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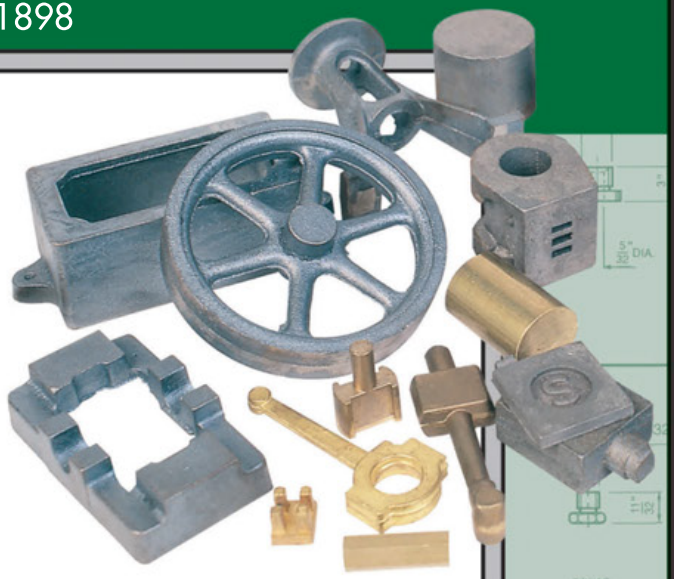

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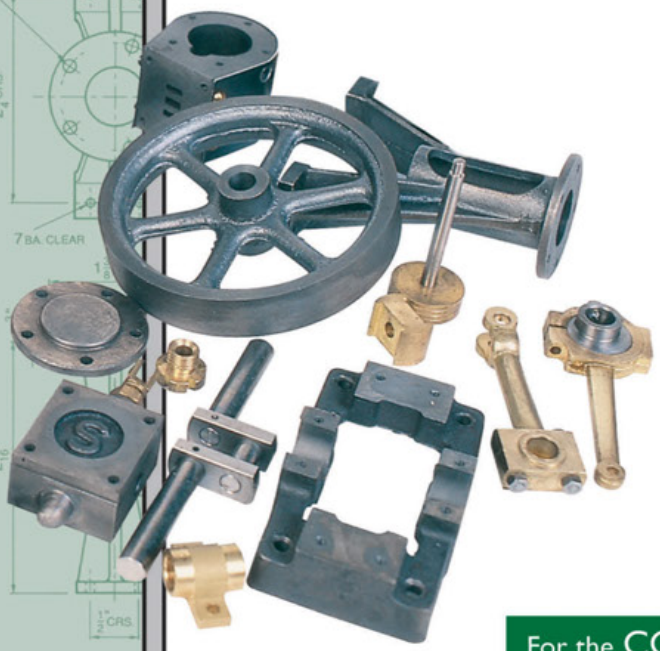

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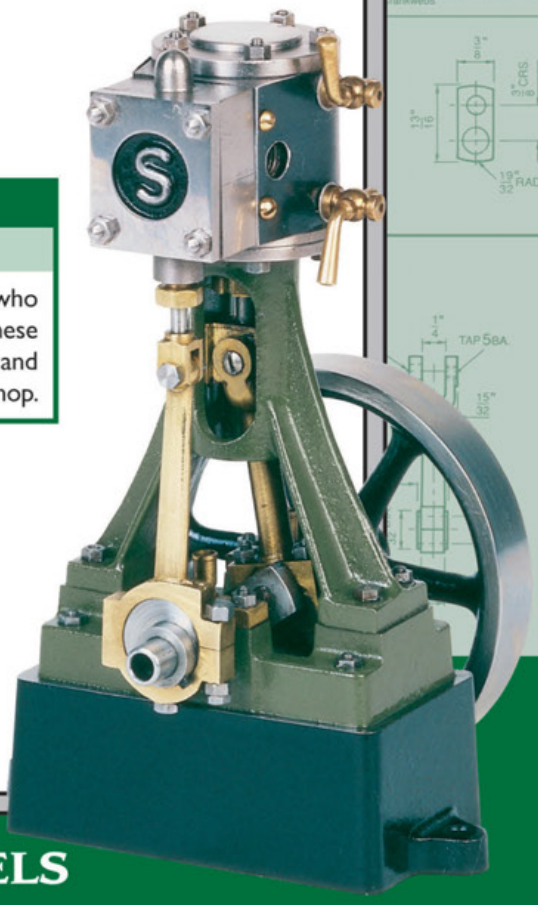

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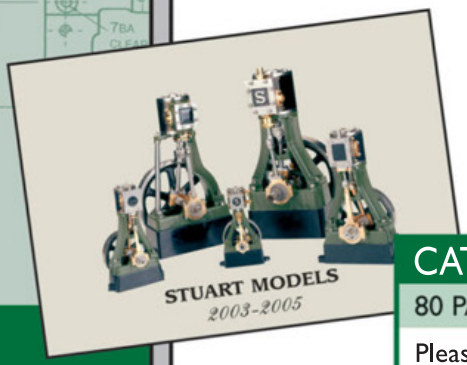

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SEPTEMBER 2021 Volume 43 Number 3

THE MAGAZINE FOR MODEL ENGINEERS
ENGINEERING in Miniature

FRONT COVER

Steam and smoke everywhere as Pete Lawson fires up his 7 ¼-gauge A1 class 'Great Northern' at Hereford SME's Summer Steam-Up early in July. *John Arrowsmith* took the photo and provides a full report on the event in this issue.

EDITORIAL

Happy with rally returns, but no-show frustration

Welcome to the September EIM and the superb front-cover photo by John Arrowsmith says it all – track gatherings are back post-lockdown and we are delighted to see them.

As I've said more than once before on this page, my basic philosophy for EIM is that it should be a magazine about making things, instructing the newcomer and interesting the experienced model engineer. But EIM is also about the wider model engineering scene, and having woken our roving correspondent Mt Arrowsmith from his enforced hibernation, I make no apologies at all for just this time including two event reports in this issue. They are our first for some 17 months, and it's great to see model engineers out enjoying themselves again.

All of which makes it doubly disappointing to also have to report in this issue that one event we won't be going to in the next few months is a major show. For a second year running the Midlands Model Engineering Exhibition, which had been scheduled for mid October, has been cancelled, and sadly so has its sister event at London in January.

This is of course extremely frustrating but you have to sympathise with show organisers. While we all enjoy such events, to continue they have to make money, and that relies on the organisers selling stand space to trade suppliers, and then attracting enough visitors to make the attendance of those suppliers worth their while.

As I write it's just two and a half months to when the Midlands event was due to take place and while just about all the Covid restrictions have been lifted in England (not yet in Wales, where EIM Towers is located), things are still very uncertain. Cases have seen some rises again with some predicting more difficult times come the Autumn.

If you are a supplier it's a huge risk to commit yourself to an event which will cost you to attend, with none of the usual certainty that you will make back your outlay in sales. And as a show organiser, with traders holding off committing and a real risk that new restrictions could cut your visitor numbers or even force you to cancel the show at short notice – it's no surprise the decision you have to take. Again, we have to be patient – perhaps Doncaster in May will be our return to show normality?

Andrew Charman – Editor

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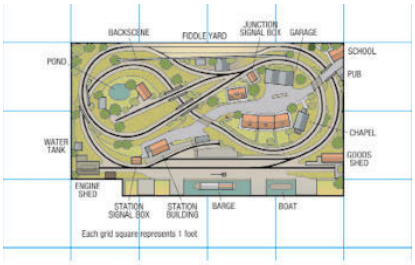

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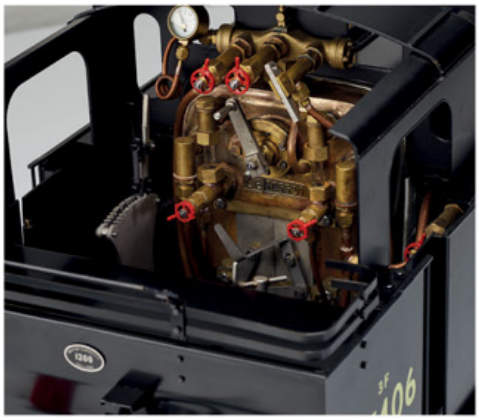
Mike Pavie



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At last a Steam-up...

After well over a season of dormant tracks, the Hereford SME's Summer Steam-up could not come quickly enough. John awoke from his slumbers to bring us a report.

BY **JOHN ARROWSMITH**

Following many months of inactivity regarding operations on model engineering track sites, the Hereford SME decided to go ahead with its annual Summer Steam-up over the weekend of 2nd-4th July.

Club members had provided all the social-distancing measures needed, such as cleaning materials to clean carriages after each passenger train had completed its journey and before the next one was populated. This worked well and the passengers were happy to wait for the little extra time it took to carry out the procedure.

Face masks were worn by passengers who were not in the same family group but on the same train, and this also worked very well. There was plenty of room at the club house both at the inside tables and outside areas for visitors to enjoy the food and drinks available.

The weather over the weekend was mixed with warm sunshine on Friday and sunshine and just a few showers on Saturday. Sunday was the worst day with longer showers with sunshine in between, but at closing down the rain again ensured that everyone got nicely wet whilst packing up to go home.

A good turnout of locomotives was enhanced by some excellent displays of model boats on the pool whilst the Hereford Preservation Society provided a display of engines and equipment used in earlier years. A small display, of what are now vintage cars and tractors, was added to by the inclusion of some high-powered models which provided a nice contrast to everything else. And another small display of models and workshop equipment enhanced the overall attractions of the weekend.

Large 7¼-inch gauge locomotives in steam are a sight to see and there was a good selection on show and working over the weekend. One in particular provided a great deal of interest and that was the model of 'Agenoria' one of the first locomotives to operate in England. The original was built by the Foster Rastric & Co at Stourbridge in 1829 and operated on the Kingswinford Railway.

The model was built by Chris Wilson from the Vale of Aylesbury club, this engine (**Photo 1**) showing all the details of the complicated motion of these original pioneer locomotives and performing very well over the weekend. His support vehicle for the engine was a nice example of a GWR Siphon H van and I know the two models were about a century apart in building dates but it looked good with this locomotive.

Friday saw some quality engines in action and Graham White from the Cheltenham club was soon putting his 7¼-inch gauge GWR 14XX tank through its paces (**Photo 2**). Callum Powrie from the host club steamed his good-looking 7¼-gauge four-cylinder Coronation Pacific (**Photo 3**) on Friday as well, and in the sunshine it looked a splendid piece of machinery.

Tom Hughes, one of the Cardiff Society's younger members Tom Hughes, was driving a pristine 7¼-gauge Warship class diesel locomotive (**Photo 4**) as well as Paul Pavier's LNER 2-6-2 'The Kings Own Yorkshire Light Infantry' which Tom handled with assured confidence (**Photo 5**). Another Cheltenham member, John Munday had his GWR Dock Tank working very well for most of the day (**Photo 6**).

Saturday action

After some overnight showers Saturday dawned a bit overcast but the

PHOTO 1: 'Agenoria' with builder Chris Wilson driving leaves platform 2 at Broomy Hill

PHOTO 2: Cheltenham club member Graham White takes the avoiding line with his 14XX locomotive.

PHOTO 3: A fine-looking four-cylinder Duchess with Callum Powrie driving waits for the signal on Platform 1.

PHOTO 4: Brand new Warship diesel 'Greyhound' waits for its turn on the track.

PHOTO 5: Tom Hughes from the Cardiff Society brings Paul Pavour's 2-6-2 into Platform 2.

PHOTO 6: The Big Boys arrive with this rebuilt steam lorry.

All photos by the author

sun soon appeared and brightened everything up so that when the large steam engines got into their stride combined with the boats on the lake the whole site was a bustle of activity, especially when a full-size steam lorry arrived to add yet another attraction for visitors (Photo 7).

What was very good to see was the number of younger people involved with the operations both on and off the track. Hereford is very fortunate to have an active Young Engineers section so their input along with a number of visiting youngsters gave everyone a chance to sample both driving and watching the operations. The previous Saturday when the club held its first training day, seven of the older youngsters turned out along with some new recruits (Photo 8) and during the rally they were able to carry out some of the tasks necessary ▶

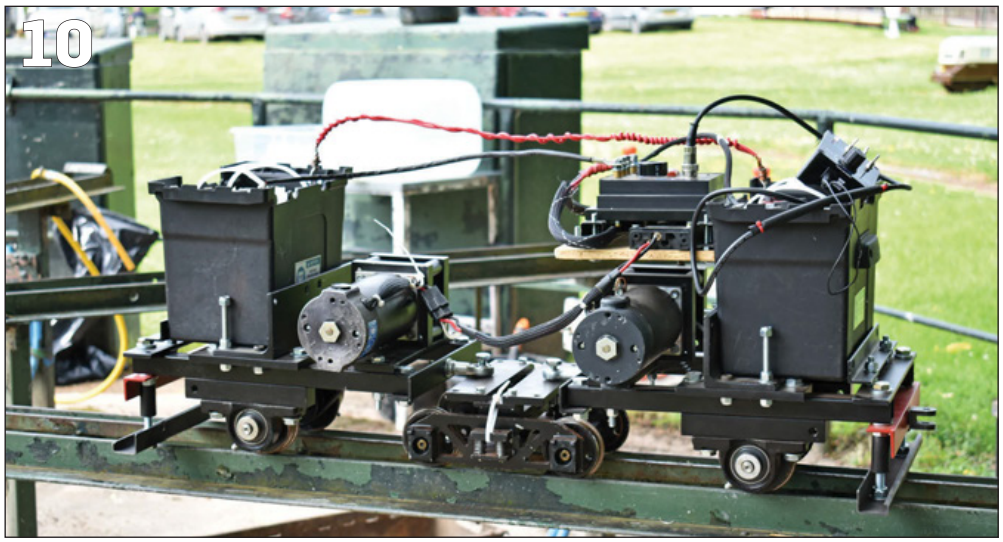


PHOTO 7: Dave Munday from the Cheltenham club approaches Platform 1 with his GWR Dock shunter.

PHOTO 8: Hereford's Young Engineers at the clubs recent training day.

PHOTO 9: With a pause in operations the two young signalmen have a chat in the box.

PHOTO 10: David Scott's unusual battery engine on the elevated track bay.

for the event to be successful.

Operating the signal box was the domain for 18-year old Ewan Wilcocks (**Photo 9**) to show his talent in controlling a busy running track which he did without any problems. Among others 17-year old Dan Bell was able to take fare paying passengers for the first time and again did so with no issues.

On the elevated track an unusual battery-powered engine was attracting attention as it was an experimental design built by David Scott from the Reading Society. Basically it was adapted from a disabled buggy and used parts from Hunslet, Jessie and Bulldog locomotives. Two batteries are fixed to the chassis which has fixed wheels at each end and a bogie in the middle. Despite its appearance (**Photo 10**) it performed very well on track.

Hereford member Fred Jenkins looks after the elevated track and regularly runs his small battery-powered loco, but Fred is very generous and will always offer a drive to any serious potential member. This event was no exception and I think the look on Paul Pugh's face says it all (**Photo 11**). He has now joined along with his two sons so the Hereford club has gained a good senior member and two new young engineers, not a bad day's work I think.

The elevated track also saw a new young engineer at work for the first time. Tommy Morris has just joined the club with his dad and he proceeded to steam his recently acquired Ajax loco on the elevated track for three hours on Saturday without once losing steam or his fire (**Photo 12**). For a 12-year old I think that is very commendable and shows a lot of potential for the future.

Among the traction engines, Andy Gough was going very well with his 3-inch scale Burrell and warming his pasty lunch on the smokebox at the same time (**Photo 13**) while John James and his 4-inch scale Fowler compound were taking things a little easier (**Photo 14**). The youngsters however were enjoying themselves with driving the electric 'steam' lorry which the club has use of again helping promote their interest and involvement with the weekend.

Mighty marine

On the pond, contributions from the Gloucester Model Boat Club, the Cwmbran Modelling Society, the Vale of Glamorgan Model Boat Club and the Hereford club's boat section made for a varied and very interesting display of marine craft. The 1:12th scale lifeboat built by Trevor Palmer from the Gloucester MBC was a fine sight as it patrolled round the lake (**Photo 15**)

A very nice example of a traditional steam trawler by Mick from the Vale of Glamorgan MBC showed some good workmanship – it was fitted with a smoke generator and card which made for a very realistic appearance (**Photo 16**).

Cardiff Society member Josh Green, aged 15, was sailing a good example of the popular Clyde Puffer (**Photo 17**), while Bob Griffin from the Gloucester BC displayed his destroyer, HMS Bristol which is still under construction and a fine job he is making. The original saw service in the Falklands (**Photo 18**).

Up on the garden railway layout Richard Donovan was operating his coal-fired example of a Western Australian 3ft 6-inch gauge Beyer Peacock 2-6-0 circa 1892 (**Photo 19**). To accompany this loco Richard had a 1898 Gloucester Carriage & Wagon Co carriage (**Photo 20**) on display. The original worked up to the 1960s when it became a camping coach. It has a unique double roof, the top six inches ▶

PHOTO 11: Paul Pugh tries his hand at driving Fred Jenkins's little 0-6-0 shunter.

PHOTO 12: Tommy Morris, aged 12, gets his new 5-inch gauge 'Ajax' underway for his first ever trip on the elevated track.

PHOTO 13: Andy Gough with one of his models, a 3-inch scale Burrell.

PHOTO 14: A pensive John James takes a break on his 4-inch scale Fowler.

PHOTO 15: Trevor Palmer's 1/12th scale lifeboat looks good on the water.

PHOTO 16: Steam trawler St Nectan was a project built during lockdown.

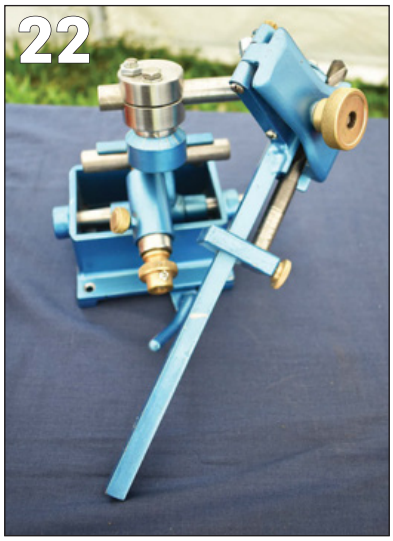
PHOTO 17: This delightful little Clyde Puffer was being controlled by 15-year old Josh Green.

PHOTO 18: Destroyer HMS Bristol. under construction by Bob Griffin. a Gloucester MBC member.

PHOTO 19: Richard Donovan's fine example of a Beyer Peacock 3ft-6in gauge 2-6-0.

PHOTO 20: The 1898 Western Australian carriage built by Richard Donovan for running on 45mm track.

PHOTO 21: The imposing A1 class Pacific 'Great Northern' and train produces just a whisp of steam, as it waits on the bypass line.



above the inner roof and overlapping the sides by around six inches each side to insulate the inside from the outside heat.

Hereford young engineer Harry Wills was operating the whole layout with his little Bagnall 0-4-0 while the layout also featured a Roundhouse model built by Steve Nicholas.

That just about sums up this three-day event, which produced plenty of track operation, lots of different boats on the water, and a good range of ancillary activities to entertain visitors and members.

The Hereford SME would like to thank all the visitors and the efforts they made to ensure this was an enjoyable weekend – they all worked very hard and showed that the model engineering world is very much still alive and kicking. Thanks also to the Hereford ladies who kept everyone fed and watered during the whole time from breakfast to evening dinners. It was all very much appreciated by the visitors and members alike. EIM

PHOTO 22: Chairman of Hereford SME, Wally Sykes, has built this drill-sharpening jig to cover a wide range of sizes.

PHOTO 23: Master boat builder Phil Brown has built his first loco, a 3½-inch gauge Atlantic 'Maisie'.

PHOTO 24: Nick Williams swings over the bridge with his 1937-built Bassett Lowke 7¼-inch gauge 4-4-0.

PHOTO 25: Noise, what noise? The twin safety valves on Len Steele's 9F relieve the pressure.

PHOTO 26: Most people were just glad to be driving on the track again – Len Steele has the 9F going well as he heads round the Jubilee curve with a good rake of carriages.

The curse of clinker

The editor describes a chemical reaction that full-size firemen fear and which can prove to be a nuiscance in our little boilers too...

BY **ANDREW CHARMAN**

The fireman of a full-size steam locomotive has one prime enemy and it is called clinker. It is formed when poorly-burning coal lumps fuse together, and turns the firebed into a gooey mass, laying across the firebars, setting like concrete and strangling the air flow that keeps the fire burning. The more clinker one suffers, the more it decreases the airflow, promoting more clinker...

On model locomotives clinker is not quite so alarming as a full-size engine, as it is rather easier to remove than on a locomotive at speed on a main line. But it is an issue and another aspect of full-size practice that it is useful to know on your path to competent model steam locomotive handling.

Blue is the colour

How do you know your fire is suffering from clinker? There is a visual sign, a blue flame, as opposed to the usual orange or white, visible in the firebox. Another sure sign is a struggle to keep the pressure up, even with the dampers wide open – if this happens then you should strongly suspect clinker...

If there is clinker in the firebox, it needs to be found and removed – as we have said if it is left the problem will simply magnify. To do this you need to employ the fire irons – on a full-size locomotive these are big and heavy iron bars. The dart is straight and looks like a spear, while the pricker has one of its end turned through 90 degrees.

You use the irons to first locate clinker – if as you thrust the iron thorugh the hot coals the firebed feels a bit like a pudding, then that's another sign of clinker forming.

