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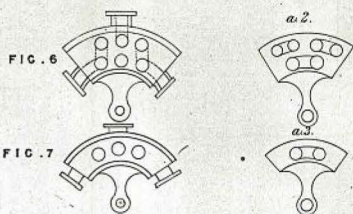


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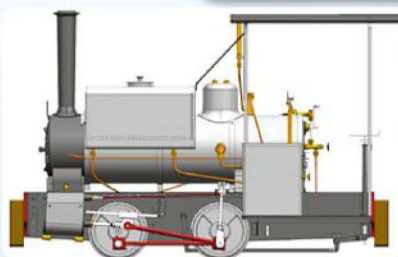
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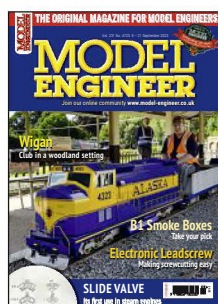
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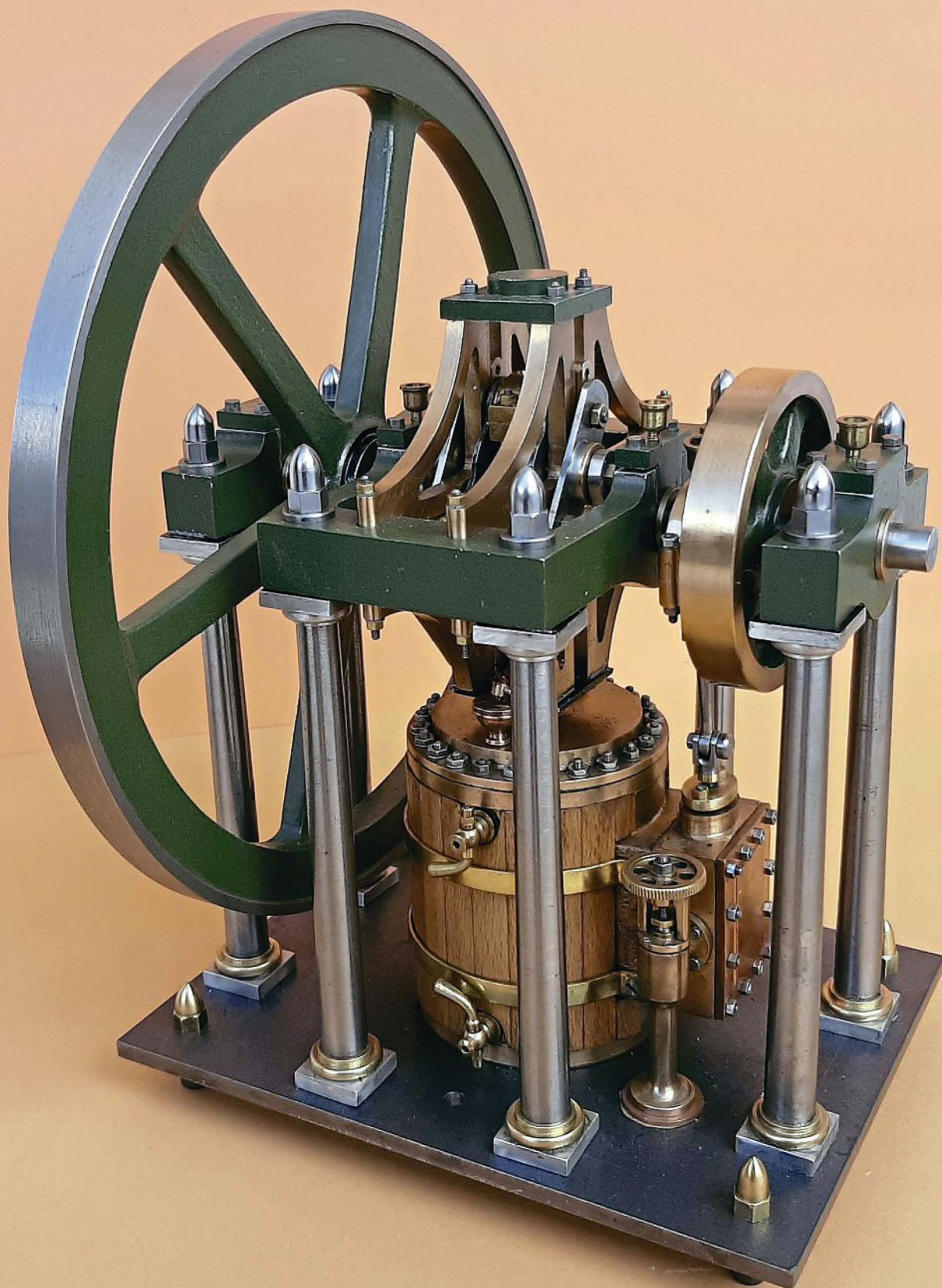
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MARTIN EVANS
Editor



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Assistant Editor



Meridienne exhibitions.



Hereford club.



Cheltenham club.

Midlands Highlights

The Midlands Model Engineering Exhibition will be running this year on a full head of steam. The Society of Model and Experimental Engineers (SMEE) and *Model Engineer* will be there in force, celebrating their joint 125th anniversary, and the SMEE workshop will once again be in full operation, including demonstrations by Neil

Wyatt, *Model Engineers Workshop* editor, of 3D printing. The SMEE stand will also feature a large collection of models from across its history. The lectures are back too, including Roger Backhouse on 'Uncle Jim' Crebbin and Bob Reeve on the behaviour of metals, and the Gas Turbine Builders Association will be outside making a lot of noise. To round it all off will be, as usual, The Fosse Live Steamers.

A particular attraction will be John Wilks's newly completed 10¼ inch gauge LNER P2 *Cock O' The North* which will be on display at the exhibition. John was a prolific locomotive builder and sadly passed away in November 2022. This is the last of five fully working exhibition standard scale steam locomotives he completed during his lifetime since 1963. The locomotive is built entirely from works drawings and original research and reflects Gresley's most advanced Express passenger 2-8-2 with Lentz poppet valve gear, Kylchap exhaust and ACFI Feedwater pump as built in its unique semi



The scene at a busy Hereford club (photo Jocelyn Fung).

streamlined form in 1934. The three-cylinder locomotive has a TIG welded steel boiler with superheaters and is based at Stapleford Miniature Railway.

On top of all this the nearly forty trade stands will provide a perfect opportunity to stock up ready for those long winter workshop evenings. More details of the show, including a list of the trade and society stands, may be found at www.meridienneexhibitions.co.uk

Dirty Tram

In this issue Ashley Best takes a small deviation from his usual pristine tram models and continues to celebrate the true Bolton tram in all its wonderful grubbiness. His latest tram emerges, not pristine as usual from the tram works, but battered, bruised and scuffed from the aftermath of World War Two. In this issue he gets on with the construction of the tram before soot and grime are applied.

Sadly, also in this issue, Steve Goodbody consumes his last mouthful of elephant and retires to take a much-deserved break. However, he will soon be back to muse on matters both physical and metaphysical, like why the toast always lands butter side down. Watch this space.



John Wilks's LNER P2 *Cock O' The North* (photo courtesy of Meridienne Exhibitions).

Cheltenham and Hereford

I recently spent a very pleasant weekend over on the west side of the country and was able to visit both the Cheltenham and Hereford clubs. Cheltenham are currently busily occupied in building a new clubhouse, which appears to be approaching completion. It comes as a kind of slot-together kit, on the log cabin principle, and already looks very smart. I shall look forward to seeing it again when it is complete and I hope to be able to include a report from the club in due course. While there I received a lesson on the dynamics of hovercraft – the subject is rather more complex than one might imagine. It involves an understanding of the workings of the gyroscope, which is not at all intuitive, and I can confirm from direct experience that the mathematics involved is not easy to get one's head around!

It was good to visit Hereford again, on this occasion while the club was busy offering train rides to a steady stream of eager passengers. There were five or six trains in operation, processing around the club's long and winding railroad, as well as the usual tea and cakes in the club room.

You can find out more about the Hereford and Cheltenham clubs (respectively) at www.hmse.co.uk and www.cheltsme.org.uk

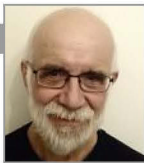
Martin Evans can be contacted on the mobile number or email below and would be delighted to receive your contributions, in the form of items of correspondence, comment or articles.
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Radial Valve Gears Again

PART 8 – CHAS. BROWN'S AND HEYWOOD'S GEAR

Duncan Webster sheds light on what is often seen as a complex subject.



Continued from p.280
M.E.4724 August 25

Chas. Brown's gear

Back at the beginning of part 2 it was explained that a corrected gear embodies some form of straight-line motion. Chas Brown's (fig 40) uses Watt#2 as described in part 6 (M.E.4723 August 11). (Chas. Brown was born in Uxbridge and, after an apprenticeship at Maudslay's, he went to Switzerland to set up the Swiss Locomotive and Machine Works (SLM) that built the locomotives for the Snowdon Mountain Railway and others.)

It is easy to visualise that as point *d* moves to the right along its mythical straight line, the correcting link *ef* pivots around point *f*, point *e* moves down and so point *g* moves down but by less and so, if the vibrating lever *gh* has been correctly proportioned, point *h* stays on the slide axis as required. In this manifestation

I have shown the drive beam connected to an extension of the conrod at *d*. It would work equally well if connected directly to the crank pin but with this setup the pin at *d* only sees a small angular rotation rather than full rotation at the crankpin, resulting in less wear, and slightly smaller overall width as *fe* can be in line with *bc*. Mr Brown is credited with quite a few valve gears. This one would work equally well with the drive beam slide etc. in front of the axle - this way round leaves more room for all the gubbins, has a larger slide radius (a good thing!) and is easier to draw (a very good thing). It is described in more detail below.

Design methodology

When this was originally worked out I used the equation heavy method as for Joy gear,

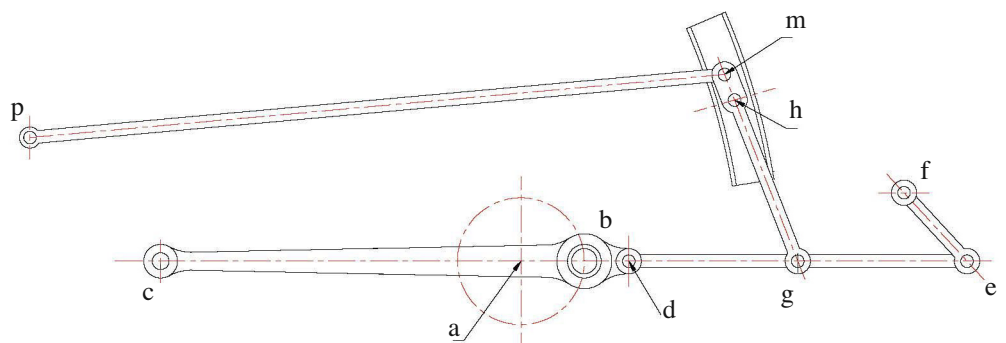
but most of it can be designed using CAD, to which most people now have access. The only equation required is to find the position of *g* along *de*. This is almost the same as finding the length of the return crank in Hackworth gear (see part 5 – M.E.4722 July 28).

First find *mh/gh* from $mh/gh = (lap + lead)/ab$

If we call the vertical movement of *g* 'vert' (total movement $2 * vert$), the outphase motion (see part 1) is $outphase = vert * mh/gh * \tan(\text{slide})$ where slide is the slide angle, which can be re-arranged to give $vert = outphase / (mh/gh * \tan(\text{slide}))$

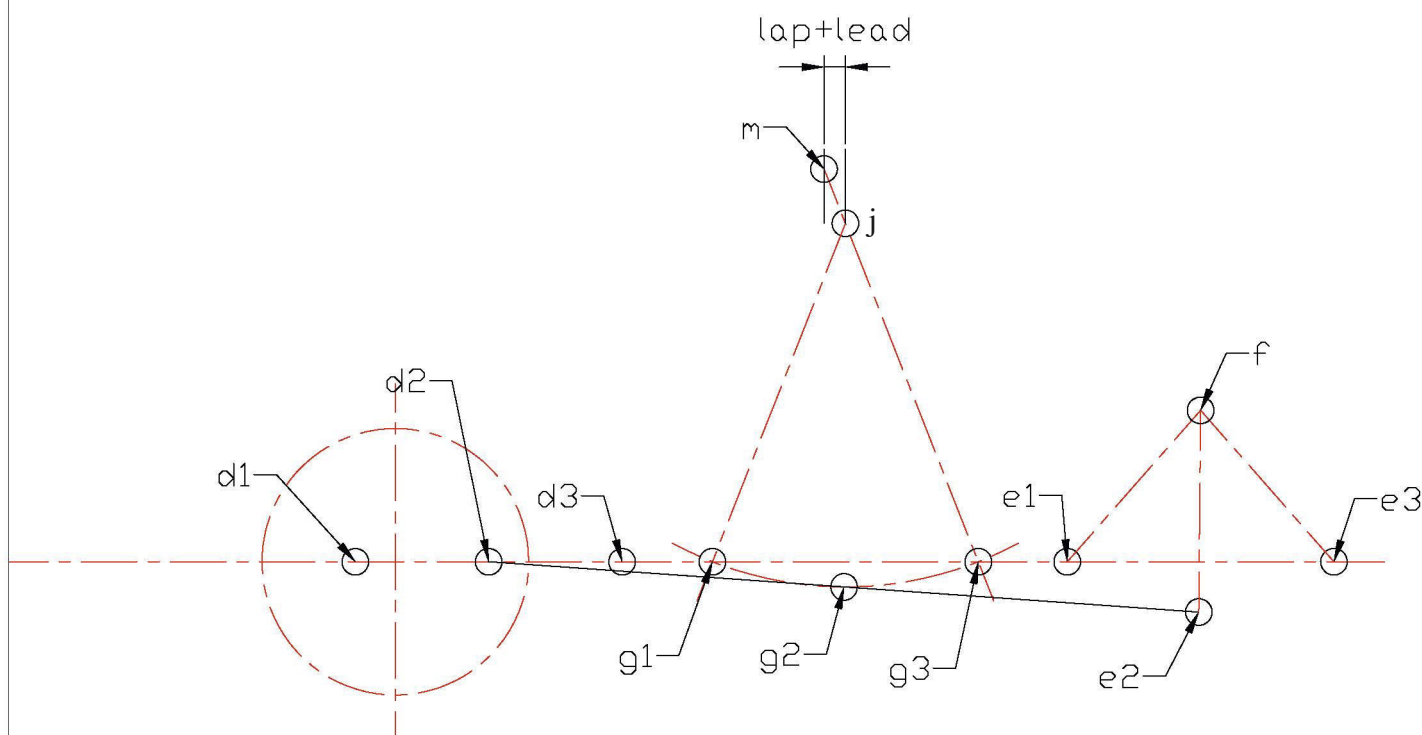
The vertical travel of *d*, which I'll call *vert2* is $vert2 = ab * (bc + bd)/bc$, and it will be seen that $vert = vert2 * (de - dg)/de$. Re-arrange this to get $de - dg = vert * de / vert2$. To avoid all this I put $dg = de/2$

Fig 40



Chas. Brown's valve gear.

Fig 41



Chas. Brown geometry.

Fig 42

Python Easy Graphics

Brown valve gear

brown2.txt
 ab = 4.250 bc = 40.000
 bd = 3.000 de = 20.750
 dg1 = 10.375 gg1 = 0.000
 fe = 5.734 Xf = 23.750
 Yf = 3.850
 gh = 10.056 mh = 1.136
 Xj = 13.375 Yj = 9.114
 mn = 0.000 pn = 36.000
 lap = 0.430 pw = 0.560
 Yvalve = 8.500
 slideRad = 42.500
 midGear = 2.617
 +ve forward (acw)
 99 to quit

slide	front lead	front port	front cut	back lead	back port	back cut	die up	die down
0.000	0.050	0.050	6.9	0.050	0.050	4.2	2.333	2.284
18.000	0.050	0.630	79.1	0.050	0.425	79.9	2.373	2.348
9.000	0.050	0.237	53.5	0.050	0.151	37.9	2.356	2.301

Brown gear forward.

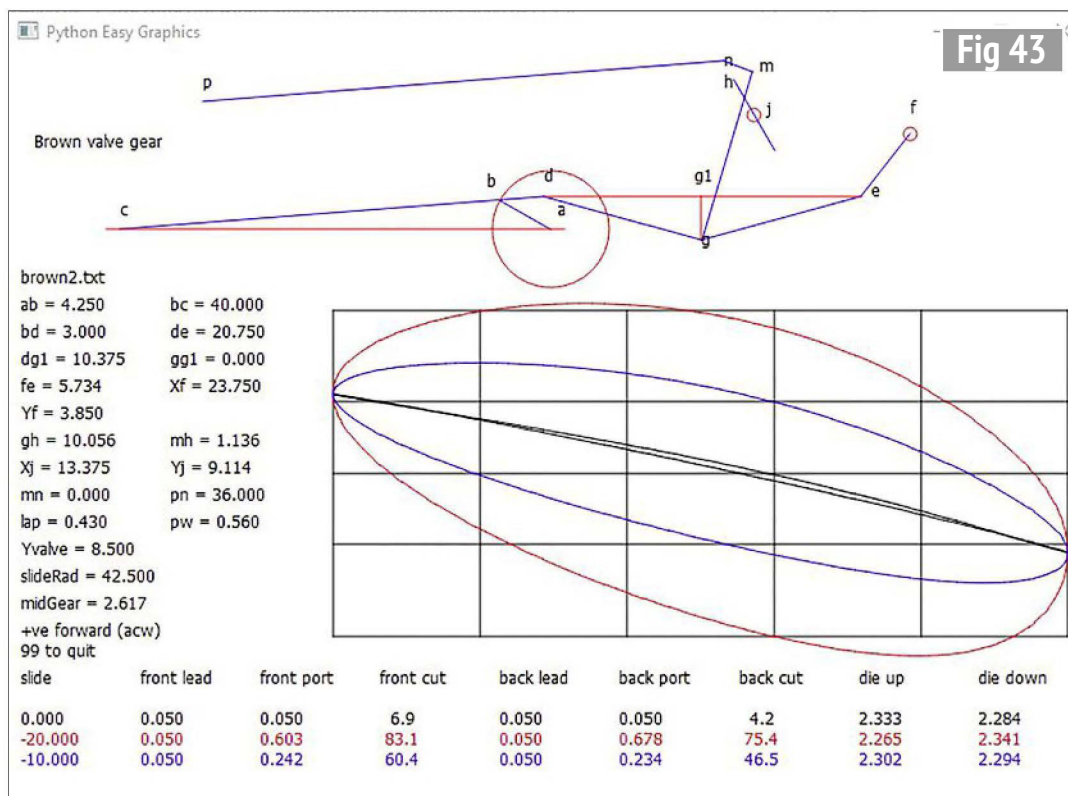
As before limit slide to 20 degrees. The rest is done in CAD.

As shown in **fig 41**, set out the three positions of *d* as though it were running in a straight line - *d1* is front centre,

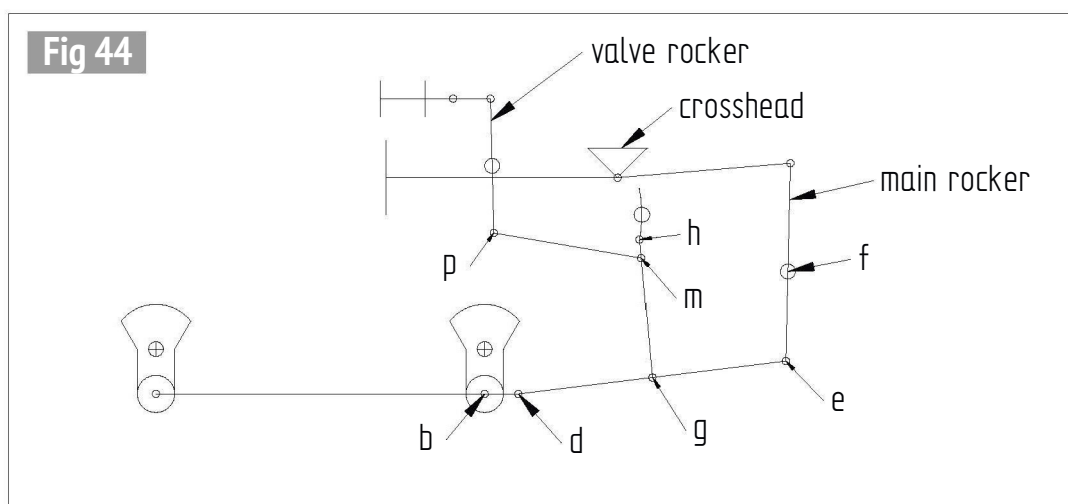
d3 is back centre and *d2* is half way between. Decide on a reasonable length for *de* - the only locomotive I know of that has anything like this gear has *de* = 4.5 * *ab*. Position *g1* and *g3*. From *g1* and *g3* draw

lines at 25 degrees to vertical and where they cross gives the slide axis *j*. From this point strike an arc through *g1* and *g3*. Now from *d2* draw a circle radius *dg* and where this crosses the arc *g1-g3* is *g2*.

Now we need to position *e1*, *e2* and *e3*. *e1* and *e3* are simply *de* from *d1* and *d3* on the centre line and *e2* is positioned by drawing a line through *d2* and *g2*, projecting it to the left and marking *e2* at *de* from *d2*. We



Brown gear reverse.



Brown gear – Snowdon Mountain version.



Ralph on the Snowdon Mountain Railway. As its name suggests the railway runs to the top of Snowdon, Wales's highest mountain. Definitely worth a trip but make sure they are running steam (photo courtesy of Snowdon Mountain Railway).

now have three points and three points define a circle. The command on my CAD system is 'circle' then '3'. This positions point *f*. If the swing of *fe* is more than ± 45 degrees you might want to make *gh* slightly longer and try again.

What we need to do now is determine *mh*. This can be done on the CAD as well. Draw a vertical line through the slide axis, offset it by lap + lead and project one of the 25 degree lines. Where these lines cross is point *m*. For the time being, set the slide radius same as the valve rod *pm*.

I have built (yet another) computer model for this gear. This computer model outputs the rise and fall of the die block. If they are not quite equal you can adjust *fe* and the position of *f* and try again. It is by no means essential that *e1* and *e2* are on the centreline, just my tidy mind.

Once the model is up and running, you can then change the slide radius to get the best results. The following is based around the dimensions of *River Irt* (see later in this episode). I have used *pn* = 42.5, and find that to get a straight line at mid gear I need to reduce the slide radius to 36 inches. I don't understand this but without a computer model I'd never have found it. For a curved slide without offset top joint, points *m* and *n* are the same.

Results are shown in **figs 42 and 43**. An all-round reasonable valve gear, it might be possible to get even better results by fine tuning *fe* and of course the position of *f*, and by changing the slide radius.

Snowdon Mountain version

This is shown in **photo 2** and schematically in **fig 44**. The pistons do not drive the crankpins directly, they drive via the main rocker. Presumably this was done to get the cylinders higher off the ground on what are very small wheeled locomotives. This main rocker then takes the part of link *fe* in the gear shown in **fig 40**, and the main driving force is transmitted from the bottom of the main rocking beam to the crankpin by drive beam *de*. The valves are inside admission and so point *h* is above point *m*. The valve motion is then transmitted via the valve rocker to the valves mounted on top of the cylinders. All in all, a most ingenious arrangement but no, for once I haven't modelled it.

Heywood's gear

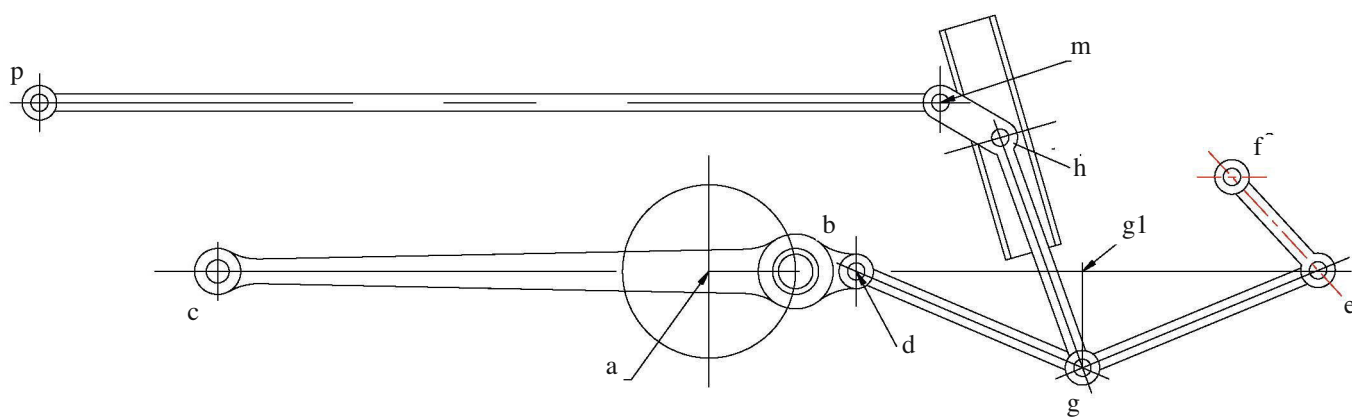
The downside of Brown's gear is that the slide axis can turn out a long way above the cylinder axis. The pioneer of 15 inch gauge railways, the Hon. Arthur Percival Heywood

3



River Irt and details of the valve gear (photo courtesy of the Ravenglass and Eskdale Railway).

