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THE MAGAZINE FOR MODEL ENGINEERS

ENGINEERING in Miniature

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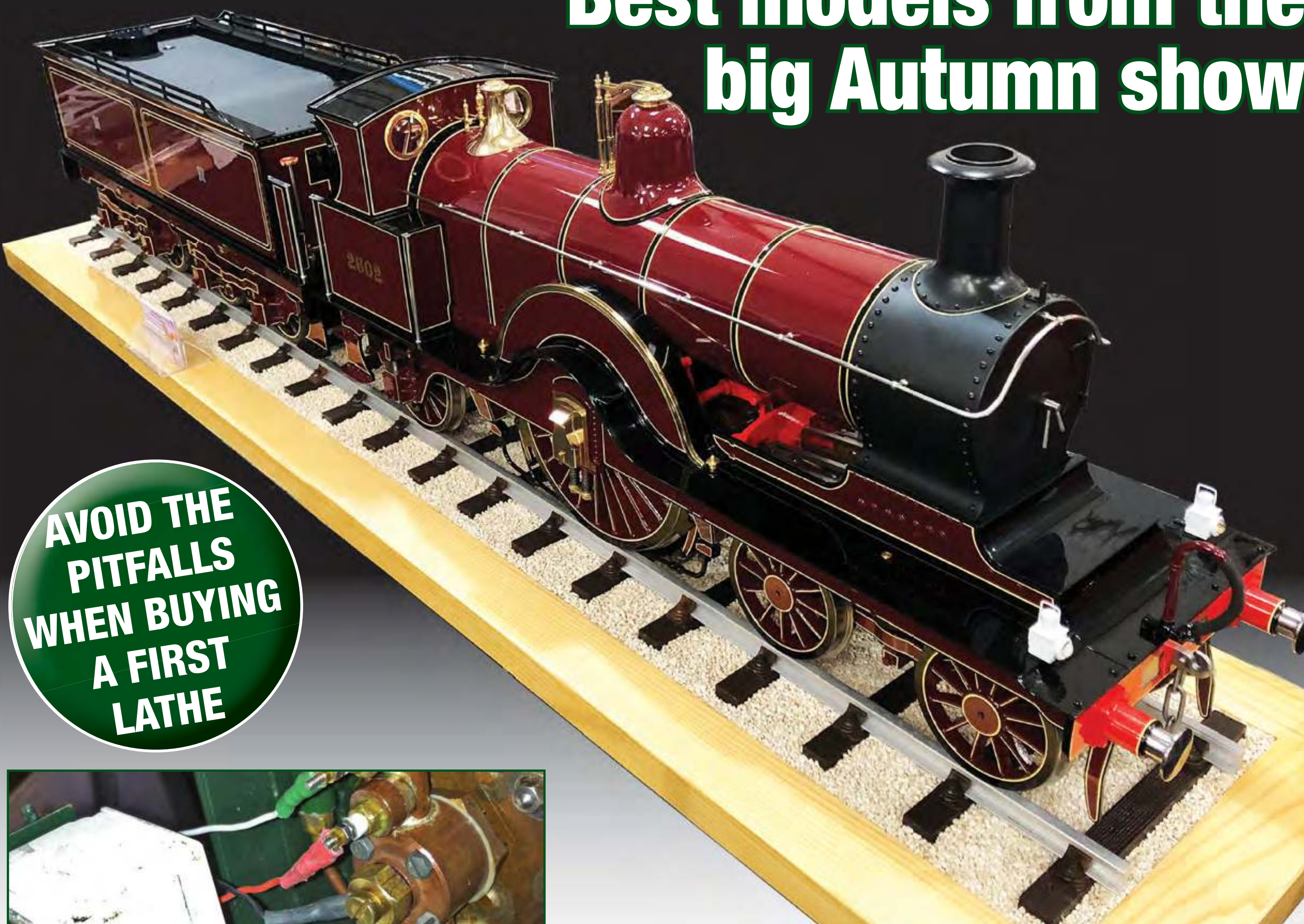
Midland at the Midlands

Best models from the big Autumn show



AVOID THE PITFALLS WHEN BUYING A FIRST LATHE

ELECTRONIC WATER GAUGE FOR A 5-INCH LOCOMOTIVE

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DECEMBER 2018 Volume 40 Number 6

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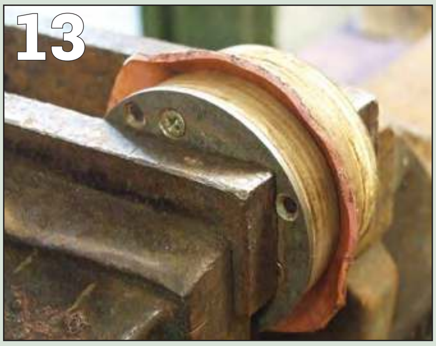

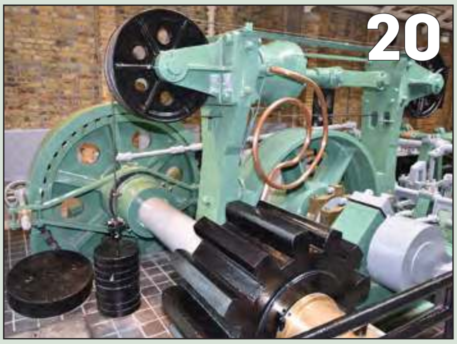

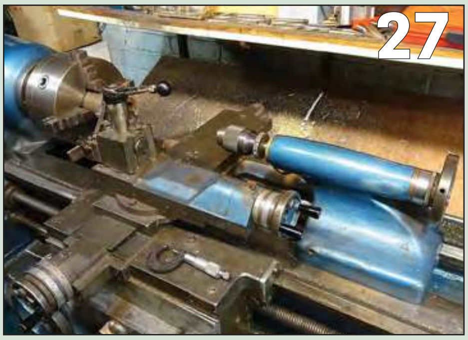

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FRONT COVER

This superb Midland Single earned only a second prize for Alan Boot at the Midlands show in October. The editor did not agree with a comment he heard from one visitor saying it was "too shiny." What do you think?
Photo: Andrew Charman

EDITORIAL

Just how pristine should models be?

Welcome to EIM. Highlight of the past month for me was without doubt the Midland Model Engineering Exhibition. As ever it was an enjoyable show and John Arrowsmith starts his traditional full round-up in this issue, but I want to share with you one incident involving the engine pictured on our cover.

I was standing admiring the excellence of Alan Boot's work when I could not help hear the conversation of two visitors standing next to me. "There's something not quite right about that," said one. "Too shiny?" replied the other...

I thought long and hard about that comment. The model was certainly pristine, and would happily grace a (large) mantelpiece. But to me this was 'ex-works' condition and looking good for it. Can a model really be 'too' shiny? If you have a view, write and tell me!

Doug Hewson's Y4 project

Regular readers of EIM will recall that this series was suspended a while ago due to some health issues for builder Doug Hewson, and we have received enquiries about the future of the project. Well we are pleased to report the Doug is well on the mend and has been doing some work on the model, but it will be a while yet before we are able to resume the series.

We are sure all readers will join us in wishing Doug a continued smooth recovery, and meantime he says he would be pleased to hear from readers who have been building the loco – he can be contacted at doug@the-hewsons.co.uk

Send us your shorts

I've stated before that we really like to see contributions from readers and we do pay for what we use. But they don't have to be long articles or multi-part features. I'd really enjoy receiving some shorter items, perhaps tips from a particular workshop session, interesting encounters while building a model and the like, of say 500 words or so with a couple of pictures. If you think you may have something suitable, by all means send it to the address below – go on, pass on your experiences to your fellow readers!

Andrew Charman – Editor

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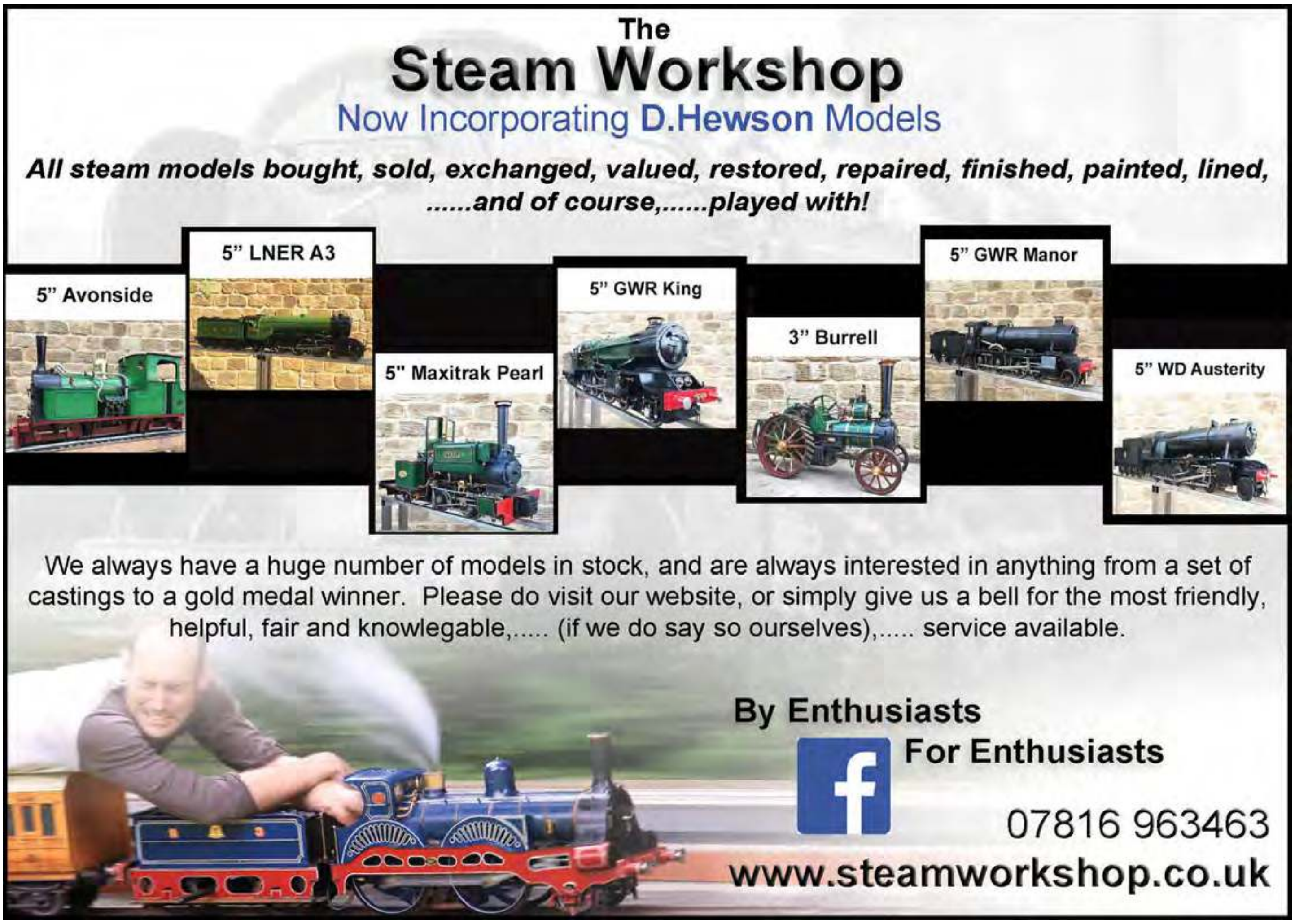
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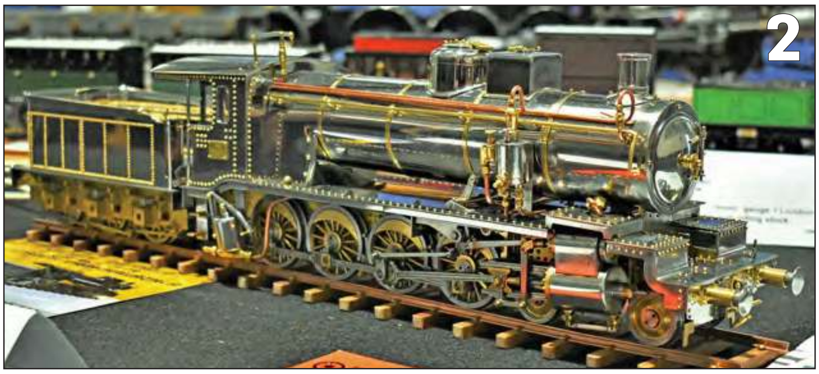
2018 Midlands Model Engineering Exhibition

John begins his two-part round-up of this year's edition of the big Autumn show.

BY **JOHN ARROWSMITH**

The 41st Midlands Model Engineering Exhibition opened for its four-day run at the Warwickshire Event Centre on Thursday 18th October with a veritable feast of quality model engineering on show, plus an international flavour to add to the proceedings.

Competition entries were present from France, Italy and Malta as well as two overseas trade stands from Germany and China. In the 15 years I have been reporting this show I cannot remember that happening before. And a really pleasing aspect of this year's exhibition was that only three classes did not attract an entry, a nice improvement over recent years.



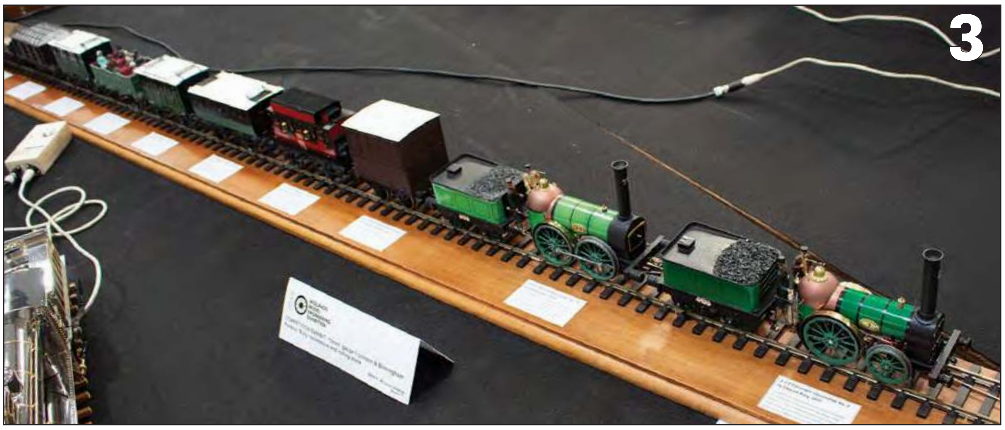


PHOTO 1: Awarded first in Class 3 was this superb example of an LNER B1 built by Alan Gent.

PHOTO 2: First in Class 1 was this Gauge 1 Mastodon by Giancarlo Mastrini.

PHOTO 3: David Viewing used 3D printing to build a Gauge 1 Victorian train. *Photo: Andrew Charman.*

Even better was the number of entries in class 14 for Young Engineers, a superb 18 which far outstripped any other class. I hope that this is an indication that perhaps we have turned a corner and young people are at last beginning to take an interest in making models and equipment.

Visitors were also greeted in the entrance by a celebration of two events, the 100th anniversary of the formation of the Royal Air Force and the 80th anniversary of the record breaking 126mph run down Stoke Bank by LNER A4 Pacific 'Mallard', both displays providing fine tributes to these two unique events.

I will start my notes by recording the prize winners in each class and then in part 2 describe the display, club stands and the various activities on offer at the show.

Competition Class 1 : Locomotives up to and including Gauge 1.

Giancarlo Mastrini from Italy again gained the first prize for his example of a Mastodon 4-8-0 Vapore Saturo Dopia Espansione locomotive. Built to what is now his exceptional standard in gauge 1, this locomotive was a miniature work of art.

Second prize in this class went to David Viewing for another excellent example of Victorian engineering, a London & Brimingham Railway 'Bury' locomotive and train, also in gauge 1. It showed off some fine attention to detail and workmanship,

while many observers were surprised to discover that much of the stock had been created through 3D printing.

Competition Class 2 : Locomotives - 2½ & 3½-inch Gauges.

Just one entry appeared in this class in the shape of a 3½-inch gauge 'Tich' 0-4-0. Built to the traditional LBSC design it showed good workmanship and captured the typical outline of the loco. It gained a Commended certificate for builder David Lee.

Competition Class 3 : Locomotives – 5 & 7¼-inch Gauges.

There was a nice competition in this class with four excellent locomotives on the stands. Located on the Nottingham SME stand the 7¼-inch B1 built by Alan Gent was awarded first prize and the Reeves Challenge Cup. Built in just 4½ years this superb example of a very popular prototype was a worthy winner.

In second place was another excellent example of model loco building. The Johnson Single Midland built by Alan Boot in 5-inch gauge displayed all the characteristics of these handsome engines, with a superb paint finish which really stood out. The judges must have had a really difficult task to separate these two models.

Brian Holland's 'Sweet William' 0-6-0 located on the Oxford SME display gained a Very Highly Commended certificate while the final award in this class went to a French model engineer, J. L. Figureau for his example of an American 4-4-0 Washington to the David Piddington design. The colourful example fully captured the essence of these old time locomotives and was awarded a Commended certificate.

Class four for rolling stock in any gauge unfortunately saw no entries.

Competition Class 5 : Stationary Engines

A competitive class here with four good entries to test the judges. First prize and winner of the Phoenix Precision Paints Trophy was Norman ▶

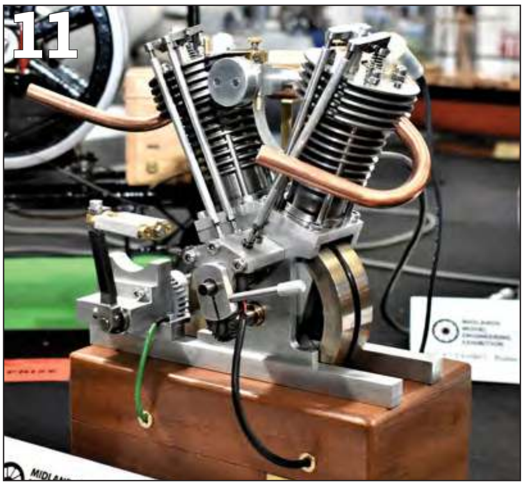
PHOTO 4: Commended in Class 2 was this 3½-inch gauge 'Tich' built by David Lee.

PHOTO 5: Brian Holland's 7¼in gauge 'Sweet William' was Very Highly Commended.

PHOTO 6: Alan Boot's superbly finished Johnson Single took second prize in Class 3.

PHOTO 7: Norman Johnson's 19th Century Working Beam Engine won first prize in Class 5.

PHOTO 8: 'Washington' designed by David Piddington and built by J L Figureau took a Commended award in Class 3.



Johnson for his example of a 19th century Beam Engine. Displayed on the Northampton club stand, the engine was part of a small diorama showing typical details of such an installation. The only castings were the flywheel and jockey wheels for which Norman made patterns.

Second prize for his twin-cylinder Flame Licker Engine went to Peter Wardle from Birmingham while third prize was awarded to David Rhodes for his example of a Stothert and Pitt Beam Engine. A highly Commended certificate was presented to Martyn Shenton for his model of a Woodroffe's Verto Engine circa 1880.

PHOTO 9: This 4in scale Foster Traction Engine built by Jonathon Gittings was Very Highly Commended in Class 6.

PHOTO 10: A Woodruffe's Verto Engine circa 1880 built by Martyn Shenton.

PHOTO 11: The superb example of a V-Twin Hoglet I/C Engine built by Neil Bottle.

PHOTO 12: The Redwing Hit & Miss Engine on an iron truck.

PHOTO 13: Terence Orton built this fine four-masted Barque Rigged iron-hulled ship.

PHOTO 14: This Picket Boat was Highly Commended in Class 10 for Michael Nicholson.

Competition Class 6 : Steam Road Vehicles

Just one award was made in this class, a Very Highly Commended certificate for Jonathon Gittings for his very nice 4-inch Foster 8HP Traction Engine.

Competition Class 7 : Machine Tools and Workshop Equipment.

A small selection of useful tools and workshop equipment featured in this class but only two gained awards. A Very Highly Commended certificate was awarded to R Tilley for his well-made turret milling machine and A Hopwood also gained a Very Highly Commended certificate for his retracting screwcutting tool.

Competition Class 8 : Internal Combustion Engines.

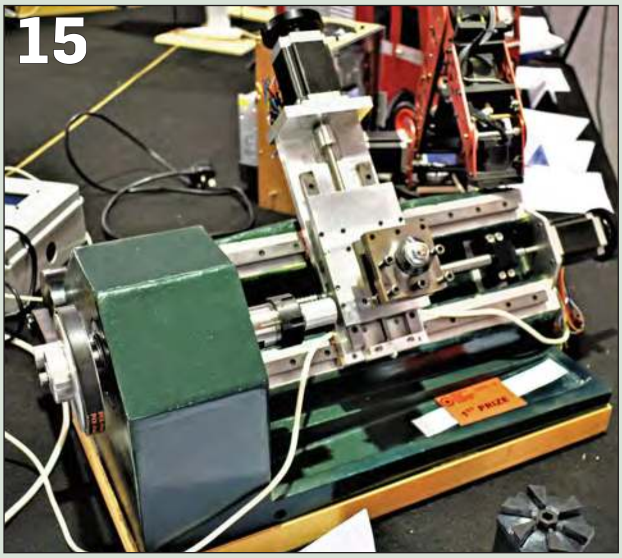
Just two prizes were awarded in this class with Neil Bottle gaining the first prize and the Engineering in Miniature Trophy for his V-Twin Hoglet dry-sump I/C engine which showed some excellent workmanship and attention to detail. Second in this class went to J Gittings for his Redwing Hit and Miss engine mounted on an iron truck.