Note, however, that you should spend as little time as possible working the fire irons through your hot fire. The iron is cold in itself, and by stirring up the fire bed with it you will always risk its temperature dropping and... further encouraging the formation of clinker.

I've yet to meet a fireman who considers getting rid of clinker a fun job. You need to ensure you wear gloves as metal tools placed in a very hot fire will quickly get pretty hot themselves. The iron is carefully worked through the fire, the aim being to get under the burning coals to the bars themselves where the clinker might lay. It's a job you need to learn and to get right – for example particularly in locomotives with small fireboxes and thinner fires you don't want to knock your fire through the grate...

Half and half

A good idea is to clean the firebox in halves. You first put some fresh reasonably-sized lumps of coal on one half of it, and then you check the other half for clinker. By the time you've finished the new coal will likely be burning and you can then push these lumps onto the holes in the firebed that you will have created while clinker hunting. You then clean the other half of the box, and finish off by topping up this section with fresh coal.

When you have found the clinker you need to get rid of it – lifting it from the firebars, and if possible breaking it up into smaller lumps that will then fall through the bars into the ashpan.

If, however, you are suffering from widespread pancakes of the stuff, you will need to physically remove it from the firebox either by working it onto the shovel or using a set of clinker tongs to grab it.

Different types of coal are more prone to clinkering than are others and if the railway you are working on uses coal known to be prone to this issue, then it's always worth being pro-active, and while the train is standing in the station using the fire irons to take a quick poke at your fire – it's far easier to handle the heavy fire irons when your loco is stationary than on the move...

There are many reasons why clinker forms and as we said some types of coal are more prone to suffering from it than others – with future consistent coal supplies becoming an issue it's quite likely this is one part of the footplateman's life that won't be going away... EIM

BELOW: A typical lump of clinker – bits of unburnt coal fused together.

BOTTOM: The driver of this 15-inch gauge loco is hunting clinker at the best time, while standing at a station...

A case in point...

This month our resident miniature railway engineer's day job sees him using yet another technique that will be useful, whatever your model engineering scale.

BY **HARRY BILLMORE**

Back in the winter at the Fairbourne Railway when we were putting the motion back onto our 6-inch scale Darjeeling Himalayan B-class 0-4-0 'Sherpa', following its 10-year overhaul, I noticed that some of the motion pins that run in needle bearings were heavily scored, where the bearing had started to fail thus allowing the bearing housing to rub on the pin.

There were two things to do to sort this issue, the first was to fit new needle bearings, while the second was to replace the pins.

The former was quite an easy job, simply take an example of the old bearing, look at the reference number etched into it and order a load of new ones and some spares. The pins on the other hand would take a little longer.

There were a few options to choose from with regards to material choice to make them from, bright mild steel, EN8, EN8 hardened, EN24T and a few other grades too.

Bright mild steel I disregarded straight away – with the amount of running our locos do each season, combined with the forces involved with moving their large slide valves, the mild steel would have worn away far too quickly.

The next option was EN8 steel, this is an excellent reasonably hard-wearing material in its base state but is also easily case hardened to improve its wear characteristics. It also has the added advantage that it is reasonably easy to machine, as the following table showing the machinability index of varying grades of steel shows:

The table is also a handy guide for the updated nomenclature now used to describe grades of steel, so EN8 in the more modern parlance is 080M40. Note too that machinability is also affected by the machine you are using and the type of tool employed on the job, so the percentages listed here should be regarded as a guide rather than precise figures!

This table also shows one of the key reasons I did not choose EN24T to make the pins from. While it is an extremely hard-wearing steel and can be hardened further by nitrile treatment, trying to machine it on the somewhat ancient machines in the Fairbourne workshop to a decent surface finish would involve extremely hard work.

To achieve a good finish would require carbide-tipped tools and a high surface speed combined with high feed rates, which was something that the somewhat clapped-out Colchester lathe I used to machine the pins on was not capable of delivering.

For anyone that's particularly interested in the different material

ABOVE: Loco requiring pins – 'Sherpa'. *Photo: Fairbourne Rly*

All photos and diagrams by the author unless stated.

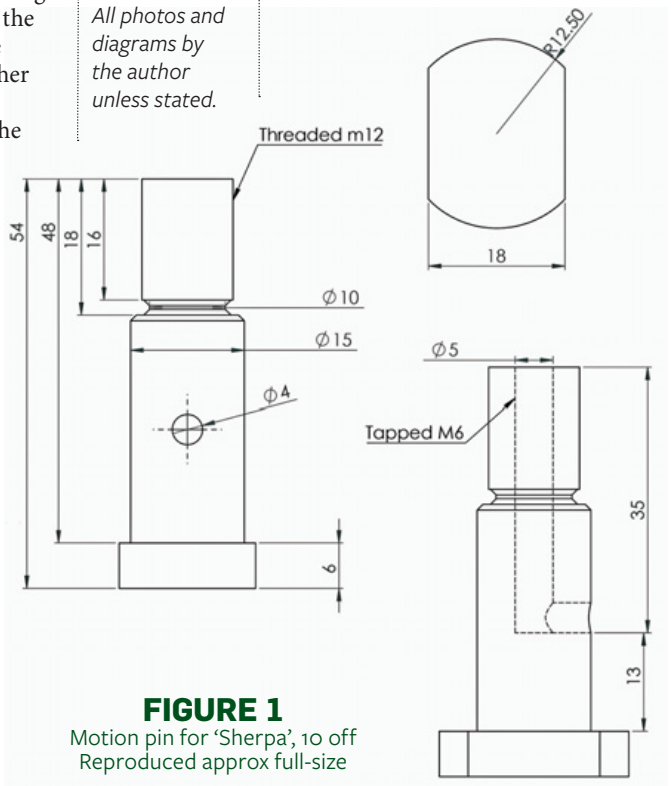
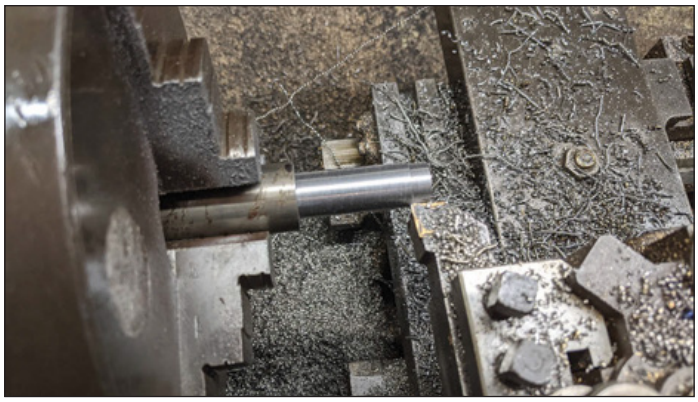


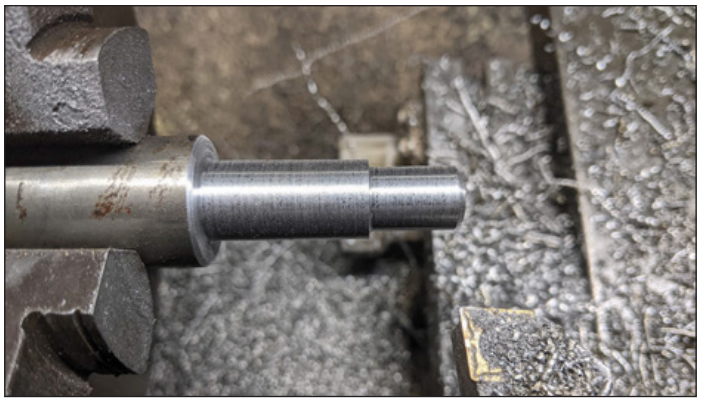
FIGURE 1
Motion pin for 'Sherpa', 10 off
Reproduced approx full-size

Machinability Index – grades of steel		
BS970 1991	BS970 1955	Machinability Index – %
230M07	EN1A	100
230M07Pb	EN1A Pb	150
Mild Steel	Mild Steel	55
070M20	EN3A/B	55
080M15	EN32B	55
210M15	EN32M	77
080M40	EN8	45
212A42	EN8M	58
070M55	EN9	30
605M36T	EN16T	29
606M36T	EN16MT	38
708/709M40T	EN19T	29
817M40T	EN24T	29

Chemical Composition of steel		
Element	080M40 (EN8)	817M40 (EN24)
Carbon	0.36-0.44%	0.36-0.44%
Silicon	0.10-0.40%	0.10-0.35%
Manganese	0.60-1.00%	0.45-0.70%
Sulphur	0.050 Max	0.040 Max
Phosphorus	0.050 Max	0.035 Max
Chromium	-	1.00-1.40%
Molybdenum	-	0.20-0.35%
Nickel	-	1.30-1.70%



1: Step one in making the 10 required motion pins, turning rubbing surface down to size.



2: Turning the thread outer diameter – a little manual CNC to put a chamfer on the end.

content of EN8 vs EN24T, it is:
a) EN8: 0.4% carbon, 0.8% manganese
b) EN24T: uses Ni-Cr-Mo as an alloying agent (Nickel, Chromium and Molybdenum)

The second table breaks down the chemical composition of the two types of steel.

Having made the easy decision on which steel to use, I then had to decide whether to harden the EN8 or not, and how to harden the pins if I went that route. The two options for this process are case-hardening using a powder or water-quenching. Water quenching produces a harder finish but usually the treatment results in a more brittle material. The case-hardening powder is annealed during the process so is far less prone to cracking. I decided to use the hardening powder to give a slightly harder-wearing finish, without having issues with cracking on hard edges while heat-treating.

I first drew up the original pin, then modified the drawing to reduce the amount of excess thread hanging out of the sides of the rods. As can be seen on the reproduced drawing (Figure 1), I also adjusted the position of the grease hole so that it sits in the middle of the needle bearing.

"Mild steel would have worn away far too quickly..."

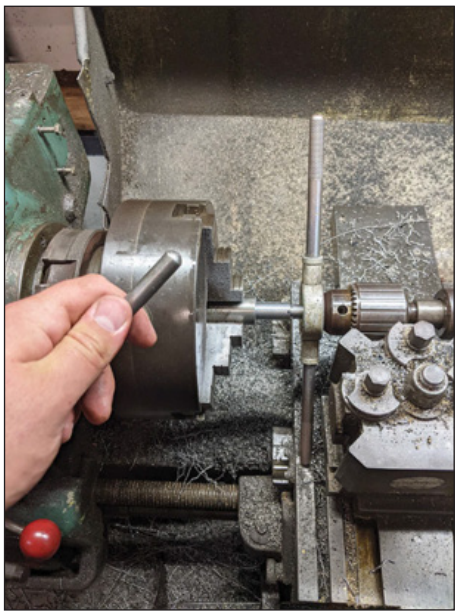
The final mod was to put two flats on the back of the head so that it would be far easier to tighten and remove when necessary – the previous ones required the use of mole grips to prevent them turning.

Pin production

The process for making the pins is shown in the pictures and the 10 ▶

3: Next step, a relief machined at base of the threaded section.

4: Face of chuck rests against die to ensure thread is cut parallel.



5: With lathe out of gear, chuck key used to turn workpiece while gentle pressure applied using tailstock.

6: Power tapping at very slow speed, tap held in tailstock chuck which is not clamped to bed and can be drawn towards chuck as thread is cut.

7: Emery paper then employed to polish rubbing surface down to final size.

8: As final finishing was done with emery, turning did not need to be perfect finish. This is after a few seconds with emery.

9: Final finish following use of emery – pin turned 2 thou under-size to allow for thickness of surface hardening.

10: Pin blanks machined on each end of piece of bar before cutting off, this allows for less wastage and better part holding in lathe.

11: Always label offcuts and leftovers – they can come in very handy later.

12: Final lathe operation – pin head faced down to final thickness.

13: The 10 finished motion pins ready for milling of their heads.

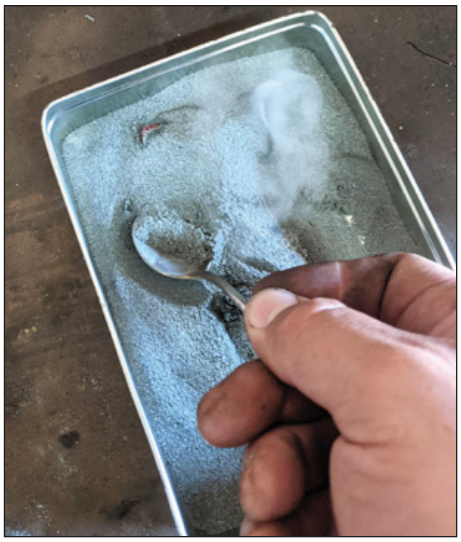
14: Milling flats on heads using rotary table to spin pins 180 degrees at a time.

15: Using 4mm two-flute end mill to put grease-way into side of pin.

16: Hardening powder as it arrived in post.

17: Heating pins with gas torch in fire-brick hearth, to medium to bright cherry red.

18: Once at correct temperature pins put into hardening powder.



19: Hot pin covered over and left for couple of minutes.

20: Pin will come out with layer of powder semi-melted onto it.

examples required were made to the drawing. The only aspect to be aware of is that case-hardening will add a couple of thou to the diameter of the finished piece, so when producing pins for needle bearings, you need to make them a couple of thou undersize to allow for the hardening compound to do its work without then putting too much pressure on the bearing and causing premature failure.

The final finishing to diameter was carried out using emery paper to clean up the surface finish of the EN8. This material is known to tear quite badly rather than cut when it is machined, so it requires the different finishing techniques.

Hardening process

I ordered some case-hardening compound on ebay, which arrived in a very suspicious-looking package wrapped in gaffer tape... Inside was a sandwich bag full of the grey powder and a sheet of instructions. These are basically the same for most hardening powders I have used, but it's worth just double checking before you start!

The first stage is to heat the pin up to a medium cherry red before rolling it in the powder and then covering it with some more of the powder and leaving it for a couple of minutes. Then re-heat until the powder becomes molten and all black before finally quenching in cold water, swirling it around to cool it off as fast as possible.

The final step before fitting is to clean the pins up on a wire wheel, fit the grease nipples and then fit them to the loco.

When we took the loco out on test the change in the valve events from previously was quite impressive. Going from the combination lever flopping around to having only a tiny amount of float, I declared the process a great success! EIM

21: Pin then re-heated until powder turns molten and black – this is also annealing temperature.

22: After quenching pins look like this – process can be repeated to increase hardening thickness.

23: Pin checked with file to ensure it is hard enough – file skates over the surface, proving pin is harder than file.

24: Quench tubular items with cross holes in carefully – this staged photo shows water can flash-boil in hole and shoot out at great speed.

25: Quick final clean-up on wire wheel brings pin up to nice standard ready to fit to the loco.

Rebuilding a Winson

Young Sussex Miniature Locomotive Society member Sam continues the build and renovation of his 14xx loco kit from a defunct manufacturer, with the end of the project nearing.

BY **SAM RIDLEY** Part Seven of a short series

The February half-term and a few more extra days allowed for the final superstructure pieces to be assembled and mounted to the locomotive. This included the new front steps and adapted handrail stanchions. However, as stated previously, the 14XX would have to be disassembled to finish some mechanical jobs still left to do but before then, a quick photo shoot was in order (**Photo 32**).

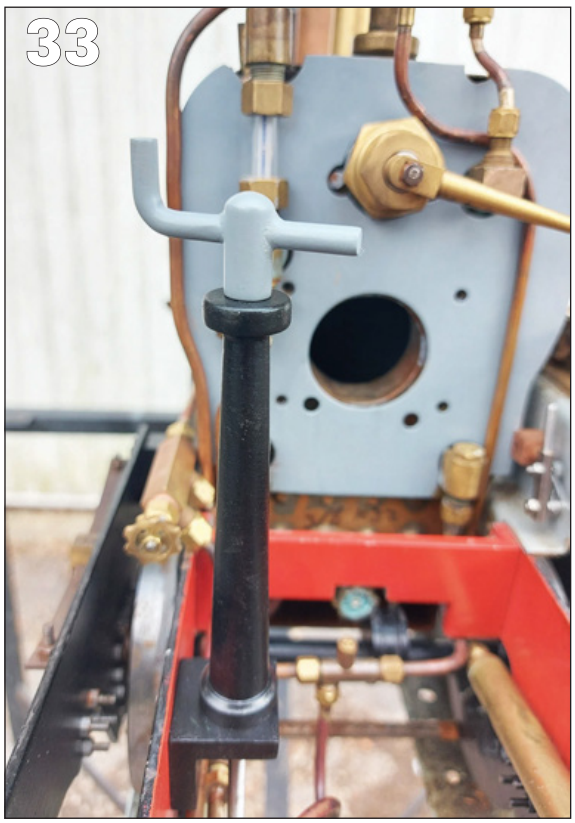
The locomotive certainly did look rather good on the show track outside! But with 'playtime' over it was back to work and as we were satisfied that the entire superstructure fitted as well as we could make it, the rest of the school holiday was spent disassembling it ready for painting when the weather would allow.

Whilst we waited for the warmer days, it was decided to tackle the small list of jobs left on the chassis. First on this list was the brake stanchion and angle bracket in the cab, which required some modification.

The supplied angle bracket, which secures the stanchion to the main frame, protruded so far into the cab that it nearly blocked access to the fire-hole doors! The angle was also made of too thin a material as it would start to bend as the brakes were applied.


32

"The top flange on the stanchion was only held on with adhesive and fell off.."


33

Too big a bracket

With the superstructure removed from the locomotive, the brake assembly was accessible and was dismantled to be examined for improvement. Aside from the angle bracket, the main stanchion was greatly oversized. It was too big in diameter, so it was decided to reduce this and at the same time improve the locking-nut arrangement at the bottom of the stem. Finally, and due to the alteration of the size of the angle bracket, the bell crank on the brake bar would also need to be changed to suit the new positioning of the stem.

The first job was to make a new angle bracket. This was made from an odd piece of 1-inch x 1-inch x ¼-inch brass angle. This was cut to just over an inch in length and then carefully faced to exactly one inch. A single hole of 0.450-inch was then centrally drilled into one of the faces and this was tapped ½-inch x 26tpi to accept the bottom of the stanchion.

Three further holes were then spotted onto the outside of the other face to match the holes in the main frame; these were then drilled 2.3mm and tapped 6BA and would be used to attach the bracket to the main frame.

Test fitting proved that the changes were successful and we managed to shift the brake stanchion an extra ½-inch closer to the frame, freeing up much more room to access the fire-hole doors.

The next job was to reduce the size of the stanchion itself. This would require some taper turning which I had never done before. Firstly, we had to get the stanchion mounted in the lathe. To do this, the stanchion was mounted between two centres in the head and tail stocks. A quick bit of trigonometry to work out the required angle on the taper and then it was time to set up the compound slide on the lathe.

We decided that 1/16-inch would be removed from the radius, so a reduction of ⅛-inch would be made from the overall diameter, the largest part of the taper would end up being finished to 9/16-inch and the smallest end of the taper would be finished to 11/32-inch over a length of 3¼-inches.

The turning itself was very successful, however it was discovered towards the end that the top flange on the stanchion was only held on with adhesive and subsequently fell off! It was therefore decided to silver solder the top flange properly and at the same time bush both the top flange and a short section at the bottom of the stanchion, so the stem was a snug running fit, rather than a sloppy one!

With the top flange soldered in place with some Easi-Flo 2, a start was made on two brass bushes, 5/16-inch in diameter, drilled and reamed to 3/16-inch and each ½-inch long. These

were a press-fit into the top and bottom of the stanchion for the stem to locate through.

One final job was to cut the 2BA thread higher up the stem, so a single nut could be locked to the stem to stop it from lifting and falling as the brake was applied and released.

With the bracket and stanchion complete, and in position on the locomotive frame (**Photo 33**), a start could be made to modify the bell crank. This required the separation of the two halves, which by luck had originally been silver soldered! Once separated, just under ½-inch was removed between the two halves, before they were carefully silver soldered back together and at right angles to each other – which was a rather delicate process and was easier said than done!

Now it was time to reassemble the brake gear, which fitted really well and with the modified pieces ready to go, they were cleaned, etch-primed and brush painted (**Photo 34**).

Linking the draincocks

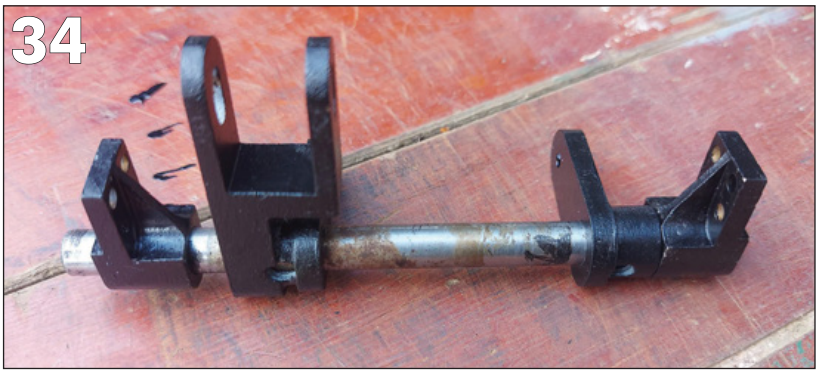
The last significant job left on the list was to link the draincocks to the cab, after a little bit of head scratching and a lunchtime natter. We decided to use a cable in a copper tube rather than traditional linkage and to adopt a central draincock disc, as opposed to using individual draincocks under each end of both cylinders.

