

The next stage was to switch on the computer and open up the CAD programme I use. The first drawing was intended for the new scale bar, for use in a CAM programme to create a CNC programme for the engraving – the original appears to have been 'acid etched'. This approach was abandoned when I found that my CAM programme got indigestion trying to create the Gcode. My engraving machine was going to be difficult to set up for all except the numbers. An assistance here is that the tiny chasers for a ¼" die head each have 'that number' engraved on them and pictures of some offered for sale gave me an idea of how many more 1/16" divisions were needed below '60' to accommodate them – quite a lot. The 2.5° angle on the chasers being constant it could be drawn up as an *aid memoire* for any size of die head chasers.

There then began the job of sawing off the suitable lengths of steel from the stock and getting ready for production. The first job was milling the step in the 20 x 60mm block, **photos 7** and **8**, and then generally knocking the edges off with a fine file to ready it for machining the mounting angled face for the scale bar. I prepared the base with a lick of the surface grinder on the under surface, so all was square. Then there was creating the machining reference points, blueing and marking out carefully, for guidance while machining. After ascertaining the exact vertical distance under the '60' mark on the existing gauge - 0.174" - I marked the new base with a thin pencil line on the top of the bar support where, within a guessed 1/64", of that number '60' on the new gauge would be – this I then scribed a very light and thin line along. I then scribed a vertical line to this with a small set square – this does not need to be extremely accurate as later explained. This was followed with a short 0.75" scribed line above the gauge blocks scribed parallel to the base across the vertical line. This gave me couple of intersecting scribe marks at 90°, across gauge height '60' and position for the '60' division at the expected distance from the left end for positioning.

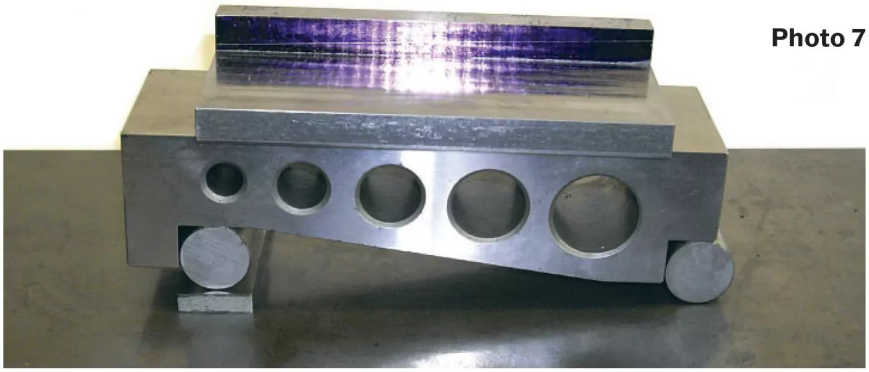


Photo 7

The next operation was conducted with the gauge base clamped to a sine bar with the appropriate spacer block under one end. I always make a new steel spacer block by using my surface grinder to avoid having gauge blocks together too long. Any difference from the gauge blocks is so small as to be irrelevant for my purposes. The scribing height gauge was reset just on the left end of the gauge blocks with the blocks just aligned with and to the right of the vertical line. This was then mounted on the sine bar and set up on my small surface plate. A thin line was then scribed for the length of the vertical face and due to the sine table was angled. To my delight all the lines when examined with a loupe were intersecting. One has to win sometimes. TBC

Photo 8

NEWTON TESLA

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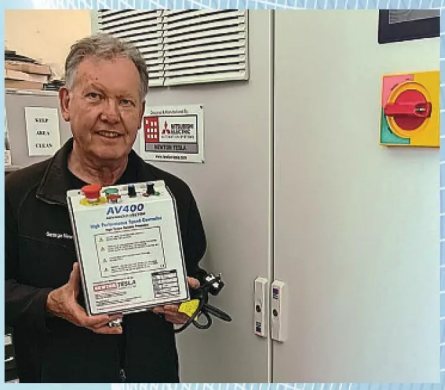

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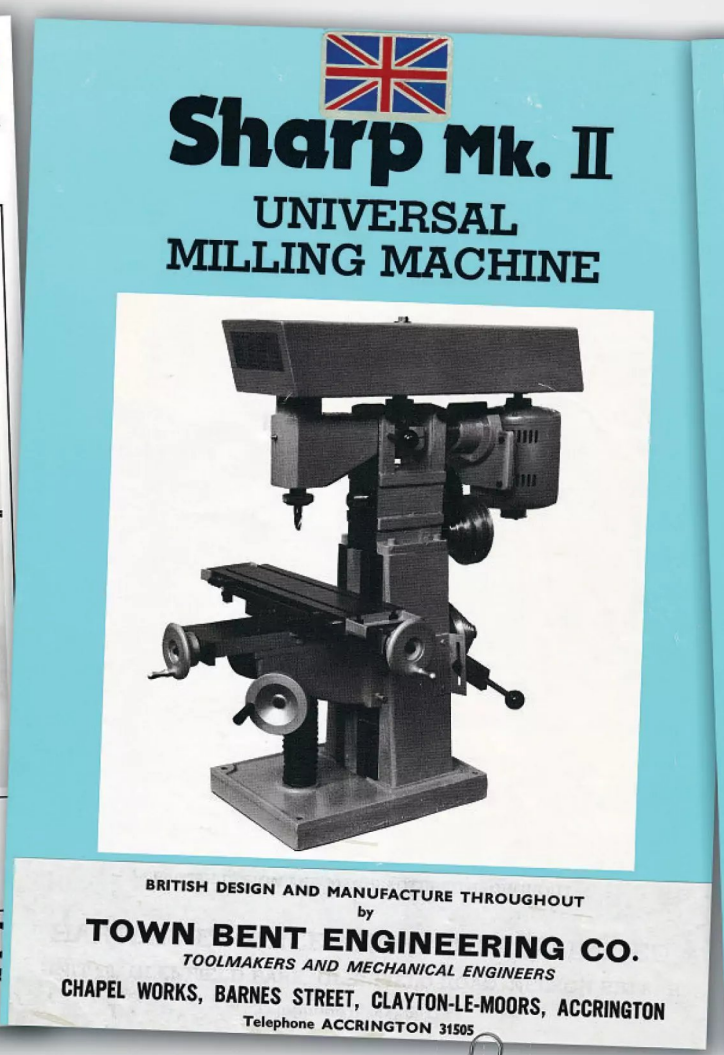

My Milling Machine and I

Rod Jenkins tells the tale of his Sharp Mk. II horizontal/vertical milling machine, from Town Bent Engineering.

Many years ago, when I obtained my second hand Myford S7 lathe, a Far Eastern milling machine came with it. This was one of the early Economy round column mill/drill machines – the sort that was reputed to still have core sand in the column (mine didn't but there was fair amount of it in the base casting! For general milling work this was immeasurably better than milling in the lathe but there were some issues with usage. The quill was inclined to be wobbly, the quill down-feed had no index and, of course, registration was lost if the head needed to be moved to change tooling. I resolved to do better and saved up for something new. Having seen the Centec machines in the machine shop for our laboratory, I decided to overcome the column issue by getting a milling machine with a rising knee on a dovetail column.

At that time, 1986, there was not a lot of choice: No Internet in those days so advertisements in *Model Engineer* and visits to the *Model Engineer Show* were the only real options to see what was available. It was at an ME show that I was waylaid by a very enthusiastic gentleman on the Town Bent Engineering stand, selling the Sharp Mk. II horizontal/vertical milling machine that they manufactured, **photo 1**. This was just what I wanted so the hard sell only needed to be quite soft before I succumbed. I must have been flush in those days (single, no mortgage) as I bought the X-axis power feed and slotting head as well. The old mill was sold to a work colleague,

SPECIFICATIONS

Table Size	20" x 4½"	508mm x 114mm
Table Working Area	16" x 4½"	406mm x 114mm
Table Travel	12"	305mm
Cross Travel	4½"	114mm
Rise and Fall	10½"	268mm
Distance Centre of Vertical Spindle to Column Face	5"	127mm
Spindle Taper	No. 2 Morse	
Spindle Nose Thread	1⅛" x 12 T.P.I.	
Maximum Horizontal Cutter Diameter	6"	152mm
Motor	½ hp Single Phase 1425 rpm	
Spindle Speeds Vertical	8	
2" Motor Pulley	180 - 350 - 620 - 1200 rpm	
3" Motor Pulley	270 - 475 - 930 - 1800 rpm	
Spindle Speeds Horizontal	8	
2" Motor Pulley	60 - 120 - 200 - 400 rpm	
3" Motor Pulley	90 - 180 - 300 - 600 rpm	

Approximate Dimensions and Weights

Weight	Universal Miller	320 lb	145 kg
	Vertical Miller	260 lb	118 kg
Height		33"	838mm
Width		24"	610mm
Front to Back		35"	889mm
Size of Base		16" x 12"	406mm x 305mm

Optional Equipment

Vertical Belt Guard
Cabinet Stand
Switch Kit
Power Feed Kit
Low Voltage Light Kit
Machine Vice
4" Rotary Table

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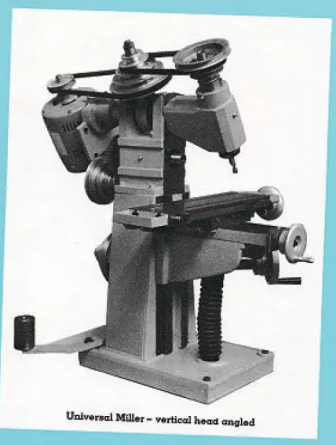
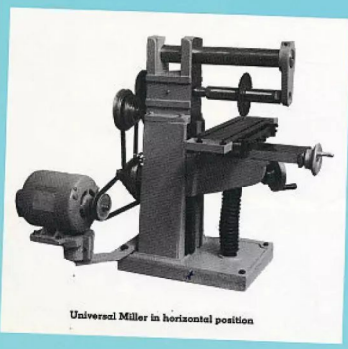
The **Sharp Mk. II** is developed from the very popular **Sharp** Universal Bench Milling Machine which was on the market until a few years ago. We have retained the sound basic design but a number of detail modifications have been incorporated to improve both performance and life of the machine. The sturdy design results in a very rigid machine on which sensible cuts can be taken without the chatter problems which are a feature of many Mill/Drill machines.



Universal Miller – vertical head angled

VERTICAL OPERATION

The Vertical Head runs in Taper Roller Bearings. The spindle, which is made from high grade steel, is bored through ½" dia. with a No. 2 Morse Taper and threaded 1⅛" x 12 T.P.I. It will accept a No. 2 Morse Taper Collet Chuck or Myford Patent Collets. For angle milling the head can be rotated 45 degrees from vertical in either direction.



Universal Miller in horizontal position

HORIZONTAL OPERATION

To convert the **Sharp Mk. II** from vertical to horizontal milling takes about a couple of minutes. The horizontal spindle like the vertical spindle runs in Taper Roller Bearings, is bored through ½" dia. with a No. 2 Morse Taper and threaded 1⅛" x 12 T.P.I. The 1" dia Milling Arbor, which has 3"-1½"-¾" and ½" collars is supported by a 2" dia solid steel overarm bar. Maximum horizontal cutter size 6" dia.

TABLE

The table is made from high grade cast iron, has a ground working surface and is carried in adjustable dovetail slides. The working area is 16" x 4½" and has two full length machine cut Tee slots. Table will swivel 25 degrees from zero in either direction.

