

THE MAGAZINE FOR MODEL ENGINEERS

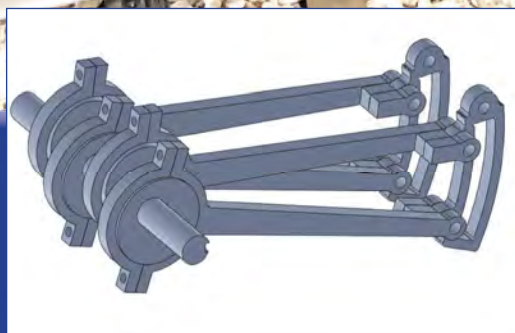
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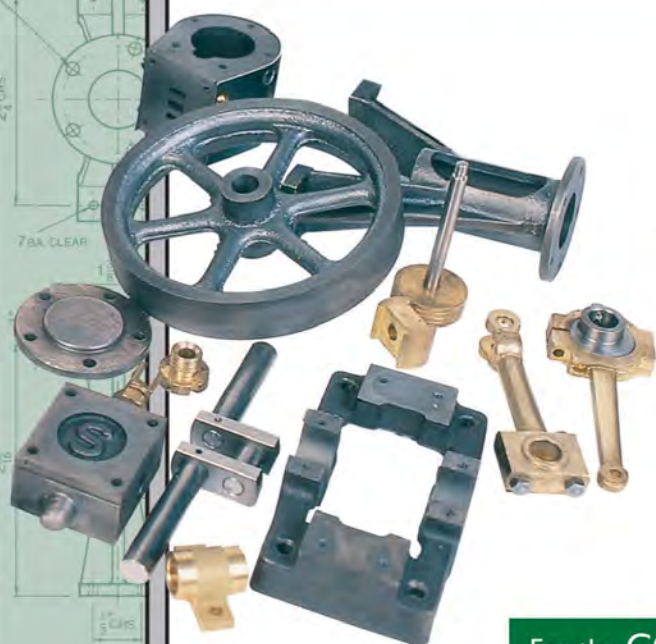
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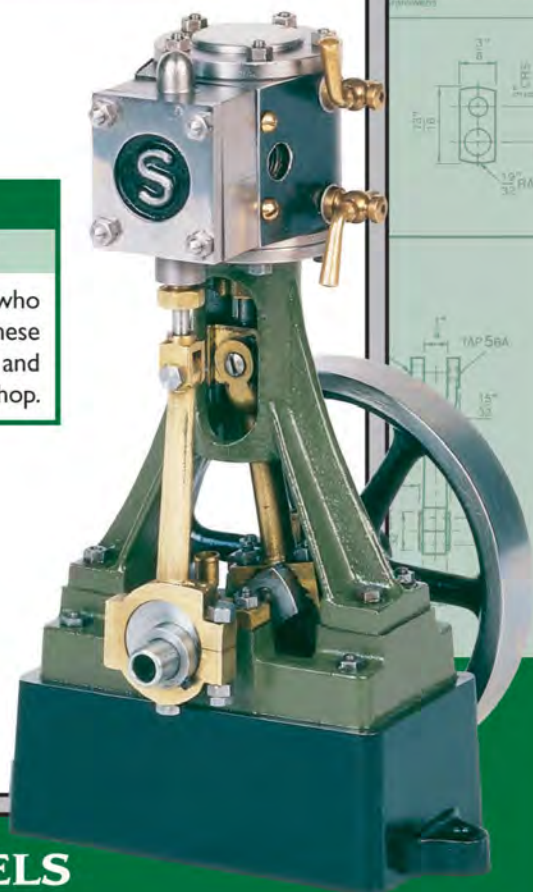
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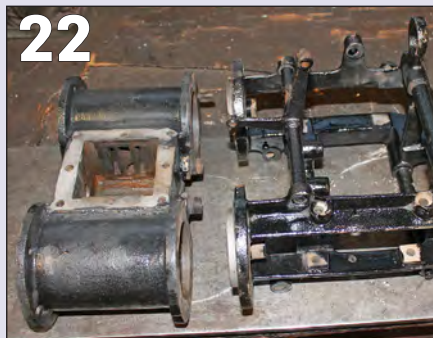
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FRONT COVER

This 5-inch gauge 'Dougal' was young Sussex engineer Andrew Strongitharm's first loco build project. He begins describing its construction in this issue.

Photo: Andrew Charman

EDITORIAL

Sales, wants and a second new face...

Welcome to this month's **EIM**, and I must start by thanking all the readers who got in touch following my editorial last month, to both welcome me to the post and to tell me what they want to see in these pages. You've certainly given me food for thought – particularly the respondent who pointed out that beginners in model engineering can be of all ages, not just the young! I have already been able to incorporate some of your thoughts, others may take longer to achieve...

Several respondents have asked for a return of the free Sales & Wants section that used to appear in the back of the magazine. Well I made some enquiries on this subject, and was told that it was dropped, "because we never got enough to make it worthwhile." So here's the deal – send in your Sales & Wants, and if I get enough, I'll restore the feature. If I don't, I won't!

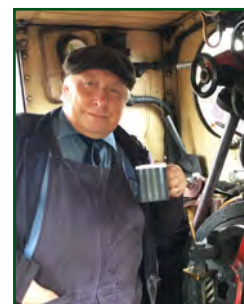
This month I'm delighted to introduce you to a new member of the team. Harry Billmore joins us as Technical Editor – Harry, pictured below right, has been around engineering and particularly steam locos all of his life, volunteering from a very young age with his parents on the Welshpool & Llanfair Light Railway, travelling the world as a marine engineer and today working in the engineering department of the 15-inch gauge Kirklees Light Railway.

While I know my way around a workshop and a locomotive, Harry provides the more in-depth engineering knowledge that is vital on a magazine such as **EIM**. He also has some quirky interests – demonstrated by his first feature this month, a project to build a 7¼-inch gauge Sentinel loco using the engine from a steam car. He has also restored an Austin 7, and is currently heading a group trying to repatriate a Sentinel steam railcar from Sri Lanka!

Enjoy the issue, and again, if you've built something interesting, why not tell your fellow engineers about it in **EIM**? We could particularly do with more features on workshop equipment, and some horology would be nice too – is anyone out there still making clocks?

Andrew Charman – Editor

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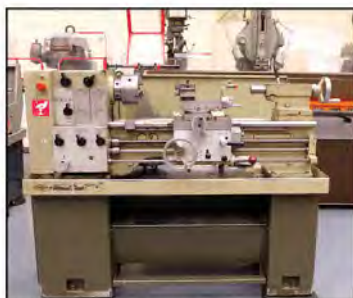
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Dougal - a 5-inch Barclay

Young Sussex engineer Andrew begins a description of his first build, an excellent choice for an entry-level locomotive project

BY ANDREW STRONGITHARM – Part one of a series



EDITOR'S NOTE: We are delighted to launch a new locomotive construction series in this issue – 'Dougal' is an excellent choice for a first project particularly suited to newcomers to model engineering, and as the pictures on this and the following pages clearly show, the finished model is an attractive but equally compact and easily transported locomotive.

I have been interested in railways and in particular steam railways for as long as I can remember. As a child I visited my local passenger carrying miniature railway at Beech Hurst Park in Haywards Heath as often as possible and needless to say I joined the owning Sussex Miniature Locomotive Society as soon as possible, when I was aged 12.

After several months of assisting with the running of the railway I was privileged to be allowed to drive, under adult supervision, a model of a Southern Railway U-Class locomotive. That was a day that I will never forget and I have been hooked by the hobby ever since.

It was three years later that I began to make enquires about

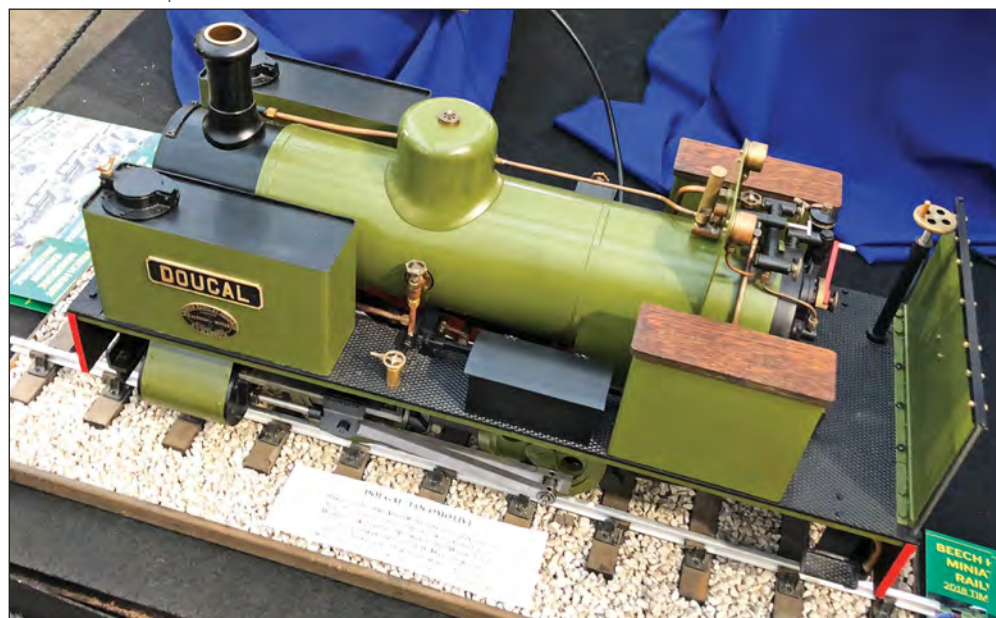
ABOVE: Proud builder Andrew with Dougal.

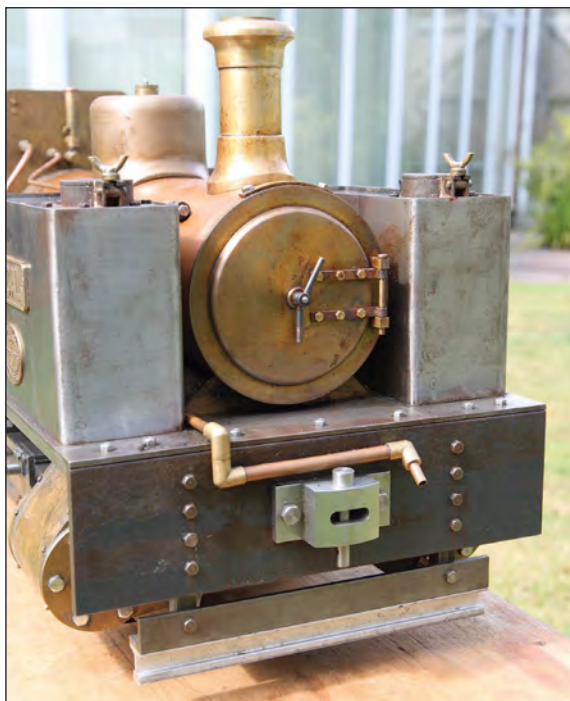
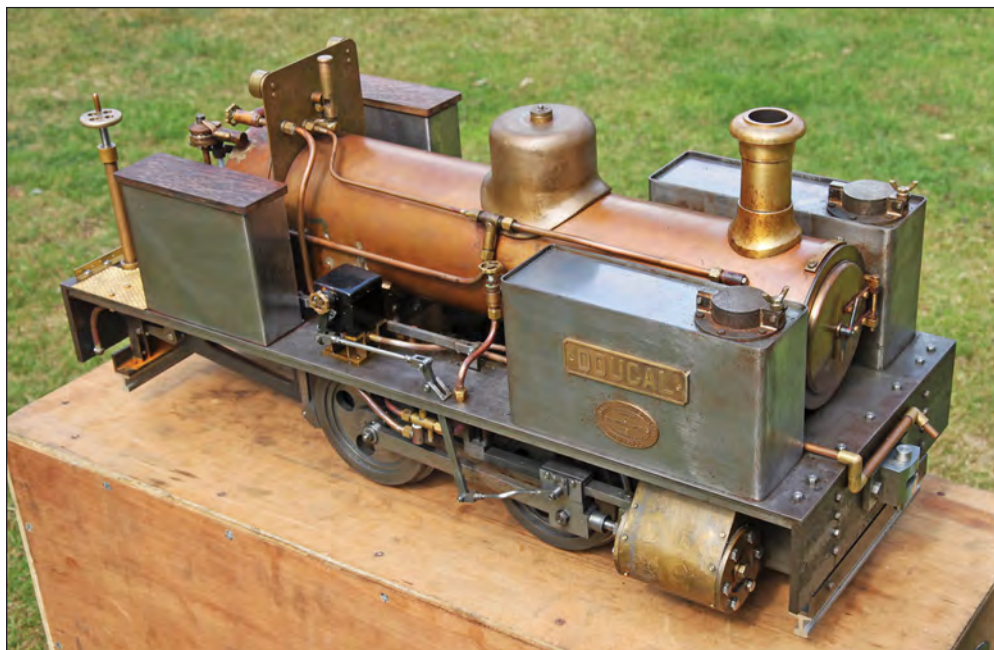
BELOW: The loco on the SMLS stand at the Alexandra Palace show.

building a locomotive myself. As well as flicking through the pages of locomotive designs in catalogues, I knew that I would also require help from someone with model engineering experience. Luckily for me I knew a fellow club member, Andrew Brock, who at the age of 29 already had one steam locomotive to

his name and was willing to spend what would become hundreds of hours showing me the ropes.

The decision to build a 'Dougal' was mainly taken due to its relatively simple design, in particular the slip eccentric valve gear, together with its rarity in model form. The boiler is also very straightforward to

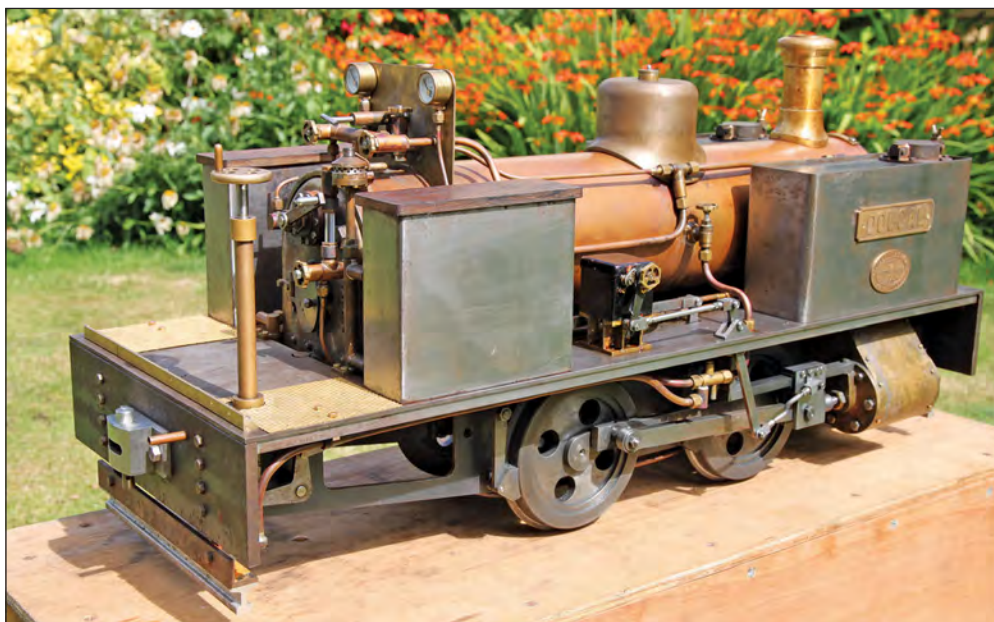




construct, with the inner and outer fireboxes being round topped. There is of course the full-size 2 feet 6 inch gauge 0-4-0 prototype still in existence which was designed by Andrew Barclay and built in 1946.

Dougal was built for the Provan Gas Works in Glasgow and used there until 1958. Some nine years later the loco was bought by two members of the Welshpool & Llanfair Light Railway – Andrew the [EIM](#) editor, a fireman and Trustee at the W&LLR, knows the loco well and has provided a more detailed history in the panel at right.

The model design was originally drawn by D Malcolm and fits onto just three sheets of drawings, which together with the castings are supplied by A J Reeves. Castings can either be purchased as a complete set or individually as the project progresses, which will be a help for those builders on a limited budget!



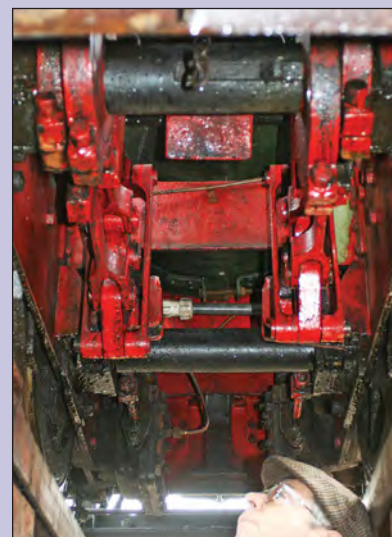
The travels

The full-size 'Dougal' was one of the youngest of several locomotives built by Andrew Barclay, Sons & Co of Kilmarnock for the Provan Gasworks in Glasgow (writes [Andrew Charman](#)).

While Dougal was supplied in 1946, (works no 2207) the original design dates back to 1903 when Barclays built the first six engines for the gasworks. At least one of these has survived today, though one would not easily recognise it – 'Darent', which today lives on the Hampton & Kempton Waterworks Railway in Surrey, has been both regauged to 2ft gauge and has been rebuilt as a saddle tank – effectively showing a different way in which the 5in gauge model could be finished.

Low profile

Gasworks across Scotland used diminutive steam locomotives, though generally running on 2ft gauge lines. They were all 0-4-0 tank locos with very low profiles, in order to operate in the very confined conditions of the gasworks retort houses. When





of Douglass...

operating in Glasgow Douglass looked very different to its appearance today, with smaller tanks either side of the smokebox and no rear tanks at all. Other notable features included the ability to operate the injectors while standing alongside the locomotive, a feature retained today, while Douglass is also said to have spent much of its gasworks life running without brakes! This feature has not been retained...

The Provan system closed in May 1958 but Douglass was rescued for preservation – bought by the Railway Enthusiasts Club in Farnborough, Hampshire it headed south from Glasgow by rail in March 1962.

The loco was partly dismantled, but then in 1967 it was sold to two members of the Welshpool & Llanfair Light Railway, Graham Smart and Ralph Russell, later to become the W&LLR's general manager.

Larger tanks

The loco arrived in mid Wales in November 1969 and was then fully restored to operate on the line, it being envisaged as a useful works engine. The overhaul included doubling the capacity of the water tanks from 40 to 80 gallons, the new tanks boasting a slight slope to their front in a manner that would be replicated on the Ffestiniog Railway's double Fairlie 'Earl of Merioneth' completed in 1979.

Douglass was turned out in a maroon livery and first steamed in December 1975. Thereafter it worked occasionally, pottering around Llanfair yard or running the odd demonstration freight train, until in 1983 it was stopped in need of boiler work. This ended up taking four years, after which Douglass worked until 1992 when more attention was required to the tubeplate and barrel.

For much of its preservation life the W&LLR has operated with very



ABOVE LEFT:

Douglass in the W&LLR yard soon after restoration. Note the sloping tanks.

BELOW LEFT:

The full-size loco uses Stephenson's link motion. Some 5in gauge versions have also been so modified.

ABOVE, BELOW:

Douglass in its element as a Gala attraction.

Photos: W&LLR Archive, Andrew Charman

limited funds and at the time there was certainly nothing available to spend on a non-passenger train hauling locomotive, so Douglass went into store. However in 1996 a benefactor offered to fund restoration work and a full overhaul ensued, including fitting a vacuum ejector to allow the locomotive to be used with passenger stock. Douglass returned to service in 1997, now again wearing the green livery of the Glasgow Gasworks Corporation complete with its crest on each rear tank, these skilfully hand-painted by W&LLR volunteer Bruce Webber. When a later repaint was undertaken, a kind fellow member had transfers made...

Gala attraction

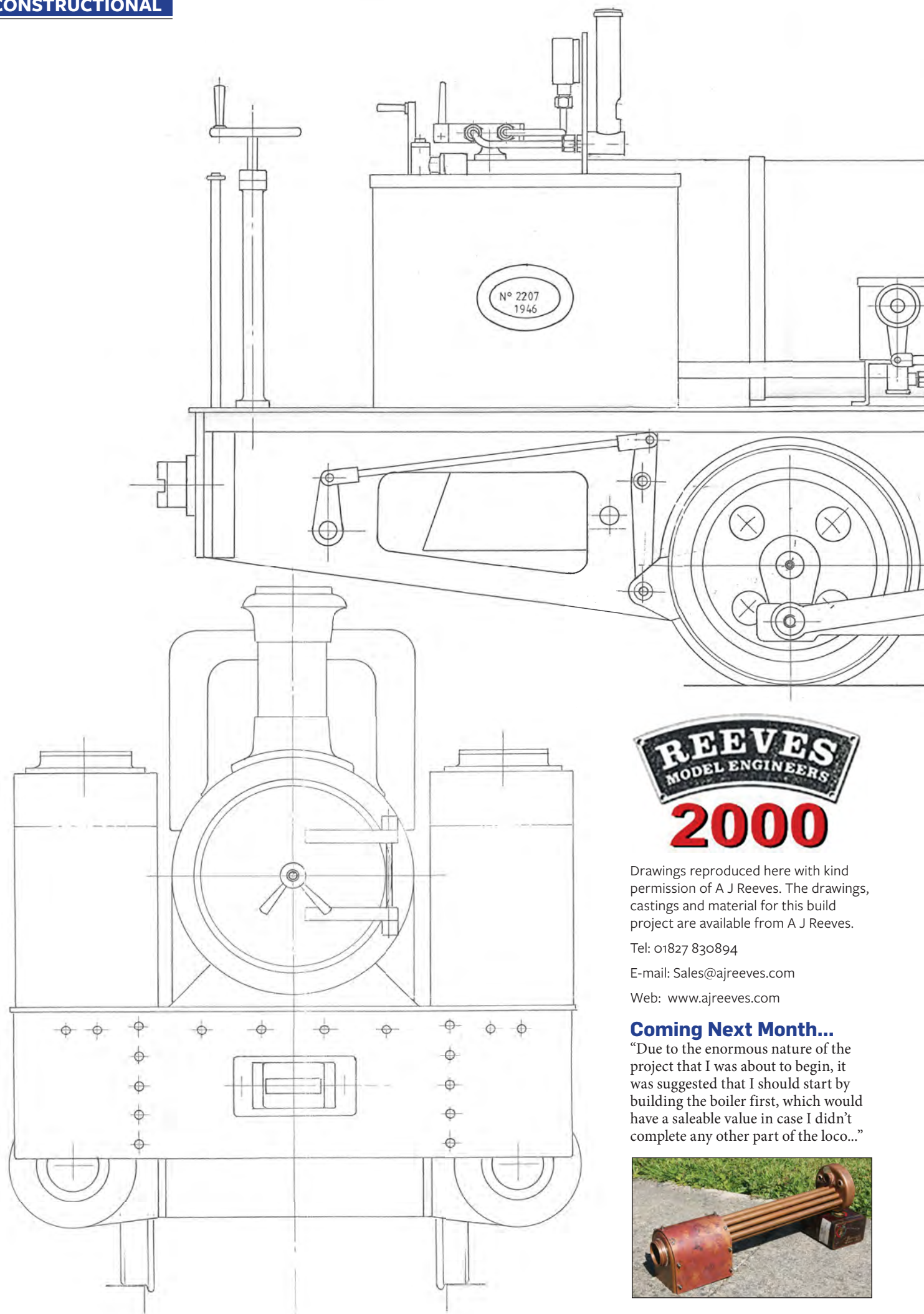
Not long after the sloping side tanks were replaced by more prototypically correct versions, and as the pictures on this page show Douglass has since proven a major attraction, particularly at the line's annual Gala where it has

been rostered on single-carriage passenger trains as far as the intermediate station of Cyfronydd.