The first job was to see if it was possible to run a length of 3/16-inch outside diameter by 18swg copper tube between the cab and the underside of the steam chest. The answer, fortunately, was yes but only after a day was spent annealing, bending, checking and repeat! This copper tube would be secured to the side of the reverser stand, bent under the motion bracket and navigating its way to the steam chest while avoiding the lubricator drive arm!

With the tube now in place, a 3/8-inch copper cube was machined from a piece of 3/8-inch square copper bar with a 3/16-inch hole drilled through one plane for the copper tube and a further 2.3mm hole, which was tapped 6BA, drilled through perpendicular to secure the cube to the reverser stand and to clamp the pipe into place in the block.

A previously part-fabricated handle was salvaged from Andrew's scrap bin and carefully formed into a suitable actuating handle for the draincock disc. At the front end, it was decided to copy Andrew's 'Railmotor' draincock design by using a rotating disc as the draincock. This design was adopted from our club Halton tank locomotive, which has a similar arrangement.

"They were carefully silver soldered back together and at right angles to each other – a rather delicate process and easier said than done..."



Four PB102 bronze elbows were made first, each with a 3/16-inch by 40tpi fitting to take the pipes from the end of each cylinder to the disc mechanism. The discs themselves were fabricated from an off-cut of 3/4-inch PB102 bronze bar. The fixed disc is 3/16-inch thick with a central hole drilled 2.5mm throughout and tapped 5BA for a stainless steel pivot pin. The rotating disc is 1/8-inch thick with a 1/8-inch central hole drilled and reamed throughout as clearance for the pivot pin.

Once these two discs were made, it was time to break out the dividing head once more! The fixed disc was mounted first and had two 1/8-inch, flat-bottomed holes, cut 5/32-inch deep on a pitch circle diameter of 7/16-inch. Next, the rotating disc was mounted and had two 1/8-inch holes drilled throughout on a pitch circle diameter of 7/16-inch, matching the holes in the fixed disc.

The fixed disc was then mounted in the vice on the vertical slide to have four 1/8-inch holes drilled around the periphery, which just break perpendicularly into the previously cut 1/8-inch holes. These holes are to mount the four 3/16-inch by 40tpi fittings which connect the pipes from the end of each cylinder.

With the discs complete, a length of 3/16-inch PB102 bronze was used to fabricate the four 3/16-inch by 40tpi fittings, each 1/4-inch long, drilled 1/16-inch throughout and with a 1/8-inch diameter by 1/16-inch-long stub turned on one end to push into the fixed disc for soldering. The opposite end of each fitting was conventionally coned for a pipe cone to locate into.

Once fabricated, all four fittings were pushed into the fixed disc and silver soldered using some more Easi-Flo 2. Both discs were then lapped on a very large and very heavy ▶

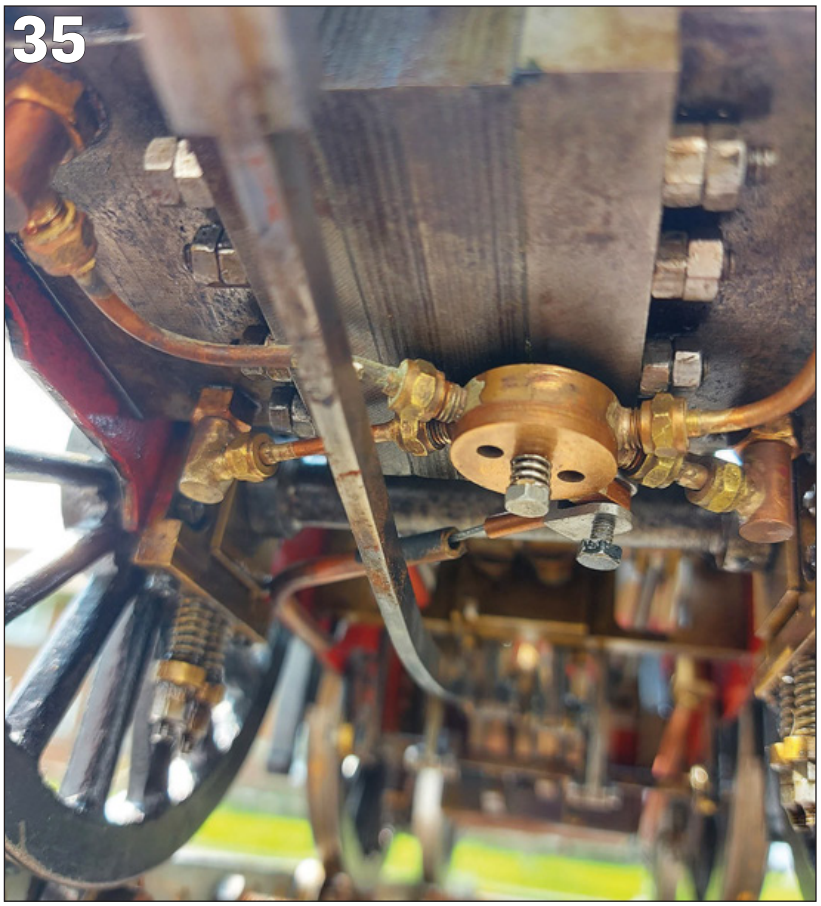


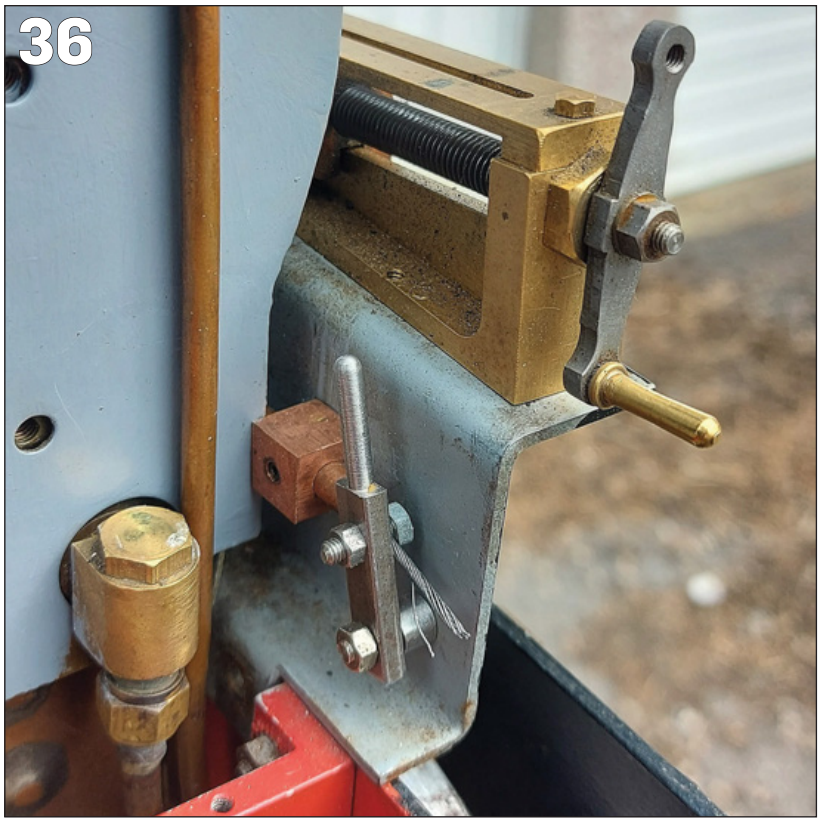
PHOTO 32: This photo that we've been using to introduce each part of this series was taken during the session mentioned at the start of this month's text.

PHOTO 33: Handbrake lever installed on the loco.

PHOTO 34: Brake assembly bell crank ready for re-fitting.

PHOTO 35: Central disc part of the assembly linking the draincocks to the cab.

All photos by the author



surface plate before trial fitting.

Four pipes were fabricated to link the elbows on the bottom of the cylinders to the fittings on the fixed disc which was easier said than done in such a tight space! Over the course of three or four days, several pipes were remade, one of the fittings on the disc had to be removed, re-made and re-soldered, and the lubricator drive arm had to be bent down slightly further, so all-in-all not an easy task!

Once together, the setup at the front end looked pleasing and with the cable loosely in position we were happy with our work (**Photo 35**).

One final task was to attach the cable to the rotating disc by means of a ⅛-inch thick by ¼-inch long copper lug that protrudes from the side of the disc. The lug was drilled 2.2mm for 8BA clearance and this was very carefully silver soldered to the side of the rotating disc and in the correct orientation to match the holes in the disc and the direction of the lever in the cab. This also took a little time to work out and some head scratching too, but we got it right first try!

Finally, an ingenious fork end was made from another scrap bin offcut to link the cable end to the lug on the disc but without the need to silver solder, which can be quite difficult with cable, especially if it is Teflon impregnated for example. One final bit of lapping of the discs was followed with final fitting at the front end which proved very successful – a satisfying conclusion!

Open and shut job

At the cab end, a 6BA fitted pin with cross hole was used to pinch the cable to the handle and gave infinite adjustment without the need to silver solder, which made the cable completely silver solder free! The handle was then finally attached to the reverser stand and 'hey presto!' the draincocks opened and closed with use of the handle (**Photo 36**). Final testing will follow once the locomotive is ready for an air test prior to its next hydraulic boiler test.

With the draincocks finished it was time to take a final look at the cab fittings before the next hydraulic test. We first tackled the crosshead pump bypass valve, the original setup was temporary for the 'premier steaming' and a 'proper valve' was required. A basic copy of the original was decided upon but this would be shorter in length so the valve would not protrude and be seen through the cab door.

"This also took a little time to work out and some head scratching too, but we got it right first try..."

With no ⅜-inch square brass in stock, a 2¼-inch length of ½-inch hexagon was machined down in the vice on the vertical slide to make the square and after three attempts I got there in the end!

The first job was to turn each end in the four-jaw self-centring chuck to 5/16-inch in diameter by 5/16-inch in length before externally threading each end 5/16-inch by 32tpi. One end was then drilled 2.5mm to a depth of ¾-inch before a second drill opened the hole out to 3.9mm but, this time, only to a depth of ½-inch. This larger hole was then threaded 2BA to accept the bypass valve spindle.

The other end was also drilled 3.9mm and to a depth of 1½-inch but this hole was just plain section. In addition, an internal cone was also cut to accept a standard 3/16-inch pipe cone. With the valve body drilled and coned, two brass side fittings were added; both being externally threaded 5/16-inch by 32tpi, drilled throughout 3.9mm and ⅜-inch in length with an internal cone cut on one end to accept another 3/16-inch pipe cone. The other end of these was then turned down to a ¼-inch diameter by 1/16-inch in length to act as a register when silver soldering them to the main body.

The fittings were then added to the main body of the valve using some more trusty Easi-Flo 2 solder. One was soldered 3/16-inch in from the spindle end and the other being ⅝-inch in from the coned end, the main body having been counterbored ¼-inch in diameter by 1/16-inch deep at these points to accept the aforementioned register on the fittings.

Two successful days

Once silver soldered in place, the 3.9mm internal hole was drilled to break into the main body. Test fitting proved to be successful and this appeared to be a rather seamless job with the only notable error at the start – a great result for a couple of days work (**Photo 37**).

Two 3/16-inch o.d. by 26swg copper pipes were then formed to connect these outlets to the boiler clack and the return pipe (possibly for use with a coal/water wagon). Once complete, the inlet pipes for both the crosshead pump and injector were fabricated from lengths of 3/16-inch o.d. by 26swg and 5/32-inch o.d. by

PHOTO 36: Neat little lever in cab opens and closes draincocks.

PHOTO 37: A bespoke valve for the crosshead pump bypass was fabricated, a copy of the original but of shorter length.

26swg copper pipe, respectively.

With all the pipes loosely in place it was decided to add a brass T-piece to support the pipes at the back of the locomotive. This 'T' was machined from a piece of 1½-inch by ⅛-inch thick brass plate, with most of the excess cut by hand before finishing in the vice on the vertical slide.

Three holes were then drilled in the horizontal part of the T, two of the holes were drilled to 5mm and the third was 4.2mm. These holes would support the pipes themselves, whilst two further 2.7mm holes were drilled on the vertical section of the T to affix the piece to the back of the buffer beam stretcher.

Test fitting of the T went well and as such the pipes were cut back so they would only protrude by about ½-inch from the back of the loco (**Photo 38**). This meant that the T could now be etch-primed.

A handle on it

The next job to tackle was the gauge glass blowdown. The original one had a side-operating handle attached to a screwed spindle, but this was perilously close to the inside of the side tank, and it leaked! By chance, Andrew's spares box produced a ¼-turn tapered valve that would look okay as a replacement. We decided therefore to modify this valve to suit the existing bottom gauge-glass fitting.

The valve had an external thread on the top, so this was turned back to a plain 3/16-inch section ready to accept a sleeve with an external 5/16-inch x 32tpi thread. The brass sleeve was silver soldered to the top of the valve using some more Easi-Flo 2 solder so it could be wound into the bottom gauge glass fitting.

The bottom of the valve was plain, so a new externally threaded 3/16-inch x 40tpi fitting was fabricated to provide an outlet for the drainpipe. This fitting was ⅜-inch in length, externally threaded 3/16-inch by 40tpi, drilled 2mm throughout and with a ⅛-inch diameter by ⅛-inch long section turned at one end which was threaded 5BA for a 5BA brass nut to be soldered to the end – this nut would also provide the drive for the valve to be screwed into the bottom gauge glass fitting.

A 3/16-inch diameter by 30 thou register was turned on the end of the fitting to locate the nut in the valve body while soldering. These two sections were also soldered using some Easi-Flo 2 solder.

The last job was to internally cone the bottom fitting before cleaning and then adding a 3/32-inch by 26swg copper drainpipe, which runs down below the backhead. Test fitting again proved to be successful and the valve will hopefully be a great improvement compared to the original screw-down version (**Photo 39**).

With the backhead fittings now mostly in place, and in between some painting, it was time to start preparing for the next hydraulic test. EIM

"The original side-operating handle attached to a screwed spindle was perilously close to the inside of the side tank, and it leaked..."

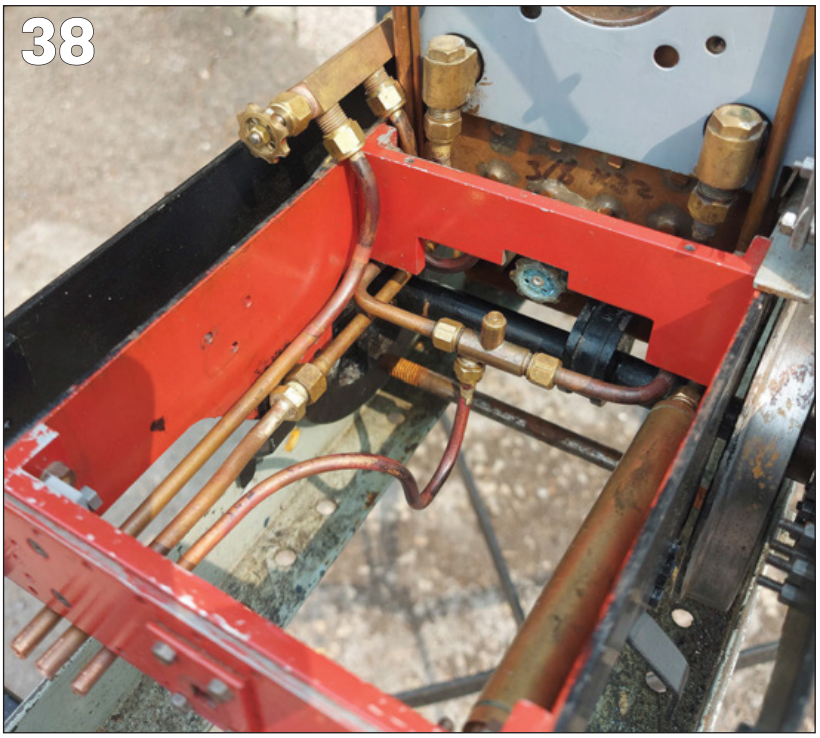
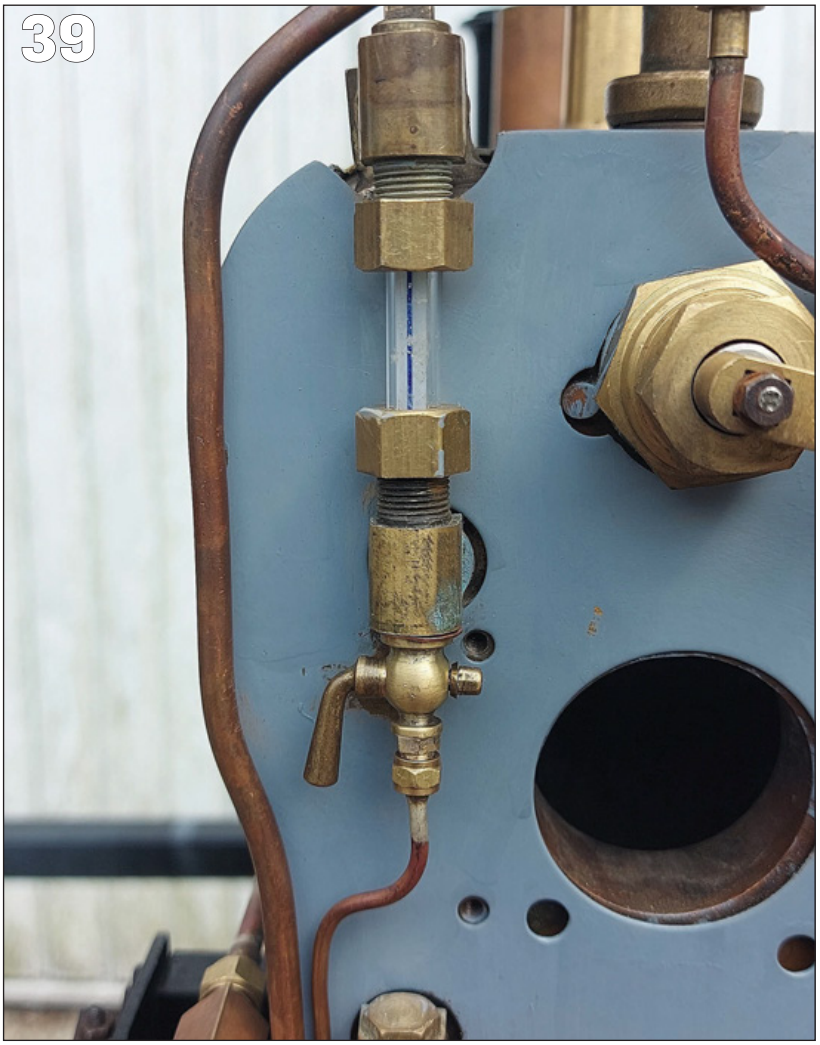


PHOTO 38: Pump bypass valve pipework all set up.

PHOTO 39: Revised water gauge with its bottom fitting gaining a new and better-design handle.

■ Parts 1 to 6 of this series appeared in the March to August 2021 issues of EIM – download a digital back issue or order printed copies from www.world-of-railways.co.uk/store/back-issues/engineering-in-miniature or by calling 01778 392484.



A pointless exercise

Peter describes a different take on the usual type of lathe dead-centre, in order to solve an interesting turning problem.

BY **PETER KENINGTON**

Regular readers of EIM will know that my son, Matthew, and I are (very slowly) making a GWR Manor class 4-6-0 in 5-inch gauge, although we do keep getting distracted by other, 'more urgent' projects (can any model engineering project ever be classified as 'urgent'?). Most of our work to date has concentrated on the tender – we received some sage advice that embarking on the tender first has two big advantages:

1) Mistakes made on the tender are either (**a**) less noticeable than those made on the loco (most people look closely at the loco, with the tender being 'taken as read' in comparison) or (**b**) less important from a functional perspective and/or (**c**) easier to rectify

2) Once a completed, working, loco is available, the temptation is to play with it and not get on with the laborious task of making a tender, from scratch.

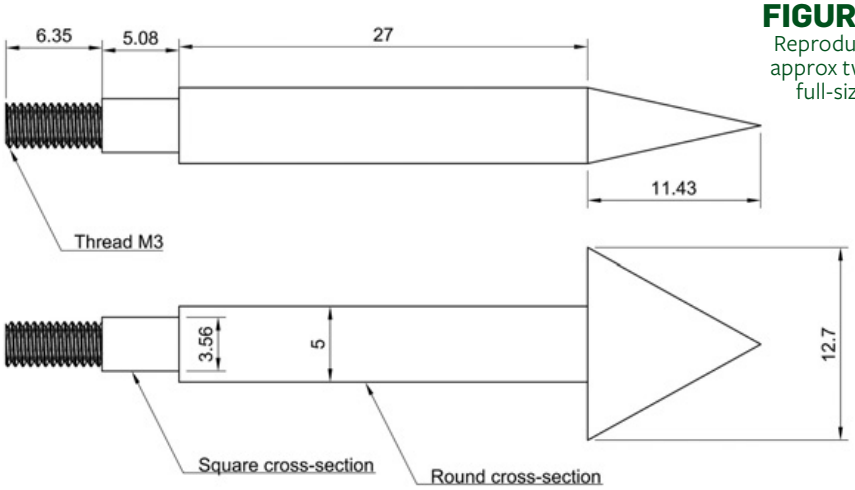
So, unsurprisingly, we started with the tender. Having said the above, we have produced the occasional part for the loco as we have been going on, perhaps because some aspect of machine setup made the making of a particular part relatively straightforward (having made another, similar, part for the tender, perhaps – aspects of the braking system, for example, fall into this category), or possibly because it was a simple part and there was an hour left in the day, in which it could be made.