Photo 1: The original Sharp Mill brochure from 1968.

but I retained the angle iron base and the machine vice, which still give sterling service. The Sharp (and the Myford) have now followed me around to four different workshops

The Sharp Mk.II is essentially a horizontal milling machine to which can be fitted a vertical head, **photo 2**. It is well made but of simple design to keep the price down. Both the vertical and horizontal spindles are bored through with No. 2 Morse tapers and a Myford 1 1/8 inch x 12 tpi thread on the nose. The spindles are mounted in opposing taper roller bearings, 1 inch i.d. (internal diameter) and 2 inch o.d, which are readily available, **photo 3**. Drive to the horizontal spindle is via a back gear to give the slower speeds required for the larger diameter cutters used in horizontal milling, **photo 4**, the motor being mounted on an outrigger. The table can be rotated around the vertical axis so, in theory, this is a universal milling machine.

I use the mill mostly in vertical mode. In this case the round overarm is replaced with a round bar onto which the vertical spindle is pinned at one end and the motor mounted at the other. There is a large taper pin

Photo 2: My Sharp mill.

Photo 3: Vertical head dis-assembled.

Photo 4: Horizontal milling.

inserted through the pillar into the arm that ensures that the spindle is at right angles to the bed. However, because the over arm is circular, rotating the head is straightforward for milling at an angle, **photo 5**, but the taper pin ensures that the head can be returned to the vertical without need to re-tram. The Myford nose thread allows the use of Myford patent collets which sit in the No.2 Morse taper. Having had a 1/2 inch cutter come loose, destroying the collet in the process, I have lost confidence in this method of holding the larger cutters and I now have an ER25 collet holder that lives almost permanently in the vertical spindle. Sometimes, if headroom is an issue, I revert to the Myford collets for the smaller milling cutters, but I do have a couple of draw bar threaded MT collets in ½" and 12mm diameters for heavy end-milling. The spindle is un-hardened and taper tooling is inclined to get stuck, needing hefty whack on the draw bar to loosen it. I dislike doing this so I've made a nut to fit on the spindle thread that has a collar that will push out any taper tools that have a flange larger than the big end of a No. 2 Morse taper, such as my Arrand boring head, but the ER collet chuck covers most eventualities. The mill in vertical mode does not have great deal of headroom and even a ¼ inch drill chuck on a 2MT arbor together with a jobber drill can take up a lot of the available free height so I invariably use the ER chuck to hold drills. I have started to amass a collection of stub (machine length) drill bits. The lack of a quill would seem to be a distinct disadvantage

Photo 5: Milling at an angle.

Photo 6: Tightening a collet.

for drilling, but I have found that using the hand wheel to raise the knee is surprisingly sensitive, even down to 1/16 inch diameter holes. Fitting drills into the ER chuck can be a bit of a trial if they are towards the bottom end of the 1mm holding range since one hand is needed to hold the drill, a second hand turns the collet nut and a third hand holds the spindle stationary. Since I only have two hands, I have developed a technique and adjusted my physique (using beer and pies) to hold a spanner as the spindle lock, **photo 6**. More recently I have purchased a micro drill adaptor which is good for the smallest drills bits, **photo 7**.

For work holding on the table, apart from various clamps, my most used tool is a vice. I have milled slots in the base for feather keys so that I can bolt the vice to the table with the certainty that the vice jaws are parallel with either the X or Y axis. I recently made a Gack Free Vice from a Hemingway kit and, being low profile, it helps if there is a headroom issue or for the larger jobs, **photo 8**.

My dividing head also has a Myford nose so can take my various lathe chucks. I find that I use the dividing head a lot for work holding, it being simple to transfer a job in a chuck to the mill, perform the required operation and return it, if necessary, back to the lathe without losing concentricity. As well as performing indexing or dividing, the dividing head can be used as a fourth axis for milling part circles, **photo 9**.

Over the years I have made two fairly major modifications to the Sharp: I have to admit that changing speeds in vertical mode was a bit of a palaver. The motor drove an intermediate pulley with four steps which match the spindle pulley, **photo 10**. I substituted the original single-phase motor with a three-phase unit and Variable Frequency Drive from Newton Tesla – the same package as sold for Myford lathes. The frequency was tweaked so that the top speed of the vertical head was now 2,500 rpm rather than the 1,800 rpm of the stock machine. The A-section belts seemed to absorb quite a bit of power, it was possible to hear them 'wheezing' as they struggled their way around the smaller diameter pulleys, so more recently I have eliminated the intermediate pulley and converted the vertical drive to PolyV directly from the motor to the spindle. There are now just two pulley ratios: a low and a high range of 0-1300 or 0-2500 rpm controlled by the VFD, **photo 11**.

The other major modification was

Photo 7: Micro drilling attachment.

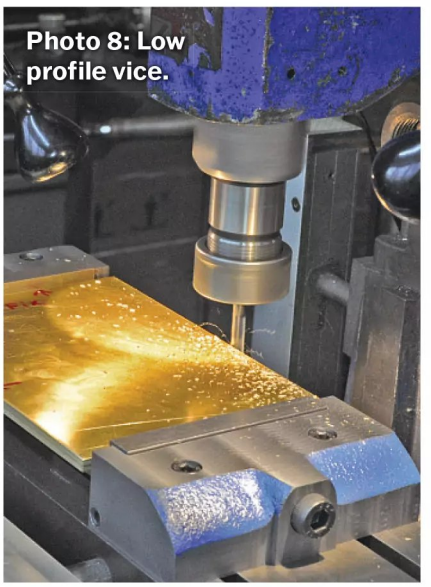


Photo 8: Low profile vice.

Photo 9: Fourth axis milling a crankcase.

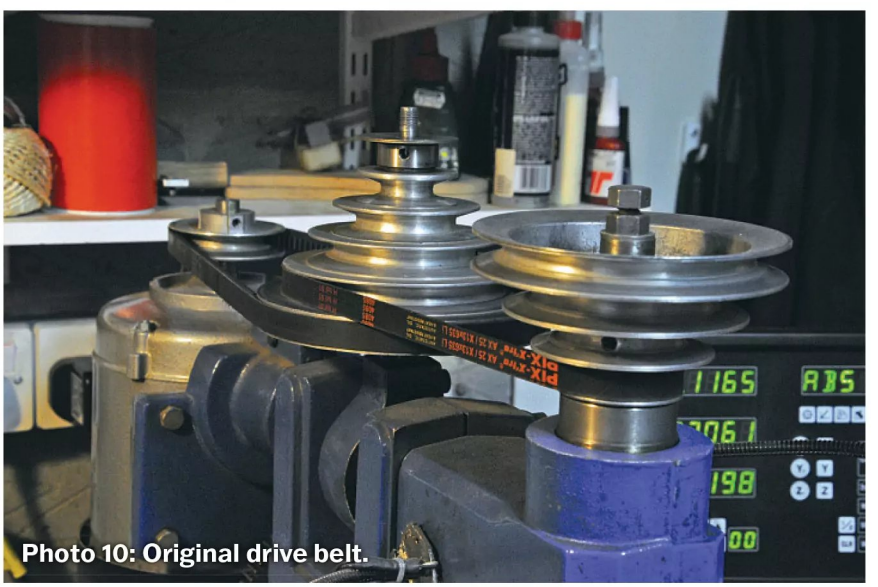


Photo 10: Original drive belt.

adding a digital read out to all three axes. Installation was pretty straightforward; I just needed to make a few angled blocks to get the Z gauge truly vertical on the sloping sides, **photo 12**. I used a low-profile gauge in front of the table for the X-axis so as not to limit any overhang on the table. The mill originally came with a bar in this position to accept stops to limit the travel and I had to remove this but was able to keep the additional bar that actuates the auto shut off for the power feed. The digital read out is truly wonderful and I would not be without it.

In horizontal mode the cutter is held on a 1-inch diameter arbor that has a No.2 Morse taper at one end and fits into a ball race, on the end of the over arm, at the other. The arbor looks to me as if it was supplied by Arrand and, incidentally, makes a very nice test bar for 'levelling' the lathe. I don't often use the mill in horizontal mode but occasionally, especially if headroom is an issue, using a slabbing cutter is a useful alternative.

When cutting larger gears a commercial cutter having a 1-inch hole can be used, as shown in **photo 13**, cutting a stick of twenty-tooth 20DP gears for the George Thomas bending rolls. Another occasionally useful function in horizontal mode is to use the mill as a horizontal boring machine. In this case an end mill or drill can be mounted in the horizontal spindle as I did on the body of the Lammas hardness tester which avoids the complication of setting work up on an angle plate, **photo 14**.

The slotting attachment fits into the over arm position and is driven by a crank held in the horizontal spindle. **Photograph 15** shows the arrangement for slotting the key ways in the bending roll gears.

So, that's my Sharp Mk. II milling machine. Jack of all trades or master of none? More headroom would be good, a quill would be useful, as would the ability to tap *in situ*. However, for my purposes the advantages of the machine's versatility outweigh the drawbacks. The Sharp MkII mill and I seem to have muddled through so far: by tailoring my aspirations to the size of my equipment I think we can manage.


Photo 11: New belt drive.

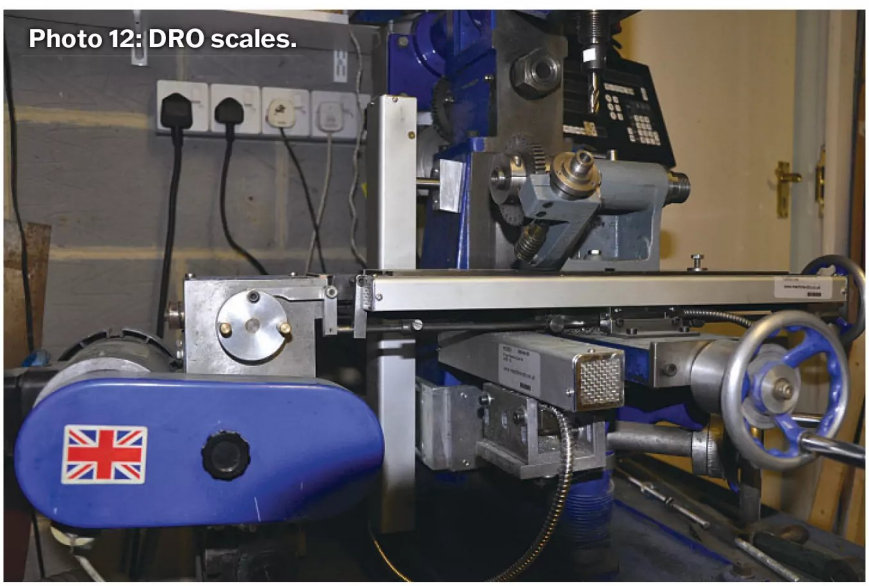


Photo 12: DRO scales.

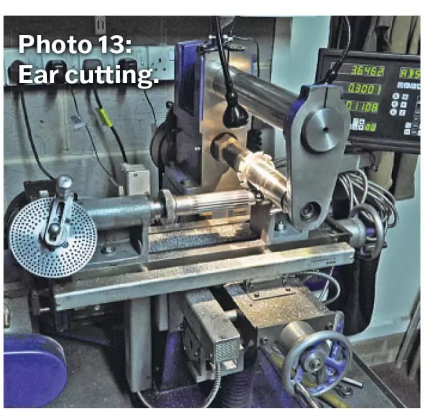


Photo 13: Ear cutting.


Photo 14: Horizontal boring and facing.