Fig 45



Heywood's gear.

overcame this problem by the simple expedient of bending the drive beam (**fig 45**). (Sir Arthur Percival Heywood Bart. was educated at Eton and took a master's degree in Applied Science in 1872. He more or less invented the 15 inch 'minimum gauge' railway and built in his own workshops at least five locomotives.)

It will also be noted that he used a straight slide with the offset top joint. On his early locomotives Heywood used straight slides but on *Muriel* (now running as *River Irt* on the Ravenglass and Eskdale Railway – **photo 3**) he replaced the slide with a Scott Russell straight line linkage as described in part 6. It might be

thought that this multiplicity of pin joints would give rise to a lot of lost motion but *River Irt* seems to work very well indeed. It is much easier to replace a bush when wear occurs than to rework a curved slide and so it is more likely to happen. The photograph shows *River Irt* in all her glory by the coaling stage at Ravenglass

with an enlargement of the valve gear.

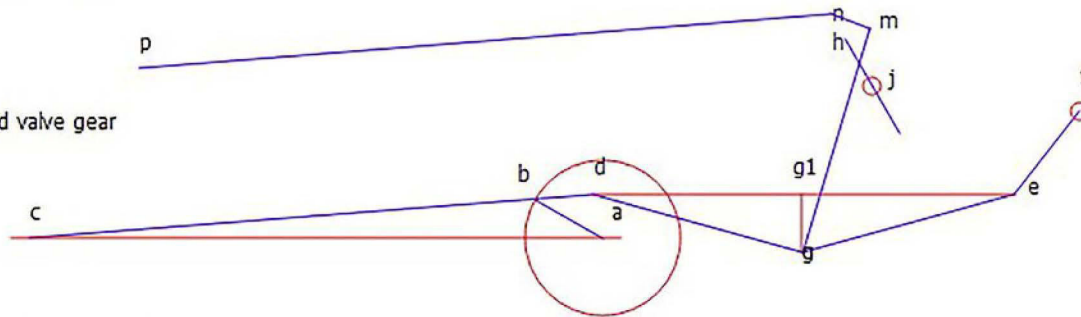
Design differences

When designing Heywood's gear we can either position the slide axis at some convenient point or calculate it such that the valve rod is horizontal at top and bottom dead centres. Either way, in fig 41 just move

Python Easy Graphics

Fig 46

Heywood valve gear



irt2.txt

ab = 4.250 bc = 40.000
 bd = 3.000 de = 20.750
 dg1 = 10.375 gg1 = 2.815
 fe = 5.808 Xf = 23.554
 Yf = 6.806
 gh = 10.000 mh = 1.136
 Xj = 13.663 Yj = 7.687
 mn = 1.000 pn = 41.500
 lap = 0.430 pw = 0.560

Yvalve = 8.500

slideRad = 10000.000

midGear = 0.884

+ve forward (acw)

99 to quit

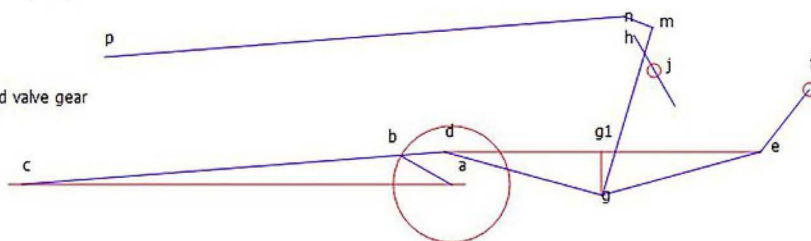
slide	front lead	front port	front cut	back lead	back port	back cut	die up	die down
1.000	0.055	0.055	5.2	0.055	0.062	8.2	2.306	2.182
20.000	0.055	0.590	80.5	0.055	0.589	76.9	2.324	2.200
10.000	0.055	0.177	50.0	0.055	0.239	44.7	2.317	2.176

River Irt forward.

Python Easy Graphics

Fig 47

Heywood valve gear



irt2.txt

ab = 4.250 bc = 40.000
 bd = 3.000 de = 20.750
 dg1 = 10.375 gg1 = 2.815
 fe = 5.808 Xf = 23.554
 Yf = 6.806
 gh = 10.000 mh = 1.136
 Xj = 13.663 Yj = 7.687
 mn = 1.000 pn = 41.500
 lap = 0.430 pw = 0.560

Yvalve = 8.500

slideRad = 10000.000

midGear = 0.884

+ve forward (acw)

99 to quit

slide	front lead	front port	front cut	back lead	back port	back cut	die up	die down
-18.000	0.055	0.481	83.1	0.055	0.574	72.2	2.272	2.275
-9.000	0.055	0.192	55.3	0.055	0.206	44.7	2.290	2.214
1.000	0.055	0.055	5.2	0.055	0.062	8.2	2.306	2.182

River Irt reverse.

the vibrating lever down to where it is wanted and bend link *dge* to suit as shown in fig 45. Then repeat the above procedure but with the bent drive beam.

The dimensions I have for *River Irt* do not give very good results, so I have tweaked it slightly as described above to get **figs 46** and **47**. Not at all bad. I can't track down why the calculated value of slide angle for mid gear is 1 degree off – I suspect it is something to do with offset top joint. I do not have the dimensions of the straight-line linkage replacing the slide, and it is entirely possible that it describes a curve, but I've assumed straight.

That's enough for this time, the next episode will delve into Sisson's gear.

●To be continued.

A Five-Inch Gauge 0-4-0 Padarn Railway Tender Locomotive

PART 11

Luker builds a five inch gauge model of a Welsh slate quarry locomotive.



Continued from p.351
M.E.4724 August 25

The steam exhausts

When I decided to model the majestic *Fire Queen* I knew the steam exhausts were going to be an interesting challenge. In all honesty, when I got to this point of the build the fear of throwing in the towel because of those insane copper pipes was one of those cliff hanger moments where the buttocks clenching was only matched by the excitement of getting it right. Well, I did get it right, with only one failure - and if I can do it, anybody can!

The original exhausts need a mention before I move onto how I made them for my model. Like a great number of the fittings they were forged into shape and brazed with the joint line at the back (apparently; I haven't been fortunate enough to actually view the prototype as is the case with all my builds). The design of the exhaust flow paths was ahead of its time with large, unrestricted flow paths to the smokebox. I cannot imagine forging that large lump of copper to fit the original locomotive; it must have been incredibly time consuming, with the original builders having a set of arms on them that would make Hercules think twice in a bar tussle.

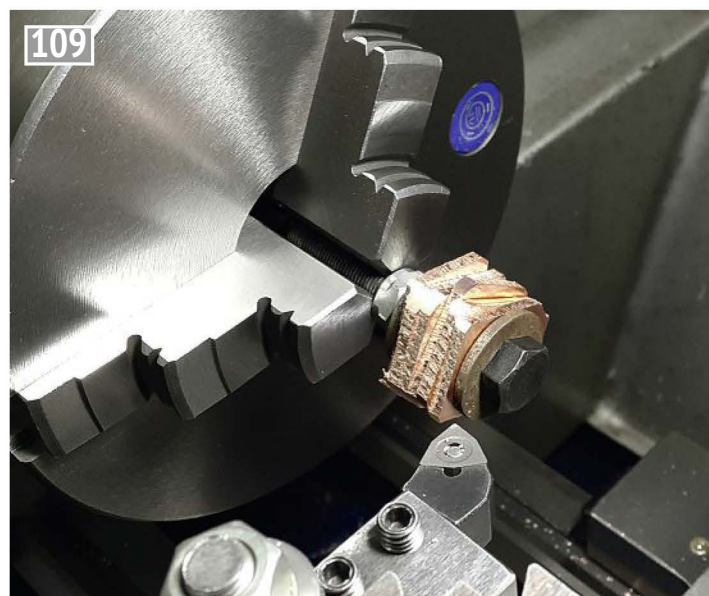
I, of course, finished my build before I wrote this article and I again found myself scratching my head as to how I made those exhausts. Luckily for me, I took a few pictures to help tell the story and to help boot up my grey matter RAM. The steam exhaust drawings are light in terms of fitment and length dimensions because

most of them will have to change slightly depending on how the cylinders were fitted and how the smokebox was fitted for the coupling rods. The inner mandrel sizing is probably more important for getting the final shape of the tapered section and blending that with the lofted cylinder. Before the hammer is brought into service the end flanges need to be made.

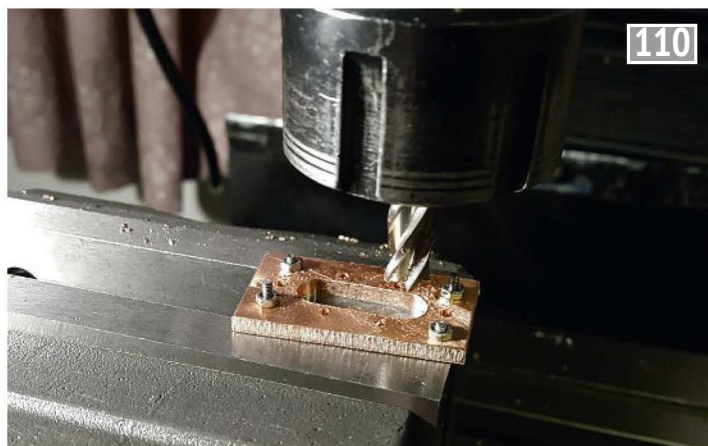
Parting off copper in a home workshop is a daunting task and I try to avoid it at all costs; making the round flanges from copper bar should be left for the industrial guys with flood cooling. Having said that, the flanges can easily be made from half-hard copper plate, with a few made at the same time by bolting them tightly together (**photo 109**). The square flange was made from the same plate; machined, drilled and filed to size on a

mild steel blank. If the copper plate is screwed to the steel blank it makes a convenient holding jig. The blank can be gripped in the vice, instead of the softer copper, avoiding any deformation when milling the centre slot (**photo 110**).

As a side note: long before my time started in the workshop, the builders of old used to use neat paraffin as a cutting fluid when machining copper. Over the years the qualities of most hydrocarbons have changed and paraffin hasn't been spared, making it unsuitable to use as-is. I've had good success with a mix of modern paraffin and 10-20% used spindle oil (from the last lathe service) which seems to work really well as a copper cutting fluid. This is applied with a paint brush to the copper and the cutting tool to prevent the galling that results in horrible cuts.



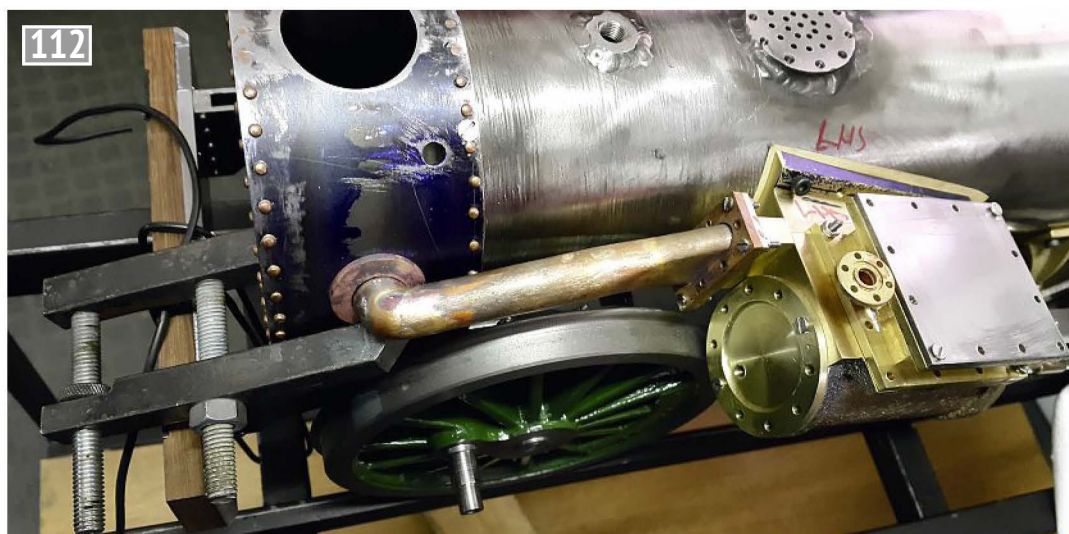
Machining a few flanges for the exhausts.



110
Machining the centre slot for the square flange, bolted to a mild steel blank that was used as a drilling jig and filing guide.



111
The inner forming mandrel and the LH and RH exhaust bodies. The bodies have different bends for the left and right sides. The split former can be used for both with the bend at the split.



112
Fitting the flanges on the assembly and checking the internal flow path is not constricted on either end with internal bars.

The main body of the exhaust was forged around a mandrel with the slender diameter 10mm and the taper flat section matching the angle of the drawings (assuming a 1mm wall thickness). The flat section should be around 6mm thick with the end of the 10mm bar blended to match the end plate (**photo 111**). A suitable piece of 5/8 inch 16SWG can be heated to red hot and quenched to soften for a little panel beating. The lofted section is forged and the straight section needs to be slit and closed around the 10mm bar. The LH and RH flat section are formed slightly differently to match the swept direction from the cylinders to the smokebox, but the same inner formers can be used. The large end was then trimmed to a tight fit inside the square flange and then fitted to the assembly to measure out the correct position of the bend

into the smokebox. At the bend the forging was cut at 45 degrees and TIG welded with the short section flipped to face the smokebox. A round piece of 10mm bar was inserted into the short section and the outside was forged against this bar to a smooth bend before filing to a perfect forgery of a tightly-bent section.

For welding copper of this nature I use normal single core household wiring, cleaned with fine emery paper to remove any coating. This may sound a little odd with many welders arguing that it is not the same as proper copper filler rods. They are of course correct - it's better and cheaper!

Finally, the three pieces of the exhaust puzzle are fitted to the assembly to check that everything is a good fit and the flow paths are not constricted at either end (**photo 112**). A bar slipped from the inside of

the smokebox into the exhaust steam pipe should fit with little effort. I made a point of

making the flanges a tight fit to make sure they stay put when moving the exhaust from the workshop to the brazing hearth. Luckily, the lot stayed put long enough for the silver solder to run neatly – which, incidentally, matched the prototype perfectly. That final heating operation naturally anneals the copper, giving the slightest amount of leeway when coaxing the soldered assembly to fit perfectly.

The holes for the smokebox flange can now be drilled on the assembly, using a punch guide for correct placement, especially the holes closest to the exhaust body (**photo 113**). The drawings call for six bolt holes like the large scale, but for my model I used five holes.



113
Punching guide for the flange holes to make sure the nuts don't foul the main body. The two back holes were done first and the remainder marked out for equal spacing using a pair of dividers.

The blast nozzle stand and steam exhaust pipes lit up inside the smokebox.

Two were drilled as close as practical to the back, just missing the bend, with the remaining three marked out with a pair of dividers.

While we're at that side of the locomotive, it's a good time to tackle the inside smokebox piping which uses the same flanges as the outside.

The smokebox plumbing

The piping inside the small smokebox (**photo 114**) is snug but there's enough space for spanners and fingers to hold screws, etc. The inside flanges are identical to the outside and the screw holes can be spotted with a holding bolt through the smokebox shell. I personally

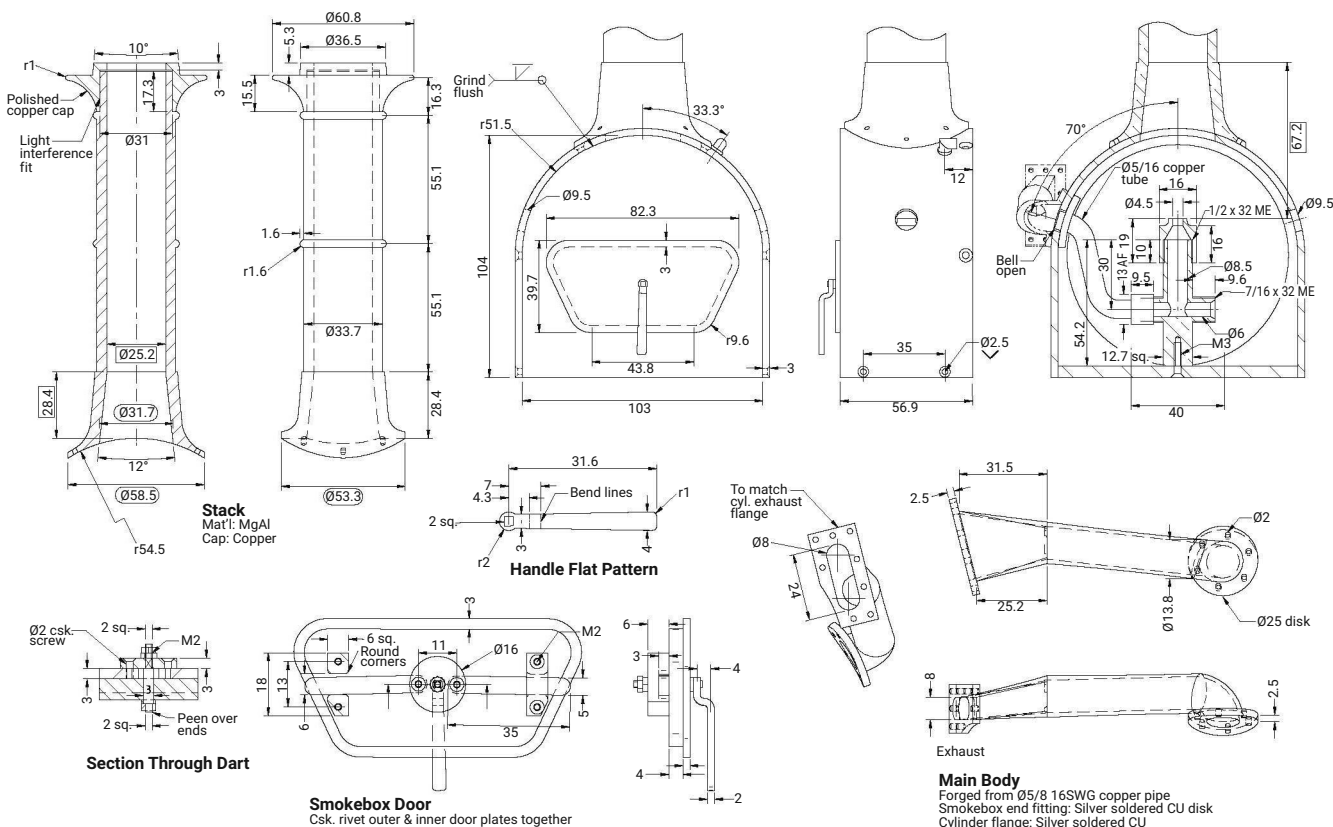
silver soldered the flanges in place but the drawings show the pipe extending through the flange with the ends bell-mouthed, which is much easier to make and assemble. I think this would be a little more flexible and would seal just as well as a fully soldered connection. Both the inside

and outside flanges will need to be sealed with RTV silicone on final assembly to prevent air ingress into the smokebox. The inside flange screw holes can be countersunk with M2 countersunk stainless steel screws fitted from the inside as studs (**photo 115**). These make assembly easier with a little finger pressure on the top of the countersink enough to tighten the nut on the outside assembly.

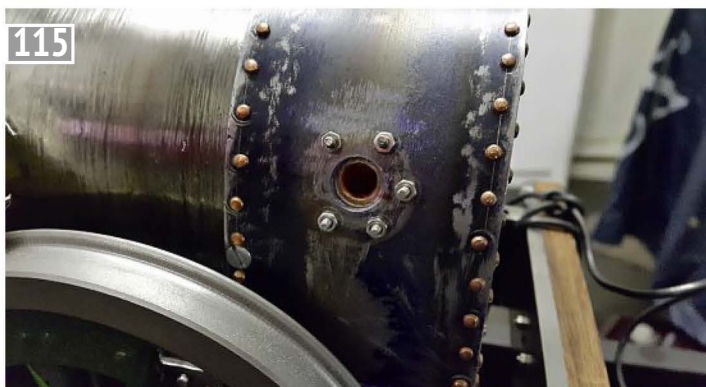
The chimney

The chimney for the large scale model was a rolled and riveted construction with a beautiful copper cap, also smithied, at the top. The nice thing with a model like this is the chimney is long enough not to require a petticoat and, with correct design of the inner chimney and smokebox dimensions, you'll end up with a decent steamer. For the model I made the bottom section of the chimney from aluminium. This was really just for casting convenience; the day the chimney was cast

Fig 23



Smokebox, chimney and plumbing.



115
Inlet piping and flange mounted with M2 CSK SS screws fitted from the inside.



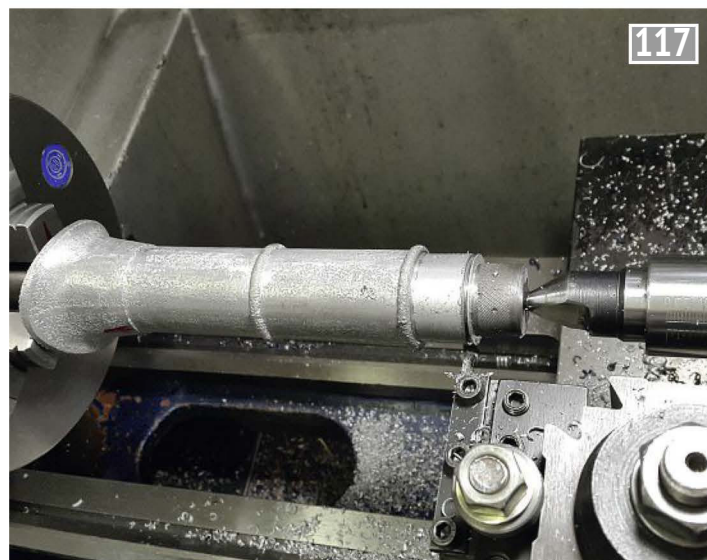
116
Machining the chimney bore. Without the usual chimney cap the casting is easier to hold in a smaller chuck.

I also cast a number of cast iron components. There's no issue with casting aluminium in the same pot as cast iron; the aluminium acts as a de-gasser for the cast iron and just reports to the slag. I could have cast it in cast iron but that meant a longer day in front of the furnace and more mess in the workshop.

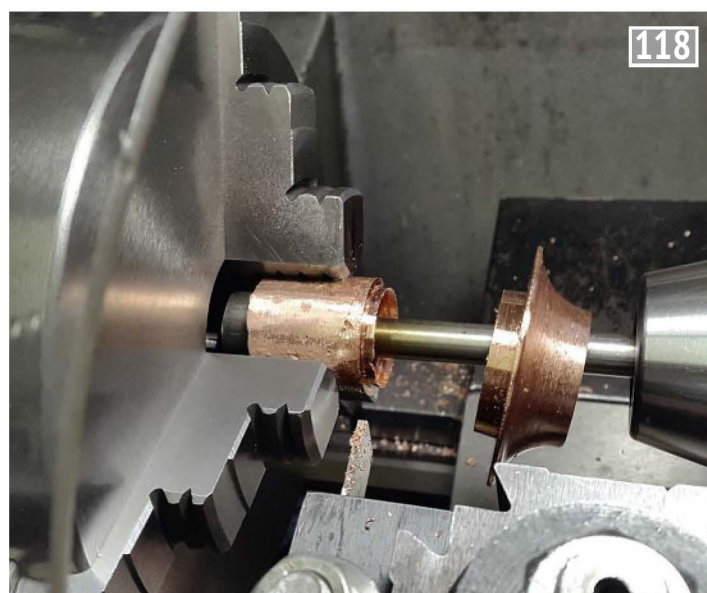
The machining requires little description and other than a stout boring bar to prevent chatter it's a very

simple component to machine (**photo 116**). The seating for the copper cap is simple to machine with the chimney pushed onto a tapered mandrel and a small plug for the other end with a centre hole to keep everything steady (**photo 117**). The copper cap is on the other end of 'not too difficult'!