It is just such an occasion which lead to the making of the dart for the smokebox door, which is the subject of this article. In building the tender (and loco), we have adopted a philosophy of trying to work with laser-cut parts and modifying them as appropriate to meet the requirements of the drawing.

For example, where a brake connecting rod could be fabricated from a piece of round bar stock, silver-soldered to a machined or filed boss, we have used a laser-cut 'flat' part instead, which has the boss already formed from the laser-cutting, and subsequently turned the square or rectangular cross-section 'tail' of the part, to yield the required round rod section.

We described this process previously, in conjunction with the use of a 3D-printed collet in a collet chuck (**EIM** August 2020). It is not always obvious that this saves time or effort compared to the alternatives although, not having a permanent forge for silver-soldering (it's on the wish-list), the setup time when we do need to do this means that we tend to avoid it, where possible!

FIGURE 1
Reproduced approx twice full-size



"Once a completed, working, loco is available, the temptation is to play with it and not get on with the laborious task of making a tender..."

FIGURE 1: Door dart drawing (all dimensions in mm).

FIGURE 2: DXF outline of lengthened part, for laser-cutting from 5mm thick steel.

All photos and drawings by the author

Laser-cut with a point

Figure 1 shows a drawing of the required door dart. The DXF file used when cutting the 'blank' of the dart is shown in **Figure 2**. It can be seen that the DXF version is somewhat longer than is required by the drawing, specifically on the 'shaft' (ultimately, threaded) part of the dart – this is to allow plenty of material to be gripped in the chuck, whilst still having sufficient exposed for cutting in the lathe. This part was cut from 5mm steel sheet by a commercial laser-cutting establishment, as part of a much larger order.

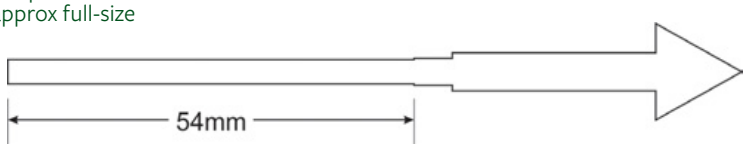
As an aside, for small parts like this, it is always a good idea to have a number of (identical) parts cut at the same time, or even a number of variants where it is not obvious which will prove the easiest to machine. Such parts typically cost peanuts when part of a larger order, and there is nothing worse than making a mistake in a machining operation on such a part, rendering it scrap, and then having to wait to get a new part cut and delivered. This wait is usually exacerbated by the 'minimum order quantity' requirements of many laser-cutting establishments meaning that you need to wait until other parts are designed and ready for cutting.

Cutting Corners

The lathe setup we planned to use involves the holding of a portion of the long shaft in a chuck, with cuts being taken along the remaining (exposed) length. Given that the part has a rectangular or square cross-section (depending upon which aspect of the part is being considered) and has been laser-cut (meaning that the cut edges will be hard), we felt it was sensible to dull the corners with a file, prior to turning (as in first two photos).

Doing this would prevent the part from experiencing multiple sudden shocks (four per rotation) when the tool was advanced into the material. This, in turn, would hopefully then prevent the tool from catching and bending (or destroying) the part. We learnt this lesson the hard way, albeit on a part which was rather less well

FIGURE 2
Reproduced approx full-size



constrained than that afforded by the technique to be outlined below.

Photo 1 shows the corners having been filed to a diagonal before then being rounded, as shown in **Photo 2**. The latter process was probably more than was needed, but was easy and quick to achieve, hence not giving us a convincing answer to the 'why not?' question. The eagle-eyed amongst you will have noticed that the workpiece shown in Photo 1 and Photo 2 is somewhat shorter than that drawn in Figure 2 – this was our practice piece, used prior to working on the 'lengthened' variant. We had a few options/variants laser-cut, as they were so cheap to produce.

Head First

...or perhaps second, depending upon your definition – it was the first aspect to be machined, at least.

Once the shaft had been quasi-rounded, as described above, we moved on to creating the two faces of the point on the head of the dart which hadn't been formed in the laser-cutting process (laser-cutting inherently being a '2D' process). We did this in the mill, using a rotated machine vice (**Photo 3**).

Matthew got to practice his trigonometry in working out the angle which the vice needed to be rotated in order to realise a satisfactory (and symmetrical) point. This was more an exercise in teaching/learning than one stemming from any real need for precision in this aspect of the part. The answer, by the way, is: arctan(½ ÷ 11.43) = 12.3 degrees (again, the eagle-eyed will spot Matthew's version of this calculation on the drawing shown in Photo 7 – note that the steel plate from which our part was cut was only 4.9mm thick, hence the slight difference in the calculation).

"Doing this would prevent the part from experiencing multiple sudden shocks when the tool was advanced into the material..."

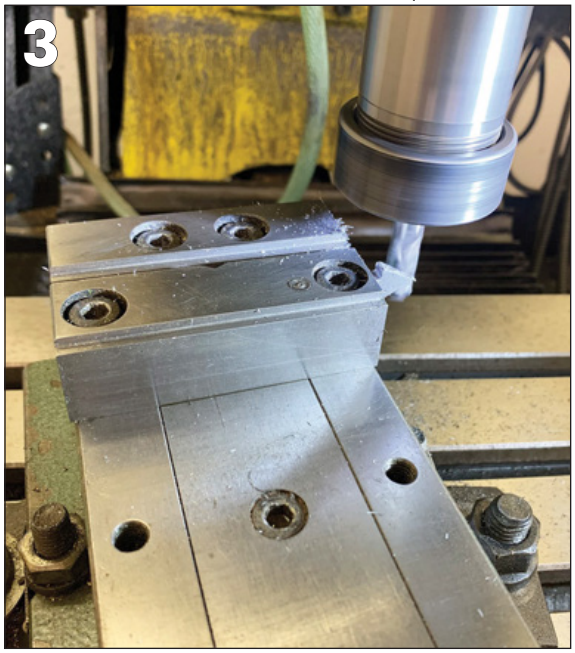
PHOTO 1: Sharp corners were filed flat on the shaft.

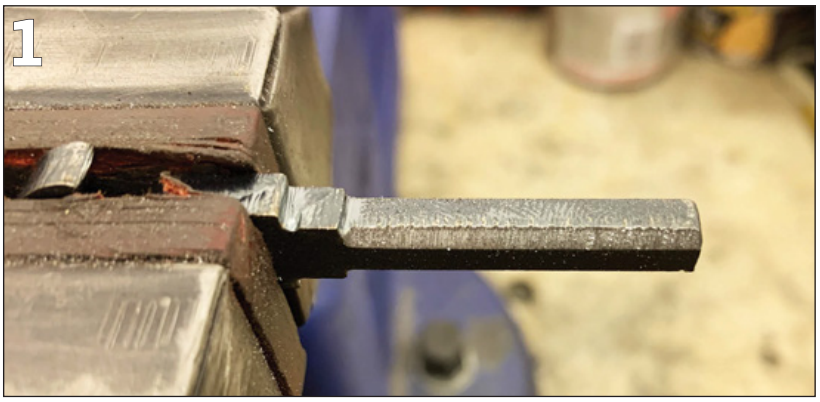
PHOTO 2: Diagonal flats were then rounded a little prior to turning.

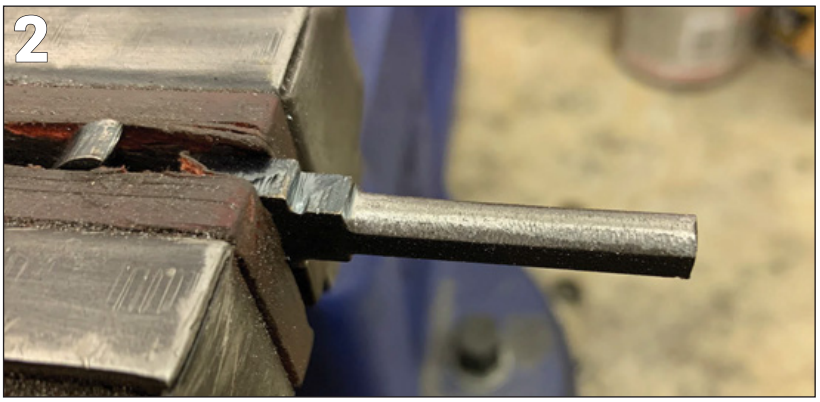
PHOTO 3: Milling flats on 'point' of dart held in rotated machine vice.

PHOTO 4: Conventional dead centre with 3MT morse-taper.

PHOTO 5: Dead centre installed in tailstock of M300 lathe.

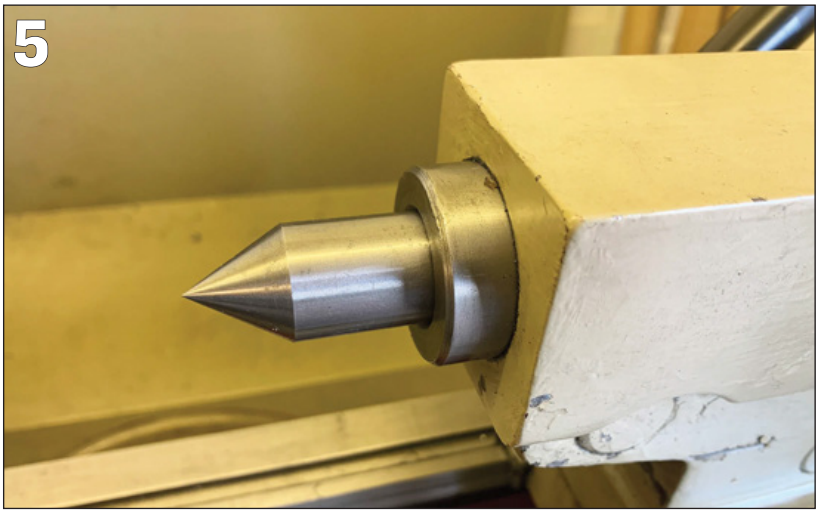


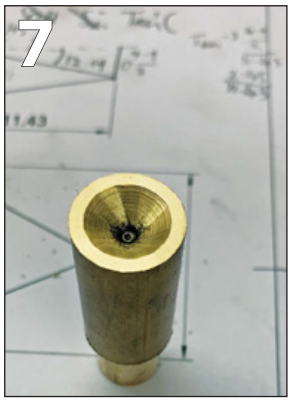




Pointless dead centre

For those of you not familiar with the concept of a dead-centre (there may be a few out there – the rest can skip this paragraph), it is worth briefly outlining what it is and its function. A dead-centre is a precision shaft with a conical point on one end and an, often tapered, shaft at the end to be held in the lathe headstock or tailstock, for example featuring a particular size of Morse-taper, to suit the lathe. The purpose of the centre is to constrain a workpiece to the precise axis of the lathe by means of a recess, cut by a centre-drill on the same lathe, in the end of the workpiece. A typical dead-centre is shown in **Photo 4** and, again, inserted into the tailstock of our Harrison M300, in **Photo 5**.

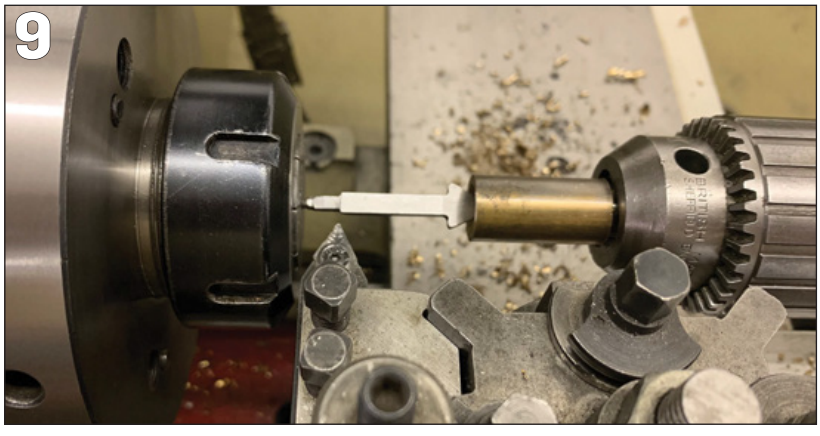




I must admit that I struggled a little with the concept of a dead-centre when I first encountered them (along with 'live' centres, which made much more sense). I felt that the centre would 'wear' the part (or maybe even wear itself) and hence quickly lose its accuracy for a given job or over the longer term (although a drop of oil substantially mitigates the wear issue). A live centre rotates on ball bearings, as the part rotates, hence all-but eliminating this wear. Dead centres do seem to work well, however (and have been used for centuries, so they are well-proven!), although I still prefer the 'live' version.

A conventional dead-centre, as noted above, culminates in a point at the tip of its cone. This is fine for situations in which a 'centre-pop' (recess) can be drilled into the end of the workpiece (for example a cylindrical axle), but not so useful where the workpiece itself culminates in a point at its end.

"The solution, or at least the one we adopted, is to create the inverse of a point (a conical recess) in a purpose-made dead-centre"



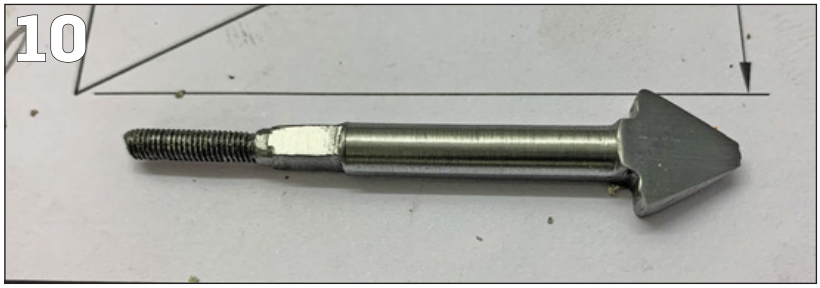


PHOTO 6: Side view of dead-centre – turned-down section allowed it to be gripped in standard (13mm) Jacobs chuck.

PHOTO 7: Recessed dead-centre (after use!).

PHOTO 8: Starting turning – note use of parting tool to allow as much of shaft as possible to be held in chuck.

PHOTO 9: Experimenting with part which had not been pre-rounded by filing.

PHOTO 10: Finished dart, after turning.

The solution, or at least the one we adopted, is to create the inverse of a point (a conical recess) in a purpose-made dead-centre. It may well be that such things are available commercially, however our workshop is sadly lacking in this area and so we had to make one, which is very easy to do.

The solution we ended up with is shown in **Photo 6** and **Photo 7**. We chose to make the part out of brass because we wanted it to wear in preference to the dart tip, whilst undertaking the turning operations. The turned-down portion of the shaft on the 'recessed dead centre' was needed to enable it to fit into our (13mm) tailstock Jacobs chuck (and, yes, Matthew forgot to take off the burr – I blame the parents…).

The fact we used a larger diameter piece of brass than the chuck could accommodate had the advantage that the 'step' in diameter prevented the piece from being forced back into the chuck, when the tailstock was tightened onto the dart, prior to machining. There is not a particularly large contact area between an item held in a Jacobs and its chuck jaws, so this 'step' allowed a good deal of pressure to be applied without any danger of axial slippage.

We could, of course, have used a longer piece of brass and turned a No. 3 Morse taper, to suit our tailstock directly, however this seemed a little unnecessary for such a low-precision part as a door dart and our 'step' allowed a similar amount of pressure to be applied to that which we would have obtained with a part based on a morse-taper, so there was no advantage from that perspective. Also, our chosen method of creating the recess (an HSS twist drill) was hardly 'high-precision', hence turning a precise Morse taper would have been somewhat of a wasted exercise.

As just mentioned, the recess was created with a twist drill (12.5mm diameter) rather than a centre-drill (although we started the 'hole' with one of these, being careful not to drill too deeply). We wanted the point of the dart to touch upon the base (centre) of the recess, with the sides of the recess acting as constraints to prevent the part from being forced sideways when cutting, whilst not actually forming rubbing surfaces to the angled sides of the dart under normal circumstances.

The 118-degree angle of the drill's tip is somewhat greater than the approximately 60-degree angle of the dart's tip, so this was achieved easily by the choice of a standard drill-bit as the recess-cutting tool.

This seemed to work pretty well, on the whole. This is not a precision solution, in the way that a

conventional dead-centre is, but as already stated a door dart is not a precision part.

Turning the Screws

Photo 8 shows the turning of the main part of the shaft, using the 'recessed dead-centre'. We opted to use a parting tool for the turning, to allow us to get as close as possible to the chuck and thereby to hold as much as possible of the part in the chuck. This is important if a 3D-printed (in other words plastic) collet is being used – see the original **EIM** article on this topic for warnings about taking gentle cuts and such.

We also tried a second part (**Photo 9**) which had not had the sharp corners removed from its shaft section, as described above. In this case, we used a neutral lathe tool to avoid the possibility of the impact shocks from the corners resulting in the breakage of our expensive indexed parting tool.

This also worked well, with the 'recessed dead centre' constraining the workpiece extremely well and not allowing it to 'kick' and bend or break. As is obvious from Photo 9, this part had been (crudely) rounded using a file at its (soon-to-be) threaded end and this portion held in a conventional circular collet. Again, this was an experiment on our part to see if this technique worked (which it did).

Once the thicker part of the shaft, in other words the part closest to the pointed end, had been turned, the part could be moved out and the threaded part turned to the required diameter prior to threading – we used a die and held the part in a vice, rather than cutting such a small/narrow-diameter thread on the lathe. Again, the dead-centre was used to constrain the pointed end of the part during this turning operation.

Endpoint

The finished dart is shown in **Photo 10** (the threaded portion will be shortened to the required length at a later date, when the remainder of the smokebox door components have been made). Note that the end of the dart has been deliberately blunted – I don't want my hand to be cut to shreds when cleaning the flues!

In conclusion, it is clear that whilst this is not a precision technique (at least not the way that we went about it), it is nevertheless a useful method. It allowed relatively aggressive cuts (for the diameter of material) to be taken on a part that might well otherwise have bent or broken if turned in an unconstrained setup.

So, we now have a door dart – just the rest of the loco to build... and the tender to finish, of course! **EIM**

Catch 'em early...

No substitute for hands-on experience, says Rich as he starts turning three grandchildren into model engineers.

BY **RICH WIGHTMAN**

In the May 2021 issue of **EIM** there was an article entitled 'Where have all the youngsters gone?'. This inspired me to write a few lines about my own granddaughters.

From time to time the problems and worries around encouraging younger people into our hobby have been mentioned both at clubs and in magazines. I have three granddaughters aged five, eight and 10, and I have encouraged them from an early age to use their imaginations to create things. It's amazing how much fun can be had from a cardboard box.

During the lockdown, because the schools were closed, we had more time to fill and I'd like to show you some of my own granddaughters' activities. The usual paints, crayons, Play-Doh, cardboard, glue and Sellotape have played a major part in these activities of course but I have also encouraged them to come into my workshop to attempt other types of projects. They love the challenge and relish a bit of shed time.

Safe environment

First and foremost it is vitally important to instil into youngsters at an early age the necessity of safety before everything else. They all know instinctively that they must never come in without shoes on. They know too that they must wear protective clothing and they know they must wear eye protection.

I ensure that all my machines are turned off when the children are in the workshop and that anything sharp is stowed away. It's impossible in my opinion to wrap youngsters in cotton wool so a lot of it comes down to common sense.

I have a section of my bench where my three can work with steps in front of it to get them up to the correct height. On occasion I have all three of them in there so the activities are limited to paint, glue and such. For anything they do which requires one-to-one supervision I only let them in one at a time.

For example Evie, the five-year old has just progressed to using the mini hot-glue gun on her projects and this is an operation that requires one-to-one supervision. We all know the temptation is there to stick a finger in the hot glue but she knows not to touch the hot gun and to use a kebab stick or the like instead.

PHOTO 1: Evie, aged 5, hard at work on her cage.

PHOTO 2: Job done – Evie's finished zoo cage.

All photos by the author

I have a bag full of useful bits that I keep for the children. Cardboard tubes from kitchen rolls, bits of wood, lolly sticks, cardboard, plastic pots, in fact any offcut from any type of material I save. Cheap pots of glue and paints from the pound shop are a must have. Children are wasteful little creatures you know!

So what have they been up to? Well I asked Evie what she would like to make next. "A zoo," she replied. "A zoo?" said I. "Yes a zoo, I want to make a cage." So we took a scrap of wood with holes drilled in it, kebab sticks and the aforementioned mini ▶

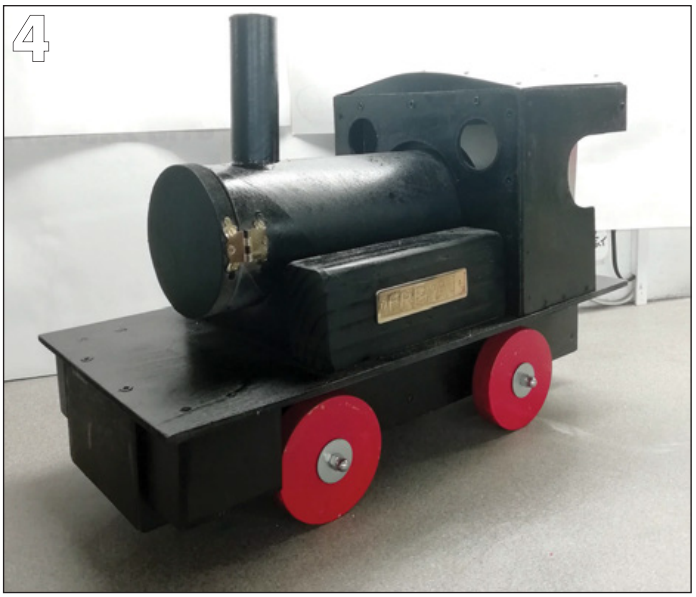


PHOTO 3: Looking the part – Freya's completed loco.

