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COVER FEATURE

IMLEC

First day's running at Bristol

Dirty Tram

A Bolton tram in its
true colours

Scoring Planks

A simple jig



FITTINGS FOR *ELIDIR*

Completing a loco

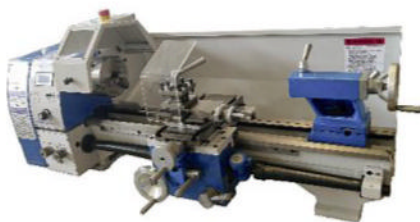


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with DRO & 4" Chuck**

SPECIFICATION:

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Taper of spindle bore: MT3
Spindle bore: 20mm
Spindle Speed: 50 - 2500rpm
Weight: 43Kg

Price: £588



AMABL250Fx750

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Spindle bore: 26mm
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Range of spindle speeds: 50~2500rpm
Weight: 140Kg

Price: £1,904
W 2 Axis DRO - Price: £2,280



**AMABL290VF Bench Lathe (11x27) - power cross
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AMAVM25LV

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Max. face milling capacity: 63mm
Table size: 700x180mm
T-slot size: 12mm
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AMAVM32LV

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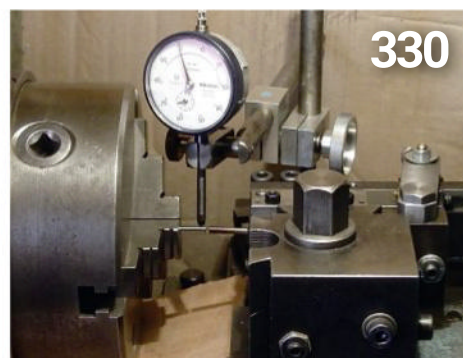
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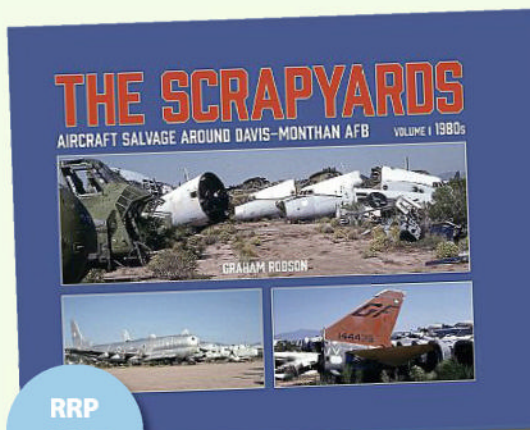


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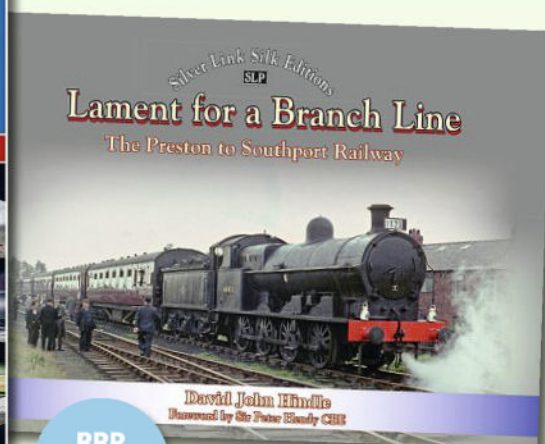
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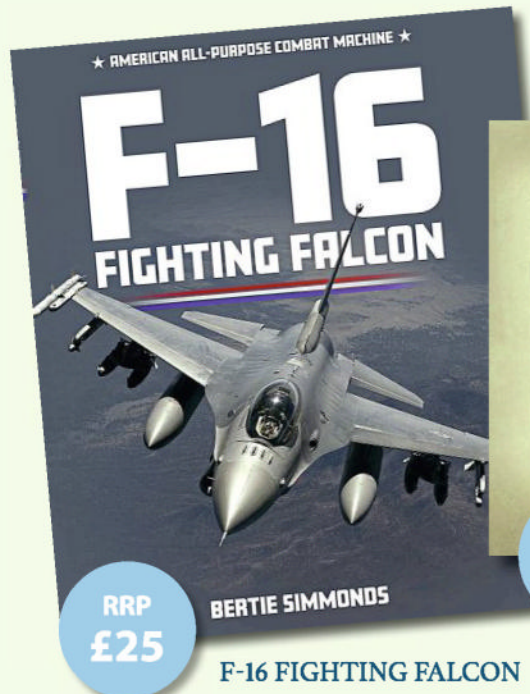
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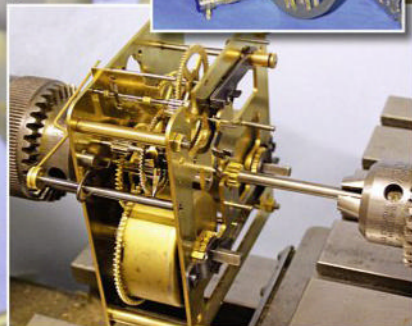
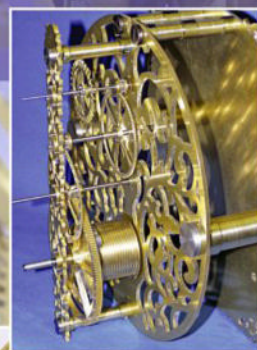
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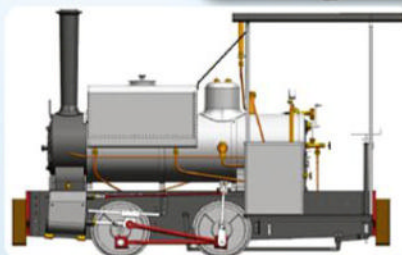
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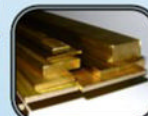
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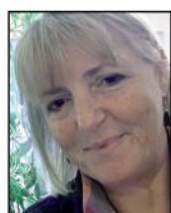
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MARTIN EVANS
Editor



DIANE CARNEY
Assistant Editor

Mother and Daughter Tram

Sarah and Rebecca Brightman have become the first mother and daughter tram crew at Crich Tramway Village, home to the National Tramway Museum, since daughter, Rebecca, passed out as a tram conductor recently, at the age of 16.

Both women have a keen interest in social history and transport, with Sarah volunteering at Crich Tramway Village since she was 17 years old, becoming a conductor at 18 and going on to become a tram driver in 2001. As a result, Sarah passed on her enthusiasm to Rebecca, who has been visiting the museum since she was five weeks old.

Sarah and Rebecca share the fact that their first solo conducting trips at Crich were on Sheffield 74 tramcar.

While Rebecca is about to begin an Applied Science course at college in September, Sarah credits Crich Tramway Village with giving her many lessons in life.