Sadly however, around three years ago the need for significant boiler work emerged again, and with the line's resources, both financial and in terms of volunteer manpower, focused on keeping the front-line locos in service to haul growing numbers of passengers, Douglass faces some more time on the sidelines.

Finally, the name – reputedly it was applied simply because Douglass, the dog in *The Magic Roundabout* children's TV programme, had a similar low chassis to the loco. The story goes that it was decided to hold a naming ceremony for the loco and to invite someone from the TV programme to do the honours. The man actually invited was Oliver Postgate, responsible not for *The Magic Roundabout* but *Ivor The Engine!* Apparently he took it all in good heart and enjoyed his day...





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

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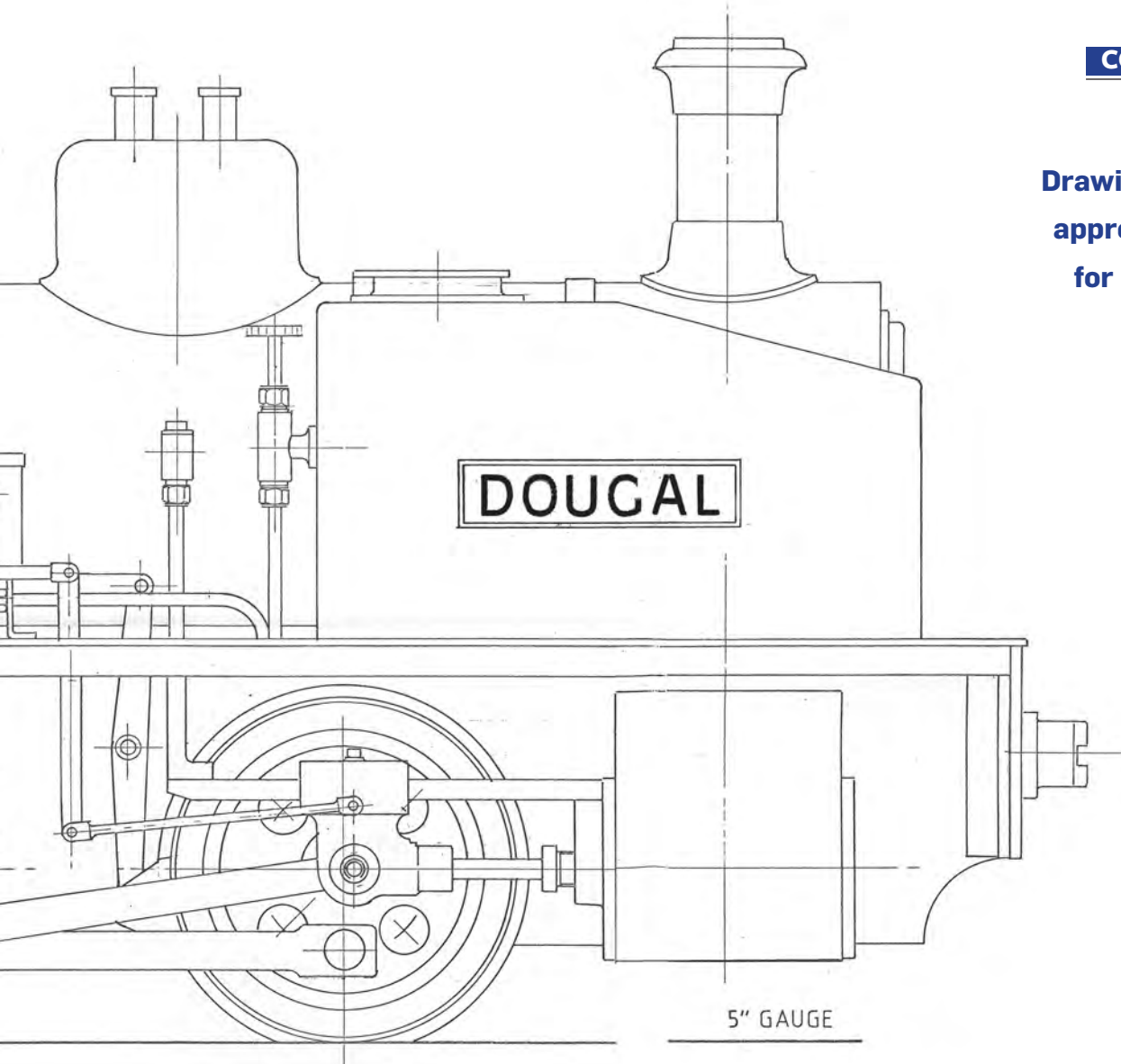
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Coming Next Month...

“Due to the enormous nature of the project that I was about to begin, it was suggested that I should start by building the boiler first, which would have a saleable value in case I didn’t complete any other part of the loco...”



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



Building a small boiler

Jan-Eric concludes his latest project employing the art of TIG welding.

BY JAN-ERIC NYSTRÖM – Part two of two



EDITOR'S NOTE: Last month Jan-Eric began construction of his small boiler using TIG welding techniques. He resumes the project at the stage of a completed firebox and welded-in tubes. Details of how to obtain part 1 are at the end of the feature.

Having satisfied myself that the tube joints were good, I welded the firebox tube sheet in place, [Photo 17](#). Then, I positioned the firebox inside the boiler, [Photo 18](#), having first shortened the firehole ring slightly, in order to pass it through the boiler shell. Here, it was important to centre the parts well.

I inserted some pre-formed, semi-circular pieces to form the foundation ring. The pieces were of course chamfered to allow good weld penetration. The welding was performed using an ample amount of filler, as seen in [Photo 19](#). The firehole ring has now also been welded to the outer shell.

Turning the assembly the right side up ([Photo 20](#)), the only basic piece missing is the top tube sheet. This was made just like the firebox tube sheet, again with a chamfered edge. In [Photo 21](#), it is in place for welding. [Photo 22](#) shows the seam. It is very important to ensure that the penetration is total, i.e. that you don't cover up a void by just melting some filler over the joint area. Finally, the bushings, made of phosphor bronze, were silver soldered in place, [Photo 23](#).

Here, I took special precautions to

avoid cracking the copper-nickel, ensuring that the tube sheet was annealed and evenly heated over a large area, before applying the silver solder. Using pure copper, there is no risk of cracking when silver soldering. In any case, proper fluxing is important, and you should check that the silver solder has flowed all through, and all around the seam.

Unorthodox Hydro Test

Since the boiler now had become an enclosure and could be pressure tested, I attached a pressure gauge and plugged all other bushings. Then, I performed a somewhat unorthodox hydro test, using no pumping whatsoever: Before plugging it up, I had filled the boiler to the brim with cold water, and then simply warmed up the boiler in hot tap water!

This is a safe procedure provided that you continuously observe the pressure gauge in order to interrupt the warming up as soon as the pressure has risen to the expected value. For an operating pressure of 6 bars, a test pressure of 12 to 15 bars is suitable. Since water is virtually incompressible, but does expand by about 1 per cent when warmed up by 30 degrees C, the pointer of the gauge rose steadily until it reached the intended test pressure, [Photo 24](#), at which point I turned off the running hot water.

Vigilance is paramount here: letting the boiler heat up too much may deform it, or possibly burst a





seam – and we don't want that to happen! You should also use the tap mixer to adjust the water to a comfortable temperature – in case of a failure, you wouldn't want to scald yourself! 50 to 55°C (the temperature of ordinary hot tap water) is quite enough for a test like this.

Note that you should not heat up a plugged boiler with a flame – that could be outright dangerous! Also note that performing a hydro test by warming the boiler in hot water is not practical in larger sizes – the boiler should fit in the sink! If the boiler pressure does not rise sufficiently when it is warmed to a safe, maximum temperature of 55°C, you'll know you have a leak in the boiler, or the bushing plugs are leaking, or there may be a large amount of air in the boiler.

When performing a hydro test by using a pump, it is just as important to be observant; the pressure may rise from the intended test value to deforming or bursting pressure with just one careless, last stroke of the pump! I've also heard a story about a



PHOTO 17:

Firebox tube sheet welded to the top of the firebox.

PHOTO 18:

Firebox placed inside the boiler, carefully centred.

PHOTO 19:

Plenty of filler in the welding.

PHOTO 20:

Just top tube sheet to add.

PHOTO 21:

Tubesheet placed ready for welding.

PHOTO 22:

Welding done – essential to check for total penetration.

PHOTO 23:

Bronze bushes added next.

PHOTO 24:

A different way to do a pressure test!

PHOTO 25:

Firehole ring gains short extension for a firehole door, with heatshield.

PHOTO 26:

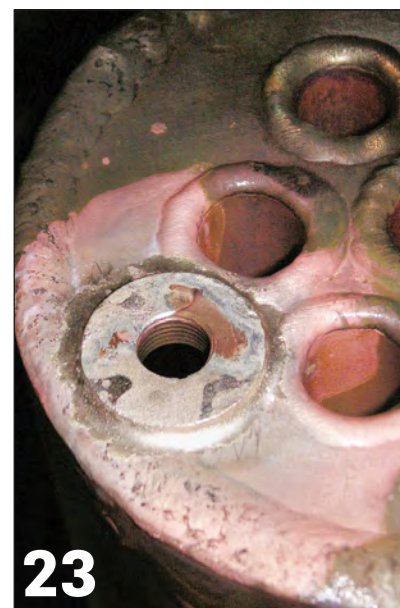
A coat of heat-resistant paint.

boiler being prepared for hydro testing, i.e. filled with cold water, plugged, and then left out in the sunshine, unattended. During a lunch break, the pressure rose to over 20 bars simply due to the water in the boiler warming up in the sun!

Fittings and fixings

Next, I made a short extension to the firehole ring, and attached the fire door to it with a simple hinge, [Photo 25](#). Note the 'heat shield' in the fire door, made from the cut-out piece of metal mentioned earlier. A coat of aluminum heat-resistant spray paint, [Photo 26](#), made the boiler much better looking – even though it may yet receive an isolating wrapper.

A small pressure gauge of the type used on fire extinguishers is shown in [Photo 27](#) – as a spare part, it cost me only £5. It has a scale of 20 bars – too high for this purpose. An extinguisher service technician gave me a valuable hint, though: This type of gauge is not of the common 'Bourdon tube' type (that would be difficult to modify), instead it uses a flexible diaphragm



27



and two spring washers. By removing one of the washers, seen crossed over in **Photo 28** among the other parts of the disassembled gauge, the scale now has a maximum of around 7 bars (Removing both washers, the maximum drops to less than 2 bars.)

Reassembling the gauge after calibrating and drawing a new scale, I could attach it to the boiler with a 'banjo' fitting. I had also made and installed a water gauge, as shown in **Photo 29**. The reverse side of the gauge connections is seen in **Photo 30**. Note that there is no siphon tube between the fitting and the gauge – it might be a good idea to include one, in order to protect the gauge from the heat of the boiler. A siphon is definitely necessary for a Bourdon type gauge.

The water glass is made from laboratory tubing (6 mm diameter, 1 mm wall thickness, costing around £5 for a 1.5-meter piece at a lab glassware supply company). Such tubing can be cut to length by nicking the glass with a file, and snapping it off by holding it so that the nick faces away from you, **Photo 31**. Pressing with both thumbs while simultaneously pulling slightly outwards with your hands will snap off the tube cleanly. Use gloves to protect your hands, just to be safe!

After cutting, anneal the ends in a propane flame, **Photo 32**. Rotate the tube slowly in the flame until a bright yellow colour appears as the sharp edge melts and becomes rounded. Avoid too much heat, or the entire glass will sag and deform – do a few

PHOTO 27:

The pressure gauge cost £5 but 20 bars is too high.

PHOTO 28:

Washer to be removed is clearly marked.

PHOTO 29:

Water gauge made and fitted to boiler.

PHOTO 30:

Rear view of water gauge – a siphon tube might be a good idea to protect the gauge from the heat of the boiler.

PHOTO 31:

Simple way to cleanly snap glass to length.

PHOTO 32:

Cut ends of glass are annealed – avoid using too much heat.

PHOTO 33:

Experimenting with best backing to clearly see water level.

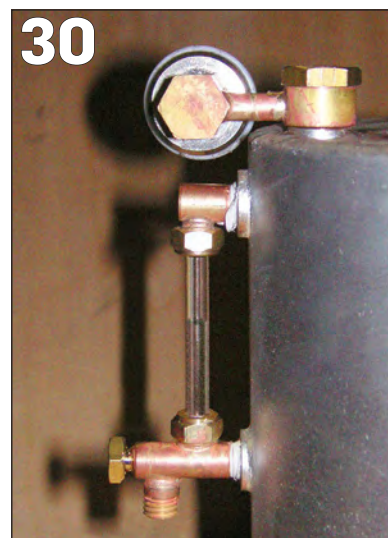
28



29



30



tests on scrap pieces first. Annealing the glass significantly reduces the risk of it cracking in use.

If the water glass is placed in a position where it is difficult to read when the boiler is in use, it might be a good idea to place a diagonally striped pattern behind it. The positioning of this pattern is important: touching the glass, the pattern is only slightly rotated, which does not improve the visibility of the water level by much.

If, however, the pattern is placed at about one glass diameter behind the glass, the diagonal stripes appear to be horizontal when seen through

the water. With the pattern still further behind the glass, the angle of the lines is reversed. These effects can be seen in **Photo 33**. You can obtain the best result on your own water glass with a quick experiment. The pattern is easy to make, for instance by using a felt point marker on a suitable white material.

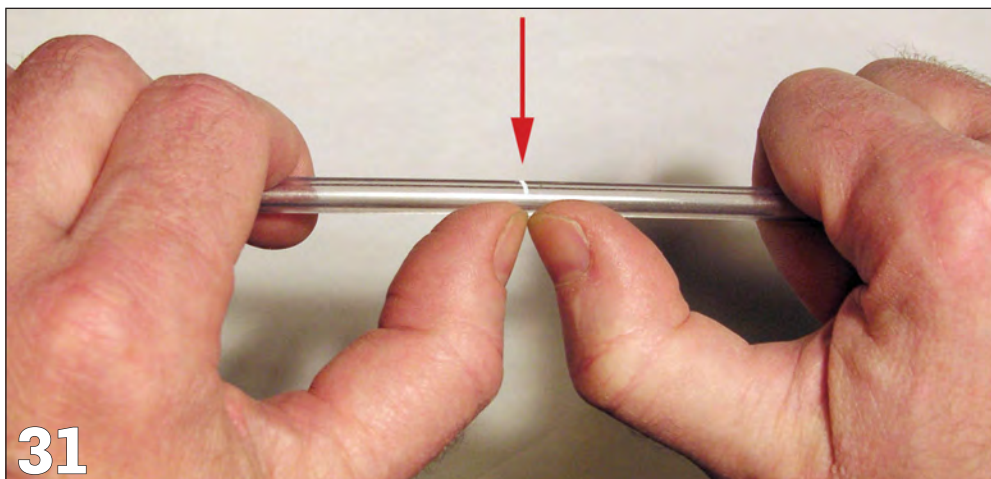
Steaming up

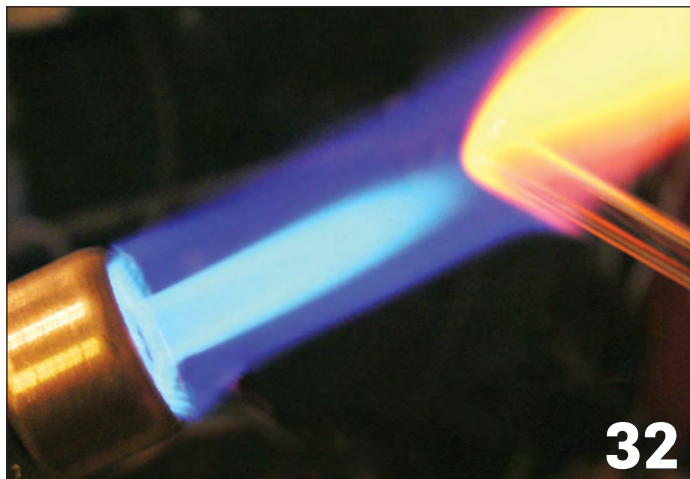
The safety valve on the boiler is of the standard stainless ball 'pop' type, with a body made from 12mm hex brass. A final addition to the fittings was a simple superheater, just a coil of 6mm copper tube above the flues, **Photo 34**. By inserting 'turbulators', i.e. spiral-wound strips of metal (preferably stainless steel) into the seven fire tubes, a better heat transfer is ensured.

The boiler was now ready for its first steam test. I used a small camping stove (the type containing a disposable gas cartridge) as a heat source, **Photo 35**. The flame filled the firebox nicely, **Photo 36**. The steam pressure rose to 6 bars in just a few minutes – then the safety valve opened with a pop and a strong hiss. The valve had previously been set to this pressure using compressed air.

When I built this boiler I had no stationary engine to run with the

31



**PHOTO 34:**

Coiled tube atop the boiler provides superheating.

PHOTO 35:

Steam test, using camping stove as a heat source.

PHOTO 36:

Flame nicely fills the firebox.



steam from it, so it sat on a shelf in my workshop, awaiting its eventual purpose – it may also be useful for testing the small steam turbine electric generator I am planning to build in the near future, for the 4-6-0 loco I'm currently working on.

Installing a boiler like this into a small steamboat or steamroller miniature would be easy. The choice of fuel is yours – coal, wood or any other solid fuel would need a grate and an ash pan, while propane needs a burner, a gas tank and valve system.

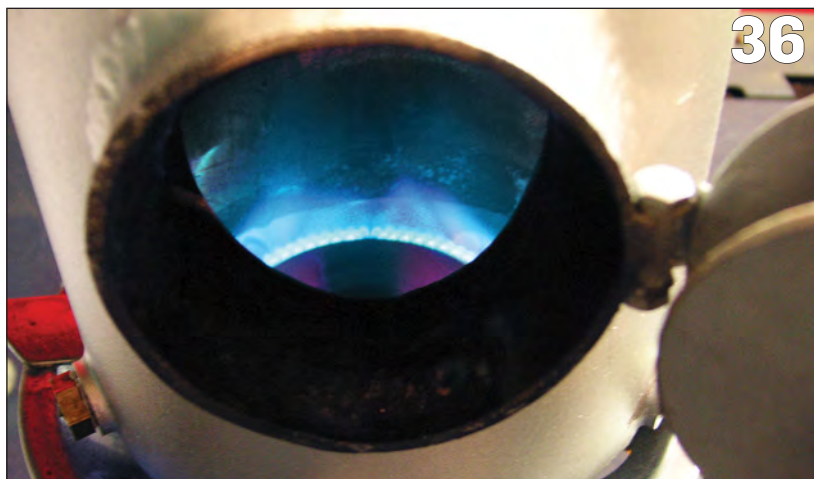
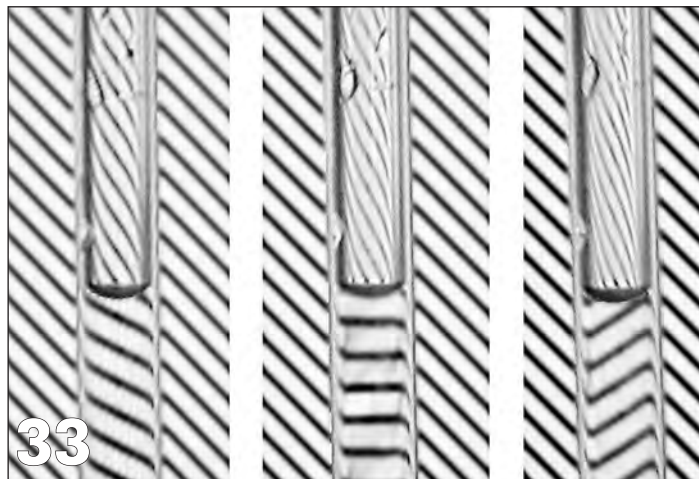
Some way of firmly attaching the boiler to its vehicle would also be needed – braces could be TIG welded to the foundation ring, as indicated in Figure 1. In addition, some insulation and cladding would have to be added,

as well as a funnel over the superheater (ending in a chimney), to prepare the boiler for its operating environment.

Finally when building a boiler in miniature, please remember that any boiler, large or small, is not a tin toy – it is a pressure vessel, so it needs to be designed, built, and used keeping that in mind. **EIM**

■ Part one of this feature appeared in the March 2018 issue of **EIM**. A digital copy can be downloaded or a printed version ordered from www.world-of-railways.co.uk/engineering-in-miniature/store/back-issues/ or by telephoning 01778 392484.

Jan-Eric has since built a stationary engine and we will describe its construction in these pages shortly.



Plans and spares...

John continues with his new series aiming to make life easier both for new model engineers, and perhaps those with a little more experience too...