Sadly there were no entries in class 9, for Horological, Scientific and Automata despite there being some excellent examples of these items on club stands throughout the exhibition.

Competition Class 10: Marine Models – Scale (over 50 per cent scratch built)

Just three certificates were awarded in this class with a Very Highly Commended going to Trevor Orton for his example of 'Parma', a Four masted Barque-rigged iron-hulled ship. Lots of detail and very fine rigging were in evidence.

A Highly Commended certificate was awarded to M Nicholson for his



Competition Class 14 : Young Engineer Award.

This class boasted a superb competition to engage the judges with a wide range of models from an equally wide age range of young people. After many years of very few entries, this year's exceeded the excellent line-up at the 2017 show. Let's hope that this trend continues, with more clubs encouraging young members to take part.

First prize among the 18 entries and the Stuarts Model Shield went to 17-year-old Angus French, a member of the Eastleigh Model Boat Club. His CNC lathe was an amazing piece of work for such a young person to build and the cement epoxy base was a very innovative way of reducing vibrations when in operation (**Photo 15**).

Joint second went to two young members from the Hereford SME – 12-year-old Matthew Kenington had built a small oscillating engine from his own modified drawings and all made from bar stock, with no castings used. He achieved remarkable surface finishes for all the details (**Photo 16**).

The other second prize went to 15-year-old Daniel Bell for his 4¼-inch scale representation of a Foden Steam Wagon, built from a discarded mobility scooter. Dan welded up a new steel channel chassis and re jigged the drive using a series of chains and sprockets. A new control box complete with a steam sound system completed an excellent model (**Photo 17**).

There were four Very Highly Commended certificates awarded. Ryan Philo's Tractor showed a good attention to detail and he had also fitted radio control (**Photo 18**).

Rosie Turner has exhibited at this show before and received appropriate acknowledgements. This year she produced her work-in-progress example of the 'Chitty Chitty Bang Bang' film car – not an easy design particularly with regard to the correct body outline (**Photo 19**).

Hereford member Tom Williams gained the other two certificates with a couple of very useful items for his workshop use. The double-ended die holder was a competent piece of work and combined with his bell centre punch provided him with the basics to continue his model engineering (**Photo 20**).

Another six Highly Commended certificates were presented to young members of the Eastleigh Model Boat Club and five Commended certificates to young people from the Halliford School in London who are in the process of building a small sailing yacht called a 'Wee Nip'.

model of a Picket Boat, well made with some nice detailing. Commended was Graham Farrow for his well-weathered and detailed model of a Grimsby Fishing Boat 'The Girl Pat.'

Competition Class 11 : Marine Models – Kit (standard or modified)

A Very Highly Commended certificate was awarded in this class to Graham Farrow for his 1/32 scale model of a Grimsby Steam Trawler 'The Boston Mariner' – another well built and finely detailed model.

Competition Class 12 : Model Horse Drawn Vehicles

Three very nice models were presented in this class, the first prize and Lenham Pottery Trophy being awarded to Eric Keggans for his example of a circa-1830 Mail Coach.

PHOTO 21: The Sussex Waggon built by Patrick Hall.

PHOTO 22: Brian Swann's lovely Napier-Railton Racer.

PHOTO 23: First in Class 12, this Royal Mail Coach by Eric Keggans.

PHOTO 23-24: John Wing won class 16 with his Stirling engine (below) while Michael Green's was Very Highly Commended.

This was beautifully made with some fine detailing including the luggage lockers under the driver's and the rear outside seats. An authentic finish made it a worthy winner.

Second prize went to Patrick Hall for his model of a Sussex Waggon circa 1850, it was well made and I suspect gave the judges a few headaches in deciding its award. The wheels were particularly interesting, an accompanying drawing showing that they were exactly as original.

A Very Highly Commended certificate was presented to Brian Young for his horse-drawn Sling Cart which was of a very high standard.

The Scale Aircraft Models class again attracted no entries, while again there were some excellent examples on show elsewhere in the exhibition.

Competition Class 15 : Miscellaneous.

Three diverse entries in this class received awards. First prize went to Brian Swann for his excellent example of the Napier-Railton Brooklands race car. A fine finish and good detailing produced a quality model depicting vintage racing at its best.

Second Prize went to Maltese entrant Carmelo Borg who presented a well-made example of an American M41 Walker Bulldog tank. Well detailed and finished, it really looked the part.

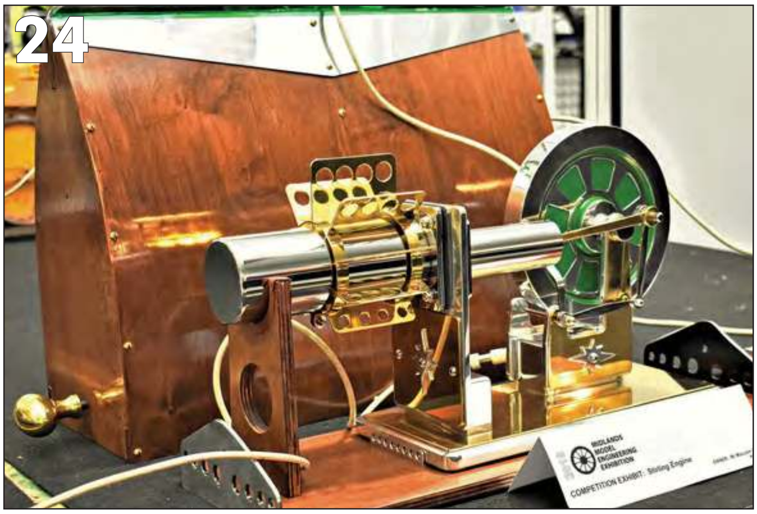
Eric Keggans secured a Very Highly Commended certificate for a lovely example of an Aveling Barford 12 DC road roller – the cab even had an open packet of cigarettes and the driver's unwashed tea mug on the window shelf!

Competition Class 16 : Hot Air Engines.

Just the two entries in this class both of which were superbly made models. First Prize was awarded to John Wing for his HAE 01 Stirling engine. An excellent overall finish and first class workmanship gave him the edge over Michael Green's variant which also sported a beautiful overall finish including a very elegant carrying case.

The quantity of this year's Competition classes may not have reflected past times but the quality was certainly still in evidence. Thanks are to all who took part and I hope this will be repeated in 2019, particularly in Class 14 for Young Engineers, your hobby needs you. EIM

■ John will conclude his report next month with the display classes and various activities.



Gas-fired vertical boiler for The EIM Steam Plant

Martin flanges the tubeplates on his boiler for the EiM Steam Plant beginners project.

BY **MARTIN GEARING** – Part 3 of a series

The open ends of the boiler barrel are closed by 16swg thick flanged copper tubeplates. Between the two tubeplates pass the firetubes and stays that, in conjunction with the thickness of tubeplate material, combine to provide sufficient strength to resist the force trying to separate them when the boiler is under pressure.

For many reasons, not least economy, tube plates are formed from flat sheet with an edge flanged ('bent' to form a short cylinder) at 90 degrees to fit the internal diameter of the boiler barrel. In this type of boiler the length of the tubeplate flange increases the joint surface area to ensure the silver solder is able to provide sufficient strength for the purpose.

Making the former

Former for Flanging the Tubeplates - Refer to Drawing B2D.

Copper is the material of choice for the tubeplate because of its resistance to corrosion, ease of joining, ductility and malleability, meaning that it can be bent and deformed without fracture. These last two features are related to copper's exceptional ease of **annealing**. The production of a flange around the edge of a copper disc – resulting in a predetermined outside diameter, demands a **former** to be manufactured. In the initial stages of forming the flange, it is helpful to have some means of locating the former against the flat disc, until the edge is brought round sufficiently (formed) to locate the former between annealings. Additionally, when in use, one of the most annoying problems with the production of a small flange comes in the final stages, with the increasing difficulty of removing the former without causing damage to either the former, the flanged plate or both.

Reference to Drawing B2D will show my attempt at overcoming these problems. The former material, bearing in mind you are most likely going to only produce two tubeplates, can be made from good defect-free hardwood (preferably not oak, unless you are extremely fastidious in cleaning all traces of chips/shavings from your machinery). My material of choice is 18mm thick Birch Marine plywood – this is laminated from birch plys of about 1mm thickness, bonded with strong waterproof adhesive and if good quality marine grade, is flawless, and works easily with normal (sharp) engineering cutting tools.

Cut out two 75mm squares, and on each one, draw lines from opposite corners, lightly centre punch at the point of intersection and using a pencil compass or dividers draw a 72mm diameter circle at this point. Cut off the four triangular corners outside of the circle and drill a 3mm diameter hole through the centre in both. Cut a 30mm length of 3mm rod, chamfer both ends and push through the centre of one of the blanks. Hold lightly on this rod in a self-centring chuck, and using the same 8mm diameter washer as before to prevent the running centre forcing too far into the ply, grip the blank against the chuck jaws with pressure applied by the tailstock. Tighten the chuck. This will allow machining the outside to 70mm diameter ±0.1mm. Remove from the pin and put to one side. This will be used as a backing disc.

Taking the second blank, use the same setup after installing on the 3mm pin through the centre, machine to 69.69mm diameter ± 0.05mm. Additionally machine the 2mm radius detail as shown, Photo 22. Release the tailstock and slacken the chuck to remove the former, leaving the pin sticking out the back of the disc.

Cut one 75mm square from 3mm thick sheet aluminium or steel. Scribe lines from opposite corners and centre punch at the point of intersection. Scribe circles of 72 and 54mm on that centre. Leave the scriber set for the 54mm circle, before stepping around this circle six times. Centre punch at each point where the radius intersects the diameter. Cut away the four triangular corners outside of the 72mm scribed line. Drill 3mm diameter through the centre and 4mm ▶

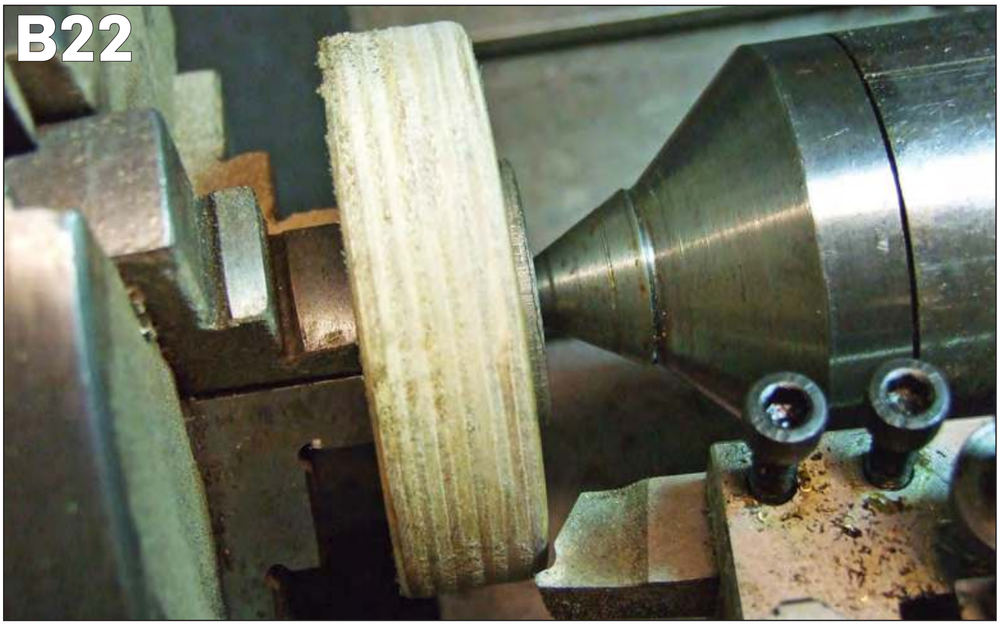
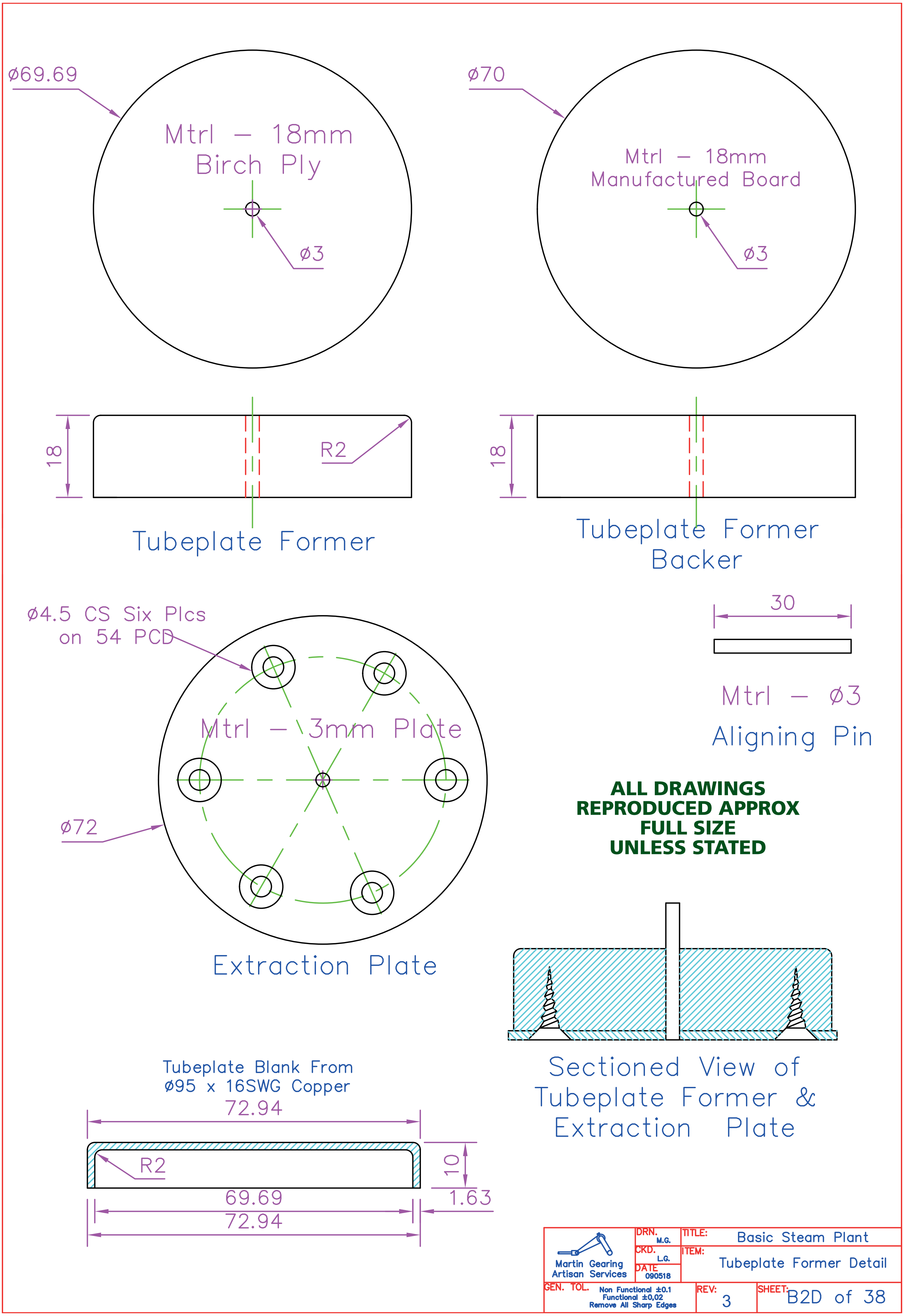


PHOTO B22
Machining the radiuses on the former for the tubeplate.

All photos and drawings by Martin Gearing



ø69.69
Mtrl – 18mm Birch Ply
ø3
ø70
Mtrl – 18mm Manufactured Board
ø3
18
R2
Tubeplate Former
18
Tubeplate Former Backer
ø4.5 CS Six Plcs on 54 PCD
Mtrl – 3mm Plate
ø72
Extraction Plate
30
Mtrl – ø3
Aligning Pin
ALL DRAWINGS REPRODUCED APPROX FULL SIZE UNLESS STATED
Sectioned View of Tubeplate Former & Extraction Plate
Tubeplate Blank From ø95 x 16SWG Copper
72.94
R2
10
69.69
1.63
72.94
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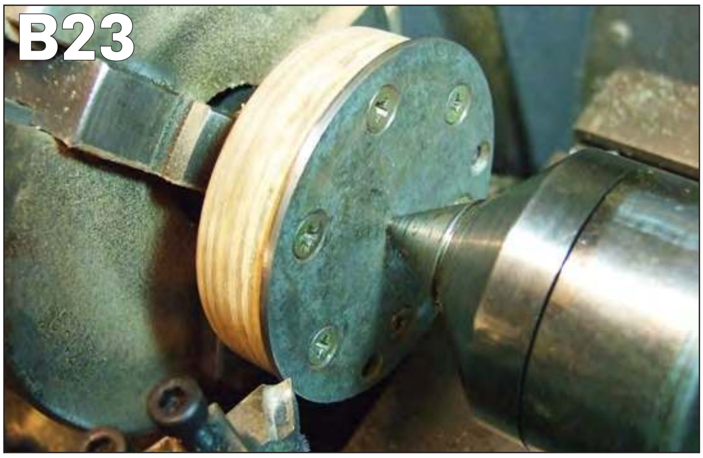
GEN. TOL. Non Functional ±0.1 Functional ±0,02 Remove All Sharp Edges
TITLE: Basic Steam Plant
ITEM: Tubeplate Former Detail
REV: 3
SHEET: B2D of 38



through the six equally spaced positions around the scribed 54mm line. Countersink these six holes so that the head of a 4 x12mm long countersunk woodscrew goes just below the surface.

Taking the wood former just machined, drop the disc over the pin and secure with six 4 x12mm countersunk woodscrews. Push the pin through the assembly flush to the metal, and grip lightly in the self-centring chuck, holding the assembly against the chuck jaws by applying pressure with the running centre positioned in the centre hole of the metal disc. When the tailstock is secured, tighten the chuck. Machine the disc to 72mm diameter and remove any sharp edges (**Photo 23**).

Flanging the Tubeplates

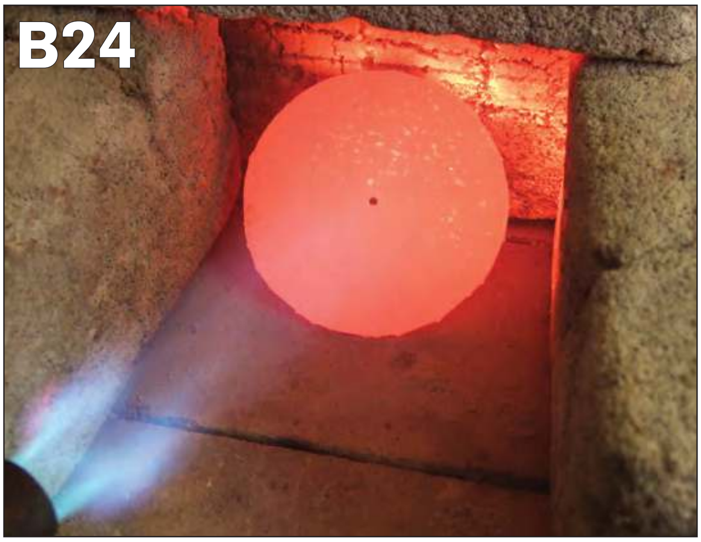
Cut two 95mm squares from 16swg copper sheet, either C101 or C106 grade. Scribe lines from opposite corners and centre punch at the point of intersection. Scribe a 95mm diameter circle on that centre. Cut away the four triangular corners outside of the 95mm scribed line, then carefully trim as much away as possible without cutting into the scribed circle. Drill a 3mm hole through the centre and remove any burrs from both sides.

These two discs should now be annealed, repeating the process described previously for the firetubes, placing them in a cavity made from fire-resistant blocks which will speed the process by reducing heat loss and/or reflecting the heat. Remember to maintain a cherry-red state for about 15 seconds before removing the disc with tongs or large pliers and plunging it in cold clean water – swirling it around so as to cool it evenly. Return to the second disc and repeat (**Photo 24**). ▶

"It is reasonable to expect flanging to be completed with around five annealings – do not worry if you need more..."

PHOTO B23
Extractor plate now attached to former for machining.

PHOTO B24
Annealing the tubeplate blank – the secret to success is to make steady progress with multiple annealings.



Place a disc over the pin against the radiused face of the former and follow it by fitting on the backing disc. Hold this sandwich between the jaws of a vice with about 30mm protruding above and from the right-hand end of the jaw (if you are right handed). Taking a soft-faced hammer (one weighing about 1½ pounds with replaceable nylon inserts is ideal), strike the disc at a point opposite and as close to the radiused edge of the former you can. Don't strike the disk directly at 90 degrees to the vice jaws but rather 'swipe' against the length of the unsupported overhang, with a 'wiping' action.

Do not try to complete the flanging all in one go! You have to consider that the outer diameter has to be compressed as it is forced into the smaller cylindrical diameter that the flange will finally adopt, in the process of slowly making it conform faithfully onto the former.

Resist the temptation to begin working on the extreme outer edge of the disk as we need to begin forming a right angle to faithfully follow the former. Start at about 11 o'clock and slowly work clockwise round as far as you can towards 4 o'clock (**Photo 25**).

Slacken the vice, move what was the 4 o'clock position to 11 o'clock and retighten the vice, before repeating. Continue in this manner until you have completed one full circuit. Repeat another circuit, evening the flange up. This should result in the edge of the disk adopting a 'reasonably' even saucer/funnel shape, with a 'conic/flared' surface running from the radiused corner of the former to the outer edge of the disk (**Photo 26**).