Sarah commented: 'Those who knew me at the start will confirm that I was a quiet, shy and innocent young girl and I spent many evenings in the Cliff pub having a great time with the other volunteers. I have made many lifelong friends who remember the trams in the cities and passed on some great stories. Sadly, many of them have passed away or are in ill health, but I hope I can pass some of these stories on to other people. It is great to see so many younger people being interested in trams and our museum, and starting the same journey that I did nearly 30 years ago.'

'We both agree that the museum is a friendly and welcoming environment, and it provides great experience in working with the public. We are also looking forward to my son, Daniel, starting his career at Crich in two years' time; we're calling it The Brightman Takeover!'

Crich Tramway Village is open daily Sunday 3rd

September and then six days a week until 5th November 2023. For details please see: www.tramway.co.uk



Sarah (left) and Rebecca Brightman (photo courtesy of Crich Tramway Village).



Crich Tramway Village.

Midlands Show

How quickly the summer passes us by! It's time now to be thinking about the autumn and one event not to be missed is of course the Midlands Model Engineering Exhibition, to be held at the Warwickshire Event centre ('The Fosse') from the 12th to the 15th of October. Both *Model Engineer* and the Society of Model and Experimental Engineers will be present, marking their joint 125th anniversary. The lectures are back and John Wilks' newly completed 10¼ inch gauge LNER P2 Cock O' The North will be on display. There will be the usual display and competition classes and if you wish to enter a model, this is the time to be thinking about it! More information is available at www.meridienneexhibitions.co.uk/events/midlands-model-engineering-exhibition.



Midlands show.

Rob Roy Rally

Here is another date for your diary - this year's Rob Roy Rally will be held at the Bromsgrove Society of Model Engineer's track at the Avoncroft Museum of Historic Buildings on Saturday the 16th of September, from 11am until 4pm. The rally is open not only to Rob Roy locomotives (and their owners!) but also to any 3½ inch gauge locomotive. For more information please contact Ian Horsfield on 01386-792628.

Unknown Engine

This engine is no longer unknown! Three readers agree on its identity. Charlie ('Chuck') Barker of the York SME was first off the blocks to tell me it is a 2 x 2 horizontal mill engine from Clarkson's of York. This was backed up by Jason Ballamy and also John Hurst from Peterborough SME, who has supplied a photograph of a complete engine (background pillowcases supplied by Mrs Hurst). They inform me that the drawings and castings are still available from Blackgates (www.blackgates.co.uk) in their separate Clarkson's catalogue.



Clarkson 2 x 2 mill engine (photo courtesy of John Hurst).



Blackgates.

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. 07710-192953

MEeditor@mortons.co.uk

IMLEC 2023

PART 1



The IMLEC banner.

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



The International Model Locomotive Efficiency Competition (IMLEC) is an annual contest that moves between numerous host societies, being supported and sponsored by the *Model Engineer* magazine since it was first held in 1969.

With 2023 being the 50th anniversary of the opening of their raised track at Ashton Court Estate in Bristol by the Bristol SMEE, society president Bernard North offered the services of the society to host IMLEC as part of our celebrations, the first occasion since 2009. In that 14 years many faces have changed within the society, so there was a fair amount of training to do.

We noticed that Maidstone society had chosen to use

a digital scoreboard, so considered that if similar content was also available to mobile devices, this could enhance spectators' participation, so adopted that approach for our event. Furthermore, our old 'mechanical' dynamometer car had long since been scrapped and a new dynamometer car could be built using the TKP load cell measuring unit, which added to the attraction.

With our society secretary enforcing our GDPR obligations, I became the main contact for competitors and applications and for the most part interaction was done using email, which avoided the postal service which at times was unreliable during the early part of the year.

IMLEC can be slightly Marmite - whilst some can't see the fun in it, others are avid fans, and many follow the competition around year on year. The event is also a really good social occasion, a chance to chat and learn from others, make new friends as well as watch some amazing competitive runs. Confounding the few IMLEC doom-mongers, we had no trouble filling the 33 run slots, choosing not to allow our own members to enter but keeping them back as reserves. For those making the effort to attend one or more days, we wanted to ensure there was a sufficiently full day of action to make their journey worthwhile.

It was slightly ambitious, but not the first time a club has hosted that many runs, and we

fully rehearsed the timings for the changeover of carriages to ensure it was achievable. We also held an internal club competition to act as a training/proving session from which we learnt a great deal.

Once the closing date passed, the runs were allocated being sympathetic to travelling distance and individual needs and it was nice that we were complimented in the variety of the line-up and the competitor sequence. We were also pleased to produce a comprehensive 32-page colour programme for the event.

Competition Day 1 – Friday

You couldn't have asked for a better start to the day, dry and sunny, but at 7:30am it was already hot. Although we arrived on site well ahead of the starting time, competitors and spectators were also arriving early but our reception area was ready to greet people.

Fortunately, we were able to offer hot food and snacks from about 10 o'clock and many bacon sandwiches were consumed, including by our own volunteers. Several members dedicated themselves to the preparation of hot food with all the proceeds going to a local Scouts group. However, the 'weekend's worth' of supply had been eaten by the end of Friday, so more supplies were bought, the same happening after Saturday.

Getting ahead of the driver demand, our coal team was already sifting new bags of coal to remove small pieces and dust, then graded it into appropriate sizes for 3½ or 5 inch gauge locomotives. Within our ranks we have two ex-professionals who worked in handling coal imports and they came equipped with precision scale balances.

Friday is traditionally a quieter day with many travelling but many IMLEC fans include the event as a mini-holiday and we were pleased at the number of spectators accumulating. We had set a mid-day start, but the first competitor withdrew



Roger Hopkins and 3½ inch Derby 4F 0-6-0.



Nick Feast and 3½ inch Bulleid Q1 0-6-0.



David Shepherd and 5 inch Polly 3 0-6-0.

several days before, so we brought the second runner forward by 15 minutes.

For the Bristol IMLEC event, the direction is reversed from normal running. After connecting trolleys at the traverser, the train runs a

short hop to the station for passenger loading. The start point is very deliberately positioned on the downhill side to assist trains to get away cleanly. That can encourage some to be slightly over ambitious with their

passengers though, as there are two ascents that can catch out overloaded trains.

On the track, here are the runs in sequence.

Run 2 (photo 2)

So, first on the track was Roger Hopkins from Nottingham SMEE, who got the day off to a fine start. His 3½ inch gauge Derby 4F set off in the bright sun and already 23 degrees. With four passengers in addition to the dynamometer car, he happily ran lap after lap with a very consistent drive, covering 9 laps in just over 36 minutes. The observer noted he had made a good run, while using 0.815 lb of coal, and this was a great start to proceedings.