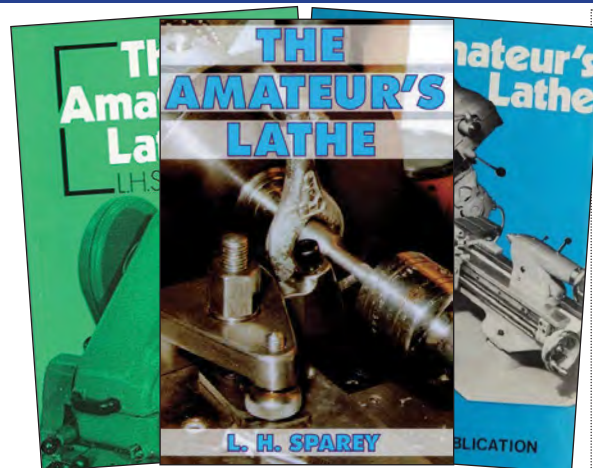
BY JOHN SMITH

I would like to start with a book recommendation for those who are starting out in our hobby. *The Amateur's Lathe* by L H Sparey is still one of the best books covering lathe work, despite it being written in 1948. You'll find it hard to seek out the recommended lard oil or whale oil today, and there is no mention of tools with replaceable carbide tips, but the book does cover the basics of turning very well.

Always have a plan

I remember from many years ago that when Martin Evans started a new locomotive construction series, several readers would do their best to keep up with him, so that when the last article in the series was published, they were very close to finishing their models. They clearly did not work or have a family! This is not what I mean by a plan. We all have enough stress in the workplace; we don't need the pressure of meeting tight timescales when unwinding in the workshop!

No, what I mean by a plan is a simple list showing a logical sequence of parts to make. There follows a scrap of mine, which is on a notice board in the workshop:



- Valve chest, valves, end covers, shackles and rods
- Cylinders
- Motion plate
- Cylinder front covers
- Cylinder rear covers and glands
- Pistons and rings
- Piston rods
- Crossheads
- Slide-bars
- Connecting rods
- Big end bearings and straps etc

Tick them off as you go. Then, when you are ready to make each part, sit down and make a note of each step needed to make it. In the IT business, this process is called

'step-wise refinement' and it works; it's very useful for writing articles and books too. Some days you will only be able to complete a couple of steps, but it's satisfying to tick them off as you go, as in the photo.

For most parts, there will be 10 to 20 steps. For complex assemblies (such as the bunker of a tank engine) there could be a hundred or more steps. Why bother? Because it will help you to avoid mistakes; it forces you to consider the best sequence of machining operations and how you are going to hold the workpiece for each one; and, during the planning, you will often think of a quicker, easier or better way to make the part.

It also helps you to work out the best sequence for riveting parts together to ensure that you can get to both ends of each rivet to close it. Also, a visitor will ask you how you made something and, without the list of steps, you won't have a clue...

Always make a spare

Even when we have a plan for how we are going to construct a part for a model, we sometimes make a mistake and the part is spoilt.

Sometimes we don't make a mistake at all but something happens over which we have little or no control.

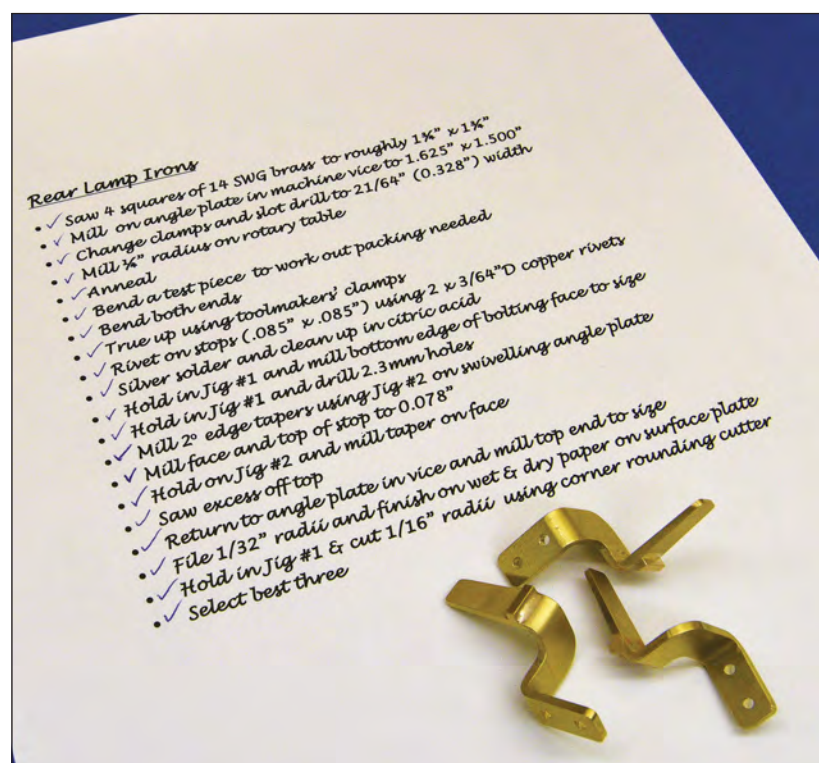
Examples of this would include:

- Coming across air bubbles whilst machining a casting,
- A workpiece fracturing when it is bent in the fly press,
- A silver-soldered joint which is sound but just looks horrid,
- A tap that breaks and cannot easily be removed.

This is particularly frustrating when we are right at the end of a long series of machining processes. The Photo at top right shows an axle box which was spoilt on the very last pass of the boring tool because I made a mistake when adjusting the cross slide of the lathe.

I can't remember just how many separate setups are required when making an axle box, but it's a lot. And it's the setups which take the most time; the actual machining can often be undertaken quite quickly.

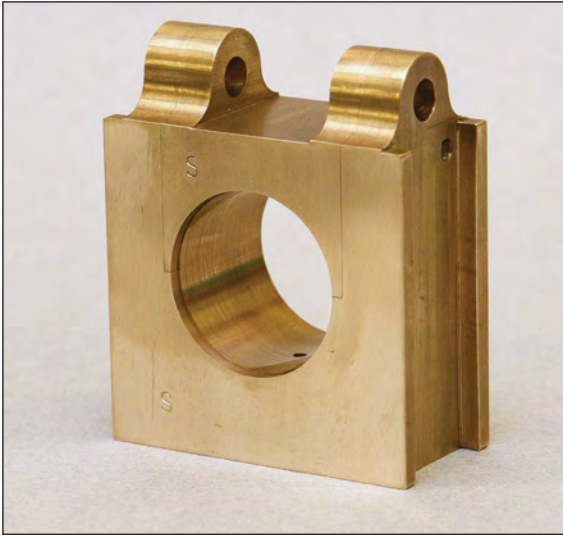
To avoid having to recreate all the setups needed to make a new part from scratch, I usually make at least one spare. The photo below shows



ABOVE:

L. H. Spary's book has been published under various covers over the years but much of the information within remains relevant to anyone using a lathe today.

LEFT: Ticking off the stages on a plan can be highly therapeutic....



the current contents of my spares box. I know; two complete crosshead assemblies and two almost complete cylinders is a bit over the top – but I was glad to know that they were there if needed.

The keen-eyed among you will spot that the axle box is stamped S for spare, so the pain of this mistake was not unbearable.

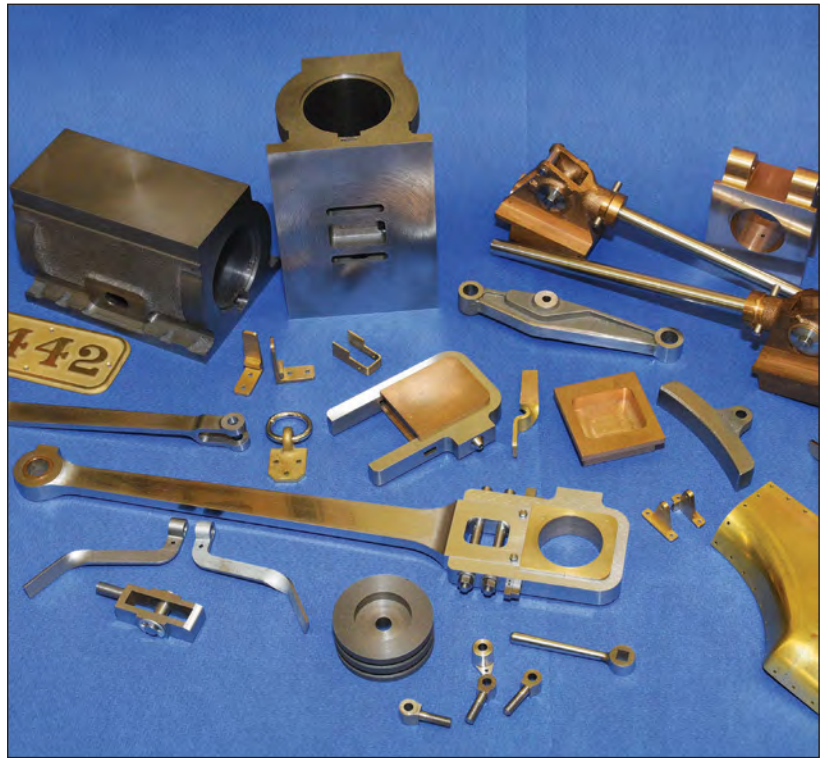
A further tip – always stamp your parts, so that when you have to take your model apart for painting or repair, you know which part goes

ABOVE:

Spoilt on the last pass – but at least it's only the spare...

RIGHT:

John maintains an extensive selection box of spares...



where when you come to reassemble the model.

This is particularly important for parts such as axle boxes which all look identical but which are made for a specific pair of horns; putting an

axle box in the wrong place will stop the wheels going round when the coupling rod is fitted. **EIM**

COMING NEXT MONTH – ACHIEVING A SMOOTH FINISH...

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Guinea Pigs

Dave continues his journey through the worlds of Automata with a novel Christmas present for his granddaughter.

BY DAVE ROWE

In September 2011 my daughter asked if I had another Christmas automation yet. No, I replied. In that case, could this year's be a small one for Hannah, my granddaughter and could it involve her dearly loved guinea pigs?

With pleasure. To the garden to observe them. Colour apart, all 10 were indistinguishable, just eating and scuttling about on almost invisible legs. But more patient observation revealed very different characteristics. Buff-coloured Popcorn running around at speed and diving through the length of soil pipe. Black and white Humbug cowering in the house I'd made to shelter them, edging out to nibble at some grass, spotting a frightening Wren flying 100ft above the garden. Panic! Back into the house at top speed!

Ummm. Possibilities there with the only movement being at ground level and only two tiny animals. It seemed like a good idea to just make a box and have the mechanism as a sub assembly that could be fitted into it. This would be in two sections, one for the bold run-around animal and the other for the nervous one.

From here on I'm going to depart from the nomenclature employed by a serious model engineer and refer to the two movements as the 'Popcorn' or the 'Humbug'. Sorry about that.

Running speed

If Popcorn was to run around on an area of 'lawn' measuring 150mm by 200mm, what speed should she run at? 7.5rpm seemed about right. When you have a hand-cranked automaton, a speed of about 110rpm on the crank feels sensible and also plays a hand-cranked musical movement at a pleasing rate, so a reduction of about 15 to 1 was required.

I'd had a 90-tooth pinion and an unusual six-start worm in my oddments box for many years, so here was a use for them at last, but Hobbies offers brass worms and 15-teeth gears and Meccano used to have them.

The axle A in Figure 1 was 6mm diameter steel. Such strength was not necessary but that was the bore of the 6 start worm B. Two offcuts of 12mm birch ply, C, with 6.1 mm holes formed the bearings.

The pinion with its 5mm axle had, at its upper end, a collar soldered to

arm D which was 2mm thick brass with a 3mm hole drilled at its extremity to carry an extension arm E. I operate on a 'work it out as you go along' basis, so by adjusting the angle of the extension arm I could quickly alter the diameter of the throw.

Had it been important that the arm continue in a straight line, I might have drilled four or five holes in close proximity and picked the one that became appropriate. Once you're set up for drilling one hole it only needs a minute to drill four more.

Second arm E carried a freely swivelling third arm F. This final arm allowed Popcorn to meander a bit in a slightly more interesting way than the plain circle of a fixed arm (Figure 2). The swivelling arm carried a 10mm long piece of 2mm bore brass tube soldered to its end.

Popcorn was whittled from a fragment of beech with an 8BA threaded rod H screwed in the fore end and a 10BA rod J to steer her, screwed in aft (Figure 3). H had a nut and washer K, the nut performing a dual purpose as it prevents Popcorn coming away from the slot and acts as the height adjuster so she travels around at exactly the correct height, not rubbing on the 'grass' and not in the air with rods J and K visible.

With an adjustable swivelling arm and adjustable Popcorn height this hardly needs to be precision engineering, but one thing must be accurate. The

vertical 5mm pinion shaft must be truly vertical or on one side of the circuit Popcorn would be trying to burrow into the lawn and on the other side, flying.

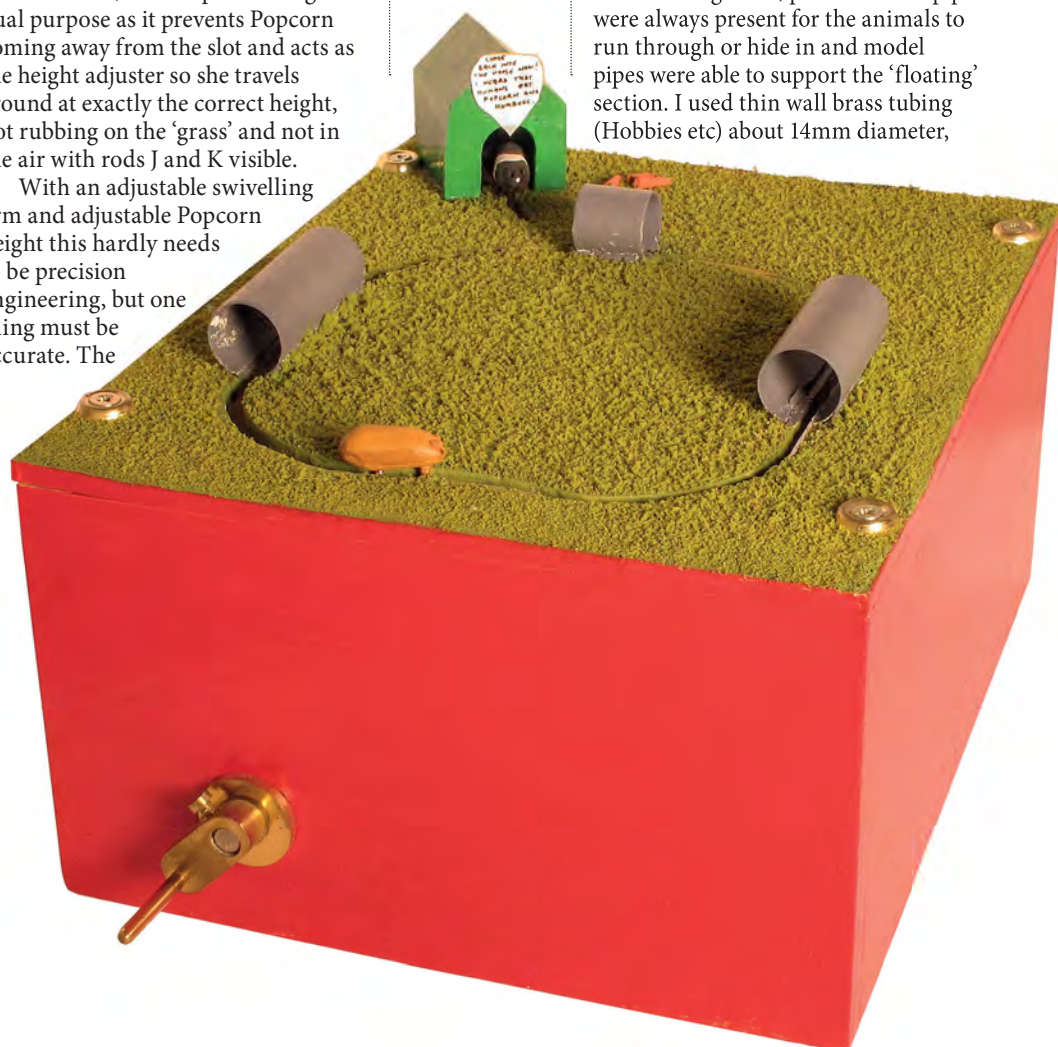
By having the rod H in conjunction with the tube G the mechanism could be screwed into place and the 'lawn' dropped into the box whilst guiding H into G. Finding Popcorn too high, I lifted the 'lawn' off, made a quick adjustment to nut K and all was correct. Much better than trying to make adjustments with two long nose pliers inside the box, all accompanied by cursing.

Working on the lawn

The 'lawn' on a piece of 4mm ply needed a 2.5mm gap to guide the animals around and this was formed by careful cutting with a fine blade in a scroll saw. The problem of course, is that you can't have hidden supports underneath for this 'floating' piece of 'lawn' when an arm is going to sweep right around underneath.

In their garden, pieces of drainpipe were always present for the animals to run through or hide in and model pipes were able to support the 'floating' section. I used thin wall brass tubing (Hobbies etc) about 14mm diameter,

Drawings in this feature by Dave Rowe. Photos by Andy York.



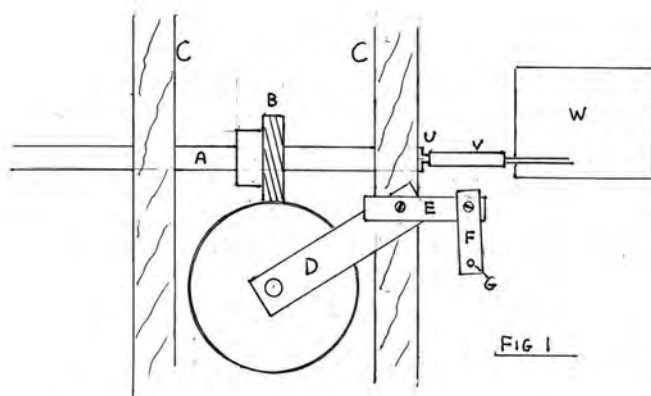


FIG 1

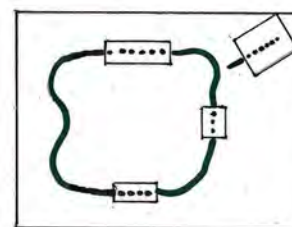


FIG 2

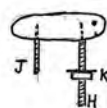


FIG 3



FIG 4

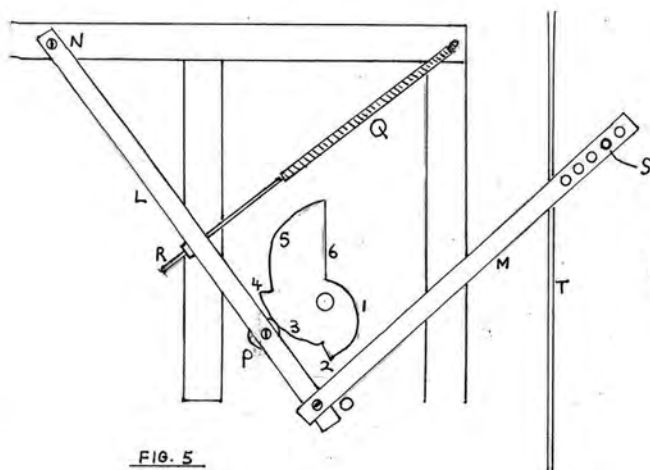


FIG 5

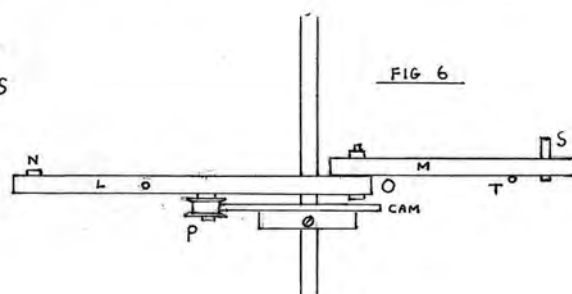


FIG 6

To see a video of this Guinea Pig automaton in action, go to the Model Engineering section of WWW.RMWEB.CO.UK

chopped off three pieces and cut them down their length on one side with a razor saw, opening the gap up to 2.5mm. They were then placed, weighted down, on rectangles of 0.5mm brass sheet as in Figure 4. The rectangles have 1.7mm holes drilled in them and they were soldered to the tubes with aid of a butane torch. 10BA CSK screws and nuts held the tubes in place across the gap. The presence of the flat glass on the lawn was hidden when the surface had fine grass scenic material glued to it.

The vertical shaft also

carried a cam below the Popcorn arm. This and the Humbug mechanism is illustrated in Figure 5 and 6. The vital part is the cam which was made from 2mm ply. Brass sheet would have been a suitable material but ply was quicker to cut and there might be unsuccessful shapes cut before I got it right.

Making concentric circles on the plywood helped me draw



the cam as the circles made it easier to judge the height of the lobes. Humbug's cam in Figure 5 gave the following movements:

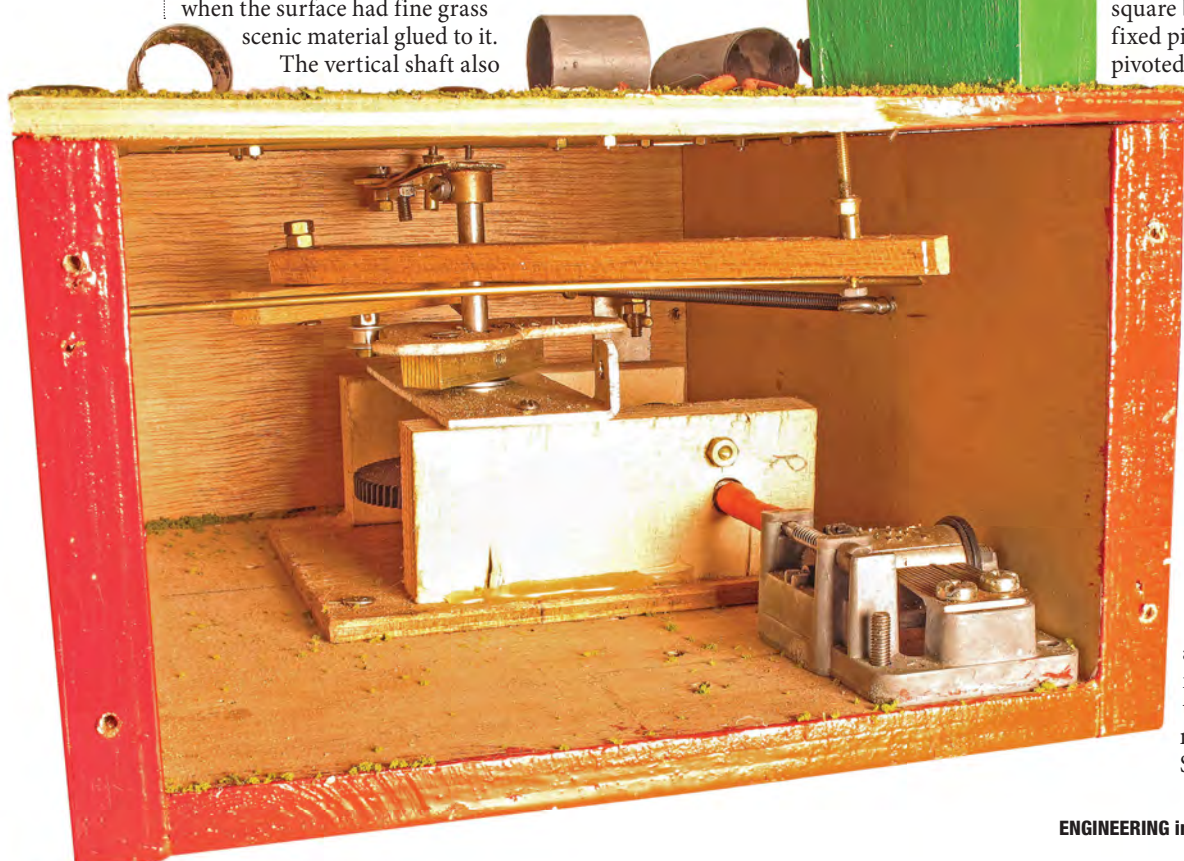
1. Edging out of the 'house'
2. Nervous partial jump back
3. Edging further out
4. Another nervous partial jump back
5. Emerge from house completely
6. Terrified jump back on seeing tiny bird

Arms L and M are of 7mm square beech. There was a fixed pivot at N and they pivoted against each other at

O, while P was a 9mm pulley which ran against the edge of the cam. Spring Q kept the pulley pressed against the cam's edge with an 8BA 40mm long machine screw R to adjust its tension.