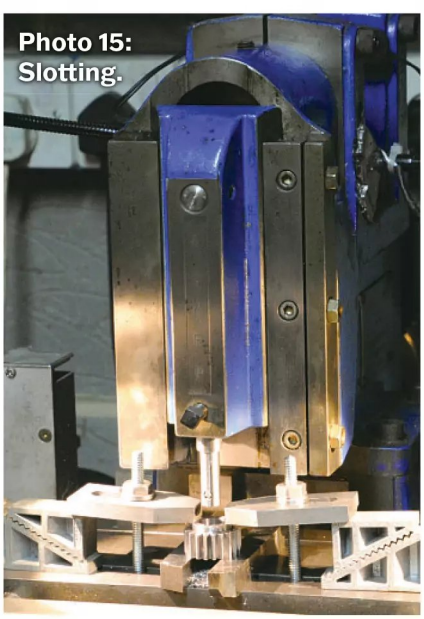


Photo 15: Slotting.

Photo 1: Martin Gearing and Tom Harrison discuss the Simplex locomotive.

A locomotive Lifting Table

Martin Gearing remembers a lifting table that also had an attachment for rotating the loco.

Photograph 1 shows the lifting table. The left-hand ends of the two H-frames have fixed pivots secured to the upper (carrying the loco track) and lower (with casters) frames. The right-hand ends have rod extensions that slide in slots milled into the box section of the upper rectangular horizontal chassis support frame and lower rectangular caster chassis.

The H-frames have a pin mid-way on their length, passing through the four pieces of box, allowing them to 'scissor'. If you look carefully, a piece of box section will be seen welded horizontally across the two left upper legs of the H-frame, attached to the loco deck. Between this and a corresponding box section welded across the caster chassis (slightly to the left of centre) is attached a car scissor jack; not very elegant but freely available and works brilliantly!

The chap in the white shirt in photo 1 is the late Tom Harrison, builder both of the loco and table. We purchased them after twenty-plus years of service, when he decided to give up driving due to physical problems.

His background was that his trade was centred around electricals and electronics. Like me, he served his time at the MoD but, unlike me, he remained for most his working life. The benefit of the MoD was that the training received included both electrical and mechanical disciplines at apprentice level, the thinking being that it gave an appreciation of the problems the other trades faced.

A fantastic bonus, in my opinion, was that when dealing with tasks demanding the 'other' trades' skills you weren't restricted by accepted convention. This showed in the design deviations that we found on his Simplex, and as it ran continuously for over twenty years shows that convention isn't always the only way!

All his machines had variable speed DC motors, that he rewound to suit his needs, supplied by a transformer he rewound on a burnt-out core he 'acquired'. Nearly all his silver soldering was done using carbon arc powered by a transformer he made up. He had a test boiler that used electrode heating.

Photo 2: Simplex elevated on the 'rotisserie'.

The list of accomplishments goes on – and to top it all, he was a lovely gentleman, willing to give his time to help anyone in difficulties; he is sadly missed.

Photograph 2 shows a wooden 'rotisserie' attachment Tom built which slid onto the track profile and could be attached to the buffer housings (after a bit of grunting) allowing the loco to be rotated 360 degrees. There were holes drilled in the fixed and rotating part at one end enabling the loco to be secured at a convenient selection of position.

I used this for over four years while we owned and rebuilt the loco and then sold it with the loco as it was too specialist to retain. But having had the benefit, there was no way I'd entertain working on/ maintaining a loco without one. So, I made a larger one to cater for the 5" and 7¼" locos we now have, but used a central trolley jack for the lifting, **photo 3**. Because the locos are heavier, I used scissor jacks to do the rise and fall at each end, with a worm and worm wheel for the rotation.

As soon as time permits, I will make a separate rise and fall transport trolley to Tom's basic design for going between workshop rotisserie/ house/ car but with as large a diameter and thin wheels as possible to make door steps/ less than smooth concrete easier to negotiate. I'm thinking of some kind of fabricated disk made up of thin sheet wood or metal or (as I have some!) Honda 50 scooter wheels… or perhaps a mixture of both.

Photo 3: Martin's stand for larger gauge locomotives.

Gerald Martyn builds a locomotive he can lift. Continued from Model Engineer & Workshop issue 4767

PART 16

Photo 119: An initial trial fit of the boiler.

A GWR Pannier Tank in 3 ½ Inch Gauge

BOILER FITTINGS

The boiler fittings are next. When testing the boiler it is necessary to plug all the various holes. Most of the bushes use common thread sizes so plugs for those can be made from some hexagon bar, or it may be possible to borrow some, and when the test is complete they can be put away/returned for future use. Remember to leave one bush (I used the safety valve bush) to connect to the test kit. Do check sizes for compatibility; most clubs have an assortment of adaptors for connecting boilers and it would be a waste to make a solid plug for that hole. The odd ones are the inner dome, the regulator bush, the safety valve bush and the mounting (expansion) brackets, I connected the tester to the safety valve bush using a club provided fitting, but for the other three I made the real parts and, in the case of the regulator bush, just left the spindle hole blind until after testing. This way there is no effort wasted making blanking plates that will probably never be used again, and it's no bad thing to have the inner dome tested, anyway, although the test code does not require it.

The drawing for the regulator is shown at **fig 50** and, for the moment, just the backhead bush is needed. The inner dome and the expansion brackets are at **fig 51**. These are simply adaptations from Rob Roy. I've found that a screw-down type regulator gives much better control than the slide valve types, with low friction, and have used them on all my own-design models. The expansion brackets are best fitted using countersink head stainless steel or bronze screws, though brass would do at a push, and a special small countersink tool may need to be made. Alternatively, very thin head hexagon screws will perhaps do. These initial items are all fairly simple to make so I'll say no more. Fit them using a sealant (that Loctite gasket stuff) and perhaps fibre washers on the simple threaded plugs, and the boiler is ready for its shell test at twice working pressure. Happy boiler day, **photo 118**! Any minor weeps can be sealed using 180 degrees C solder but anything substantial would

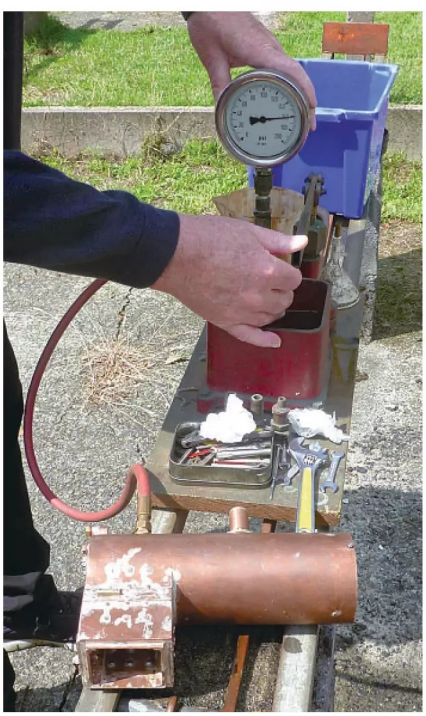


Photo 118: Boiler test day.

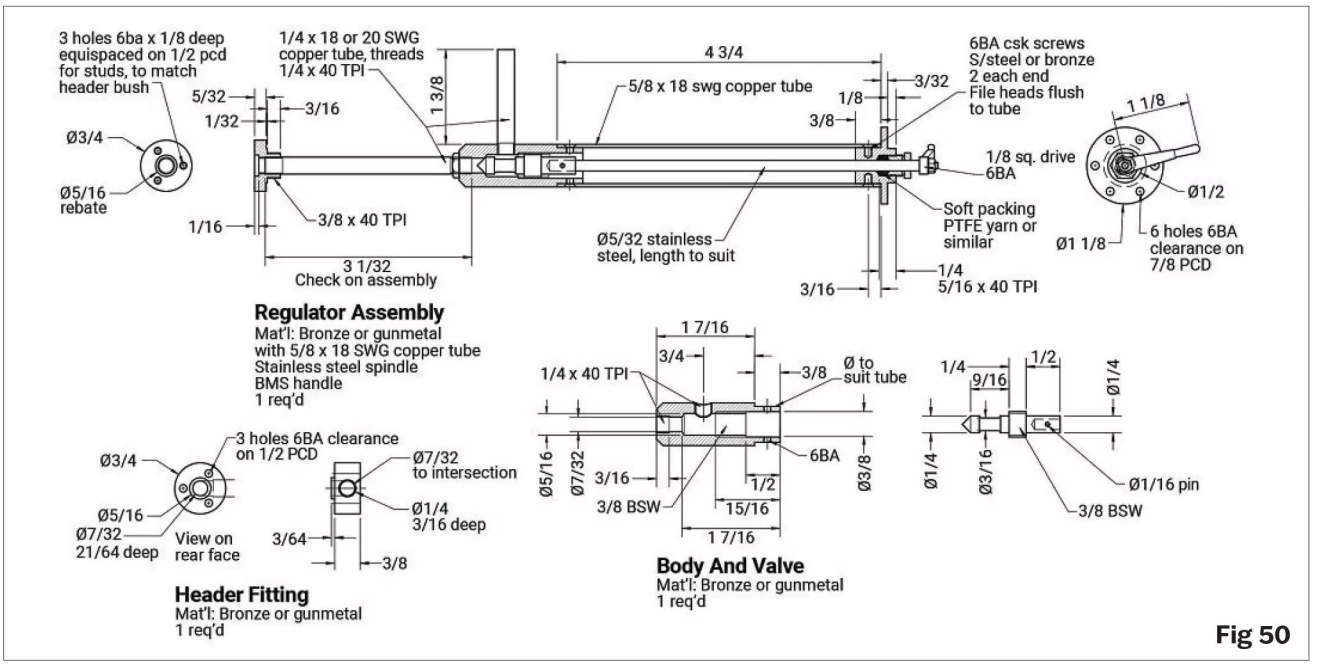
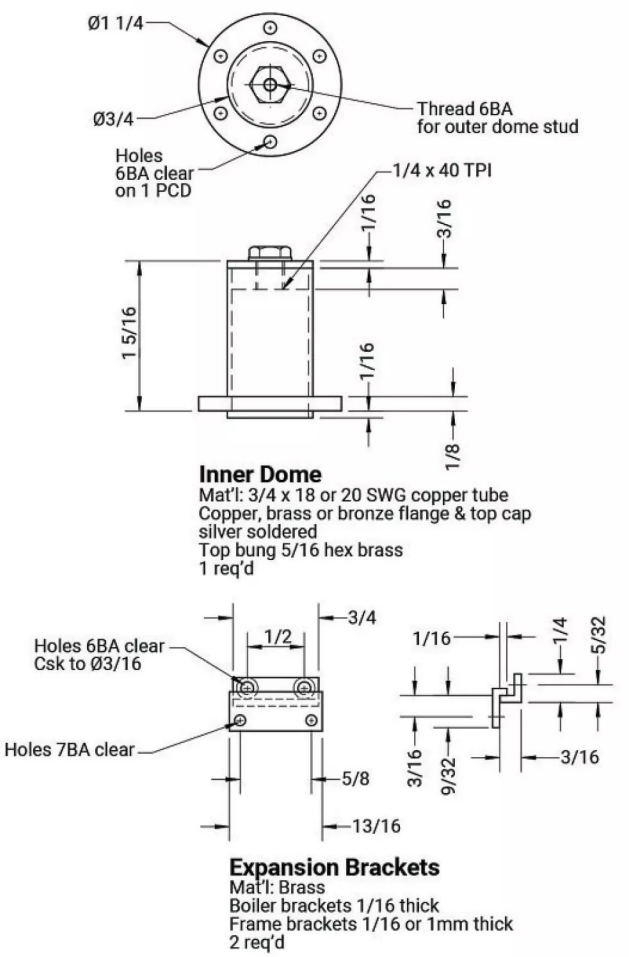


Fig 50

be better done with CupSol or similar.