Run 3 (photo 3)

Next to light up was Nick Feast from Bournemouth & District SME with his 3½ inch gauge Southern Railway Q1. The same locomotive had valiantly battled in the previous year's contest, so hopes were high. The locomotive is not too dissimilar in size to the 4F and again Nick got away well, also taking four passengers. But after some really good laps, he stopped on lap 7 to regain pressure. After a good attempt to climb the bank to the station, sadly he stopped short of the finish line and, in a further attempt at a blow-up, ran over the allowed eight minutes of stop-time and had to retire. Nevertheless, a very creditable run for a medium size locomotive.

Run 4 (photo 4)

Next was David Shepherd from the Bracknell society with his Polly 3. This Polly is around 20 years old and was also entered in last year's contest at Guildford. His 2:15pm run started in bright hot sun with two passengers. Although making steady progress, David ran out of steam at the bottom of the climb up to the tunnel, while also finding his injector refused to work. After achieving 4½ laps, he also exceeded the maximum allowed stop time, forcing a retirement.



Paul Davies and 5 inch Ajax 0-4-0T Batty Thomas.



Andy Healey and 5 inch BR Britannia 4-6-2 Apollo.

By now the sun was baking, and many spectators had moved under trees for shade. We think it reached 27 degrees, and with memories of last year's hot dry IMLEC, we had fire beaters positioned around the track, although happily their services were not required.

Run 5 (photo 5)

Fifth was Paul Davies from Stroud MES with his 5 inch gauge 'Ajax' tank locomotive, although sadly becoming our third retirement. During the lighting up process, upon removing the electric assist fan, Paul discovered his steam blower was blocked, and was unable to continue to raise steam. Our scoreboard was beginning to turn blue with non-finishers.

Run 6 (photo 6)

Next running on this hot afternoon was Peter Wardropper, representing

SMEE. Although Peter hadn't competed in a number of years, his 3½ inch gauge Betty River Darenth was beautifully prepared and the green paint was striking in the bright sunshine. Peter and his locomotive gave a very spirited run with a trolley of four passengers. Taking on water via bottles in laps 3, 7 and 10, and completing 12 laps in just under 28 minutes, while using 1.405 lb of coal, Peter achieved a very commendable run.

Run 7 (photo 7)

Our penultimate run of the first day was from Andy Healey from Gravesend MM&ES. Although owning a Britannia himself, he was running the Britannia previously entered by his nephew Karl Midgeley, a regular IMLEC competitor who sadly passed away two years ago from Covid-19, so this run was a tribute to Karl.

Finished in distinctive LNER



Peter Wardropper and 3½ inch LBSC Betty 2-6-2.



Alan Heywood and 5 inch Hunslet 0-4-0ST Tilly.

blue, Andy took the Britannia Apollo out for a near flawless run with six passengers, completing 14 laps with no stoppages. The observer noted that this was a 'great run', which consumed 2.45 lb of coal, Andy completing his run in 31:55 minutes. It was becoming clear that rather than running to just 25 minutes, drivers who were doing well were intent on using every second they could.

Run 8 (photo 8)

Wrapping up our first day was run 8, Alan Haywood from Urmston & District MES. Alan entered a 5 inch narrow gauge Hunslet quarry locomotive Tilly. Alan had built this to the design of a fellow member of his society and it was very nicely presented too, setting off with a seemingly ambitious load for an 0-4-0, of 12 passengers across three carriages. Well, any concerns were unfounded and this locomotive just seemed to romp away, and powered up the gradients with aplomb, even picking up a speeding mark on lap 10.

But, having decided to run into the 30-minute zone, on lap 11 Alan stalled on the climb to the tunnel, and over the radio we heard how he was struggling to raise pressure. It was starting to get a bit nail biting when, breaking the radio silence, we heard that he was dropping his passengers and trying to get home. Suddenly, the locomotive seemed to burst out of the tunnel and gunned it towards the finish line, as all eyes were intently fixed on the run clock. To a tremendous amount of cheering, Alan passed the finish line with a little over 5 seconds to go. That was a close call and a thrilling end to our first day. Coal usage for this exhilarating run was 3.455 lb.

It had been a hot day but our volunteers had stood up well to the challenge. I think we were all pleased at how the day had come together. So how would it go on day 2...?

Photographs courtesy of Rob Speare, Bernard North and Richard Pearson.

●To be continued.

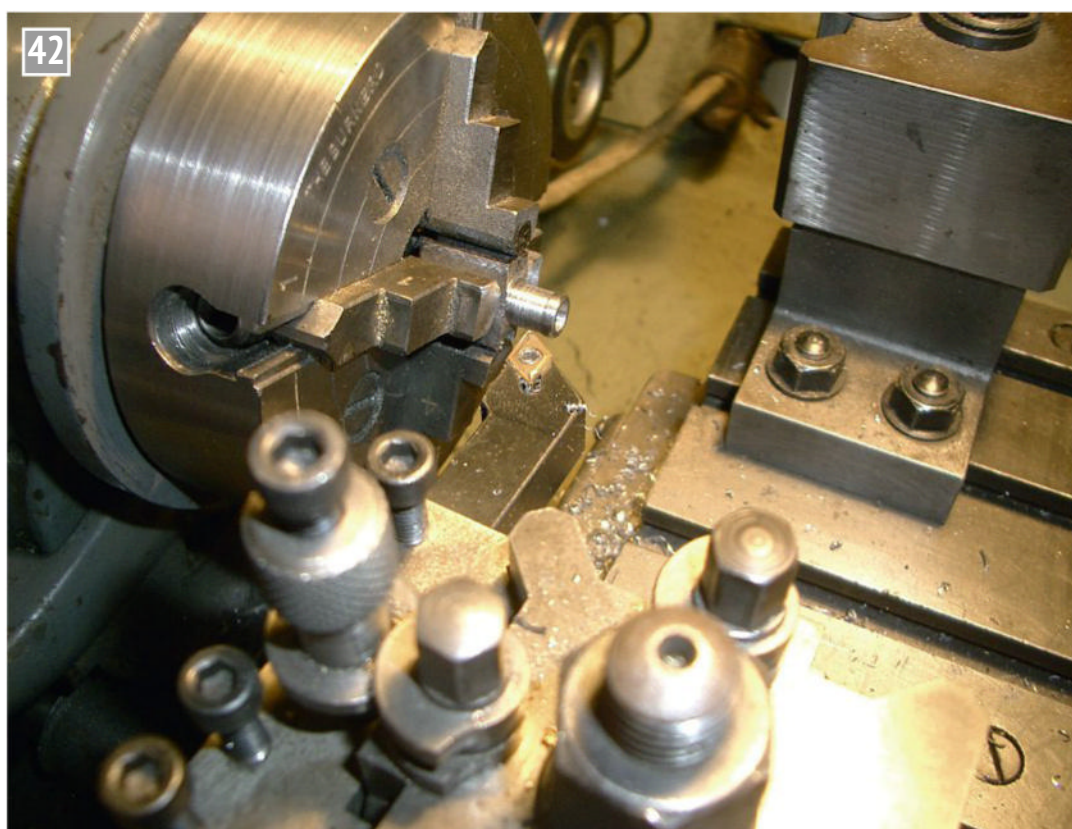
RECYCLING PART 3

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.272
M.E.4723 August 11



Roughing out the crosshead blank.