Arm M had five 2.5mm holes at its far end giving alternative locations for a 10mm length of 2mm bore brass tubing S to accept Humbug's 8BA rod in the same way as Popcorn's.

With pivots at N and O and free movement essential, there was rather too much 'slop' by the time S was reached so a



1.6mm steel rod was installed across the box as a support T.

The 6mm crankshaft was turned down to 2.5mm where it protruded from the bearing wood at U.

Here a length of electrical cable sleeving connected it to the musical movement W, a simple, reliable way of connecting the two together, totally avoiding the precision necessary when using a metal coupling. If the thought goes through your mind “couldn’t you have the movement line up by having it only loosely screwed and thereby ‘floating’”, forget it. Musical movements only give out a good sound when tightly against a wooden surface acting as a sounding board.

Wrong way

Snail cams are clearly capable of operating in one direction only, so to prevent damage being caused by the crank being turned anticlockwise I had fitted a ratchet and pawl onto axle A. When I took the toy home and opened it up to enable me to write this article, I found that some person, determined to see Popcorn running backwards, had twisted the crank anticlockwise with such force that the pawl’s huge screw had been wrenched out of the wood. This did not result in anything else breaking as wrong direction turning surprisingly causes the pulley P to travel up the snail’s

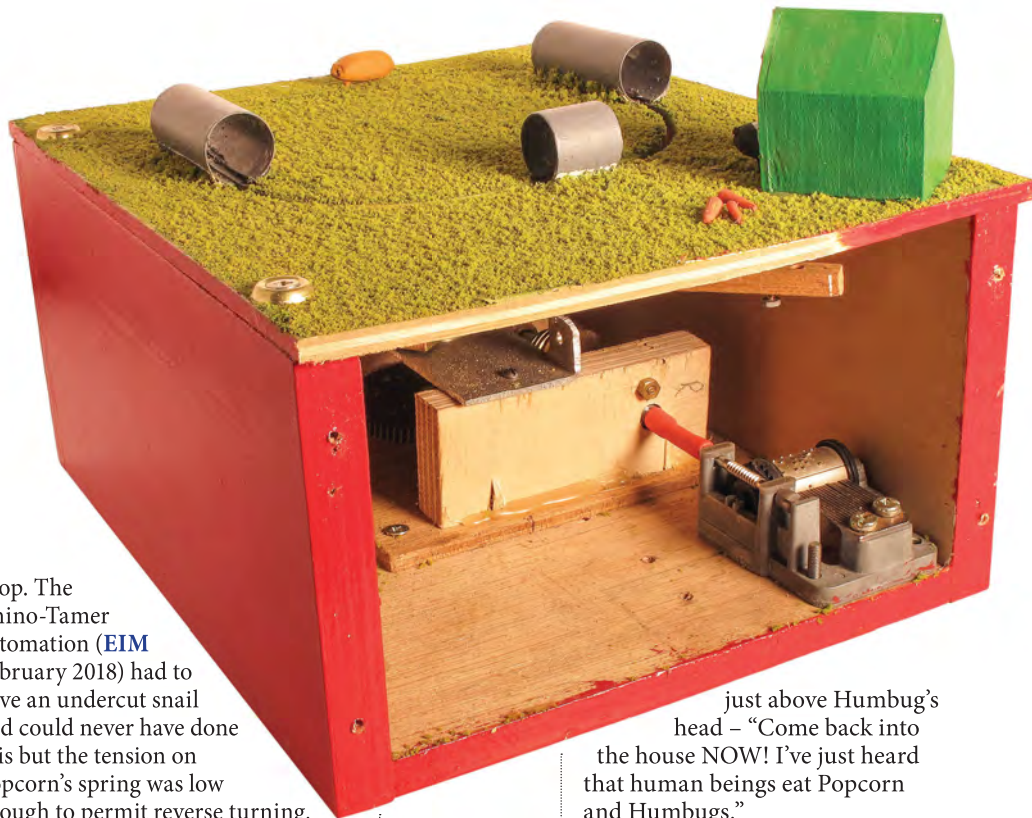
drop. The Rhino-Tamer automation (EIM February 2018) had to have an undercut snail and could never have done this but the tension on Popcorn’s spring was low enough to permit reverse turning.

Model engineers who treat their hobby as an ultra-strict, serious religion should pass on to the next night article now in order to avoid apoplexy.

I made humbug’s house from 2mm plywood and painted it using the same green paint used on the full size one in their garden, but the model house has a speech balloon

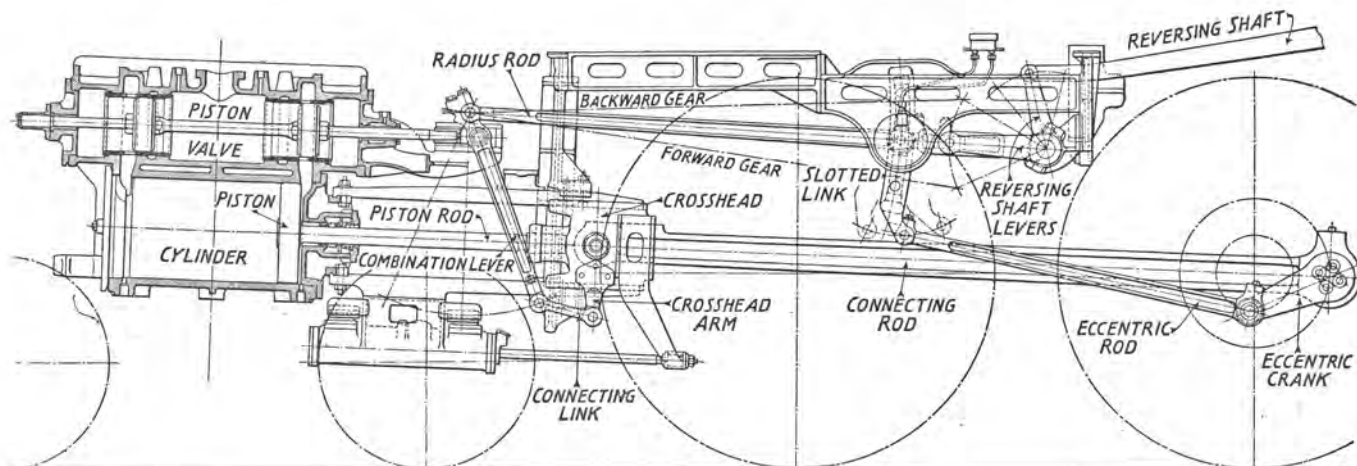
just above Humbug’s head – “Come back into the house NOW! I’ve just heard that human beings eat Popcorn and Humbugs.”

Nuts, bolts, woodscrews and a musical movement were the only expenditure on this Christmas present. Scrooge would have been proud of me. The musical movement installed was “Love me tender love me true” and no girl in this world could have loved her guinea pigs more tenderly and more truly and my granddaughter Hannah. **EIM**



Walschaerts walk-through

A new regular feature helping beginners to the hobby understand the intricacies of our models.



Writing his first editorial last month, the editor mentioned that he was keen to produce features to assist new recruits to the hobby and particularly the young. “Hang on,” replied a correspondent, who quite rightly pointed out that newcomers to the hobby can be of all ages, including in particular the newly retired!

Our writer added that he would like to see more explanation of the more complex bits of engines; “I know how a steam or a traction engine works, but I don’t understand the different valve systems, also some of the technical names baffle me – I think I know what a crosshead is, but I’m not sure.”

It’s true, what is familiar to us

experienced model engineers can be a complete mystery to the new recruits. So in coming issues of **EIM** we intend to do something about that, starting with this simple diagram of which bit of the Walschaerts gear is which. Watch too for something rather more complex on this particular motion coming soon...

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Steam car to Sentinel

EIM's new technical editor introduces himself with a typically unusual project, making use of a steam car engine to create a novel 7¼-inch gauge locomotive.

BY HARRY BILLMORE

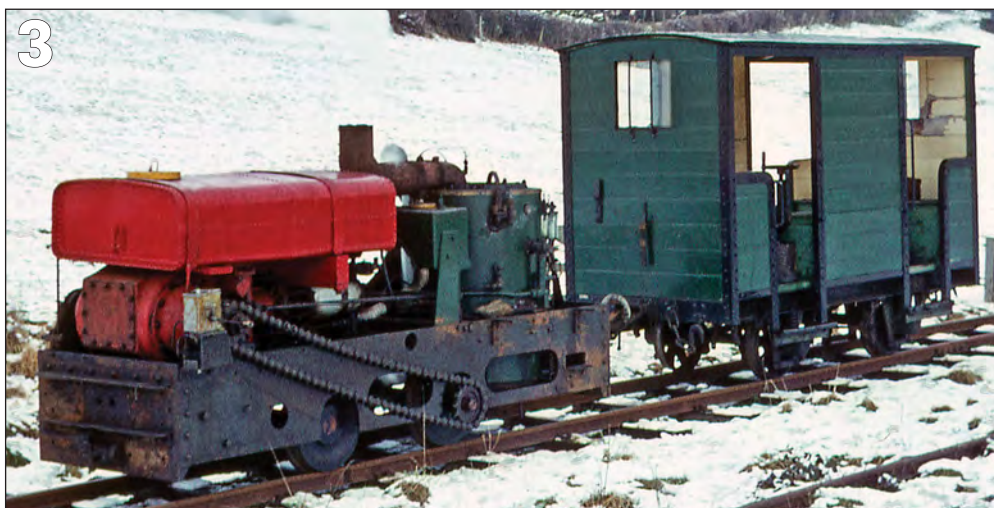


PHOTO 1:
'Nutty' at Llanfair
in the mid 1960s.

PHOTO 2:
Nutty in London
Brick Co service,
with we presume
driver 'Nutty'
Rowell alongside.

PHOTO 3:
Running on the
W&LLR without
covers exposes
the loco's layout.

Photos: Basil
Roberts,
W&LLR Archive



I have had in my possession for a while an incomplete steam car engine, dating from the late 1800s and built by one of the American manufacturers of the time. The same basic engine was produced by four to five different companies across an eight-year span for different bodies or just different licences. I believe mine is a Mason, though it is virtually impossible to tell whether it is a Locomobile, an early Stanley, a Grout Bros, a Milwaukee or perhaps even something not even intended for a steam car, as many more engines than cars were built and used as mobile power units in all sorts of places.

My unit is a twin double-acting slide valve engine with Stephenson Link valve gear. It is currently in a pretty poor state, having been stored somewhere damp for a while and is badly corroded in places, while it is also missing some of its major components. This also came with a new boiler from the well known steam car restorers J R Goold.

There have been several ideas for making use of this particular bit of kit, which have included building it into a replica steam car of the period, which looks like a flying bench, or maybe a take on the Stanley racing cars of the time, or perhaps building it into a steam motorbike or a static generating station.

The project that I have settled on, however, is to make a 7¼-inch gauge

version of 'Natty', the currently 2ft 6in gauge former London Brick Company Sentinel Shunter. This intriguing chain-driven locomotive was built at Sentinel's Shrewsbury works in 1929 as one of a batch of five destined for the 2ft 11in gauge system of the London Brick Company works at Farcett, Peterborough.

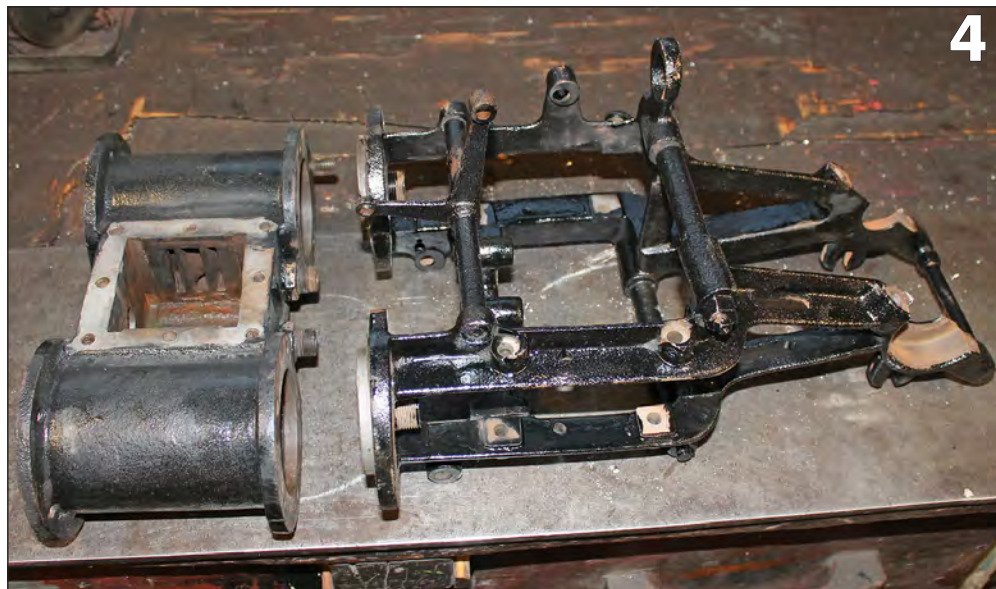
Tight dimensions

The loco was constructed using standard Sentinel Waggon Works components to an extremely tight loading gauge to fit into the brickwork kilns. The vertical boiler in the cab is a standard Waggon boiler, while both the horizontal twin-cylinder engine and the water tank that it sits under are both straight off the shelf.

The loco and its sisters had a very successful life, and a second batch was later built to the same design. They worked until the 1960s when they were replaced by diesels, after which most of the Sentinels were scrapped. One, however, was preserved and donated to the Narrow Gauge Railway Museum at Tywyn on the Talylyn Railway. From here it was loaned from 1964 to the Welshpool and Llanfair Light Railway.

At the W&LLR Natty was regauged to 2ft 6in and used primarily as a permanent way loco, though it also saw occasional turns on passenger trains, particularly shuttles to Heniarth in 1965 while the Banwy bridge was repair following damage from floods the previous winter.

Eventually in the 1970s Natty fell out of use at Llanfair and was eventually moved to Tywyn, where it was displayed in the former gunpowder store. In 1991 a lease was agreed with the Great Whipsnade Railway and Natty was dismantled for work, the boiler being removed. This work stopped in 1994 and it moved to Railworld at Peterborough. A cosmetic restoration was subsequently undertaken by the grandson of the man Natty was named after, London



Brick Co driver and fitter 'Natty' Rowell. The loco has since been moved to the Leighton Buzzard Railway and is on static display – recently I had a good look around it and took a lot of photos for my project.

Having decided on the prototype basis, and had a good look at it, I now needed to decide how I was going to create it. I have chosen to have the vertical boiler in the cab, fired by gas as opposed to the pressurized petrol of the original burner for the steam car. I intend to eventually fit an automatic water level control to it as a prototype for other projects I have in mind.

The engine will fit, as in the prototype loco, horizontally under a water tank. Water feed will be via a crosshead pump and injector, and for the automatic level control an electric pump will be fitted.

Planning to fit

Just like the prototype the drive to the wheels will be via chain, and I will hopefully be able to hide everything required under the bonnet, with the gas bottle at the front away from the heat of the burner.

My steam car engine needed a ▶

PHOTO 4:

Steam car cylinders and frame, stripped for examination.

PHOTO 5:

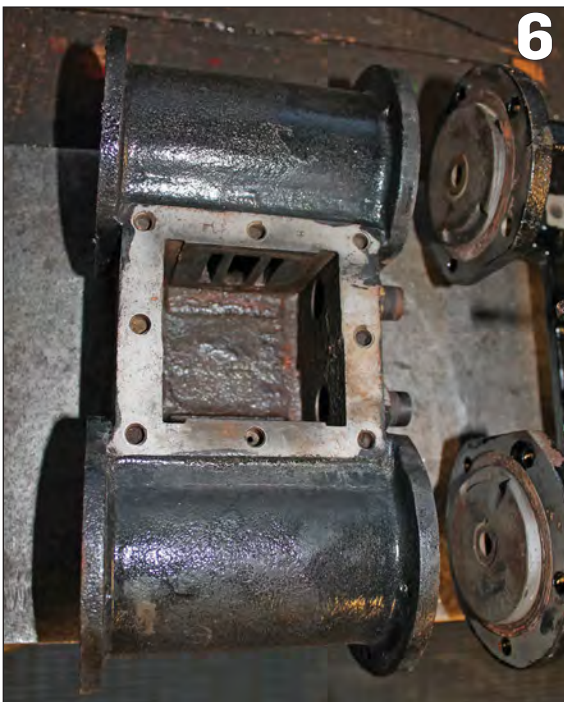
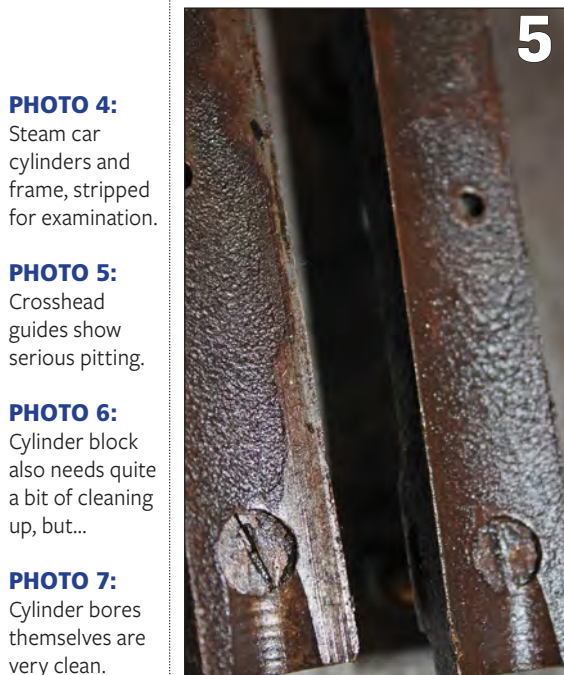
Crosshead guides show serious pitting.

PHOTO 6:

Cylinder block also needs quite a bit of cleaning up, but...

PHOTO 7:

Cylinder bores themselves are very clean.



8



9



thorough investigation to determine the work required to return it to operating condition. As can be seen in the photos there is a lot of pitting on the motion work, the cylinder end covers, crosshead guides and main frame casting. There is also a distinct lack of crankshaft, fly cranks, eccentric straps and rods.

On the plus side, the cylinder bores are very clean, albeit of different sizes, and the crossheads themselves are in good condition.

I have changed my mind a couple of times about the pistons and rings, I originally thought that I was going to replace them completely as I am not a fan of the split pistons with one large

ring gap filled with two rings as I don't consider this method of sealing very efficient. I then thought about just replacing the two rings with Clupet piston rings, this idea has merit but the wait and cost of ordering custom-sized rings put me off.

So I eventually decided just to put the unit back together as it is and see how well it works, as replacement at a later date will be an easy task if required. Doing things this way also reduces my work load a little as well as satisfying my curiosity about the crescent-shaped piston rings.

Other decisions I have made include replacing the valve rods and reaming the guides in place rather than removing them from the main frames. This will require a special futtock to be made to keep the bores parallel with the valve face. I will also be making new expansion links and die blocks to go with the new eccentric rods. These I intend to have water-jet cut by Model Engineers Laser before final finishing by welding the rod ends up, and draw filing the rubbing surfaces of the expansion links.

Complex CAD

I have drawn up the new components required in Solidworks in three dimensions, as well as producing a rough idea of what I am going to do with the crankshaft. These 3D models will be converted to 2D DXF files in the profile of what I need to be cut out. This is more complicated than it first appears as you have to remember that if you intend to carry out further machining on the parts, for example the clamping bolt through the eccentric straps, then you cannot include this on the DXF file as the water jet will cut any line there is on the file. This does require a fair amount of juggling at times to get it to

PHOTO 8

Split pistons, the rings, piston and con rods.

PHOTO 9:

Close up on the con rods – lower one has had new ball bearing press fitted.

PHOTO 10:

The piston end covers with one already cleaned up. Above them are the expansion links and valve guides.

PHOTO 11:

Vale guides also show evidence of heavy pitting.

All component pictures and drawings by Harry Billmore

10



11





work first time, but it definitely makes life easier!

I have also started the rebuild by borrowing a friend's shot-blasting cabinet to clean all of the components of rust and then painting pretty much everything except for the bearing areas. I did consider trying to polish them up, but the pitting is too deep and would require the removal of far too much material.

The next step is to start the machining operations, the first will be the crosshead guides, which will require some careful jigs making to hold them perfectly in line with the cutter axis. After that I will be making the futtock to ream the valve guides before making new guides. **EIM**

Harry will be documenting this project, including the various extras he needs to make up, in detail in forthcoming editions of **EIM**.