The boiler can now be mounted in the frames. At the smokebox there is plenty of clearance which will eventually be filled with a sealant. Use shims to set the boiler in the middle of the ring, slide it so that the front edge aligns with the front of the firebox ring, check around to ensure it looks right elsewhere and spot through the two attachment holes before removing the boiler and drilling and tapping them 6BA. The boiler can now be bolted in place and admired pending further work, **photo 119**. I'll admit here that the inner dome in the picture is rather too tall and subsequently had to be cut down. How I made this mistake is still a mystery. The gremlins had a good day.

Fig 51



On a point which may be contentious, I call up bronze and stainless steel for the regulator machined parts, as being the best options because the regulator is not at all easy to get out or inspect. For the easily accessible parts I have found, over many years, that brass is perfectly acceptable, notwithstanding those in our hobby who worry about de-zincification. A little boiler like this one should always be blown down after use and the engine put away dry until the next time. This limits exposure to moisture and stops electrolytic chemical build-up. For those of a nervous disposition, the safety valve will be removed to fill the boiler every time it is steamed and can be used as a condition indicator for parts above the water line. The blowdown can be made with a brass plug which can be periodically removed, say when the annual inspection is carried out, to monitor the state of sub-surface parts. Any pink colouration more than skin deep will be cause for further investigation - otherwise, just carry on.

Pressing on with the build; finish the regulator parts and the front tubeplate bush and associated header fitting. One of my stainless screws for the assembly dropped on the floor and rolled away, leaving me short. Rather than re-order and wait I made a set of phosphor bronze screws and this proved quick and simple,

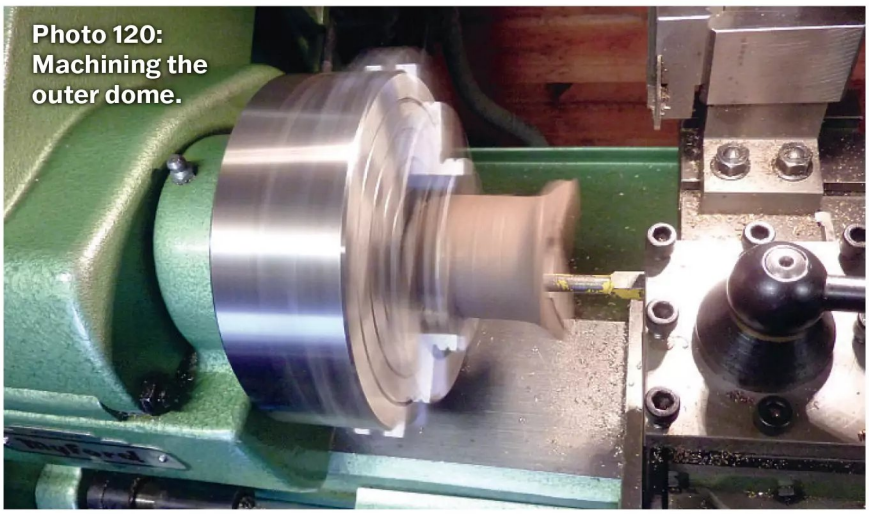


Photo 120: Machining the outer dome.

taking less than half an hour. Assemble the main body, spindle, tube and backhead fitting, sealing the joints. File the screw heads to the tube profile and dry fit the whole assembly into the boiler. Any misalignment can be corrected by bending the front delivery pipe, and any difficulty engaging the front end threads by cutting out and fitting gasket paper under the rear bush. The holes in the front bush need to match the header fitting which should be orientated so that the steam pipe exits to the left or slightly downwards when looking into the smokebox. With the bush tight then these can be spotted through from the header fitting for drilling elsewhere. Now remove and re-install the regulator using sealant on all the fixed joints.

The outer dome, safety valve and bonnet are shown at **fig 52**. Great Western pannier tanks had great big outer domes, far larger than Rob Roy. For this one the casting for the 3 ½" gauge Loch class, obtainable from Blackgates and listed in their Clarkson's catalogue, is just right and satisfies my 'no new castings' criteria. It adds some useful weight too. Most of the finishing can be done with hand tools, but the inner diameter needs to be opened out as per the drawing to clear the inner dome flange. I don't think the chucking spigot is up to the job for this and a 4" Myford chuck is not really big enough to hold the whole dome securely either. Fortunately, my 5" 4-jaw just coped, **photo 120**. The chucking spigot can be used when cleaning the outer surface with files etc. There will eventually be 1mm insulation and cladding sheet on the boiler and this needs to be allowed for when shaping the skirt.

The safety valve is simple turning and will work with just drilled holes rather than square bottom (which is done with a D bit) and reamed, but may fizzle a bit. The spring is light duty and can be easily made from stainless steel wire, from our suppliers, wound around a 1/8" bar then cut off and pulled or pushed to get the right turns, length and load. This load, 2.2 lbf, is simply orifice area times pressure and it can be checked using kitchen scales loaded via a small metal bar into the valve with sufficient accuracy to allow final adjustment during the boiler pressure test. I've specified a silicone rubber O-Ring for sealing, which will work when just finger tight, but requires a home made tool to cut the groove. I put some dimples in the barrel to fit my 'standard' C-spanner just to give it an extra nip, but other options are possible. If the O-ring groove is too difficult then a fibre washer could be used instead but will need the valve to be screwed in more tightly. The outer bonnet can be made from anything as it should be painted, not polished brass, and is fun to turn. I used a piece of brass bar that I bought at a sale years ago and needed to use. For a 90g finished bonnet I managed to catch 360g of swarf, not to mention the rest that sprayed all over the workshop, as brass does (you do all wear eye protection when machining?). Do the job with the lower end facing out so that the rebate can be bored, and use a copy of the drawing to make a simple template to get the outer shape about right. For this job use a round nose tool and finish with files and emery.

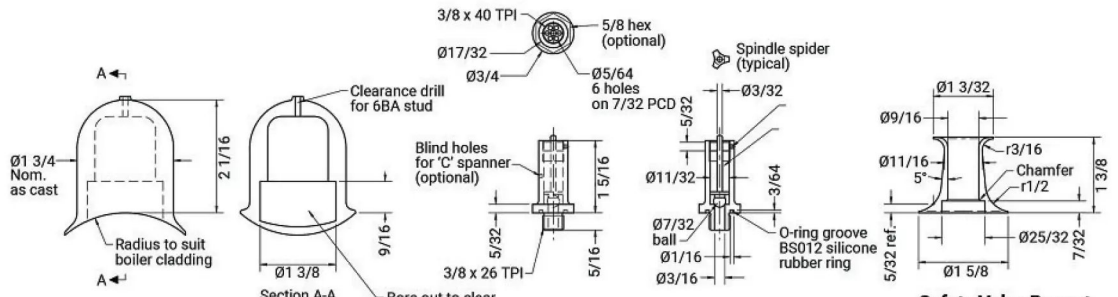
The drawing for the backhead layout gives sufficient information to understand the smaller fittings and is shown at **fig 53**. GWR locomotives generally used wood insulated handles for valves, rather than brass handwheels as we tend to do, and that they would commonly be lined up above the boiler. It's almost impossible to do a scale working layout in a working model this size, but I do follow the above trend. For the model the valve handles can be turned from 3/16" square bar to give a 1/16" handle. To finish, then turn and drill a redwood handle and bond it over the rod using Araldite, and then varnish. Commercially made valves and handwheels are available and can be a time saver, but generally they are a bit over-size for small models, and anyone wishing to use them may need to adjust the design to suit.

I started with the backhead cover and firehole door, **fig 54**. The cover can be made from 28 SWG (0.38mm) brass lagging sheet hammered around the former purchased with the boiler flanging plates. The former should be radiused around the edges to the maximum allowed by the 2mm thickness and backed with plywood. The thin brass material will wrinkle on the external

Photo 121: Comparing plain glass with the red line-backed type.

Photo 122: My home-made pipe bending tool.

Fig 52



Outer Dome
Mat'l: Gunmetal
Make from 3 1/2" gauge 'Loch' class dome casting
See Blackgates 'Clarkson's Of York' catalogue, pattern 3/109

Safety Valve
Mat'l: Ø3/4 or 5/32 hex brass body
Brass spider spindle
Stainless steel spring & rustless ball

Safety Valve Bonnet
(section)
Mat'l: Any rustless material
Make to template

Fig 53

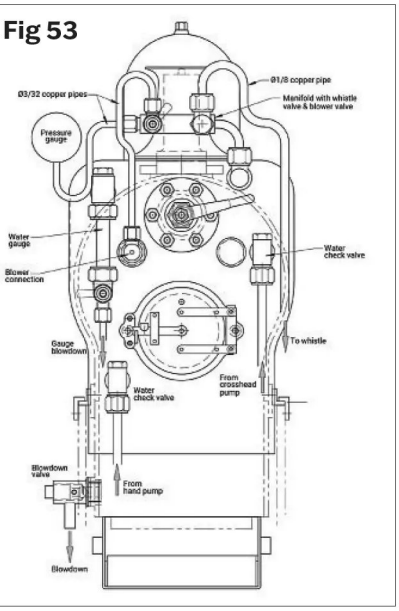
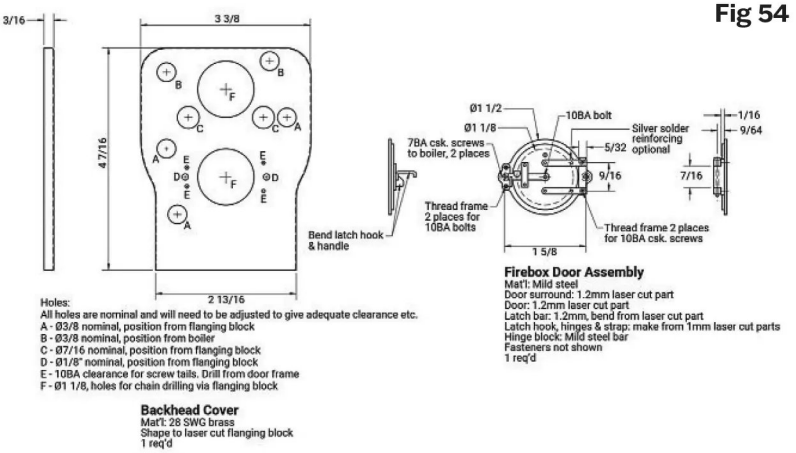


Fig 54



Backhead Cover
Mat'l: 28 SWG brass
Shape to laser cut flanging block
1 req'd

Firebox Door Assembly
Mat'l: Mild steel
Door surround: 1.2mm laser cut part
Door: 1.2mm laser cut part
Latch bar: 1.2mm, bend from laser cut part
Latch hook, hinges & strap: make from 1mm laser cut parts
Hinge block: Mild steel bar
Fasteners not shown
1 req'd

curves, but several annealings and some perseverance will teach it manners. Most of the holes can be pilot drilled from the former (guess who glued it to the wood backing the wrong way up and had to drill from the back face). Clamp the cover between two pilot-drilled pieces of plywood to stop the larger drills grabbing when drilling the holes out to size. I found that the clamped assembly can be restrained by hand as the annealed brass is very soft and cuts easily. The holes are all given at nominal size and some careful opening up with files will be needed to get an easy fit. The top two bushes were not positioned by the laser cutting process so need to be marked onto the cover (I used Engineers Blue) and drilled, to complete the job. There is room under the cover for 1mm of ceramic paper lagging.