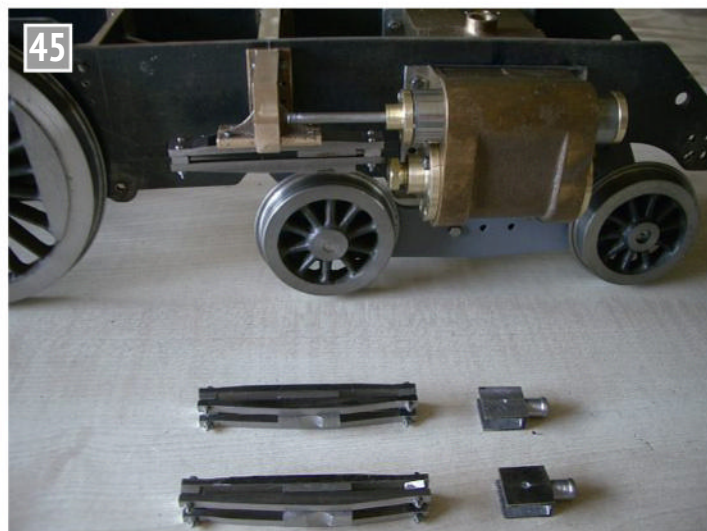
The crossheads were tackled next and are formed from two sections, the main section being made from a mild steel blank that was squared up on the vertical mill before turning the piston rod collar in the lathe. **Photograph 42** shows the blank being roughed out in the four jaw independent chuck mounted in my Myford. The blank was then transferred to the vertical mill and the throat cut out using an end mill (**photo 43**). To complete the crosshead we needed the 'tee'



Crosshead throat being cut in the mill.



Crossheads with tee section sliders.



Fitting the slide bars.



Soldering the two parts of the crosshead.

section to slide in the guide bars and these 'tees' were formed using the mill and are shown in **photo 44**, together with the main section. The 'tees' have a scallop cut in the lower edge which will enable the connecting rod to fit in the crosshead. The three slide bars were fabricated from stock mild steel bar, each one having a wide top and two lower bars,

the bars being separated by four spacers on each end. The profile of the tapered slide bars was machined to shape in the vertical mill. The slide bars and the crossheads are shown in **photo 45**, one set bolted loosely in place on the support bracket.

The two pieces of the crosshead were then mounted in a simple plate jig to align the

'tee' and a collar was placed in the throat to maintain the position of the 'tee'. Before silver soldering the connecting faces were thoroughly cleaned and coated with flux. **Photograph 46** shows the jig, flux and the soldered crosshead. **Photograph 47** shows the partially cleaned up crossheads and the radius rods that also require tidying up after soldering. The valve gear and its operating levers on the three cylinder Schools are quite complicated and require a lot of effort to create something that works so, after a chat with Ed at Model Engineers Laser the necessary inside and outside valve gear lifting arms, eccentric rods, expansion links, reach rods and gear frame sets were ordered, together with the main coupling and connecting rods. I have used this laser cutting service several times and have been pleased with the quality and the speedy service.



Cleaned up crossheads with radius rods.

It saves a significant amount of time and effort on a project.

The connecting rod blank was mounted on a supporting mild steel plate with bolts into tapped holes to enable the profile to be reduced and once completed the same setting was used to cut the flute. This set-up is shown in **photo 48** and was repeated for the second rod. A similar procedure was carried out on the coupling rods and these, together with the inside connecting rod, are shown in **photo 49**. The inside connecting rod was a more



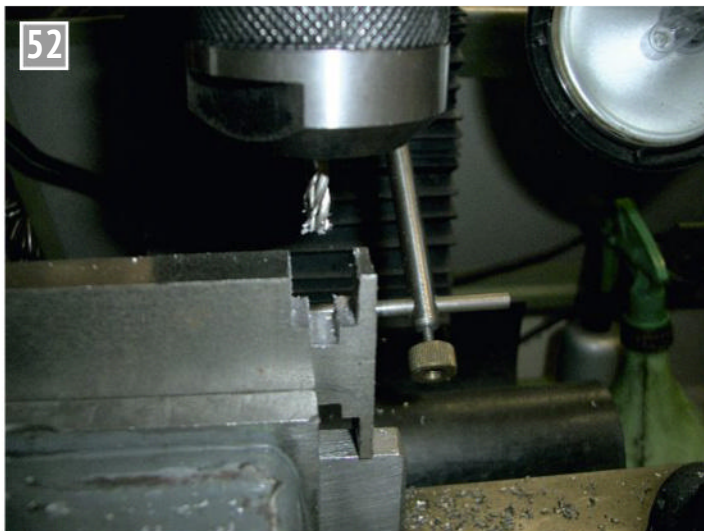
Cutting the flute in a coupling rod.



A partially finished set of rods.



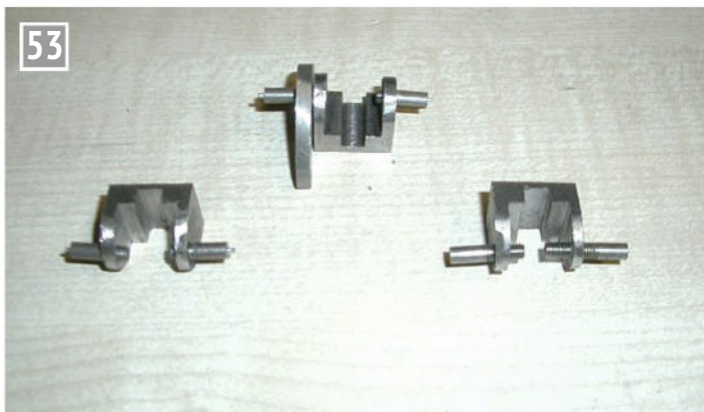
Boring the big end for the inside connecting rod.