Separate the blank from the former/backer. Anneal the blank and repeat the process. Go around drawing the flange down gradually towards the former, with the bend originating from the former's radiused edge and the flanges (reducing) 'conic/ flared' surface remaining even to

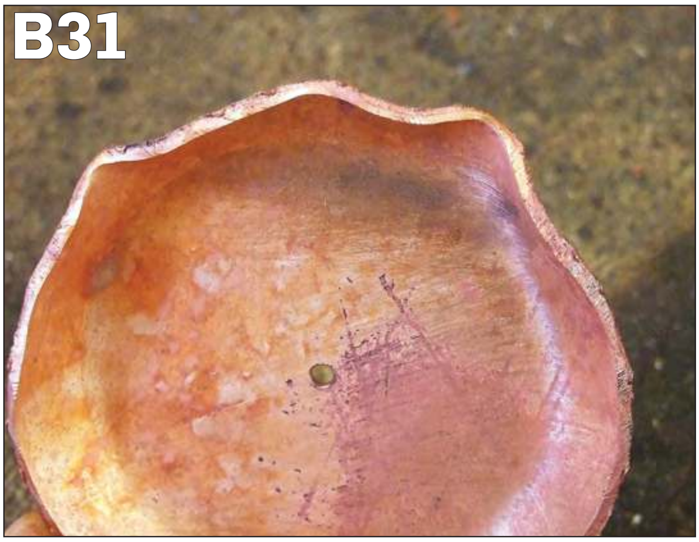
PHOTO B25
Starting the flanging – work round from 11 to 3 o'clock.

PHOTO B26
The copper blank after the first flanging.

PHOTO B27
After the second round of flanging – progress is clear to see.

PHOTO B28
The plate hugs the former after completing the flanging.

PHOTO B29
Extracting the tubeplate from the former – work round in gentle steps .



produce a tighter 'funnel/cone' shape (**Photo 27**).

When the flange is completely formed to the outside diameter of the former, (**Photo 28**), the addition of the extraction plate comes into its own, as the process of removing the flanged tubeplate is made relatively easy, using a pair of external circlip pliers. Again, it is a case of make haste slowly! Work around in little steps, gradually easing the formed tubeplate off its former (**Photo 29**). Finally after going around a few times the now fully flanged tubeplate will come free from the former (**Photo 30**). The complete process is then repeated for the second tubeplate.

It is reasonable to expect flanging to be completed with around five annealings. Do not worry if you need more, no harm will come to the copper, and it's far better to take it slowly, bringing the flange over evenly in small stages, and avoid having to deal with wrinkles which if allowed to go too far can be almost impossible to remove and would mean the blank will have to be scrapped.

If you find that the outer edge begins to wrinkle, inwards or as shown outwards, **stop** immediately! (**Photo 31**). It is a sign that you are trying to force the bend/flange too quickly. Should this occur, remove the blank. Anneal the copper, and work the wrinkle out by gently striking the wrinkle on the inside of the copper disc, using a minimum of force with the nylon hammer face against a smooth flat surface (**Photo 32**). Anneal the copper again before assembling the former/blank/backer sandwich and continue.

PHOTO B30
Tubeplate with its completed flanged edge.

PHOTO B31
If your plate begins to wrinkle like this one, stop the process immediately.

PHOTO B32
A wrinkle can be dressed out with gentle taps from a nylon hammer.

PHOTO B33
The flange is machined to its final length in the lathe.

The flanged edge will now need to be tidied up, as it undoubtedly will have a fairly ragged appearance with regards to its length, and varying thickness around its diameter due to the flanging process that involves both stretching around the radiused edge and compressing the extremities of the disc into a cylinder.

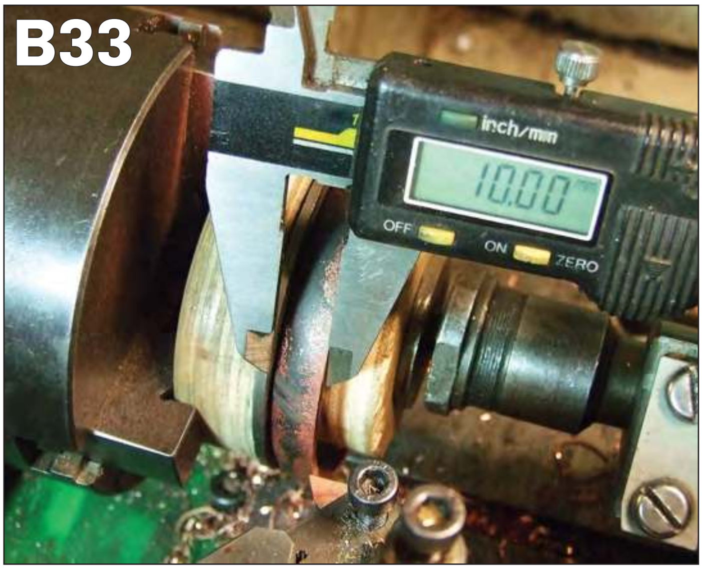
Take the backing disk and with the same setup used to produce it, skim the outside to 55mm diameter.

Hold the former in a self-centring chuck after pushing the locating pin back until it is flush with the wood face, with the extractor plate facing outwards, pushing it against the jaws as the chuck is tightened.

Slip the tubeplate, with the flange facing outwards, over the pin followed by the backer and clamp to the former using the running centre – with an 8mm washer over the tip to prevent it forcing too deep into the backer. Taking light cuts, machine the edge of the flange until the distance between the tubeplate face (measured off the backing plate) and flange edge is 10mm (**Photo 33**).

Check the diameter which needs to be the same as the diameter of the plugs that you made when bringing the boiler barrel to length. If it is over that dimension skim the outside of the flanged diameter to match, checking that it is able to be pushed inside the boiler shell tube without too much force, remembering the tube is unlikely to be truly round. Repeat for the second tubeplate. **EIM**

■ The first two parts of this series appeared in the October and November 2018 issues of **EIM**. Digital copies of previous issues can be downloaded or printed versions ordered from www.world-of-railways.co.uk/engineering-in-miniature/store/back-issues/ or by telephoning 01778 392484.



Turning small convex and concave radii

More in John's useful series for novices in the workshop.

BY **JOHN SMITH**

"The tools were never totally convincing. They did the job, if set a little below centre height, but they did not cut very well..."

PHOTO 1: A set of Imperial radius gauges

PHOTO 2: Lathe tools ground to a desired radius can be used to cut small concave radii – a typical set is shown here.

PHOTO 3: A concave radius turning attachment is easily made.

A set of radius gauges is extremely useful when there are radii to be cut. Imperial (**Photo 1**) and metric sets are available and they can often be found on eBay.

A small concave radii, such as that at the root of a wheel flange, can be produced easily by grinding a carbide-tipped or HSS round-nosed lathe tool to the desired radius. Recently, tools with replaceable circular carbide tips have become available but you will be very fortunate if you are able to find a tip with the exact radius to be cut. A selection of useful lathe tools is shown in **Photo 2**.

The lathe will complain when a profile tool cuts along an extended edge. This can be minimised by either using the lowest back-gear speed or by turning the lathe by pulling the belt by hand. For lathes without convenient access to the belt, a lathe spindle handle (also shown in Photo 2) works well, provided that you have access to someone to turn the handle while you feed the tool.

Turning attachment

For concave radii larger than around ¼ inch diameter/6mm, it is hard to find a suitable round-nosed tool. They can be made – there is one in Photo 4 – but a simple concave radius-turning attachment will produce a better result. My first such attachment is shown in **Photo 3**. It is basically a tool-post made from square bright mild-steel bar, which can hold round-nosed tools made from ¼in dia HSS tool blanks. If you have access to a local engineering firm with a wire-erosion machine, they will be able to cut a square hole; this would make it a little easier to make suitable round-nosed tools. This tool is very useful where space is limited.

A ⅜in dia bolt is Loctited into the base of the tool-post, the unthreaded portion of which acts as the pivot bearing of the tool. The pivot fits into a reamed hole in a ¼in thick mild steel plate which is bolted to the cross-slide. A little grease is applied. The Nyloc nut is nipped tight, but not so tight as to prevent the tool-post from being rotated by hand

using a ⅝in dia A/F spanner working on the flats milled in the tool-post. This tool will cut concave radii from just over ¼ to 1in dia, producing a good finish.

I used to make tools for turning small convex radii – for example for turning the outer profile of a locomotive wheel flange – from ⅛in thick gauge plate by drilling (at an angle of 5-10 degrees to provide front relief) a hole of diameter twice the radius needed, sawing and grinding at least half of the hole away, and then hardening the tool (**Photo 4**). The tools were never totally convincing. They did the job, if set a little below centre height, but they did not cut very well.

Milling cutters

I now use corner-rounding milling cutters (**Photo 5**). These are made from high speed steel, HSSCO or carbide, are very accurately ground, and they cut any metal beautifully. They are available to buy in a wide range of Imperial and metric sizes.

Small cutters can be easily held in a Dickson-type tool-holder designed for circular tools, while large cutters which will not fit a tool-holder can be held in a V-block bolted to the cross-slide with some packing to bring the cutting edge to centre height. The axis of the tool needs to be at 90 degrees to the lathe spindle. Alternatively, you can mount the tool parallel to the lathe centre-line and cut the rear of the workpiece with the lathe running in reverse (**Photo 6**).

■ Next month – Turning large convex and concave radii

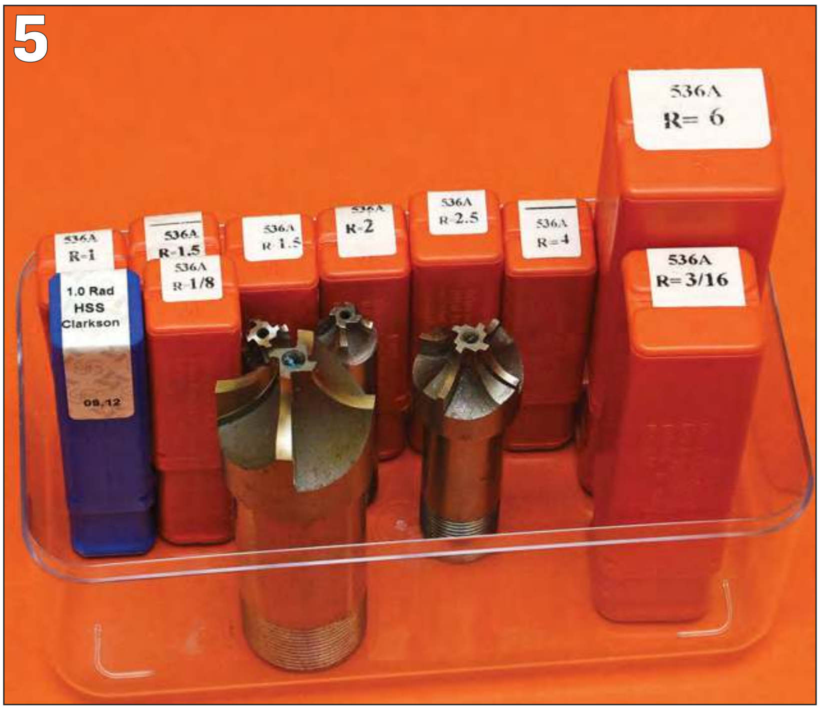
John's series of Top Tips, aimed squarely at those new to workshop practice, has appeared in every issue of **EIM** since March 2018. Digital copies of previous issues can be downloaded or printed versions ordered from www.world-of-railways.co.uk/engineering-in-miniature/store/back-issues/ or by telephoning 01778 392484.

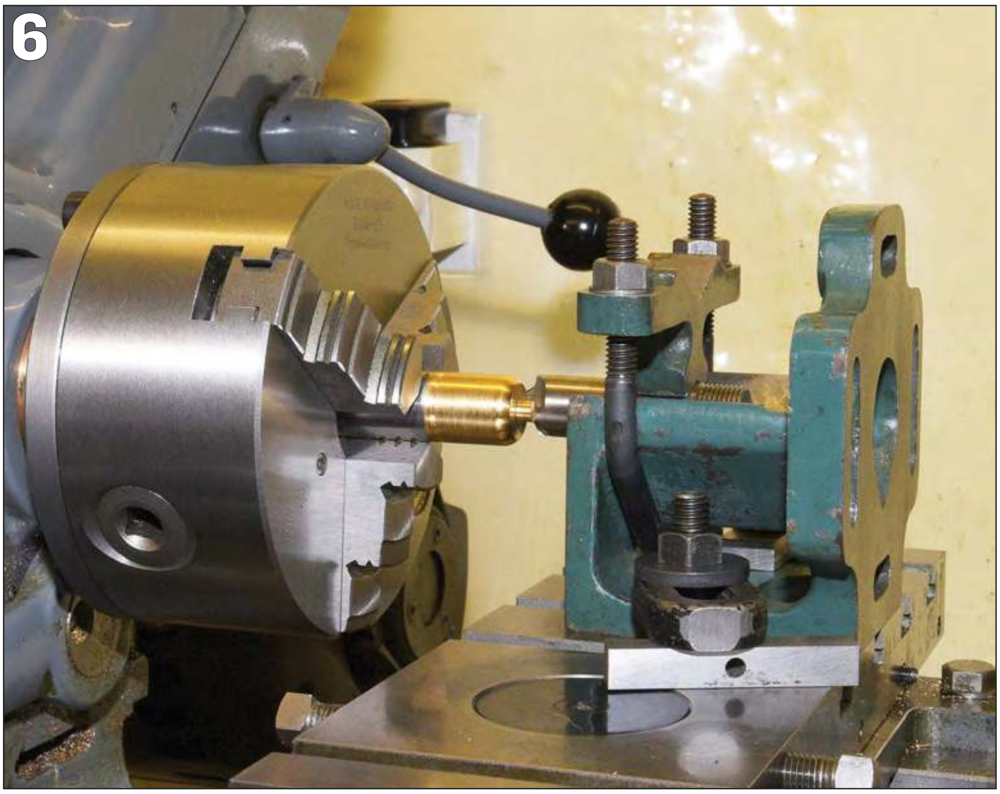
PHOTO 4: Tools for turning small convex radii, as shown here, are not entirely satisfactory.

PHOTO 5: Corner-rounding milling cutters do a much better job.

PHOTO 6: Such a cutter in use, showing the mounting method on the lathe.

Photos: John Smith





The original operating technology of Tower Bridge

John concludes his two-part feature describing the fascinating engineering solutions inside one of the UK's most familiar landmarks.

BY **JOHN SMITH**

ABOVE: On 5th October the bridge opened in salute to the paddle steamer 'PS Waverley', sadly towed through by a tug, probably because paddle steamers have a rather large turning circle...

Each of the two piers of Tower Bridge houses two engine rooms. These are positioned just below pavement level at each end of each pier. As originally installed, there were two 3-cylinder, single-acting hydraulic engines of unequal power in each engine room.

John Wolfe Barry (the engineer for the bridge) tells us that the design intention was that, in normal circumstances, one small engine would be capable of lifting a bascule. In a wind pressure of 56 pounds per square foot (unheard of at the location of Tower Bridge and only mandated as a result of the Tay Bridge disaster), one small and one large engine acting together would be capable of lifting the bascule. This meant that the small and large engine at the other end of each pier would provide a massive power reserve of 100 per cent even in worst-case conditions.

In each engine room, the small and large engines sat side by side, with their crankshafts on the same centreline, the smaller engine being situated towards the end of the pier and the larger engine closer to the centre. Each engine had a 15-tooth pinion rigidly attached to its crankshaft which engaged with a 41-tooth pinion on an intermediate shaft running behind, and connecting, the two engines.

The two 41-tooth pinions were fitted with manually-operated dog clutches, so one or both engines could be disengaged from the intermediate shaft for maintenance or repair purposes. A 13-tooth pinion on the end of the intermediate shaft closest to the bascule engaged with a 29-tooth pinion on the final drive pinion shaft, effecting an overall step down gearing of 6.097:1 between the engine crankshafts and the pinion drive shaft.

The small engines have a stroke of 24 inches and cylinders 7½ inches in diameter. The large engines have a stroke of 27 inches and rams 8½ inches in diameter. Separate piston valves are provided to admit and exhaust high-pressure water to and from each ram. These are similar to the valves in a cornet or trumpet. They are operated by 'pokers' and closed by return springs.

The valve and reversing gear is a simplified form of Stephenson valve gear. Stephenson gear normally features a forward eccentric and a backing eccentric, each driving, by means of an eccentric rod, one end of an expansion link which can be lowered and raised to change the position of the link block working within the link. In the Tower Bridge hydraulic engines, each expansion link is pivoted near its centre and driven by a single eccentric rod connected to the lower end of the link. The blocks, rather than the links, are raised or lowered by the lifting links attached to the weighshaft lifting arms.

Rods transfer the motion of the blocks to rocking levers which actuate the pokers. The position of the blocks in the expansion links determines the direction of the engine and the stroke given to the valves. The starting position (full forward or full reverse) was determined by the initial movement of the main starting valve (or regulating valve) in the control

cabin, the reversing gear being operated by a hydraulic cylinder. A screw and nut arrangement on the end of the pinion drive shaft moved the weighshaft automatically to cut the supply of high-pressure water to the engines as the bascule approached the end of its intended movement. This was both a safety feature and a water-saving measure.

Photo 6 shows the ram end of the large hydraulic engine which is on display at the Tower Bridge Exhibition. Many of the valve gear components can be clearly seen. The weighshaft is the shaft which crosses the engine from side to side, on elevated bearings. This is the only large hydraulic engine remaining at Tower Bridge, the other three having been disposed of to make way for new technology. Thankfully, all four small hydraulic engines were preserved and remain in the engine rooms in the piers, Photo 7 showing one of these. Either the large or small engine would be a super prototype for a model, all operating parts being on display.

Photo 8 shows the crankshaft end of the same large hydraulic engine. A section of the intermediate shaft and one of the dog clutches is clearly visible. The braking system is a prominent feature. A large brake wheel is fitted to the crankshaft against which two brake blocks work. When the engine is required to operate, the brake blocks are forced away from the brake wheel by a hydraulic cylinder. When the brake needs to be applied (or if hydraulic pressure is lost) the brake blocks are forced against the brake wheel by means of a heavy weight attached to the end of a steel wire wound around the two high-level grooved wheels.

Tractive effort

A contemporary account of the operating technology tells us that the total force which must be applied to the quadrant racks in a wind exerting a pressure of 56 pounds per square foot on a moving leaf is about 190 tons. Let's see if it was right!

Tractive Effort (TE) of a steam locomotive with two double-acting cylinders is usually calculated as:

TE = $0.85*d^2*p*s/w$ pounds

Here **0.85** is a coefficient which reflects the fact that boiler pressure in practice might be only 85% of rated pressure;
d is the piston diameter in inches;
p is the boiler pressure in pounds per square inch;
s is the stroke in inches;
w is the diameter of the driving wheel in inches.

To be accurate, there should also be a multiplier of $\pi/4$, but this is normally overlooked and we will do the same.

The formula shows that the smaller the driving wheels of a locomotive, the larger the tractive effort. Tractive effort was a very 'big deal' for the 'Big Four' railway companies in the heyday of the steam locomotive. Every railway wanted to hold the blue riband for the most powerful locomotive.

When Chief Mechanical Engineer Charles Benjamin Collett designed the King class locomotive for the Great Western Railway in 1926, he went to the substantial expense of specifying 6ft 6in driving wheels, rather than the customary 6ft 8½in wheels used on all GWR express locomotives (for which patterns were available), purely to wrest the blue riband back from the Southern Railway's Lord Nelson class.

For hydraulic engines, the pressure is fixed, so we can remove the coefficient. As the Tower Bridge hydraulic engines were single-acting, we must divide by two, but as the engines had three cylinders we must multiply by 1.5. So the formula for the tractive effort of the Tower Bridge engines is:

TE = $0.75*d^2*p*s/w$ pounds

w is the pitch circle diameter of the final 13-tooth pinions driving the racks, which is 24.5 inches. The reduction gearing between the engine crankshafts and the final pinion drive shaft is 6.097, so:

TE = $6.097*0.75*d^2*700*s/24.5 = 130.65*d^2*s$ pounds

So, the tractive effort of a small hydraulic engine is 176,377.5 pounds or 78.74 tons, and the tractive effort of a large hydraulic engine is 254,865.5 pounds or 113.78 tons, making the total tractive effort of a small and

PHOTO 6: The ram end of the surviving example of the four large hydraulic engines fitted to the bridge.