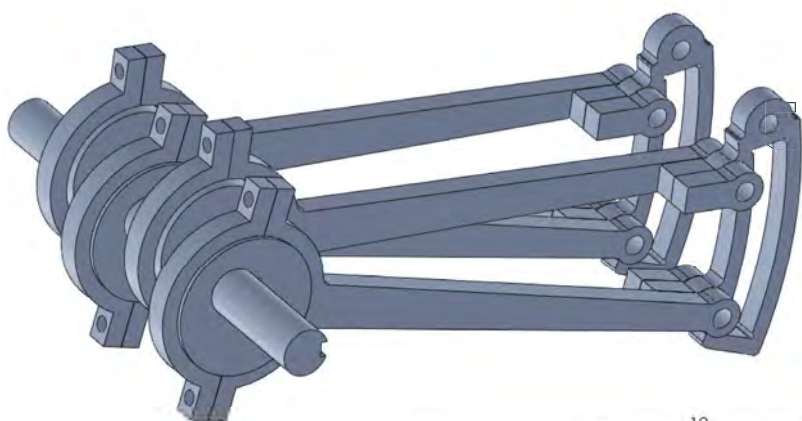
PHOTO 12

The engine unit on the original Nutty, taken as the loco is today at the Leighton Buzzard line.

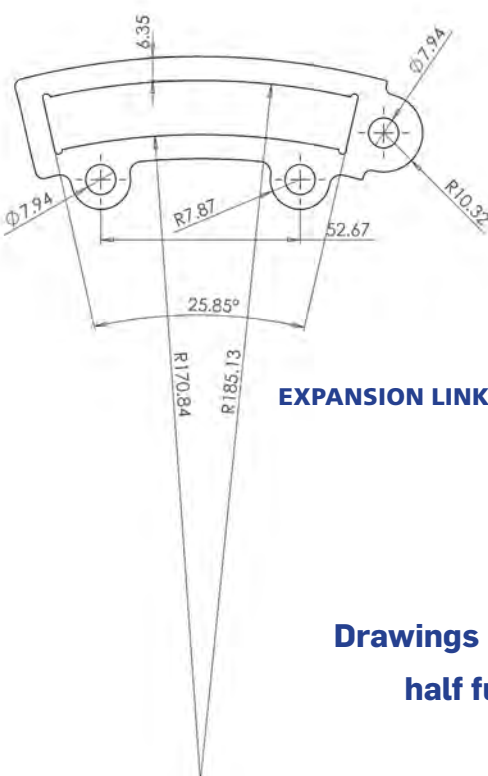
PHOTO 13

The driving position on Nutty is somewhat cramped, with a boiler in the way!

Both photos courtesy of Andy Chapman

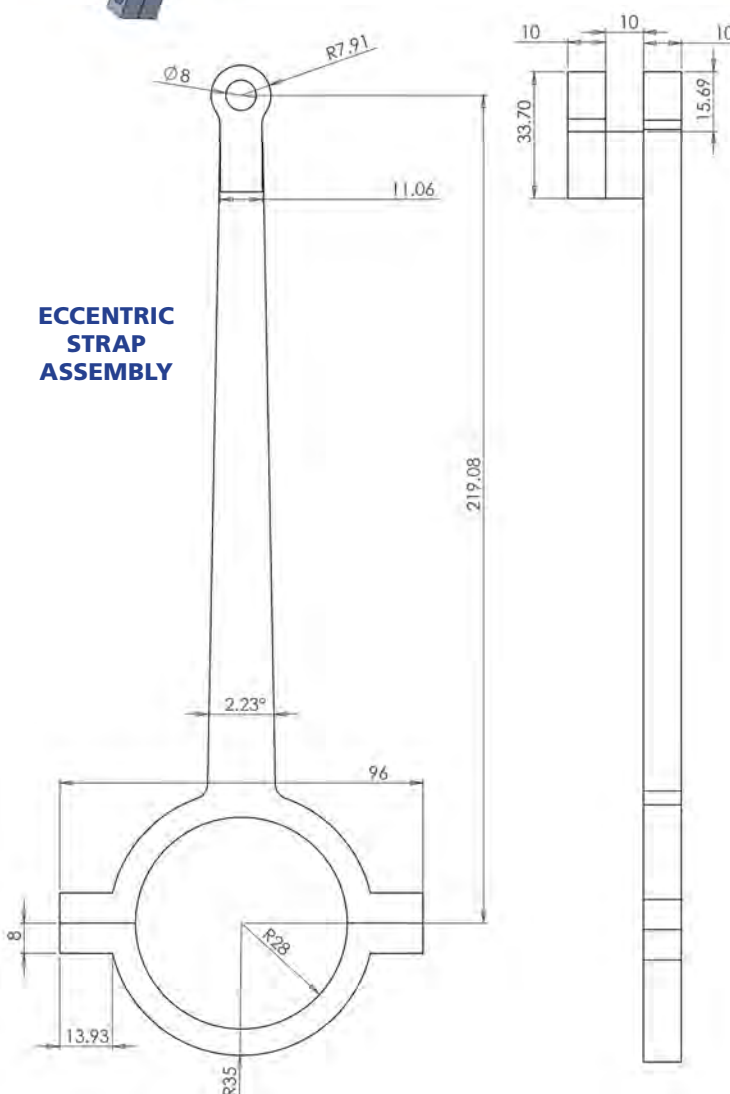


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The Middleton Railway

The engineering heritage of Leeds is well represented on the Middleton line with much of technical interest on display and in operation.

BY MARK SMITHERS



The importance of the city of Leeds during the history of the Industrial Revolution can hardly be overstated, given the presence in the parish of Hunslet of several important manufacturers of steam-powered engineering products, notably those connected with the locomotive-building industry.

A major driving force behind the growth of this industrial base was the availability of coal at a reasonable

price, and as early as 1758, the owner of Middleton Colliery, Charles Brandling, obtained statutory authorisation for the building of a horse-drawn railway, or 'waggonway' linking his workings with a staith closer to the centre of the city of Leeds. The Act of Authorisation was the first of its kind and completion of the railway soon followed. The first train ran on 20th September 1758 according to contemporary reports.

PHOTO 1:

Demonstration freight train on the seldom-used Balm Road Branch. Hudswell Clarke 0-6-OST Slough Estates No. 3 is about to cross Moor Road heading for the main station.

PHOTO 2:

An impression of the size of the main hall of the Engine House – both Manning Wardle 'New L' class locomotives are visible on the left-hand road, along with ex-Manchester Ship Canal Railways Hudswell Clarke 0-6-0 'Long Tank' No. 67.

By the early years of the 19th century, Britain was embroiled in the campaign to thwart the ambitions of Napoleon Bonaparte, and there was an unprecedented military demand for draught horses, principally for the haulage of supplies and artillery equipment. The newly-emerging steam locomotive, as pioneered by the work of Richard Trevithick, appeared to offer a solution to the scarcity of horses, but its major drawback was that it was too heavy in relation to its haulage capacity for the brittle cast-iron rails used on the Middleton Railway and at other locations.

The Middleton estate and colliery steward, John Blenkinsop, came up with a system to increase the haulage capacity of locomotives light enough to use the cast-iron rails. This consisted of arranging the locomotive's two vertical cylinders to drive, via an 'outrigger' pinion, onto a rack cast integral with the outside of one of the running rails. The use of two double-acting cylinders set at 90 degrees also did away with the need for Trevithick's flywheels for starting purposes.

The first of these locomotives, the 'Salamanca', was built to the design of Matthew Murray at Holbeck's Round Foundry and entered service in 1812.



In all, four locomotives of this design saw use on the Middleton Railway and the class appears to have been in regular use up to 12th February 1834 when a boiler explosion was reported on one of the locomotives, after which they rapidly fell out of favour.

Horse traction appears to have been reverted to for a while (apart from a short section rope-worked by a stationary engine), but by 1866, the cast-iron rails had been superseded and the first conventional steam locomotive purchased from local manufacturer Manning Wardle & Co.

In 1881, the railway and one of its Manning Wardle locos, 0-4-0ST 'Matthew Murray' (284/1869), was converted from the original 4 ft 1 inch to standard gauge. Four years later, a connection was laid to the main Midland Railway network (via Balm Road with its associated goods yard), and in 1947 the colliery and the Middleton Railway came under National Coal Board ownership.

Early preservation

By 1960, closure of the Middleton Railway's final city-based staithe at Kidacre Street (adjacent to BR's Hunslet goods depot) had ensured that coal traffic over the 'Moor Street' section had dwindled to a trickle and this part of the line's main use was for scrap metal traffic between Balm Road goods yard and the premises of Robinson & Birdsell Ltd (ironically responsible for the scrapping of several Manning Wardle locomotives, according to a 1949 letter in that company's records) and neighbours Claytons Ltd. The latter purchased part of the railway and allowed the Middleton Railway Society (later the Middleton Railway Trust) to operate freight trains on its behalf. The earliest 'volunteer' trains, which began in 1960, were, however, passenger workings and the true preservation era of the railway had begun.

Over the years, an assortment of historic locomotives, both steam and non-steam, and mainly of the industrial variety, were acquired, whilst passenger operations expanded during the 1960s and 1970s to cover a significant number of weekend and bank holiday workings, over a stretch of line that now reached to the site of Broom Pit. This had closed in 1968, ending NCB traffic on the section between Dartmouth Junction (leading to a partially extant siding from the Middleton Railway's 'main line', which had originally been part of a connection to the GNR opened in 1899) and the Pit.

A major setback occurred in 1983, when Claytons Ltd closed its Dartmouth Works scrap metal depot, which had been the preservation



PHOTO 3: Hunslet 2-6-2T 'Picton' was built for a sugar estate in Trinidad. Its size and condition prevents full restoration and a display shelter has been built for the loco.



PHOTO 4: Crude slots appear to have been cut into Picton's frames after excess vertical deflection resulting in the pony trucks fouling.



PHOTO 5: Left hand valve and piston are both exposed.

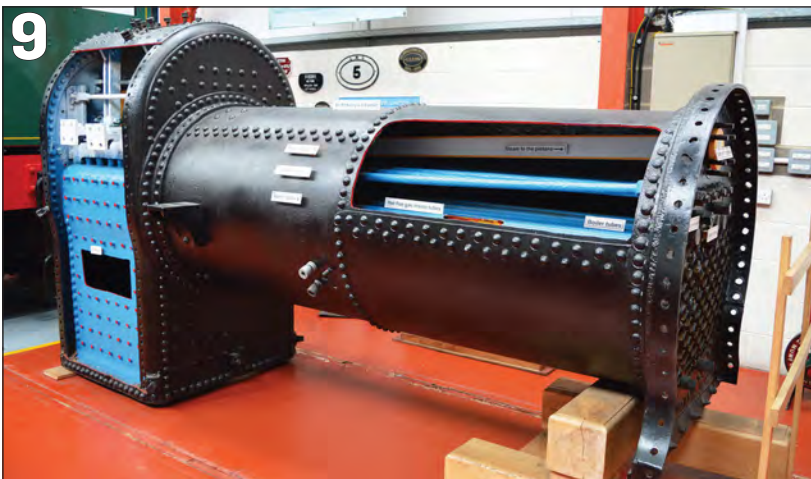
PHOTO 6: Much of the Walschaerts' motion is missing. Traces of the makers' standard green livery visible.



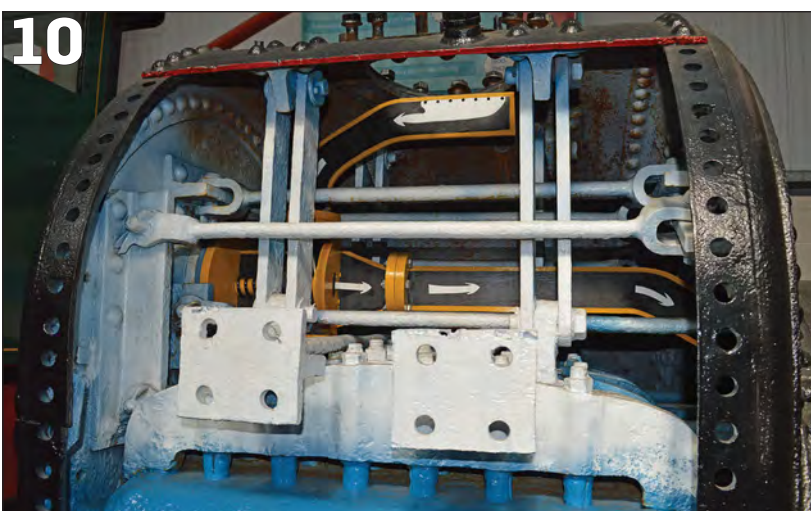
PHOTO 7: Belpaire firebox backhead with all of the non-ferrous fittings missing.

PHOTO 5: Replica of Blenkinsop's cog wheel, cast in 2012 and on display in the Engine House.




PHOTO 9:

The life-expired boiler from 'Sir Berkeley' has been sectioned and displayed in the Engine House Museum. Notable details include the raised inverted U-shaped firebox wrapper, waisted-in to fit the mainframes; the domeless boiler barrel, and the leading tubeplate, also forming a one-piece rear section of the smokebox.


PHOTO 10:

Close-up of the steam collection area showing the wrapper longitudinal, lateral and sling stays and inner firebox crown stays, with sectioned regulator and main steam pipe.

body's base. A new headquarters was secured at Moor Road, where workshop, siding and station facilities were established.

From 2005 onwards, important upgrading work was undertaken at Moor Road, and this is immediately apparent to the casual visitor in the form of the excellent Engine House Museum, which houses many of the railway's locomotive collection, along with other smaller exhibits.

More recently, a new running shed has been constructed, along with a conservation shelter for Hunslet 2-6-2T 'Picton' (1540/1927). This locomotive was originally purchased by former Middleton Railway Trust Chairman, David Monckton, and

subsequently transferred to the Trust's ownership with the aid of a Heritage Lottery Fund Grant.

Picton is currently the railway's sole example of a design specifically intended for export, having spent its working life with the Sainte Madeleine Sugar Co in Trinidad. The engine's design is fully commensurate with its date of construction, incorporating a Belpaire firebox, piston valves, steam braking and screw reverser, and it was initially hoped that restoration to working order would prove feasible.

Unfortunately, this idea was defeated by two main difficulties: firstly Picton's overall width was too much for the domestic loading gauge; and secondly, it had suffered an

excessive amount of corrosion during a long period of dereliction in the open. It was therefore decided to conserve the main 'bulk' (sadly the cab and tanks were in extremely poor condition and could not be displayed with the loco on safety grounds) in the purpose-built shelter, open on one side for viewing. The engine was shot-blasted and coated with a metal preservative prior to going on display.

Double century

In 2012, the Middleton Railway celebrated the 200th anniversary of the introduction of the world's first commercially successful steam locomotives by having a full-size replica of John Blenkinsop's pinion wheel cast by Terrill Bros of Bradford. This was unveiled by the Lord Mayor of Leeds, Councillor Ann Castle, on 24th June 2012. In addition to their role in gaining commercial acceptance for the steam locomotive, if not for Blenkinsop's rack system, the early Middleton specimens were also the first steam locomotives built in Leeds, paving the way for the thousands produced for commercial usage over more than a century and a half by a variety of local manufacturers.

These concerns are well represented amongst the preserved railway's collection, not least amongst them being the Manning Wardle specimens, 'Sir Berkeley' (1210/1891) and 'Mathew Murray', formerly 'Arthur' (1601/1903). Both began their lives as contractor's units (with Logan & Hemingway and John Aird & Co respectively) and both exhibit typical features associated with one of the makers' standard six-coupled designs, namely inside cylinders; domeless boiler barrel; raised firebox wrapper; firebox falling neatly between the rear and intermediate axles, and flat-sided saddle tank. But they differ in certain details owing to their age disparity.

These two are officially members of the maker's L class, although 'New L' would be a more appropriate term, given that the earliest five locomotives to bear the L classification (nos 504-5 of 1874; 731 of 1881; 769 of 1880 and

PHOTO 11:

H class 0-4-0T 1310 is one of the best-known locos on the line, saved by the Steam Power Trust in 1965.

PHOTO 12:

Hudswell Clarke 0-4-0 'Carroll' with a train close to the former junction for the Claytons and Robinson Birdsell scrap plants.





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13


908 of 1883) possessed a longer wheelbase and larger boiler than the mainstream, or 'New L' class (which commenced with 1034 of 1887).

The iconic feature of the Manning Wardle standard classes was the boiler design, which dated back to the 1850s and the makers' predecessors, E.B. Wilson & Co. Following the building of a replacement boiler for Sir Berkeley, its life-expired boiler was sectioned and set up as an exhibit in the Great Hall of the Engine House. Visitors can now examine the intricate

stay structure necessary to support the high 'inverted U-shaped' firebox wrapper, and the simple lap-joints that hold the barrel together. Detailed study of this exhibit is a 'must' for anybody wishing to produce an accurate large-scale model of any of the Manning Wardle standard classes.

During normal operating days, trains run from Moor Road over a distance of just under a mile to the current remote terminus at Park Halt, close to the site of the former Broom Pit Colliery. In doing so, they must

PHOTO 13

Single-speed high-pressure Sentinel 0-4-oVBT Y1/2 built in 1933, this loco recently underwent a restoration to working order.

14


PHOTO 14:

Manning Wardle 0-6-oST 'Sir Berkeley' is an icon of preservation, the only 19th century product of the Boyne Engine Works to have steamed on home soil in the current century. Note the weatherboard, based on those found on locos of the predecessor manufacturer, E. B. Wilson & Co., and modified to incorporate a central 'bump' to accommodate a conventional pressure gauge.

15


PHOTO 15:

Hunslet 0-6-o 'John Alcock', originally built for the LMS. Latter owners included the War Department, until it was re-acquired by Hunslet and later sold to the Middleton Railway in 1960.

first pass through a 263ft tunnel under the M621 motorway, almost immediately prior to reaching the junction with the Birdsall/Dartmouth siding stub. The train will then pass the John Charles Centre for Sport and the South Leeds Academy before Park Halt is reached, where a platform and run-around loop are situated.

At the other end of the line, the Balm Road Branch from Moor Road (approximately a third of a mile in length) is only used for special events, and its connection to the main line has been bolted closed since 1990.

Most of the photos accompanying this feature were taken during the 'Mixed Traffic Event' of 29th-30th July 2017, although that showing loco No. 6 dates from the 2015 weekend marking the 150th Anniversary of the formation of Hunslet Engine Co.

Wide ranging

The exhibits in the main hall of the Engine House cover a wide range, both in terms of chronology and technical features. A range of patterns for steam loco components (and some for non-steam items) are on display to demonstrate the methods used in locomotive construction generally. The Leeds manufacturers are well represented, as is to be expected, and there are items ranging from models of Matthew Murray's locomotives for the Middleton Railway, Hudswell Clarke 0-4-0ST 'Lord Mayor' and a Fowler 0-4-0 diesel to full-size units of both Leeds and non-Leeds origin.

Manning Wardle's Jack Lane neighbour, Hudswell Clarke & Co. Ltd, is particularly well represented by three currently non-operational steam locos: 'Henry De Lacy II' (1309/1917) is the oldest of these and this '14in by 20in' 0-4-0ST is built to a basic specification that saw service with the Great Western Railway in the form of 'older sister' 725/1905, the former Swansea Harbour Trust No. 3.

Former Manchester Ship Canal Railways 'long tank' 0-6-0T (1369/1919) last saw use on the Middleton Railway between 2002 and 2012 before its boiler ticket expired, since when it has been a display item.

The final phase of steam loco construction at what may be termed the 'Third Railway Foundry' is represented by 'Mirvale' (1882/1955), produced a mere six years before the last batch of Hudswell Clarke engines appeared. The Middleton Railway is also home to two Hudswell Clarke diesel products: early representative 'Mary' (D577/1932), originally built for Beswicks Limeworks of Hindlow, near Buxton and fitted with a six-cylinder Mirrlees 100-120hp engine (now replaced by a 102hp four-cylinder Gardner 4L3); and

'Carroll' (D631/1946), fitted with a six-cylinder Gardner 6LW 60hp engine and originally built for service at Laisterdyke Gasworks, Bradford. Both are currently operational and see service on the railway on selected occasions, although Carroll is, as the engine ratings would suggest, somewhat less powerful than Mary.

Hudswell Clarke is not the only Leeds manufacturer well represented amongst the diesel units as John Fowler & Co. Ltd '390' class 3900002 is also currently in the Great Hall. This 40hp loco was completed in June 1946 and its bonnet has been opened so that visitors may view its four-cylinder engine, which bears the Fowler logo. The line's other Fowler representative is 'Harry' (4220033/1965), a currently-operational six-cylinder 250hp unit built for British Sugar Corporation's Wigginton Light Railway, and acquired in 2007.

Historic show star

Of greater historical significance, perhaps, is Hunslet 1697 of 1932. After appearing at the British Industries Fair in its year of completion (a feat repeated during the subsequent year), this 150hp 0-6-0 unit impressed the London Midland & Scottish Railway authorities and was purchased after modifications for ordinary service (along with three other experimental Hunslet units). It was given the running number 7401, later 7501.

After a period in War Department service during World War Two, 1697 was re-acquired by the makers and later fitted with a McLaren six-cylinder M6 engine to replace its original item of German MAN parentage. Following a spell of hire work, the loco finished its career as a Hunslet works shunter until 1960 when it was transferred to the Middleton Railway and named 'John Alcock' after the then-chairman and managing director of Hunslet Engine Co. John Alcock is currently operational and has been restored in its second LMS guise as 7501.

One important point to note about Fowler 4220033 and most of the pre-1960s Leeds-built diesel locos on the Middleton Railway is that they employ the final jackshaft-drive system of transmission from the gearbox, although this is not true of Hunslet 'Courage' (1786/1935), a 0-4-0 22hp chain-coupled unit of Lilliputian proportions once employed by the Courage Brewery at Alton, Hants.

In terms of non-Leeds-built locomotives, the true 'celebrities' amongst the Middleton collection are the ex-main line specimens. The earlier of the two to arrive on the line was ex-London North Eastern Railway Sentinel high pressure vertical boiler geared Y1/2 class 8837 of 1933. This

PHOTO 16:

This Peckett 0-4-oST, built in 1948, previously worked at the Croydon Power Station and was purchased by the Middleton Railway from CEGB in 1981.

PHOTO 17:

Hudswell Clarke 0-4-oST 'Henry de Lacy II' never left its county of birth, spending its entire revenue-earning career at Kirkstall Forge, Leeds prior to being donated to the Middleton. Its domed boiler and rounded saddle tank, illustrates a separate path of evolution that this builder and Hunslet took from the standard design approach favoured by Manning Wardle.

PHOTO 18:

With full-length saddle tank and rounded cab profile Hudswell Clarke 0-4-oST 'Mirvale' is an example of the final phase of steam locomotive building at the third Railway Foundry. It was constructed for Mirvale Chemical Co Ltd, Mirfield, where it worked until acquired by a private purchaser, being re-sold to the Middleton Railway in 1985.