Machining the trunnion blocks for the expansion links.

complex bit of machining because of the split big end and the tapered reduction on the shaft. The reduction was milled on each side of the rod with packing between the rod and the support plate on the first side that had been machined. The split big end/

bearing housing was mounted in the four jaw independent chuck in the Myford and bored to suit the bronze bearing. The set-up is shown in **photo 50**. The completed inner big end/ connecting rod is shown in place on the main crank axle in **photo 51**.



A set of trunnion blocks.



Inside connecting rod and crank axle.

The three cylinder valve gear is anything but clear in the drawings but faint heart never won fair lady so here we proceed with the trunnion blocks to hold the expansion links. The trunnions were machined from mild steel stock in the vertical mill (**photo 52**) and the throats were cut out using an end mill in two stages; one to hold the expansion link, the other to provide clearance for the fork end arms of the radius rods. The expansion links were water cut by Model Engineers Laser and only required draw filing to bring them to size. Water cutting is used to avoid hardening the links which would have happened if they had been flame

cut. **Photograph 53** shows the three trunnions, after the jaws had been filed to shape, and the holes for the pivot pins drilled and tapped. The one in the centre has the additional arm for the eccentric link that operates the inside valve gear. The pivot pins are loosely in place and would be centralised later by holding one pin in the lathe chuck and the other pin in the jaws of a tail stock drill chuck, after which the pins were superglued in place. **Photograph 54** shows the two outer expansion links in place with the secured pins trimmed to length.

Continuing with the valve gear, the combination levers were profiled in the vertical mill,



Expansion links fitted to the trunnions.



Profiling a combination lever.



A set of three lifting links.



Mounting for the inside valve gear.

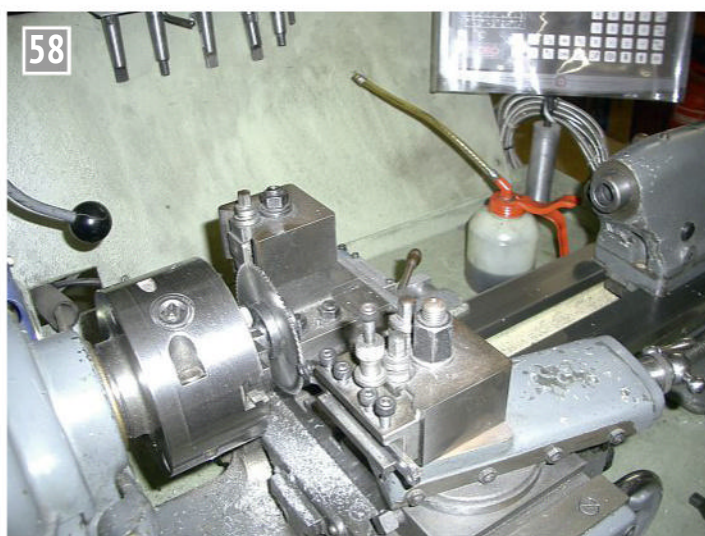
holding them on the mounting jig as shown in **photo 55**. Similarly, the lifting and union links were machined to size and together with the weigh bar or top reversing shaft (as it is known on the Schools) are shown in **photo 56**.

The main components of the

inside and outside valve gear are shown in **photo 57**. Using the Myford has become my first choice when forming the fork ends of the various links and levers. Using a thin slit saw at a slow speed provides a clean cut that can be adjusted to suit the width of the jaws.



The top reversing shaft.



Forming the fork in the eccentric rod.



Valve gear mountings in place.

Photograph 58 shows the set-up in the Myford for cutting the forks using the clamping screws in the quick-change tool post to hold the work piece securely.

The inside valve gear was mounted on the pump bracket casting which had two brackets fitted to suit the trunnion block (**photo 59**)

whilst the outside valve gear was mounted in gear frames fabricated from mild steel sheet and riveted together (**photo 60**). The front part of the gear frames was used to support the bearing blocks for the reversing gear top weigh shaft. The area around the valve gear, especially the inside set, is very cramped and



Valve gear mountings in place.



Splasher components.

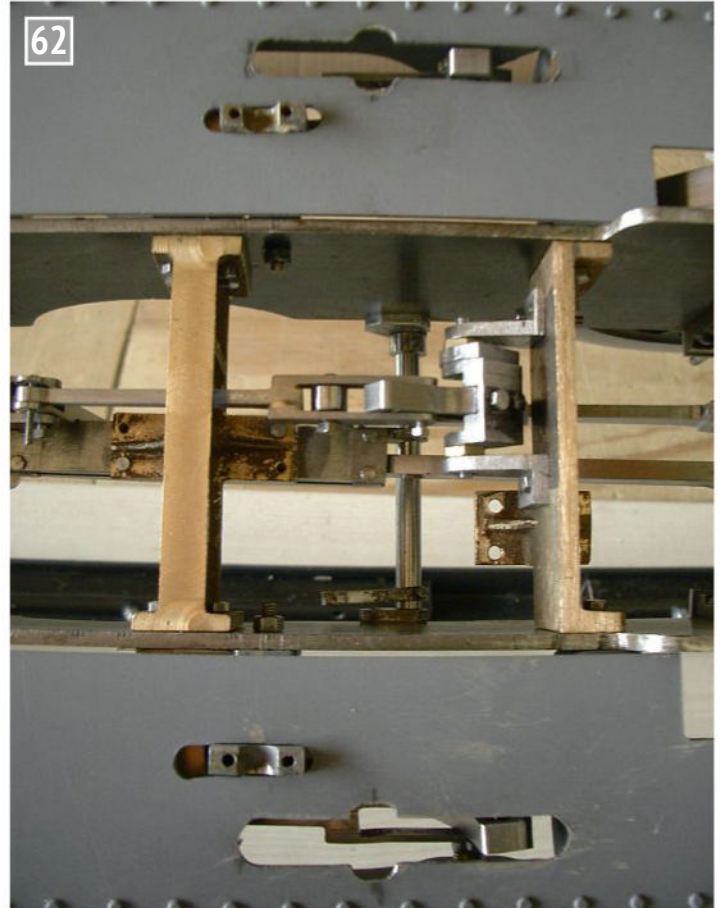
complicated and needed a trial installation just to see if the items could be placed in the correct position. **Photograph 61** shows the inside valve gear from above the main frames. Bolts have been used to loosely hold everything in place and the slide bars have been temporarily added to the outside support brackets. Before the top reversing shaft could be fitted the trunnions that supported it had to be

made from mild steel stock and silver soldered in to position on the gear frames. Once this was accomplished the running boards could be folded from sheet galvanised steel and the cut-outs for the wheels/ splashers were hacksawed out and filed to shape.

The ports in the running boards for the lifting arms were cut out using the vertical mill. **Photograph 62** shows the machined ports and the lower trunnion blocks. With the sheet metal work well under way the splashers were the next to be made from galvanised steel. The tops were rolled in my 12 inch rolls to suit the segments and **photo 63** shows these components prior to being soldered. **Photograph 64** shows the splashers loosely in position on the running



Splashers placed in position.