Most foundries are reluctant to melt and cast copper. There are a few reasons for this but the biggest problem is blowholes in the final casting,



117
Machining the copper cap seating, with the chimney fitted to a tapered mandrel and a plug pushed into the other end to steady the job between centres.



118
Parting off the chimney cap with a centre bar to prevent the cap from clashing with the tool post. The paraffin mix used for turning copper made machining much easier!

normally misdiagnosed. The melting points of copper oxides and copper metal are very close. This results in the oxides mixing in with the base metal copper, only to come out of solution (as gas) when poured into the mould. Melting larger chunks of clean copper helps but you would still need to prevent gas pick-up in the crucible. In typical back-yard foundry style a suitable de-gassing and capping mix was devised, using raw materials from the local grocer and garden shop. The copper caps came out beautifully with not a blowhole found during machining.

Of course once you've cast the copper, the next challenge is machining it, which is just horrible. It is gooey (that's the technical term) and sticks to the cutting tools, resulting in a very poor surface finish. This is far worse than the normal half hard copper commercially available (as-cast copper normally comes out fully annealed). The paraffin trick mentioned at the beginning of the article came to the rescue again and the copper caps were easily machined (**photo 118**) and then polished for final fitment to the chimney.

●To be continued.

IMLEC 2023

PART 2

Rob Speare
reports on
this year's
IMLEC held at Bristol on
7th – 9th July.



Continued from p.311
M.E.4724 August 25

Well ahead of the IMLEC competition dates, members of the Bristol Society of Model Engineers constructed a track degreasing vehicle with the curious nickname of the *Dribbler*, whose sole role was to spread degreasing fluid thinly on the rails, which would then be rolled in by its own and other trolley wheels. The job seemed to have been done well and, when we arrived to set up the event, the rails were clean with rust patches, showing its effectiveness. Excellent – when it's dry.

Competition Day 2 – Saturday

For Saturday, all down to the 'jet stream' being south of the UK, TV weather forecasters were suggesting the conditions of the day would be 'unsettled' and, certainly, the early morning feel was already rather different from the hot and dry Friday. I have often noted that at Ashton Court track you can get four seasons of weather in just one day.

In anticipation of hosting the event for the first time in many years, we made a video trailer promoting it (as far as I know the first time this has been done) and the feedback we received was that it was well liked. Embedded in it was the famous phrase 'anything can happen in the next 30 minutes' – the drama hook of one of the best period TV shows; so how would we fare?

Saturday was an earlier start with the first contestant due to run at 9am and, while not quite having the tenacity of zealous tourists placing reserving towels on a Tenerife beach front, our spectators and competitors were arriving promptly and positioning themselves for a seated view of proceedings.



Andy Pope and 5 inch S15 4-6-0 No. 835.



Danny Hayward and 5 inch LBSC 4-4-0 Maid of Kent.

On the track, the runs commence...

Run 9 (photo 9)

First out on Saturday was Andy Pope from Southport MEC, with his 3½ inch gauge Southern Railway S15. The start of his run coincided with a brief rain shower and, after coupling up to the dynamometer car plus two trolleys, his locomotive had no traction and was just slipping; the rain was acting as a lubricant. After dropping both cars, Andy made it to the start line. He commenced his

run but, probably unsettled by the earlier difficulties, lost his pressure on the first lap and retired. It's a shame because had Andy got off to a good start and I'm sure he would have done much better.

Run 10 (photo 10)

Next was Danny Hayward, also from Southport MEC, with a Maid of Kent - a locomotive he first drove at 10 years of age. After not seeing the locomotive for many years, he managed to purchase it earlier this year than gave



Roger Holland and 5 inch Union Pacific Switcher 0-6-0.



George Winsall and 3 1/2 inch Welsh Highland Railway 2-6-2T Russell.



Alex Linkins and 5 inch LMS Black 5 4-6-0.



Tom Parham and 5 inch LNER A1 4-6-2 Tornado.

the bottom half a fairly hefty overhaul. It was a bit damp as Danny's run commenced with three passengers but, with this sensibly light load, the locomotive just flew round, picking up some speeding marks in the process. But on lap 10 the locomotive slowed and stopped; the axle boxes were seizing up, so he could not complete the run, exceeding the 35-minute limit - an otherwise excellent run using 2.315 lb of coal.

Run 11 (photo 11)

Roger Holland from the Chesterfield DMES entered an unusual locomotive a superb example of a Union Pacific Switcher, modelled on a preserved example in Colorado. This tall 0-6-0 with an eight wheeled bogie tender was certainly an eye catcher

with three domes and a raised bell and apparently Roger built it because he liked the tender steps! With a starting load of nine passengers across three carriages, Roger had a good first lap but on the second lap suffered slipping on the climb to the station so he set back and tried again. Roger completed a third lap but came to a halt approaching the tunnel. Although dropping three passengers, he could not make it past the summit and ran over the stop-time limit and retired. Despite using 3.13 lb of coal, sadly Roger said he couldn't get the locomotive to steam properly.

Run 12 (photo 12)

And so to George Winsall, with a model of the narrow gauge Hunslet Russell built by his grandfather, this being

George's tenth time competing. Managing to bag a dry spell, this was a strong run from the outset, going the duration of 32:22 minutes with a decent load of twelve passengers maintained throughout. George can be congratulated on a good performance, with no recorded stop time and completing a full eleven laps using 2.350 lb of coal.

Run 13 (photo 13)

Alex Linkins from Romney Marsh MES was also driving a locomotive built by his grandfather to his own design, in the shape of a lovely B.R. liveried 5 inch Black Five. Although his first time of entering IMLEC, Alex was clearly a master of this locomotive. Setting off with a load of nine passengers, the overcast conditions suited

him as he reeled off lap after lap, although it was noted he was taking on a fair amount of water. He had a fast, consistent run, picking up a speeding mark on lap twelve, although his run likely warranted a few more. So, using 2.275 lb of coal, and no stop time, Alex completed a text-book run of fourteen laps in a time of 30:53.

Run 14 (photo 14)

Another South East based competitor, from Maidstone MES, Tom Parham was driving a beautiful 5 inch gauge model of an LNER A1. Owned by Edgar Playfoot, who built it to the Michael Breeze design, it was completed in 2012 but in the guise of the full-size new build A1 Tornado. This graceful locomotive purred around the track allowing Tom time to switch between drinking

coffee and taking videos over the course of the 32:00 minute run. There is no doubt this was a competent drive of this well constructed three cylinder 4-6-2, with no stop time encountered. There was just moderate slipping while taking the sixteen passengers on a journey of thirteen laps of the Ashton track, consuming 2.00 lb of coal and finishing in rainy conditions.

Run 15 (photo 15)

Also, from the 'locomotive shed' of Maidstone MES, Luke Bridges brought his 5 inch Polly 'Trojan' 0-4-0 saddle tank, which he has modified to improve the exhaust and to aid driving. Dressed in blue 'Port of London Authority' colours, Luke also entered

this locomotive in last year's IMLEC. With the weather starting to deteriorate, Luke's run started in rain, as he set off with a sensible choice of two passengers. On the ascent to the tunnel though Luke suffered slipping and had to set back and take a run at it. Although the trolleys are very free running, in these conditions this normally plucky 0-4-0 was finding it hard work, so Luke decided to hang up his shovel after completing two laps, the locomotive having consumed 1.98 lb of coal.

Run 16 (photo 16)

Another competitor starting in light rain was Fareham DSME member Chris Dore. He had entered his LNER B1 in last year's event but chose to

retire after suffering slipping problems in dry conditions, so could he do better this year? Starting with a load of eight passengers, well in excess of his last outing, Chris managed a steady consistent run with the track slowly drying out towards the end. So, a much better year, successfully completing at 31:28 minutes, and using 2.170 lb of coal to deliver his full load of passengers to their destination.

Run 17 (photo 17)

Linda Gearing from Andover DMES was entering an interesting locomotive, one that has evolved in the 25 years since a start made by two previous owners. It had further received a bespoke saddle tank and a new coat of paint in the

short time since applying for the event. This 0-6-0ST also features outside Stephenson's valve gear, making it interesting to watch. Again, beset by showery conditions, with three passengers in tow, Linda suffered a fair degree of slipping and had difficulty maintaining boiler pressure, requiring several stops to restore the fire on this otherwise spirited run. Although completing five laps, Linda dropped her passengers but was forced to retire at 28:00 minutes having reached the maximum stop time, with a total coal usage of 1.125 lb.

Run 18 (photo 18)

Our next entrant, Graham Hickey was not only new to IMLEC but also the only entry



Luke Bridges and 5 inch Polly Trojan 0-4-0ST No. 53.



Chris Dore and 5 inch LNER B1 4-6-0 Nyala.



Linda Gearing and 5 inch freelance Metre Maid 0-6-0ST Eric.



Graham Hickey and 5 inch Super Simplex 0-6-0T.



Alan Crossfield and 5 inch LMS Patriot 4-6-0 Royal Army Corps.

from the South West - rather disappointing considering it was the first time IMLEC had been in the area for well over a decade. Graham had built his green 5 inch gauge Super Simplex over a period of eight years but had never driven it other than on his home club track at Newton Abbot DMES nor with such a large load. Setting off Graham started well with a load of six passengers and settled into a good rhythm, until catching another Saturday rain shower after about four laps.

From then on, Graham suffered quite a lot of slipping, and had to make several stops to keep his fire in order. In a wise move, all the passengers were dropped and Graham returned to the station to finish in 30:00 minutes, with a total coal use of 1.685 lb. While maybe not the best run of the day, Graham succeeded in this new challenge and could hold his head high having completed his run.

With many runs struggling and overrunning, we were in danger of eating into the start time of the next run, meaning we had no time to download the tablet data between runs. Furthermore, during the afternoon, our data team were finding a little difficulty in getting the recording tablet to connect cleanly to the dynamometer unit so we asked

our next competitor if he would mind pushing his start back by fifteen minutes while we took the tablet away to download it.

With the not-so-great British summer causing many spectators to retreat into our protective marquee to dodge the intermittent showers, I popped my head in and asked if they were okay? The consensus was that they were having a lovely time, swapping stories, debating issues - essentially just enjoying the moment.

Run 19 (photo 19)

In contrast to the previous driver, Alan Crossfield from the Leyland SME is a seasoned competitor, having won the contest three times before. His beautifully detailed model of an ex-LMS Patriot class 4-6-0, built to his own design, has received a number of prodigious show awards, including the Duke of Edinburgh award, and this was Alan's third entry to IMLEC with this locomotive.

While understandably leaving the feeding of coal onto the fire until the last minute, this possibly affected his run. Sadly, experiencing a very rainy wet start, Alan set off with a load of six passengers which was sensible in the conditions. He stopped in the station for nearly three minutes after the first lap to rebuild his fire, and then put in seven good laps, although



David Kerry and 5 inch BR 9F 2-10-0 92220 Evening Star.

the section from the traverser to the station was tricky on a number of occasions. He stalled on the eighth lap before the station summit, so dropped off all passengers before dropping back and taking a run at it. Alan admitted to running out of steam on the last lap but managed to finish in 32:20 using 1.495 lb of coal.

Run 20 (photo 20)

David Kerry, a regular IMLEC entrant from Chesterfield MES had nicely prepared his wonderful BR 9F but he was another one caught by a sudden turn in the weather. With the observer's notes stating 'wet', David and his twelve passengers got a fair soaking during the start of the run. David encountered a few set-backs and stoppages before the sun reappeared towards the completion of his run. While retaining a full complement of passengers, his coverage of just six laps displayed the struggles encountered in his 30:32-minute run and accounts for the slightly high coal use at 2.940 lb.

And that phrase 'anything can happen in the next 30 minutes' suddenly came to haunt us. Sitting in the control room, the event overseer burst in looking somewhat pale - "the load cell has failed" he

blurted - arrghh... that was definitely not in the game plan! While attempting to retrieve values from the dynamometer tablet, our data manager discovered there were no readings for David's run.

There seemed little choice but to take the dynamometer car aside and find out what was wrong. It was wheeled across to the workshop, while a hasty message on the tannoy blurted out that running had ended for the day, which came as a bit of a surprise to everyone. The load cell unit was removed and it was soon apparent that water had got into the circuitry, inhibiting its ability to work.

Fortunately, we had a backup load cell unit on loan and, within half an hour, the car was fully operational again. However, ahead of running again on Sunday, additional measures were taken, including the installation of some 'mud flaps', to prevent any repeat of water ingress.

So, sadly runs 21 and 22 were postponed. This was a very different day from Friday - the gremlins had really got in, and we staggered home to ponder how to sort it out on Sunday.

Photographs courtesy of Rob Speare, Bernard North and John Allen.

●To be continued.

The Eating of Elephants

PART 22 – THREE TIMES AROUND AND BACK TO THE STATION

Steve Goodbody finds some things are best tackled in small helpings



Continued from p.337
M.E.4724 August 25

By the autumn of 2020, after thirty-five years in the making, *Jennifer Ann* (née *Elidir*) was at last painted, lined, assembled and ready for testing. As we re-join the story for the final time, the moment had arrived to see if she would work.

Lights, camera, action

I have never made a video before but, having spent a decent portion of my life building her and wanting to record *Jennifer Ann*'s first steaming for posterity, the idea of doing this using moving pictures rather than still images was rather appealing.

And so, on the morning of Friday, 23 October 2020, with camera and tripod at the ready and with the last few items on the extensive *Things to Do* checklist ticked off, I carefully eased *Jennifer Ann* off her wooden building stand onto a rolling-road mounted atop a hydraulic trolley and wheeled her out of the workshop; her first trip outdoors since arriving in America twenty years earlier.

Then, with water at half-glass in her boiler, the tank filled once I'd found a temporary solution to the airlock problem, a layer of charcoal in the firebox and the electric blower gently drawing at her chimney, I lit a match, ignited a lump of paraffin-soaked charcoal on the shovel and dropped it through the firehole door.

Over the next hour, as the engine gradually warmed through and pressure began to register on the gauge, I noticed a slow drip of water from the front blowdown valve which, evidently, was not fully sealing and added it as the fourth item on the *Things to be Fixed* list, although that soon became the second item when the two dribbling injector overflow pipes - items two and three on the list

respectively - ceased to drip once sufficient pressure seated their boiler check valves.

With pressure rising, I removed the electric fan from the chimney and slowly opened the engine's own blower, curious to see how well her Laurie Lawrence inspired front-end would perform. With smoke billowing from the chimney accompanied by a soft hiss and the fire burning brightly, I deemed the blower a roaring success, if you'll pardon the tenuous pun.

Next on the list, after blowing down and checking the water gauges and before pressure rose too far, was to test the injectors and see if they still worked.

Now, despite having tested them the previous year on the Allchin, I was still worried about the injectors because, as I assuredly knew, an injector's performance is highly engine-dependent and can be adversely affected by a multitude of variables. A tiny air leak on the water supply? Water too warm? Delivery piping too restrictive? Dirt from the tank in the cones? All were potential problems which would need correction, with varying degrees of difficulty, should they occur. And so, with trepidation, I twisted the right-hand injector's handle through ninety degrees, waited for water to appear at the overflow and, holding my breath, began to open the steam valve. As I did this, the overflowing water instantly disappeared and began making its way into the boiler. Satisfied, I repeated the exercise for the left-hand injector and the result was the same.

With a huge sense of relief knowing the injectors functioned on *Elidir* as they had on the Allchin, I moved on to the boiler handpump, which worked but required a lot of

pumping to make a noticeable difference to the water level, just as expected. Next came the whistles, then the steam and vacuum brakes and fortunately all of these did what they were supposed to do. Finally, after opening the blower wider and popping some more coal onto the fire, I allowed pressure to rise and the safety valves to lift which, as seems typical for Ramsbottom-style devices, opened as they should but needed a gentle tap on the lever to fully close afterwards. Never mind - that's not difficult to do on a quarry Hunslet where the safety valves are inside the cab.

With nothing else to test, the time had finally arrived to open the drain-cocks, warm the cylinders, and, with fingers firmly crossed, see how the engine ran. And, with a hiss and a rumble, I opened the regulator and away she went, stiffly at first, with a satisfyingly sharp beat from her exhaust.

By the time the testing was over, I am happy to report that the *Things to be Fixed* list contained only three items: the airlocked water filler, the dripping blowdown valve and the regulator which had begun leaking slightly when closed, although it turned out that the regulator and the blowdown valves were two symptoms of the same cause - dirt in her insufficiently-washed-out boiler had unseated both - and all three items were fortunately simple to fix.

Should you wish to witness these events exactly as they happened, albeit compressed into a manageable twenty-minute edit (as we cinematographers say), then I've included a link to the video in the final Postscript. So, grab some popcorn, sit back and relax, for the show's about to start.



Jennifer Ann poses for the camera in 2022.

Reflections

Well, there we are. Today, the eighth day of September in the year 2022, nearly two years after *Jennifer Ann's* first steam test, finds me sitting in a comfy armchair on the front porch, a gentle breeze providing pleasant relief to the late summer sunshine and my laptop, appropriately enough, sitting on my lap. I am periodically checking the headlines because the news

unfolding from Balmoral is not good and wondering how best to draw things to a close before leaving you with a selection of pictures of *Jennifer Ann* and her siblings as a parting farewell.

Perhaps unsurprisingly, the most common questions I am asked whenever I take her on an outing (other than the one about her paintwork which we've already covered) is: "Did you build it yourself?" and "How long did it take?", the

latter generally being a follow-up to the former. And while seemingly innocuous, I have found these two questions particularly difficult to answer and confess that I generally don't do a good job, so let's take each in turn and I'll see if I can do better for the record.

Did I build *Jennifer Ann* myself? Well, I'd like to say that the short answer is yes, but in the spirit of completeness and honesty, I think more detail is warranted. Firstly and most significantly, I did not build her boiler, which is by far the largest bought-in item. Additionally, the three pressure gauges are commercial items, as are the corrugated vacuum hoses with their connectors at front and rear and the pressure-test isolation valve hidden in her smokebox. Furthermore, her nameplates, works plates and builders plate were all professionally made and, finally, her valve handwheels, draw-hooks and draw-hook shackles were lost-wax castings which required minimal machining and clean-up to finish. To the best of my recollection that's the complete list of the bought-in items, everything else on *Jennifer Ann* being built from scratch.

And now to the more difficult question: how long did it take to build her? The simplest answer, and the one I usually give, is thirty-five years, for she was started in 1985 and finished in 2020, unless you believe the date on her builder's plate which you shouldn't. However, thanks to A-levels, university studies and emigration, there was a heck of a lot of downtime in those three and a half decades. Therefore, deducting the long periods wholly separated from workshop and hobby, I arrive at a figure of fifteen years available to work on *Jennifer Ann* and that, I believe, is probably a better answer to the question. Either way, I am sure you have spotted that both are rather longer than my original six-year worst-case estimate!

Now, while these are good questions, to me the most important question and one which is never asked because no-one suspects, is: *Was Jennifer Ann built entirely with the same equipment with which she had been started?* That, you may recall, was the goal I set myself in England in 1985 and re-affirmed while recreating my workshop in America in 1999 and, although some may find it strange, that is my personal measure of success.

And the answer to that question is a resounding yes, for I can honestly say that, except for the few items previously mentioned, *Jennifer Ann* has been entirely scratch-built using the original combination of hand-tools, pillar drill and a George Adams round-bed lathe of 1905 vintage. As an impecunious seventeen-year-



Her lubricator about to be filled, the handwheel of Jennifer Ann's front blowdown valve is visible behind the oil can's spout.



The whistles cast their reflection in the spectacle plate's paintwork.



The fly crank, coupling rod, connecting rod and lubricator drive rod with its return crank bolted to the crankpin collar. Without the aid of a milling machine, a lot of handwork went into Jennifer Ann's components.



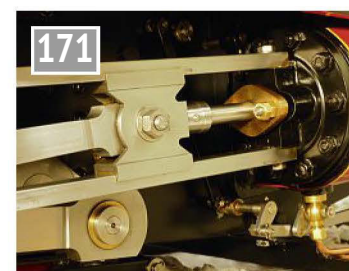
The upper portion of Jennifer Ann's cab is open; sliding doors provide access to the firehole below.



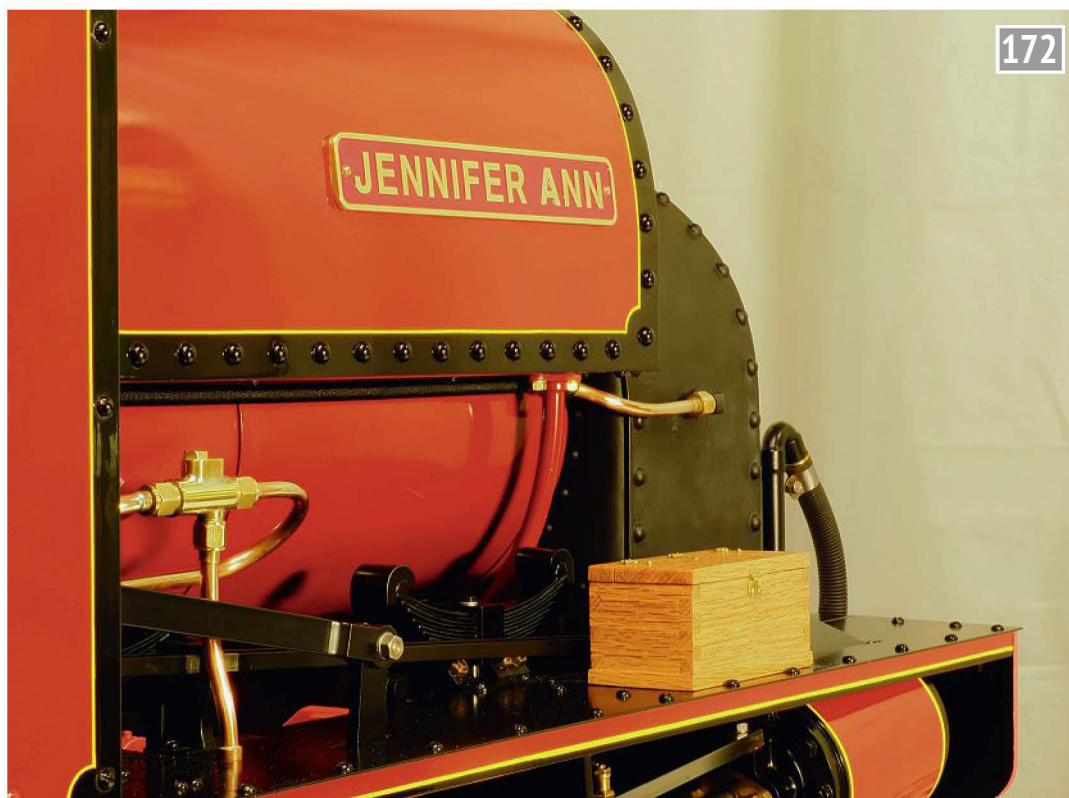
Her cab fittings, arranged on either side of the steam dome and safety valves.



Jennifer Ann's lower cab with oak-planked floor. The firehole access doors are closed in this picture.



Slippers are silver soldered to the crosshead centre, with bronze inserts to provide the guidebar bearing surfaces.



A box-jointed oak toolbox mounted to the running board provides useful storage for small items.



Jennifer Ann, Rob Roy and Bluebell, photographed together for the first time since 1985.

old I wanted to see if it was possible and I can now proudly say that it is and **photos 164 to 174** provide the proof.

Beginnings and ends

If you have been following this series, originally conceived as a three-part piece but eventually growing into an improbable twenty-two part trilogy, you may have noticed that we've come full circle, for *The Eating of Elephants* was conceived exactly three months after *Jennifer Ann's* first steam test, during a journey back to the states from England fuelled by a breakfast of prawn salad sandwiches, crisps and a banana-milk chaser - a combination which I still don't recommend.