PHOTO 4: Freya, eight, showing off her finished loco.

PHOTO 5: Preparing the brass name plates for etching.

PHOTO 6: Adjusting the voltage for etching the plates.

PHOTO 7: The finished and polished name plates.

PHOTO 8: One of 10-year old Frankie's candle holders.

PHOTO 9: Frankie at work, forming the bottom for her copper jug.

PHOTO 10: Making the spout for the jug.

hot glue gun, lots of paint and a cage was made. Photo 1 shows Evie hard at work on her cage and Photo 2 is her finished cage. It kept her happy for a few hours and she was proud of her achievement. It's important I think not to interfere too much to make a bespoke model but to let them get on with it to the best of their abilities.

First loco

Freya, who is eight years old now, tackled a bigger project which she has been working on for six months or so. She has seen me working on my steam locos and been to our club so decided she wanted to make a train. This would be a good project to learn that things are not made in an afternoon and that a little patience would be required.

We decided a 5-inch gauge would be about right and Photo 3 shows Freya's finished loco. A cardboard tube from the centre of a roll of carpet formed the boiler while the rest was made from various offcuts of plywood, a couple of brass hinges and the like and some thin aluminium sheet. I have a small cordless screwdriver that came with a few drills that she used to drill the holes she needed. She finished it with a can of black aerosol paint.

As a result of this project Freya, seen showing off her work in Photo 4, knows which end is the firebox and which end is the smokebox and which bit is the boiler. I'm not sure it's quite ready to be submitted for its hydraulic test though...

In one of my previous articles I described a method of etching name plates. It uses nothing more than salt water and low voltage so Freya had a go at making some for her loco. She prepared a couple of strips of brass and some stick-on letters – Photo 5 shows her applying the letters.

Next it was into the salt solution with about three volts – I have an adjustable low-voltage supply. Photo 6 shows Freya adjusting the voltage and Photo 7 the finished nameplates – polished up they look good.

On her metal

Frankie, who is now 10 years old has progressed to a bit of metalwork. She has made some key rings and a couple of candle holders from copper and brass – Photo 8 shows one of the candle holders.

Frankie has just finished a copper

jug which she gave her mum for Mother's Day. She has learnt how to cut copper with tin snips, how to anneal the metal and form it into shape. She was taught to use files and how to silver solder and then the hard work of polishing.

The jug is made from a copper tube with a handle and spout silver-soldered on. The bottom is copper formed into a shallow dish.

Photo 9 shows Frankie forming the bottom of the jug. She then silver soldered it into the copper tube. The next job was to cut and shape the spout, **Photo 10**. Finally a handle was formed from a copper strip and silver soldered in place, **Photo 11**.

After a good polish-up using a small multi tool (**Photo 12**), it was time to show off her work. In **Photo 13** Frankie is showing her finished jug.

All three grandchildren are proud of their achievements and are keen to move on to their next projects. And for my part I am just as proud of all three. I like the idea that they are free to use their imaginations and are learning how to use hand tools on a variety of materials.

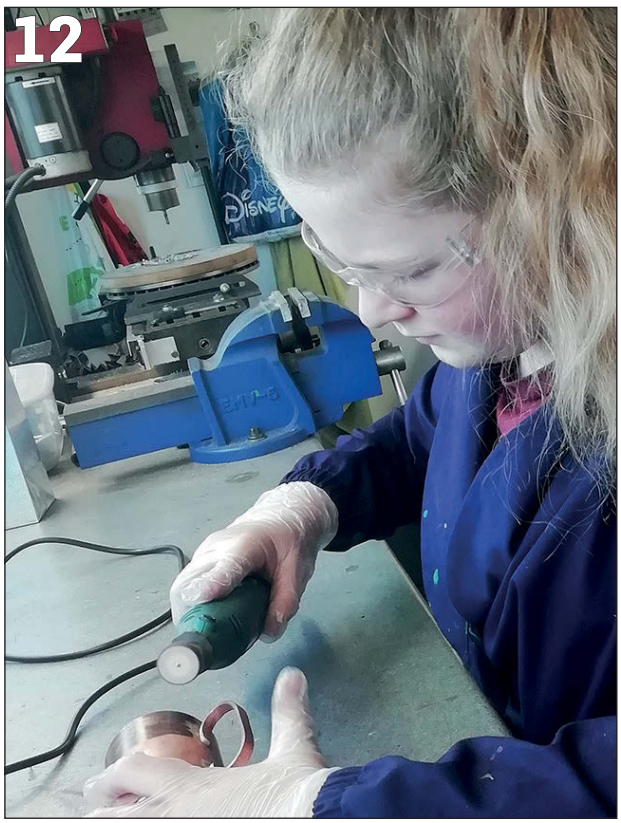
I must add that their parents are happy for them to be in my workshop and I am happy to let them work under my supervision. It is of course essential that you assess your own child's capabilities and supervise them at all times.

Whether or not they grow up to be engineers is something I will have to wait and see. But at least I hope they will be capable of drilling a hole and knocking a nail in. **EIM**

PHOTO 11: The handle being silver soldered on.

PHOTO 12: Fine finish – polishing up the jug.

PHOTO 13: Proud of her work, Frankie with her jug.



High standards

Echills Wood rallied to the cause in July with its first major post-Covid gathering.

BY **JOHN ARROWSMITH**

PHOTO 1: John Spokes has plenty of steam as he waits to depart from Far Leys station with the NE Railway Uniflow locomotive.

PHOTO 2: George busy preparing a British Railways Standard Class 4 which has only recently been steamed after it was built in 2015.

PHOTO 3: The yard shunter awaits its next turn of duty.

All photos by the author

Held just a week after the Summer Steam-up at Hereford also reported in this issue, the Echills Wood Standard Gauge Rally on 9th-11th July further emphasised a welcome and long-awaited return to something like normality for the model engineering world.

The rally was held at the excellent Echills Wood Railway in Kingsbury Water Park near Tamworth, Staffordshire, and organisers were hoping for good weather and an equally good selection of locomotives and drivers.

The gods certainly smiled on them as the weather was fine and lots of interesting locomotives and rolling stock were put through their paces over the three days.

For those who don't know the railway or its location, it is a 7¼-inch gauge track with a main line more than 2km long and additional alternative lines and sidings. It is located in a 600-acre park which houses 15 lakes so it is a large and interesting area.

This event was postponed last year because of Covid so it was with a little trepidation that the decision was made to hold it this year. It all went ahead without any problems and was thoroughly enjoyed by all those who joined in. The impressive array of locomotives included large American prototypes on show alongside small UK tank engines.

Unusual prototype

One of the most interesting and fascinating entries was the North Eastern Railway 4-6-0 Uniflow locomotive designed by Sir Vincent Raven. This three-cylinder engine has very steeply inclined cylinders and Stumpf valve gear with a high front running board (**Photo 1**) giving it a unique appearance.

This locomotive worked for quite a few hours on Saturday and was again rostered on Sunday – owned by John Spokes who is a member at both the Swindon and Reading clubs, it appeared to operate very well for the whole weekend.

As at Hereford, another very pleasing aspect of the event was the number of young people who were involved both on the track and in the operations to run the railway. A very nice BR Standard class 4 tank locomotive was under the control of a

couple of quite experienced young men (Photo 2). Tom and George both work on heritage railways, Tom at the Epping & Ongar and George on the Dartmouth Steam Railway and both are members of the East Herts Miniature Railway Society.

Early on Saturday morning the station yard pilot was a well-made GWR 0-6-0 Pannier tank and for the first shift was being driven by Tom Hubble. This particular Pannier (Photo 3) has 30lb of lead in its bunker to give a good deal of extra adhesion.

These types of rallies do throw up some unusual combinations and none more so than the GWR King 4-6-0 which was coupled to an LMS tender (Photo 4). It looked a bit strange but it worked extremely well.

This locomotive was being prepared by two more members from the East Herts Society who are firemen on the Epping & Ongar Railway – plenty of experience in this little group.

I mentioned a large American locomotive as part of the visiting engines and this Mikado 2-8-2 'Screaming Eagle' built by Ian Dixon from the North Wilts club certainly caught everyone's eye (Photo 5). Superbly built and finished, this large engine just purred round the track with it's full sounding chime whistle announcing its presence.

Signalling intent

The young people I mentioned above really were very much involved in all aspects of the weekend. The busy Harvester Station signal box was handled for most of the weekend by 16-year old Daniel Tromans who regularly attends events at the club. Another of the Echills Wood Railway young members, 16-year old Charlie Martin, was the assistant shed master on Sunday responsible for operation of the yard, getting locos out onto the main line, sorting carriages and stock and generally ensuring that everything went smoothly. Charlie told me that the railway has about 10 young engineer members of whom ▶

PHOTO 4: Andy and Bruce Harvey work on their King class 4-6-0 'King George V'.

PHOTO 5: 'Screaming Eagle', the 2-8-2 Mikado built by driver Ian Dixon from the North Wiltshire club.

PHOTO 6: The Great Gathering at Echills Wood, with A4 Pacifics 'Lord Faringdon', 'Merlin' and 'Wild Swan' posed for the camera.

"The Great Gathering at York was replicated here with three A4 models all in different but authentic liveries..."

seven attend regularly which these days is really encouraging.

Gathering take two

As an example of the organisation, the posing together of three full-size LNER A4 locomotives at York in 2013 for the Great Gathering was replicated here with three models all in different but authentic liveries. 'Lord Faringdon' in BR green, 'Merlin' in BR blue and 'Wild Swan' in LNER garter blue made for a fine sight as they were lined up in the yard (**Photo 6**).

The weekend progressed with different locomotives taking their turn on the track, varied formations and double headers all providing entertainment for both spectators and crew. The railway's location provides it with a ready-made pool of passengers who regularly patronise it. With the track crossing a number of public footpaths visitors see a wide variety of locomotives and trains.

Among the double-headed trains, the combination of the Black 5 of Anthony Walters and the Class 37 of Richard Gomersall (**Photo 7**) could have been an authentic arrangement as during the change over from steam to diesel on the full-size railways, double heading such as this happened when locomotive failures occurred.

Double heading

A steam double header came from the pairing of a Britannia with an A3 Pacific and again I suspect this could have happened on the East Coast main line. Here we had the A3 'Prince Palatine' of Neil Mortimer coupled to the Britannia of Martin Holland with a rake of carmine and cream coaches pulling well-loaded trains (**Photo 8**).

This rally provided a great re-introduction, allowing fellow model engineers and railway enthusiasts to enjoy all the facilities available at Echills Wood after such a long spell of inactivity. Everyone seemed to be enjoying themselves, the club working very hard to ensure everything went smoothly. The great banter and laughter evident on all days was a tribute to a successful weekend.

Sincere thanks must go to Audrey and her catering staff for all their hard work in producing food and drinks to satisfy all the needs of the attending visitors – you did a grand job ladies and I hope you managed to enjoy yourselves as well. Thanks also to Jeff Stephens and all the members for their hard work on the steaming bays, turntable, signal boxes, yards and stations particularly, with the cleansing of each train before departure, not a simple task but one which had to be done. Well done to every one of you and we hope to do it all again next year.

PHOTO 7: Anthony Walters with his Black 5 pilots Richard Gomersall with his Honda-powered Class 37 diesel out of Platform 1.

PHOTO 8: Britannia class 'Coeur de Lion' driven by Martin Holland pilots A1 'Prince Palatine' driven by Neil Mortimer away from Platform 2.

PHOTO 9: A fine example of an 0-4-4 LSWR O2 locomotive owned by Terry Jenkins waits to depart from Far Leys.

PHOTO 10: Treble header? The yard shunter pushes the Jubilee and Midland Compound locos towards the turntable.

PHOTO 11: A fine array of motive power at the main storage shed.

PHOTO 12: A fine Class 40 Co-Co diesel passes replacement track panels on its way to Far Leys.

PHOTO 13: Going well, another 14XX escapes the gloom of Wren tunnel.

PHOTO 14: LNER power at Harvesters as A1 'Great Northern' departs and A4 'Merlin' waits for its passengers.

A freelance traction engine in 3-inch scale

For his latest project Jan-Eric hits the road, building a traction engine inspired by a full-size example, but designed to work rather than follow a particular prototype...

BY **JAN-ERIC NYSTRÖM**

As many readers probably know, I've been a Live Steamer for two decades by now, having built three 7¼-inch gauge steam locomotives, as well as some smaller steam 'toys', and also a couple of battery diesels, all described in this magazine over the past years.

The steam locos provide the most fun, both during building, as well as letting my passengers and myself experience the enjoyment of real steam operation during run days, either on my own track around our summer house, or at the track at our Railway Museum.

However, you do need a track when you want to run any kind of locomotive! This means I only have those two locations available for running unless I disassemble my 'portable' track and put it up at another temporary location – I've done this a few times but it's really quite a hassle. Furthermore, the M6 joining bolts on the track pieces are already quite worn, and probably won't stand many more disassemblies before they have to be renewed – a giant task, considering the more than 100 track pieces...

This fact, as well as inspiration gained during a visit to the Science Museum in London some years ago, where I could inspect a beautiful Aveling & Porter traction engine, (**Photo 1**), encouraged me to design and build a 'freelance' version of a traction engine in 3-inch to the foot scale (in other words one fourth of full size). This could be run in any suitable location with relatively flat ground, obviating the need for any track! In size, it would be comparable to my steam railway engines, and should be able to pull several passengers – provided that I would also build some kind of wagons, of course.

"In size, it would be comparable to my steam railway engines, and should be able to pull several passengers..."

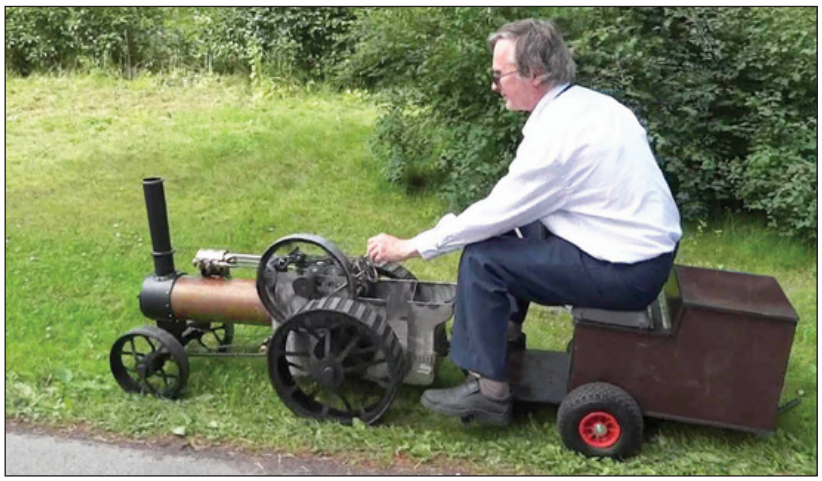


PHOTO 1: Aveling & Porter traction engine built in 1871, on display at the Science Museum in London.

FIGURE 1: CAD design loosely based on a Marshall single-cylinder, four-shaft prototype. Complicated gearing is indicated in the side view.

Photos and diagrams by Kustaa Nyholm and the author

The traction engine

As many readers will be aware traction engines became popular for agricultural and heavy hauling purposes in the mid-19th century, and were manufactured well into the 1920s, when gasoline and diesel-powered tractors took over, albeit gradually. Steam-powered traction engines were still used, at least in some locations, into the 1950s and even later.

In the UK, the use of such engines became uneconomical due to the high axle-weight taxes levied on all commercial haulers. This led to most of these engines being scrapped or simply abandoned. Fortunately, a large number have been preserved and restored, and can be seen in museums all over the world. Many are in operating condition, and are fired up and run during steam festivals.

Their designs varied, in addition to pure 'haulers', some were used as ploughing engines, having a plough-pulling, rope-winding drum under the boiler or on the hind axle. Others were elaborately decorated with a canopy and flashy paint work, and fitted with an electric generator. They were used as 'showman's engines', providing mechanical power for carousels or other fairground rides, as well as electricity for long strings of light bulbs at fairs and exhibitions.

The American and English engines were clearly different in design; you can tell this by their wheels alone. The US engines (Case, Avery, Advance, Reeves and others) almost always had spokes made from round steel and welded to the wheel rim, while the British engines (such as those built by Burrell, Fowler, Aveling & Porter, Allchin, Marshall and Ransomes, to mention just a few) all had spokes made from flat steel stock, bolted to a typical 'double T-profile' in the rim of the hind wheels.

Another notable difference was the often much larger flywheels as well as the more forward positioning of the cylinders on the British engines. The US engines usually had longer boilers, and a smokebox that protruded quite a bit forward over the front wheel. Case in point: Case!

I chose the British design as a general prototype for my model, and gained inspiration for the details from many different manufacturers, so I'm not building an exact scale model, rather something that generally looks British. This really shouldn't matter to readers, since I'm definitely not writing a proper construction article – my intention instead is to show the techniques I have used in design and fabrication of my model.

I hope that some of the ideas shown may be of use to other builders of miniature engines, regardless of exactly what they are building – many of the methods can be used for locomotives, too. Therefore, I will not provide anything more than very general measurements, nor any detailed drawings. If you intend to model a particular engine, there are companies providing detailed drawings and sometimes even castings for many of the different British prototypes.

Design methods

Having decided to build the traction engine in 3-inch to the foot scale, I was faced with a big problem: how do

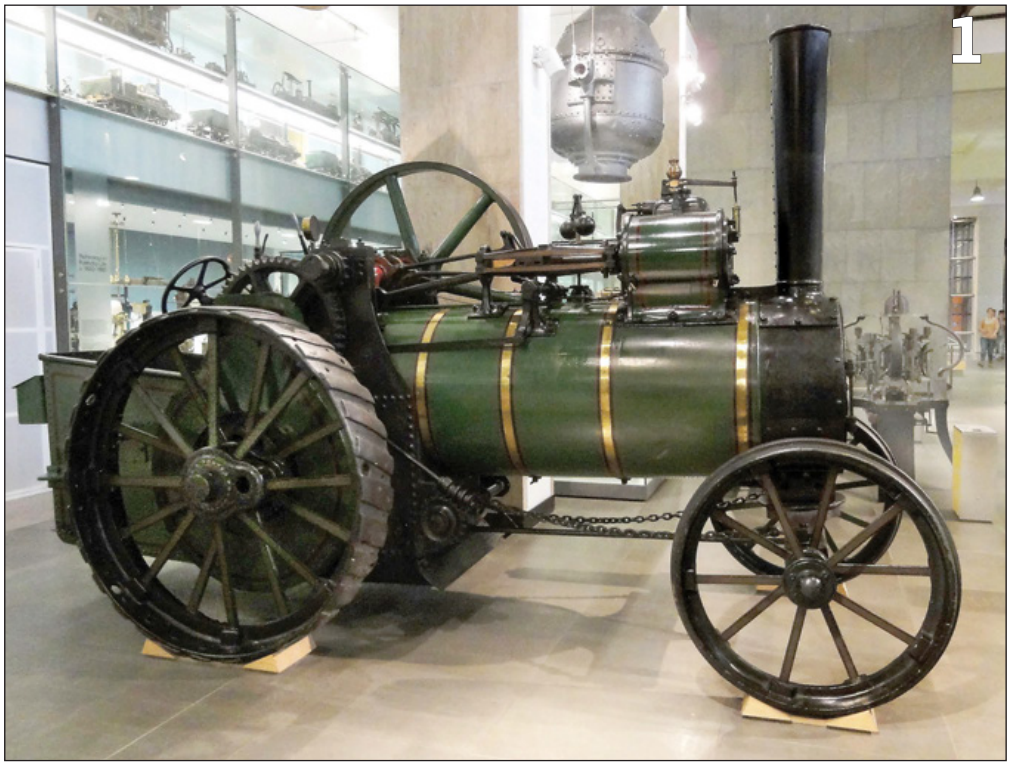
I make the huge wheels? They would be more than 450mm, 18 inches in diameter, twice what my little hobby lathe could handle – it is one of those ubiquitous, low-cost Asian '9 x 18' lathes. The only way possible to produce such large wheels in my little workshop would be to make the wheel rims from steel plate, formed around other pieces of plate cut to the correct circular outline.

You may remember my recent locomotive articles, describing how I used either laser or plasma cutting to speed up both the design and the actual construction of two 7¼-inch gauge steam locomotives as well as a battery diesel. Now, I am once again using the time-saving methods of CAD (Computer-Aided Design) and CAM (Computer-Aided Manufacturing) – with the help of my model engineering friend Kustaa Nyholm and his home-brew plasma cutter, we cut most of the parts for the traction engine from 3mm steel plate.

I used a simple, free 2D CAD program to draw all the parts to be plasma-cut, first scanning an old outline drawing of a Marshall traction engine that looked particularly pleasing in my eyes. This drawing formed the background for the parts to be traced in the CAD software.

Making changes here and there, both for technical and constructional reasons, as well as incorporating some parts and shapes from other British-style traction engines, I produced the general outline seen in **Figure 1**. This drawing already shows the shapes of some of the plates to be cut, the four-shaft gearing, as well as a tentative arrangement of the boiler's tubes and fire-door.