Shrewsbury-built specimen became successively BR No. 68153 and 54 in Departmental Stock before being purchased by the railway in 1961.

Four years later, 1891-vintage inside cylinder ex-NER H-class 0-4-0T (later LNER class Y7) was acquired by the Steam Power Trust from the National Coal Board at Watergate Colliery, County Durham, arriving at the Leeds site in June 1965. Both locomotives are currently operational.

Two non-operational 'foreign' locomotives in the literal sense are on

display in the Great Hall, namely Cockerill outside cylinder 0-4-0VBT 'Lucie' (1625/1890) and Hartmann 0-4-0WT 2110 of 1895, ex-Danish State Railways No. 385.

At the time of writing the operational industrial steam locos on site comprised Matthew Murray (Sir Berkeley having just fallen 'out of ticket') and Hudswell Clarke outside cylinder 0-6-0ST 'Slough Estates No. 3' (154/1924), the latter of which was in steam during my July 2017 visit.

The workshop contained the





newest of the Leeds-built diesel locomotives on-site, namely Hunslet 6981 of 1968, the 252hp 0-4-0 'Phillips '66'. Three steam locomotive restoration projects were also in evidence: the most advanced (and virtually completed) was sole surviving standard Hunslet '14 in' 0-6-0ST 'Brookes No. 1' (2387/1941). This locomotive was built as part of a wave of related Hunslet designs of graduated sizes (i.e. 12in, 14in, 15in, 16in and 18 in cylinders) from 1923 onwards in a manner that echoed the Manning Wardle 'standard six-coupled' progression, albeit with a

much more modern specification.

As with Picton, this locomotive was acquired by the Trust from David Monckton with the aid of the Heritage Lottery Fund and it last saw service on the railway on the expiry of its last 10-year boiler ticket in 2009. Initial worries that major boiler repairs (apart from the mandatory re-tubing) would be required fortunately proved unfounded and during the period from April 2013 up to the time of writing a thorough overhaul of Brookes No. 1 to operational condition has been undertaken, most of the work concentrated on the



PHOTO 19:

One of the Middleton Railway's two Fowler diesel shunters is this 390 class 0-4-0 which arrived in 1967. Note the distinctive cab profile and final jackshaft drive to the rear axle.

PHOTO 20:

Part of the 40hp four-cylinder Fowler-Sanders '4B' engine.

PHOTO 21:

The Fowler loco's drive shaft from the clutch to the gearbox, with its pulley and belt connection to the radiator fan.

PHOTO 22:

Hawthorn Leslie 0-4-0ST No. 6 is undergoing a protracted overhaul, the cost of which is estimated to be in excess of £60,000.

PHOTO 23:

Repairs to the boiler of No. 6 have involved removal of the firebox wrapper side plates – the boiler is pictured in 2015 shortly after the work was carried out.



chassis. The locomotive's public debut in newly-restored condition was on the 28th August Bank Holiday trains.

Another Hunslet locomotive in the workshop undergoing restoration is former Pye Hill Colliery (Notts) cut-down outside cylinder 0-4-0ST No. 11 (1493/1925) which, with its flush-firebox domed boiler is another representative of the Alcock-era school of Hunslet steam loco design.

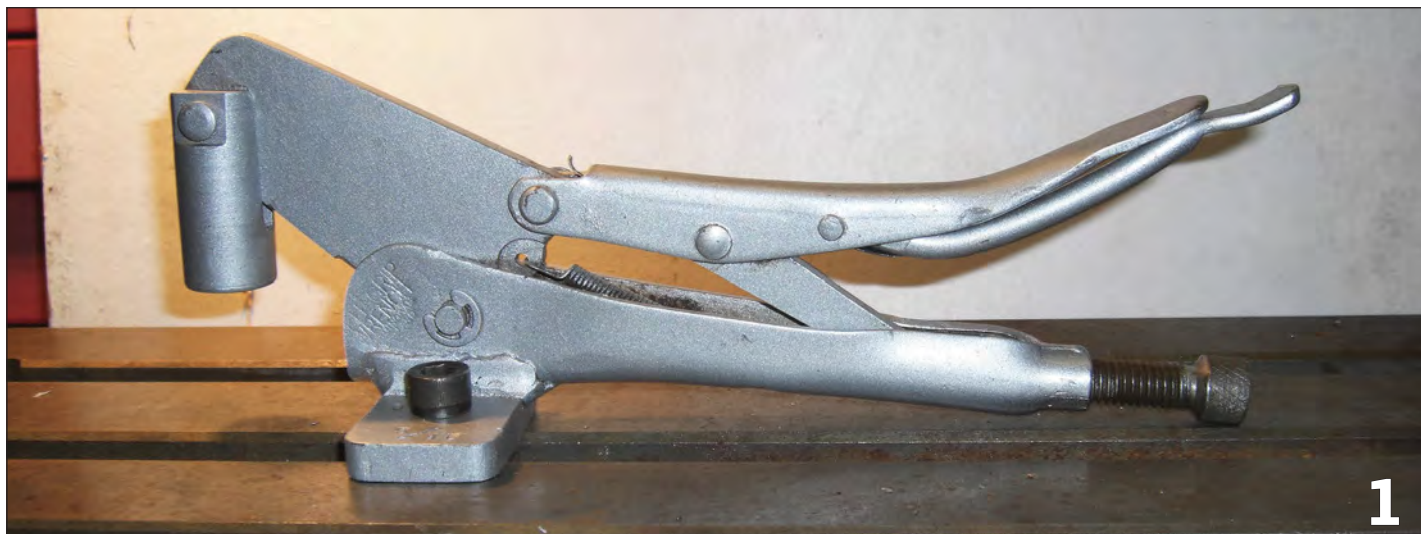
The third steam locomotive in the works is Hawthorn Leslie outside cylinder 0-4-0ST No. 6 (3860/1935). Although not a Leeds product, it should be remembered that its manufacturer's successors, Robert Stephenson & Hawthorns Ltd, held the goodwill of Manning Wardle and Kitson & Co for more than two decades before this passed to Hunslet Engine Co in 1960. No. 6 arrived on the railway from APCM, Swanscombe on June 5th 1971 and put in four years' service prior to being laid up for overhaul. This has been a protracted affair, owing to other commitments, and unlike Brookes No. 1, extensive boiler repairs have proved to be necessary following an inspection in 2014. An appeal has been launched to finance the return of No. 6 to steam, which it is hoped can be accomplished by 2020. **EIM**



From Grip to Clamp

Norman modifies a familiar repair tool into something more useful in the workshop.

BY NORMAN HURST



Back in 2013 I read an interesting article in a magazine by a Mr Michael Cox. He had cleverly converted locking pliers – commonly known as Mole grips – into a drilling machine clamp. This is secured by a screw that passes through the centre hole in the drilling machine table and is locked by a nut underneath.

I don't have a drilling machine, but I do have a mill drill and I wondered whether his design could be modified into a clamp that would suit the T-slots on my milling machine table. I had an ancient 10-inch Mole grip which was redundant, so I knew that I wouldn't be losing a lot in attempting to convert it. I achieved this conversion satisfactorily (Photo 1) and have found it to be a useful tool in clamping small components

As far as I remember, I acquired the Mole grip (Photo 2) several years ago in a 'job lot' and I can't remember ever having used it. When I decided to convert it, I measured the overall length and found it to be nine inches, but I then noticed that it was stamped 10ins. I realised that this length could only be achieved by screwing out its adjusting screw to its fullest extent! This screw was $\frac{7}{16}$ inch x 14 TPI so was probably Whitworth or UNC. Apart from this, all dimensions were rather strange and could have been either metric or imperial.

There are different types or makes of locking pliers; some have the fixed jaw riveted in position and I'll call this type 1, while others (as in Photo 2) have the jaw as an integral part of the body; I'll call that type 2. Both have their swivelling jaw located in position

PHOTO 1:

The completed clamp, usefully converted from a pair of Mole grips.

PHOTO 02:

Basis of the conversion was this pair of 'type 2' grips.

PHOTO 03:

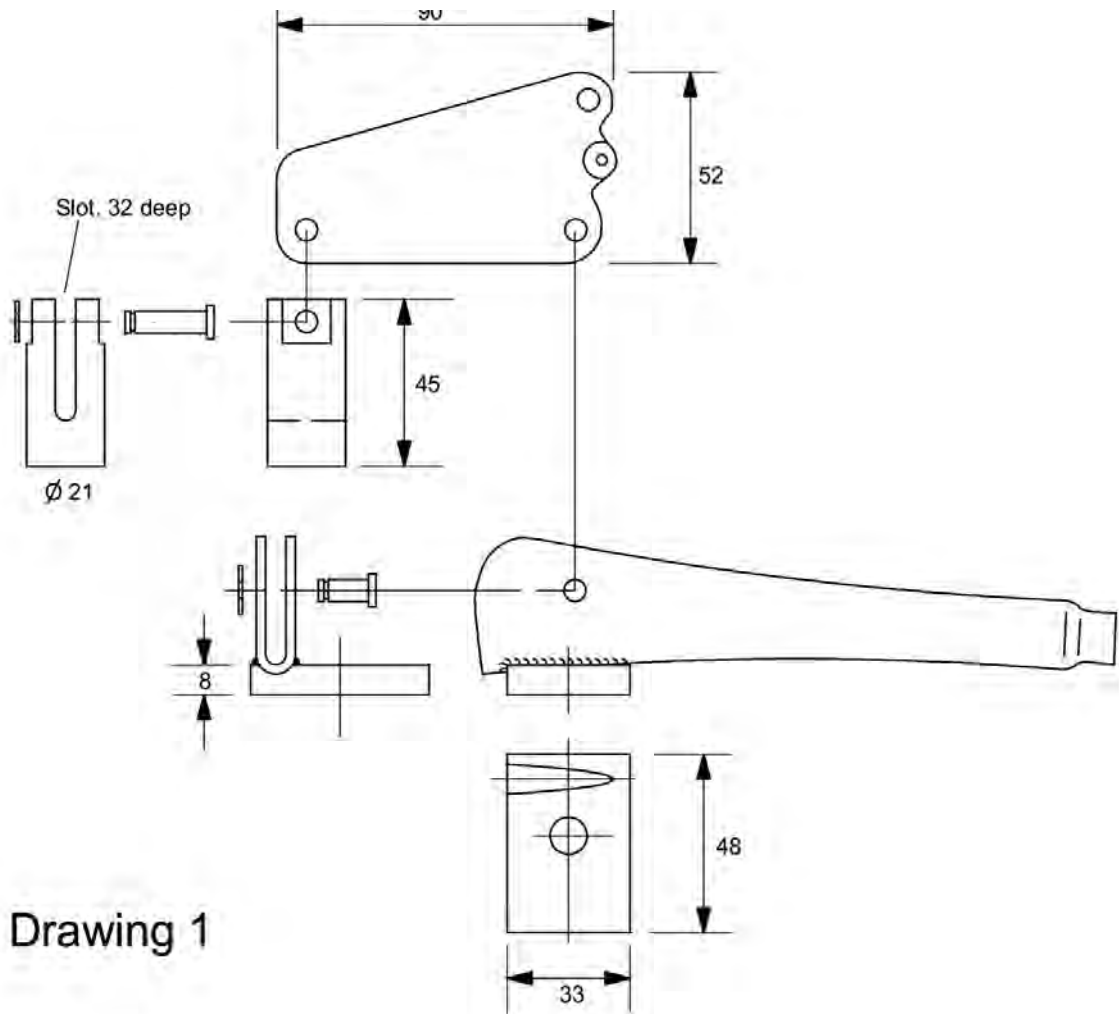
The grips after dismantling, only one rivet shown as other went astray...

with two rivets that act as pivots.

For my clamp it would have been ideal if the fixing screw was positioned on the centre line of the clamp (as with Mr Cox's item), but that is not possible if used with a T-slot. I therefore decided that the

screw should be as close to the centreline as possible. I achieved this by welding a steel plate to the bottom of the clamp frame with a hole for the screw; this being as close to the side of the clamp as I could get. I used a cap screw for securing the clamp to the





4



mill table because it had a comparatively small diameter head and hence would be positioned just a little closer to the frame.

Dismantling Mole grips

Firstly, the jaw rivets must be removed. Type 1 has four rivets to remove; two in the fixed jaw itself and two through the pivoting jaw. Type 2 has only two to remove, these both being the swivelling jaw pivot rivets.

My clamp was the latter type and I removed the rivets by grinding off their heads on one side and punching them through. An alternative way would be to drill away the rivet heads instead of grinding, then punching the rivets out. The rivets will then be discarded but the swivelling jaw should be retained at this stage to act as a drilling jig.

Photo 3 shows my dismantled Mole grip with the swivelling jaw at top left. Only one rivet is shown; the other was lost! The two white marks at the bottom of the frame body show the position that I had decided on for the base plate. The fixed jaw will be removed; this being done automatically on type 1 by removing the rivets, but some 'surgery' will be required to achieve this on type 2; the frame being cut away generally as shown in **Photo 3** and **drawing 1**.

Construction

The cut-away frame is shown on **Drawing 1** along with the type 2 components that I made for my clamp. The same items are also shown in **Photo 4**, but in this photo the base plate has been welded on. As can be seen in **Photo 1**, the adjusting screw end of the tool almost touched the mill table. The reason for this error is that I had welded the base plate butted up against the body frame (**Photo 5**). After assembly, I realised that the body should be tilted about three or four degrees to avoid this error. A tapered groove should be cut in the base plate (**Drawing 1**) to overcome this problem.

In the drawing I have shown the bottom of the body frame to be circular, but it is likely that the frame could have a rounded-off flat bottom. Cutting out the baseplate tapered groove with an angle grinder should be sufficient for positioning the frame prior to welding. I used an odd piece of steel (8.85mm thick) from the scrap box for my base plate, but that could be reduced for this size of clamp; I would suggest at least 6mm thick.

The hole in the base plate should be approximately in the centre and will be the diameter suitable for use with the constructor's tee slot nuts. Mine was a $\frac{3}{8}$ inch clearance hole to suit my T-slot screws. I have noticed that new mole grips have a silvery coating; this is probably a paint finish, but to be sure of a good weld, this finish/coating should be lightly filed off in that area.

I used a MIG welder for this job and that proved to be successful. For constructors without welding or brazing facilities, steel screws – possibly two or three $\frac{1}{8}$ inch or M4 screws with reduced diameter heads – could be used to secure the frame to the baseplate. Drill through from inside the frame with a tapping size drill into the base plate; open out the frame holes to a clearance size and tap the holes in the base plate; the screws will then be passed through from the inside and tightened up. Alternatively an adhesive could be applied to reinforce the fixture.

Measure the distance between the frame walls; mine was about 6mm and I used some odd-sized plate (5.75mm) that I happened to have to make the swivel plate; this gave an acceptable clearance. If the clearance is found to be a little too large, the frame sides can be squeezed in to reduce this.

The swivel plate can be cut approximately to the shape shown, with its dimensions suitable for the constructor's Mole grip. There doesn't appear to be any rule or formula for arriving at the dimensions or sizes and all of mine were guessed. I suggest

that if the constructor keeps within my proportions with his/her Mole grip, the result will be satisfactory.

Using the removed swivel jaw as a drilling jig and keeping the jaw roughly parallel, drill the two holes for the swivel rivets and one small hole for the spring end. I milled the plate surface on each side around the small hole, down to a thickness of about 2mm; this thin section being similar to that on my removed jaw, making it suitable for securing the curved end of the spring. This feature can be seen in **Photos 1** and **6**.

The jaw can be made from a length of round mild steel bar. I used an odd piece from the scrap box. Cut the slot to suit the width of the swivel plate, allowing a small clearance. The depth of the slot should be sufficient to permit the jaw to hang vertically with the clamp in the fully open position (**Photo 1**). Sufficient thickness should be left at the bottom of the jaw; I suggest at least 6mm. Flats can be milled at the top to suit the rivet head. I used e-type circlips for securing the rivets, so if a circlip or washer is used, the diameter of these should be allowed for when cutting the flats.

The rivets

Two short rivets are required; these being a replacement for the two swivelling-jaw pivot rivets that were removed. I was fortunate to have some secondhand rivets or pins of the correct diameter so it just entailed cutting circlip grooves and finishing them to the correct length. I used circlips, but other methods of securing the rivets could be used. The longer rivet is also a swivelling pin and will hold the clamp jaw.



Assembly

This is quite straightforward; the new swivel plate and jaw simply taking the place of the original swivelling jaw. I gave the clamp a finish by spray painting in Hammerite Smooth Silver spray paint, as seen in **Photos 1** and **2**.

My clamp will open to about 40mm and will close down to zero. **Photo 6** shows a test that I carried out. I drilled small pieces of 4.75mm steel plate with a 13mm drill. The clamp held the pieces as tight as if they had been bolted down. For drilling several small work pieces (batch production), this clamp would be a quick and convenient accessory; especially if combined with a jig. **EIM**

PHOTO 4: New components made for clamp as per the drawing above.

PHOTO 5: A slight error when welding required some modifications.

PHOTO 6: Completed clamp in action.



Making model hinges

John needed some tiny hinges for his 7¼ inch gauge GWR 1400 class tank locomotive...

BY JOHN SMITH

This article describes a way to make model hinges which work well and which don't fall apart, as the pin is a press fit in the 'fixed leaf' of the hinge and a clearance fit in the 'moving leaf'. This is facilitated by the use of a taper pin for the pin of the hinge.

Photo 1 shows a pair of hinges made for one of the tool boxes which sits on the running board of the GWR 1400 class loco. This was my first effort at hinge-making. The hinge was considerably over scale in terms of the thickness of the leaves and the diameter of the knuckle (the part through which the pin passes). The hinges described here are for the metal doors in the rear of the cab of the loco.

Imperial taper pins have a diametral taper of 1 in 48 (1/4 inch per foot), the nominal diameter being measured at the large end. Metric taper pins have a diametral taper of 1 in 50, the nominal diameter being measured at the small end. So a metric reamer cannot be used for an Imperial pin and vice versa.

Metric versus Imperial

The smallest and longest Imperial taper pin available has a diameter of 1/16 inch and a length of 1 inch, the diameter at the small end being 0.042 inch; the smallest metric taper pin has a small-end diameter of 1mm (0.039in). So if you are looking for the smallest hinge possible, metric pins win by a whisker.

Having some 1/16 inch D x 1 inch Imperial pins and a 1/16 inch D taper pin reamer in stock, I opted to use these. I noticed at a recent show that Polly Model Engineering carries these

RIGHT:

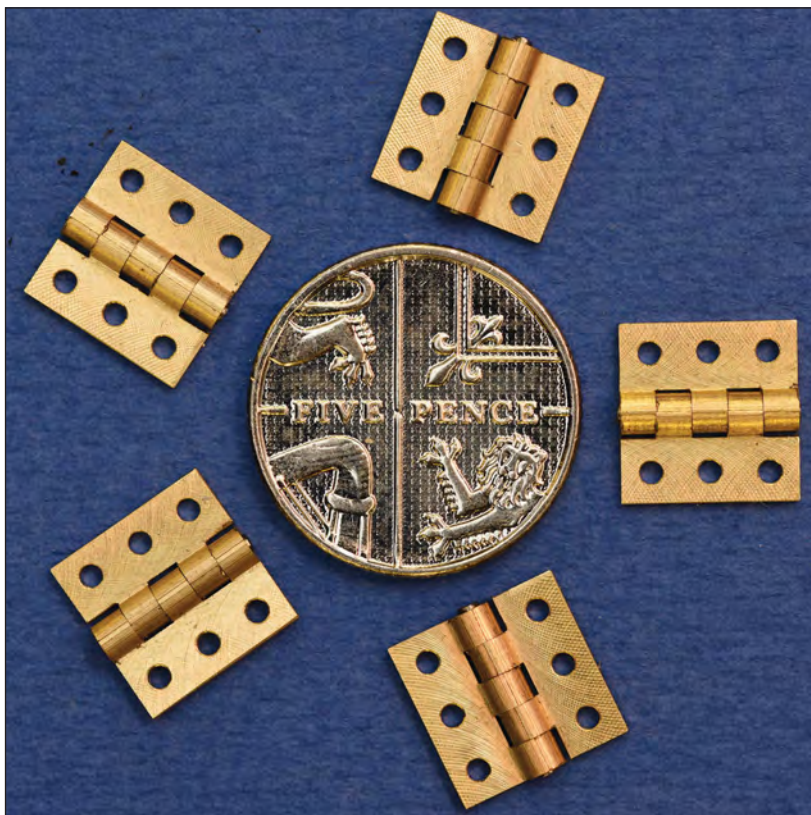
Yup, those are small hinges...

PHOTO 1:

First attempt – compared to the later versions in the lead photo these hinges look somewhat overscale.

PHOTO 2:

Milling the initial slot.

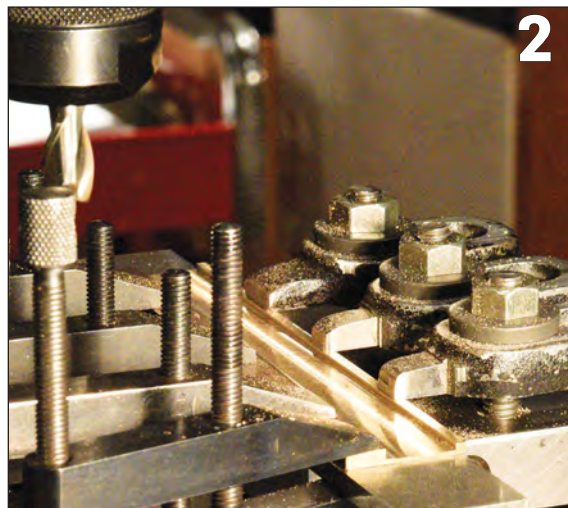


pins. The diameter at the large end of a 3/8 inch length cut from the small end of one of these pins is 0.0495 inch, so the knuckle diameter for a minimum wall thickness of 1/64 inch would be 0.081 inch (2.051mm).

Corner rounding cutters are available in 1mm and 1.5mm radii, so knuckle diameters of 2mm and 3mm are possible. I was sorely tempted to opt for a knuckle diameter of 3mm, but the challenge of a smaller diameter was too strong! I decided to make the knuckle diameter 2.2mm, the 1mm

corner rounding cutter still being usable, there just being a small flat in the centre of the knuckle.

A drawing of the hinges to be made (four off) is shown in Figure 1. This is the first drawing I have produced using DraftSight for which measurements to the nearest tenth of a millionth of an inch were input! The hinge is still a little over scale in terms of leaf thickness, knuckle diameter and leaf width, but it's dauntingly small! I opted for a rivet diameter of 3/64 inch which is a little over scale,



but I don't have much time for 1/32 inch D rivets. You can hardly see them once paint has been applied and I seem unable to close them neatly.