Platforms fitted with cut-outs for the reversing shaft bearings.

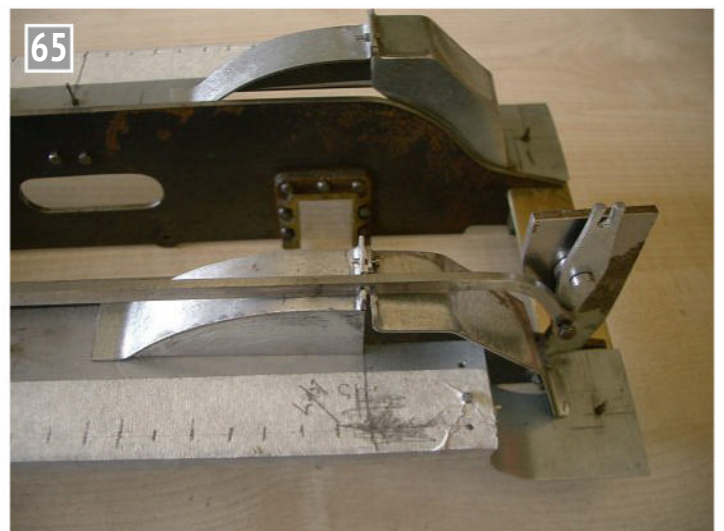
boards and the main frames and **photo 65** shows the more complicated splashers that fit over the driving wheels on the inside of the cab. These took quite a bit of trial and error, even after using cardboard patterns to get the shapes correct. It is evident in photo 65 that the reversing stand, reach rod (which was supplied by Model Engineers Laser) and the cab spectacle plate all

contributed to the detail fitting that was required to obtain a satisfactory fit.

● To be continued.

NEXT TIME

We will catch up again with the sheet metal work in part 4 of this series.



Rear splashers.

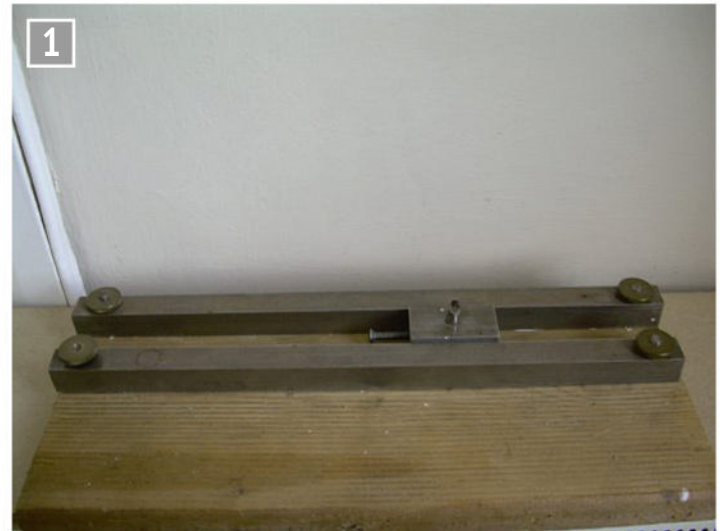
A Simple Device for Producing a Plank Effect

Dave Woolven finds a better way of scoring planking.



This is a simple, quick device that I made out of odds and ends for just one job – but I soon realised that it had other uses.

I was helping a friend to build a model boat. When it came to making the deck planking we saw that wood scored with a scribe or



The planking gadget.

Stanley knife looked like wood that had been scored with a scribe or knife. On top of that, whatever you are using for a straight edge is just bound to slip or the scribe will follow the wood grain resulting in a 'plank' line that goes everywhere except where you want it to go!

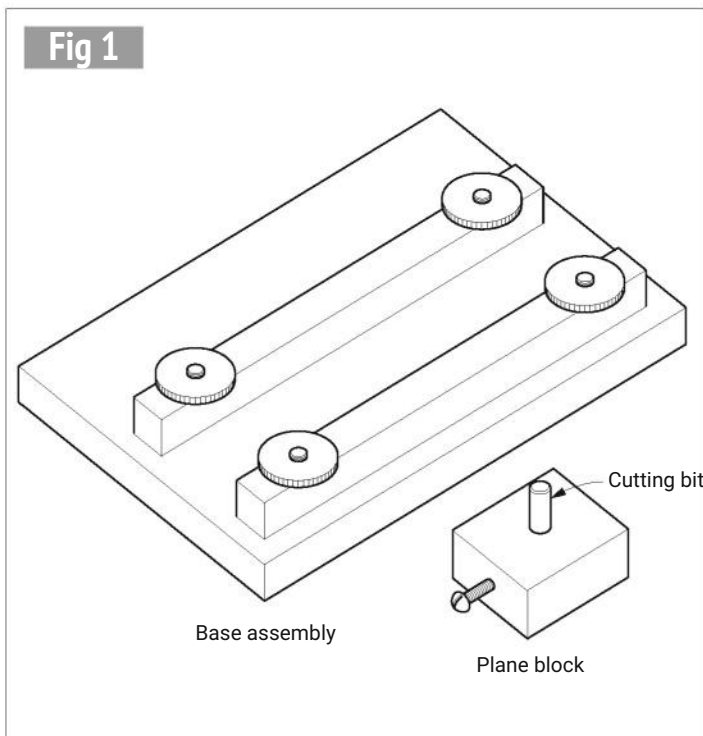
This is a simple plane running between fixed guides which holds the wood and guarantees a straight line of exactly the same depth every time – a perfect plank (**photo 1**).

Making the base and guides

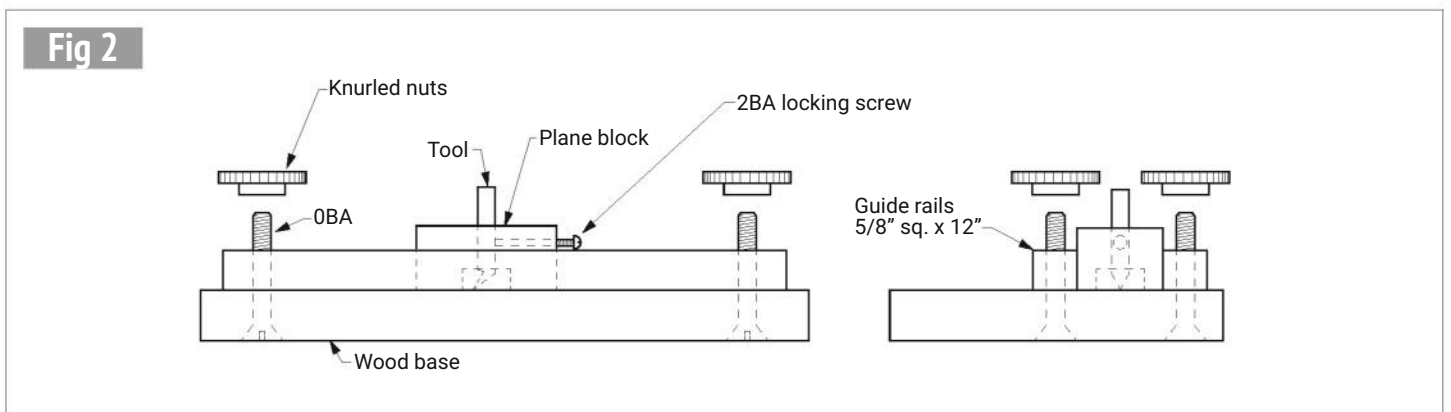
This unit was made from whatever came to hand – so sizes etc. are not important.