The total length of the engine, when finished, will be 1,180mm, almost 4ft, while the width, measured over the hind wheel hubs, is a little under 600mm/2ft. At the time of writing, I estimate the final weight to be at least 120 kilograms, in other words 260lb. The boiler diameter is 160mm, or 6.3 inches – maybe a bit smaller in proportion than most typical British traction engine boilers, but I did happen to have a copper-nickel tube of that size 'in stock', so my choice was predictable...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"A big problem: how do I make the huge 450mm, 18 inches in diameter, wheels – twice what my little hobby lathe could handle..."

Figure 2 shows most, but by no means all of the parts that I have drawn in the CAD software. These are all to be cut with my friend's plasma machine. Our raw metal retailers normally supply steel plates in sizes starting from 1,000 by 2,000mm (3.3 by 6.6 ft) as delivered from their wholesalers, or sometimes even much larger than that, if the plates are coming directly from a steel mill. Since Kustaa's plasma machine 'bed' can hold material of a maximum size of 300 x 1000mm (1 by 3.3 ft), I paid the supplier to have the plates cut to strips of this size before delivery.

This also meant that I had to break up some of the largest parts of the engine into several smaller pieces of plate, later to be joined by TIG welding; more about that in a forthcoming article. Altogether, we used a dozen or so of these steel plate ▶

FIGURE 1

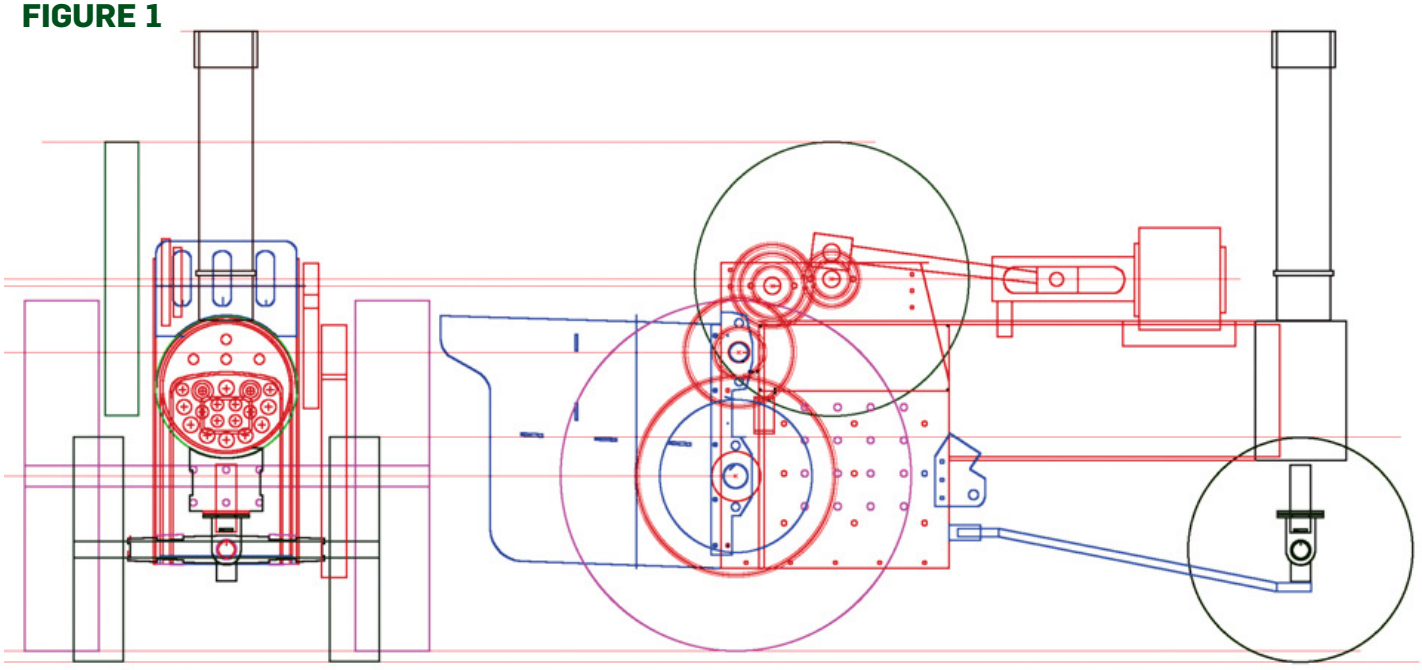
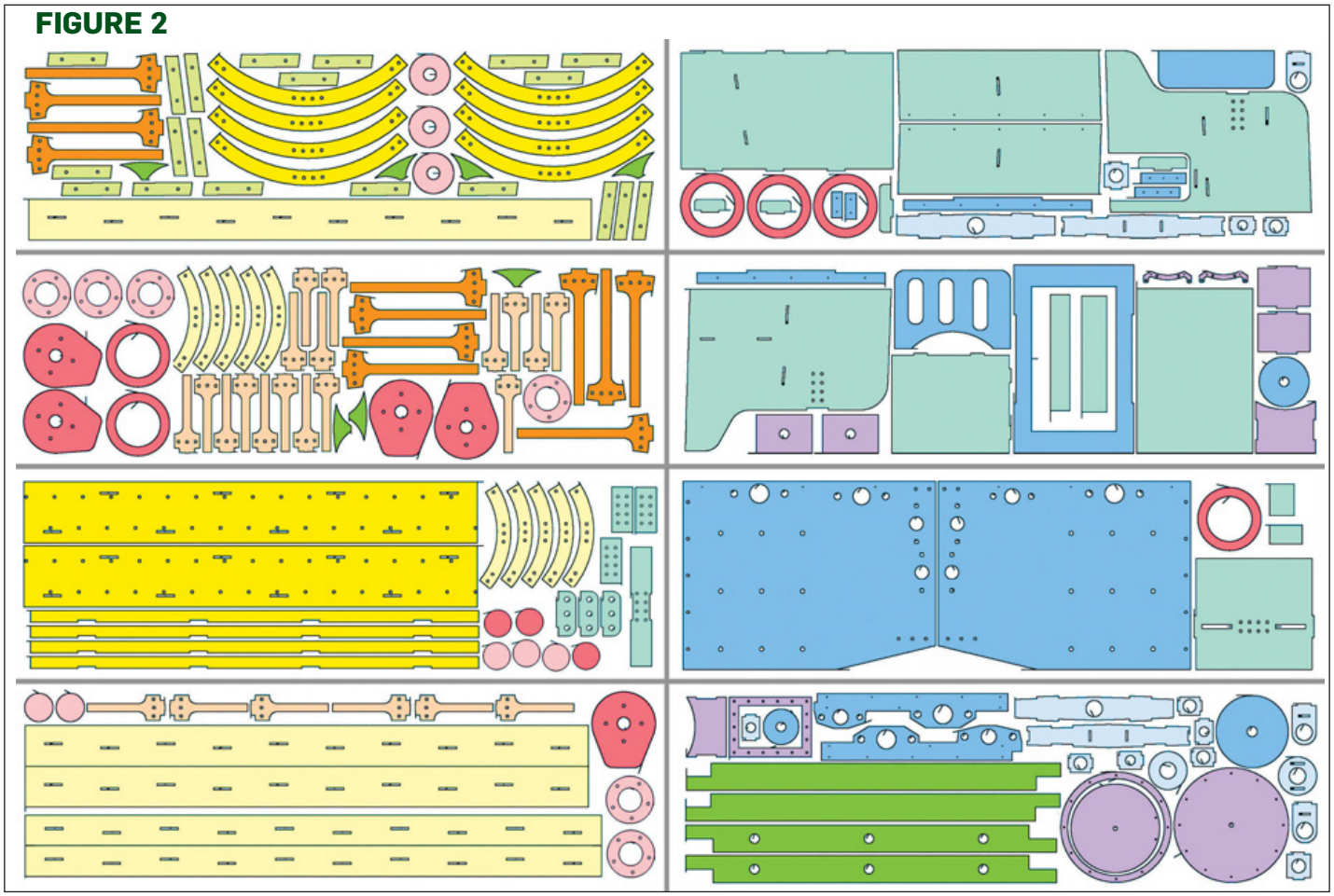


FIGURE 2



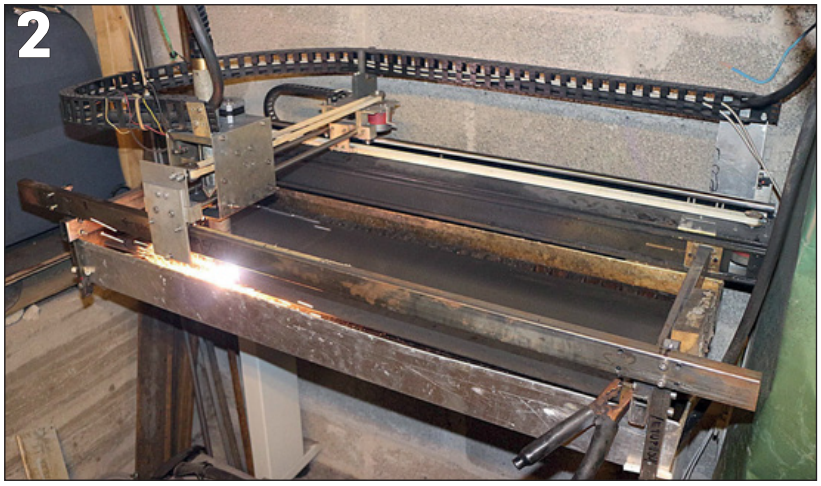


FIGURE 2: Some, but not all of parts needed for model. Colours represent use of parts – dark yellow, hind wheels: light yellow, front wheels: orange, hind wheel spokes: tan, front wheel spokes: light green, hind wheel strakes: dark green, flywheel: red, hind wheel hubs: pink, front wheel hubs: blue-green, cab: dark blue, horn-plates and transmission: light blue, front axle: violet, smokebox and saddle.

strips, weighing 7kg (15lbs) each. Only a small fraction of this material became waste, thanks to placing all the parts as closely as possible in the CAD layout.

Photo 2 shows the plasma machine when it has just started cutting, beginning at the lower left corner of the 3mm (a tad under ⅛-inch) thick steel plate. The cutting speed is around 35mm (1½-inch) per second, so it doesn't take very long to cut the whole plateful of parts.

The bottom of the machine contains a water tray, since there are a lot of sparks flying around, requiring protection both for the workshop (note the aluminum spark-arresting plate at the extreme right in **Photo 3** – it is an old offset printing plate) as well as for the operator and also the onlooker, in other words yours truly.

I'm smiling in the photo, but you can't see it because of the face mask – a necessity in the atmosphere of steam and metal dust generated in the cutting process! Ear protection was required too – the compressor and the plasma torch are extremely noisy. After we had cut five plates during one session, my mask was all brown with rust, **Photo 4**!

Photo 5 shows the parts cut from one single plate, ready to be picked up with a magnet (at this stage, the parts are hot), while **Photo 6** shows the waste that was left of five steel plates

after the parts had been removed.

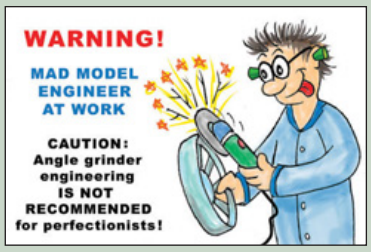
There is one finished part at right in the photo; the long strip with rectangular slits will become the rim of one front wheel. The slits will secure the outer ends of the wheel spokes. Many of the parts for this engine were designed with the same tab-and-slot method I used for my previous loco projects, making the final assembly a breeze, almost like putting together jigsaw-puzzle pieces!

TIG welding

The two most useful tools in my workshop are a TIG welder and – hold your breath now – an angle grinder! Together, they enable me to build relatively complicated assemblies in a very short time, albeit not with the precision that is required by most dyed-in-the-wool, true model engineers, who enjoy making museum-quality miniatures.

My TIG welder can provide 160 Amps pulsed DC, it has a HF 'spark' start of the arc – and it can also be used as a 'stick' welder by changing the electrode holder. Welding in TIG mode, it of course also needs a tank of Argon gas with regulator and valves. The total cost for such a system is around £1,500 these days, a lot more than when I bought it more than ten years ago. Cheaper units made in Asia are available, but they lack many of the features this EU-made unit has.

With TIG, some parts can simply be melted together, others need filler metal in wire form. In Photo 7, I've started fusing a steel strip to the inner ▶



■ I build simple engines that are intended to work (hopefully!), not to be displayed. I take short-cuts wherever I can, simplifying the design if it speeds up the process, and I get a kick out of devising and using novel, possibly untried, 'quick-and-dirty' methods of design and construction. If this is not your way of enjoying the hobby, I can only say, "to each his own" – I do admire models perfect to the last rivet, but I'm way too impatient to build any such myself!

***The Ed** adds: We are sure too that readers will realise that the cartoon above is in jest and that you should NEVER hold a part in this way for operations involving angle-grinding!*

PHOTO 2: Kustaa Nyholm's home-built plasma cutter can take plates up to 300 x 1000 mm. There is a shallow water bath under the bed.

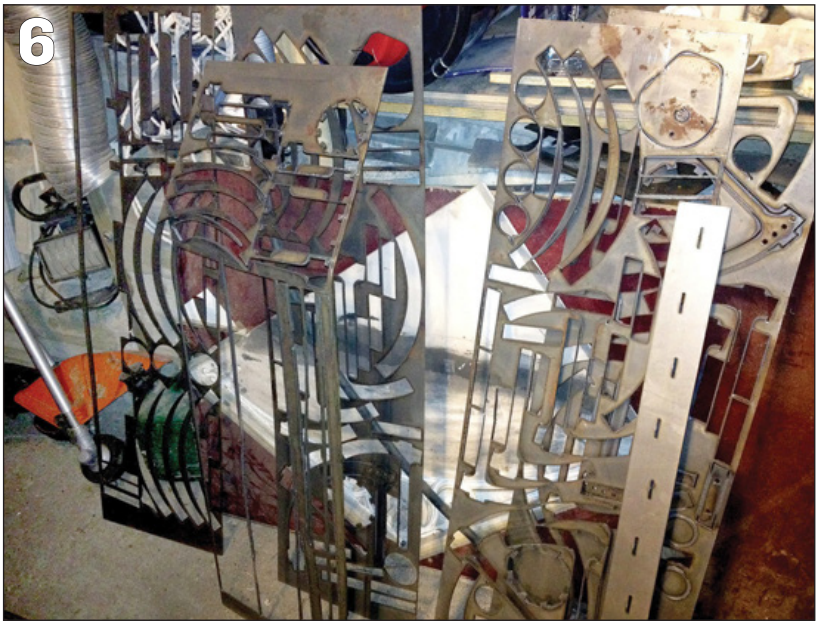
PHOTO 3: Note spark protector at extreme right: discarded offset printing plate prevents sparks flying around. Onlooker also needs shielding; as well as noise and dust protection, you should never look directly at the arc unless wearing a welding helmet.

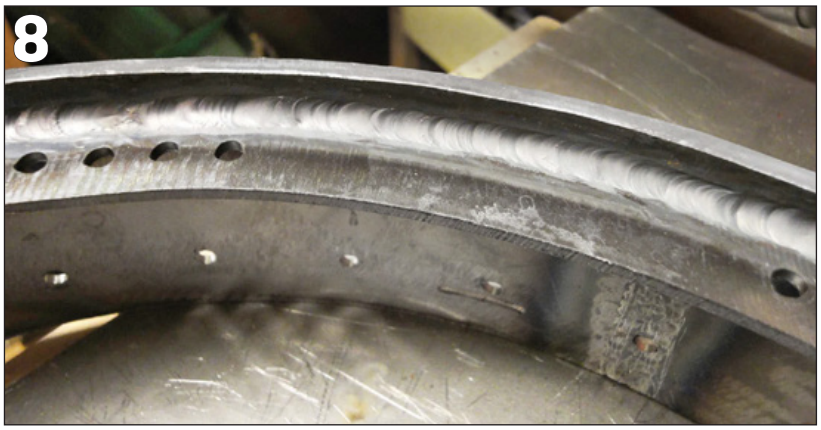
PHOTO 4: Face mask after couple of hours of cutting.

PHOTO 5: Single plate provides well over 40 parts, ready for assembly after cursory cleaning and removal of slight slag left by cutting process.

PHOTO 6: Efficient use of material – little left of plates after parts have been cut.

PHOTO 7: Beginning assembly of hind wheel fusing parts together, using TIG-welding torch.





edge of a rim of a hind wheel, using no filler – note the C-clamps holding the strip securely in place, thus avoiding any gap. Passing the TIG torch over the junction area, the pieces are securely fused together. The edge will later be smoothed with the angle grinder.

The two long and flat, perforated pieces which were needed to form one wheel rim (these parts are coloured dark yellow in the third section at left in Figure 2), were first joined together into one long strip by TIG welding (a complete piece, more than 1.4 metres/4.5 feet long, could not be cut in Kustaa's plasma machine), and then 'rolled' to circular shape in a professional metal workshop. The welded joint was of course cleaned up with the angle grinder before the rolling operation – any difference in plate thickness at a weld would wreak havoc in the rolling process! The final splice was again welded, in order to form a continuous, unbroken circle of steel for the wheel rim.

Note the flat 'ring' lying under the rim in Photo 7 – it consists of four parts, also coloured dark yellow in the top left section of Figure 2. In the photo you can also clearly see the welded joins connecting the four pieces into a circle.

I had ground the outer edge of this ring free of any imperfections, to be as circular as possible, and in **Photo 8** you can see it welded in place, under the aforementioned edge strip. Here I have used a substantial amount of TIG filler wire in order to get a nice 'fillet' in the weld, which imitates the slightly rounded inner corner of the original T-profile rims used in the full-size traction engines.

Uppermost, the photo also shows that I have tidied up the outer, previously fused 'double-thickness' edge of the wheel rim with the angle grinder. Note the smoothly ground splice of the wheel rim at lower right. The wheel will later be painted with a rather thick rust-proofing primer paint, so the remaining grinding marks and the slight unevenness of the welds will hardly be visible.

In this way, I was able to produce a reasonably round wheel, just from pieces of flat plate as in **Photo 9**. Here, only one side is finished, soon there will be another strip and ring welded to the back side of the wheel. Measuring the diameter at several points, I noted that this large wheel was no more than 1.5mm (1/16-inch) out-of-round anywhere – good enough for my purposes, considering the rough method of construction!

This photo also shows the TIG equipment: the yellow welding machine on the shelf, the automatically darkening helmet (almost totally blocking the view of the Argon tank and its regulator behind it), as well as the special TIG gloves, with fingers made from thin, very supple chamois leather. A TIG arc contains very intensive ultra-violet radiation, so properly covering all your bare skin is a necessity. I use a leather welding apron, since even a light-coloured shirt transmits enough UV to cause a good sunburn...

PHOTO 8: TIG-welded seam showing nice fillet of metal added in form of filler wire. Top edge of wheel rim has been cleaned up with angle grinder.

PHOTO 9: One side of wheel welded. Thanks to using inner circle of steel to shape rim, overall tolerance for roundness was held to less than 1.5 mm (1/16-inch).

PHOTO 10: Strakes added to rim, attached with two short pieces cut from 6mm (~1/4-inch) round steel, welded in place.

PHOTO 11: Author in his workshop, with assembled hind wheel. Smaller front wheels visible on floor.

PHOTO 12: Close-up of a temporarily assembled hind wheel, showing how spokes and strakes were made from flat steel plate.

Getting a grip

A very typical feature of British traction engines are the strakes on their hind wheels, absolutely necessary in order to get a grip in loose soil. On US engines, these were often made of angle iron, protruding quite a bit more from the rim, like the 'spuds' that can

be attached to British wheels.

There are 32 of these strakes on each hind wheel in my model. They were all plasma-cut from the same 3mm steel plate as the rims, and were cut with two holes each, aligning with holes in the wheel rim. The strakes are coloured light green in the top left section of Figure 2. Short pieces of round steel welded into the holes in the strakes were fitted into the holes in the rim, and again welded, now from the inside. **Photo 10** shows this, carried out halfway around on one wheel. The welds on the strakes were later ground smooth, of course.

"Any difference in plate thickness at a weld would wreak havoc in the rolling process..."

All in all, I needed four wheels; the two front wheels, at a bit under 280mm (11 inches) in diameter, are significantly smaller than the hind wheels, and have only 10 spokes each, instead of the 16 on the larger wheels, and they have no strakes. In **Photo 11**, among the mess in my tiny basement workshop, you can see all four wheels with spokes attached.

Photo 12 is a close-up of a tentatively assembled hind wheel; the hub is still missing. The hub will contain ball bearings – I plan to use only self-lubricating, completely sealed bearings in this project. The construction of the wheel hubs will be described in a later article.

In order to continue building the traction engine, I will next have to design and build the boiler, since, unlike its counterpart in a steam locomotive, the boiler is an important element of the mechanical structure holding all the other parts of the engine together. **EIM**

■ Jan-Eric begins building his boiler in next month's edition of **EIM**.

PHOTO EXTRA

■ When the Statfold Barn Railway held its '150 Years of the Quarry Hunslet' Gala over the weekend of 10th-11th July, it was good to see that the smaller versions of this so familiar narrow-gauge industrial loco were not forgotten.

Inside the Roundhouse museum at the line near Tamworth in Staffordshire was an impressive quartet of 7¼-inch gauge Hunslets, of three different types. Leading the display were a pair of Penrhyn 'main-line' locos, 'Charles' in original spec as an 0-4-0 with a cab back, and 'Blanche' as it first ran when sold to the Ffestiniog Railway, with a tender but before the addition of a pony truck making it a 2-4-0.