Step by step

This is what you do:

1. Cut enough 1 inch x 1/8 inch brass flat to make four hinges plus a spare (of course – see page 22!).
2. Anneal the components to relieve cold-rolling stresses and reduce post-milling bending.
3. Clamp the workpiece to an angle plate held in the machine vice and skim the outer knuckle edge to ensure an even knuckle width down the strip.
4. Mill the knuckle top to 0.088 inch in height.
5. Mill a 1/2 inch wide slot to give a leaf thickness of 1/32 inch and a knuckle width of 0.088 inch (Photo 2).
6. Use a corner-rounding cutter to shape the knuckle (Photo 3).
7. Saw to a width of about 9/16 inch and cut strip in half.
8. Make 'carriers' to hold the hinge blanks snugly in the machine vice. The hinges would be too weak to withstand the milling forces without this support (Photo 4).
9. Mill the 'moving leaves' leaving about .005 inch over length at each end (Photo 5). Let's hear it for Doctor Heidenhain! I'm not sure that I could have made these hinges without the DRO (digital readout).
10. Saw into individual leaves and stamp them 1-5 on the part of the leaves which will later be milled away.
11. Mill each 'fixed leaf' using a "moving leaf as a gauge (Photo 6).
12. Saw into individual hinges, unfinished top, bottom and non-knuckle edge.
13. Stamp each fixed leaf.
14. Make a drilling jig using a length of trued-up angle and a V-block. Saw the root of the angle with a 'thin saw' to remove any slight curvature.
15. Set up the V-block at 45 degrees to the table and set the DRO. Push each half of each hinge into the corner of

Figure 1

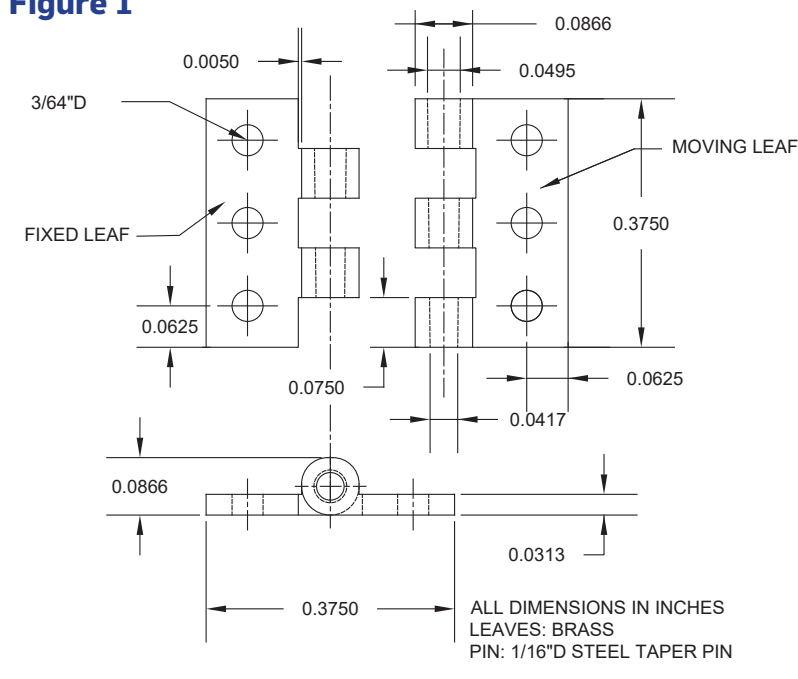


FIGURE 1:

The general arrangement drawing of the brass hinges.

Figure 2

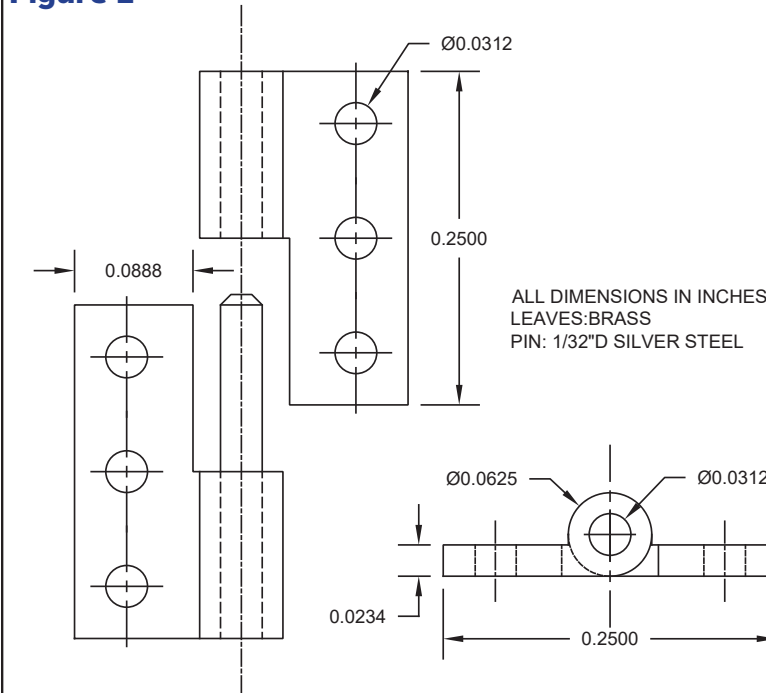


FIGURE 2:

A potential solution for smaller scales – see text.

PHOTO 3:

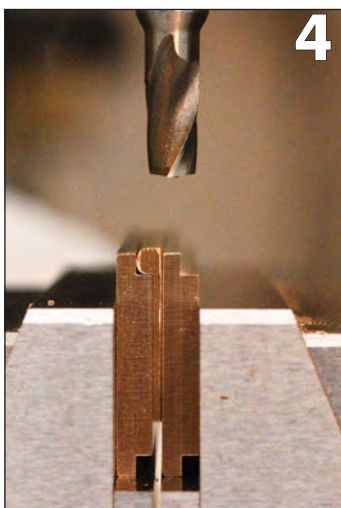
Using a corner rounding cutter to shape the knuckle.

PHOTO 4:

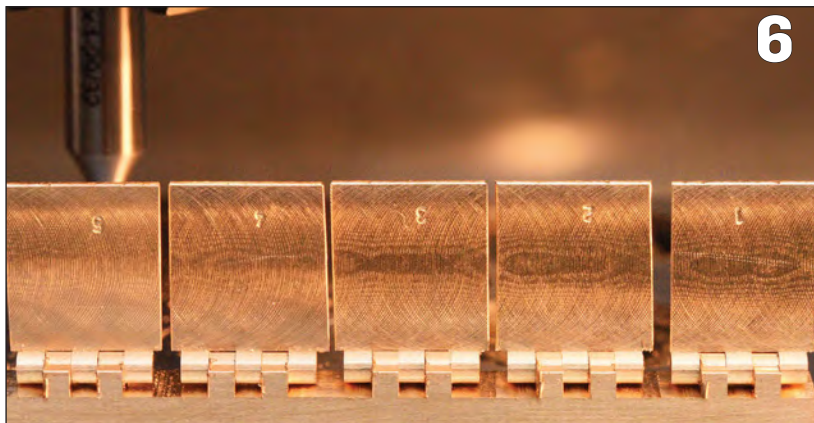
Carriers are essential to enable hinges to withstand milling forces.

PHOTO 5:

Moving leaves are milled – a DRO is a godsend for this task...



6

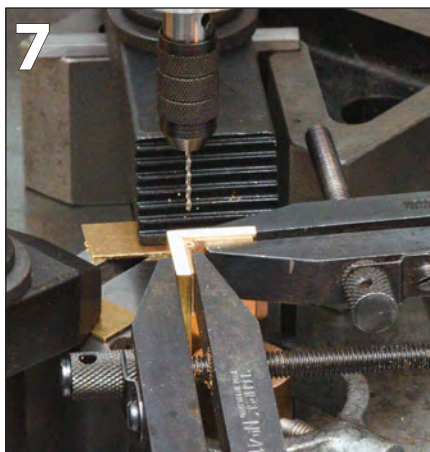


the angle to align the knuckles. Clamp. Drill 1mm, starting with a centre drill with a 1mm pilot (Photo 7). Then drill halfway through the knuckle using a 1.1mm drill.

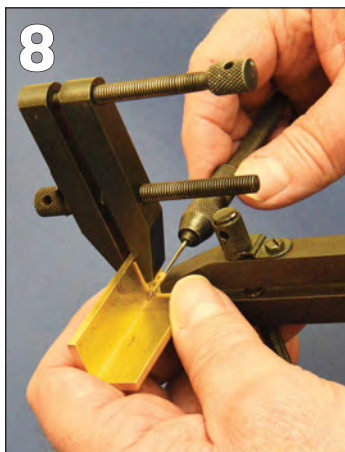
(leaving the clamps in place) and ream the hole by hand (Photo 8), holding the reamer in a pin chuck, so that the small end of the pin just comes through the fixed leaf.

17. Repeat steps 15 and 16 to produce

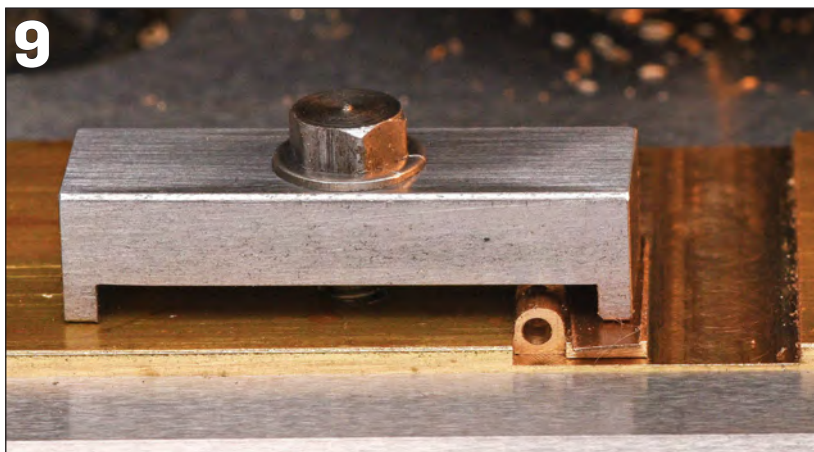
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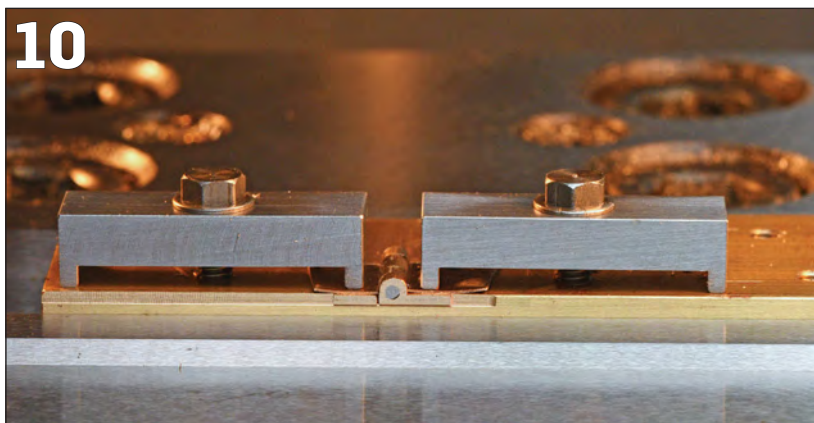


PHOTO 6:

Moving leaf provides a gauge for milling the fixed leaves.

PHOTO 7:

Drilling the hinges with a 1.1mm drill.

PHOTO 8:

Holes can be reamed by hand.

PHOTO 9-10:

Jigs are a very useful aid when milling hinges to size.

PHOTO 11:

Having made such useful items it is easy to create a useful copy stand to mount your camera on and show EIM readers how it's done....

the remaining hinges required.

18. Mill to size (top, bottom and edges). I used a jig or two to support the leaves/hinges for milling (Photos 9 and 10).

19. Drill holes in the leaves for 3/64 inch D rivets (another jig).

20. Disassemble the hinges.

21. Take a tiny bit off each 'moving leaf' with the taper pin reamer.

22. Finish the pins to length, holding them in a pin chuck to grind the ends.

23. Reassemble each hinge and press the pin in tight.

24. Hold the leaves at 90 degrees and file the required radius on the rear of the knuckle.

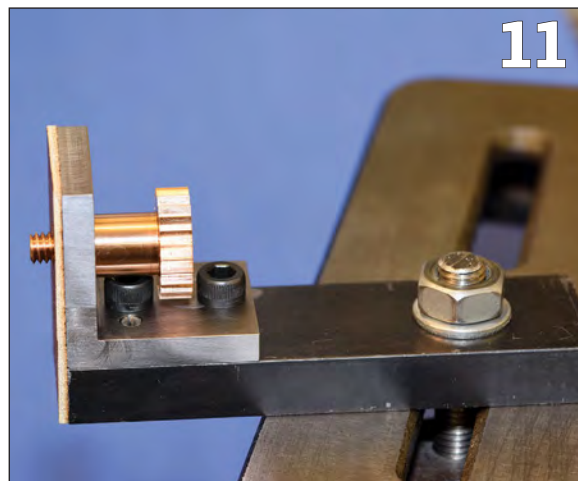
The finished hinges can be seen in the photo heading this feature. Photo 11, meanwhile, might be of interest to modellers who are also keen photographers. It's an attachment made to convert a drilling machine into a macro copy stand. It cost me just the price of a 1/4 inch x 20 UNC die (the universal tripod thread). I'm quietly confident that my Fobco Star copy stand is sturdier than any copy stand ever seen!

Smaller scale

What about hinges for a 3½ inch gauge loco? Well, taper pins don't come in a small enough size. I think we would need a simpler design, something similar to the lift-off butts shown in Figure 2. I would back myself to make two good ones from every three attempts. I would make the knuckles square to start with and either mill them into an octagonal section after the holes have been drilled, or file them into a cylindrical section by hand. A 1/32 inch radius corner rounding cutter could also be used. Loctite the pin into the lower leaf. To give a bit more leeway against inaccurate hole positioning, the pin could be made from the shank of a 0.65mm HSS drill.

Somehow, I don't fancy making one just now. I want something big to machine; re-boring a Land Rover cylinder block will do it for me. **EIM**

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Letters to the Editor

RIGHT:

Looking at this loco at the Alexandra Palace show, the editor heard a fellow visitor ask himself "Was there ever a Terrier called Barcelona?" No there wasn't, because as our correspondents point out, this is no Terrier!

Photo by John Arrowsmith.



Micro? Hardly...

No doubt you will be inundated with references to smaller live steam locomotives than the OO gauge Crampton shown on page 36 of the latest issue of *EIM* (March 2018).

The smallest that I have found is an article by A A Sherwood in *Model Railways* Volume 2 No. 11, November 1973, which shows photographs of two models, a Pennsylvania K5 and a Delaware & Hudson 4-8-0 built to 1:240 scale which is 6mm track gauge. He also built a Great Northern 2-8-2.

A number of OOO live steam models have been built to 9mm track gauge. I look forward to learning if anyone has built anything smaller.

Robert H Fielding

The HO scale (1:76) A4 and Crampton Live steamers you mention in the March *EIM* are positively gigantic compared to the work of Arthur Sherwood of Sydney, New South Wales.

Back in the 1970s Arthur specialised in very small live steam. He built a working live steam butane fuelled locomotive in 1:240 scale, (Z Gauge) based on a Delaware & Hudson 4-8-0. Arthur went even smaller with a 3mm gauge (half Z gauge) electric powered model of a Great Northern 0-6-2T at only 22mm long. It ran on a track around the edge of a dinner plate.

I remember a magazine article many years ago describing techniques he used including recycled medical hypodermic syringe needles for steam

pipings/cylinders and gas burners made from Robson cigarette lighters.

More details of Arthur's micro models can be found online at www.zen98812.zen.co.uk/aasherwood.html

Ian Kitson

The editor replies: As Robert suggests, we were inundated with replies suggesting that our 'smallest models' were in fact huge, and pointing us at the work of Arthur Sherwood. In fact when the editor made his first visit to the newly formed Cambrian Model Engineers, as soon as he sat down he was presented with photocopies from a 1957 copy of *Model Engineer* magazine, describing one of Arthur's creations in detail.

This particular model, built to 2mm scale, today known as N but in those days OOO, was a fascinating creation – it was spirit fired and used a boiler 1¾-inch long by ⅞-inch diameter and machined from solid, as was the cylinder block.

The loco employed large dummy side tanks to conceal a firebox of sufficient volume, with small driving wheels so as not to take up too much space, and outside cylinders – apparently squeezing two cylinders and their valve gear between frames only ⅜ inch apart was considered a step too far... Even so, the slip-eccentric gear produced valve travel of a whole 0.038 of an inch!

Sadly we haven't so far been able to secure any photos of these amazing models – can anyone out there assist?

That's no Terrier

The engine in picture 12 of the Alexandra Palace report in the March *EIM* is not a LBSC 'Terrier' A1X class, but a one-off special for the 'Cuckoo line' based on the Stroudley 'E' class 0-6-0T, but with a bigger boiler and cylinders.

Special E-Tank No. 157 'Barcelona' was the result, finished in September 1884 and withdrawn in June 1922 as a result of the boiler plates becoming so thin that pressure had been reduced from 150 to 120psi in February 1921.

More details can be found in the *RCTS Locomotives of the LB&SCR Part 2* by Don Bradley, published in June 1972 and a mine of information.

Mike Foreman

I was interested in the caption to the photo of the Stroudley Locomotive in *EIM* March 2018. 'Barcelona' was a unique engine built in 1884 for a specific line, that being the Eastbourne to Tunbridge Wells route, to handle increasingly heavy freight traffic on the steep gradients and sharp curves. At 41 tons 18 cwt. and designated 'E-special', she was amongst the heaviest of Stroudley's locos and was very successful. 'Terriers' by contrast were mere lightweights at 28 tons 10 cwt. 51 of them were built and 10 are still with us at various locations.

Full details of all Stroudley's locomotives can be found in *Stroudley's Locomotives, a pictorial History* by Brian Haresnape.

Michael Malleeson.

Opinions or information to share? A point to make? **Engineering in Miniature** welcomes letters on all model engineering subjects. Send your letters to the editor at the address on page 3.

New locos head for 15-inch lines

Not a lot of general news from the hobby reaching the editorial office this month, so we thought we'd show you a couple of newcomers at what could be considered top-end model engineering – 15-inch gauge!

Heywood locos have long been a passion for many and none more so than James Waterfield. After 10 years in construction, James's replica of the 1.25-tonne Heywood locomotive 'Effie' was completed on New Year's Day. Effie is a copy of Heywood's first 15-inch gauge locomotive of 1875 and its livery has been carefully researched to reflect the loco in 1881 on the Duffield Bank Railway in Derbyshire.

Effie will run on James's private garden line, where he already has the 1999-built 0-8-0 'Ursula', a reproduction of Sir Arthur Heywood's last engine of 1916 and rather heavier at 4.5 tons.

Meanwhile at the Ravenglass & Eskdale Railway they are getting used to a new whistle tone, courtesy of the 'Train from Spain'. Krupp Pacific 'Whillan Beck', restored for the Cumbrian line having been purchased by the R&ER Preservation Society in 2016, is to be christened at a ceremony at Ravenglass on 5th May.

The loco was built in the 1920s for an exhibition line in Seville, and afterwards was placed into store following very little running. A major appeal helped secure the engine and fund its rebuilding and modification for service on the Ravenglass line, including the building of a new tender.

The event on 5th May will feature a number of attractions including appearances by heritage locos from the line's newly extended museum, and a free evening photo shoot.



YOUNG ENGINEERS



From John Arrowsmith comes pictorial evidence of the latest goings-on at the **Hereford SME**, a club that has enjoyed great success in attracting younger entrants to model engineering.

John tells us that the club now has 11 young people actively working on projects that range from a steam-powered Collett locomotive in gauge 1 to a 7¼-inch battery electric 0-4-0 shunter.

In between the new recruits are being taught how to use the club's machine tools in the best way, by making basic tools such as a Tailstock Die holder and centre punches.

"I think you will be impressed with the quality they have produced bearing in mind they did not know one end of a lathe from the other when they came," John tells us. Judging by the photos they have a bright future in model engineering.

Meanwhile we were very taken with an article in the latest **Model Steam Road Vehicle Society** magazine, written by 11-year-old Daniel Faizey and describing his life as a steam apprentice. Having assisted with his father's 4-inch engine Daniel was registered with the Steam Apprentice Club, which has not only given him access for free to rallies but also allowed him to get involved with various aspects of steam engine management, owners permitting him to learn such skills as firing and maintenance on their engines.

Daniel reckons he is now competent at looking after and running engines, and takes time to thank all those that have shared their knowledge with him. Which of course is the key – well done to those who are helping to generate the next generation, simply by giving them the chance to get involved...



24 hours on the plate

Records and relays feature in this month's club news round-up...

Compiled by **ANDREW CHARMAN**



So as I sit down to compile my first monthly club news round-up after becoming editor of **EIM** and taking over this role from the retired John Arrowsmith, my overall impression is just how vibrant the model engineering scene is – I've been amazed at the sheer variety of club magazines and newsletters arriving at the editorial office in the last month – all enjoyable reads. Sadly I can only extract some highlights from them to fit in the space available.

Definitely the 'lead story' this month is the impressive achievement by members of the **Pietermaritzburg MES** in South Africa, who recently captured the Guinness World Record for the total distance travelled by a miniature coal-fired steam locomotive in 24 hours.

The challenge was set up and managed by Andries Keyser – he had designed and built the loco, 'Doreen' (named after his mother), which was used for the attempt. It is a superb recreation of a mainline locomotive used in the late 1800s on the line from Beira (Mozambique) to Umtali (then Southern Rhodesia – now Zimbabwe).

UK loses title

The clocks were started at 3pm on Saturday 9th December at the Society's track in Bisley, Pietermaritzburg. After running through the night the long-standing world record of 269km, set in the UK in 1994, was beaten at 10.55am the next morning.

The challenge was then on to set a new record – by 3pm on Sunday a total

of 330km had been recorded, which was translated from a total of 881 laps and 294 metres.

Driving the locomotive was, according to the Pietermaritzburg newsletter, arguably the best team of ten drivers that could be assembled in South Africa. They showed incredible skill, patience and deep understanding of what was required of them. "A very large degree of fearlessness was displayed," the Society told us.

An excellent effort all round, and the record goes from the UK to South Africa – who will be next to take up the challenge?