The firehole door should really be a sliding type, but on a little boiler like this there's not enough space so a simple hinged one is used. It is made from a set of laser cut parts with just a small piece of bar and some fasteners needed in addition. When ordering, then, get the ashpan parts at the same time. These are tabulated below. Apart from the grate supports these are all mild steel as it takes paint better or can be blackened to resist corrosion, whereas stainless steel does neither and, in my opinion, is too bright. Spray over with WD40 after a run and all will be well.

The boiler fittings are shown in **figs 55, 56** and **57**. These parts were not all drawn for Rob Roy. These days it's worthwhile doing so because by using CAD to confirm sizes and assembly it's easy to make them right first time and

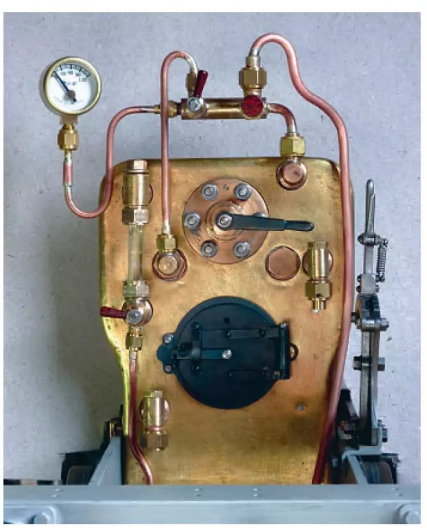


Photo 123: The finished backhead.

Title	M.E. Laser Part No.	Material	No. Required
Fire Door Frame	32939	1.2mm Mild Steel	1
Fire Door	32940	1.2mm Mild Steel	1
Fire Door Latch Bar	32941	1.2mm Mild Steel	1
Fire Door Latch Bar	32942	0.9mm Mild Steel	1
Fire Door Straps	32943	0.9mm Mild Steel	3
Ashpan	33952	0.9mm Mild Steel	1
Ashpan Rear	33953	0.9mm Mild Steel	1
Grate Support	33954	0.9mm Stainless Steel	2

little thought is needed in doing so. One disadvantage is that defining every detail and dimension takes time and makes for a very cluttered drawing. So, with the dimensioning I've cheated a bit and put some of it in as notes as this seems clearer. Done this way, rather than displaying the CAD dimensions, introduces the possibility of errors but having made the parts, I have hopefully found and corrected them all. However I do it, these parts look a bit complicated, but they are not really too bad and, being small, don't actually take too long to make.

The water gauge, **fig 55**, uses 5mm glass as this seems to be the smallest that does not encourage the meniscus to rise far up the inside to give a false reading. This is so for plain glass tube but the red-line stuff appears to be much worse so should not be used without a masking ring around the glass at the bottom to compensate, **photo 121**. I do the right-angle 'tee-pieces' by turning the parts, cutting the threads, then part drilling the 'leg' and putting just a 3/64" hole right through before parting off over length. The leg then has a saddle filed in to give the correct finished length and the cross piece a 3/64" hole in the right place. A simple 3/64" rivet or piece of rod just popped through will generally be sufficient to hold things for silver soldering. The external threads need to be, and can be, cut prior to soldering because only one short acid pickle is needed afterwards and not enough metal will be removed to be a problem, unlike the boiler where

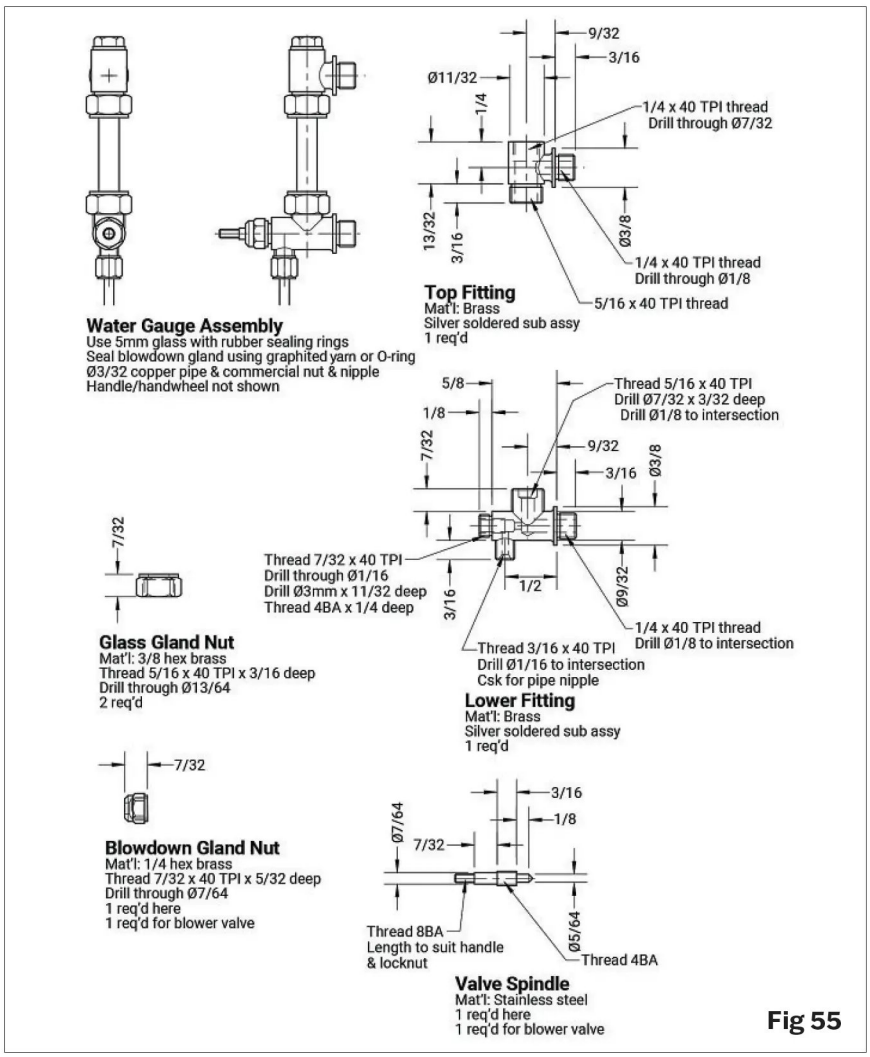


Fig 55

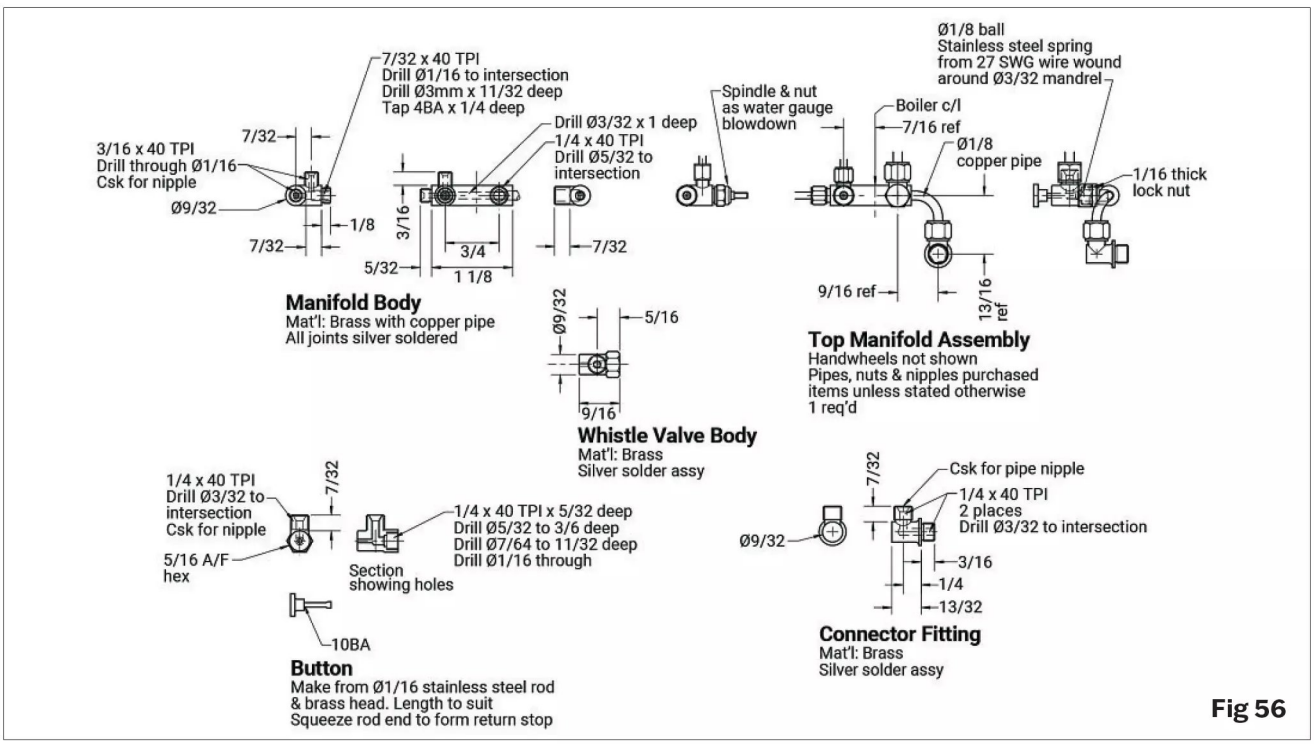


Fig 56

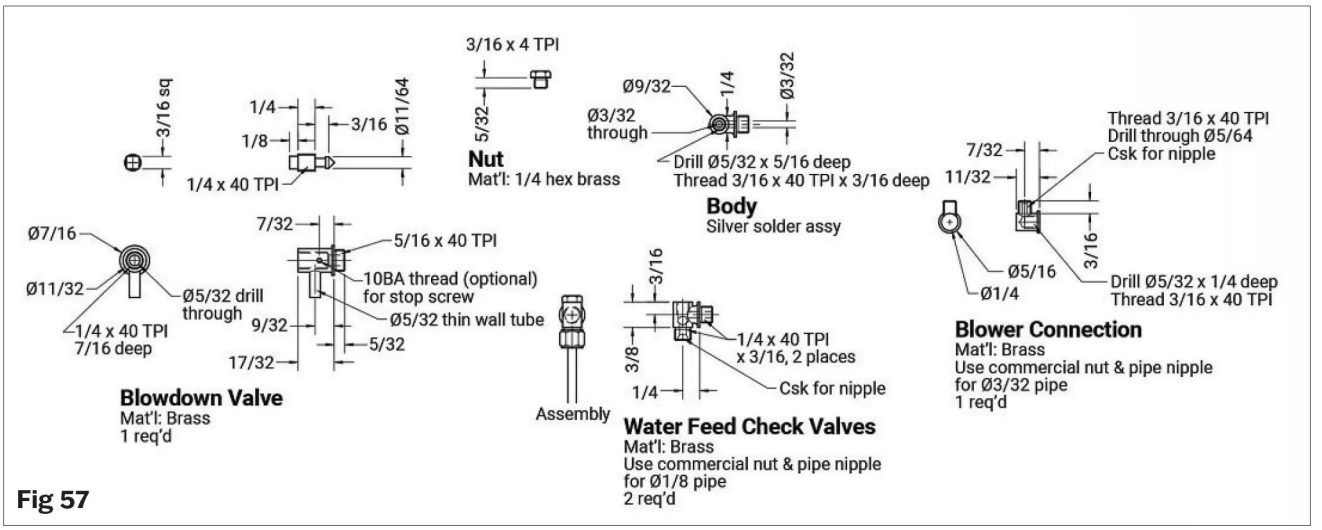


Fig 57

multiple picklings may be needed. Final drilling through and internal threads are done after soldering. Forget to drill through and the valve or whatever will not work (or so I have found). The manifold, **fig 56**, is the most difficult bit but mine worked out first time so is certainly do-able. The whistle valve is as simple as possible; just a push button. It may get hot so I Araldited a little disc of dark wood veneer on the button as an insulator. When varnished it looks good, too, but is not essential. The location of the manifold is not critical, just what can be achieved by pipe bending. It is just held by two pipes at this stage, and even so is fairly stable. A simple cradle for it will be added when doing the cab. The little valve spindles for these parts are turned (at high RPM) progressively from one end, having just enough extended from the chuck each time. So, turn and thread 8BA, turn shank, turn and thread 4BA, turn shank, and finish by parting using the top slide set at an angle to form the point. All the turning and the parting was done with my universal tiny undercutting tool mentioned previously. For pipe bending I use just a piece of bar with a deep groove in it, **photo 122**. Annealed pipe will go around surprisingly small radii using just this simple tool. Any flattening on the outside of the bend can be corrected by squeezing the bend flatwise in the vice. The other parts, **fig 57** - the blowdown, check valves and the blower connector - are comparatively simple. Finally, I've not drawn a whistle

Photo 124: My technique for avoiding the inevitable 'run-off'

Photo 125: A collection of finished boiler fittings.