'Cackler' is an example of a quarry engine that worked the tramroad connecting Dinorwic quarry to its transhipment point, while 'Rough Pup' represents one of the numerous 'Alice' class that worked the Dinorwic galleries.

Joey Evans took the pictures, inbetween crewing somewhat larger Hunslets on the Statfold running line.

Another quarter master

Australian reader of EIM Adrian describes his particular way for ensuring the essential accuracy when quartering locomotive driving wheels.

BY **ADRIAN KRUGER**

PHOTO 1: Shoulder turned to aid location of tyre on wheel.

PHOTO 2: Wheels with plug inserted to aid broaching and boring of the crank pin.

PHOTO 3: Bore of wheels after broaching and boring for crank pins.

PHOTO 4: Recess turned in wheel for counterweight.

PHOTO 5: Machining the axle boxes as one before parting them.

PHOTO 6: Axles during assembly – grease nipples for lubrication have been added, these are trailing set.

Photos by the author

After reading about wheel quartering from several sources including Julian Harrison in the April 2021 edition of EIM and whilst constructing my own locomotive, I have come up with the method described below. It negates the need for a jig and is quicker and easier and I believe just as accurate as others.

When the castings for the loco I'm building, a London & South Western Railway Adams 415 class 4-4-2T, arrived, the first thing to do was to rough machine them to prepare them for the fitting of the steel tyre. A shoulder was turned on the inside of the wheel to aid the placement of the tyre on the wheel during the shrink-fit operation (Photo 1).

After the tyres had been shrunk on to their wheels each side was then turned flat. The next step was to insert a plug to hold them together while they were tack-welded to aid the subsequent broaching and the boring of the crank pins (Photo 2). The wheels then became a front set and a rear set.

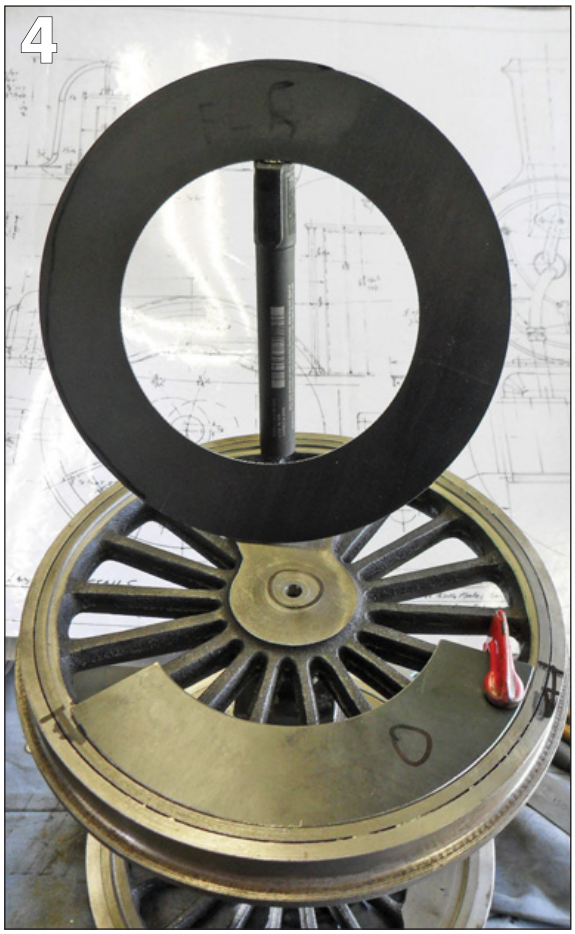
Marking for certainty

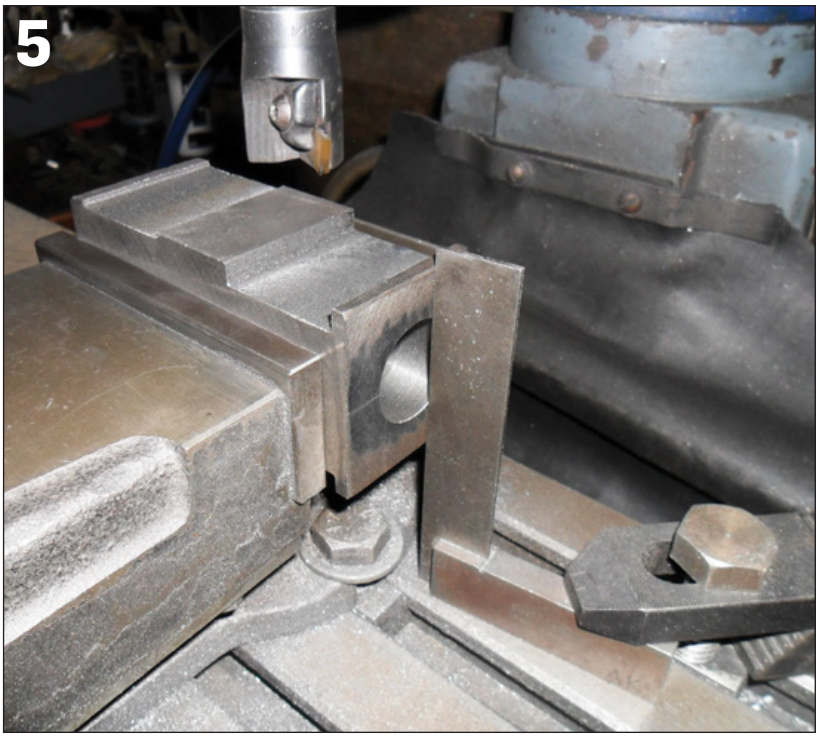
I mark the axle boxes so that all equipment relating to them will be indicated roughly the same in that area. For example the designation FLC, 'front left coupled', will indicate Front for the axle box, Left for the left side of the loco while Coupled designates this as the rear of the driving wheels.

I set the wheels up under a CNC boring machine. After the centre plug was 'clocked' to ensure it was central to the axis of the machine the stroke length was programmed into it and the crank pin holes where bored (Photo 3).

They were then returned to the lathe and the locating recess for the counterweights was machined (Photo 4), these then becoming a matched set. Following this process they were separated and prepared for assembly on the axles.

Next the axles were turned – my method is to use a four-jaw chuck and as an aid to memory to write the measurement required on the work piece after the first end is faced. I mark off and place a small centre





punch mark on the required measurement and when I am at the required length half the mark will be visible, remembering to turn the axles to the limits required for a push-fit and the use of Loctite.

After the axles are turned the keyways were cut under a milling machine with the aid of a chuck, to hold the axle mounted on a dividing head. The first keyway was cut then was removed, turned end-for-end, lined up at zero degrees and rotated though 90 degrees. Then the second key was cut.

"when I am at the required length half the mark will be visible..."

The axle boxes were turned and machined (**Photo 5**) as one unit with all holes being drilled and taped before parting. Then they were checked for fitting in the correct location as per markings.

Assembly

The assembly was cleaned with Loctite primer and assembled with keys and grease nipples in place. Then after assembly the 'gallery' holes were plugged with grub screws. (**Photo 6**).

The axle was then left for the Loctite to dry before the others were secured in place. The grease-nipple gallery holes are to be plugged with Allen screws.

I found this method of quartering to work well when assembling the connecting rods between the main driving and the other coupled wheels – as mentioned with my method no jig is required and the resultant wheels are a matched set. **EIM**

CONTRIBUTING TO EIM

Adrian's piece is a typical example of a reader realising a technique might be of interest and use to other readers too.

Contributing to **EIM** is really easy. You simply need something that your fellow readers will enjoy, whether it's a build project (rail loco, road engine, marine, stationary?), tools, techniques, anything of interest to model engineers.

Simply get everything down on a Word file or similar, and we'll make it suitable for the magazine – you don't need to be a professional writer.

Photos of course are vital but again not an issue – we need as big a files as possible, but if you have a modern smartphone its camera will produce all you need.

Send everything to editor@engineeringinminiature.co.uk and we will do the rest. And we pay for all feature material used.

Any questions? Feel free to drop the editor a line at the above address.

Following a bio-coal agenda?

Your article in the August edition ('E-coal, a possible future saviour for steam locomotives?', *General News*) read more like a press release to promote a certain product rather than the balanced review that your readers deserve.

You give no reason for dismissing the other two smokeless fuels tried.

The promoted product is actually up to 50 per cent crushed olive stones, not husks, as stated, the rest is anthracite and typically a small amount of some binding agent.

The manufacturers claim "up to 40 per cent less CO_2 emitted than conventional house coal," but unless this claim is explained I would not be surprised if this is based on the assumption that the olive stones are considered to produce no net CO_2, a questionable assumption. Instead of being dumped the stones could usefully be burnt to raise power at source.

You also claim that the tests measured "exhaust performance", what is that? Smoke?

We aren't going to make progress unless we have all the information, advertising is often about selective use of facts to create the desired impression. ***F Wilson***

The Editor replies: A somewhat harsh response one feels to what was not an article or indeed a review in the August issue, but the reporting of a news story based on a press release issued by the Heritage Railway Association and widely reported across the railway industry.

As mentioned in the report our sister magazine *Narrow Gauge World* followed up the press release with an in-depth feature on these tests, consulting the general manager of the Bure Valley Railway where the trials were conducted. Three varieties of bio-coal were trialled, all supplied for the trials by the same producer but of different types.

As mentioned in the news report a great deal of careful data was taken using electronic measuring devices, as well as making use of the long-established skills and experience of the locomotive crew. The data taken included measuring smoke, yes, but any **EIM** reader will know that 'exhaust performance' means a lot more than smoke, the draw through the blastpipe and up the chimney essential to the successful performance of any steam locomotive.

The other two smokeless fuels were not "dismissed" as suggested. While the Ecoal50 was deemed to match the performance of the Welsh steam coal used as a baseline for the tests, the data suggested that the second bio-fuel, Homefire Ovals, produced 85 per cent performance compared to the Welsh steam coal, and the third, Briteflame, between 80 and 85 per cent.

The Ecoal50 proved slightly more economical than the Homefire, by around half a bucket per trip on the line, while as well as not matching the performance of the others the Briteflame produced a lot of ash, more than six times that of the Welsh steam coal, and covering both loco and carriages in a thin film of dust.

Based on this it is no surprise that the Ecoal50 was declared the winner but this does not mean that all steam users will be switching to it, and we dis not say they will – the headline to the report includes the word 'possible' and a large question-mark. Equally we don't report the claim of up to 40 per cent emissions savings as proven fact – we only mention it in a direct quote from those involved in the tests.

ABOVE: Bio-coal producing what was described as an even fire bed in the Bure Valley Railway's locomotive 'Blickling Hall', on which the trials were conducted. *Photo: BVR*

This was one test, with a whole lot more to come focusing on a wide range of considerations, led by emissions of course but also considering cost – bio coal is currently around £150 a tonne more expensive than traditional steam coal.

What is certain, however, is that these trials must take place – the entire heritage steam industry produces just 0.023 per cent of all UK carbon emissions but that does not make it any less important that we look for ways to reduce our carbon output.

We are delighted since publishing our report to hear of model engineering societies planning to conduct bio-coal trials – we will follow their experiments with interest and continue to report such trials in our pages.

So just how hard are your jaws?

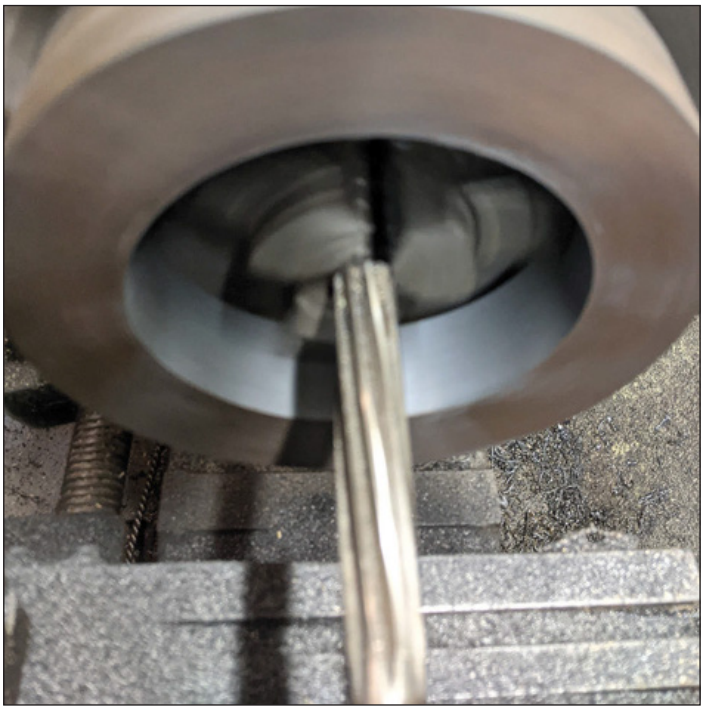
Lots of interesting workshop stuff from technical editor Harry Billmore in the August **EIM**, please keep it coming!

However, I was horrified to see Harry using an expensive reamer to true up his chuck jaws, which are probably hardened.

A much better method is to put a round aluminium bar in the tailstock chuck, and coat it with fine grinding paste. Then enter the bar into the chuck and lightly tighten the jaws onto the bar, then run the lathe at a slow speed whilst working the bar in and out from the tailstock.

After grinding and cleaning up, put a piece of steel rod of smaller diameter, preferably precision ground mild steel (PGMS) in the tailstock chuck, and coat it with 'Hi-spot' blue. Enter it into the chuck and tighten the jaws onto the rod, then release the jaws and remove the rod. If the operation has been successful, there will be a blue line along the inside of each jaw, from front to back.

I've used this method to restore a worn chuck, and can confirm that it works! ***Ron Head***



Tech-ed Harry replies: Thanks to Ron for his letter and his concerns! He offers a perfectly valid method of carrying out this operation that will no doubt give good results.

However I can tell him that the chuck jaws on my lathe are actually not hard at all – a reasonably soft scriber will mark them. So I was quite safe in using the reamer method and I did not ruin a reamer in the process!

The Farmer's Engine in print

I refer to the letter from Neil Smith in the July 2021 issue of EIM, seeking information on the 1849 Willis Farmer's Engine. There is a chapter devoted to this engine in *Traction Engines Worth Modelling* by the late W J Hughes, published by David & Charles. The book includes a general arrangement drawing which gives the overall dimensions.

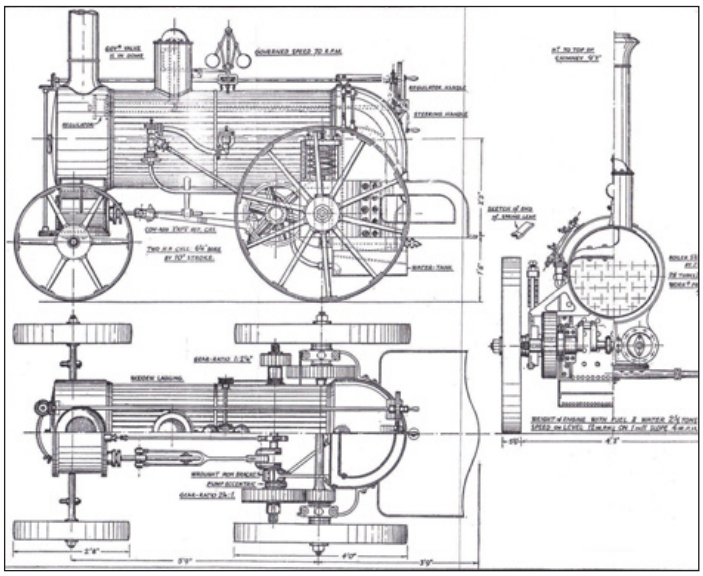
Mr Hughes mentions that he obtained the information provided from sources such as the *Practical Mechanics* journal and the book *English and American Traction Engines* by W Fletcher. Perhaps the book by W J Hughes was the inspiration for the model that appeared in 1993.

The farmer's engine is also described in detail in The Development of the *English Traction Engine* by R H Clark (published by Goose). This latter material mentions the risk of accepting early engravings as accurate. Apparently they rarely are!

I trust this information will be helpful to Mr Smith in his quest.

Neil Read

The editor replies: Thanks to Neil for this very useful information.



A quick look at the David & Charles website suggests that the company no longer publishes W J Hughes's seminal work (even the Ed had a copy many years ago, and to this day wonders what became of it...), but an equally quick Google search brings up a host of inexpensive used copies available.

Helpful sources to keep going in the workshop

I recently attempted to buy some replacement parting-off inserts for my Q-cut parting-off tool that I purchased from Greenwood Tools many years ago.

As you are probably aware (from the firm's website) Greenwood has recently ceased trading (*also reported in the May edition of* EIM *and due to fallout from the Covid pandemic – Ed*).

Without replacement inserts the tool is useless but happily I was able to talk to the helpful proprietor of Greenwood who provided me with advice which enabled me to purchase replacements – the following information may be of use to readers.

Bit Details: Sandvik, Q-Cut Parting Insert N 151.2-250-5E 1125 Carbide

Bits Supplied by CR Hollands of Stroud, Tel 01453 839 600

Nev Boulton

What if I'm not really into steam engines?

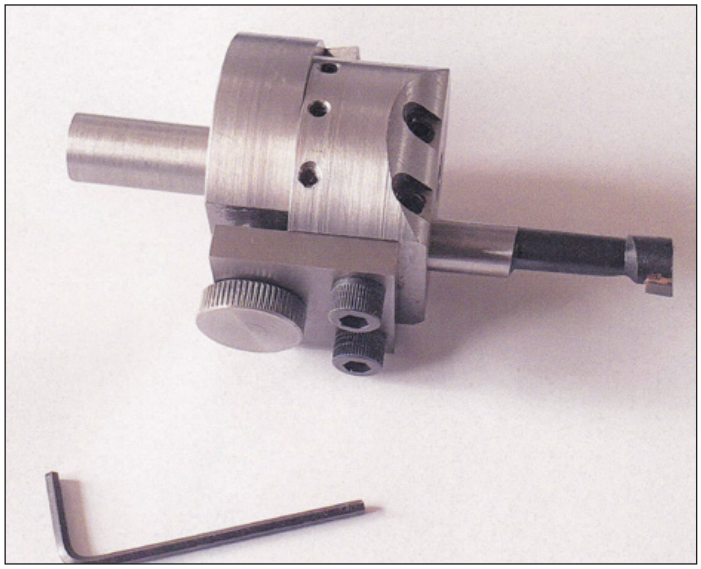
I consider myself a model engineer, but I have precious little interest in steam engines and I wonder if I am in the minority?

Most articles in magazines, EIM included, do seem to focus on railway engines, with some road locomotives and the odd stationary engine thrown in.

Myself, I am into clockmaking – now I consider this engineering and of a very technical nature, but perhaps it is not 'miniature', or 'model' and so earns scant coverage? I would very much like to see more features on clockmaking in your pages. ***Mike Goldsmith***

The editor replies: Mike, I would very much like to see more clockmaking in EIM too, along with the often neat engineering that goes into the marine modelling scene. I suppose one could argue that a clock is not a model but its engineering is certainly miniaturised and I know of interest to many – I recently had a reader showing me the many clocks he'd made alongside his 7¼-inch gauge King loco...

The simple problem is, we don't get nearly enough articles on clocks sent into us. We do have one interesting feature coming up, we are just sorting some extra photos for it, but we would like to see rather more...



Inspired to finish my own boring and facing head...

Graham Meek is to be congratulated on the quality of his design and tool-room work for the boring and facing head described in the July and August issues of EIM.

I can only marvel at the details but his articles did encourage me to finish my own compact boring head, so thank you!

Neil G Heppenstall

The editor replies: Nothing pleases us more than to receive evidence that the features we produce each month in EIM encourage our readers to get into their workshops!

If you have produced a tool, or an engine, in your workshop based on what you have read in our pages, then write in and tell us about it!

Model engineering subject to raise or question to ask? Send your letters to the editor at 12 Maes Gwyn, Llanfair Caereinion, Powys, SY21 0BD or by email to editor@engineeringinminiature.co.uk

Midland show cancelled by Covid again and London also off

ABOVE: For a second successive year we won't be seeing scenes like this in London in January. *Photo of the 2019 event by Phil Parker*

The fall-out from the Covid-19 pandemic has seen the Midlands Model Engineering Exhibition cancelled for a second successive year, and its sister event in London has also been called off.

Organisers Meridienne Exhibitions had scheduled the event, which is traditionally sponsored by EIM, for 14th-17th October at its usual venue of the Warwickshire Event Centre. But on 19th July exhibition manager Avril Spence announced that "with deep regret" the show could not go ahead due to the ongoing uncertainties of Covid-19 pandemic.

"This difficult decision is taken despite a real determination by the Meridienne Exhibitions team, trade, clubs, societies, exhibitors and other supporters, all striving to continue to deliver the usual high quality and successful event during this very difficult time," Avril said.

"Over the past few weeks, we have been in the excruciating position of considering every possible scenario to see how we might be able to proceed, but sadly the risks of holding the event now far outweigh the reasons for going ahead."

Avril added that rising cases of Covid-19 and the risks that widespread illness and self-isolation could have on everyone involved had made the decision inevitable.

"We have navigated our way over the past 16 months through obstacles, but now feel that the odds are stacked against us and we are no longer in a position to be able to proceed safely with the unknown government Covid-19 requirement for Autumn/Winter ahead," she said.

Meridienne has also decided to cancel the London Model Engineering Exhibition which was due to take place at the Alexandra Palace in January. The two sister shows are closely linked to each other and organisers concluded that it would not be practical nor financially viable to proceed with the London event.