PHOTO 7: One of the four small hydraulic engines still in the pier engine rooms

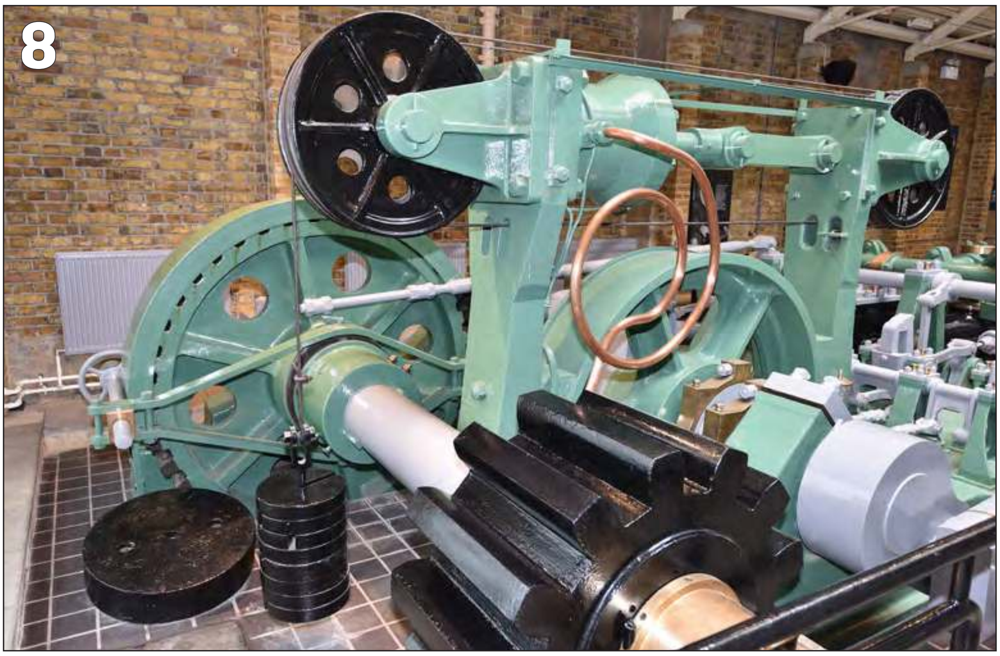
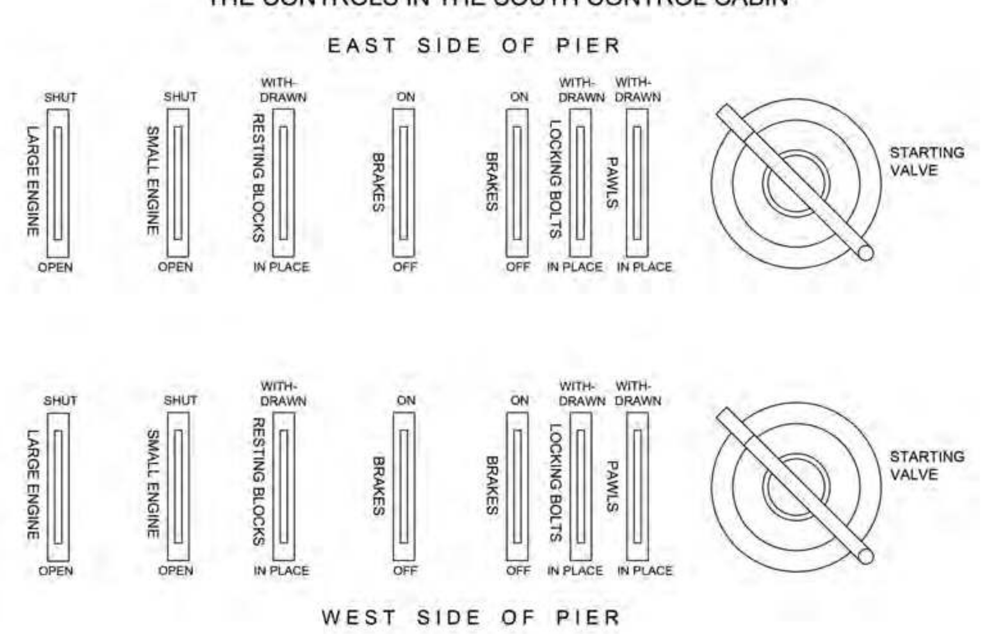


PHOTO 8: Large hydraulic engine at the crankshaft end.

DRAWING 1



DRAWING 1: Layout of the controls in the south cabin.

large engine working together equal to 431,243 pounds or 192.5 tons, almost exactly the figure given in the contemporary account.

Incidentally this is more than the tractive effort of ten King class locomotives. And there was the power of another ten Kings on call at the other end of the pier. The Tower Bridge hydraulic engines were not short of power!

Bridge control

Bridge control and interlocking equipment was provided by Messrs Saxby & Farmer, well-established signalling contractors who supplied signalling equipment and signal boxes to many British railway companies.

Two lever frames exactly like those in railway signal boxes were provided to control the hydraulic machinery, together with mechanical interlocking frames below the floor of each control cabin, each identical to that in a railway signal box. The interlocking frames were designed to prevent, for example, any hydraulic engine from being operable until the pawls and resting blocks had been withdrawn. The nose (or locking) bolts were controlled from the south control cabin only.

A control, or driver's, cabin was built on the east side of each pier and a watchman's cabin constructed on the west side of each pier. Stairs in each cabin led down to the engine room below. The cabins were constructed of wood, which would have been perfectly normal for Saxby & Farmer, but seems a little bizarre today, given the majestic construction of the bridge itself. They were rebuilt more sympathetically, in stone, after the Second World War.

Semaphore signals, indicating to shipping during daytime whether the bridge was open or shut, were mounted on top of the cabins, operated manually by levers in the cabins. These were, perhaps, a little superfluous, as the bascules themselves provided the largest semaphore signal in the country. Four red and four green lights in both upstream and downstream directions performed a similar function at night.

Small additional Saxby & Farmer interlocking lever frames were provided some years after the bridge was commissioned to control road and river signalling, fully interlocked with the bridge controls.

Operating the bridge

Drawing 1 shows the layout of the controls in the south control cabin. Two rows of levers were provided, one for use when the machinery on the east side of the pier was to be deployed and one for operating the engines on the west side of the pier. The levers were operated like point levers in railway signal boxes; they had to be in one extreme position or the other, not at some point in between.

At the end of each row of levers was a large spindle valve, variously known as the starting valve or the regulating valve. The first movement of the starting valve handle 'against the sun' would cause the hydraulic cylinder controlling the weighshafts to set the valve gear to lift the bascule. Further movement opened the regulating valve, the extent to which the valve was opened determining the speed of the selected engine.

Movement 'with the sun' back to the original position would cut off the supply of high-pressure water to the engine, with further movement first fully reversing the engine and then supplying it with high-pressure water. Either or both hydraulic engines in the chosen engine room could be selected and brake levers were provided for both engines.

Photo 9 shows the inside of this cabin today, still containing its original equipment. The bank of gauges on the wall showed the driver the pressure available to operate the machinery and the pressure admitted to the chosen engine by means of the regulator valve. Gauges also provided visible confirmation that the locking bolts were withdrawn or locked.

A telephone system for communicating between control and watch cabins, and between control cabins and the engine room under the southern approach, was installed by Messrs Spagnoletti and Crookes. There was also a system of signalling bells and a set of bell codes, again inspired by railway signalling practice.

The procedure to operate the bridge was as follows. The Bridge

9

PHOTO 9: The original controls in the south control cabin, still surviving as part of the museum tour.

Photos and diagrams by John Smith

Master would have decided which engine room on each pier was to be used that day and the engine drivers would have selected either the large engine or the small engine in the chosen engine room by means of the levers. Clutches would not normally be operated on a daily basis, the three unused engines being kept in gear and allowed to run idle.

As the bridge was required by Act of Parliament to lift on demand, a watchman would be on look-out at all times in all four cabins and a driver would be available in each control cabin. The approach of a vessel would be signalled by a bell code.

The Head Watchman would decide when to instruct the clearance of the bridge. On his order, the City of London policeman on duty on each pier would operate the traffic signals and clear traffic from the moving leaves. Watchmen would clear foot passengers from the moving leaves and close barriers across the roadway and the pavements.

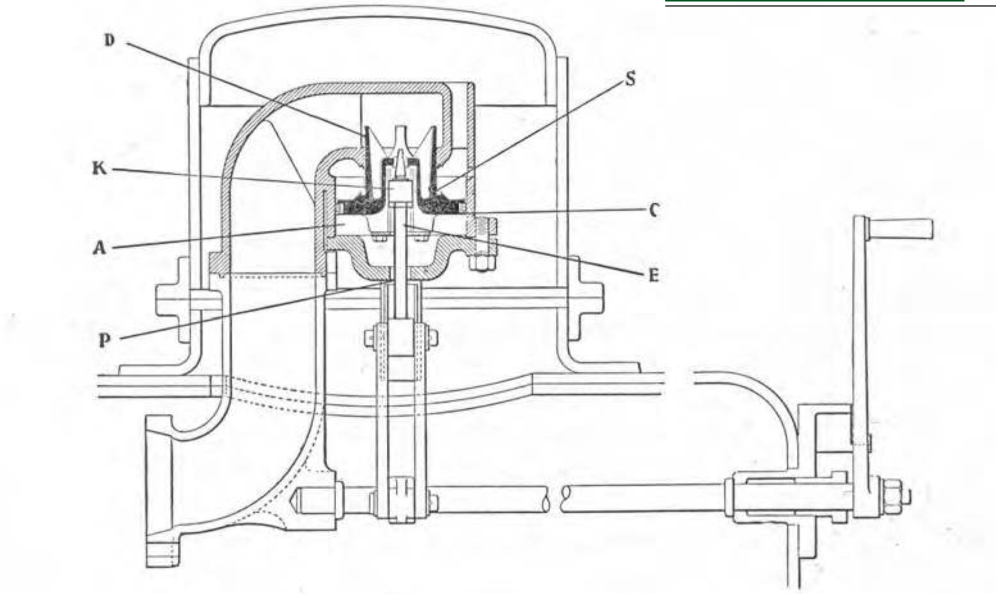
On the Head Watchman's signal, the drivers would retract the pawls and resting blocks and the driver on the Surrey pier would withdraw the nose bolts. The driver on the Middlesex pier had no way of knowing when the nose bolts had been withdrawn, so the Surrey bascule always lifted first, the driver in the Middlesex control cabin operating his starting valve when he saw the first movement of the Surrey bascule.

Once the bridge was as open as necessary, the semaphore signals or lights for shipping were changed to advise the master of the approaching vessel that he could proceed. The drivers would apply the brakes on the engines being used. Normally, the moving leaves were not opened fully, this being reserved for 'a salute of honour'. The procedure was essentially reversed for lowering the bascules.

Availability

So what level of availability did the bridge provide? My analysis suggests that the availability of at least one operational hydraulic engine in each pier was 99.99999999731 per cent, which is as close to 100 per cent availability as one can get. The availability of the bridge as a whole was 99.9952 per cent. That might fall short of the availability of an Air Traffic Control system, but it is an impressive achievement for a steam-hydraulic system in 1894. EIM

■ Part 1 of this feature appeared last month, see page 17 to order back issues. John is working on a detailed history and engineering appreciation of Tower Bridge, due to be published in the spring of 2019 by Haynes Publishing.



From boiler to cylinder

Our series examining the workings of steam locomotives focuses on steam delivery, and the role of the dome.

In recent editions of this series we have looked at the cylinders and their valves, but how does the steam from the boiler reach them, and how is it controlled?

Steam created by heating water in the boiler rises into the space above the water level and is then taken from here in a pipe to the cylinders. It is vital that water is not also taken through this pipe – if it was to make its way into the cylinders and was then compressed it could do a great of damage to them – we will look more closely at this phenomenon, known as priming, in a later edition.

To assist with steam collection the vast majority of steam railway locomotives have a dome – as its name suggests this is a collecting chamber, mounted on the top of the boiler. Mostly it is located close to the centre point of the boiler, again to guard against priming – for example, when a loco descends a steep gradient, the water level will rush towards the front of the boiler and if the dome was mounted at the front, said water could easily be directed up the steam pipe.

Smaller standard gauge and narrow gauge locos tend to have tall, prominent domes, but on larger UK locomotives the dome is short and squat to meet the loading gauge.

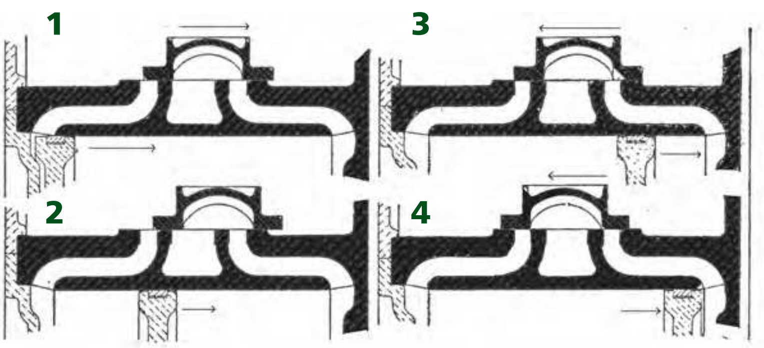
Often the regulator is mounted in the dome, though it can be in the smokebox. The regulator is a valve, operated by the driver and controlling the amount of steam going to the cylinders – it is the equivalent of an accelerator pedal in a car. EIM

ABOVE: Diagram of a steam dome, with the regulator mounted within it.

RIGHT: Typical steam domes, the upper on a narrow gauge loco and the lower on a standard gauge engine.

ERRATUM...

In last month's *Start Here* describing lap and lead in cylinders, the numbers were missing from the drawing of each stage of a valve's travel across the cylinder port. The correct drawing here should be referred to when reading the captions.



Dougal - a 5-inch Barclay

Young Sussex engineer Andrew allocates significant time for a major part of the build – machining the cylinder blocks.

BY **ANDREW STRONGITHARM –** Part Eight of a series

The next logical parts to machine were the cylinders; however I knew that it would take a significant amount of time to machine both of them. I decided that it would be best to try and machine them during longer workshop sessions in order to maintain continuity– a lot of concentration would be needed and I had to get them right first time. I identified a week when I would have sufficient time to embark on and hopefully complete the work.

The cylinders have the advantage of being a very simple design, compared to those on other models. All the internal steam ways are drilled straight or at right angles to the main bores, which makes setting them up on the mill a much easier task.

Holding each casting in my hand one at a time, I initially used an engineer's square to determine how square the faces were to each other. I measured all the dimensions with dial calipers and compared them to the drawings to establish if there was sufficient material to machine them. Based on how square I found the faces of each casting to be, I chose the best pair to start with.

First passes

I began by holding each cylinder casting upright in the mill vice and after one end of each casting had been machined flat, I placed this face down in the mill vice to ensure that the other end would be parallel to the first. I took my time to make sure these faces were machined to the correct dimensions and that I had a finished overall length of 2⅝ inches for each cylinder.

I repeated this process for the other cylinder, before turning it round and holding it between the two newly machined faces in order to clean the side face which mounts against the frames. I made sure that the casting was slightly protruding from the top of the vice and roughly levelled it by eye. I used a large diameter shell mill to machine this face, as it could cover the whole work in two passes, and used it to touch onto each corner of the casting to find out if it was set up level or not.

I made a note of the number on the dial when the shell mill began taking a cut and adjusted the casting until it started cutting at the same number on the dial on each corner. After this, I cleaned up the rectangular weight saving cut-outs in the side face and used a ⅜in end mill to leave a suitable radius in the corners. Next, I squared off the top face, holding the casting on the two end faces. I used an engineer's square to help me set the casting up by placing it on the base of the vice and against the inside face of the cylinder I had just machined.

With all four sides now machined square to one and other, it was time to machine the main bores. I therefore set the castings up vertically in the mill vice again, making sure that I could not see any light behind the side face and the vice jaw. This time however I placed a pair of parallels beneath the cylinder to keep it slightly off the bottom of the vice, which I later removed once it was clamped up tightly, to prevent the boring tool from plunging too deep and damaging the vice. For this operation I chose to use a fly cutter and I initially set this up so that when I rotated it by hand it was roughly central with the bore which was pre-cast into the cylinders. I used the quill power feed on the Bridgeport milling machine to lower the fly cutter through the bore

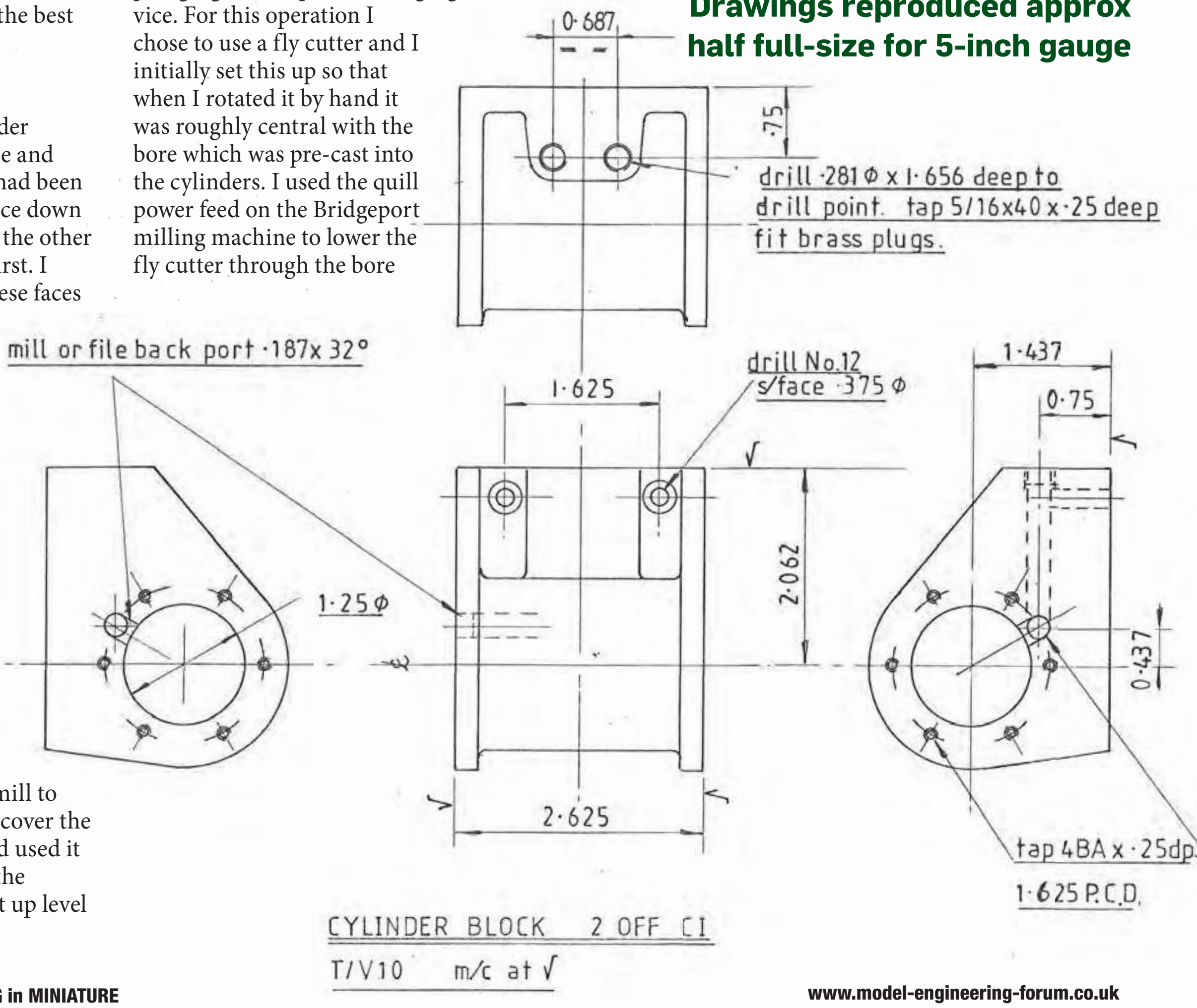
'Dougal' is a 2ft 6in gauge Barclay 0-4-0 today preserved on the Welshpool & Llanfair Light Railway in mid Wales.

and after each pass, I extended the boring tool out by 5 thou.

After two or three passes the majority of the bore had cleaned up and I was able to take a measurement with calipers between the bore and side face. I also measured the current diameter of the bore to calculate the position of it in relation to the side face. This dimension is very important as it determines the centre line of the crosshead and connecting rod since Dougal doesn't have outside valve gear.

The centre of the bores must be 1$\frac{7}{16}$in from the frames and I was able

Drawings reproduced approx half full-size for 5-inch gauge



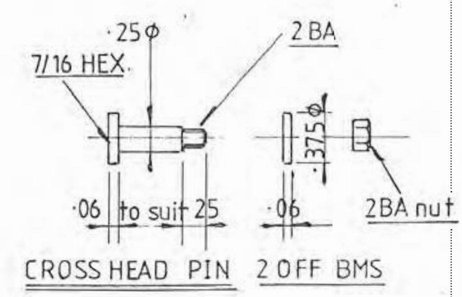
to move the bed of the mill over to ensure this was accurate before the size of the bore become too big to prevent any further adjustment. I continued to open up the bores, checking the overall diameter regularly as well as the distance from the side face until I was within 2 thou of the finished size. It was at this point when I came to move the boring tool out for the final cut that I realised I had reached the limit of travel on the tool! So near yet so far!

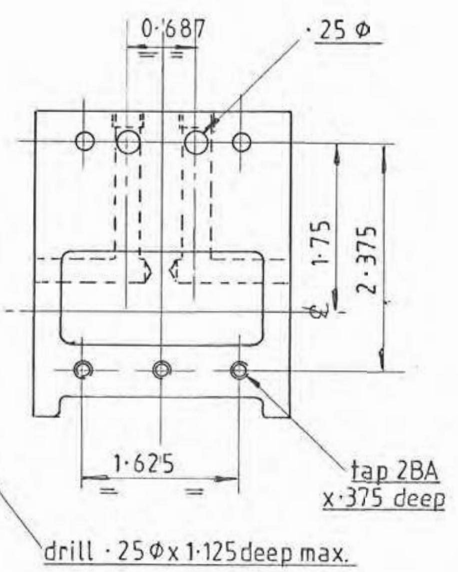
As a result both of my cylinders are still 4 thou under size to this day but it is not the end of the world. For the final few passes, I set the quill to feed very slowly in order to achieve the best possible finish in the gunmetal casting. This would be essential for the O-rings that I intended to fit to the piston heads, to prevent them from becoming scored on a rough internal finish.