Fig 58

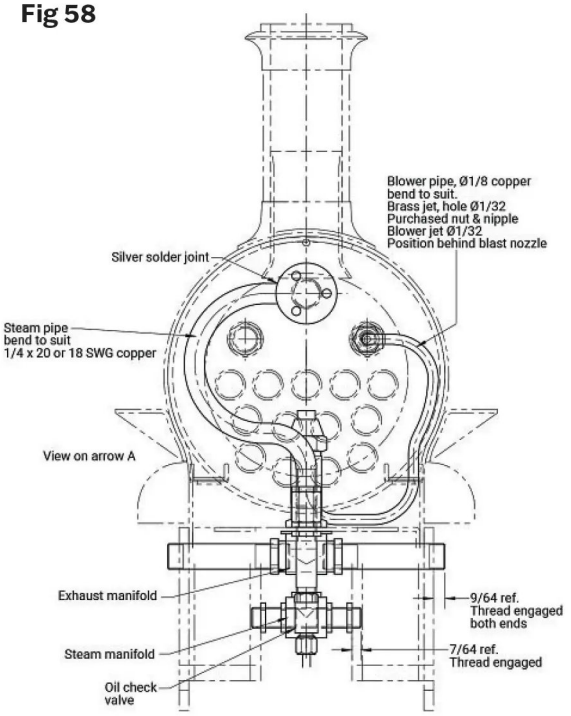
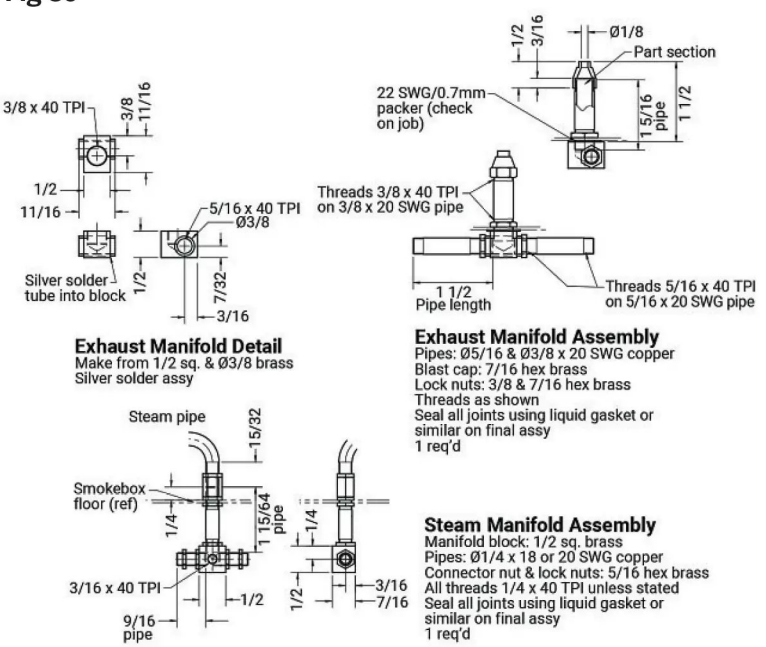
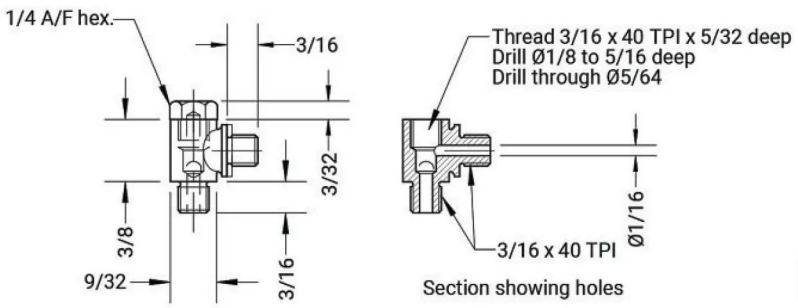


Fig 59





Oil Check Valve
Mat'l: Brass
Use Ø3/32 ball
Drill hole into top nut for spring
1 req'd

Fig 60

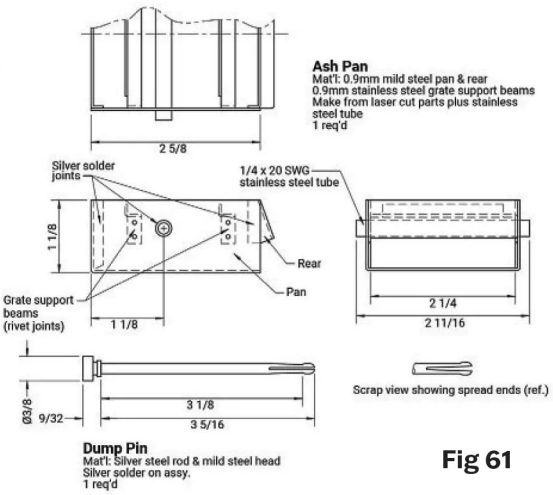


Fig 61

as there are lots of designs already out there, including in the Rob Roy book, or one can be purchased. The finished backhead, just awaiting water feed pipes, is shown in **photo 123**.

The layout of parts in the smokebox is shown at **fig 58** and details of the manifold assemblies and pipes at **59**. The layout is similar to Rob Roy which, I have to say, is not ideal as the flow paths have sharp right angle bends and are not very smooth. To mitigate this, make sure any parts which may be in the steam inlet or exhaust flows, the inside ends of pipes etc., are all thoroughly de-burred.

The two manifold blocks are made from ½" square brass. The smaller one, for the inlet high pressure steam, is quite simple, needing just some holes to be drilled and threaded. The exhaust block needs to be a bit wider so that the pipes can be inserted between the frames but still have some thread engaged when screwed into the cylinders. This is achieved by soldering in a tube made from 3/8" brass bar threaded internally 5/16" x 40 TPI in the lathe. The intersection between this 5/16" hole and the exit 3/8" threaded hole is offset and needed some thought as I found that when the 3/8" thread hole is drilled it will run off when it breaks through. To get around this, take a piece of 5/16" brass bar and put a thread on it long enough to go right through the block. Screw it in then drill and tap the 3/8" x 40 TPI hole. Finally, unscrew the bar and throw it away. These parts are shown in **photo 124**. Bending the steam pipe takes a bit of care but if annealed each time as soon as it work hardens is not too difficult. I tried to make the threaded joint underneath the smokebox where it will be cooler, but the pipe turned out to be too long to assemble onto the header studs. Copper is lovely stuff and I annealed it and re-bent it to join up inside the box. Threaded sleeve and nuts as shown are my usual jointing method but do need a high temperature sealant. The single jet blower is simply positioned behind the blast nozzle and will be found to be sturdy enough. The jet is just a short bush with a 1/32" hole. This is a bit smaller than Martin Evans recommended but is perfectly adequate so why waste steam with a bigger one? The blast nozzle started at 9/64" diameter but more suck was needed to get enough air through the small deep fire so I reduced to 1/8" which is close to the Martin Evans's general recommendation of 1/7 cylinder diameter.

I'm not sure why 1/8" pipe is generally used for the cylinder oil supply as the flow is tiny and 3/32" pipe makes for a much neater job. My oil check valve, **fig 60**, is designed accordingly but feel free to use larger pipe and the commercially available Rob Roy check valve if you wish to save some time. I make the tiny springs for these valves from 0.0085" (35 SWG) fishing wire but this is now on the unobtanium list so unless you have some already then you've had it. An alternative, ready-made spring which can be cropped to length may be found under the flint in a disposable lighter, or try an auction website - search for micro miniature springs. The finished parts, ready for fitting, are shown in **photo 125**.

Dry assemble the smokebox, boiler and piping to check that it all fits before even thinking about sealant. Note that the boiler and smokebox need to be bolted together before dropping the whole lot between the frames. Trying to tilt the boiler to slide into an already mounted smokebox will foul the rear horns. Depending on your plan then if you are going to dismantle the whole locomotive for painting then don't seal anything now. This is my usual route, but this time as I want to test run the engine before publication, then I sealed all the joints. Painting will be done at some time beyond testing, maybe. A view inside the finished smokebox is shown in **photo 126**. Because there is no superheater then the space is much clearer than on a Rob Roy, and there's good access for tube cleaning etc.

The ashpan, **fig 61**, is simple enough to make. I've marked the fold lines on the laser cut part and these assume a sharp bend with the line marking the position required for the finished folded flap or side with the pan bottom clamped under the folding bar. Folding methods vary and my tools will not be the same as yours, so some variation of results between us is likely. Hopefully there's enough allowance in the design to make things work. The pan should be a sloppy fit on the boiler to allow for movements. The dump pin runs through a stainless steel tube. Stainless just loves stainless so the pin must be made from a different material otherwise it may grab the tube and seize tight. The slit in the pin needs to be as fine as possible and I again used a piercing saw. If it's too difficult then drill out the holes in the pan and frames and use 3/16" bar for the pin. I've not drawn the grate. Make one to fit from pieces of bar, making the gaps at least 5/32" wide, or do as I did and purchase a small piece of stainless steel grate from Blackgates. This latter, though, proved to be unsuitable as purchased and needed slimming down and the gaps widening before the engine would steam properly. I plan to draw up a model for a laser cut version under 'improvements' when I find time.

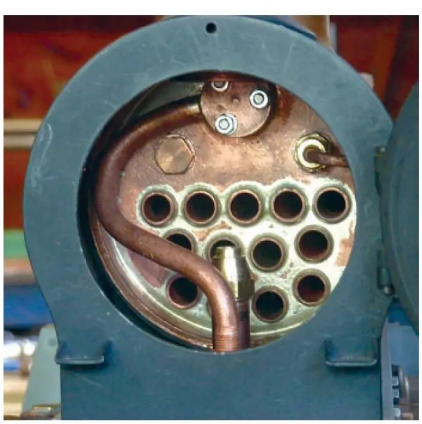


Photo 126: A view inside the smokebox.

On the Wire

News from the world of engineering

The Midlands Model Engineering Exhibition

Meridienne Exhibitions look forward to welcoming you to the UK's largest model engineering exhibition, the Midlands Model Engineering Exhibition, taking place from Thursday 16th to Sunday 19th October 2025 at Warwickshire Event Centre.