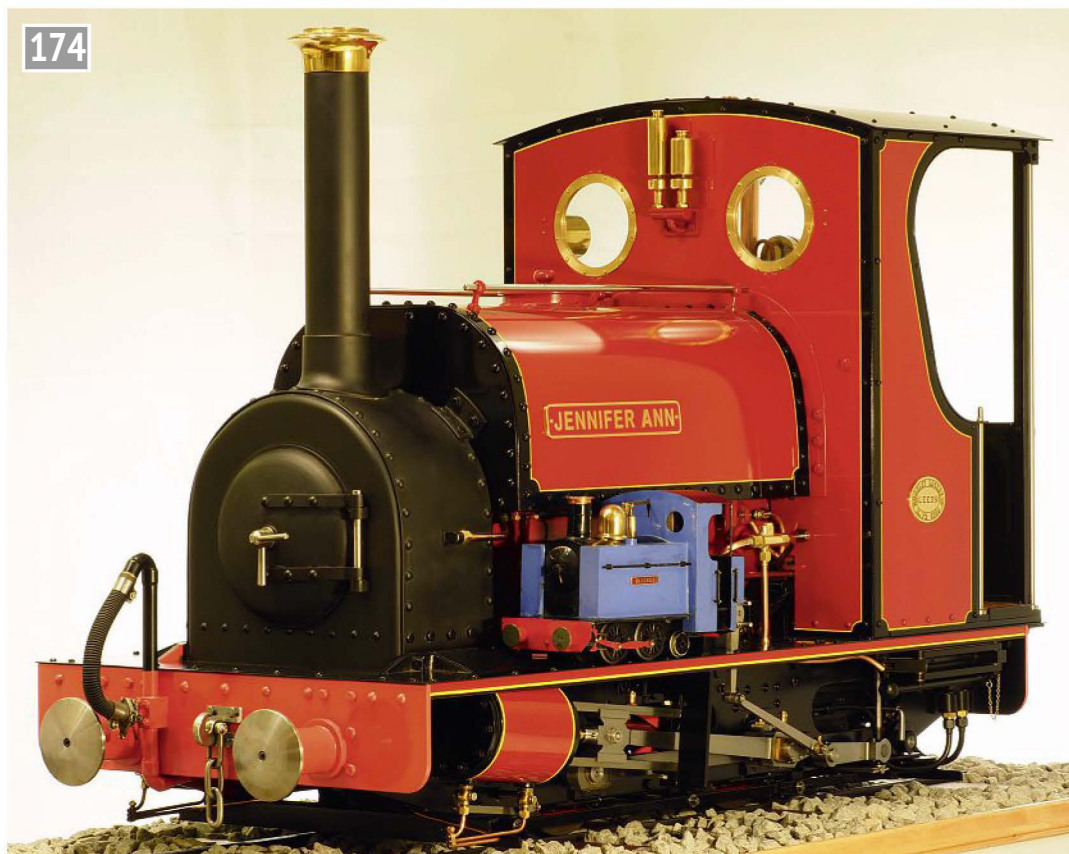
In that first episode, resolute Reader, over sixty thousand words ago would you believe, I expressed my hope of providing a little inspiration to the budding model engineer who, perhaps sitting on the side-lines and unsure whether they have whatever they think is needed for the job, may be afraid to take the first step. And while their situation won't be exactly as mine, I would like to think that the stories behind *Bluebell*, *Rob Roy* and *Jennifer Ann* show what can be achieved by a beginner if they have patience, perseverance and the support and guidance of their friends and mentors, even if their means are limited and their confidence is shaky.

Yes, I made plenty of mistakes and some of the results were not as perfect as I would have wished, but who really cares? The main point is, you will never know what you can do unless you start the journey, so go on, give it a go; I promise you won't be disappointed.

And that brings me once more to the many friends and mentors who have played a part in this story, sadly not all still with us, but all flourishing in fond memories regardless, for without them my journey would have been much shorter and far less enjoyable.

So, to mum and dad, Chris and Alf Goodbody and to Bob

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Bluebell and Jennifer Ann, their completion dates separated by forty-one years, both inspired by a 1970s family holiday to Snowdonia.

Douglas and Cecil Woods and to Nick, Geoff and Anne Swift and to Geoff and Lorna Billington, Peter Southern, John Pollington, Roy Foster, Pete Shott, Paul Heafield, Des Beeney, Bill Powell, Robin Eaves and Mike Wadey and to Barry Miller of TBSITW and to Our Expert and of course to my long-suffering wife, Jenny, I would like to express my profound gratitude and thanks once again.

And, just like the train ride at Bentley during those early years, we have lapped the circuit three times and arrived safely back at the station - and I sincerely hope you enjoyed the trip.

Postscript to Part 22

Jennifer Ann's successful steam test, memorialised at youtu.be/5FbTqFqHD-M which can also be reached via the QR code below, really isn't the end of the story of course. Her first track day at the New Jersey Live Steamers the following spring was an unmitigated failure thanks to repeated priming but a subsequent

backyard steaming session, with her boiler repeatedly filled to full-glass and blown down to the bottom nut over a three-

hour period, eventually solved that problem and highlighted a habitually-blocking spark arrestor and a loose injector

Steam test.

combining cone; the first soon abandoned and the second easily fixed, so it wasn't the end of the world.

I am happy to report that Jennifer Ann has been well behaved on each visit to the railway since, although she keeps reminding me that I need to finish the other two wagons, whose chassis are sitting in the workshop, because she really wants to stretch her muscles and, as you can see from **photo 175**, her train is unchallengingly short at present. I've told her it won't take too long, a year at the most and have asked her to be patient, but she is giving me a disbelieving look nonetheless. I really can't imagine why.

ME

175



Jennifer Ann, impatient for the other wagons she knows are in the works, pulls the author around the New Jersey Live Steamers' track in 2022.

We Visit the Wigan & District Society of Model Engineers

John Arrowsmith takes a trip to a club with the benefit of an attractive woodland setting.



My visit to the Wigan and District Model Engineering Society was part of a short tour I made in this part of Lancashire and Yorkshire. The present site is located in the Haigh Woodland Park which is a

lovely woodland area through which the railway now runs. The Society has a long history having been started in 1937 when they were able to build an 'L' shaped track in a member's garden, then the World War II interfered with the operations. When this had run its course the members started to look for a more permanent site that would allow a continuous track to be built. Haigh Woodland Park was part of Lord Crawford's estate and when he returned to his ancestral home in Scotland he gave the whole park to the Wigan Council. They then allowed the club to build their first oval of track but it did have some quite severe restrictions, like they had to keep a low profile and not draw attention to themselves, and if they gave rides they were not

allowed to charge for them. This was not ideal but at least the membership of the day had somewhere to call a club site and continued to use the site for a number of years. Because of the lack of advertising for the club within the park, the footfall to the railway was quite poor which has restricted the development of the club as they would have liked. However, a major problem with the rhododendrons in the woods and the resultant clearance of all of them made much more space available which enabled the club with the permission of the Haigh management to increase the length of the track. In the 1980's the length was increased again to about 1/3rd of a mile and this is how it has stayed up to the present day.



The sylvan surroundings as the track winds its way through the trees.



New steaming bays outside the running line with easy access to the park roadway.



A low level stock shed receiving some attention.

At one time they had a membership of about 120 which made it quite a large organisation but because of the low footfall membership dwindled over the years down to about 50. They kept going through all these difficult times and now that the park management has adopted a more generous outlook and now appreciate that the club is an asset rather than just a miniature railway they are looking forward to the future with some enthusiasm. They now have their own web page and social media outlet which is helping with their promotional work. This stems from the fact that last year the Park itself enjoyed round about 1.5 million visitors and now that they are accepted and being promoted, membership is growing steadily with approximately two new members a month this year, so that they now have around 70 members which

must be encouraging for them. Chairman Lee Westwood told me that they have recruited three new junior members and their families and is the way he would like the club to progress. This is something that I know is being followed by other clubs and seems to be working well here. One of the families is a three generational family which he says is working very well. These younger families are also beginning to take on some of the heavier work where like many clubs the older members are finding it more difficult as the years pass.

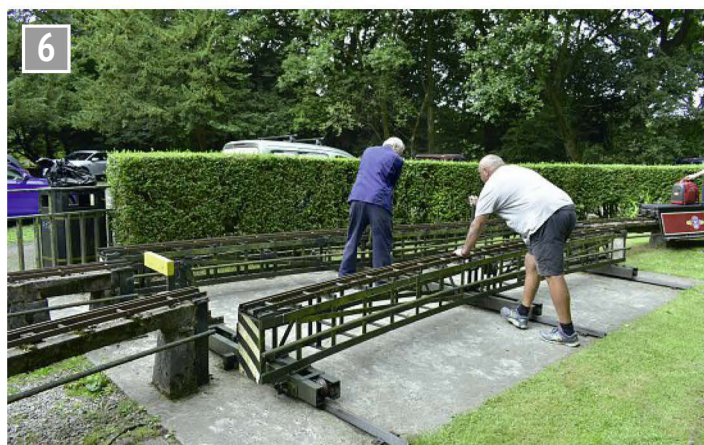
My arrival coincided with their normal work day and I found myself in a quiet woodland area with the sun shining through the mature trees onto the railway. The well constructed track has all been built by members who made all the moulds for the concrete support beams and pillars as well as pouring all the concrete, so there is continuity round the system, which is



One of the club carriages being used to transport a generator for some track work.



The main traverser being checked out.



Where do you want me to stop this?

also fitted with a substantial anti-tipping rail (**photo 1**). The journey from the station follows the contours of the land as well as the climb up to the summit and as it bends round many mature trees the passenger is anticipating what is round the next bend as you cannot see the whole track from any one place, it is an intriguing ride. When the track was originally built the steaming bays were

within the oval so to get a large locomotive to the bays entailed some heavy lifting across the tracks. When it was extended the decision was made to move the steaming bays to a more convenient position for loading and unloading (**photo 2**). Lee told me that this is very much appreciated by visitors and members. Three of the older steaming bays are retained adjacent to the stock storage



An outside view of the compact club house.



A useful tea bar inside the club house.



Two additional traversers from the steaming bays.



Inside the compact carriage storage shed.

shed and they are served with a large turntable.

Preparations for their next open day were in full swing with lots of sprucing up going on with the outside surfaces on buildings being brushed and leaves being cleared from the track (**photo 3**) while others were attending to the track and traversers to ensure everything was working as it should (**photos 4, 5 and 6**). I mentioned that in the formative years of the club with the restrictions imposed on them facilities were quite basic but these days they have a small but effective little club room with a nice little tea bar and stove to provide some comfort during the winter (**photos 7 and 8**). Carriage and stock storage is housed in purpose built low level buildings to blend in with the park environment and this is serviced with a good strong moving sector section to accommodate all the four roads of the sheds (**photos 9 and 10**). Another storage shed provides some basic repair facilities. It was good to see the progress the club is now making and I am sure under the chairmanship of Lee Westwood the club will not only continue to be a great facility in the park but will become a focus for many model engineers in the area for a long time to come. My sincere thanks to Lee and all the members I met for their hospitality and I hope that all their ambitions for the future are fulfilled.

ME

RECYCLING PART 4

A SOUTHERN SCHOOLS 3½ INCH LOCOMOTIVE

Robert Hobbs takes a box of bits and turns out a Schools Class 4-4-0



Continued from p.316
M.E.4724 August 25



Parts for the cab sides and spectacle plate.



Smoke deflectors.

The cab sides, roof and spectacle plate were cut from galvanised steel using a Vibro saw. Cutting steel is a bit demanding on the blades but if you do not push too hard it is worth the effort and expense of the replacement blades. The profiled cab components are shown in **photo 66**.

The smoke deflectors, which are a dominant part of the

Schools class were cut from galvanised plate, care being taken to leave sufficient metal for final fitting to the front curved section of the running board. The deflectors are shown in **photo 67**. The central section of the front apron was fabricated from sheet metal and embellished with the door handles and rivets and is shown in **photo 68**.

The profiles of the steps

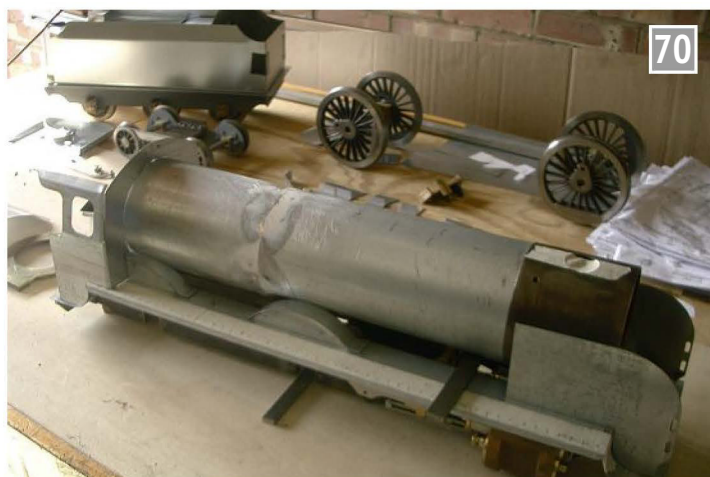
were cut from sheet steel and the actual steps were lengths of angle riveted in position, the eight assembled steps being seen in **photo 69**. The boiler shell was rolled in two sections because my twelve-inch rolls could not accommodate the overall length required. The two sections were aligned with a supporting ring on the inside and silver soldered on the



Central section of the front apron.



A set of steps.



Trial fit of the boiler casing.



Smokebox door with clamps.



Completed boiler.

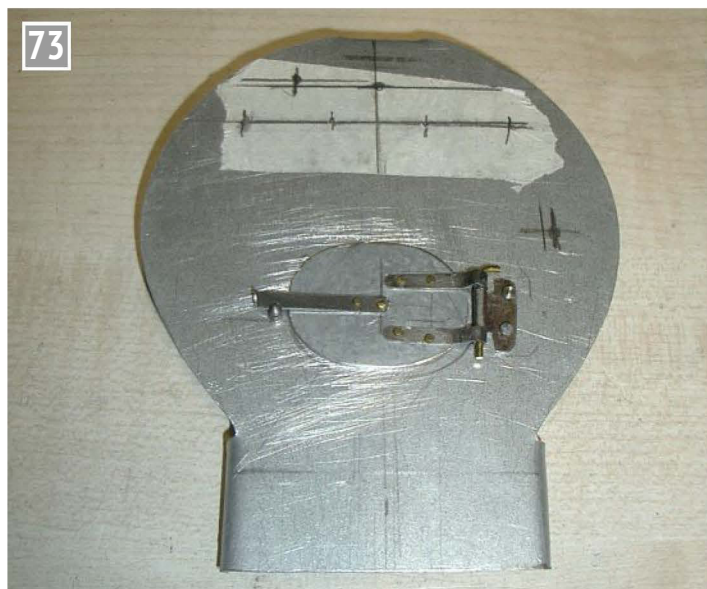
central seam. **Photograph 70** shows the loosely assembled boiler casing located on the main frames and fitted into the spectacle plate and the smoke box ring. This photograph also shows the marking out for the rivets on the running boards and the position of the smoke-deflectors.

The rivet positions at the front and rear of the smokebox were marked out using masking

tape as an aid and drilled in the bench drill. **Photograph 71** shows the set-up with packing clamped in place to ensure the rivet holes were parallel with the edges. The holes were first spotted using a centre drill and then opened up to suit the rivet size. The front of the smokebox was a brass casting and the flange was turned in the Myford lathe on the rear face to produce a flange over which



Drilling the rivet holes.



Fire hole door.



Cab in primer.

the smokebox ring could snugly fit. Once the casting and the chimney hole had been lined up the holes were drilled for the front edge rivets.

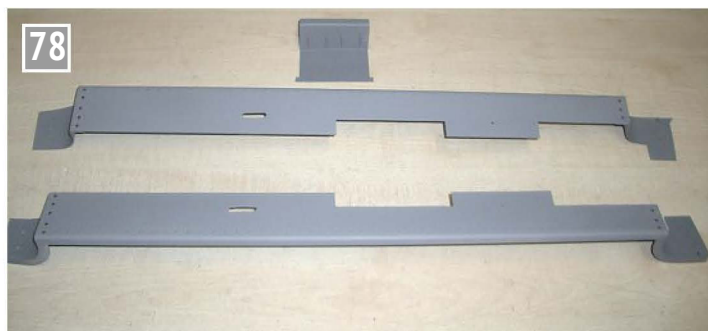
The smokebox door hinge positions were determined and the cleaned up smokebox door casting drilled for the hinge pin. The Schools class does not use the normal dart and twin handle

closing system, the door being held in position by six bolted clamps around the periphery of the door. **Photograph 72** shows the front of the smokebox and the clamps.

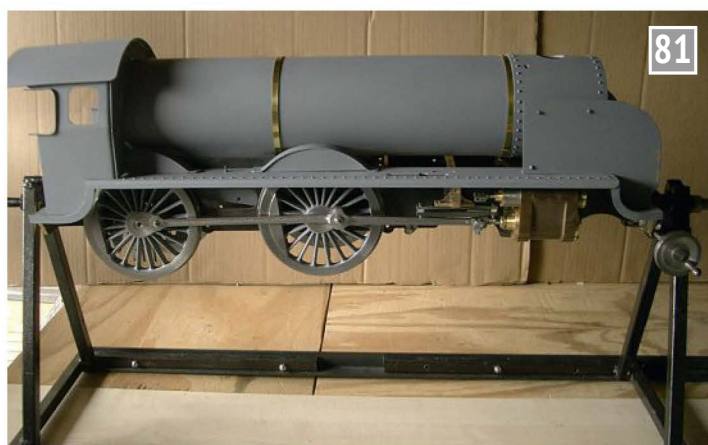
The dummy boiler back plate was shaped from 2mm steel and a fire door and hinge system and this is seen in **photo 73**.



Splashers in primer.



Platforms in primer.



Locomotive assembled, primed and ready for painting.



Finished platforms.



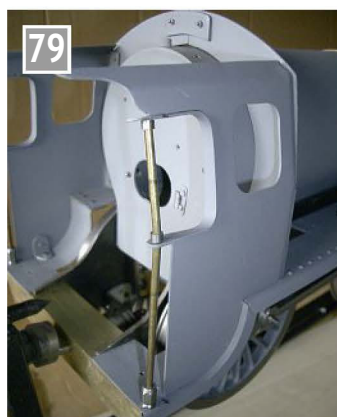
Finished smokebox.



Finished cylinders.



Steps in primer.



Cab sides added to locomotive.



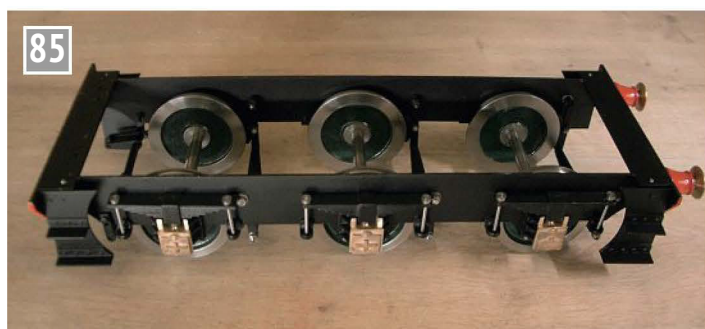
Smokebox front.

The cleaned up and loosely assembled boiler is shown in **photo 74**. While the paint spray was out the cab components, splashers, steps and running boards were cleaned up and given a base coat of grey etch primer and these items are shown in **photos 75 to 78**.

With so many of the components primed it looked sensible to do a trial assembly of the locomotive. The main frames were mounted in my roll-over stand and the cab (**photo 79**) and the front end (**photo 80**) were attached. **Photograph 81** shows the assembly and how the

locomotive was developing, the grey finish providing an uncomplicated by colour impression of how substantial and powerful the Schools locomotive was in real life.

The etch primed components were left to harden before rubbing down with wet and dry after which a second coat was applied. When this was hard the topcoats were applied leaving drying time before a rub down between the coats. Matt black was applied to the frames, running boards, cylinder blocks, smokebox and the tender chassis. These are shown in **photos 82 to 85**.



Finished tender chassis.



Painted boiler.



Painted cab and splashers.



Finished bogie.



Main wheel sets.



Painted cylinder covers.

The boiler casing was rubbed down and the blemishes filled with P38 car body filler, rubbed down and refilled until a smooth finish was obtained. Several stages were necessary to deal with the central soldered area of the boiler before the etch primer and then several coats of finish coat could be applied. **Photograph**

86 shows the boiler casing after top coating, with the safety valves and steam dome in position.

The cab sides and the splashers were carefully rubbed down and recoated with etch primer prior to being given several top coats of green and these are shown in **photo 87**. The front bogie

was given a similar treatment and is shown in **photo 88** while **photo 89** shows the main driving wheels which had the spokes filed out and cleaned up before being hand painted to match the boiler/cab colour. This photograph also gives a clear image of the central connecting rod and eccentric.

The last locomotive items to be spray painted were the covers for the outside cylinders and these are shown in **photo 90**. With all the parts painted and finished we just have the assembly of the locomotive and the tender to complete in part five of this series.

● To be continued.

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Models

■ 3 1/2 Collett 22XX scratch built to scale, well advanced build, slip eccentric air running boiler and fittings with certificate, all platework tender 95% complete except pipework, £1,500. 5" Maxitrak Dixie built from kit Cheddar boiler steamed once, £2,500. 5" Caledonian 498 (Rob-Roy) scratch built detailed finish Northern boiler certificate true to scale and air running but never steamed, £3,000. **T. 01902 424164. Wolverhampton.**

■ Foden 3inch scale steam waggon part built most parts but boiler needed. £1600ono. **T. 07885345356. Kirkbean.**

■ New 3 1/2" gauge Silvercrest Duchess Class Locomotive, 1950's BR green, water test certificate, many refinements and details added to this exhibition quality model, accessories/documentation, realistic oak framed display track, transport crate, buyer collects, £4,000 ono. **T. 01933 663350. Northants.**

Parts and Materials

■ Part built 3 1/2 G William tank engine drawings, construction book, castings to complete running gear, some machined, coupling hooks, drain cocks, over £600 castings, needs work on cylinders, assembled frames on stand, photos available, £350 ono. **T. 01772 673410. Preston.**

■ Metre Maid 80% complete, super engineering new Blackgates boiler with all fittings and certificates, all platework to complete, £2,000. **T. 01902 424164. Wolverhampton.**

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■ Dore Westbury Mill. Miller must be in good useable condition. **T. 01246 277357. Chesterfield.**

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A Dirty Tram

- a Bit of Nostalgia

PART 2

Ashley Best
tells it as it
was.



Continued from p.340
M.E.4724 August 25



A completed 22E truck.

Construction

The model was built exactly like all the others in almost all respects, but with any changes and new methods designed to aid and improve the process. The 22E trucks, for me, are always the first things to make and then fitted to the underframe, tested and adjusted as required before moving on to brake gear and life guards (**photo 10**). I find getting all this 'under-tram' detail work done at the beginning to be essential as having to work on an inverted model can be difficult. It is important, in particular, to make sure of perfect clearance for the swing of the bogies and proper clearance for the life guard front gate and tray,

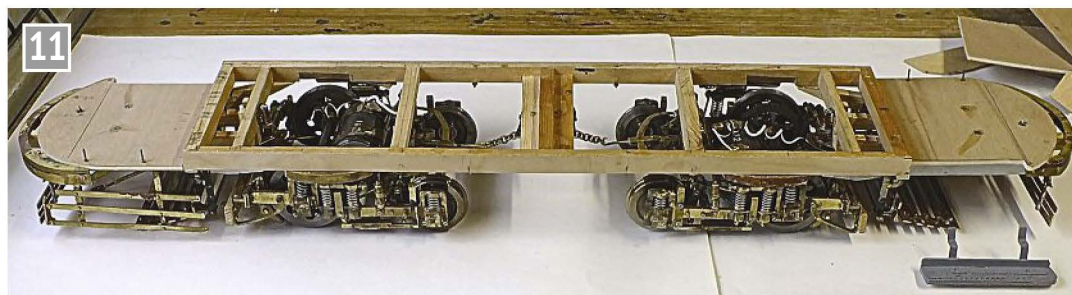
remembering to allow for the final weight the car is likely to achieve (**photo 11**). The underframe should include the metal fender at each end and those are quite difficult to make with an accurate curve and flange. They can be made with successive bouts of annealing and silver soldering, rather than cutting the flange section from brass sheet with a piercing saw, which is often the suggested method and is incredibly wasteful. A flat strip can be successively annealed and bent as mentioned above. It needs delicate use of a light or planishing hammer on a flat surface plate after each bending before finally silver soldering to the already curved member (**fig 1**). The completed

work is then fixed by pins and epoxy glue to the platform bearers (**photo 12**).

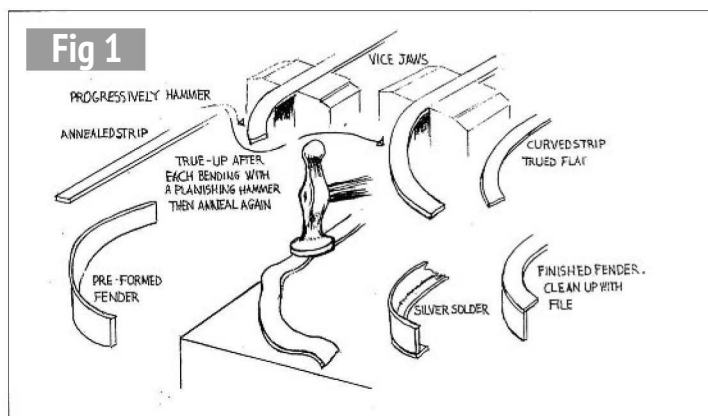
Platform bearers ideally should be adjustable by U-bolts and keeper plates as on a real tramcar (**fig 2**). On 420, after all the underframe details were finished and checked, and *only then*, the floor was fitted. I now fix this with small countersink screws so in an emergency, should it be necessary, at least during construction, the floor could be lifted (**photo 13**). Final construction makes this impossible. If lighting is to be included, as was the case in this model, it is useful to drill a series of holes in the cross members as the frame is constructed. Some, at least should be provided even in the absence of lighting to accommodate the main power cables.