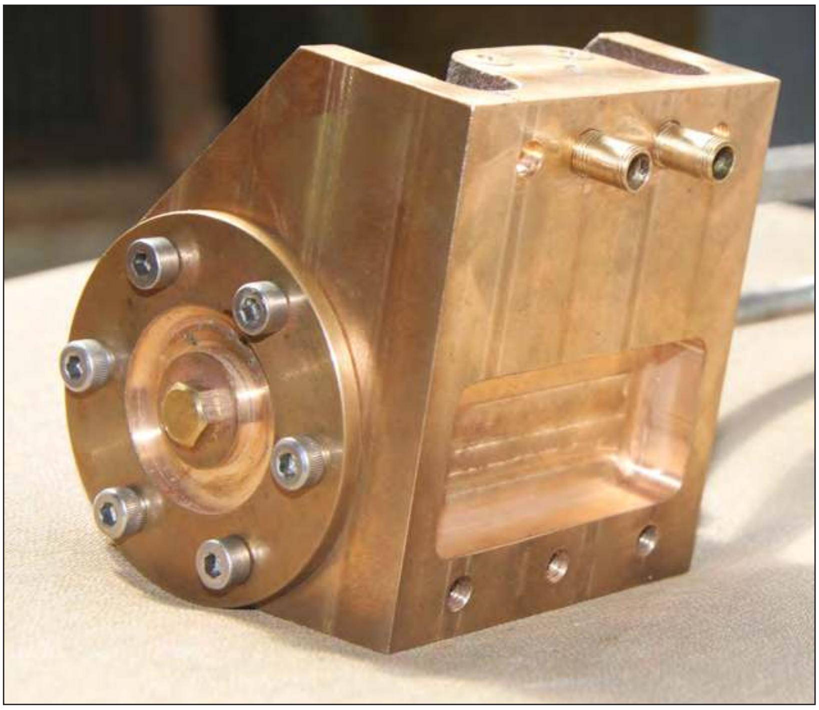
"When I came to move the boring tool out for the final cut that I realised I had reached the limit of travel on the tool..."

Internal steam ways

Next, I began drilling the system of internal steam ways that are hidden within the castings. With the casting still set to machine the bore and as the chuck was positioned central to it, I took the opportunity to drill the pair of steam ways which run parallel to the bore. I moved the bed of the mill over by 11⁄16in towards the side face and up by 7⁄16in to line the chuck up with the hole.



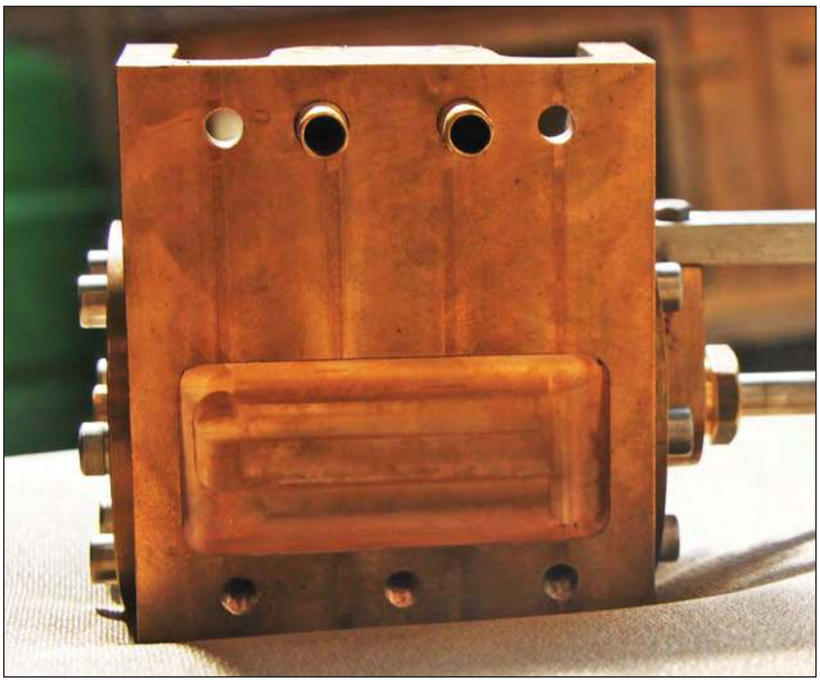




ABOVE: Three-quarter view of the completed cylinder block after machining.

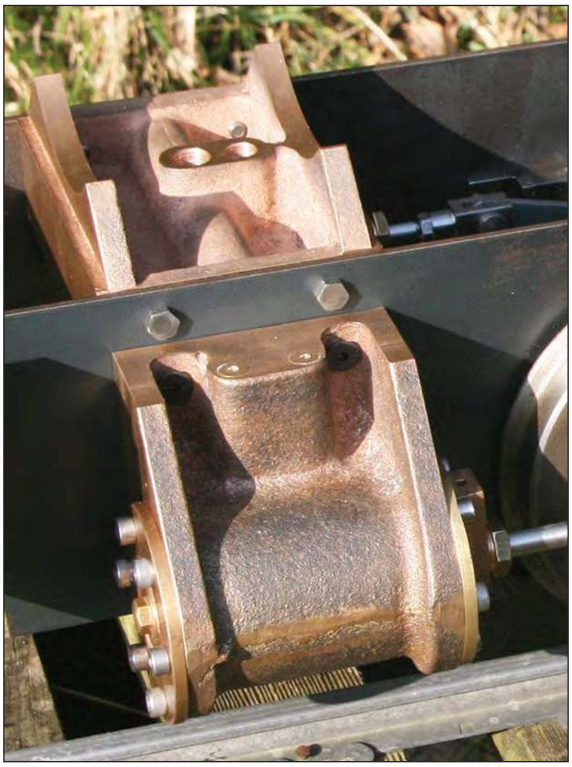
After spotting the hole with a centre drill and checking the location again with the calipers, I drilled it out with a ¼in drill to a depth of 1¼in. The depth must not exceed this, and that is clearly shown by the dotted lines on the drawings which illustrate the proximity the holes are to each other. I then turned the cylinder over and repeated this process at the opposite end; however I had now lost the centre datum point that I was working with after taking it out of the vice. To overcome this I turned an aluminium centring blank, one end of which I held in the collet, while the other end was turned accurately to fit inside the bore of the cylinders. I then offered this up to the bore and moved the bed of the mill until it slid into it. This was then used to find the centre of the bore each time and it is important this is a very good fit.

Once all four parallel steam ways had been drilled, I finished them off by machining the steam ports which direct the steam into the ends of the bores. The drawings state that these ports should be machined at 45 degrees to the bores however some simple trigonometry proved otherwise. Using the dimensions shown on the drawings, this angle actually works out as 32 degrees. Luckily, the vice that I had been using on the mill was a compound one which means that it can be rotated about its centre point. This came in extremely useful to machine these angled ports and I therefore set the compound vice round to 32 degrees and with a ¼in end mill machined ▶



RIGHT: A view from the mounting face, showing the steam pipes and the weight-saving rectangular cut-outs.

NEXT PAGE: Two views of the cylinders once mounted on the frames, their distinctive outside shape clearly evident.



Drawings in this series reproduced with kind permission of A J Reeves. Drawings, castings and material for this build project are available from A J Reeves.

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Web: www.ajreeves.com

Previous Episodes of the build...

Introducing Dougal, **April 2018**; Building the boiler, **May 2018**; Frames, axleboxes, **June 2018**; Wheels, eccentrics, **July 2018**; Rods, boiler saddle, **August 2018**; Machining the steam chest, **September 2018**; Adding the eccentrics, **November 2018**

Digital copies of previous issues can be downloaded or printed versions ordered from www.world-of-railways.co.uk/engineering-in-miniature/store/back-issues/ or by telephoning 01778 392484.

Next Month...

"Now for the tricky bit, I had to machine the angled sides of the boss..." More cylinder work for Andrew, including the pistons and their rods.

the ports to a depth of 3/16in.

I then moved on to drilling the remaining steam ways and I began by scribing the location of them on to the side and top face of the cylinders using the calipers. I held the first casting between its two end faces in the mill vice and levelled it using an engineer's square placed on the base of the vice and against the top face. I then placed a small piece of damp paper towel on the side of the cylinder and with the machine running, gradually moved the bed of the mill over until the centre drill touched and pulled the towel off. I now knew that the tip of the centre drill was within a couple of thou of the side of the cylinder.

I dropped the bed of the mill down and continued to move the X-axis over by half the width of the centre drill plus 5/16in, which is the depth from the top of the cylinder to where these holes need to be drilled. I repeated this process for the Y-axis and visually checked to see if the tip of the centre drill was in line with my original scribe lines.

Preventing corrosion

I adapted the design slightly at this point to accommodate two pieces of ¼in outside diameter thin-wall brass tube screwed into the side of the cylinders. These would fit through the frames and locate in an O-ring which I have already fitted into the side of the port and saddle block. The addition of this pipe avoids steam coming into contact with the steel of the frames and having the potential to corrode them. I therefore drilled this pair of steam ways 7/32in (instead of ¼in) in each cylinder to a depth of ¾in. Both holes were then threaded ¼in x 40tpi internally and four lengths of brass tube were cut and machined to size. These were then threaded externally to match and screwed in with Loctite 243 to seal them once the machining on both cylinders had been completed.

The five bolting holes then had to be drilled and in the case of the three at the bottom of each casting, threaded as well. I marked the location of each hole with the calipers and using the same method described above, positioned the mill chuck over the first hole. After spot drilling each hole, I double checked the spacing on the corresponding holes in the locomotive's frames. These must ultimately line up with those which I had already drilled.

The two holes at the top of each casting were drilled out 4.8mm, which is the clearance size for 2BA, as these bolts screw through the loco frames and into the port and saddle block. The three holes in a row along the bottom however were blind drilled 3.9mm to a depth of ⅜in and threaded 2BA. These bolts are fitted through the frames from the inside and bolt into the cylinders.

The next task was to turn the cylinders over and hold them between the end faces for a final time but with the top face upright in the vice this time. The next internal steam ways were drilled vertically down towards the main bore. These were two 9/32in holes drilled to a depth of 1 11/16in which would be blanked off with two brass plugs in similar form to one of the steam ways in the port and saddle bock. These holes should break into the horizontal steam ways which I drilled earlier. I threaded the top ¼in of each 5/16 x 32tpi and turned two corresponding plugs threaded externally the same to block the holes up. These plugs were made out of hexagonal material to give me something to hold with a spanner to screw them in. The heads were made deliberately thin as I machined them off flat with top of the cylinder once they had been fitted and sealed with Loctite 243.

Bolt holes

The final job was to drill and tap the bolt holes for the cylinder covers. First, I sat down and calculated the position of the holes in relation to the centre of the bore and from this I could work out how far I had to move the bed of the mill in order to drill each of the six holes. With the side face of the first casting mounted against the vice jaw, I used the aluminium centring blank to locate the centre of the main bore again and pitched across to where the first hole would be drilled. After spot drilling and subsequent opening out with a 2.9mm drill to a depth of ¼in, I put a 4BA tap in the drill chuck and lowered the quill down to begin threading each hole to ensure that the threads started straight. I finished threading the holes once the casting was taken out of the vice and used a bottoming tap to make sure that each hole was threaded to its full depth.

With the machining finished, I could now trial fit the cylinders to the chassis for the first time. Having fitted the brass pipes which fit through the frames, I gently pushed them into the O-rings in the counter bores on the port and saddle block. These were a good snug fit and I could feel the compression of the O-rings as I pushed the cylinders on. I then checked that all the holes in the castings lined up with those in the frames and screwed the bolts in to ensure they all fitted and held the cylinders in the correct position. I could also temporarily fit the cylinder covers at this point, using Allen head bolts. EIM

Choosing a first lathe

Seasoned model engineer Keith introduces his new regular series aimed at newcomers to the hobby, advising on what for the majority is the most important item of workshop equipment.

BY **KEITH APPLETON**

The hobby known as Model Engineering can be very interesting to some people and positively frightening to others. It largely depends on the way that you approach it in the first place.

Being interested in a subject that you may know very little about can be a daunting experience to many people, as there seems to be an immense amount of knowledge that you do not have as a raw beginner. Even grasping the essential basic rudiments seems an uphill struggle. Beginners can be easily put off the hobby by either being bombarded with a deluge of technical information very early on or just being given misguided information in the first place.

I have been into model making and model engineering for many years. I was interested in the subject as a child, sparked initially by playing with my small Meccano set. A few years would pass before I could be in a position to start my own workshop and build miniature steam engines.

As a child I often built various rubber-powered balsa wood model aircraft on the kitchen table, and I had a very old Triang 00 gauge model railway mounted on a modest board in my playroom.

My uncle left a collection of magazines at our house, *Practical Mechanics* and *Model Engineer.* I used to read these regularly and that is really how it all started...

It wasn't until I reached my early '20s that I bought my first lathe, a Unimat 3. This was a very small machine but it served the purpose when it was initially used to reduce bits of metal to swarf so I could then figure out tool angles, feeds, speeds and the like.

By this time I had a few bound volumes of *Model Engineer* and I was an avid reader of the popular LBSC articles mainly from the 1950s period – the teachings of Lillian Lawrence (LBSC) helped me immensely. I really appreciated his 'no nonsense' style of teaching and I recommend reading his book *Shop Shed & Road*. His biography which was written after his death is also well worth a read.

At the time LBSC had many contemporaries who were very critical of the way he did things and after reading a book about model boiler making written by one of his main critics it made me realise just how good the LBSC style of tuition was.

The style of teaching in the book just served to put me off ever wanting to build a model steam boiler – and to this day I have never built one. I have on the other hand built quite a few stationary steam engines and a few miniature steam locomotives in 5-inch & 7¼-inch gauge. These days I mainly carry out high quality rebuilds and restorations of miniature live steam engines and I make videos showing the stages of the work and explain (without a script) every step of the process in detail.

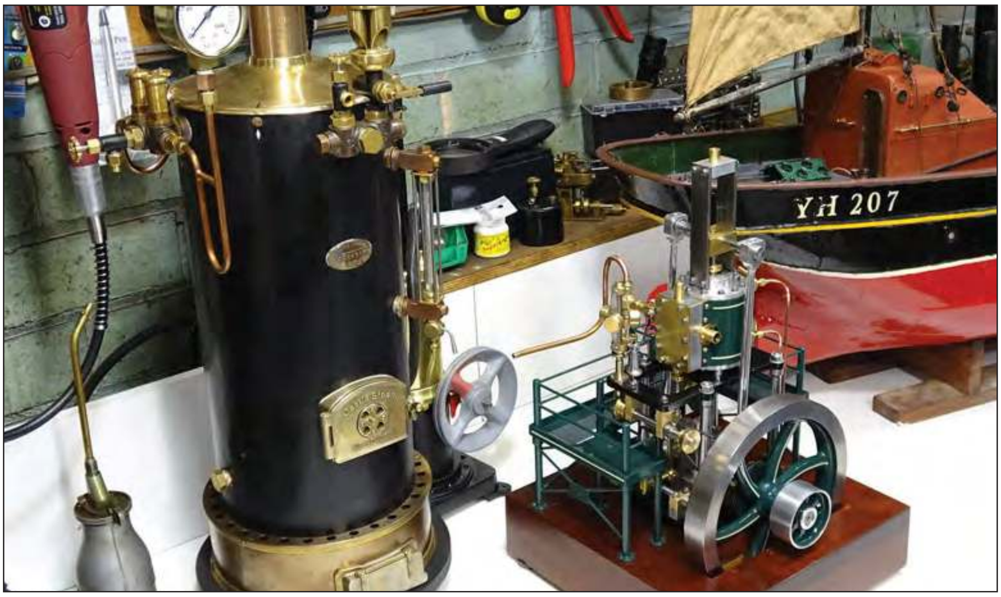
In this series of articles, I intend to provide information specifically aimed at the beginner to model engineering without trying to be too technical or clever whilst doing so.

If maths is not your strong point, don't worry about it. My final school Maths report read: 'Further critical comment would be futile.'

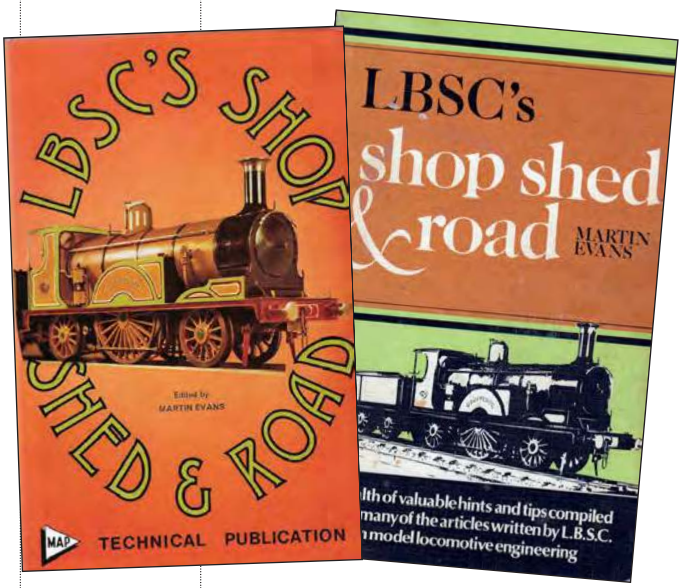
Winding the clock forward for a moment – when I eventually reached 60 years of age, I felt that it was time to 'put something back' after a lifetime of model making, so first of all I created an E-Book titled *The Complete Guide to Miniature Steam* then I began to make detailed tutorial videos about rebuilding model steam engines for my Youtube Channel (www.youtube.com/keithappleton)

What started as an extension to my lifelong hobby, making model engineering videos that are easy to understand by combining my experience as a videographer, recording studio engineer and a lifelong model maker describing the model steam locomotives, stationary steam engines and steam boats that I built, has developed into a job and as I write this the number of tutorial videos on my Youtube channel is approaching the 1100 mark.

What is very important to me is the constant volume of feedback from the viewers, that is of course excluding comments from 'trolls and 'keyboard warriors. Viewers' comments reveal the common things that people would like to be shown and explained. To date my Youtube channel has had around 17 million views, receiving on average 18,000 views per day.



ABOVE: Want to make anything like this varied selection on Keith's bench? You will need a good lathe.



BELOW: LBSC's book, recommended by Keith, has been much reprinted over the years. It is available today from EIM founder Tee Publishing.

Starting out

I often get asked the question: “What is the best way to start my workshop?”

There are a few ways to do this and in my opinion the first essential asset to acquire is a suitable metalworking lathe. The choice of lathe is dependent on a few factors, some obvious and some less so. I will use my own personal experience to illustrate this starting many years ago when I was an absolute beginner with no engineering training, but already a good deal of common sense.

As mentioned the first lathe that I acquired was a Unimat 3. I bought it new from a local model shop. Despite its small size it worked well and I immediately put it to good use making some stub axles for the suspension on a trailer that my friend was building.

ABOVE: Keith’s workbench with his Boxford lathe. Note the three-phase convertor at left and impressive line-up of ready-mounted dies!

BELOW & RIGHT: The humble Unimat 3, offered in various forms over the years, has served many a novice model engineer... *Photos: David Hunt*

The job proved a bit too much for this ‘watchmaking’ size lathe, but I got there in the end after breaking four of the rubber drive belts.

In the weeks that followed I reduced quite a lot of metal to swarf. At last I could put into practice what I had been reading about for some years in *Model Engineer* magazine and various engineering books that I found in secondhand bookshops. It is easier now – I use the Internet for most of my information, but in those days that just wasn’t an option...

After a few months of wrestling with this tiny lathe, making things such as tailstock die holders and tap guides I realised that I needed a larger one so I returned to the local model shop to see if he could help and to my amazement there in the corner of the shop was a much larger lathe.

This was an old ‘South Bend’ machine that had definitely seen better days, but owing to my total lack of experience a deal was done and it was duly installed in a corner of my father’s garage.

Then the troubles began. The lathe made a shrieking noise whenever I turned any pieces of metal and the turned finish on the metal was very poor. I had read about using ‘coolant’ so I got some but it made little difference – there was a problem. I now know this shrieking noise is called ‘chatter’ (vibration) and it was driving me mad – however I ground the lathe tools the chatter was there.

Around this time, I met a very talented and experienced ‘proper’ engineer who owned his own engineering company. He came to my humble garage workshop and explained what the problem was. The lathe bearings were worn out, in fact most of the machine was worn out.

I contacted the model shop and reluctantly they took it back but only after I held the owner of the model shop prisoner in my workshop and asked if he would like to try out the set of thumbscrews that I had made (while at the same time apologizing for the chatter marks on them).

My model engineering hobby ground to an abrupt halt as I was now without a lathe, but then luck intervened. The proper engineer that I met had a lathe in his engineering works that was seldom used. It was very old but it was in very good condition for the age of it.

By this time at 21 years old I had bought my first house with a cellar which was suitable for a workshop. The layout was not ideal but it was okay for starters – I plan to discuss workshop layout in a future article in this series.

This old lathe, a Holbrook B Model Number 9, was the first thing to be installed in my workshop. It worked perfectly and I sold it a few years later to a friend of mine – it is still in use today.

The moral from the above? These days there are many lathes available online, some good and some not so good, but do be careful what you buy and I would recommend that you see one working, even if you have to travel to where the lathe – I recommend that you 'try before you buy'. As a beginner you need all the help you can get, so fighting with a low-quality, badly adjusted and worn-out lathe is not the ideal scenario.