There will be 35 clubs and societies present displaying hundreds of exhibits covering a wide range of modelling skills. There will also be 39 of the leading model engineering specialist trade suppliers, all waiting to meet you and provide everything you need for your modelling activities. It looks to be a jam-packed exhibition – don't miss it. Book your tickets now!

This year the Society of Model & Experimental Engineers are featuring practical advice for newcomers to model engineering and the stand will feature demonstrations and advice covering lathe work, milling, computer aided design, simple CNC machining and 3D printing. SMEE members will be on hand to give advice based on their experience. The stand will also feature the range of activities the Society has to offer, some small projects useful for gaining experience, recent competition winners, interesting work in progress and relaunch of training activities.

Neil Wyatt, editor of the combined magazine *Model Engineer & Workshop*, will be hosting a series of expert talks again this year. Expect a fascinating series of presentations covering a wide range of different aspects of the hobby. The schedule will be released soon as the final arrangements are being made now.

The competition and display entries are now open, and the entry form can also be downloaded from the website. Fully completed models are welcome to the competition and any part-built models can be put in the display categories so visitors can see the work in progress!

Entry is free and prizes for 1st, 2nd and 3rd will be awarded by the judging panel. Judging will take place on Thursday 16th October with the awards ceremony on Sunday 19th October. Entering a model into the competition or display also gives you 2 days' free entry to the exhibition! Closing date for entries is Monday 22nd September.

There will be live action from the Fosse Way Steamers, Gas Turbine Builders Association, Model Engine Makers, Steam Apprentice Club, The Society of Ornamental Turners, Stirling Engine Society and the UK Micromouse and Robotics Society.

This unique exhibition is the result of a tremendous amount of effort by many hundreds of modellers and other enthusiasts.

A full list of confirmed exhibitors to date is available at www.midlands-modelengineering.co.uk as well as the competition entry form and all the latest news!

Ticket Prices: Adults: £13.50; Seniors (65+): £12.50; Children (5-14 years): £5.00; Under 5s: Free. Tickets are valid for any one day and can be purchased in advance via the exhibition's official website.

Facilities: The venue offers free parking, restaurant and coffee shop facilities, and a shuttle bus service from Leamington Spa Railway Station on Thursday 16th October (charges apply). For the latest updates and detailed information, please visit the official exhibition website: www.midlands-modelengineering.co.uk.

University of Warwick School of Engineering 2025 Honorary Graduate: Colin Furze (Hon DSc)

As part of the School of Engineering's 60th anniversary celebrations, Warwick University has awarded Colin Furze an Honorary Doctor of Science (Hon DSc). Colin Furze is a British inventor and YouTuber known for his imaginative and often outrageous engineering creations, including a hoverbike, underground bunker and several world-record-breaking inventions. Originally trained as a plumber, Colin has built the world's longest motorcycle, a 71-mph mobility scooter, and even a motorised pram. His YouTube channel has attracted over 13 million subscribers and 1.8 billion views worldwide. Widely credited with making STEM engaging and accessible to younger audiences, Colin has also appeared on television in both the UK and Germany.

In his acceptance speech, Colin shared insights into his journey: "When I started my YouTube channel nearly 20 years ago, I just saw it as a way to entertain. It became a bigger classroom for me to share my projects. I wanted each build to be different, whether it was using a tool in a new way or making jet engines out of lorry turbos. Each one pushed me to try something unique."

arceurotrade.co.uk
UNBEATABLE VALUE ENGINEERING PRODUCTS

Arc Euro Trade - A Message from Ketan Swali

This is just to let everyone know that Arc Euro Trade is in the process of closing the engineering tools and machinery part of the business.
To achieve this goal, we are selling off certain products to our competitors. At the same time, we are selling off products at discounted rates to end user customers via marketing emails to our mailing list subscribers and via google search promotions.
The result is that a good range of certain products/categories are sold out. In turn we are getting calls and emails from potential customers enquiring when we are likely to get new stock, especially for items which are now out of stock.
Initially, the plan was to continue the business, if I could find a suitable buyer for it, or, if I could see a natural progression/successor. So my team has been advising potential customers that they didn't know when a certain item will come back in, and/or it could take between three to six months.
However, as continuation is an option which is off the table, and as I have now made a clear decision to close the engineering tools and machinery part of the business, we will not be re-stocking any product once it is sold out.
My apologies to potential customers for any inconvenience due to this. Moving forward, my team has been advised to direct enquirers accordingly.
Most of the stock we are selling off now is being sold at a loss, just to raise cash for the items we still have. The discounted prices give the customer the opportunity to buy a 'usually more expensive' product cheap, but only while stocks last.
To avoid speculation, I would like to clarify that Arc Euro Trade Ltd. is financially sound and reason for closing is that I wish to retire.
Thank you, Ketan at ARC

Ex-Woodhams Yard Locomotive to feature in new Harry Potter Series

The planned TV series of the Harry Potter books will feature the Great Western Railway 4900 class steam locomotive *Wightwick Hall*, playing the part of the 'Hogwarts Express'. The 4-6-0 mixed-traffic engine was restored by Buckinghamshire Railway Centre volunteers and was salvaged from Woodham's Scrapyard in Barry, South Wales, in 1978. The restoration took 40 years. Quainton Railway Society, which runs the centre, said it was "extremely proud" that the locomotive would "play the role of the iconic locomotive for the Hogwarts Express".
In the earlier Harry Potter films the role of the Hogwarts Express was played by *Olton Hall*, another survivor from Woodham's yard.

Wimborne District Society of Model Engineers 50th Anniversary celebrations

The society held their golden anniversary event on Sunday 25th May by gathering together over fifty miniature steam engines. The fifty engines were to signify the 50 years of the club's operations. The mayor and mayoress of Wimborne, along with the town crier, attended to open the proceedings, and with the majority of society members present witnessed a day of friendly interaction. After a short speech by the mayor an anniversary cake was cut by the president, John Ilott and was shared with the members.
The southern armoured group gave displays with their 1/10th scale radio controlled tanks and military vehicles. Our neighbouring model railway club, the South Western MRC opened their club room and exhibited two layouts of 4mm and 7mm scale. It was good to welcome visitors from other model engineering societies, some brought their locomotives to run on the 5" track. The public were enthralled to see the gauge 1 and 16mm layouts operating their live steam trains. Enthusiasm ensued and the day was enjoyed by everyone.

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 **meweditor@mortons.co.uk** marking them 'Readers Tips', and you could be a winner. Try to keep your tip to no more than 400 words and a picture or drawing. Don't forget to include your address! Every month we'll choose a winner for the Tip of the Month and they will win **£30 in gift vouchers from Chester Machine Tools**. Visit **www.chesterhobbystore.com** to plan how to spend yours!

A Jacot Tool for Long Workpieces

This tip for upscaling a watchmaker's tool is from Dr Peter Venn:

I thought you might be interested in my solution for turning narrow bar stock in the lathe.

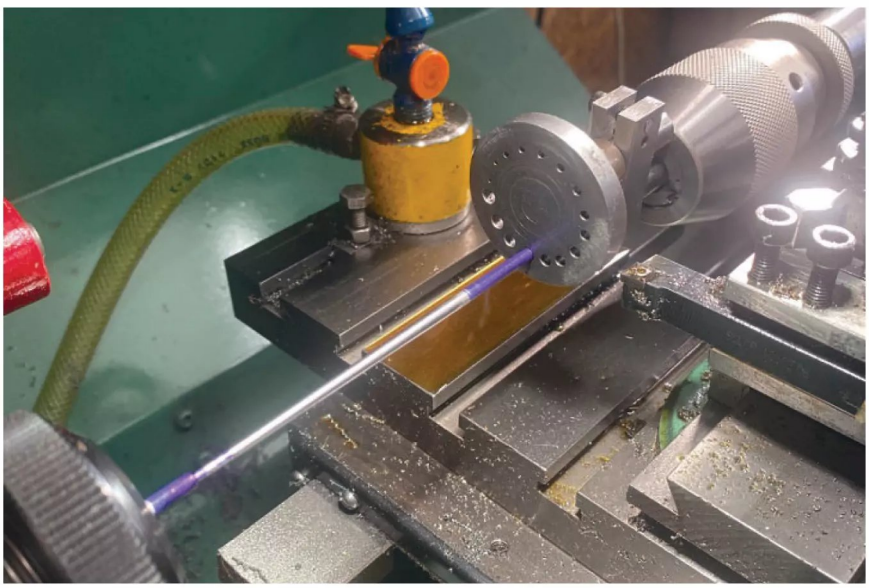
I am building Don Young's 5" gauge O2 and I am making the vertical hand posts which are positioned one each side of the entrance to the cab and also the front of the side tanks. They are 1/8. inch diameter at the bottom tapered to 1/16. inch at the top over 3¾ inches. As everyone knows, it is difficult to machine narrow stock like this in the lathe.

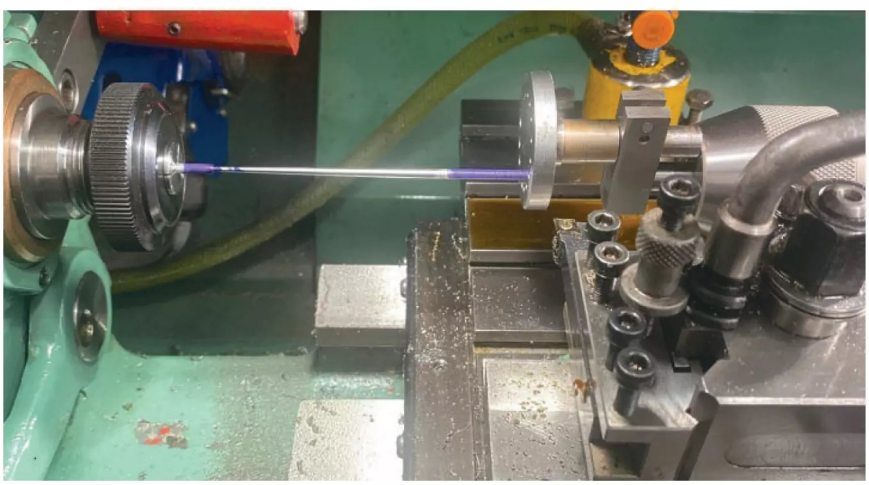
However, it occurred to me that using a Jacot clock maker's pivot tool would be a possible solution to 'tailstock support', and it seems to work well. The Jacot tool is familiar to clock and watch makers who use it for burnishing pivots when servicing and repairing. I made mine some years ago for my interest in repairing antique clocks.

I have used the closed drum in the tailstock. This would normally fit in the head stock and there is an open drum which is exactly the same, but with the rim machined away leaving the holes as U-shaped gutters where the clock pivot sits for burnishing. The drum has a series of increasing diameter holes to hold different sizes of pivot held at centre height on the lathe.

I have used the device to cut a taper on 1/8" bar stock and it works really well. I hope the accompanying pictures demonstrate how I used it. You can also file between the collet and Jacot drum to get the final shape exactly right.

One of the finished posts is shown in the last picture.





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.

Club News

Geoff Theasby reports on the latest news from the clubs.

We went to the Sheffield steam rally and were agreeably pleased to see that it was clearly signposted from the M1. We didn't see much exotic machinery on the way there or back, but there were several examples on the rally field. This unrestored 1930 Renault KZ5 panel van, for instance, **photo 1** and an old tinplate Marshall traction engine, **photo 2**. Some bits of this model are out of scale and it seems very crudely made, possibly intended as a toy. A Ransomes threshing machine was operating, but without any straw to munch on; unguarded flat belts flying and powered by a portable engine in fine condition. I have never seen this working combination before so it was really good to watch, **photo 3**. Another one to watch was the Gallopers, with musical accompaniment from a fair organ.