Making the saloon

Bulkheads were the first things (**photo 14**), followed by the window pillars and longitudinal beams to create a full framework (**photo 15**). It is not unlike model aircraft construction, but rather simpler. I used 0.9mm ply for the panelling. The saloon ceiling had to be completely finished before



Underframe with trucks in place.



Making the fender.

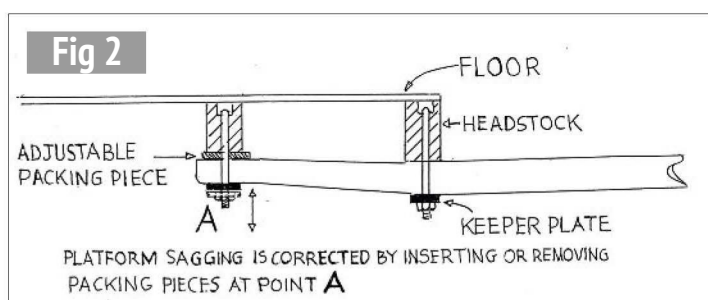


Diagram of adjustable platform bearers.



Bulkhead with sliding door.



Lower saloon framework.



Fender fixed to platform bearers.



Underframe with floor attached.

fitting as otherwise it would be impossible to put in lights, strap-handles and details of lining and decoration (photo 16). The ceiling was therefore finished and varnished before fitting. This is one of the parts that had to be brought to final standard early in the construction, with the platform bulkheads and stairs also needing the same treatment. It is all part of the essential forward planning

needed in such models; indeed much of the bodywork construction consists of making many separate parts to completed condition before final assembly as, once fitted, access becomes impossible. The dashes are an example of this as making them complete with headlights and painting, putting in the fleet number and applying lining, if required, is far easier when off the model (photo 17).



Completed ceiling.



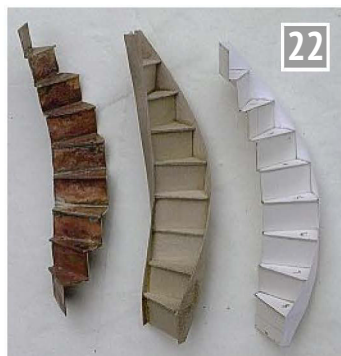
Completed dash with headlight.



A basic headlight.



Pair of model English Electric controller tops.



Trial stair assemblies.

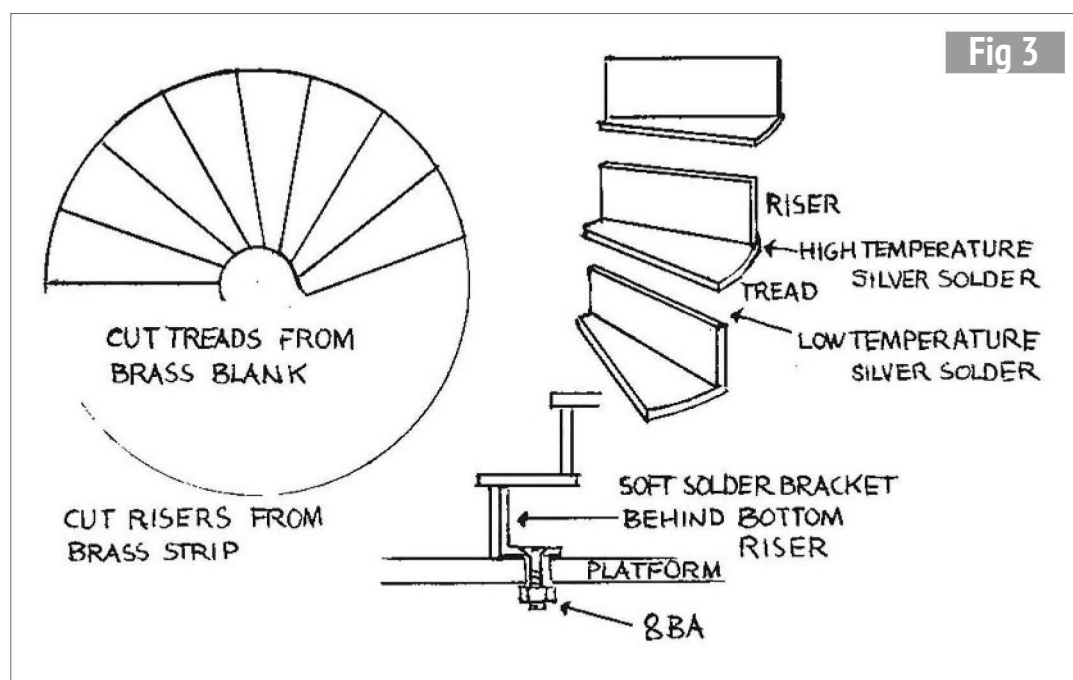
Tramcar spiral stairs are one of the really tricky things to make – the others being headlights (photo 18), trolley gear (photos 19 and 20) and controller-tops and handles (photo 21). I now make the stairs from brass, having tried wood, card and a mixture with only limited success (photo 22). It requires suitable brass sheet and probably two grades of silver solder throughout. It can all be achieved with one grade with sufficient care (fig 3). It is possible with super-human care to silver solder the treads and risers and soft solder the stringers, but it is so tricky not to be worth the effort. Soft solder for the whole job is almost impossible. Wood is the easiest but lacks two main benefits of metal - it is difficult to fix the handrail stanchions



Trolley base parts.



Trolley base showing bearing.



Stair making plan.

Fig 3



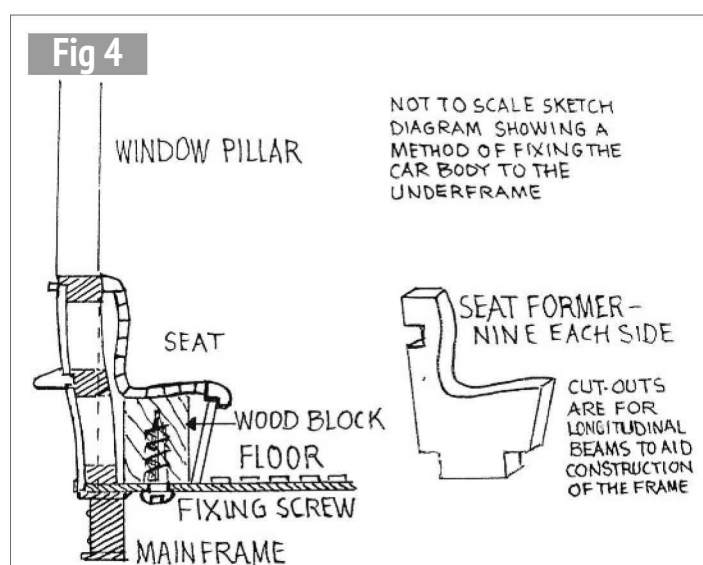
Finished metal stairs.



Lower saloon longitudinal seats in place.



Upper saloon seats.



Bodywork fixing.

and, unlike metal, it cannot be used to transfer power from the overhead line. The stairs should be finished - including fitting handrails and painting fully - then put aside for later fixing (**photo 23**). I made all the top light window frames complete with glazing and trial fitted these and the main windows ready to be put in place later. All were numbered for their respective openings. A scratch built model, however carefully marked and cut, inevitably has tiny size differences, so individual marking is important even if most parts are accurate enough to appear interchangeable.

Assembly

As the model progressed, I paid special attention to interior details which on the actual

trams were kept in reasonably clean condition. The interiors were not intended for a later application of grime. The flip-over seats for the upper saloon were each made to work and were carefully stained and varnished (**photo 24**). The lower saloon longitudinal seats were similarly stained and varnished (**photo 25**). These seats served the purpose of concealing wooden blocks, so the whole lower saloon and thus the tram body itself could be fixed to the underframe with small screws from below the floor and into these blocks (**fig 4**). In this tram there were two screws at each end and six more distributed down the length of the saloon. Interiors were stained, painted and varnished completely before fitting the glazing and



Upper saloon roof – sticks.



Fixing the roof planking with weights.



Rubbing down tools.

the ceiling details. A full set of upper saloon roof sticks were made by drawing out the shape via a stencil onto a large close-grained, suitably sized wood block which was cut to profile on the bandsaw and then progressively fed

through against the fence to produce all the identical roof sticks (**photo 26**). These were all then drilled for thin wires for the lighting circuit. Interior lights for the upper saloon were 12V 'grain of wheat' (LED lamps would each have required a resistor and this would be difficult to conceal under the single skin roof). All the roof sticks were glued into place and then, starting on the centreline, the roof panel planks were fitted and glued down with weights and with clamps on the ends where the roof turned down (**photo 27**). Finally, after a lot of sanding to gain as smooth a surface as possible, a final covering was applied by simulating the canvas on a real tram with high quality cartridge paper.



Rubbing down with wet & dry tool.



Clean ex-works model No. 420.



A last look before the dirt.

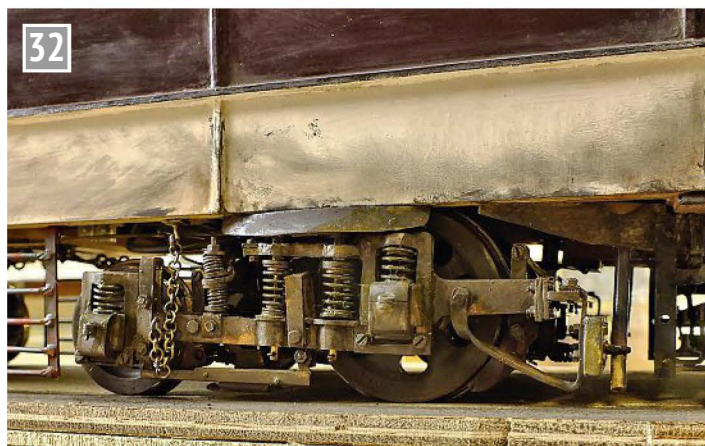
This was cut approximately to size, soaked in water until flexible and then glued down with PVA glue. It needed smoothing and holding down with weights and with clamps on the ends until absolutely dry, which took a surprisingly long time. I cut out a section of this paper to facilitate the fixing down of the trolley plank as I thought it would need a wood against wood joint for such an important part.

Painting

Upon completion of the main structure, the painting had to be tackled. This was quite straightforward but had to be methodical. On this model, only the application of primer was sprayed and all the rest was brush work. The very first task was preparation. The ply panels needed a lot of careful sanding to get the surface as smooth as possible to prevent the grain showing through the paint layers. Sanding sealer was then applied and when dry, rubbed down with fine wet and dry paper. This work did manage to produce a good smooth base for the primer which was sprayed on after masking out. I used standard automotive primers, red oxide and white, then rubbed down with wet and dry papers. This rubbing down is most important and I made a collection of simple wooden jig tools of suitable sizes to aid the process (photo 28). Strips of different grades of the abrasive papers were glued to these tools and easily replaced with fresh pieces

as they wore out (photo 29). Two undercoats were applied and rubbed down after each application. I found it best to allow several days to allow these undercoats to dry really hard before applying the top coats. I had to make up the colour of the maroon top coat from oil-based modellers' paints. Finally the tram emerged in its ex-works condition – clean but plain and simple. Once completed, it was photographed to provide a record (photo 30). It would never be seen like this again!

Having arrived at this stage – the tram in its 1942 condition, straight out of the workshop, I was faced with the decision of whether or not to finish it as first intended. It is not easy to take a model with a carefully painted finish and effectively to mess it up! The possibility of overdoing it or getting it wrong could not be ignored and there was therefore a temptation not to go ahead (photo 31) ... but this would be a cowardly get-out and defeat the purpose of the original idea. I therefore took the plunge and acquired various weathering compounds and painted trial panels so I could experiment before working on the model. Once started, things became more relaxed and I used several methods and materials. I found weathering powder gave the most realistic results but these, while looking good, needed fixing as otherwise they would be liable to rub off at least in places. I also used, on some parts, a liquid weathering paint which



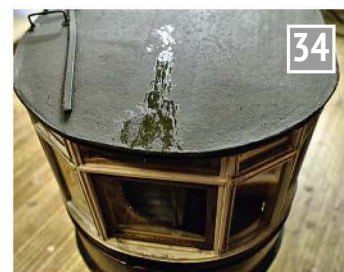
Filthy truck.

could be made up from base colour and diluted with white spirit. Photographic reference of many of the trams taken towards the end of operations showed most of them dirty, some of them incredibly so. The trucks obviously were entirely free of any sign of the underlying colour (photo 32). Dirt on the bodies of the cars was most noticeable on the cream rocker panel which often appeared almost grey. The dirt was mostly, as might be expected, on the lower decks, becoming less conspicuous on the upper parts of the tram (photo 33). This would be because much of the dirt would be acquired from the road surface, but the atmospheric conditions of the industrial smoke generated pollution and the damp fog and mist of industrial South Lancashire at the time also added to the overall grime and degradation of the paint surface and colour. The maroon was generally darkened and the cream became mostly off-white. Despite this, the windows were generally kept clean. The car roofs were really grubby and assumed a uniform dark grey with oil from the trolley-head splattered on the ends (photo 34).

The finished tram has received a mixed reception, mostly approving, but some observers are horrified and are of the opinion that models should always be presented as ex-works. As an aside, I remember, a long time ago, that at a Tramway & Light Railway Society meeting, showing my



Most dirt on lower parts.



Oil from trolley head.

slightly weathered model of a South Lancashire bogie car to a horrified reception, leaving me to be taken on one side at the end of the meeting by the then president of the society and told "Don't ever do that again! Trams should always be depicted in perfect condition; otherwise a wrong impression is conveyed to the public." I was neither impressed nor won over. Regarding this model I am satisfied with the result which to me is so much more realistic and a reflection of my memory.

● To be continued.

The Stationary Steam Engine

PART 50 – SMALLER ENGINES AND THE D-SLIDE VALVE

Ron Fitzgerald takes a look at the history and development of the stationary steam engine.

Continued from p.262,
M.E. 4723, August 11

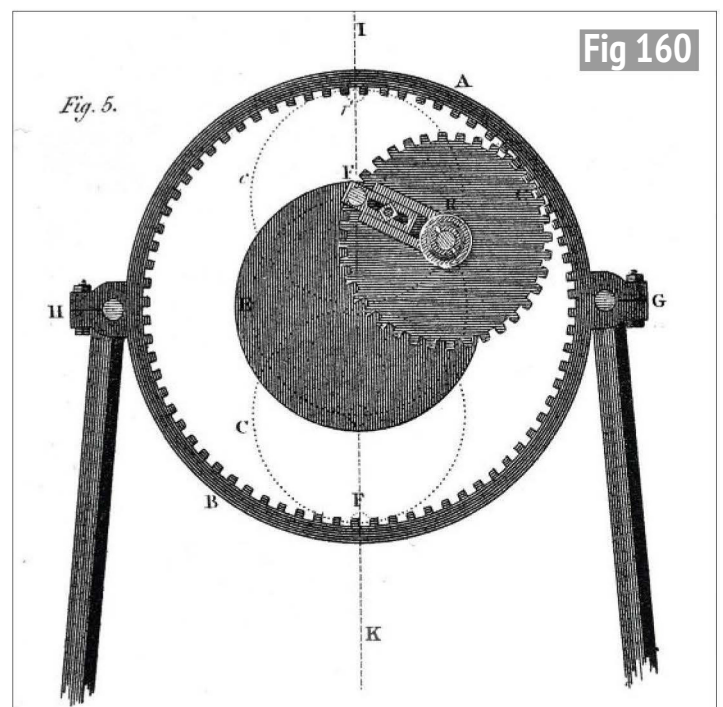
Matthew Murray was less successful than Crowther in his effort to produce a direct-acting engine albeit Murray's machine has remained famous for its hypnotic action and, following Anthony Mount's series, it has become a popular choice amongst modellers. Murray aimed to replace both the traditional beam and the parallel motion by an epicycloidal gear system. The underlying geometry was that of a hypocycloid in which a smaller circle rolls around the interior curve of a larger circle (**fig 160**). When the diameter of the smaller circle coincides with the semi-diameter of the larger circle the tip of the radius of the lesser circle where it touches the circumference of that circle will trace a straight line oscillating up and down the vertical diameter of the larger circle.

Drive can be imparted to the inner rolling circle or planet wheel if the outer circle is fixed and a rigidly attached radial link connects the centre of the planet wheel to its periphery, equivalent to its geometrical radius. Reciprocating the outer end of the link up-and-down the vertical diameter of the larger circle will drive the planet wheel around the internal circumference of the larger circle. Assuming the planet wheel with its link is mounted on a pin upon which it freely rotates and the pin is rigidly fixed to the periphery of a disc of the same diameter as the planet wheel, mounted behind it but centred upon

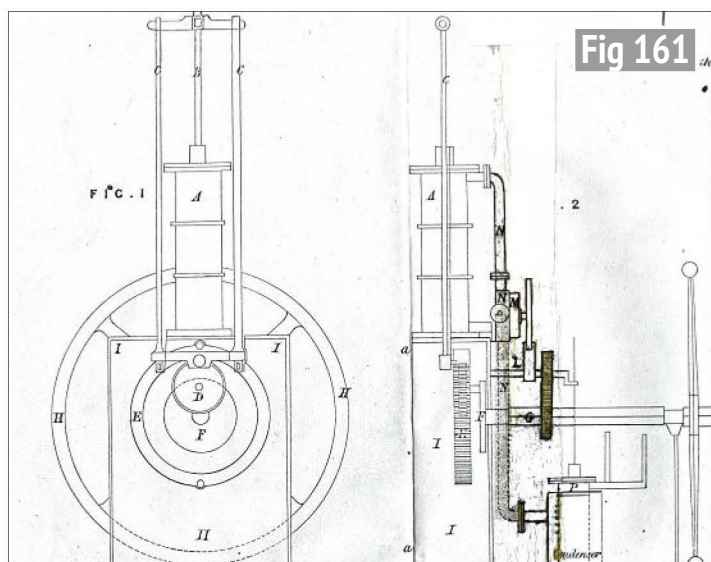
the large circle, the planet wheel effectively becomes a crank by which the backing disc is rotated and its axis forms the power output shaft of the machine. The straight-line motion of a piston rod is ideally suited to providing the reciprocating action required to set the planet wheel in motion.

The concept of the hypocycloid was an ancient one in astronomy but the first appreciation of its value as a mechanical device was probably owed to the mathematician and natural philosopher Geralamo Cardano (1501 -1576). It remained an intellectual exercise for the next two centuries but in 1781 James Watt made a close approach to employing it in his

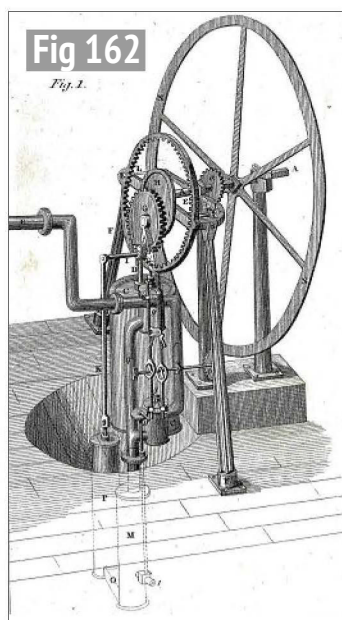
1781 sun-and-planet patent where he specifies both internal and external planet wheels (**ref 259**). Murray's patent for the hypocycloid engine was dated the 28th June 1802 but if G.F. Tyas's account is credible he would have been aware of the principle at least twelve months before that time as, according to Tyas (**ref 260**), he communicated the idea to James White who published it in his *New Century of Inventions* of 1801 and was awarded a medal by Napoleon for which reason it became known as White's parallel motion. Tyas is probably offering a corrupted version of this story to which he has added his own interpretation. The origin appears to have been John



The action of the hypocycloid. Rees, Cyclopaedia Art. Parallel Motion.



Murray's Patent 2632 28th June 1802 (drawing re-touched).



Murray's Hypocycloidal Engine, Olinthus Gregory's *Treatise of Mechanics Vol II* (1826 ed.) Plate XXXI.

Farey's *Treatise* where, on page 686 of volume I, Farey says:

...The parallel motion used in this engine was invented by the late Mr. James White, an ingenious mechanic who spent several years in France; it is described in his *New Century of Inventions*, quarto p. 30 and he says that in 1801 it procured him a medal from Bonaparte, then First Consul of the French Republic...

Farey may also have been the anonymous author of the article *Parallel Motion* in Rees's *Cyclopedia* where the account simply becomes:

...the contrivance has been ascribed to an American named

White and it has been adopted in steam engines by Mr. Murray of Leeds...

Simon Goodrich cites an entirely different authority. On first seeing an example of Murray's hypocycloidal engine in January 1803, he observes that:

...Mr Bunce made a model exhibiting this motion exactly about 6 years ago ... he said that he took the idea from a mathematical book which stated that if a circle revolves on the inside of another fixed circle of twice its diameter every point of the moving circle will traverse in right lines backwards and forwards thro' the centre of the fixed circle...

In Murray's patent specification the drawing (fig 161) shows the engine in an inverted form compared to the more familiar layout. Arranged in this way it requires an overhead crosshead and two connecting rods flanking the vertical cylinder. A similar cross bar at the lower end of the connecting rods carries the pin of the planet wheel which Murray refers to as the pin wheel (D in the patent drawing). The engine is equipped with a separate condenser and air pump both housed in a small tank. The entire engine is built into a cast-iron frame, shown schematically in the drawing. In section 35 of the patent specification Murray says:

...The parts so combined form a perfect engine without

requiring any fixture of wood or any other kind of framing than the ground it stands upon and is transferable without being taken to pieces, the motion of the fly wheel giving circular power to any process or manufactory requiring circular motion or for irrigating land or for the various purposes of agriculture...

The patent also includes a two-cylinder version of the engine with the 'cranks' set at 90 degrees and the application of such a double-cylinder engine to colliery winding.

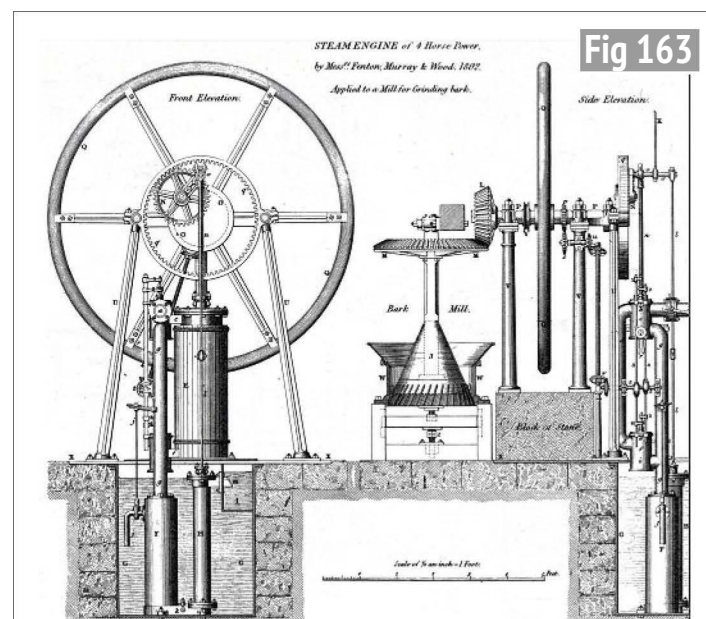
Probably the earliest application of Murray's hypocycloidal engine was to power the boring mill at the Round Foundry which, as previously stated, is known to have been in existence in March 1800, when it was included in the Royal Exchange Insurance policy of that date. The policy associated a steam engine with the boring mill. When Simon Goodrich toured the Round Foundry in January 1803 he recorded that:

...The first thing we saw was a Steam Engine for driving a boring (sic) mill with a planet wheel upon a crank revolving within a fixed wheel of twice its diameter producing at once the rotative motion for the fly wheel on the crankshaft and the parallel motion for the piston rod the upper end of which was connected to a stud projecting

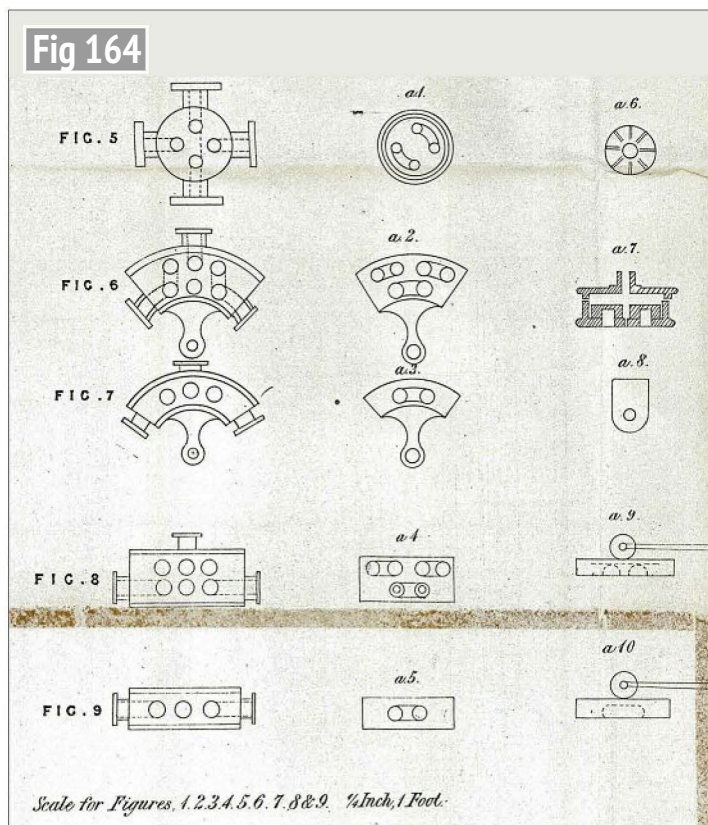
from the side of the planet wheel. It is necessary that the centre of this stud should be on the pitch line of the planet wheel...