My lathe timeline
Emco Unimat 3 (sold)
Worn out South Bend Lathe (returned)
Holbrook Model B Number 9 (sold)
Hobbymat (sold)
Myford ML7R (sold)
Boxford AUD (sold)
Another Myford ML7 (sold)
A small Chinese lathe which I bought in a 'job lot' (I sold that very quickly)
Smart & Brown Model 1024 (current)
Boxford AUD (current)

As you can see from the list I have owned a few lathes over the years and the current two that I have are still with me because they are very suitable for the jobs that I use them for.

Not about the looks

Cosmetically my two current lathes are not much to look at. I don't spend too much time on cleaning them, but they are both accurate and they work well. When I look at the list it is a pity that I didn't just buy the two I have now in the first place ...

I would personally like a Hardinge lathe as these are extremely good old British machines. I have also used a Harrison M350 lathe at The Steam Workshop and I did appreciate the smoothness of it after working on my old lathes.

My home workshop is a humble affair, devoid of expensive gleaming machine tools, instead mine could really do with a repaint, but underneath the chipped paint they are accurate old machines and that is what you need first and foremost.

ABOVE: Close-up of the Boxford lathe – it may not be in pristine condition cosmetically but it remains accurate, which is what counts.

BELOW: The second lathe in Keith's workshop, made by Smart & Brown.

I have an old milling machine in my current workshop called a 'Naerok' ('Korean' spelt backwards). I bought this in the early 1990s and even though it's not much to look at, it has given very good service so far. My pillar drilling machine is not good at all and although it is a lot newer than the lathes, I am currently looking to buy a replacement soon.

Back to your lathe – I would recommend spending as much as you can afford, but do shop around as the prices and condition of new and used lathes can vary tremendously.

You also need to know whether the lathe that you are buying is Single-Phase or Three-Phase. In a domestic environment the mains electricity is Single-Phase – if you buy a Three-Phase lathe you can buy a converter to make it run but obviously this will be at extra cost. Good Three-Phase converters are not cheap.

Alternatively, you can change the motor but be aware that you will need to also change the Contactor as a Three-Phase Contactor operates on 415 volts not the usual 240 volts domestic supply.

In 2018 as I write this there are lots and lots of machine tools available from overseas. Some are okay but some of them are terrible – so be careful if buying via the Internet.

There are many and varied lathes of different sizes, age and condition out there and many of them are available secondhand, but don't rush into buying one before thoroughly reading up on the specifications, including the pros and cons of individual models. It is very like buying an old secondhand car inasmuch that there is a lot of rubbish out there in the marketplace.

My advice is not to rush into buying a lathe – it's a good idea to ask everyone that you know who uses one what they recommend. But beware if you ask a professional engineer as you may find that the recommendations you receive are only really valid in a professional industrial application.

It is a good idea, however, to seek help from an experienced model engineer who knows his stuff, and if

you can view the lathe that is for sale 'in the flesh' so to speak and not just by looking at a photograph online, get him to check it out before taking the plunge and shelling out your hard-earned money.

It is also a good idea to take a test cut on the lathe using the method described at the end of this article. This will verify the basic accuracy of the lathe before you buy it. If the lathe is inaccurate, just walk away from it, because as a beginner and even as an experienced model engineer you can do without a machine that doesn't turn true.

Joining a model engineering club or miniature steam railway society before you buy anything is a very smart thing to do. Most clubs will help you and often members will provide you with leads to good machine tools that are currently for sale.

In summary: – If you buy the best machine in the first place, then you will only need to buy it once. Spend as much as you can afford to, and if you have the funds, why not even consider buying a brand new one?

Lathe tooling

Most lathes will have a three-jaw self-centring and four-jaw independent chuck included in the sale. Other useful accessories are;

- A micrometer
- Faceplate and angleplate
- Quick-change tool post
- A set of good quality carbide-tipped lathe tools
- Fixed and travelling steadies
- Top-slide milling attachment
- A set of collets
- Imperial twist drill bits
- Metric twist drill bits
- Reamers in popular ME (Model engineering) sizes
- Number twist drill bits
- Hand operated tailstock chuck (they save time looking for the chuck key).

"Always treat machine tools with great respect because if you get it wrong they will bite..."

ABOVE: Brass bar mounted in the chuck of the Smart & Brown lathe. True running is an essential early check on a newly acquired lathe.

LEFT: Lathe accuracy can be checked by taking a cut in the centre of a bar, and then at the outer end and close to the chuck jaws, and then measuring each cut with a micrometer to check they are the same. *Photo: Harry Billmore*

Installing your lathe

Once you have selected and purchased your new or secondhand lathe, the first thing to do before even plugging it in is to make sure that the lathe is perfectly level on the floor of the workshop. A spirit level is an obvious tool to use for this job. If the lathe is not perfectly level on the ground it may not be accurate when you come to use it as the bed may be twisted slightly. I know it sounds strange to say that a substantial cast-iron lathe bed can twist if it's not level – but this can happen.

Always level your lathe before you start working on it.

Health and safety

Operating a powerful machine tool can be extremely dangerous and I would recommend any beginner to seek help from an experienced engineer to carry out the operation described below.

Always treat machine tools with great respect because if you get it wrong they will bite and an afternoon of pain and suffering in your local hospital's A&E department is not the best way to start the hobby.

Once the machine is wired up and ready to go, you now need to fit a piece of round bar of at least 1 inch in diameter into the chuck with about 6 inches of this bar sticking out of the chuck. This will be your test bar.

Next, fit a sharp round-nose cutting tool in the toolpost and adjust it to be precisely at the centre height of the lathe spindle, by using a centre in the tailstock in order to accurately set up this parameter.

Move the cutting tool into a position that is approximately 2 inches in from the end of the bar that is sticking out of the chuck and take a cut along the bar, to remove some of the metal from the middle part as shown in the photo at left. This makes it quicker to check both ends of the bar and saves any possible wear of the tool if it had to traverse the entire bar.

To check the accuracy of your lathe, you need to machine the end of the bar, then move the tool to cut the part of the bar that is nearest to the chuck jaws, then test both ends of the test bar using a micrometer.

If all is well, the diameter of the outer part of the test bar and the inner part of the test bar should be identical. If by any chance there is any difference in the diameter of the two ends of the bar, check that your lathe is 100 per cent level on the floor. If the lathe is good and the test bar cuts are accurate, then you are ready to start Engineering in Miniature. EIM

■ Look out for more from Keith in future editions of **EIM**

An electronic water gauge

David adds a modern enhancement to a 5-inch gauge 'Tich' locomotive.

BY **DAVID MACHIN**

Having rebuilt a 5 inch gauge 'Tich' locomotive for a friend, including fitting a new boiler, I was surprised to find that the water gauge did not work at all. It always read low when in steam, in spite of furious pumping with the hand pump. Yet when the boiler cooled down, the reading was very much higher – well above the normal half a glass. I sought advice from online forums, all to no avail, though very grateful for the interest shown. I tried various 'cures', and finally tried LBSC's American Reflex type, described in his *Live Steam Book*, later republished as *Shop. Shed & Road*, and, again to no avail.

When I was reading Malcolm High and Derek Crooke's recent excellent series in **EIM** on building Yorkie, a 16mm scale locomotive (*Sept 2015 - Feb 2017*), it was mentioned that a 'normal' water gauge couldn't be fitted because the boiler was too small, and they had therefore designed an electronic one.

For me, this was a 'light bulb' moment; would such a gauge work on the Tich (**photo 2**)? Well, I can now say yes, it does work and it occurred to me that this might be of interest to other readers with similar problems, hence this article.

In order to understand what follows, I have included a photo of the reflex modification system, (**photo 3**). In making the parts for the LBSC Reflex water gauge, I had found that the original threaded bushes silver soldered into the boiler backhead were not on exactly the same axis as each other, which meant that I could not make a simple square bar arrangement for the additional parallel tube required for the reflex system. Instead I made two sets of bushes with large flanges, relying on the annealing effect of the silver soldering of the copper tube to allow fitting of the second flanges to allow the 6BA screws to pull each of the two sets of flanges together, with an oiled card gasket between the two. Since the difference in the axes was quite small, this worked well – but still did not help with creating a reliable conventional water gauge!

For the electronic water gauge, I have simply adapted the reflex arrangement, and silver soldered additional gunmetal bushes threaded 3⁄16 x 40 into the copper tube to take the electronic sensors. The new bushes are fitted half an inch apart, and a quarter of an inch above and below the half-a-glass level of the normal water gauge (see **Drawing 1**).

I made blanking plugs for the threaded holes, sealing the original threaded bushes for the conventional water gauge fittings. This latter point helped, because when I needed an electronic ground connection for the electronics, I could use a 5⁄16-inch fibre washer for one of the blanking plugs, instead of plumber's jointing paste, which made a good electrical connection through the threads, yet still sealed the plug.

I have spent some hours attempting to design a leak free system for this article, using a piece of square bar. This was anything but simple, as I suggested earlier, mainly because the area of the original bush facings is so small. Therefore, if converting a 'normal' water gauge system to electronic, I would recommend the large-flange method of fitting an electronic water gauge, even if the bush axes in the backhead are correctly aligned.

Electronic kit

Malcolm High will supply an electronic water gauge kit, comprising a boxed and sealed electronic circuit, sensors, and instructions. (Usual disclaimer). The supplied sensors are simply a pair of M2 stainless steel Allen screws, and two M2 nuts, fitted into insulating bushes mounted in 3⁄16 x 40 threaded gunmetal bushes. As already mentioned, two additional bushes need to be made to silver solder into the copper tube to take the sensors. **Drawing 2** shows these - easily made in the lathe.

Regarding the M2 threads, I found that 9BA is virtually interchangeable. Not having any 2mm or 9BA brass nuts, I drilled and tapped 10BA ones, and used them for securing the male spade connector fittings supplied by Malcolm High.

The electronic circuit, in its box, is sealed by a protective coating of some kind, which means you're left guessing as to its secrets. My thinking on this is that, broadly, water being a conductor and air/steam an insulator, I would therefore think that the circuit consists of a potential divider operating a transistor switch, where the sensor is connected to one side of the potential divider , with a resistor to the other of a value which will allow triggering of the transistor when the voltage reaches a certain level, presumably when the sensor becomes wet or dry, according to its position. There would have to be one transistor switch for each sensor.

To practicalities: The circuit will operate between 4 to 8 volts DC, and I used a pair of 3 volt, 20mm button cells in series. Typically, type CR2016, CR2025, or CR2032 all give 3 volts each, so two in series will give 6 volts. How long these will last, I don't know at present, until the steaming season (Spring to Autumn, 2018) is complete I will then be able to give guidance via the letters pages, with the agreement of our editor.

The kit of parts from Malcolm ▶

PHOTO 1: The completed electronic water gauge installed on the footplate, with its green and red indicator lamps visible. The Ed would probably tone its look down with a coat of green paint!

PHOTO 2: The guinea pig loco, a 5-inch gauge Tich.

3

High comes with full instructions. The circuit has five connecting leads; three with female spade connectors, coloured white, red, and black. These have additional insulating covers over the female connectors coloured green for the white wire; red for the red wire; and black for the black wire.

As you will see in Photo 1, the sensors are fitted into the pair of bushes already discussed. These are fitted with the supplied male spade connector, and the female connectors are pushed on to these. As already mentioned, the black (ground lead) is connected to the boiler by the blanking plug and a 2BA brass screw which holds the male connector. Malcolm, in his instructions, suggests that the male connectors will need a little filing at the ends (to look more like a chisel), to allow the female connectors to be easily fitted. I found that this certainly needed doing.

There are another pair of wires, red and black and separate from the other three, appearing out of the circuit box. They are for connecting to the power supply; the pair of 3-volt cells, mentioned previously. Red to the positive cell's holder connection, black to the negative cell's.

I cut off the tiny supplied connectors and soldered the black wire to the Negative directly to the Veroboard circuit board, which was used to mount the cell holder. The holes in the veroboard are correctly spaced to fit the cell holder, but will need to be drilled larger to suit the connector/mounting 'prongs' on the cells holder. Drawing 7 shows the location centrally on the Veroboard. Simply measure the 'prong' width on the cell holder with a micrometer to determine the drill size – apologies, I did not note this figure when preparing the Veroboard.

If you are not familiar with using Veroboard, sometimes called strip board, it is a means of easily making prototype electronic circuits. In Photo 6 are two pieces of Veroboard showing each side. It is a Tufnul (non conducting) sheet to which thin strips of copper are bonded, with interconnecting holes drilled. The other side is plain Tufnol, with the holes all the way through the sheet. These holes are spaced at 0.1 inch centres, and the electronics industry, worldwide, uses this spacing for I.C.– Integrated Circuit – pin connections. For prototyping electronic circuits, I.Cs and discrete components such as resistor, transistor, and capacitor connections can be soft soldered in the holes through the copper strips, which will then conduct current to other components.

Where conduction is not required between components, a break in the copper strips can be made by simply countersinking one of the holes on the copper side to remove the piece of copper strip, just deep enough to reveal the insulating tufnol. A small drill, around ⅛in diameter, is used as a countersink, one's fingers supplying sufficient turning motion to remove just the copper strip. This operation is not required for our project.

I found an online company, Rapid Electronics (usual disclaimer), supplying small pieces of Veroboard of 64 x 25mm, the ideal width for our purpose. The only snag is the smallest quantity sold is five pieces.

For this project, the veroboard needs to be cut to 1⅜in in length. The 25mm width provides just enough holes to fit the cell holder. Rapid Electronics also supplied the holder for two 20mm, 3 volt cells, mounted in series, to supply a total of 6 volts.

Mountings

I used Veroboard to mount the cell holder, through which the rest of the power connections can be made. As you can see in Drawing 5, the Veroboard is mounted in the container by using a pair of spacer bushes at the base, and opening out a couple of holes in the board at 10 holes apart (1 inch), for tapping 7BA. Drawing 9 shows all the details.

A couple of 7BA brass countersunk screws hold the veroboard in position at the base of the container. There is no need to worry about the bushes in contact with the copper strips shorting anything out, as only the two outer copper strips are used for connecting, these are well away from the central copper strips.

I bought a miniature on/off slide switch from a local branch of Maplins (*before the retailer sadly closed down -Ed*). Rapid Electronics also has these, but again, you need to buy five. Most online dealers seem to stock such small items with this minimum quantity buying policy.

For the container, I used plastic (PVC) electrical cable trunking. I found a short length in a skip! This is

PHOTO 3: Starting point,t he reflex modified water valve.

PHOTO 4, 5: Interior of the electronic water gauge container.

4

5

shown in **Photo 7** (adhesive side uppermost.) On my daily walks, around the estate where I live, there is always someone having building work done with a skip for waste, and I always have a look to see if anything might come in handy...

For those who don't want to look into skips, a friendly electrical contractor may be able to help. Online there is also a better size of trunking - 40mm.x 40mm - requiring no modification, for our present project. Your electrical contractor may have some short ends of this.

The conduit has a cover which snaps into position – ideal for battery changing. The back of the case has an adhesive coating, revealed by a thin (blue coloured) plastic protective removable strip, which was handy to fasten to the inside of the loco bunker (or as LBSC said in his original article and book, 'bunkum' – it doesn't contain any coal!). Although to clear the brass angle of the 'bunker', I had to add another piece. I just simply cut another length of trunking plastic/adhesive strip to add to the thickness.

My skip-sourced trunking needed modifying to make it big enough. I used some additional pieces cut from left-over PVC guttering; and I also used offcuts of PVC angle (described as mouldings on the Wickes DIY chain website)

The extra pieces were cemented on with PVC cement. This is a 'cold weld' – the cement dissolves the mating surfaces, thus bonding them together. Plumbers use this cement when fitting PVC drainpipes and it is available from Wickes (usual disclaimer). The cement is very volatile, so replace the lid (with brush built in) immediately after applying.

The PVC guttering is 0.093 inches thick – about 3/32. The PVC angle is 0.048inches thick. **Photos 4** and **5** show the assembly and also the wiring and general set up, and **drawings 5, 6** and **7** show full details of the assembly. I cut pieces of 3/32in thick PVC guttering for the end caps – slightly larger in area than the end cap shape, cemented them on and trimmed off the surplus when the cement had set.

Shaping to fit

Please also note that the shape of the 'snap on' lid section of the end caps – drawing 7 – will also want trimming to allow the lid to fit. I used needle files for this shaping.

One final point – for the lid, I added a short strip to offer a dust seal when the lid is in position. But to allow those parts of the lid to flex when fitting the lid, a 1/32in gap must be left between the lid sealing strips and the tiny inner flexible 'cast-in'

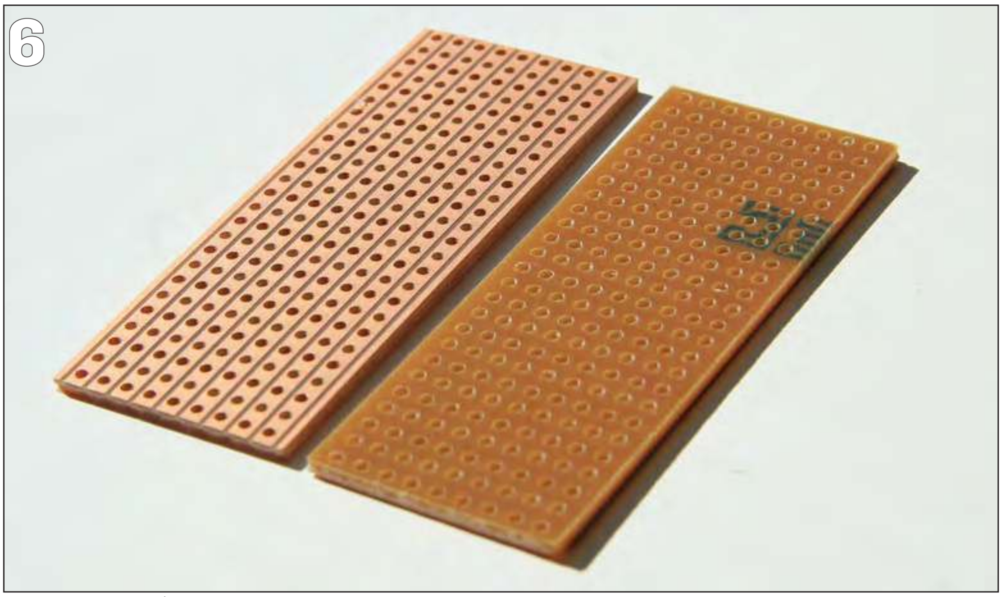


PHOTO 6: Veroboard, the basis of electronic circuit boards, is used in this project.

"There is always someone having building work done with a skip for waste, and I always have a look to see if anything might come in handy..."

sections. See drawing 7 for this.

When fitting the circuit box, holes will need drilling in the container for the LEDs. These need very careful marking out. First, measure the centres distance between the pair of LEDs. I used a micrometer to ascertain this, by measuring across the outer diameters, and subtracting an LED diameter, (0.118in). This gives the exact between-centres distance, which can then be carefully marked out on a small piece of scrap sheet steel, to act as a jig.

I used a 1/8in drill to give some clearance. Once drilled, the jig can then be tested on the circuit box for the fitting of the LEDs. It is important to carefully position the drilling jig, so that the circuit box will be exactly positioned relative to the container, to allow the LEDs to fit correctly when the circuit box is finally fitted.

I used a small piece of 18g brass sheet to mount the circuit box, as shown in drawing 7. You will note that 18g is very nearly the same thickness as the PVC container, facilitating the location of the circuit box LEDs. The mounting lugs of the circuit box are tiny, with equally tiny holes, see drawing 5. I intended using 10BA screws for this, and the tiny holes in the lugs were enlarged, using a No 50 drill – clearance for 10BA.

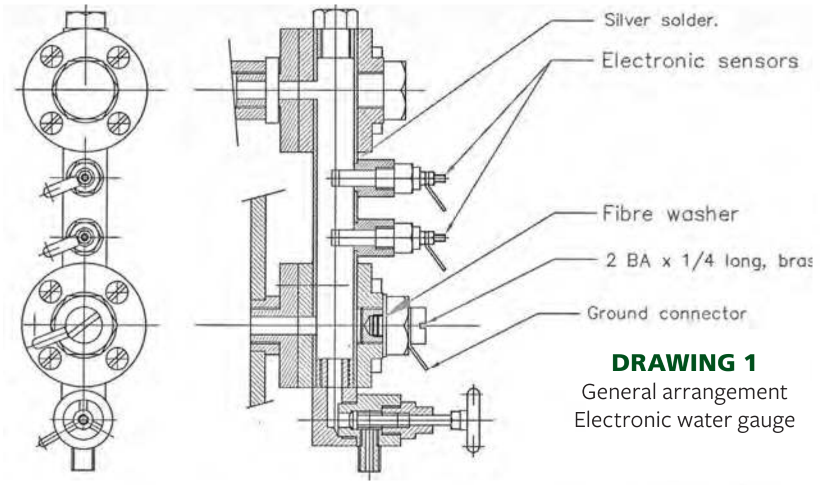
The three leads, white, red and black for connecting to the sensors and a ground connection to the boiler already mentioned, have to be passed through the container, using a hole in the side. This hole has to be big enough to allow the female connectors and their insulating sleeves to pass through. A 1/4in diameter hole doesn't seem big enough, but remember that the leads with the female insulators don't have to go through all at once!

Ideally, the hole should be fitted with a grommet (a grooved rubber bush). Since the container is made from plastic, not metal, I used some silicone seal (used in bathrooms) for this, which you can just see in photos 4 and 5. A metal container would need a rubber grommet, because metal can cut through the insulation of the wires, causing a short circuit.