I wasn't able to include in the last issue the GMES signalling cable layout map. This is reminiscent of the well-known London Underground map in that its cable access points are shown relative to its neighbours rather than a precise geographical location. I can't print it here as I can't get a sharp enough image so readers will have to visit GMES or join the Society to see it.

A 53-lot live steam auction on 4 July was held in Sheffield, mostly a collection from a single source. Prices averaged £200 - £500. All well made. Notable were two James Coombes, a Sweet Pea (£2500/£3000) a reversing winding engine, an exhibition quality pumping engine, paddle boat reversing engines, a twin Victoria, A Kacio (Chinese) reversing vertical and possibly asking the lowest estimate in this auction, (£60 to £100) a reversing, all brass, twin boat engine and many others. I have placed a copy of the catalogue in the Sheffield Society of Model and Experimental Engineers' library.

One of Sheffield's recent auctions sold a violin, made circa 1900, which they faithfully report had an internal label baring the legend, 'Stradivarius'. I kid you not. This fine portable engine, **photo 4**, was at Claymills Pumping Station (see CN 4767). I don't see many such fully restored engines.

Photo 1: Renault KZ5.

Photo 2: Marshall tinplate model.

In this issue; an auction, a threshing machine, radar, marker pens, an inquorate AGM and a dribbler.

Halesworth and District Model Engineering Society, Summer, begins with the after effects of Lowmex, in that money was raised to help young Tommy who is severely epileptic. Air conditioning for his bedroom, a sunshade for his wheelchair and his car modified with an Isofix fitting, all provided by the Society. Tommy is going to the USA this summer to help with research into severe epilepsy, thanks to Halesworth's generosity. John Child built a Stirling beam engine using bits of scrap and hard disk drives, encountering several vicissitudes along the way. It is based on Darryl Boyd's website (www.boydhouse.com/stirling/index.html) W. www.hdmes.co.uk

PEEMS, June, from Pickering Experimental Engineering and Model Society runs an article by Brian Mulvaney on WWII radars at Ravenscar. North Yorkshire. This is one of my interests, partly because the nearby GCHQ outpost is on land that was occupied by my family up to the mid-1930s and partly because it tallies with my amateur radio interests. I very much enjoyed his piece. Ravenscar was Yorkshire's first working radar. W. www.peems.co.uk

Photo 3: Ransomes threshing machine under power.

Gauge 1 Newsletter and Journal, May, has a fine picture of young Andy filling a Southern locomotive boiler with water. Inside (the newsletter, not the boiler...) Robert Anderson makes a cylinder drain for his Johnson 4-4-0. An unusual locomotive is a Mason bogie 2-8-6 (not a misprint!). Some past models leave one wondering why the maker spent so much time on it. A photo shows a Birmingham 'dribbler' made in 1880. By contrast, a GNR 8 foot Single is practically perfect. Other modellists (sic) should confine their activities to paper only, says the writer. Photos have been requested.

Plymouth Miniature Steam sends Goodwin Park News, Summer, which opens with Editor, Phil Chant's report of record-breaking attendance figures and the shop stock regularly running low and being replenished several times. A new model engineering exhibition has been scheduled for next year in Newton Abbott. Junior member, Alfie had gained an apprenticeship with Babcock and another junior member has already been apprenticed to Ambrosia and has been awarded the County's Trevithick STEM award. *Dear Christopher* is a new book detailing the origins of the *Thomas the Tank Engine* stories. Ty Daly builds, from a kit, a Montezuma, a 2-4-0 for the Denver and Rio Grande. The laser cut kit parts are raw wood finish and he tried furniture marker pens, then felt markers and metallic Sharpie pens. The kit is not motorised, nor is there provision for it, but there is room for a small motor. He found some 8mm ball bearings for the tender which are a great improvement. The kit is from R. Duck Locomotive Works in the USA. (www.rducklocomotiveworks.com) W. plymouthminiaturesteam.co.uk

Model and Experimental Engineering, Auckland's Newsletter has Murray Lane writing up the various projects he has worked on over the years. The first are a 21 foot yacht and the restoration of a Niagra

Photo 4: *Portable engine at Claymills.*

Pobjoy aero engine. John Burnett brought a book on *The Discovery of the Bismark* by Robert Ballard, in which Mr. B. suggests that the *Hood* had no deck armour to save money. (This is not what I thought was the case. The 'battlecruiser' concept was championed by Admiral Jackie Fisher and the ships had reduced armour to be able to travel at much higher speeds than the contemporary battleships, approaching 25 knots, but retained the large calibre guns - Geoff.) Graeme Quayle updates his model Newcomen engine.

The Gauge 3 Newsletter, Summer, from The Gauge 3 Society opens with Ian Harper's interview with U.S. modeller, Barry Boggs and describes some of his work. One is this Northern Pacific Mikado. For those fond of civil engineering and other stationery models, John Tuckett surveys the buildings on his layout including this one, modelled on Damems station on the KWVR. Sydney A. Leleux remembers reading *Model Railways and Locomotives* magazine as a child. Imagine his joy at finding that the G3 Society had a set of these, which was published from 1909 to 1922 and latterly carried Everyday Science in its pages. Some of the ES articles had little to do with railways, pumping out the Zuider Zee and after death 'spirit' photographs, for instance. One item decidedly not railway or locomotive was a Maxim Norfdenfelt quick firing gun using 0.22 cartridges. From the text it may have fired automatically, using the recoil to load the next projectile. It sounds positively lethal! Henry Greenly and W.J. Bassett-Lowke were the editors. W. www.gauge3.org.uk

Hutt Valley and Maidstone Model Engineering Societies sent two editions of Blastpipe, their joint newsletter. The first, for June, began with Caleb Scott who showed a brass model locomotive from Japanese Railways, as given to footplate crews on retirement. John Antliff built a Bodmer sliding cylinder engine, which was quite a challenge in that there are a multitude of steam joints and the large mass of the rising and falling cylinder tends to make it go walk-about. John has added counterweights to the crankshaft, with limited success. As far as he can tell, there was never a full size version made. It is driven by a stepper motor, as the torque from a brushed DC motor is not constant. The July issue reports from the AGM, which was found to be inquorate, leading to urgent phone requests for additional members to make up the numbers. There are still no nominations for Secretary or Treasurer, therefore a Special General Meeting had to be held a few weeks later. If these posts were not filled, the Society may have to close. A good photo shows Brian Hawke on his jigger, built with two tubular steel office chairs and the drive is by bicycle chain, **photo 5**. W. www.hvmes.com

Reading Model Engineering Society's Prospectus, for July, has Editor, John Billard spending a weekend aboard *S.S. Shieldhall*, giving a good view of *Queen Mary II* in Southampton, taken by John from the emergency steering position right aft. Wolverton Pug went to Czechia, noting the Skoda trains and trams. As they disembarked by the river they saw a single decker bus absolutely covered in graffiti. Not a place to loiter after dark! Terry Wood has been detailing his 5 inch gauge diesel. John Billard then relates the best day of his life; he was taken round Swindon Works where he managed to 'cab' a freshly painted Hall class locomotive and had an unplanned sight of *City of Truro* on a short train. A perfect day for a 14 year old boy. John Spokes returns with the second part of his piece about Taylors bell foundry where he sadly notes that the method of tuning the bells is now run by computer, which has a familiar ring to it (ho ho!). He noted that the workforce appears to be relatively young and that the company can provide a complete service. The bell frames are usually oak, ash and elm and assembled on an adjustable jig, but metal wheels are often fabricated from steel. Several photos from their Open Day feature all but one locomotive in green - and that is bright red! W www.rsme.uk

Photo 5: Brian Hawke on his jigger at HV&M.

Rochdale and District Model and Experimental Engineers' committee were approached by three younger members with a proposal for a special event. In an abridged report from Treasurer, Bob Hayter, it transpired that this was to celebrate Armed Forces Day and with much burning of the storm lanterns and Tilley lamps, became an event attended by the Lord Mayor and Littleborough Brass Band (who played mobile, on the last train, filling four carriages: the tune was Slaidburn, by William Rimmer, as they claimed not to know the Thomas theme music). The juniors were to do most of the work, including organising and raising funds for bunting, decorations and a 100-seat buffet. They proposed running trains as usual, but rattling donation buckets at visitors and passengers. Cadets from all three armed forces arrived and set up their stalls and displays. The organisers, being all youngsters with a combined age of 45, did a superb job. The proceeds were shared between Help for Heroes and Soldiers, Sailors and Airmen Families Association. And finally, humorous conversation at the dinner table recently referred to the North and how its residents would deal with an alien invasion. Parallels were drawn with the *Lord of the Rings* characters, including a slimy serpent whose favourite saying was *Eee, by Gollum...!*

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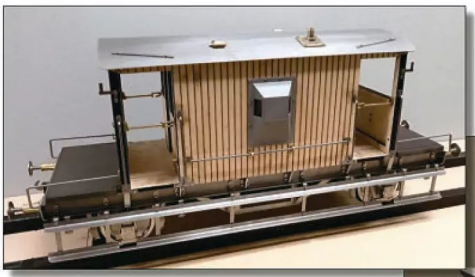

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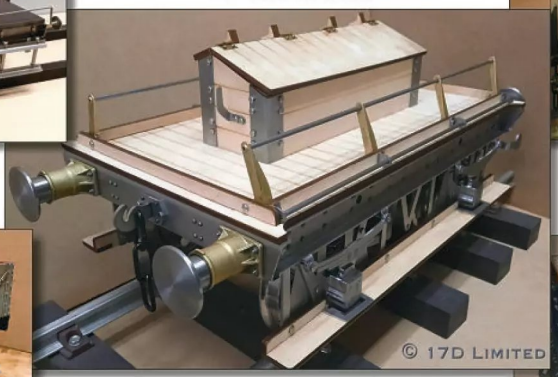

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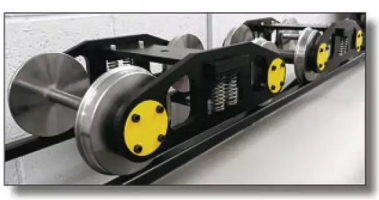

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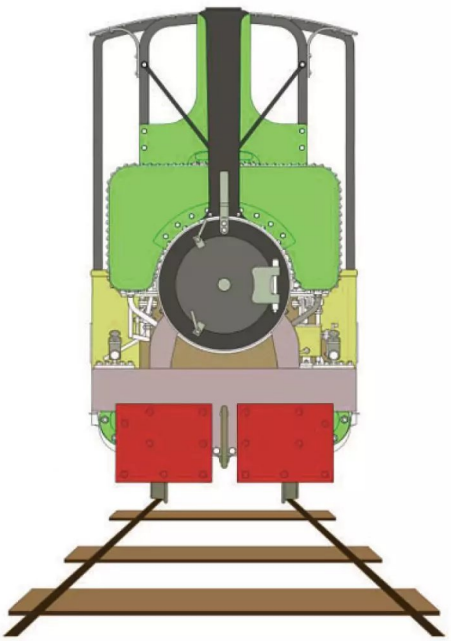

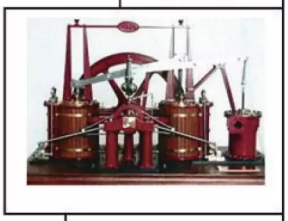
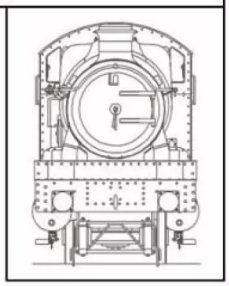

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