Many clubs will be opening their seasons on improved tracks, a lot of hard maintenance work having gone on over the winter no matter what the weather. The latest edition of *The Blower*, newsletter of the **Grimsby & Cleethorpes MES**, pictures members Greg Marsden and Tom Burton digging out a grass bank in rain and sleet, which they described as "hardcore model engineering" (!) to provide more room around the steering bays at their track.

The Society has also undertaken much winter track relaying, and like others has been replacing wooden sleepers with more durable recycled plastic versions. Now in my other editorial role, at the helm of *Narrow Gauge World* magazine, I recently spent a very wet January day observing track relaying in the Moelwyn Tunnel of the Ffestiniog Railway (and yes it was still wet inside the tunnel!). The FR is also replacing wooden sleepers,

laid when the tunnel was built in the late 1970s, with recycled plastic alternatives. So is miniature following prototype, or the other way round?

The **Bradford MES** has been another club busy over the winter with a complete rebuild of its raised track and admits that work at the Northcliffe site has slipped slightly behind, due mainly to members suffering with the flu. However the last few sleepers were screwed down on 7th January and only the inclement weather prevented a start being made on attaching the rails.

The editor of the Society journal, Graham Astbury, paints a chilly picture from the group's marine section at Wibsey Park, stating that "on some Sunday mornings the members huddle together in the clubhouse, drinking coffee and eating bacon butties instead of braving the

ABOVE:

The team of drivers, along with water loader Ryan Gillett that took the Guinness record for a 24-hour steaming to South Africa.

BELOW:

Inclement winter weather is not preventing Grimsby & Cleethorpes members making major upgrades at their track.





elements and sailing their boats..."
Nothing wrong with a bacon butty...

As I write these words another cold spell is hitting mid Wales with the odd snow flurry, but the bursting of the club diary over the page reminds

BELOW:

One of the earliest rallies of the year on the Isle of Wight.

Isle of Wight Model Engineering Society

Rally!



The Society will be holding its Annual Rally at Broadfields on Sunday 29th April. The site will be open from 10:00

Both the raised level track (3 1/2" and 5" gauge) and the ground level track (5" & 7 1/4" gauge) will be available for use.

A light buffet will be provided.

NOTE: Food will be provided to ticket holders only. Please advise how many 'food tickets' you require. Your tickets will be given to you on arrival.

You can contact me via email, on scottroberts_1@hotmail.com or by telephone 01983 525920

The event is NOT open to members of the public, ie we will not be 'public running'.

me that winter really is on the wane even if the temperatures don't suggest it! And one of the earliest annual rallies of the year has to be that planned by the **Isle of Wight MES**. From 10am on Sunday 29th April, both the raised-level track of 3½ and 5-inch gauge and the ground-level 5 and 7¼-inch gauge at the Society's Broadfields site will be available for use. The event is not a public open day, and is only open to those holding pre-booked tickets, to whom a light buffet will be served. More details are available from the club secretary by phone at 01983 525920 or at scottroberts_1@hotmail.com.

Narrow minded

Later in the year the **Rugby MES** will be pandering to the editor's personal passion on 28th-29th July with a themed event open to all models of locomotives where the prototype was built to a gauge of less than 4ft 8½ inches – in other words narrow gauge!

The 2½, 3½, 5 and 7¼ inch tracks at the Society's Onley Lane site will all be available – the track team have been working hard over the winter to complete the laying of the extension to the 7¼ inch gauge ground level track, putting in the new station facilities and finishing off fitting the motorised points that will allow drivers to select the routes they wish to take.

Alongside the running locos at the gathering there will be an exhibition of other scales and part-constructed locomotives. Anyone that wishes to be a part of the event or who requires further details can contact the club at NGEvent@outlook.com

If you are reading this issue just after publication you will be just in time to catch what sounds like a fascinating event being organised by the **GL5 5-inch gauge Main Line Association**. Between 22nd and 25th

March the group will be setting up shop at the National Railway Museum's 'outstation' at Shildon, Locomotion. Track with shunting yards and signalling will be laid between the rows of full-size railway exhibits in the main hall of the museum and for the three days 5-inch gauge steam and diesel train movements will take place, all running in a realistic and true to scale manner will provide constant activity.

A static display of GL5 members' work will also be staged in the Hackworth Room and the group promises a warm welcome to visitors and an opportunity to chat to like-minded enthusiasts – more details are on the website at www.gl5.org.

75 years young

Saturday 19th May 2018 will be looked forward to by some as the wedding day of Prince Harry to Meghan Markle and by some others as FA Cup Final day. But for members of the **Cardiff Model Engineering Society** the 19th will herald a very special event at its Heath Park track site in the Welsh capital, celebrating the Society's 70th Anniversary.

Back in May 1948 the dozen or so founding members of the Society met first in a church hall and later that year in a rented stable with a loft in Groveland Road, Cardiff. Their first formal meeting took place in August 1948 and the model engineering press were duly informed of the existence of the new organisation.

The Society has since grown and prospered, and 70 years later occupies its own buildings in Heath Park, while boasting a membership now exceeding 200. While the anniversary celebration will be a private event for members and families, a few weeks later all visitors will be welcome to the annual two-day Welsh Rally at Heath Park on 9th and 10th June.

My first editorial last month emphasised my desire to encourage people to build things, and so I'm delighted to read about an initiative at the **Bournemouth & District SME**. At least 18 members have signed up for a project to build a simple steam tram loco for 32mm or 45mm gauge. Dubbed 'Ellie', the project is said to be very suitable for those who haven't tried constructing their own steam locomotive before. We will follow the success of these builds with interest – how about some pictures for these pages folks?

I mentioned earlier how impressed I was by the various club journals sent to the editorial office, and I'm pleased to hear that the efforts that go into producing them are to be recognised, in memory of model engineer Alan Bibby who passed away late last year.

Alan was a long-standing member of the **Leyland Society of Model Engineers** and designed many excellent models – particularly of the Liverpool & Manchester Railway's locomotive 'Lion', Alan organising the annual 'Lions Meet' for the **Old Locomotive Committee**. He also designed workshop equipment – an example of his work is illustrated on these pages – and was an officer for the Northern Association of Model Engineers (NAME) as well as Newsletter editor for the website (www.nameng.org.uk).

Editors recognised

In his will, Alan left a sum of money 'to provide a suitably engraved trophy to be known as The Editor's Cup with a cash prize, to be awarded annually to the editor of the best model engineering club newsletter as determined by the officers of NAME.

It has since been decided that the award will take the form of an annual cash prize of £50, which will be presented together with a suitable trophy to the winning newsletter's editor, rather than to their club.

The award starts this year and editors who wish to compete for it should send a copy of their newsletter to the NAME Chairman, Frank Cooper, either by email to yorkhouse.flyer@btinternet.com or by snail-mail to 47 Holmes Road, Stickney, Boston PE22 8AZ.

Entries for the 2018 award will close on 30th November and the winning newsletter will be announced in our Club News section towards the end of the year.

Meanwhile Frank Cooper tells us that all clubs should be aware of revisions to the Boiler Test codes, which from March this year will be in three volumes – Volume 1 for 3 bar. litre up to 1100, Volume 2 for under 3 Bar.litre and Volume 3 for testing LPG tanks of up to 250ml capacity. Club inspectors and boiler officers of the various organisations should soon have copies.

Frank adds that work is continuing on a replacement for HSG 216, the guidance on the safe operation of passenger-carrying miniature railways, issued by the Health & Safety Executive in 2001 but for which the HSE withdrew its support four years ago. More details are on the website of the **Passenger Carrying Miniature Railway Safety Group**, www.pcmrsg.org, and Frank says that all passenger-carrying railways should take a look.

Frank is also chairman of the **7qtr Society** and tells us that it will be holding its AGM and Gathering at Perth on 15th September with activities stretching over five days. More details can be found on the

FACING PAGE, TOP:

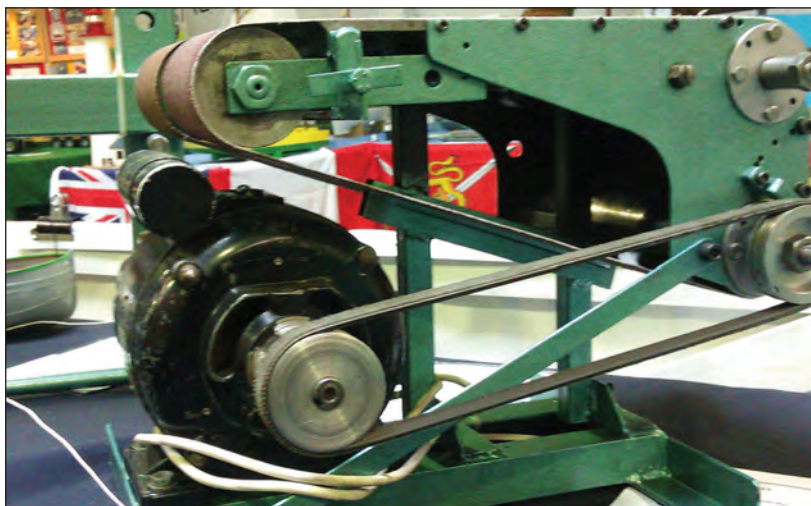
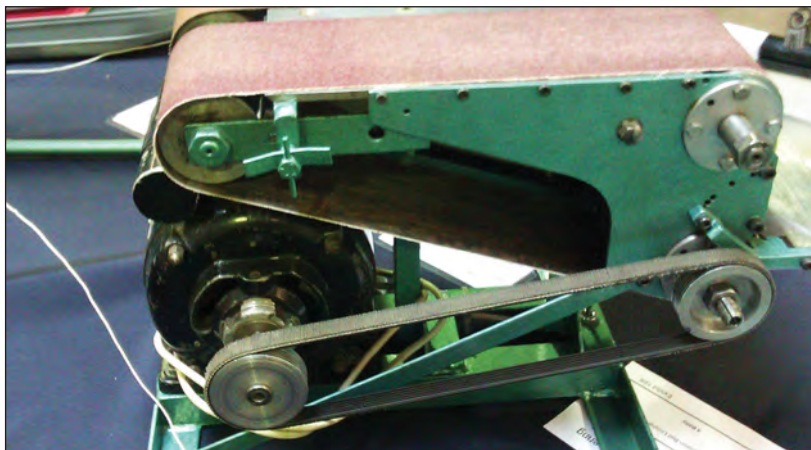
The Editor recently joined a track relay on the Ffestiniog Railway, using recycled plastic sleepers – just as at several model engineering venues this winter...

RIGHT:

Leyland Society member Alan Bibby was renowned for the workshop equipment that he designed. Now he has left a legacy to celebrate the excellent work done by club magazine editors..

LOWER

RIGHT: John Arrowsmith has sent in a couple of pictures of the latest excellence coming out of the **Hereford MES** workshops, a vertical boiler intended for a 7¼-inch Shay 0-4-0-0-4-0. We certainly want to hear more about this John....

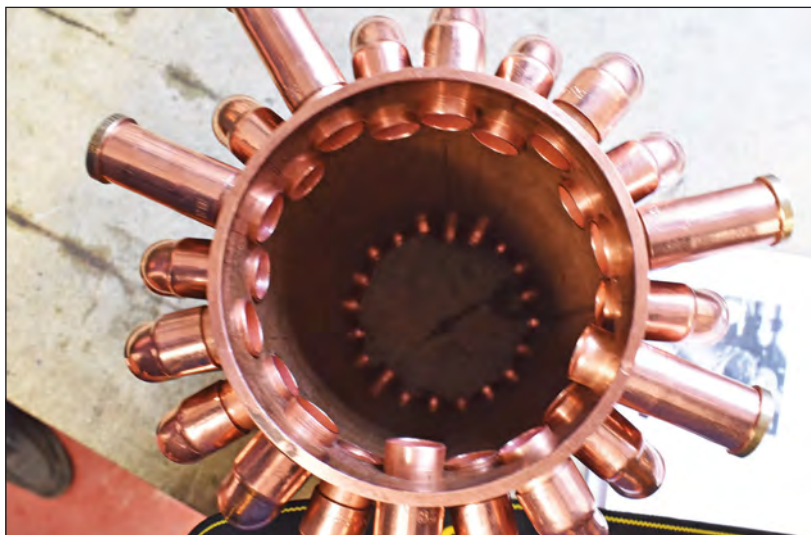


website at www.sevenandaquarter.org/

In last month's issue we described the launch of the Government-backed Year of Engineering initiative at the London Model Engineering Show, and we are pleased to see in the latest edition of the **Leeds SMES** newsletter that chairman Jack Salter is asking for volunteers to assist at a Department of Education organised event in June at Doncaster Racecourse aiming to enthuse young people into engineering. One of a series of events across the country, it could well produce more future model engineers, and that can't be a bad thing... **EIM**



Photographing your club's event for the newsletter? Why not send in a couple for the Club News pages in **Engineering in Miniature**? The editorial address is on page 3...



APRIL 2018 DIARY

EVERY SATURDAY

(Weather permitting)

South Lakeland MES Public running, Lightburn Park, pm.

Sussex MLS, public running, Beech Hurst, Haywards Heath, 2-5pm

EVERY SUNDAY

(Weather permitting)

Bournemouth SME Public running in Littledown Park 11am – 3.30pm.

Canterbury SME (NZ) Public running from 1pm at Halswell Domain

Fylde SME Public running at Thornton Cleveleys from 1pm.

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

Kings Lynn & District SME, Lynnsport Miniature Railway, 11am-4pm

Kinver MES Public running at Kinver 2pm – 4pm.

Lancaster & Morecombe MES Public running at Cinderbarrow. 10.30am – 3.30pm

Maidstone MES Public running at Mote Park, Maidstone from 1pm.

(From 15) Portsmouth MES Public running, Bransbury Park, 2pm-5pm

Rochdale SME Public running in Springfield Park from 12 noon.

Ryedale SME public running, Village Hall, Pottergate, north Yorks

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

Southport MES Public running at Victoria Park 11.30am – 4.30pm

Sussex MLS, public running, Beech Hurst, Haywards Heath, 2-5pm

Urmston MES Public running in Abbotsfield Pk 10am – 4pm

Vale of Aylesbury MES Public running, Quainton Rly Cntr, 12 noon.

West Huntspill MES public running, Memorial playing fields, 2-4.30pm

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

1 City of Oxford SME, public running, Cutterslow Pk, 1.30pm-5pm

1 Frimley Lodge MR Public running 11am–4pm, Sturt Rd GU16 6HT.

1 Pietermaritzburg MES (SA), Public running, Pietermaritzburg 3201

1 Sutton Coldfield MES Steam Up at Little Hay from 10am.

1 Taunton SME public rides, Vivary Pk, 2pm-5pm.

1 Tyneside SMEE Public Running, Exhibition Park, Newcastle upon Tyne, 11am-3pm

1 Worthing SME public running, Field Place, 2-5pm

1– Cardiff MES Open Day, Heath Park, 1pm-5pm

1– Bristol SME public running, Ashton Court, noon-5pm.

2 Bracknell Railway Society Public Running, Jocks Lane, RG12 2BH, 2pm-4.30pm.

2 Brighton & Hove SME Public running at Hove Park 2pm – 5pm.

2 City of Oxford SME, public running, Cutterslow Pk, 1.30pm-5pm

2 Grimsby & Cleethorpes MES public rides, Waltham Windmill, DN37 0JZ, 10am-4pm

2 Lancaster & Morecombe MES Public running Cinderbarrow. 10.30am – 3.30pm

2 Maidstone MES Public running at Mote Park, Maidstone from 1pm.

2 Sussex MLS, public running, Beech Hurst, Haywards Heath, 2-5pm

2 Sutton Coldfield MES Steam Up at Little Hay from 10am.

3 Peterborough SME AGM, All Saints Church Hall from 7pm.

3 Taunton SME AGM, St Mary Village Hall, 7.30pm.

4 Bradford MES Spring Auction (members only bids) Saltaire Methodist Church, 7.30pm.

4 Bristol SME talk 'SS Great Britain, Terry Chivers,' Begbrook social club 7.30pm.

4 Chesterfield MES Afternoon Running Day at Hady

4 Leeds SMEE trophy night, Eggborough, 7.30-9.45pm

5 Halesworth DMES meeting, professional model making by Terry Fleet,, Reydon, North Suffolk, 7.30pm

5 Sutton MEC meet, bits & pieces, 7.30pm..

5 Westland & Yeovil DMES AGM, Preston Rd Methodist Church, 7.30pm.

5 Wirral MES Club Night, WI Hall Thornton Hough, 7.20pm.

6 Portsmouth MES club night, Eastney Community Centre, 7.30pm

6 Rochdale SME meeting, 3D printing & laser cutting, Castleton Comm Centre 7pm.

7 Isle of Wight MES Open Afternoon, Broadfields 2pm-4pm.

7 7 SMEE silver brazing talk, Marshall House, London SE24, 2.30pm. Pre-book only at chairman@sm-ee.co.uk

7 Tiverton MES Monthly Steam Up at Worthy Moor from 11am.

7– GL5 Association event, Brent House (www.gl5.org)

8 Bracknell RS Public Running, Jocks Lane, RG12 2BH, 2-4.30pm

8 Halesworth DMES Steam Up from 10.30am, Reydon, North Suffolk

8 Leeds Public Running, Eggborough, 10am-4.30pm

8 Sutton MEC Track Day, from noon.

8 Westland & Yeovil DMES Track running day, Westland Leisure Centre 11am – 4.30pm.

8 Worthing SME public running, Field Place, 2-5pm

11 St Albans DMES AGM and Auction, Christchurch Centre, AL3 4QT 7.30pm.

12 Cardiff MES My 49 Year Railway Career, Dennis Flood, Heath Pk, email secretary@cardiffmes.com

12 Sutton MEC AGM, 7.30pm.

12 Worthing SME meeting, Nutrition by Kath Callaghan, Field Pce, 7.30pm

14 Old Locomotive Committee AGM, Museum of Liverpool, 1pm

15 Bristol SME public running, Ashton Court, noon-5pm.

15 Cardiff MES Steam Up and Family Day, Heath Park, 1pm-5pm

15 City of Oxford SME, public running, Cutterslow Pk, 1.30pm-5pm

15 Guildford MES Public running, Stoke Park 2-5pm

15 Pinewood (Wokingham) MR Public running at Pinewood Leisure Centre 1.30pm – 4pm.

15 St Albans DMES steaming day, Puffing Field from 10.30am.

15 Surrey SME Public running at Mill Lane, Leatherhead 11am – 4pm.

15 Taunton SME public rides, Vivary Pk, 2pm-5pm.

16 Cambrian ME meeting, 10.30am-1pm (ish) for more details contact Robin King, 01686 414939

16 Pietermaritzburg MES (SA), Meeting, Pietermaritzburg 3201

17 Chesterfield MES club night, Hady.

17 Grimsby & Cleethorpes MES monthly meeting, Waltham Windmill., 7.30pm

17 Model Steam Road Vehicle Society meeting, 'The Titanic' by Paul Burnett, Longford Village Hall, Gloucester, 8pm

17 Taunton SME meeting, Rail Accident Investigation, Richard Brown, St Mary Village Hall, 7.30pm.

18 Bristol SME meeting, on the table night, Begbrook social club 7.30pm.

19 Halesworth DMES Grand Auction night,, Reydon, North Suffolk, 7.30pm

19 Sutton MEC club night, 7.30pm.

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

- 19** Wirral MES Club Night, Merseyrail extension by John Ryan, WI Hall Thornton Hough, 7.20pm.
- 20** GL5 Association Rally, Cinderbarrow
- 21** Yealand Redmayne, Lancs
- 20** Rochdale SME meeting, Castleton Comm Centre 7pm.
- 21** Brighton & Hove SME Public running at Hove Park 2pm – 5pm.
- 21** Chesterfield MES Running Day, Hady
- 22** Halesworth DMES Steam Up frm 10.30am, Reydon, North Suffolk
- 22** Chesterfield MES Public Running Day at Hady, 11am-4pm
- 22** Tiverton MES Steam Up, Worthy Moor from 11am.
- 22** Worthing SME public running, Field Place, 2-5pm
- 24** Sutton Coldfield MES meeting at Little Hay from 10am.
- 25** Westland & Yeovil DMES running day, Westland Lsre Centre 1pm-late.
- 26** Cardiff MES, South Africa At War 1939-1945, Paul Clarke, Heath Pk, email secretary@cardiffmes.com
- 26** Sutton MEC Afternoon run from noon, talk on UK prep for cold war attack, Harry Paviour.
- 26** Worthing SME Bits & Pieces, Field Place, 7.30pm
- 28** Tiverton MES Maintenance & improvement day, Worthy Moor.
- 29** Bristol SME public running, Ashton Court, noon-5pm.
- 29** Cardiff MES Open Day, Heath Park, 1pm-5pm
- 29** City of Oxford SME, public running, Cutterslow Pk, 1.30pm-5pm
- 29** Isle of Wight MES Annual Rally, Broadfields, 10am (not open to public)
- 30** Cambrian ME meeting, 10.30am-1pm (ish) for more details contact Robin King, 01686 414939

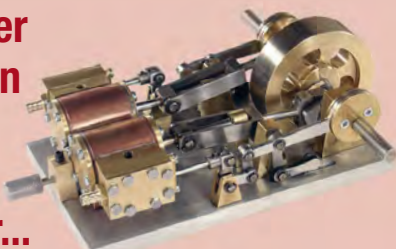
Please send all club news, diary dates etc to
andrew.charman@warnersgroup.co.uk
 Tel: 01938 810592
 12 Maes Gwyn, Llanfair Caereinion, Powys, SY21 0BD

Coming next month in

THE MAGAZINE FOR MODEL ENGINEERS

ENGINEERING in Miniature

- Jan-Eric's small engine project
 - We build Dougal's boiler
 - We go inside another workshop
 - Another clever tool conversion
- ...and much more for the model engineer...



May issue on sale 19th April

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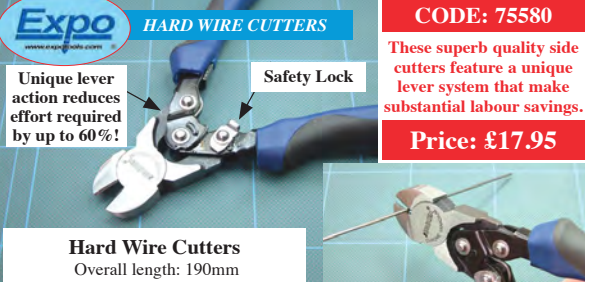
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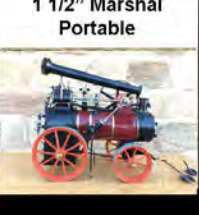
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