There are two well-known contemporary illustrations of the Murray cycloidal engine. The earliest is contained in Olinthus Gregory's *Treatise of Mechanics Theoretical, Practical and Descriptive* which was first published in 1806 (fig 162). The plate and description show an engine supplied in 1802 to Francis Brewin's tan-yard in Willow Walk, Bermondsey. Apart from the distinctive hypocycloidal motion the engine is shown with cruciform standards supporting the Great Wheel frame and two cylindrical columns carrying the outboard drive shaft with the flywheel sandwiched between them. The foundation is ashlar and the cold well is literally that, a stone built well into which the condenser and air pump are immersed. The valve gear is of type that makes use of the wiper tappet eccentric and the valve spindles are of the concentric pattern, both of which have been discussed previously.

When John Farey published his own *Treatise on the Steam Engine* he illustrated the same engine but with several differences (fig 163). The bark



John Farey's engraving of Murray's Hypocycloidal Engine used at Francis Bewin's tannery.

Fig 164

Murray's patent 2632, figs 5-9, the slide valve.

mill that the engine drove is also shown and the cylinder has wooden lagging possibly covering a steam jacket. The valve arrangement is identical to Gregory's engraving. The lower parts of the machine are different in that the engine is bolted to a flat, cast-iron baseplate and attached to the underside of the plate is cast-iron tank which forms the cold well. The engine is thus a self-contained entity.

It is not known how many of these engines were built by the Round Foundry. One may possibly have gone to Joseph Drabble whose textile machinery making business was near to the Round Foundry, in Water Lane. Tyas spoke of another which had been used on St. Peter's Quay on the Tyne ...said to have worked uncommonly well for many years... He also recalled one lying at a disused colliery near Leeds where it had been used for winding. Only two examples survived into recent times, both now preserved, one at the Birmingham Science Museum and the other at the Henry Ford Museum in Dearborn, Michigan. For a number of reasons

it is unlikely that either of these were built by the Round Foundry; both will be discussed later in this series.

The hypocycloidal design suffered from fundamental shortcomings which had been recognised by White (ref 261) and of which Murray became aware at a very early stage. Goodrich concludes his comments upon the boring mill engine at the Round Foundry by saying:

...Mr. Murray has a patent for the application of this motion but proposes not to continue the use of it upon account of its being too complicated and delicate to keep in good order...

It is notable that the boring mill excavation at the Round Foundry revealed an engine foundation but there was nothing about it that suggested a hypocycloidal engine, the remaining evidence being more appropriate to a conventional beam engine. This may indicate that the engine seen by Farey was subsequently removed and replaced.

Farey identified the problems with the hypocycloidal engine in his *Treatise* (ref 262). The principal weakness related to

the arrangement of the planet wheel crankpin. If the pin that carried the planet wheel was to be sufficiently long to provide an adequate bearing surface for the journal, the bending stresses would become excessive and the journal of the planet wheel would tend to wear oval. The stresses on the pin were made greater by its extension to carry the air pump drive rod, as shown in the two engravings. Apparently in Brewin's engine some attempt was made to balance this stress by an improvised suspending rod which was attached to a weighted steelyard. Farey concludes his remarks by saying:

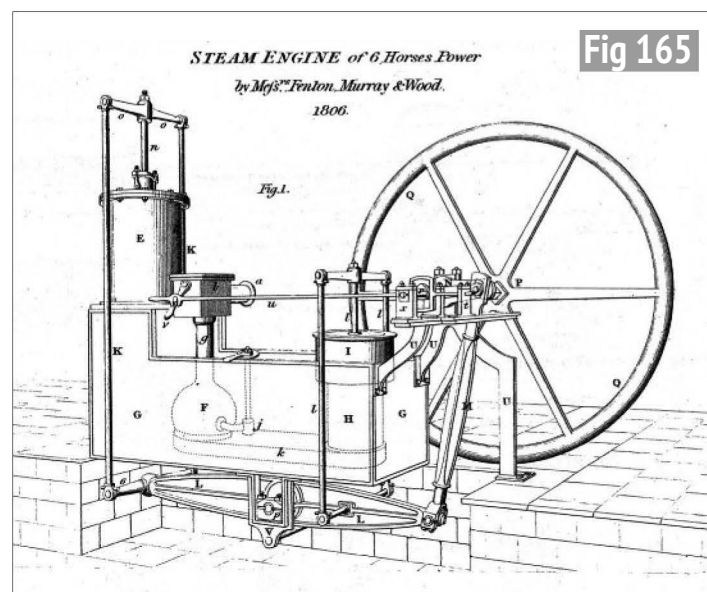
...With this addition the engine continued to work for a few years but the joints became very loose by wearing and then the wheelwork went unpleasantly. For these reasons this kind of parallel motion was laid aside after a few engines had been made with it and some of these engines have since been altered to work with other parallel motions...

A similar conclusion was reached by the contributor to Rees' *Cyclopaedia* in the article on *Parallel Motion* (possibly written by Farey):

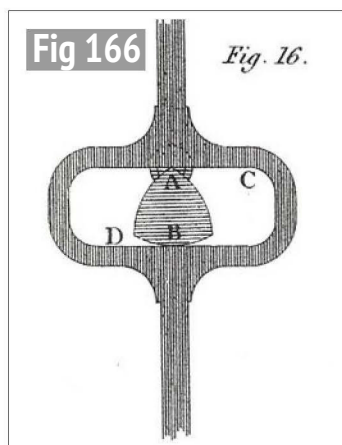
...It has been employed by Mr. Murray in many of his engines; the objection to it is that the cogs in time grow loose and it then makes a very noisy and unsteady motion...

Murray's patent for the hypocycloidal engine also included a section devoted to his slide valve (fig 164). The hypocycloidal engine that is featured in the patent drawing incorporated the slide valve and page 3 of the specification has a description of the separately detailed illustration. Neither the general arrangement drawing of the engine and the valves nor the detailed description is particularly clear.

Murray's stated objective was to reduce the four valves necessary to work a double-acting engine (two valves for a single-acting engine) to a single valve. Three types of valve are shown on the patent drawings, the first a circular valve (a1) in a circular valve chest with a steam inlet branch pipe, pipes to either end of the cylinder and an exhaust branch pipe. The circular valve oscillates within the valve chest and drilled holes and slots cut into the face of the valve bring into alternating communication the inlet steam and exhaust ports with the cylinder supply pipes. The circular valve is pressed against the valve face by a spring disc (a6) and the valve box has a cover which maintains the pressure on the spring disc (a7, section through the valve chest, the valve and the cover). Two more variants make use of segmental valves swinging through an arc within a curved valve chest; Fig. 6 is



Murray's tank-bed underslung beam engine. Rees' Cyclopaedia.



Reuleaux Triangle as shown in Rees' Cyclopaedia 1819.

the arrangement for a double-acting engine and Fig. 7 is for a single-acting engine. The principle of the porting is the same as the circular valve, drilled and slotted transfer cavities. In the final two variants, Fig. 8. the valve for double-acting engines and Fig. 9. for single-acting engines, linear reciprocation replaces the oscillating action.

The subsequent debate about the originator of the slide valve which places Murdoch and Murray in contention is readily resolved. Murdoch's valve has previously been discussed and whilst it was a valve with sliding reciprocating action, it was much longer in the valve body and the exhaust exit was through the hollow centre of the valve to the outlet in the bottom of the valve chest. Murdoch's valve was a D-valve by virtue of its horizontal cross section and it subsequently became known as the long D-valve. The valve was divided into two separate slide valves in its later, more common form.

Murray's patented valve was far more compact and much closer to the slide valve that is familiar today. In the patent version the design falls short of the features familiar in the common nineteenth century slide valve but Murray or the Round Foundry design team was almost certainly responsible for its final form. (Despite the fact that the slide valve is part of Murray's hypocycloidal engine patent neither Gregory's nor Farey's

illustration of this machine shows such a valve, as noted above in both the tappet eccentric type and the valves are poppet or plug valves actuated by concentric valve spindles.) The Murray engine that is first to show any obvious evidence of the new slide valve is the tank bed, inverted beam engine which seems to have made its appearance in 1806 or possibly somewhat prior to that date (fig 165).

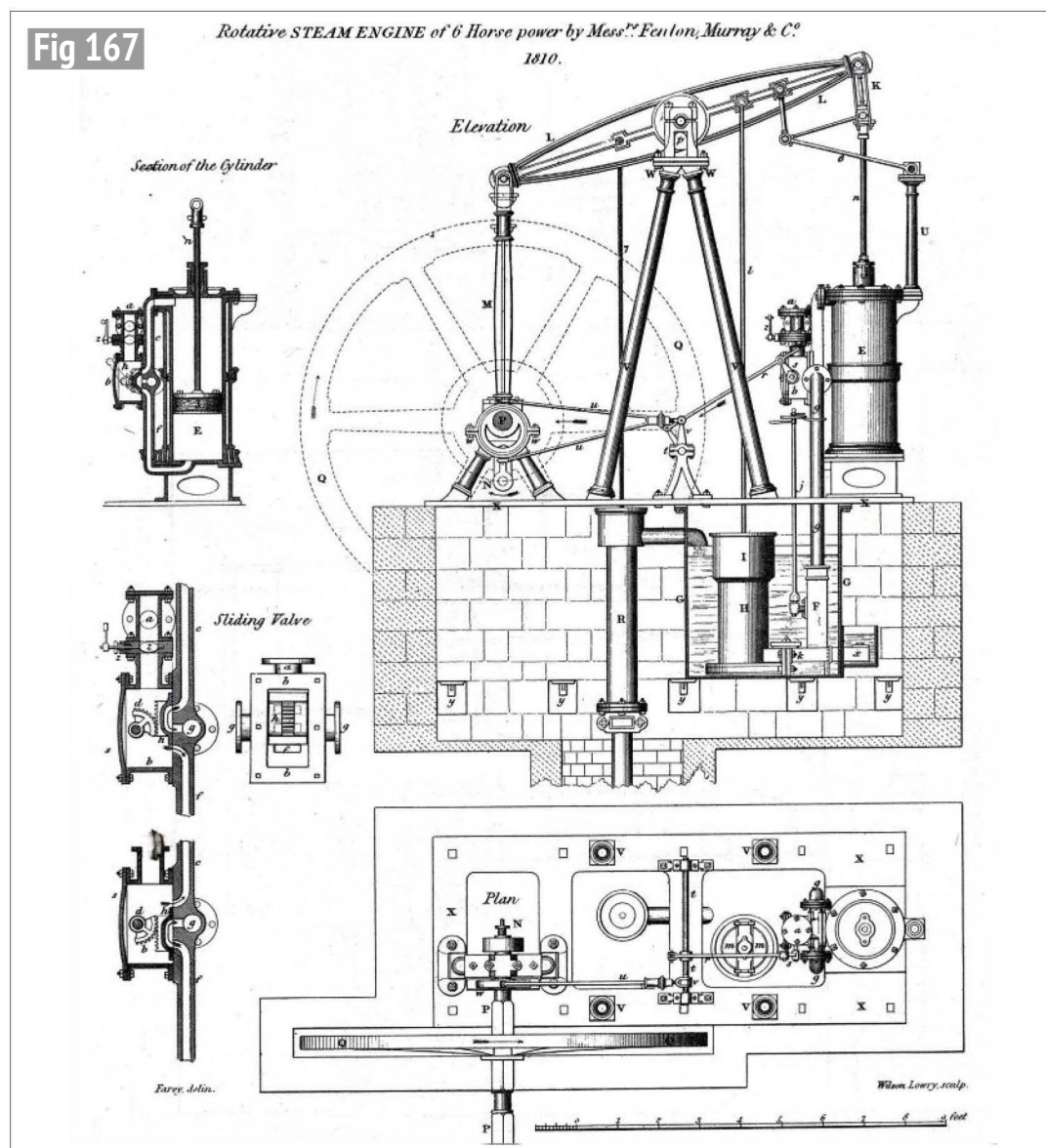
Farey states that this engine uses the slide valve which was enclosed within the square valve chest attached to the lower end of the cylinder. The valve slid horizontally (ref 263) but the steam ports connecting the upper and lower ends of the cylinder with the valve

chest are not shown. The valve spindle emerges through the side wall of the valve chest and terminates in a swinging lever with a handle for manual operation but the handle is usually driven mechanically by a long rod connected to a cam box enclosing a triangular cam with curved sides. This form of cam later became known as the Reuleaux triangle after Franz of that name although 23 years were to elapse before he was born (fig 166).

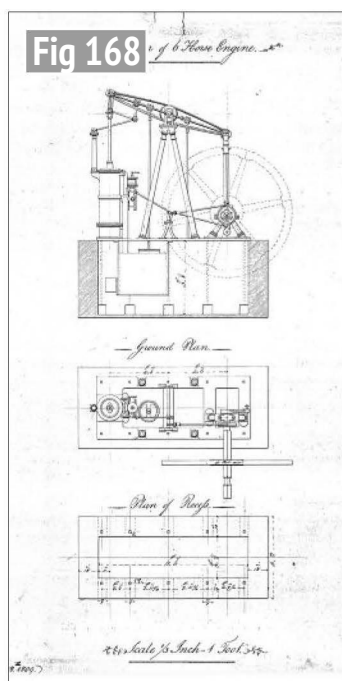
Subsequent illustrations give more detailed views of the Murray D-valve, all of which show progression towards its ultimate form. As always, John Farey's superb draughtsmanship in the *Treatise* (ref 264) gives the clearest presentation. The left-

hand margin of the engraving of an 1810 engine shows the slide valve in section (fig 167). The port faces have now assumed the characteristic rectangular three-slot configuration, the centre one of which is the exhaust port and the two outer, the live steam ports. The transfer port in the slide valve has been simplified to a rectangular cavity with toes projecting from the outer edges to overlap the inlet ports.

A relic of Boulton and Watt's earlier practice is the toothed rack sector which moves the valve to and fro. A gland passes the sector spindle to the outside of the box and the rocking arm is driven by rods connected to a disc eccentric mounted on the crankshaft.

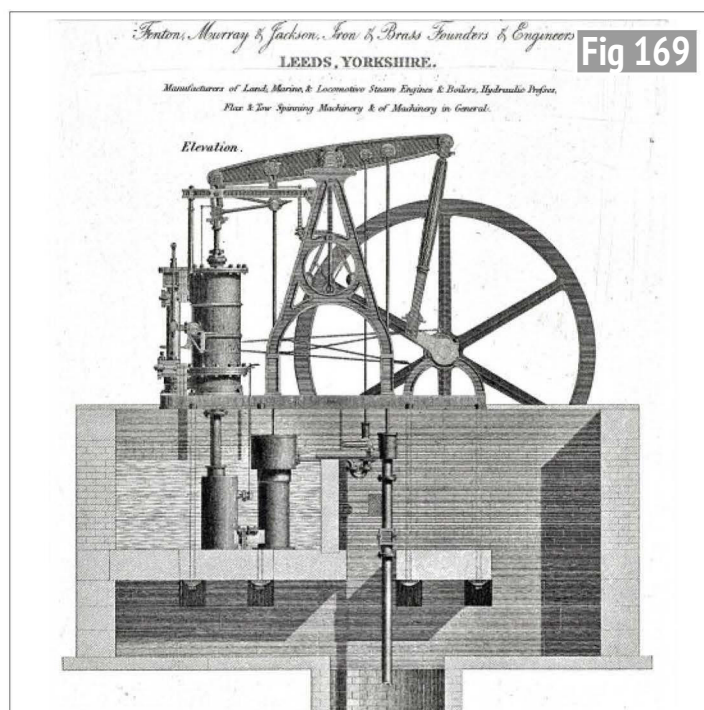


6 hp inclined column engine with details of the Murray slide valve. Farey Treatise.



Drawing in the Goodrich Collection of a 6 hp engine initialled B.H. in the bottom right-hand corner.

The engine that Farey depicts is of the inclined, four-column type. The design is often claimed to have been originated by Murray, usually on the basis of Farey's drawing which is dated 1810. This assumption should possibly be qualified as the extent to which Murray was involved in detailed design by this time is questionable. He may have continued to have been the source of concepts but the firm had grown to be large and sophisticated. Overall management must have been Murray's major pre-occupation, in addition to which he was frequently away from Leeds travelling. It is probably more accurate to suggest that, as was the case at Soho, sustained development increasingly devolved upon the drawing office.



An A-Frame engine built after 1832.

Murray's drawing office was to be of primary importance in training many engineers who subsequently rose to eminence. Amongst these was Benjamin Hick, born in Leeds in 1790. Hick's father was landlord of the Old King's Arms and it was from here in January 1801 that the sale of the Shoulder of Mutton Close took place to Fenton Murray and Wood. Subsequently Hick's son, Benjamin, was apprenticed to Fenton, Murray & Wood. Benjamin Hick's talent must have been precocious as before he was twenty he had been entrusted with construction of several large engines and was later offered a partnership which he declined, leaving Leeds for Bolton in 1810 (ref 265). In later years Hick was acknowledged to be a skilled draughtsman and it

would seem that he finished his time at Round Foundry in the drawing office. In the Goodrich Collection there is drawing of a six-horsepower four-column engine that is almost identical to the Farey drawing (fig 168). In the lower left-hand corner of the sheet there is the date April 18th 1809 and in right hand corner the initials B.H. This is the earliest known representation of the four column engine and it is possible that the detailed design was by Benjamin Hick. Possibly the evolving design of the slide valve was also owed to him.

The Murray D-valve was not universally acclaimed by contemporaries. As Farey observed, the frictional force acting on the valve was a function of the steam pressure applied to the back of the valve

and this, with higher pressures, was conducive to rapid wear although it is interesting to note that Murray in his patent description suggested that wear should be relied upon to make the valve's faces steam tight. Farey also identified the other shortcoming of this type of valve, the unduly long steam passages that represented an undesirable increase in the clearance space occupied by steam which was ineffective in terms of performing work (he failed to comment on the concomitant loss of heat). Farey favoured the Murdock valve inasmuch as the frictional loading was less and the clearance in the ports was much reduced.

Farey's latter criticism was less valid when applied to small engines and Murray may have confined its use to engines below 10 hp. The inclined column engine illustrated was 6 hp and Murray also produced an otherwise identical 8 hp version but no Round Foundry engine above this power with the D-valve has been traced. The A-frame engine which was developed by the Found Foundry as an alternative to the inclined column engine within the same power range which began to appear after 1815, seems to have eschewed the D-valve to judge by the available illustrations (fig 169). A possible exception was the engine of this type which graces a promotional flyer from the later company of Fenton, Murray and Jackson where a divided version of the valve may be indicated.

Nor was it used by Murray in the Middleton Railway locomotives even though by 1814 George Stephenson had adopted it for his locomotives (ref 266). Thereafter the Murray D-valve became the virtually universal locomotive slide valve.

● To be continued.

REFERENCES

259. *James Watt and the Steam Revolution*, Eric Robinson and A. E. Musson. Adams and Dart 1969. Drawing No. 5 Pt 2.
260. *Matthew Murray, A Centenary Appreciation*, G.F. Tyas T.N.S. Vol. VI 24th February 1926, p.113.
261. Farey, *Treatise*, Vol I p.686, fn.
262. Op. cit. Farey *Treatise*, p.686.
263. Farey *Treatise*, p.689.
264. Op. cit. Farey, *Treatise*
265. Obituary, P.I.C.E. V.2 1843, p.12.
266. *Practical Treatise on Railroads*, Nicholas Wood. Third Edition 1838, p.298.

NEXT TIME

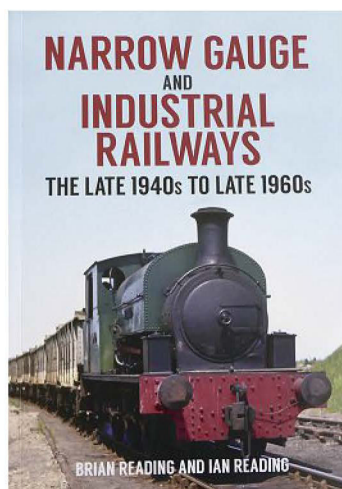
We study the rise of the Trevithick dynasty.

Book Reviews

Narrow Gauge and Industrial Railways

Brian and Ian Reading

Published by Amberley Publishing, 2023
ISBN 978-1-3981-0012-1
£14.39, 96pp, 180 illustrations, paperback (order through the website Amberley-books.com)



This, the third volume of Brian and Ian Reading's books of early railway photographs, all previously unpublished, deals with four standard gauge industrial railways and eight narrow gauge railways, mainly to be found in Wales and East Anglia. It starts with 26 photographs of the Isle of Man railways, taken by Brian during 1961 and 1962, including several in colour. This was of course before most of the system was closed in 1967 so we have shots of Ramsey and Peel stations, looking somewhat tired but still jaunty. We can even see some wagons, prior to freight traffic vanishing in 1967, as well as some rolling stock lost in the 1987 fire.

Then we travel to Corby and the intensive railway operation of Stewarts & Lloyds, then the sand quarries at Middleton

Towers and Leziate sand refinery, near Sandringham, and backdrop for some 'Dads Army' episodes, before visiting nearby Whissington sugar beet railway, which looks to have been laid in parts on grass, before visiting Richard Garrett's Leiston factory in Suffolk, completing our tour at Bowaters Railway in Kent. All these photographs are of the railway as it was working at the time but like all early photographs benefit from the skilled computer enhancement administered by Ian.

Moving to Wales, the Dinorwic and Penrhyn quarry railways, both of which were closed by 1962, are well covered. Brian's photographs, mainly taken in 1955 and 1959, show some dereliction but also much activity. The other four railways featured are still operating today but

the photographs, some in colour, show earlier scenes of preservation. I particularly enjoyed seeing Bessie Jones, Station Mistress at Tan-y-Bwlch on the Ffestiniog Railway, clothed in Welsh National Costume, scampering to the station house where she lived. The station has no platform at the time of the photograph and the passengers perambulate at rail level, unlike today.

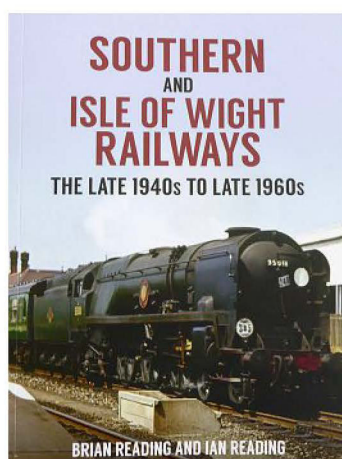
This third volume, containing many useful snippets of information, illustrating the forgotten world of industrial railways and scenes long gone, is published by Amberley Publishing of Stroud and is also available from booksellers or Amazon.

Brian Baker

Southern and Isle of Wight Railways

Brian and Ian Reading

Published by Amberley Publishing, 2023
ISBN 978-1-3981-0008-4
£14.39, 96pp, 180 illustrations, paperback (order through the website Amberley-books.com)



Sometimes books, like buses, come along as pairs and this is the case with Brian and Ian Reading's series of books featuring Brian's photographs of UK railways. Just as I had finished reading volume 3, dealing with industrial and narrow gauges, then volume 4 arrived, dealing with the southern area of the UK, including the Isle of Wight.