The base is a piece of wood – in my case I used some from the frame of a divan bed that I'd broken up. My base is 12 inches long, by 5½ inches wide by ¾ inch thick. Try to get as smooth and flat a piece as possible (**fig 1**).

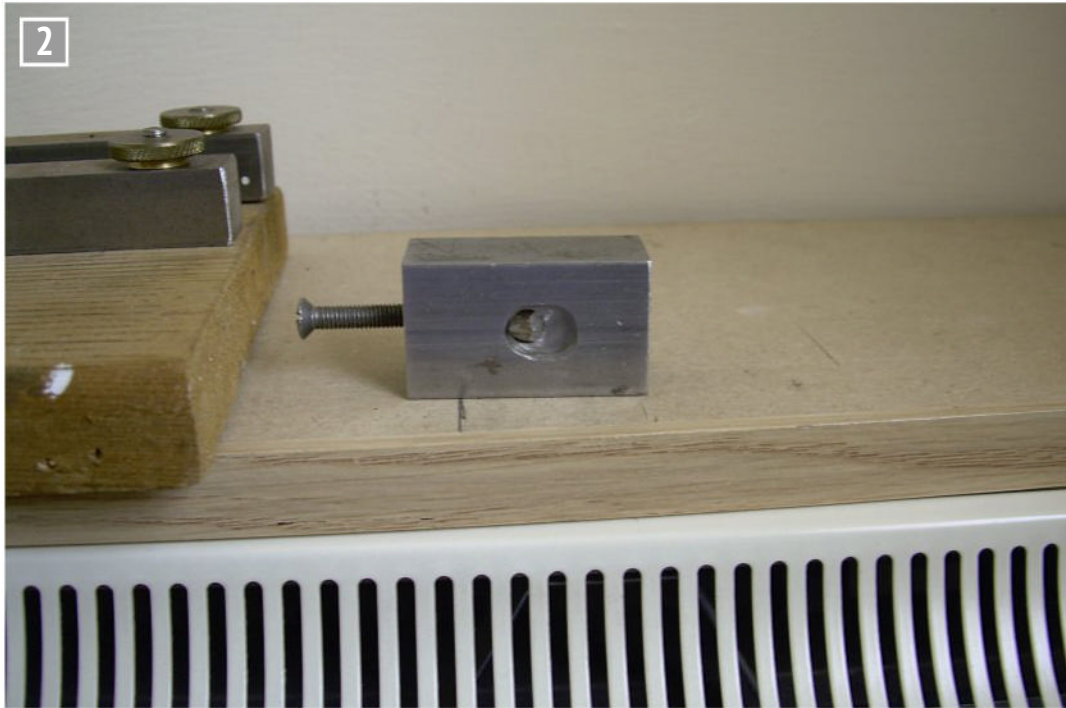
The guides are two 12 inch lengths of bright steel ⅝ inch square (**fig 2**).



Outline of the planking gadget.



Planking gadget drawing.



The scribing block.

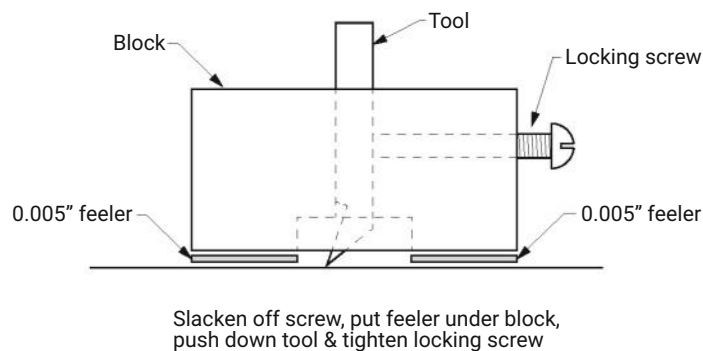
The plane block is a piece of bright steel $1\frac{1}{2}$ inches long by 1 inch wide x $\frac{3}{4}$ inch thick (**fig 3** and **photo 2**).

The tool is a piece of $\frac{1}{4}$ inch round tool steel (**fig 4**).

Drill 0BA tapping size holes through the ends of the guides, about $\frac{1}{2}$ inch from the ends.

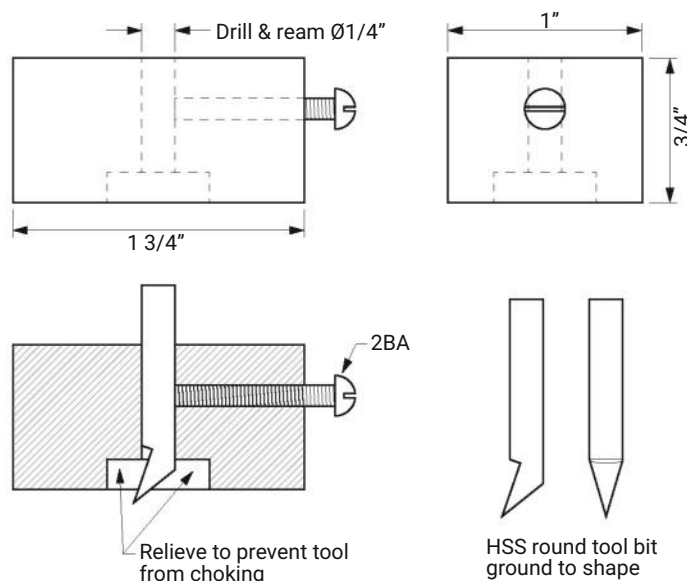
Clamp a 12 inch length of $1 \times \frac{3}{4}$ inch (from which you will make the plane block) between the two guide rails (**fig 5**). This is a temporary measure to ensure that the two rails stay parallel and set at the correct distance apart for the plane block. Put this on the base and pop a 0BA tapping drill through the holes in the rail ends and through the base. Tap the holes in the wood 0BA (horror of horrors – tapping holes in wood! – it's just to stop the screws from turning or dropping out). Open