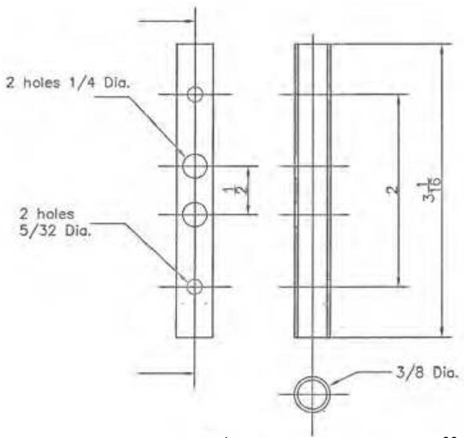
For soft soldering the electronic parts, a very small (about 25 watts) electric soldering iron should be used.

The resin flux used looks like a very thick grease. The tin I have was made by Frys Metals – look online for suppliers. Liquid, zinc chloride type,

PHOTO 7: David found the PVC conduit that he used in the electronics box in a skip!

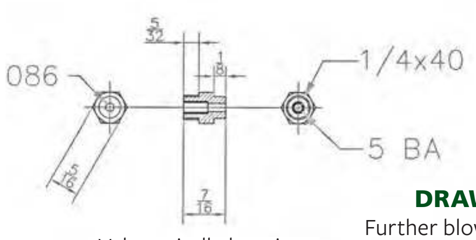


DRAWING 1
General arrangement
Electronic water gauge

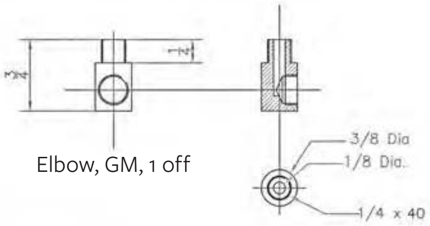


Tube, copper, 20G, one off

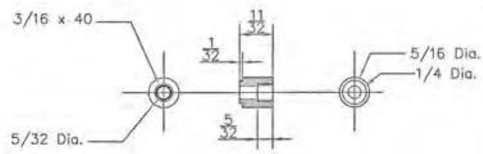
DRAW
Water gau



Valve spindle housing, GM, 1 off

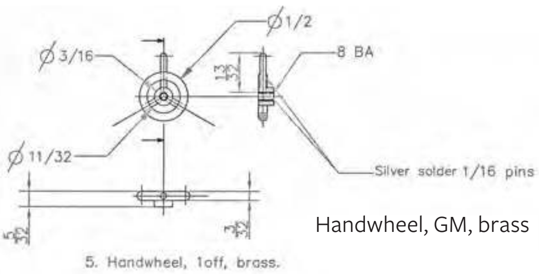


Elbow, GM, 1 off

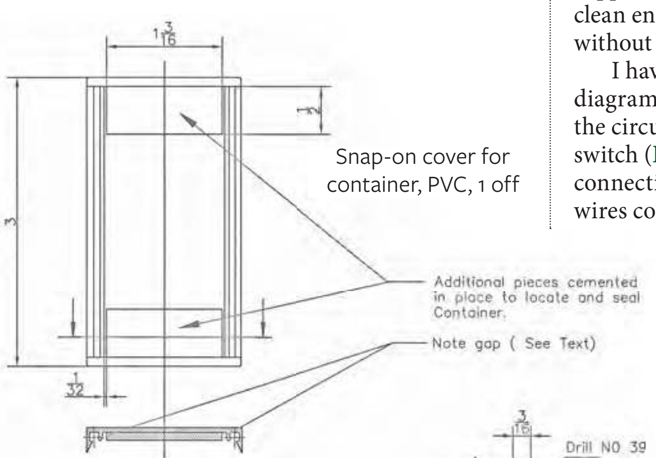


Sensor bush, GM, 2 off

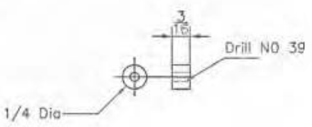
DRAWING 4
Further blowdown details



Handwheel, GM, brass

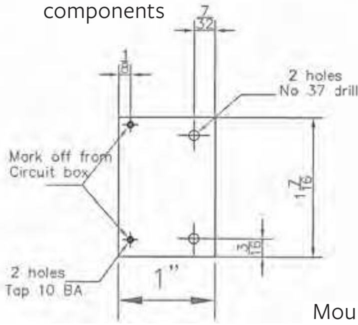


Snap-on cover for container, PVC, 1 off



Spacers (part 7), brass, 2 off

DRAWING 7
Electronics container components



Mounting plate (part 3), 18g brass, 1 off

fluxes such as Bakers are never used for electronic circuits as zinc chloride is very corrosive and the very necessary washing off of the flux on electronic circuits is NOT a good idea!

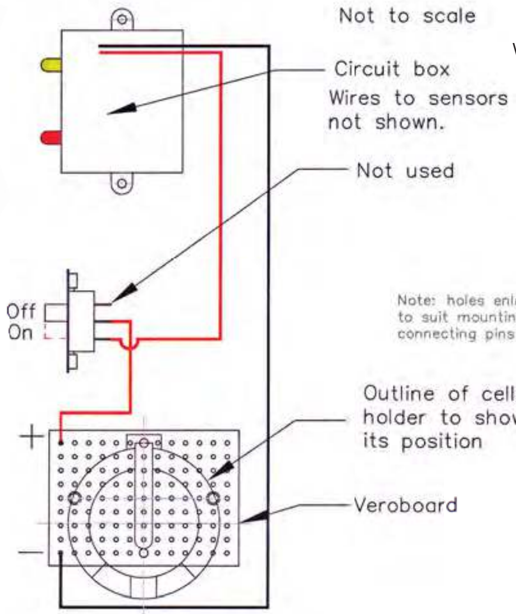
Reels of small diameter soft solder can be bought, and for electronic soldering is resin cored, eliminating the need for a separate resin flux. However, all the components connections, wires and such should be clean for successful soldering. I always apply some additional resin flux to copper wire when soldering, but freshly stripped insulation from copper wire usually leaves the copper clean enough for successful soldering without further cleaning.

I have drawn a simple wiring diagram for connecting the cells to the circuit box, using a simple on /off switch (**Drawing 8**). For the cell connections, the red/black pair of wires coming out of the circuit box are connected as follows:

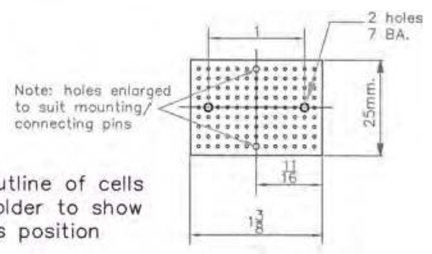
- **Black wire** soft soldered to the Veroboard strip connected to the negative pole strip of the cells holder
- **Red wire** soft soldered to the output side (outer lower tab) of the slide switch connectors
- Input of the slide switch (centre tab) soldered to the copper strip on the Veroboard connected to the positive pole of the cells holder, as shown on the drawing.

Although I used a single pole double throw (SPDT) switch, with two 'on' positions, a single pole, single throw (SPST) switch is better. The difficulty is finding one! I have already mentioned the wiring to the sensors, and **Photo 3** clearly shows this. No soldering is required.

Fit the two cells, each one positive side uppermost, and the gauge is now ready for use. An initial test is to switch on, and with a dry boiler, the

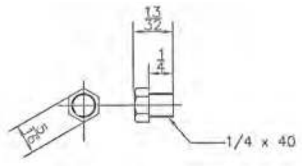


DRAWING 8
Wiring diagram for switching power

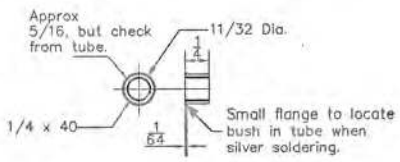


DRAWING 9
Veroboard, 1 off

ING 2
ge details

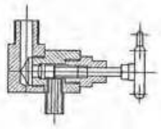


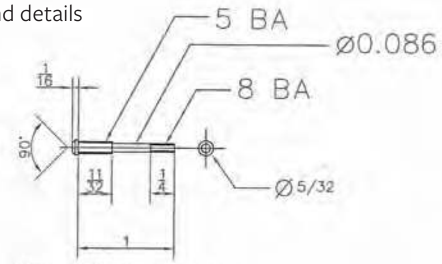
Blanking plug, GM, one off



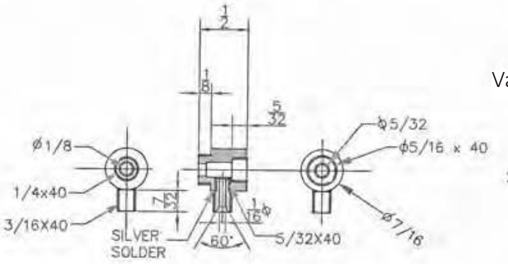
Bush for blanking plug at tube top, blowdown valve tube bottom. GM, 2 off.

DRAWING 3
Blowdown valve, GA and details

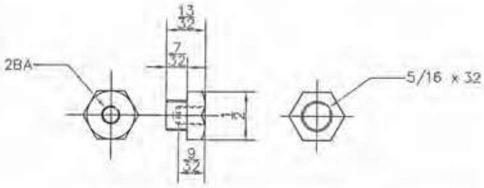




Valve, stainless steel, 1 off



Valve seat housing and outlet pipe, GM, 1 off



Blanking plug, GM, 2 off, one tapped 2BA

red LED should light up. A further test needs a steam up.

The boiler is filled through the safety valve holes. I should say that this 5-inch gauge Tich has a pair of safety valves fitted. The original 3½inch Gauge Tich design had only one safety valve underneath the steam dome. With both safety valves removed, the air can be let out as the boiler is filled. This is also handy for checking the level during filling.

I was hoping that the gauge would turn the red LED off, once the required level was reached, but it did not – as mentioned as a possibility in the kit instructions, the electronic gauge did not work with cold water. When the water is hot, the gauge does work. Why this should be so, I don't know. Perhaps one of our readers does?

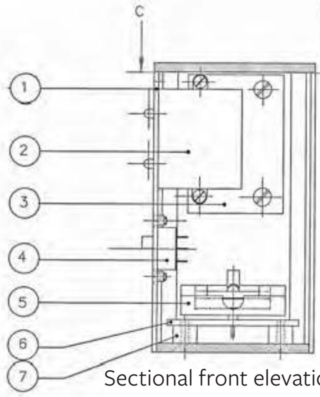
Green for go

With boiler pressure raised, and a correctly filled boiler, the gauge will show a red LED off and the green LED on. If not, more water is added via the hand pump. When running, with more water used, and the level dropping, the green LED will turn off, a signal to pump more water in. Closing the bypass will make the axle pump put more water into the boiler, until the green LED comes on again.

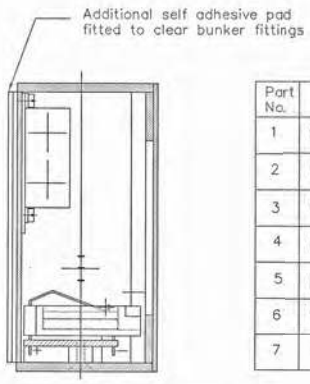
If the red LED comes on, the water level is too low. Again the cure is to pump more water in, even if the axle pump bypass is closed, by using the hand pump as well. If, in spite of pumping, the red LED stays on, drop the fire, and investigate when cool.

I found when steaming that the green LED came on and off as described above, and responded immediately to pumping. I now know the level of water in the boiler, when steaming – a successful result, worth all the effort.

Malcolm High can be emailed at Sales@modelengineerlaser.co.uk, or by telephone: 0132337772. His stand attends a number of 'our' shows. EIM



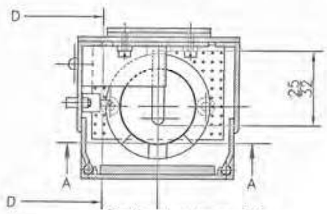
Sectional front elevation, AA



Sectional front elevation, DD

Part No.	Description
1	Container
2	Circuit box with LEDs
3	Backplate
4	On-off switch
5	Cells holder
6	Veroboard
7	Spacer bushes

Please note, Container made from PVC electrical conduit.

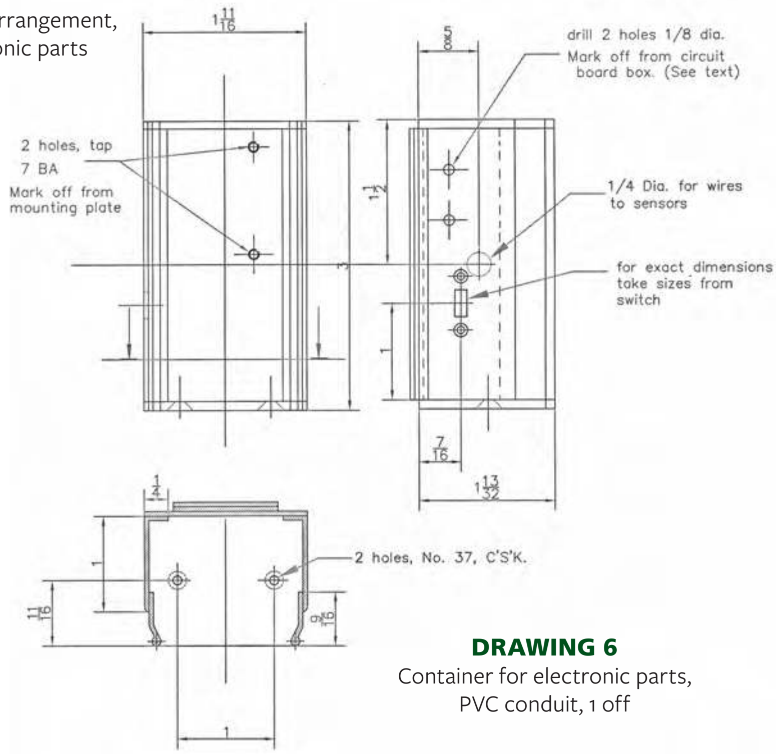


Sectional front elevation, CC

DRAWING 5
General arrangement, electronic parts

ALL DRAWINGS REPRODUCED APPROX HALF FULL-SIZE UNLESS STATED

All photos and drawings in this feature by David Machin



DRAWING 6
Container for electronic parts, PVC conduit, 1 off

Filling the gap in educating the young...

The Learning Centre

The miniature railway in Beech Hurst Gardens, Haywards Heath, has been providing rides for passengers for more than 60 years and is now recognised as an enormously valuable attraction and amenity. Many people, and especially children, are keen to have a ride behind a steam engine but often they don't understand how the engines work. Even adults can be amazed to see small lumps of coal being put into the firebox and sometimes children see water being put into the tender and think it is petrol. Nevertheless, it is encouraging that parents will ask if there is any way their children can learn about how steam engines work.

When most miniature railways were built many years ago, children were taught metalwork and engineering drawing at school. These skills laid the foundation for many of the older generation to build and maintain model steam locomotives. Nowadays, schoolchildren don't have these opportunities but some may wish to take up model engineering as they grow up. Without this new blood, the heritage of building, maintaining and operating miniature steam locomotives will not be sustainable.

The model engineering industry has also changed and evolved over the years, so it is now possible to buy a range of products from ready-to-run steam locos to detailed component parts. However, even if access to models is easier there is still a need to maintain, repair and operate them.

It was apparent to me that there is an obvious shortfall with miniature railway clubs in that very few have the facilities where the engineering and technology associated with steam engines can be taught, understood and passed on to the mainly younger generations.

To address this issue, I decided that there is a need for a totally new initiative to move with the times. The concept I came up with is the establishment of a Learning Centre designed to create an environment where people of all ages, but especially children, can learn about steam engines in an exciting and engaging atmosphere. This centre would have;

- Static and active displays
- Interactive displays
- How-it-works display;
- Hands-on true-scale sub-assemblies and computer-aided-design displays
- Fun activities
- 'Fixing it' advice for problems with mechanical models
- Other groups bringing in different displays
- A social friendly environment for volunteer staff.

This would establish a technical and engineering environment conducive to learning but there is a need to do more. It will be important to develop that sense of dedication and common interest in the Learning Centre activities, as was the case in the early days of railways. To achieve this, small groups or communities will be encouraged, such as:

- Volunteers who staff the facility;
- Friends of the Learning Centre – a group who might help with special events and liaise with other groups;
- Special Interest Groups.

The benefits of establishing the Learning Centre will therefore go beyond the gaining of knowledge and lead to the establishment of new community groups and friendships, of wide benefit to local society.

We, as a group of like-minded members of the Sussex Miniature Locomotive Society (SMLS) that operates the Beech Hurst miniature railway, set about planning the establishment of our Learning Centre to be called 'The Branch Line'.

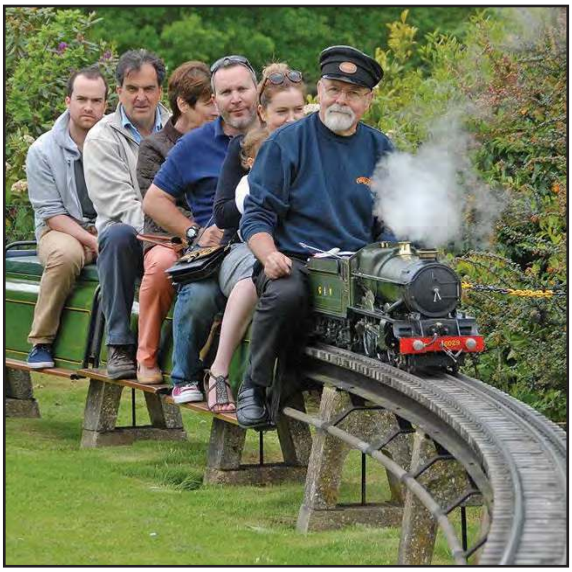
Working with Mid-Sussex District Council (MSDC), approval for the centre was given by the Beech Hurst Trustees in September 2017. The centre would be attached to the existing SMLS Club House, run by volunteers and operated as a Charitable Incorporated Organisation (CIO) that was approved by The Charity Commission in May 2018 (Charity registration number 1178407). A Planning Application has also been approved by MSDC and now we have developed promotional material and a website. An MSDC Facility Grant Application has also been submitted.

Our next stage in this innovative project is to raise £200,000 to build and equip The Branch Line and then recruit the services of volunteers. If you feel you would like to help, donate or would like to know more about the project please contact us by e-mail at branchline255@gmail.com

To donate go to our web page www.branchlinelearningcentre.com or alternatively our Facebook page, TheBranchLineLearningCentre

Dr Roy C Preston
Chairman of the Trustees of The Branch Line CIO

Model engineering query to have answered or point to make? Email or write to the address on page 3.



BELOW: Visitors of all ages enjoy riding behind our miniature locomotives but how do we encourage them to make the leap from viewer to partaker? See Roy Preston's letter at left.

FACING PAGE: John Smith explains his accessories on behalf of one of our readers, see 'Rotary Confusion'

Rotary confusion

Having had some recent experience using a rotary table, with mixed success, I was drawn to John Smith's *Tips for Model engineers* article in the November 2018 issue of **EIM**. I was particularly drawn to the section on 'True to form', but was unable to work out how his system illustrated in Photo 2 actually works.

Can John be prevailed upon to write a fuller article showing how the various components fit into the table centre tapered hole using a blank arbour, where the tapped extraction hole is located, and with examples of each type of accessory in use. It looks to be a really useful kit !

Michael Malleson.

Author ***John Smith*** *replies:* My apologies for any confusion caused. The main idea is that you make a simple accessory for your rotary table. If the table has a 2 Morse Taper hole in the middle, you buy a 2 MT blank arbor (one without a tapped hole in the rear).

These are usually not hardened, so can be machined. Cut it so that the sawn surface sits just below the face of the table. Mount the arbor in the taper of the lathe headstock and;

1) Face it
2) Drill right through using a tapping size for (say) 6mm or 2BA, whatever you like.
3) Drill and bore a ½-inch D hole ½-inch deep.
4) Tap the hole.

You now need to make a series of fitments to fit the hole. Make each of these as and when you need it.

If you need to mill around the edge of a part which has a central hole ½in or bigger (such as a connecting rod) put the accessory into the rotary table and turn a fitment which has a ½in diameter part (say ⅜in long) and a $\frac{13}{16}$in diameter part (if that is the size you need to fit your connecting rod).

Position the table of the mill so that a ½in dowel, held in the chuck of the mill slides nicely into the hole in the accessory. Clamp the Y axis and move the table away from the mill centre using the X axis handwheel.

Slap in the fitment you have made, slip the connecting rod over the top and clamp it down with a sacrificial piece of brass underneath it so that you don't mark the top surface of the rotary table. Then you mill away until you have the external diameter you want on the connecting rod end.

If you need to mill around the edge of a part which has a central hole less than ½in diameter, the fitment becomes a simple bush with a central hole of the diameter you need. Stick it into the accessory and put a dowel of the appropriate size into the hole in the bush.

If you need to mill a part which does not have a central hole, put the fitment into the accessory and clamp a square against it (as shown in the article). Remove the fitment and place and clamp the workpiece tight to the square. Remove the square and start milling.

Hope the above helps and thanks for reading.

Winter open days

Looking for an escape from the festive excesses at the end of the month? Home And Workshop Machinery might have the answer.

The used equipment specialist is holding two open days on 28th and 29th December from 10am to 4pm.

Regular readers will know that the firm deals in a wide range of used machines and tooling including Myford parts. Special deals are promised at the open days.