Now this was my territory. As a boy I lived in South London and my bike took me to most of the London terminals at some time and trams ran to Waterloo (well covered in this book), Euston and Kings Cross. Included were two pictures of Bricklayers Arms, a shed which I knew well.

Parts of the system that I never visited outside of London are covered as well:

Bournemouth, Tunbridge Wells and the whole of the South Western mainline to Exeter and from Ilfracombe to Wadebridge. Finally, we visit the Isle of Wight and the pictures of Ventnor station in its quarry setting reminded me of long forgotten school journeys to the Island. Not all the photographs, some in colour, are of Southern locomotives; some show ex-GWR locomotives working in former Southern strongholds.

All the pictures have excellent captions with much detail of the location or the ultimate fate of the locomotive shown. A detailed map of the location of each picture taken is included. The odd electric set is also shown, like the Brighton Belle, but this book demonstrates Brian's love of the steam locomotive in all its forms (he is

still the president of the Seven and a Quarter Gauge Society and was a prolific builder of miniature steam locomotives until ill health stopped visits to his workshop).

Brian has taken many photographs of railways and locomotives, mostly sadly now gone, but his series of books enables them to be preserved and computer enhancing by Ian reveals hidden details not clear in the original prints. They reveal how many places have changed beyond recognition. They show how the railwayman's pride overcame problems and how sadly the pursuit of fiscal efficiency reduced standards later on. Amberley Publishing have done an excellent job in allowing us access to this series of volumes of previously unpublished photographs.

Brian Baker

The Lathe Electronic Leadscrew

PART 1

Peter Russell explains how screwcutting can be done electronically.



A while ago, while searching the Internet for something completely different, I came across the electronic leadscrew. This was something quite new to me, so I read on.

Now excuse me while I tell granny how to suck eggs!

Anyone with a small, screw cutting lathe will tell you that in order to cut a thread, there has to be a fixed relationship between the spindle and leadscrew.

If, for example, the leadscrew pitch is 2 mm and the relationship between spindle and leadscrew is 1:1, then the

lathe is set up for cutting a 2mm thread.

This relationship is achieved through the use of a gear chain.

If you need a different thread pitch, then you need to change the gear train. Your lathe handbook will tell you which gears to use and in what order they should be mounted.

The same goes for setting up for a fine feed.

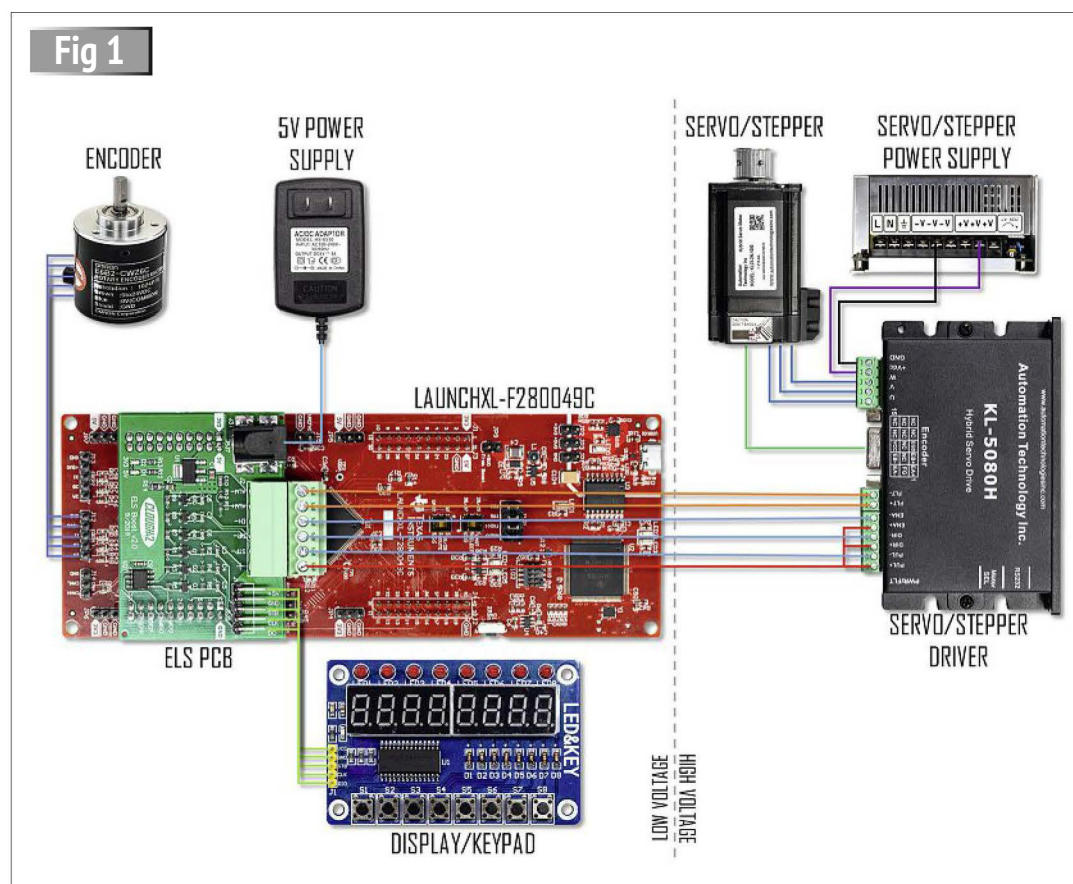
This is great, until you need to change the fine feed or cut a different thread. If you are anything like me, you won't be using the leadscrew – far too noisy - and you will balk at the thought of changing gear

wheels and setting it all up. What should be a 10 minute job usually turns out to be at least half an hour – or more!

So, what if you could change gears at the touch of a button?

Sounds pretty good to me. (Okay, bigger lathes can just about do that, but most of us don't have professional lathes).

This is where the electronic leadscrew comes in. It uses a shaft encoder to accurately measure the spindle speed sending 4096 pulses per revolution to a small computer. The computer does all the calculations and sends pulses to a stepper motor which drives



The wiring diagram - courtesy of James Clough.



The control panel, mounted in a die cast box

the leadscrew directly. There is also a control panel where you can select screw pitch or fine feed rate and also display various parameters.

This completely replaces the gear train and a change of fine feed or screw pitch is accomplished within seconds.

Okay, so now I'm hooked. Where can I get one?

As far as I am aware there are no 'one size fits all' solutions, this is very much a 'do it yourself' job.

There are several suppliers (I found four suppliers of control units, Rocketronics, Automation Artisan, Clough42 and Kachurovskiy) offering a control unit to which you attach your own encoder, stepper motor and power supplies and you then have to figure out how to fit it all to your lathe.

Some control units handle just the one stepper motor on the leadscrew, while others can also handle a stepper on the

cross slide, giving extra facilities such as ball and taper turning.

The unit I decided on was from James Clough (clough42 on YouTube), mainly because he bothered to produce about 20 videos starting from basic concept to final installation.

(I have no financial interest here, just a happy customer!)

The Clough42 system (fig 1) comprises a rotary encoder, a TI Launchpad F2800 computer development board, a small interface board, a keypad / display unit, a stepper drive unit and stepper motor and a couple of power supplies (5V and 48V).

This particular computer board was chosen for its very high speed (100Mhz). At 2400 rpm spindle speed the rotary encoder is producing 163840 counts per second. Considering that the computer has lots of maths and other things to do between counts, we need a very fast processor. An Arduino would be hard pressed to keep up.

The keypad / display unit (photo 1) is available on Ebay, but if you get it from Clough, you also get the keycaps, a 3D printed frame and a nicely produced front panel, ready to fit into a diecast box.

He also supplies the interface board. (Just search Ebay for 'clough42 els'). He supplies the software to drive the whole thing free of charge. If you've played with a Raspberry Pi or an Arduino, you shouldn't have any problems installing the software.

You do have to decide on which stepper / servo/ hybrid motor and driver to use and I'll go through that in the next article.

After all of that, you then have to decide how to mount it all on your lathe and where to put the electronics. That's the subject of my next article – how I fitted one to my Warco WM250v.

●To be continued.

NEXT ISSUE

Fire Queen

Luker tackles the lagging, cladding and splashers for his 5 inch gauge Welsh slate quarry locomotive.

Electronic Leadscrew

Peter Russell fits an electronic leadscrew to a WM250V lathe, making gear cutting very simple.

M.E. Clock

Jim Clark constructs a 'Model Engineer's Clock' inspired by John Wilding's skeleton clock and making full use of modern techniques.

Cambridge

Your editor catches up with developments at the Cambridge Club's track and attends a celebration of the life of a prolific model engineer.

IMLEC

Rob Speare reports on the last day of the IMLEC event held at Bristol in the beginning of July.



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Content may be subject to change.

ON SALE SEPTEMBER 22 2023

LNER B1 Locomotive

PART 28 – SMOKE BOXES

198



Early smoke box door on 61100 (photo by Rail Photoprints).

Doug Hewson
presents an
authentic 5 inch gauge
version of Thompson's
B1 locomotive.



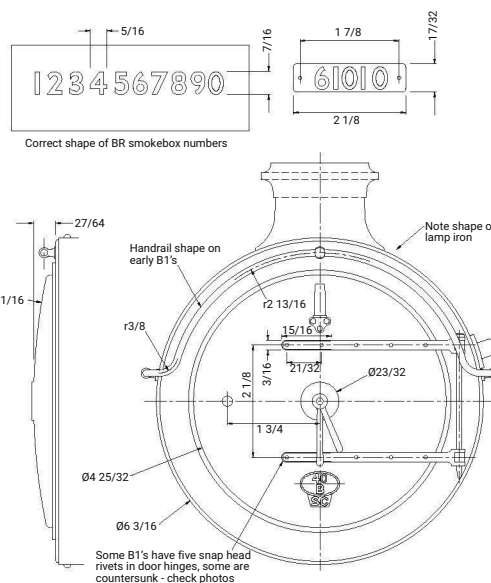
Continued from p.329,
M.E.4724, August 25

199



Later hinges on 61376 (photo by Rail Online).

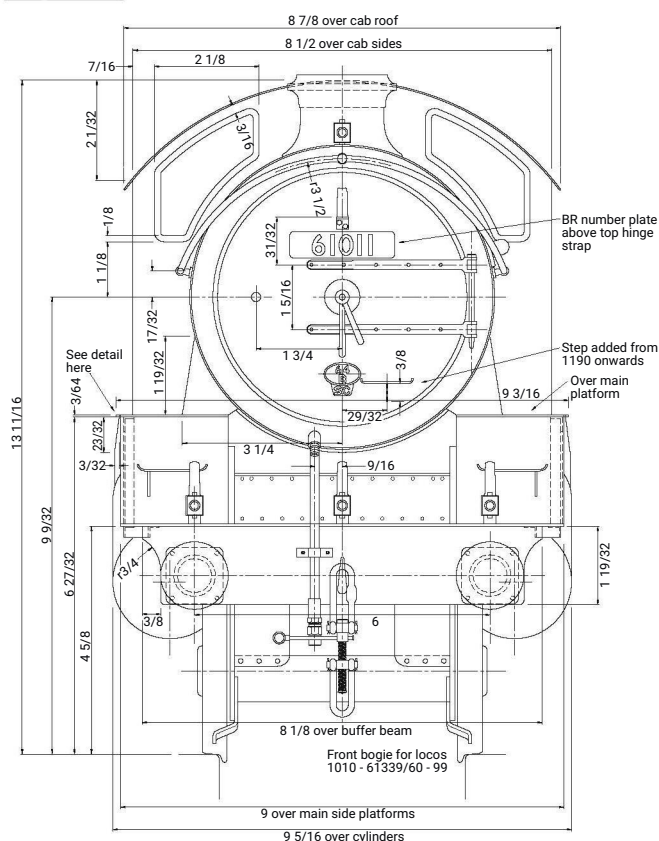
Fig 102



Smokebox Door Details For Locomotives 8301 to 8310

Smokebox door details (1).

Fig 101

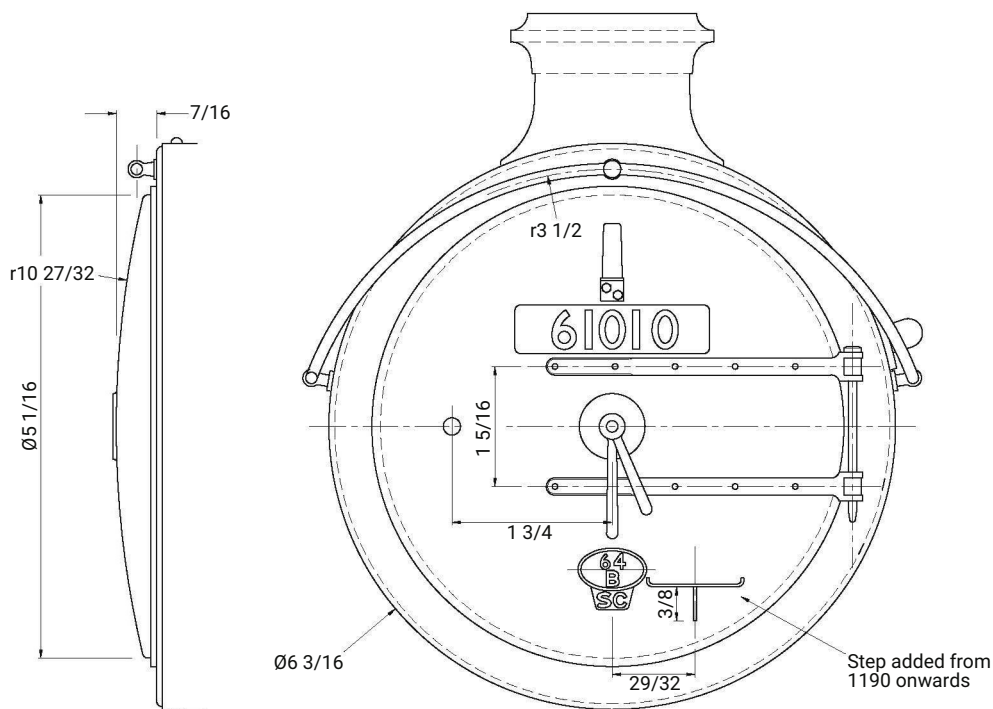


B1 full frontal view.

Now, we will get on with some more differences with our B1.

First of all, were you aware that there are at least four different front views of the B1, notwithstanding the front bogies? I understood that the first ten B1s had handrails turned in at the front and then followed the radius of the smokebox as it went around the door. I may be wrong about this but, in any event, the doors on the first ten were considerably smaller than on the remaining four hundred. These varied somewhat too. The door hinges were spaced at 2½ inch spacing (on the model) and the rivets on the door hinges were at least visible. On the engines from 61010 to 61349 the door hinges were only 1 5/16 inches apart but this time the door was quite a bit larger at 5 1/16 inches diameter.

Photograph 198 shows the door on 61100. The photo of 61376 on shed at Kentish Town (**photo 199**) shows something

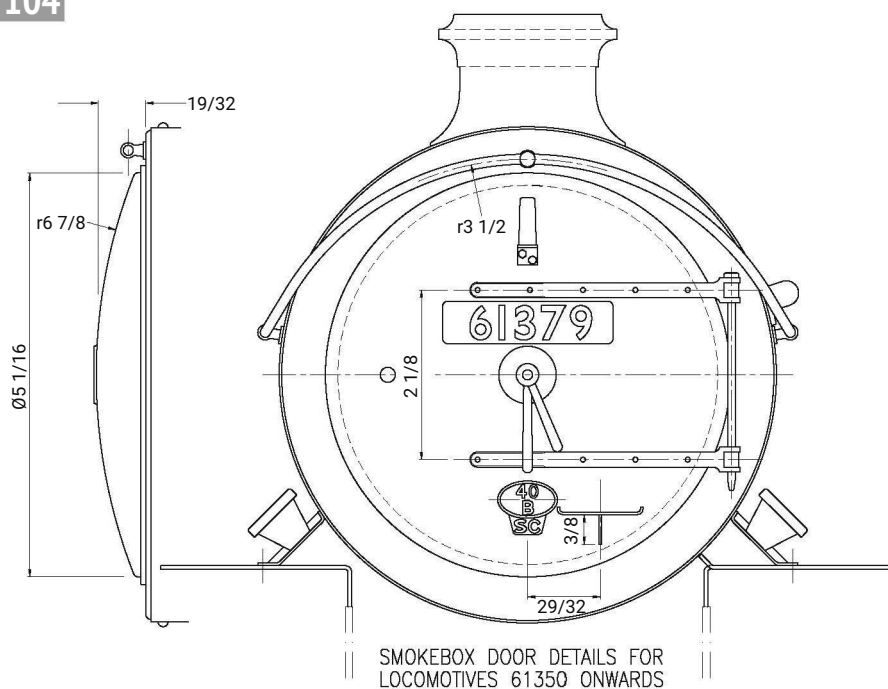
Fig 103

Smokebox Door Details For Locomotives 61010 to 61349

Note that due to smokebox changes any combination of the above & below could occur

Smokebox door details (2).

Fig 104



Smokebox door details (3).

a little different, with the rivets on the top door hinge quite unpronounced. These doors had a radius quite a bit less, at 10 25/32 inches, which gives them a little bit more of a domed effect.

The doors on locomotives 61359 onwards reverted to a

hinge spacing of 2 1/4 inches but in this case the door was quite domed with a radius of only 6 7/8 inches but they seem to have settled on a diameter of 5 1/16 inches at last. The other thing that you need to look at is the way in which the smoke boxes are attached to the boiler

and the front ring is riveted on to the wrapper. These seem to vary enormously with some locomotives having no rivets visible at all to others which have quite pronounced rivets at both ends. 61376 photographed at Eastfield shed does not seem to have any

rivets visible that I can see. That is why you need to pick an engine and stick to building that one. **Photograph 200** shows B1 61399 on Doncaster Carr Shed. This is one of the engines which has the narrowly spaced hinges but has no rivets visible around either end for the smoke box. It also has the step on the smoke box door but I understand that fad did not last very long, although the step also appears on the previous two photographs!

There are some excellent photographs online and it is well worth having a look through all the B1 photographs on one of the websites mentioned above and you can study those to your heart's content. **Photograph 201** is another B1 which has the hinges closer together and smoke box type two as I now call it. The photograph is a little over exposed but the hinges are clear!

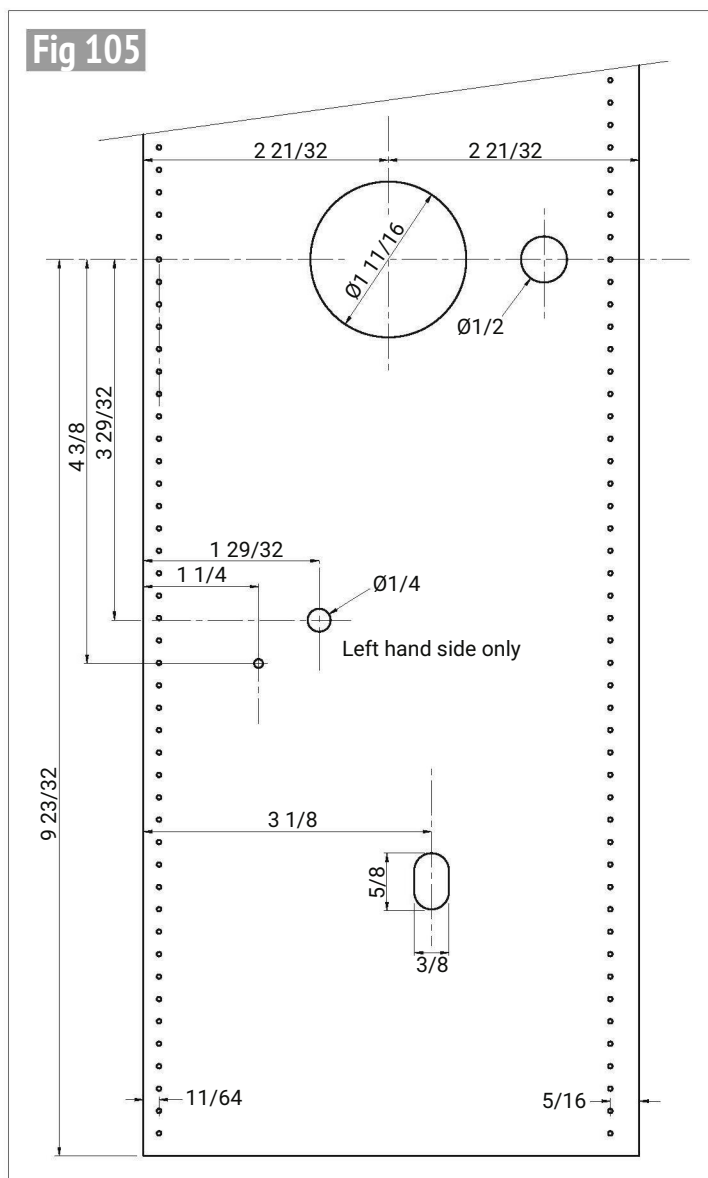
To me these photographs are very important as I love all these details, which you need if you want to build a proper model of the engine. I had a gentleman from Havant ring me one day who was building my 4MT. He told me that he



Smokebox with no apparent rivets (photo by Rail Online).

200

Fig 105

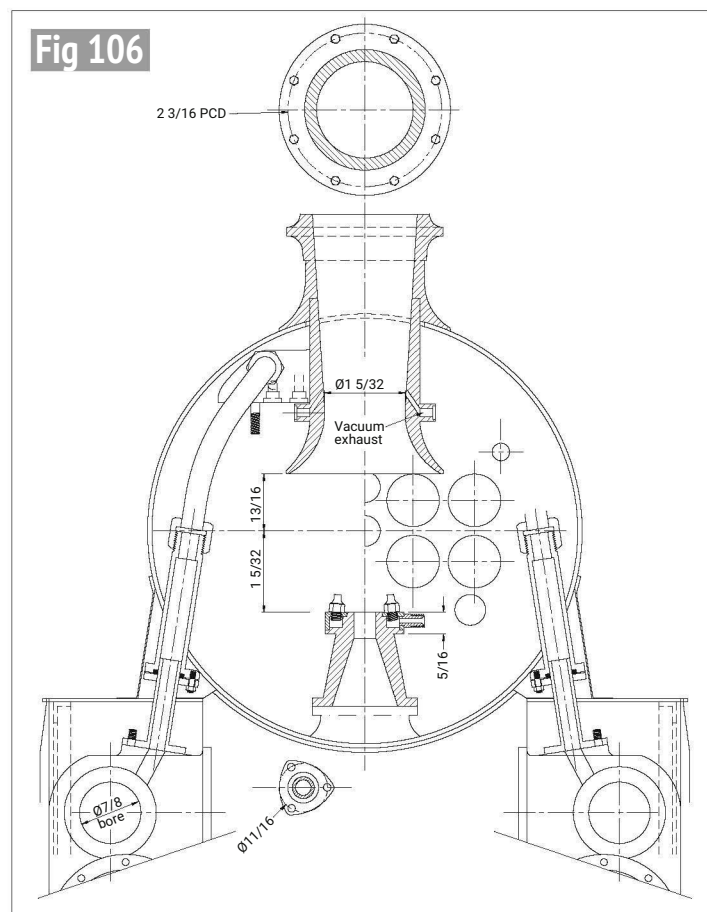


Smoke box wrapper 'in the flat'.



Another example of the later smokebox.

Fig 106



Smoke box internals.

had assembled his frames and stretchers and had been down to the Swanage Railway and taken said frames with him where they we restoring 80078 from Barry condition. He seemed absolutely amazed that the engine he was building was exactly the same as the full size 80078! That is why I like to copy things from the works drawings and then one knows they are correct.

I have produced a drawing of the smoke box wrapper and it is of course symmetrical about the centre line even though I have only drawn just over half of it. I also spent some time counting all the rivets around the periphery of 61264 so I know that they are correct! The only thing I would say is - don't roll it inside out as it is, of course, drawn from the outside! I have drawn out the plate for the smoke box so that it can be laser cut and I would use 16swg steel plate for the smoke box, for two reasons. One reason is that it will take paint far better - or go to a special paint supplier and buy

a tinlet of 'Sign Writing Paint' as that has all of the correct ingredients and you can buy it in all different colours. If you can't get sign writing paint the next best thing is 'Heritage Paints' as this definitely has all the right ingredients in it as that is what is used on all listed buildings so that it lasts five times longer than this watery stuff you buy nowadays. It is sold by any good paint suppliers. The same goes for painting your engine once you get that finished. We always use it for all of our signals on our railway. The second reason is that there will always be a mist of steam oil around the inside of the smoke box so that should preserve it.