"Having presented model engineering and other exhibitions for well over 40 years these decisions represent a tremendous disappointment for all but hopefully the situation will be different in later 2022 and we may again present a model engineering exhibition," Avril concluded.

Yeo wheel appeal celebrates success

Fairbourne Railway Lynton & Barnstaple-style 2-6-2T 'Yeo' will be getting its new wheel sets after an excellent response to the 12¼-inch gauge line's urgent £10,000 appeal.

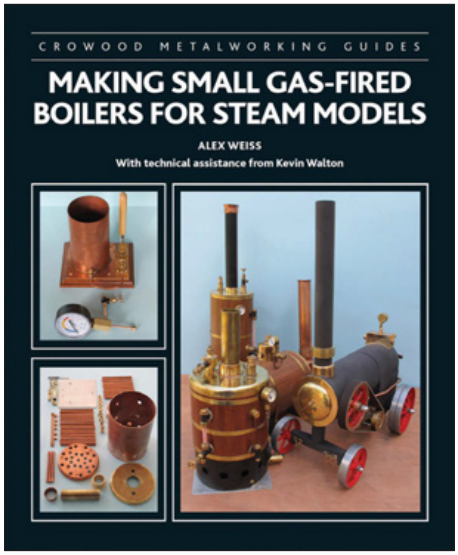
Fairbourne chief engineer and EIM technical editor Harry Billmore described in his column in the July issue how the discovery of cracks in the loco's wheel sets had resulted in them being written off sparking the appeal.

"We would like to thank everyone who donated so quickly and in such a generous manner," a statement from the Fairbourne directors said. "We are expecting the new wheel sets and axle boxes to be delivered very soon, Allowing Yeo to return to service in time for the railway's busiest period and reducing the reliance on the other two steam locos.

Making Small Gas-fired Boilers for Steam models

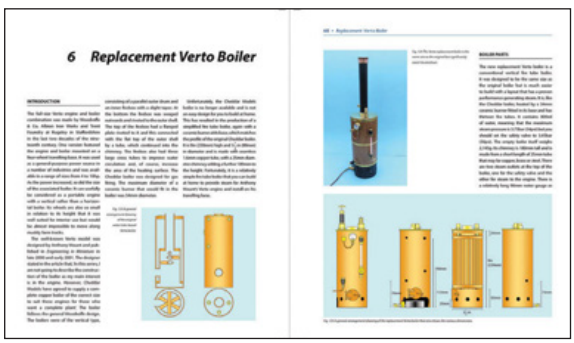
By Alex Weiss – technical assistance from Kevin Walton

Yet another in the well-known and respected series of Metalworking Guides published by Crowdood, and one that will be very useful to readers working in the smaller scales, especially those perhaps put off by building their own boilers for gas firing.



The book describes how to make two vertical and two horizontal copper boilers with a capacity of less than three-bar litres, and of course the techniques described can easily be adapted to suit designs for a particular modelling project..

Chapters cover tools and equipment required, important safety considerations; how to work the various materials to make parts; step-by-step instructions on the technique of silver soldering; testing plus a review of various sizes and shapes of gas burners and how to connect them.



Instructions are given for building replacements for the Verto boiler, a vertical boat boiler, a portable-engine boiler and a Cornish boiler with Galloway tubes. Guidance on safe and efficient operation is also included.

The text is very descriptive without becoming confusing, and with more than 285 colour photos and diagrams included, the book will certainly take the mystery out of small boiler making.

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Events overload at busy tracks

Lots of action to report from the clubs this month, and we love being able to write that...

COMPILED BY **ANDREW CHARMAN**

If you read your **EIM** in the correct fashion (in other words in the totally opposite manner to myself who has a habit of first flicking through magazines from the back to the front...) you will already be aware that this issue has a definite theme of events, very welcome after so long without steam-ups and rallies.

The *Club News* pages start in similar vein, as we've had a flurry of event notifications come into the office over the past couple of weeks. Clubs are clearly taking the opportunity of easing restrictions to get back to doing what they enjoy, while of course earning some much-needed revenue from passenger rides.

We are not quite in the position yet where we can rouse the *Club Diary* pages from their now 17-month hibernation, but we hope that if the situation continues to improve we will be reawakening them soon. If you are a club diary secretary now getting back into the habit of planning a forthcoming calendar of meetings and events, please send details into us at the **EIM** office (by email to editor@engineeringinminiature.co.uk or to the editorial address on page 3). Once we have enough material to fill it, the diary page will return!

Poster art

Of the 'coming soon' events notified to us, the efforts made by the **Bromsgrove SME** for its open day on 5th September stand out, with one of the club's members creating a poster for the event, reproduced above right, in the style of those very collectable items that used to be produced by the railway companies back in the 1930s. Bromsgrove chairman Peter Maybury tells us that the day is "for all model engineers", the club track alongside the Avoncroft Museum of Historic Buildings offering gauges to run on that range from 32mm (16mm scale) to 5-inch.

If you have picked up your **EIM** immediately upon publication you swill till have time to enjoy a Standard Gauge Running Day on 21st August at the Wythall Miniature Railway, which is run by members of the **Elmdon ME** at Transport Museum Wythall, south of Birmingham.

Locomotives promised to be running on the 3½/5/7¼-inch gauge track, on what will be the Wythall club's first such day, include an LMS Black 5, GWR King, dock tank and Prairie tank and a Southern Railway Q class, plus hopefully several visitors.

Standard museum entry charges apply with a supplement to ride the trains. Details of the museum, which itself is well worth a visit, can be found at www.wythall.org.uk and information on the railway at www.wythallsteamrail.com.

As mentioned in the July **EIM** this is an interesting club, a host of veteran members working with a very young chairman – we paid a visit to Wythall recently and a feature on the club and one of its oldest but most active members will appear next month.

Social appeal

Your editor was first alerted to the Wythall club on Facebook and while I know some readers regard social media as a force of evil, it can be a great source of news, even on the model engineering scene! For example I've learnt this month that the **North Weald MR** is planning a major extension to its running line at the Harlow Garden Centre in Essex and has started a crowdfunding initiative to help finance the work.

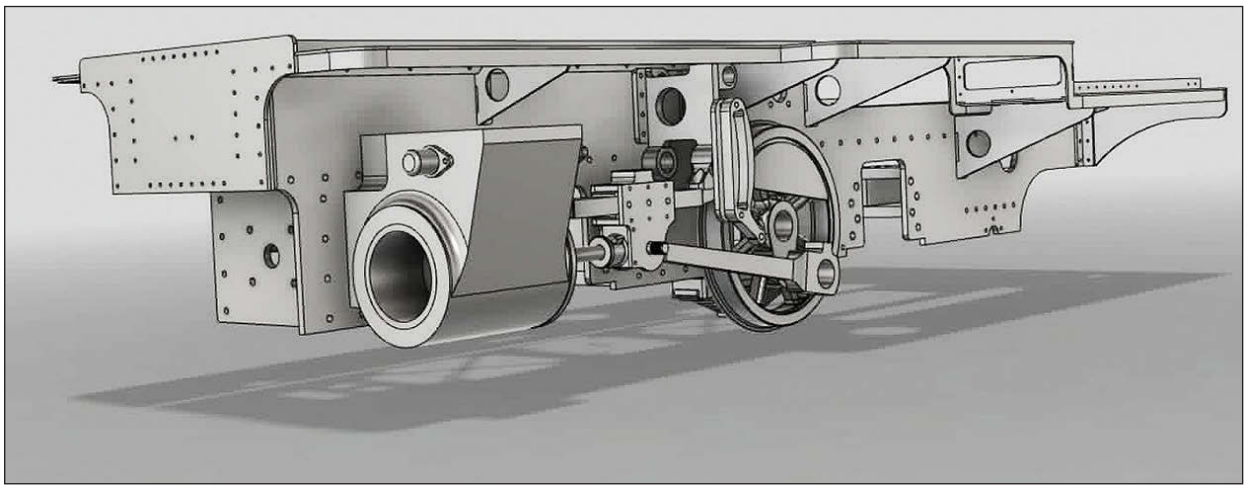
This organisation started as a group of volunteers at the Epping Ongar Railway standard gauge line, running trains on a portable track at EOR events while looking for a permanent site. They reached an agreement with the garden centre owners early in 2019 and the first trains ran later that year.

Now the line is moving into phase ▶

"While some readers regard social media as a force of evil, it can be a great source of news, even on the model engineering scene..."

ABOVE RIGHT: Recalling past times on the big railway, Bromsgrove's poster for its open day.

BELOW: The first standard gauge running day at Wythall Miniature Railway will feature this Black Five amongst its loco roster. *Photo: WMR*



"Sharpening high-speed steel to prevent tool chatter during the finishing cut is a common exercise for the old hand but it's a revelation for the young ones when they get it right..."

2, which will involve a quarter-mile extension to its existing half mile of 7¼-inch gauge line. They are hoping to raise £10,000 – details are at https://gofund.me/fd22eff0

So to the latest selection of club newsletters and we are delighted to make contact for the first time with another club across the globe, the **Rand SME** in Roodepoort, Gauteng in South Africa.

The quarterly newsletter *The Smokebox* is apparently a new venture in itself, and we like the comment from the editor on the front page, urging members to contribute; "Not for the club, or for the newsletter, but for the young chaps to guide and help them in their model engineering endeavours. Remember, something as simple as sharpening high-speed steel to prevent tool chatter during the finishing cut is a common exercise for the old hand but it's a revelation for the young ones when they get it right." Absolutely, exactly the mantra that **EIM** follows...

South Africa is feeling the effects of the pandemic right now and the Rand newsletter reports the latest efforts being made to allow the club to continue to run trains at its track. It also appears to be a busy club, the newsletter detailing lots of build projects by a wide number of the membership. We were particularly taken by Patrick Ackerman's build of a G3/3 narrow gauge tank loco that ran on the 750mm gauge Waldenburg Bahn in northern Switzerland. He's making good progress with what he describes as a popular model amongst European builders, and he's certainly been aided by some impressive CAD drawings, one of which is on this page.

Modern image

Many people looking from the outside at our vocation regard model engineers as mostly elderly men building models of ancient steam engines, but of course we know that both those modelling and the subject matter they choose to build is of a much wider range.

Nowhere is this more obvious than on the cover of the latest *Bristol Model Engineer* from the **Bristol SME**, where the club's newest locomotive is illustrated – 'Brunel' is a 7¼-inch gauge representation of a thoroughly modern Class 800 high-speed driving car as running on today's Great Western lines.

The newsletter includes an article from member Bob Lilley on the building of the model, which was commissioned by the club committee in 2019 – with the number of steam locos and drivers available for public running days steadily decreasing and the club's two existing i/c locos 10 and 20 years old respectively, it was felt a new reliable loco was needed.

To make the loco as robust as possible the design was kept simple with many proprietary components used. It's battery powered with two power bogies, each housing a pair of 750W DC electric motors.

Most difficult apparently was the distinctive shape of the body, the main part built in steel and the dummy bogie fronts, cab and nose all 3D printed. It took two attempts as the first design wilted and distorted in a heatwave last year! A new, stronger design has since been produced and the loco is now ready for service – as you'll see from the photo certainly looking the part and bringing a real modern-image theme, which of course children will be most familiar with, to Bristol's public running days.

Pen is mightier...

An almost afterthought mention in the July edition of *B&DSME News* from the **Bournemouth SME** made your correspondent smile, editor Brian Merrifield asking if any members make their own pens? Apparently kits to do just that are widely available – you turn the wooden bodies, polish them with friction polish and then assemble. "They make nice gifts for the nice people in your life," says Brian and we agree – it's a typical trait of a model engineer, instead of buying some plastic rubbish from Tesco, making something much more attractive, with a bit of personality in it...

The Journal from the **Society of Model and Experimental Engineers** always offers a lot of interest and the latest August edition is no different, with wide-ranging subject matter that reflects the equally wide-ranging interests of SMEE members.

Particularly fascinating is a 'Picture from the Past', actually an engraving taken originally from *The Engineer* of July 1867 (reproduced here) and illustrating the cylinders and motion installed in HMS Sappho, a wooden sloop built for the Navy. This ship was to have four boilers and

ABOVE LEFT: Rand SME member Patrick Ackerman's build of a Swiss narrow gauge locomotive is being aided by some impressive CAD work. *Image: Patrick Ackermann, RSME*

LEFT: The latest club loco at Bristol is as modern image as they come. *Photo: BSME*

16 furnaces, with cylinders of 70-inch diameter and three-foot stroke. Quite a beast – the Ed's curiosity about what became of it led him to Google where he found a succession of Sapphos, but the most likely candidate appears to have been launched in November 1867, by which time it had been renamed HMS Eclipse. It was apparently sold out of service in 1921...

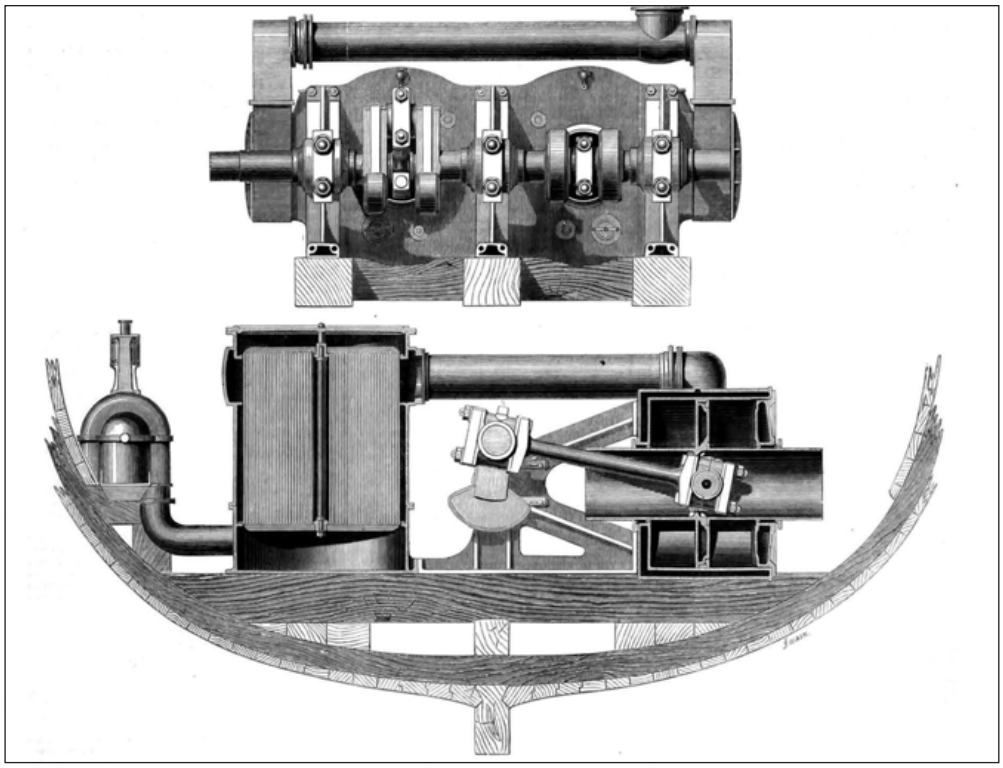
Container pressure

Further on in the SMEE *Journal* and continuing the marine theme, there is an eye-opening piece by naval architect Guy Gibbons on the challenges of designing hulls for container ships. The problem it seems is that by stacking loads of containers on top of it, the hull effectively changes from a box section to a U-shaped channel, putting huge stresses on the tops of the 'U' at certain points when the ship rides over waves. A phenomenon called 'hogging' is when the front and rear (sorry, bow and stern...) of the hull are forced downwards compared to the middle, leading to a risk of cracking. They can also suffer from the opposite effect, however, 'Sagging', when the centre of the hull is forced down compared to the ends and thus compresses the top of the centre increasing the risk of buckling. Special structural measures have to be built into the design to prevent this – fascinating stuff...

The latest *LeedsLines* from the **Leeds SME** includes on its front cover a happy picture of pre-season boiler testing under a cloudless blue sky, and inside chairman Jack Salter reports further encouraging progress that could soon see the club returning to its former track site of the now decommissioned Eggborough power station. Your editor read this having only 24 hours earlier watched a BBC news report of four of the power station's eight 300ft high cooling towers being demolished in dramatic fashion by means of explosives on 1st August – plenty of fill available for the new track bed then...

The newsletter also reports the club's first face-to-face committee meeting for 12 months in April, and members being keen to get back to holding their Monday morning social meetings – at the time of the newsletter going to press they were waiting to see if Boris Johnson would go ahead with his promised lifting of restrictions, which of course he did so hopefully those meetings are up and running again.

The July newsletter of the **Lincoln & District ME** is full of good news, particularly the restarting of public running days in July. "We normally start running trains at 9am but there was such a queue on 4th July, our first day of running, that we started at 8.30," reports editor Neil Grayston, adding that extra running attached to organising car parking at a car boot sale in the park location of the club's track, which always includes a donations bucket, has seen a welcome upturn in finances – not before time we don't doubt...



ABOVE: 1800s engravings of engineering subjects never lose their fascination *Image: SMEE – image from* The Engineer, *1867 via www.gracesguide.co.uk*

BELOW: The first public train at Rugby ME in 20 months pulls away. *Photo: Howard Brewer/RSME*

Like in most clubs, Lincoln members have certainly not wasted their lockdown time, the newsletter featuring not one but two virtually completed Fowler 4F 0-6-0 locos.

Back to the events, and the **Rugby ME** decided to hold a celebratory opening for the extension to its raised track on 24th-25th July, inviting model engineers to come and have a go on the 2½/3½ and 5-inch gauge line. It's no surprise they wanted to show it off, as not only does the extension double the running length from 1100ft to 2400ft, but as we reported in the July issue it includes a seriously impressive girder bridge built by club chairman Aubyn Mee.

Easy does it

The June edition of the Rugby newsletter is as ever packed with activities at this ever-busy club and we particularly noted the way members dialled back into public running. June saw the start of 'Ease In' events, welcoming to the track site just a few public visitors who had pre-paid. "No tickets, we just run trains for two hours and they have as many rides as they wish," reported newsletter editor and club secretary Howard Brewer. "We have had some very favourable feedback from these, but more ▶

importantly it has allowed us to get back into public running again with minimal stress."

Public visitors to Rugby later this year could also enjoy a ride behind yet another impressive locomotive. Member and regular **EIM** contributor Edward Parrott also mentions in the newsletter that the East African Garratt 'Mount Kilimanjaro', which has been under restoration for some months, has passed its boiler test and is almost ready for service.

As briefly mentioned last month, **Chingford ME** continues to see a return to normality, their track having been open and running every Sunday since April, and newsletter editor Chris Manning reports that passenger numbers have been particularly good, with on one Sunday more than 280 passengers carried despite the Covid rules that restrict capacities on trains.

Noggin and natter

Chris also reports that club members are now returning to the park for Wednesday evening meetings; "nothing specifically arranged during the evening, we are just using the time to have a chat over a cup of tea and training the junior members which has been progressing well." And who needs any more than that?

Club newsletters produce so many interesting articles, some of which of course go on to appear in our pages, and **EIM** correspondent Ted Joliffe scores again in the Chingford newsletter with the intriguingly titled 'Parting off and screwcutting are doddles' – "the skill is built into the machine, these few simple dodges will help make you its master," Ted adds before describing a host of potential problems and their solutions.

The piece is useful one feels not just to novices but more experienced members who probably won't admit they read the article out of more than just casual interest... (I still have nightmares about parting-off...)

The **Bradford ME** also restarted its public running in July and reported "a steady stream of passengers, young and old."

The Bradford newsletter has been highlighting members' lockdown projects and the latest features a 3½-inch gauge loco built by Jim Jennings – it combines a small commercial engine with a Meccano chassis to produce something that – well it's different! Unfortunately we couldn't obtain a picture in time for this month's pages but hopefully we'll print it next month.

Finally I smiled (yes, again!) at the description of a footplate turn on the 2ft gauge Welsh Highland Railway in the latest *Criterion* from the **High Wycombe ME**. For many of us such things are just beginning to become familiar again – before the pandemic your editor was a footplateman on the Welshpool & Llanfair Light Railway – last month he lit up a steam engine for the first time since 2019!

It wasn't on the W&LLR mind, but you guessed it, on the Fairbourne during a workshop day with our tech ed Harry. I didn't get to have a drive though – not yet... **EIM**

ABOVE: The opening of the Rugby club's extended raised track attracted a visitor with a fine 2½-inch gauge LMS Duchess. We don't see enough 2½-inch gauge locos in our pages... *Photo: Rugby ME*

BELOW: One more from *John Arrowsmith*'s visit to the Echills Wood Standard Gauge Rally, brothers Tom and David Hughes from the Cardiff Society demonstrating that model engineering can be a pastime for all the family...

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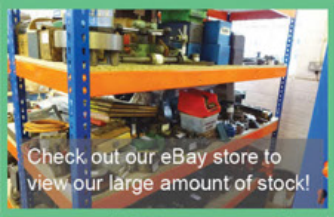

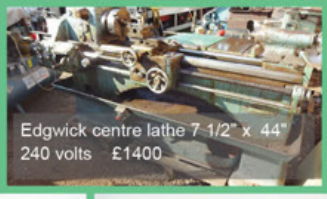

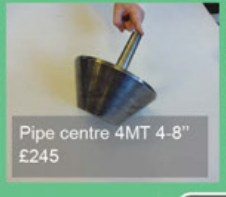

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