Home And Workshop Machinery is at 44 Maidstone Road, Foots Cray, Sidcup, Kent DA14 5HS – 10 minutes from junction 3 of the M25 motorway – more details are at www.homeandworkshop.co.uk

Stolen locomotive

Sadly we have to report the theft of a locomotive. Readers are asked to be on the lookout for a 5-inch gauge Simplex locomotive taken from the clubhouse of the Welling & District Model Engineering Society, on the Electricity Station site close to Falconwood station, off Rochester Way, Welling.

The society is asking readers to keep an eye out for the loco at model train meets, trade fairs, boot fairs and auction sites.

The loco is described as possibly missing a firebox and grate but is otherwise in excellent working order. Boiler number is N2410067.

Anyone with information that may lead to the return of the loco to its owner and/or prosecution of the thief should call the Metropolitan Police quoting crime number 3621419/18.

Midlands launch for Station Road's General Gordon

Debuting at the Midlands Model Engineering Exhibition on 18th-21st October was a brand-new locomotive from Station Road Steam. 'General Gordon' is a 7¼-inch gauge 0-6-0T described as for the larger garden railway or for club running.

The concept of the loco is based on Station Road's proven Stafford and Feldbahn design. Its styling is inspired by the 0-6-0s that Kerr Stuart built for First World War service, and which in turn was based on a Decauville design – 'Sgt. Murphy' which later worked at Penrhyn quarry and is today preserved on the Teifi Valley Railway in Wales, is an example of the class.

Weighing in at 470lb, the model has been built for both ease of use and maintenance. The steel boiler has a working pressure of 120psi and is fed by two injectors, while full Walschaerts motion is fitted.

Station Road will supply the loco fully finished, painted and tested with a 12-month warranty at £15,131 or as in machined form to build at home, comprising 12 kits at £1,137 each. For more details see the website at www.stationroadsteam.com

Steampunk at the London show

The Midlands show may be fresh in the memory but already thoughts turn south towards the next one, the London Model Engineering Exhibition.

The show will be held at its traditional venue of Alexandra Palace from Friday 18th to Sunday 20th January 2019, and tickets are on sale now from londonmodelengineering.co.uk, with savings available by booking in advance.

Organisers TEE Exhibitions promise more than 45 clubs and societies to enjoy and almosy 2,000 models, both model engineering and other modelling scales, together with the usual host of trade stands.

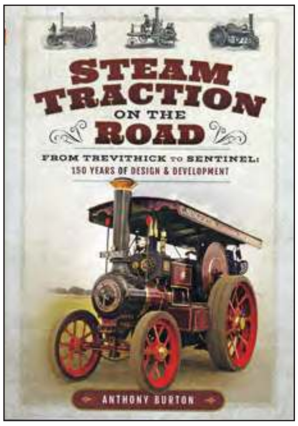
A somewhat different special display this year will be 'The Ministry of Steampunk' – showcasing the Steampunk fashion tend that which combines the past with imagination to create a new versions of some of popular culture's favourite shows and stories.

The exhibit will include a range of art pieces and costumes but most importantly what are described as 'incredible and amazing never-before-seen models'.

Tales of tyres...

Steam Traction on the Road

by Anthony Burton



This new title gives a useful overview of how steam traction played such an important part in the development of road transport over a period of more than 100 years. Rather than tell a chronological story, it looks in turn at each area in which steam was employed, starting with buses, ranging through agricultural work including ploughing, road maintenance including the ubiquitous steam roller, to fairgrounds, wagons and cars.

While in the confines of such a wide-ranging book it cannot go into implicit detail, the author has obviously studied his subject closely resulting in an informative work with an interesting selection of images. ***AC***

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E-mail: enquiries@pen-and-sword.co.uk
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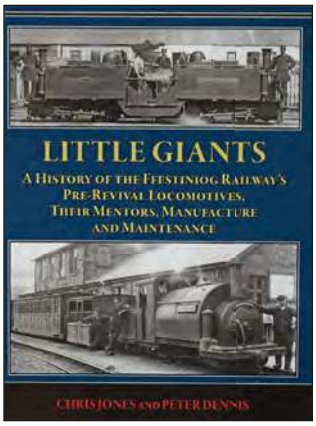
Little Giants

by Chris Jones and Peter Dennis



This is a remarkable book. Running to almost 600 pages, it provides by far the most definitive history of the Ffestiniog Railway's pre-preservation locos – some of the most important engines on the narrow gauge. Yet while EIM readers will enjoy the sheer level of technical detail, the extensive photos and period drawings, this is no dry, hard-to-read account.

Instead the story is related in a highly readable manner, giving due space to the personalities involved and how they worked with one another. One of the best chapters is 'A Virtual Footplate Turn Circa 1870' which over 43 pages describes the working day of an FR footplate crew, in a way that really brings the time to life – it is very well written.

Drawing extensively on new information that has become available in recent times, from newspaper records and the recent cataloguing of the FR's archives, the book covers the England tanks and Fairlies, and also the locos of the Welsh Highland Railway and even internal combustion tractors used on both lines.

This is a sumptuous publication. Yes the £60 asking price might deter many a buyer, but it shouldn't – whether you are a student of the narrow gauge or simply an engineer, this book will quickly become a favourite of your collection. ***AC***

ISBN 978-1-911038-43-6 Published by Lightmoor Press.
Email: info@lightmoor.co.uk Web: www.lightmoor.co.uk
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End of season brings uncertainty for some, much activity for others

Again it is the Bristol SME that kicks off our club news round-up this month, and sadly the news does not get any better for this club, this time on two fronts.

We have been following the campaign to save the club's Ashton Court track, established more than 45 years but under serious threat by the city council's attempts to make a lot more money from the park in which the track is sited.

Last month we reported that the club was being offered a 12-month extension to its lease but being pressured into becoming what BSME chairman Norman Rodgers described as "ruthlessly commercial."

The latest we hear is that a five-year offer has been put on the table, but with such conditions so draconian, right down to restrictions on taking cars onto the site to unload locomotives, that the club cannot consider it. We can only hope that in time sense prevails and the council realises what it has in the Ashton Court Miniature Railway is not an irritation but an asset...

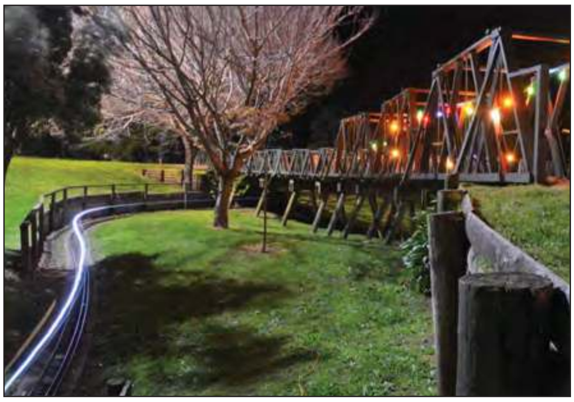
No Bristol show in 2019

Sadly there is further bad news emerging from Bristol this month. The popular Bristol Model Engineering and Model Making Exhibition will not happen in 2019.

Announcing the news "with great regret", exhibition manager Steve Birch emphasised that the society does not see this move as the end of the line for the exhibition; "We are looking at alternative venues and approaches to see an event return in 2020, a return that will build on our success over the past 17 years."

Steve adds that the BSMEE faces considerable challenges in 2019 "both with the exhibition and with other society affairs" – obviously the issues over Ashton Court.

"In respect of the exhibition, it is evident that the model engineering environment is undergoing increasing change – we see changing



demographics having an effect on many exhibitions, including ours, with increased costs, reduced visitor numbers and the growth in internet-based purchasing being used by consumers," Steve said.

"All these changes contribute to uncertainty around what might be the best exhibition format. We wish to thank all traders, clubs and societies and individual exhibitors for all your support in the past and we will be in contact as soon as we have any news on a new event in which we hope you will want to be part of."

Considering that as these pages are made up seriously wintry weather has arrived in mid Wales and this morning the editor had to defrost his car for the first time in many months, It was amusing to open one club newsletter and read in the editorial "Spring has finally arrived and with it some warmer weather..." Mind you the newsletter in question is *Conrod* from the **Otago MES**, based in Dunedin, New Zealand, where of course Spring, and warmer weather, really is arriving.

Thrill of the night

Mind you further on in *Conrod* editor Lachlan Clark does describe himself as thawing out after attending a recent night run at the Kapiti club in Raumati. These events sound like a great deal of fun, Lachlan commenting on the "sparks erupting from the chimney, the clatter of wheels piercing the silence, and the added drama of the steam under torch light."

Staying in further climes, it is also spring in South Africa apparently, according to the latest *Maritsburg* ▶

FACING PAGE: Davinder Matharu will not be able to defend the best in show trophy won by his showman's engine at the Bristol show, as it will not take place in 2019. *Photo: John Arrowsmith*

ABOVE: An ethereal scene after dark at Otago. *Photo: 'Conrod', OMES*

BELOW: A useful milling machine vice spanner created by Maritsburg member *Martin Hampton.*

Rudi Michetschlager

■ Rudi Michetschläger, who died on 20th October aged 94, was born into a country family in the Austrian Alps, where he found a natural affinity for engineering and motor mechanics. Conscripted to Germany during the Second World War, he became a bomb aimer in a Luftwaffe Dornier squadron, and first formed the idea that he would like to visit England in less troubled times.

After the war, in the family business which included running a guest house, he became attracted to a young English girl Sheila, whose family supported his emigration to this country, where he worked in their retail business before setting up a successful motor repair business in North London. He joined the North London Society where he regularly attended the general meetings.

On his retirement in 1987 Rudi and Sheila moved to a bungalow in Oakham, Rutland where he built a workshop shed outside the back door, overlooking the garden which Sheila lovingly tends. Here he produced a plethora of models, from a Clyde Puffer to a wall clock, including a Rider Ericsson engine and a number of steam locomotives, a notable one being a 'Lion' in 5-inch gauge. He followed this with an 08 class diesel shunter which performed beautifully on the Stamford Society's track where he joined as a member before moving on to the Peterborough Society and eventually the Melton Mowbray Society.

Rudi then found his eventual modelling passion in hot air engines, of which he made a significant number. This in turn allowed him to relate to and encourage young engineers and he formed a vital catalyst within the Melton Mowbray Society in the training and motivating the younger generation.

In spite of having made England his home for 70 years, Rudi still maintained his own endearing version of English, in which three conjunctions were notably absent: his hallmark was the exclusive use of 'unt', 'mit' and 'von'. To make a point he also used the phrase 'My God I tell you…" in a wonderfully gravelly tone. These will be the sounds by which he will be remembered.

On a visit to the Oakham house one could not fail to be impressed by the number of artefacts on view from the moment you entered the front door, interspersed with Sheila's needlework skills and her outstanding handwriting ability. Rudi leaves Sheila and their two grown children, the elder of whom, Helen, is a noted luthier (violin maker).

D A G Brown

Owen Jones

■ It is with great sadness that I have to report the passing on 18th September of Owen Henry George Jones.

Born on 28th May 1925, Owen was a much loved and respected member of the West Huntspill Model Engineers, standing as secretary for many years during which he guided the society along a sensible and practical path. On his retirement he was elected President for life and remained in this post until January 2016.

Owen was a very practical man of high principle and belief, He served as a Bevin Boy during the war working in the mines. He was a very clever and practical engineer with many models and engines to his name, always willing to help and guide when needed by fellow engineers. He was a gentle and kind man.

Owen also had a great gift of language, his letters and newsletters were always worth waiting for and reading, always with a touch of good humour. He also had a twinkle in his eye for the ladies. In essence we were all the better for knowing him and we all miss him.

Simon Wager

Matters from the Pietermaritzburg MES. Catching our eye in this edition is a useful tool created by member Martin Hampton, in a bid to solve the issue of a milling machine vice handle that is slightly too long and hits the Y axis handwheel just at the wrong time.

As the picture shows Martin's solution involved a 14mm ring/set spanner that fits the vice spindle, the set spanner part removed and replaced by a copper drift. Smart, and just the sort of workshop dodge we want to hear about from readers – see our editor's column on page 3...

TOP, ABOVE: A busy month at Rugby from concreting to record trains. *Photos: RMES*

BELOW: Roy Urquhart's single. *Photo: VoAMES*

Perusing the latest edition of the St Albans & District MES *Gazette*, the December club night on the 12th of the month certainly looks interesting, member Terry Summers bringing a festive air to the proceedings with a magic lantern presentation. The two lanterns in question both date from the 1890s, though Terry adds they are no longer powered by the acetylene gas they used originally. Instead they have both been converted to use probably somewhat safer electric projector lamps.

Non members are welcome at the club nights which start at 7.30pm in the Christchurch Centre, High Oaks, St Albans AL3 6DJ – there is a modest £3 charge to cover costs.

The latest news from the Rugby MES shows the club as busy as ever, in the past month having planted a lot more pillars for the extension to its raised track at its Rainsbrook Valley Railway site in Onley Lane, concreted a new queuing area at its ground-level station and put the fence up around it, carried out track maintenance and enjoyed record takings at its September public running event.

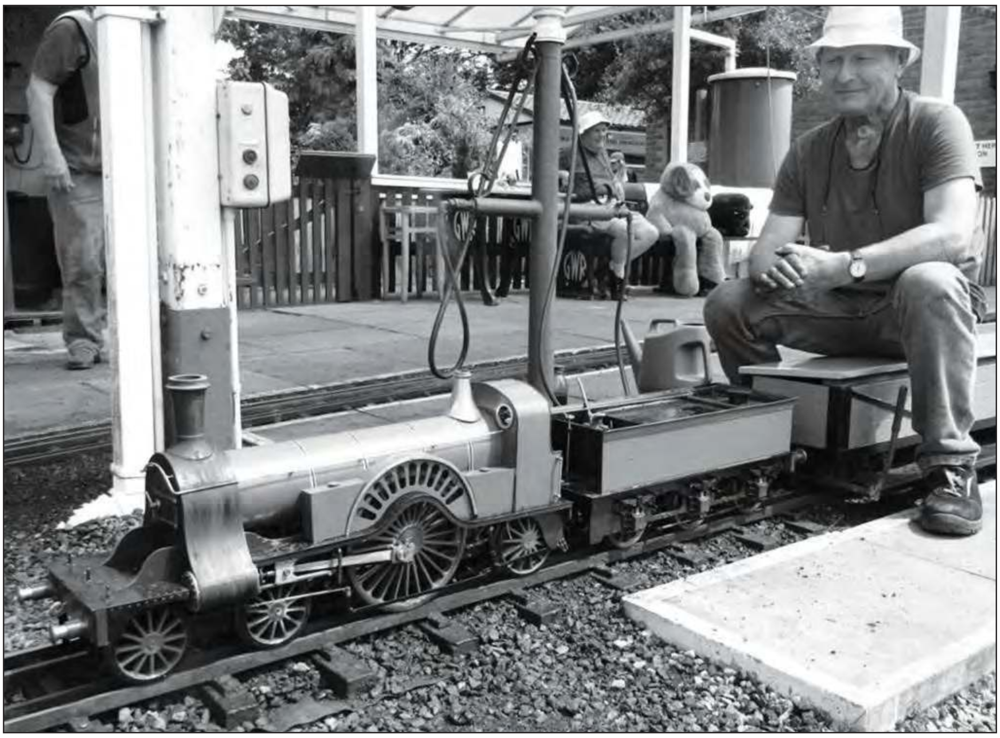
A while ago the Rugby club was able to lease additional land which has allowed its previous 4.5-acre site to be extended by a further 7.5 acres.

As a result the 7¼-inch gauge ground level track has grown from 1000 metres to a mile and the current work on the raised track (offering 2½, 3½ and 5-inch gauges) will take it from 335 metres to 762 metres – clearly a club going places....

Charting the Single

The latest edition of the *Aylesbury Link* from the Vale of Aylesbury MES tells the fascinating tale of a 5-inch gauge Stirling Single, which member Roy Urquhart acquired in part-built state from a couple who had inherited it from their late uncle.

The builder was apparently an instructor of apprentices at Rolls-Royce and as a result the loco was well built. Roy spent some months finishing it and was recently able to run it for the first time on the club's track at the Buckinghamshire Steam Centre, Quainton Road. "The engine goes like the clappers but is very prone to slipping – it will never be a passenger hauler but my goodness it's fun to play with," commented Roy. A fascinating story and we would love to hear more at EIM...



Recently we were delighted to receive a document in the office effectively announcing the formation of a new model engineering society – at least we think it is...

The group is called T.I.M.E – The Itinerant Model Engineers, and describes itself as 'a Refined Gentleman's Club for the Confused and Confounded Model Engineer.'

According to its Mission Statement, T.I.M.E. comprises a group of 'like-minded engineers to the principles, disciplines, interests of our hobby, Model Engineering in all its many and varied interests that are the very essence of what The Itinerant Model Engineers are all about.'

Apparently a newsletter is being developed to improve communication and understanding within the society with the main stated aim being to promote model engineering in all its disciplines, while procedures for the protection and safeguarding of all club members are currently being put ▶

in place, as are boiler testing procedures and testers.

The only aspect that has not been revealed, at least to EIM, is exactly where this group is based! We understand T.I.M.E has been accepted to membership of the Northern Federation, so we suspect they are in the upper half of the UK. We hope to have more detailed info next month...

Finally we send seasonal greetings to all clubs, together with a request. Keep sending in your magazines and news, and if possible please let us have your 2019 diary of events as soon as possible, so we can ensure we fully publicise your happenings on our diary page... EIM

ABOVE: A sizable display was mounted at the recent Midlands show by the National $2\frac{1}{2}$-inch gauge Association. A feature on the gauge is set for next month's EIM.

AND FINALLY...
German company KM1 Modellbau attracted a lot of enquiries when it displayed this 5-inch gauge version of Stephenson's 'Rocket' on its stand at the Mildands show. However those asking about prices were disappointed to be told the model is merely a concept, and that the firm would likely need to re-size it to $7\frac{1}{4}$-inch due to its lack of pulling power! *Both photos: Andrew Charman*

DECEMBER DIARY

EVERY SUNDAY
(Weather permitting)

Sale Area MES Public running in Walton Park from 12 noon.

Wirral MES Public running, Royden Pk, Frankby, 1-3.30pm.

1 Bromsgrove SME Candlelit Christmas running, Avoncroft Musem of Historic Buildings, Stoke Hth, B60 4JR

1 Grimsby & Cleethorpes MES public rides, Waltham Windmill, DN37 0JZ, noon-4pm

1 Tiverton MES Steam Up, Worthy Moor from 11am.

2 Bristol SME Santa Special, Ashton Court, BS8 3PX

2 Pietermaritzburg MES (NZ), Public running, Pietermaritzburg 3201

2 Tyneside SME Santa Specials, Exhibition Park, Newcastle upon Tyne

3 Lancaster Morecambe ME informal evening, Tarn Lane, near Yealand Redmayne,7.30pm

5 Bristol SMEE Ladies Night, Behind the Scenes at the Antiques Roadshow, Stapleton and Begbrook Social Club, Frenchay Park Road, Stapleton,Bristol, BS16 1HY, 7.30pm

7 Vale of Aylesbury MES Film Night, Community Centre, Prebendal Avenue, Aylesbury HP21 8LF

7 Portsmouth MES club quiz, Tesco Fratton Centre, 7.30pm

9 Bradford MES Santa Specials, Northcliff Woods, Shipley

9 Cardiff MES Santa Specials, pre-booked only, Heath Park, 11am-4pm

9 Chichester ME Santa Specials, Blackberry Lane, PO19 7FS. 1-4pm

9 Frimley Lodge MR Santa Special 11.30am-2.30pm, pre-booked only, Sturt Rd GU16 6HT.

9 Worthing SME Santa Specials, Field Place, 10.30am-2.30pm

12 St Albans MES club night, Terry Summers' Magic Lanterns, Christchurch Centre, High Oaks, AL3 6DJ, 7.30pm

13 Worthing SME meeting, Video evening, Field Place, BN13 1NP, 7.30pm

15 SMEE Competition Day & Christmas Party, Marshall House, Marshall House, London SE24, 2.30pm. Pre-book only at chairman@sm-ee.co.uk

16 Chichester ME Santa Specials, Blackberry Lane, PO19 7FS. 1-4pm

16 Tiverton MES Steam Up, Worthy Moor from 11am.

16 Tyneside SME Christmas Party, Exhibition Park, Newcastle upon Tyne

17 Pietermaritzburg MES (NZ), Meeting, Pietermaritzburg 3201

18 Grimsby & Cleethorpes MES monthly meeting and Christmas Social, Waltham Windmill, 7.30pm

18 Nottingham SME monthly meeting, 'Experiences Big & small Railway Insurance' by Anthony Taylor, plus Xmas party, Nottingham Transport Heritage Centre. Ruddington, 7.30pm

19 Bristol SMEE Club Night, Bring a memory stick/model, Stapleton and Begbrook Social Club, Frenchay Pk Rd, Stapleton,Bristol, BS16 1HY, 7.30pm

26 Worthing SME post-Christmas steam-up, Field Place, BN13 1NP

27 Bradford MES Mince-pie steam-up, Northcliff Woods, Shipley, 12.30 until frost sets in...

Don't forget to send in your club's 2019 diary dates to the address on page 3!

Details for inclusion in this diary must be received at the editorial office (see page 3)at least EIGHT weeks prior to publication. Please ensure that full information is given, including the full address of every event being held.
Whilst every possible care is taken in compiling this diary, we cannot accept responsibility for any errors or omissions.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