Once you have rolled your plate and welded it I would advise that you remove one of the rolls and then thread it back through the rolls and give it a few more turns to smooth out any wrinkles that may have occurred in the rolling.

●To be continued.

Geoff Theasby reports on the latest news from the clubs.



As my amanuensis, John Arrowsmith, sets gently below the Western horizon, it is time for me to inflict more of my deranged opinions upon you, Gentle Reader. In my absence, Sheffield SMEE Open Day and Gauge 1 North have been held but Norway's North Cape was blessed with my presence instead. This was in two weeks of the warmest weather the area has seen for many a year, with flat calm seas too. A number of interesting vehicles were spotted, including a Norwegian Coastguard vessel *Jan Mayen*, an LPG-powered offshore patrol boat *Barentshav* and a 'stealthy' Skjold missile corvette (**photo 1**) – also some very swish police Marell M12 boats, a Hillman RAF staff car outside the cruise terminal, a double decker coach in Henningsweg, a neglected Bedford TA medium truck in Olden, a three wheeled motor bike and the smallest car ever, even surpassing the SMART car. Investigation shows it to be an Econelo electric 'cabin scooter'. The salmon farming boats look very strange but I can thoroughly recommend the Bodø Air Museum, a very good, imaginatively designed and executed, museum.

The Arctic Cathedral in Tromsø is very striking, simple yet exotic in the Scandinavian style, with tall windows in the sidewalls of the nave, reminiscent of Coventry Cathedral. However, the utterly inspired design of the Northern Lights Cathedral in Alta defeats it hands down (**photo 2**).

The most striking visit, visually and audibly was to the Briksdal glacier, near Olden. Europe's largest glacier, the meltwater thunders through a small gorge and subjects you to an icy cold spray when crossing the bridge for a better view (**photo 3**).

Stamford Model Engineering Society's newsletter says that John's mechanical toy collection includes two ladybirds, which move around and are animated by small

electric motors. He also has a mechanical accelerometer, possibly from a Vulcan bomber, which measures +12g to -5g. A brief item concerned the origins of the Churchward Saint class of locomotive, with reference to the current rebuild of *Lady of Legend*.

York Model Engineers, July Newsletter, says Martyr Whillock has designed a projection screen for a telescope, making it easy to look at the sun without risking your eyesight. A memorial to the navvies who built a local part of the UK railway system can be found in Otley's All Saints churchyard, a replica of the north face of Bramhope tunnel. It is Grade II listed and is the only national monument to these people. The tunnel was built for the Leeds & Thirsk Railway in 1849. Richard Gibbon writes on 'Slime on the Line', or how some trees dropped a sticky exudate on the lines, which was hard to remove when kneeling on the ballast and scrubbing. David Woods produced a broom with

paint scouring pads fixed on with tie-wraps. This made the job much easier. Editor Roger Backhouse made a double ended lathe tool height gauge using an old steel rule.

W. www.yorkmodelengineers.co.uk

Bradford Model Engineers Monthly Bulletin, July, has news of their radio-controlled locomotive competition. Some members of **PEEMS** were also present, to observe the mayhem, er, proceedings. Roger Jordan had a streamlined version, reminiscent of the A4 'streaks'. Nicholas Wright brought lateral thinking to his locomotive. Reasoning that axle driven vehicles were slower than propeller driven versions, his had unflanged wheels, with 'O' rings as tyres, guided round the track by horizontal ball bearings. Michael Hawkridge's attempt was manned (?) by Sean the Sheep. John Coppin's didn't make all four circuits but Dennis Round's was fastest with his ducted fan design and his run was without incident.



Stealthy corvette, Bodø.



Northern Lights Cathedral, Alta.



Briksdal glacier, Olden.

Well done! Road Vehicle News reports that Otley Carnival Parade was led by the Town Bellman (Town Crier) leading a convertible Morris Minor bearing the VIPs. Jim Jennings' Vienna regulator clock (see M.E.4722) has a cousin. Jim notes that winding one takes 11 turns of the key and the other clock 14 turns. Both run for 8 days without winding. So, begging the question, how long do they run for when wound...? **W.** www.bradfordmes.co.uk

Goodwin Park News, summer from **Plymouth Miniature Steam**, Mike Salmon built a 4F 'Project' and right from the start he documented the mistakes, how they arose and how cured. An 'Engineer's Day Out' by Martin Elver was in NZ (he was there for a family visit) where, amongst other visits, he took to the waves in the *TSS Earnslaw* which was sent to Lake Whakatipu as a knocked down kit by rail, and reassembled in 1912. This lake's water is clean enough to drink without treatment and sports a mechanical killer whale! **W.** www.plymouthminiaturesteam.co.uk

The News Sheet, July, from **North London Society of Model Engineers**, includes the tale about how the 'Standard Gauge' came to be. The grounds maintenance team has been at work and this

time a rare Pyramidal Orchid has decided to make the club site its home. Martin made a radiant superheater header for his Maisie. Michael writes about the IV 'K' locomotives of the Saxony State railways and the 750mm gauge line. Roy's series on his model boat collection reaches No. 9, the Harvey Marine 575. A Standard Gauge rally, in August, and a Narrow Gauge rally in July, are two events being advertised by Rugby model engineers, offering their facilities for the summer. **W.** www.nlsme.co.uk

Gauge 1 North Yorkshire Group, had a great day at Bakewell. I apologise for not being there but I was within 2000 miles of the North Pole, and I came away clutching a certificate to my bosom, for having crossed the Arctic Circle. The traders turned up in force at Bakewell and there were more visitors than last year, so everyone is happy and satisfied. **W.** www.gauge1north.co.uk

There are some interesting offerings coming up in August at Sheffield auctions - several 'repro' locomotive nameplates, several Mamod vehicles, the contents of an enthusiasts' Meccano, a 2½ inch gauge part built 'Speedyette', a 99% complete 'Speedy', several track controllers, clockwork models etc. Otherwise, Hardy fishing

rods, miners' lamps and a violin, estimate £20-£30, with a 'Stradivarius' label. Yeah, right...

Reader John Bauer offers, as a collective noun for men in sheds, 'A Companionship'... I like it!

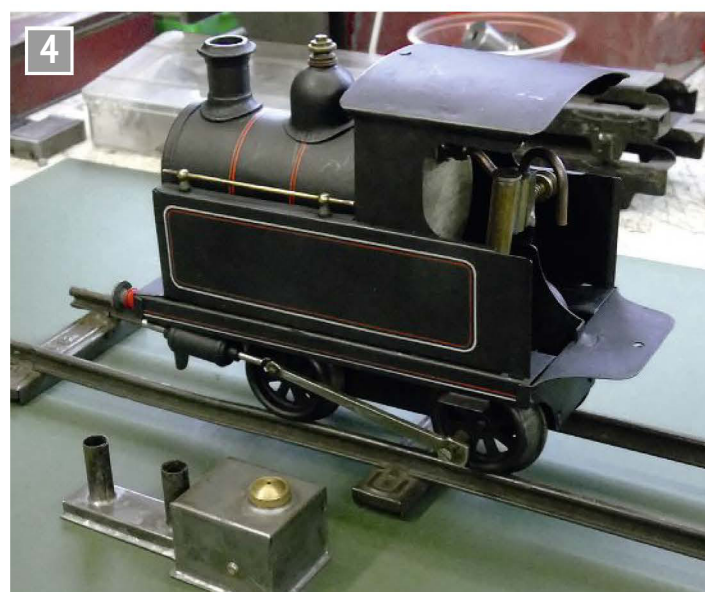
The same reader also joins in the 'Thick Nuts or Thin on Top' debate by coming down on the 'Thin Nuts on Top' theory. To which I add myself, as I am also thin on top.

Kingpin, summer, from **Nottingham Society of Model & Experimental Engineers**, opens with a great picture of ex-chairman Nick Harrison posing riding on an industrial vacuum cleaner. The circumstances

in which this was taken are lost in the archives of some photographer, whose identity is unknown, (unless, of course ...). Bob Bramson writes on **Model Engineer 125**, a celebration of Dr. John Bradbury Winter, who famously spent 23,000 hours on a 1 inch scale model of the LBSCR D2 No. 308 *Como*. His skills were magnificent, all his work being made on a treadle operated lathe and a planing machine, making all the nuts, bolts and rivets himself. Some of them were threaded 100 tpi, and many small bolts were cross-drilled No. 70 (0.71 mm) for retaining pins. This superb model was bequeathed to Brighton Museum, where it can be seen to this day. Dr. Winter built his first clock in 1922, based on a Congreve clock but with modifications to improve its well-known inaccuracies. He also developed a calendar to be operated by levers as in a signal box. This has been mentioned in a previous Club News.

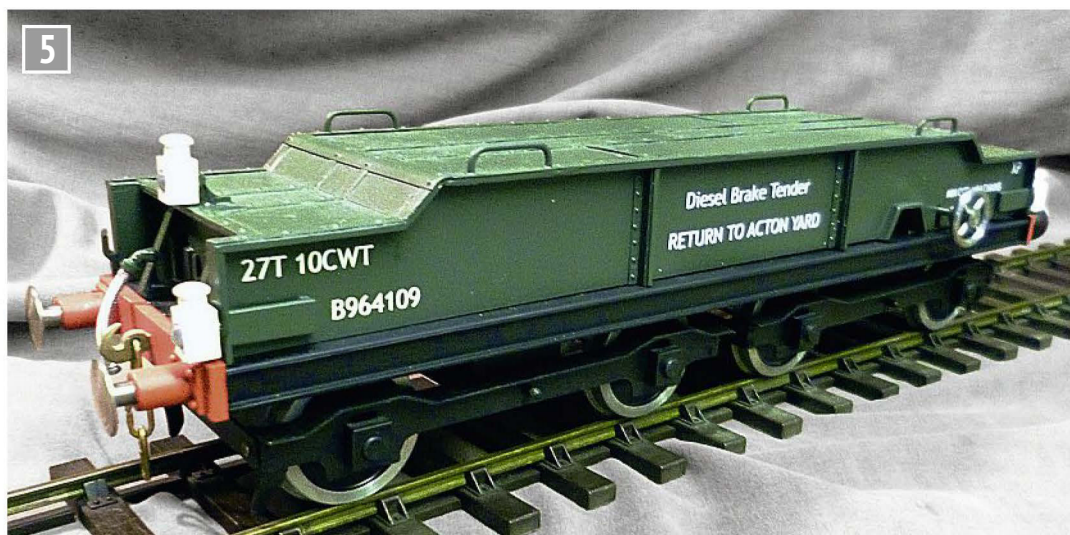
W. www.nsmee.org.uk

Gauge 1 Model Railway Association's Newsletter & Journal has arrived, bearing a fine picture of Eric Bowles tending to his coal-fired Aster 'Hudson'. In its 100 pages, we learn how to fit an opening cab roof to a Merchant Navy locomotive and Barrie Clear writes on his rescued Carrette SE&CR railmotor, allied to a suitable coach (**photo 4**). Geoff Clifford made a Gresley 1:32



G1 Carrette railcar locomotive (photo courtesy of Barrie Clear).

5



G1 Diesel brake tender (photo courtesy of Phil Shrimpton).

scale buffet car, Martin Ford writes about 'scale', not from inside a boiler but the size relationship and its conflicts. Denbury is a complete working model railway by Pat Honey and can be viewed on YouTube - see 'Pat's Railway 3'. Peter Micenko discusses track buckling in hot weather. Phil Shrimpton designed and built a diesel brake tender (**photo 5**), weighing 23 tons and adding braking force to unfitted trains, whilst David Taylor discusses rivet counting.

W. www.g1mra.com

The Cam, from **Cambridge & District Model Engineering**

Society, July, arrives, informing us that co-editors, Tim and Helen, spent their holiday walking in the Derbyshire Peak District, on disused railway lines, natch! They also visited the Cromford & High Peak railway, the location of the oldest, still working, railway workshops in the world. A good picture is of Hartington Tunnel which is now better lit than ever it was in railway days. The name Hartington, by the way, has its origins in the local landowner the Duke of Devonshire who, before inheriting the Dukedom, was the Marquess of Hartington. Similar

names abound in the North of England. One of the factories in Keighley, my birthplace, was called Burlington Shed, originating in a subsidiary title, Earl of Burlington (what time he rises was indicated by Vesta Tilley). A proposed raised track, 500 feet in length, currently being built, will use rails first used in 1958, as observed by Tim, then seven years old. Furthermore, he has acquired a Wren 80 turbine which has been unused for many years. He has also acquired an eight-foot wingspan 'Boomerang' jet trainer in which to install it. At full power this engine runs

at 160,000 rpm. 2,700 revs per second! He also writes on the progress of the Easter Traverser.

W. www.cdmes.uk

PEEMS June/July, from **Pickering & Experimental Engineering & Model Society**, notes that both *Model Engineer* and *Engineering in Miniature* have front covers with pictures of PEEMS members' models. Mel Doram has a gravity clock with no weights. Instead, the weight of the clock supplies the power. It is lifted up the vertical rods to wind it and it slides down them under gravity. And it runs for 24 hours at one 'winding'. (See previous joke... and www.youtube.com/watch?v=d0xwbaE66tE). Paul Gammon has a useful tip to help ensure that power drills are truly aligned to the work. Obtain a three-axis bubble level, £3 from Amazon, and attach to the drill. In June, Graham Sykes spoke about his updated *Force of Nature*, a steam jet propelled motorbike. In a lengthy piece, his numerous improvements were explained, with his reasoning. Currently, he has reached a peak speed of 175 mph. 100 litres of water lasts for only four seconds but a lot can happen in those 4 seconds... It is cheap to run, £4.20p per run, but is very expensive to build.

This knitting machine is a celebrated artefact in the museum in Honningsvåg, Norway. In an excellent local museum, dwelling mainly on the events of WWII, this machine was owned by a lady who earned a living from it. The machine was hidden from the invading Germans and moved about to keep its location, even its existence, a secret, being buried at one time. It is a survivor from that period of oppression (**photo 6**).

And finally, returning from a coach tour of a glacier, a lady said, "These coaches are very high, aren't they?". I replied, "If they were any smaller, the wheels wouldn't touch the ground" and she went away to think about it.

6



Knitting machine in Honningsvåg Norway.

ME

Club Diary

6 September– 18 October 2023

September

6 Bradford MES

Talk – Roger Backhouse, 'King Cotton', Saltaire Methodist Church, 19:30. Contact: Russ Coppin, 07815 048999

6 Bristol SMEE

Talk : 'Midsomer Norton Station and the S&DJR', Begbrook Social Club BS16 1HY, 19:30. Contact : secretary@bristolmodelengineers.co.uk

7 Sutton MEC

Bits and Pieces evening 20:00. Contact: Paul Harding, 0208 254 9749

7 Warrington & District MES

Projects/natter night, St Mary Magdalene Church, WA4 3AG, 20:00. See www.wdmes.org.uk/events

9 Polly Owners' Group

Rally at the Rugby MES, from 10:00. Contact : Neil Mortimer, 07900 133201 or neilmortimer@gmail.com

10 Bristol SMEE

Public running at the Ashton Court Railway BS8 3PX, noon-17:00. Contact : secretary@bristolmodelengineers.co.uk

10 Canterbury MES

Public running. Contact: ginapearson@btopenworld.com

10 North Wilts MES

Public running at the Coate Water Railway, 11:00-17:00. See www.nwmes.info

10 Sutton MEC

Track Day from noon – 16:00. Contact: Paul Harding, 0208 254 9749

10 Warrington & District MES

Running day at the club track. See www.wdmes.org.uk/events

12 Taunton Model Engineers

Club evening, Vivary Park, 18:00-21:00. See www.tauntonme.org.uk

15 Rochdale SMEE

Auction night, Castleton Community Centre, 19:00. See www.facebook.com/RochdaleModelEngineers

16 Frimley and Ascot Locomotive Club

FMES Autumn Rally, Frimley Lodge Park, 10:00-17:00. See www.fmes.org.uk

16 Rob Roy Rally

Bromsgrove SME, B60 4JR. Contact: Ian Horsfield, 07857 336425

17 Bradford MES

Public running day, Northcliffe, 13:30. Contact: Russ Coppin, 07815 048999

17 Bristol SMEE

Public running at the Ashton Court Railway BS8 3PX, noon-17:00. Contact : secretary@bristolmodelengineers.co.uk

17 Canterbury MES

Public running. Contact: ginapearson@btopenworld.com

17 Guildford MES

Open day, 14:00-17:00. See www.gmes.org.uk

17 North Wilts MES

Public running at the Coate Water Railway, 11:00-17:00. See www.nwmes.info

17 Tiverton & District MES

Running day at Rackenford track. Contact: Chris Catley, 01884 798370

17 Warrington & District MES

Running day at the club track. See www.wdmes.org.uk/events

19 Taunton Model Engineers

Meeting, West Buckland, 19:30-21:30. See www.tauntonme.org.uk

20 Bristol SMEE

Auction, Begbrook Social Club BS16 1HY, 19:30. Contact : secretary@bristolmodelengineers.co.uk

21 Warrington & District MES

Talk: Paul Caldwell on 'Big Game Hunting', St Mary Magdalene Church, WA4 3AG, 20:00. See www.wdmes.org.uk/events

23 Brandon & District SME

Running/family day, Weeting track. See www.brandonanddistrictsme.com

24 Canterbury MES

Public running. Contact: ginapearson@btopenworld.com

24 North Wilts MES

Public running at the Coate Water Railway, 11:00-17:00. See www.nwmes.info

24 Sutton MEC

Diamond Driving Centre fete. Contact: Paul Harding, 0208 254 9749

24 Warrington & District MES

Running day at the club track. See www.wdmes.org.uk/events

28 Newton Abbot & District MES

Club night at Rydon Community Hall, Kingsteignton. See nadmes.org.uk

28 Sutton MEC

Afternoon run from 12 noon. Contact: Paul Harding, 0208 254 9749

October

1 Bristol SMEE

Public running at the Ashton Court Railway BS8 3PX, noon-17:00. Contact : secretary@bristolmodelengineers.co.uk

1 Canterbury MES

Public running. Contact: ginapearson@btopenworld.com

1 North Wilts MES

Public running at the Coate Water Railway, 11:00-17:00. See www.nwmes.info

1 Small Model Steam Engine Group

Open meeting. 14:00-17:00. See www.gmes.org.uk

1 Taunton Model Engineers

Public running, Vivary Park, 14:00-17:00. See www.tauntonme.org.uk

1 Warrington & District MES

Running day at the club track. See www.wdmes.org.uk/events

4 Bradford MES

Talk – Graham Astbury, 'Twist Drills', Saltaire Methodist Church, 19:30. Contact: Russ Coppin, 07815 048999

4 Bristol SMEE

'On the Table' evening, Begbrook Social Club BS16 1HY, 19:30. Contact : secretary@bristolmodelengineers.co.uk

5 Sutton MEC

Bits and Pieces evening 20:00. Contact: Paul Harding, 0208 254 9749

5 Warrington & District MES

Projects/natter night, St Mary Magdalene Church, WA4 3AG, 20:00. See www.wdmes.org.uk/events

6 Rochdale SMEE

Models competition night, Castleton Community Centre,

19:00. See www.facebook.com/RochdaleModelEngineers

6 Warrington & District MES

Night running at the club track. See www.wdmes.org.uk/events

7 Tiverton & District MES

Running day at Rackenford track. Contact: Chris Catley, 01884 798370

8 Bradford MES

Public running day, Northcliffe, 13:30. Contact: Russ Coppin, 07815 048999

8 Bristol SMEE

Public running at the Ashton Court Railway BS8 3PX, noon-17:00. Contact : secretary@bristolmodelengineers.co.uk

8 Canterbury MES

Public running. Contact: ginapearson@btopenworld.com

8 North Wilts MES

Public running at the Coate Water Railway, 11:00-17:00. See www.nwmes.info

8 Sutton MEC

Track Day from noon – 16:00. Contact: Paul Harding, 0208 254 9749

8 Warrington & District MES

Running day at the club track. See www.wdmes.org.uk/events

15 Canterbury MES

Public running. Contact: ginapearson@btopenworld.com

15 Guildford MES

Open day, 14:00-17:00. See www.gmes.org.uk

15 North Wilts MES

Public running at the Coate Water Railway, 11:00-17:00. See www.nwmes.info

15 Taunton Model Engineers

Public running, Vivary Park, 14:00-17:00. See www.tauntonme.org.uk

15 Warrington & District MES

Running day at the club track. See www.wdmes.org.uk/events

17 Taunton Model Engineers

Meeting, West Buckland, auction, 19:30-21:30. See www.tauntonme.org.uk

18 Bristol SMEE

Talk: 'Steam Launches and Engines', Begbrook Social Club BS16 1HY, 19:30. Contact : secretary@bristolmodelengineers.co.uk

Places to go for inspiration ... or just a great day out!

With summer drawing to a close, now's the perfect time to get out and about and draw inspiration for your own projects and to feed your passions over the darker and colder months.

We're sure you will have your favourite places to go, whether that's a heritage line, museum, model exhibition or another attraction, but if you are looking for somewhere a bit special, a part of the country you may not have been to for a while, or an attraction on your doorstep you'd forgotten all about, then take a look at our map and the adverts on these pages to gain some inspiration.

All the venues and businesses here help provide a memorable day out or provide that inspiration and education we all need to feed our passions and hobbies... you really can't beat a super day out at one of the fabulous attractions highlighted on these pages... and maybe some lovely locally-sourced food and hospitality too!

Even better, you can always find some interesting byways and highways to and from them so it's a great opportunity to get off those busy motorways and explore the great British countryside.

As you can see from the map here, there are venues to visit all around the country, so go on, support these great British attractions... you will not be disappointed!



**SUMMERFIELDS
MINIATURE RAILWAYS**

Bedford Model Engineering Society open their railways with over one mile of track about 25 times a year between Easter and October.

Ground level tracks are dual gauged as 7¼" and 5" with a raised track of 2¼", 3¼" and 5" gauges. The clubhouse provides as a buffet and picnic tables are popular while families view the garden railway.

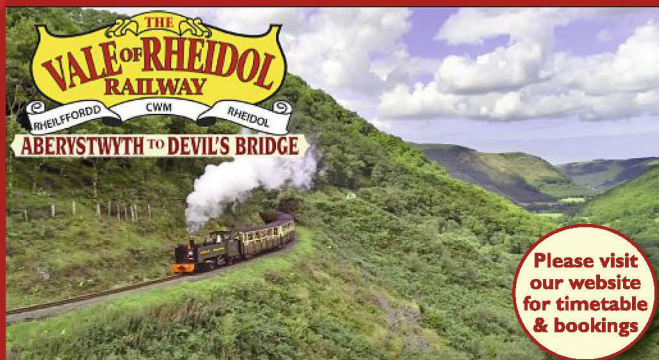
A variety of locomotives haul visitors between the two stations with steam at most running days.

Turntables, signals, bridges and a signal box add to the atmosphere. Our rural site has toilets and free parking.

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Further information and directions are on our website... bedfordmes.co.uk

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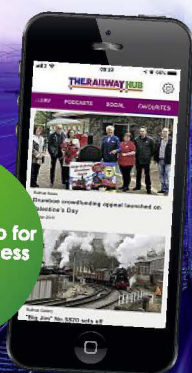
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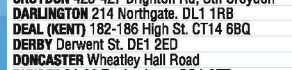
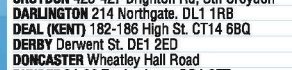
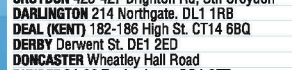
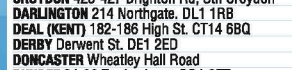
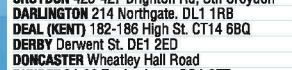
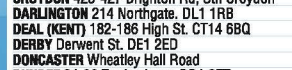
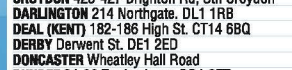
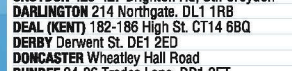
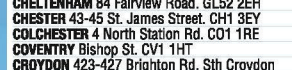
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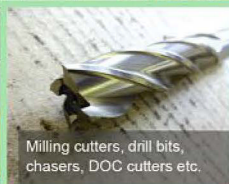
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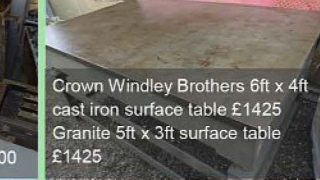
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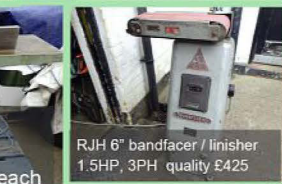
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