Fig 3



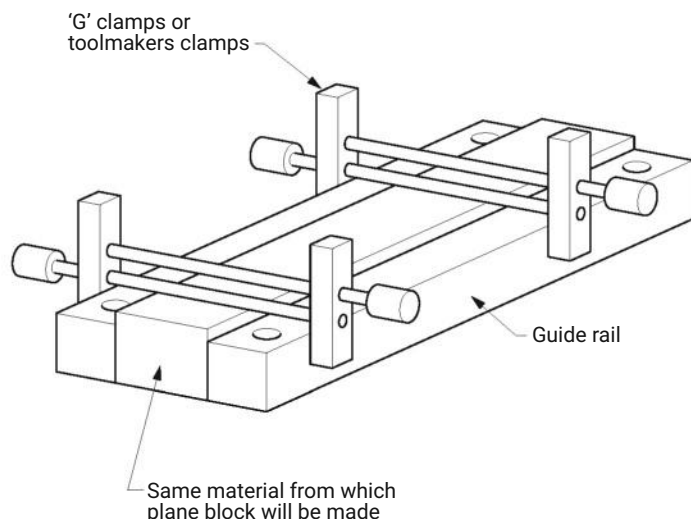
Setting the scribing tool.

Fig 4



Scribing block details.

Fig 5



Positioning the guide rails.

3



Guide rail posts.

4



Planking for a wagon.

up the holes in the guide rails to 0BA clearance. Screw four 0BA screws up through the wood, remove clamps and drop the guide rails on. Make four knurled nuts for these screws (**photo 3**).

Making the plane block

Cut off 1 3/4 inches from the 1 x 3/4 inch bar and clean up the ends. Drill and ream the centre of the top face. Drill and tap 2BA on one end for a 2BA clamping screw. You will need to relieve the underside of the block around the reamed hole. I found that without this relief the 'throat' of the tool quickly became choked and refused to cut. I used an end mill to make this relief but a touch with a half-inch drill should work just as well. Grind the tool and clamp with the point to whatever depth you want.

Using the unit

Slacken the four knurled nuts, lift the guide rails, slip the wood under (cut with the grain), tighten the nuts, slide the plane block along between the rails – one 'plank' made. Slacken the nuts, move the wood over, cut the next plank. Depending on how you grind the tool point you can make 'V' groves, square ones, shiplap etc. - the choice is yours. The unit is excellent on plasticard as well for wagon sides, buildings, walkways, locomotive cab floors etc. (**photo 4**).

I also found it useful for scoring brass sheet to give a clean, straight and sharp bend. If – for instance – you want to score 0.015 inch brass, set the cutting tool to 0.005 inch (fig 3), lift the tool point just on to the start of the metal sheet, press down hard and score the line. The brass will fold exactly on the line - ideal for making small tanks etc.

I had all the above materials to hand but instead of metal guide rails and metal plane block you could use DIY store hardwood, the tool from a suitable nail, a wood screw for the tool clamping screw, the screws for the guide rails from coach bolts and wing nuts from the DIY merchant.

An Engineer's Day Out

Sheffield's Kelham Island Museum and the Ken Hawley Collection

PART 2

Roger Backhouse returns to Kelham Island to learn about Sheffield's industrial history.



Continued from p.253
M.E.4723 August 11

The Ken Hawley collection and Sheffield made tools

Ken Hawley (1927-2014) was a remarkable collector. He owned a tool shop in Sheffield but besides selling tools he was fascinated by their making and makers. Sheffield then made an incredible variety ranging from garden tools (**photo 23**) to surgical instruments (**photo 24**) and from builder's tools to precision measuring equipment. Sadly, much of the industry was in decline. Many smaller manufacturers were closing down with others sending production abroad.

He recorded how craftsmen like the 'Little Mesters' would make specialised tools or even parts of tools like handles, sometimes filming operations. He built a vast collection of tools occupying several garages and his home. Almost equally importantly he collected manufacturers' catalogues and sales information, now a vital record, along with engineering drawings and patent information. Documentation is a vital part of a good museum collection.



How to make a garden fork - a more complex process than most gardeners realise.



Just the tool to make you shudder. An amputation saw, one of many surgical instruments made in Sheffield.

There is so much in the collection that one article cannot do it justice. "Our mission is to preserve the collection and the knowledge behind it" says Keith Crawshaw, Ken Hawley Trust chairman. A multi-skilled team of around thirty active volunteers helps with cataloguing, conservation and meeting the public. Museum staff and volunteers have worked to collect many of the stories of people who worked in the city's industries. Sometimes whole families were in one trade and family histories can be traced.

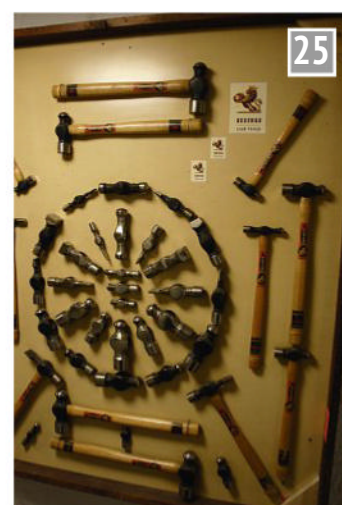
Special displays and giant tools

Manufacturers liked to show off their wares. So, they marketed their products in carefully arranged displays used at exhibitions, trade fairs and in shops (**photo 25**). Displays were often preserved and now make an attractive feature of the collection (**photo 26**). Often with several dozen specialist types of one tool in the same case, they show just how varied Sheffield's output was.

Others liked to make giant versions of their tools. Some are displayed, spectacular if useless, but helped sell products (**photo 27**).

Measuring tools

Sheffield made more than wood and metal working tools. Sheffield companies



Display case featuring the range of Bedford Lion hammers.



Presto cutting tools in display case.

James Chesterman, Moore and Wright and Shardlow dominated production, specialising in measuring instruments ranging from carpenters' two foot folding rules to large micrometers



Trade fairs were important places for Sheffield's manufacturers to make sales. These giant tools were made for display at a fair. The collection also has the promotional literature manufacturers produce, a vital record.

and dial test indicators. They worked in wood and metal (photo 28). High precision became increasingly important in engineering products.

The collection has a comprehensive range of measuring tools made by these companies. There are over 300 different designs of micrometers and a vast range of Vernier caliper gauges and height gauges. Some equipment used in the manufacture of these tools is also in the collection including an SIP linear dividing engine, used by James Chesterman. Many innovative products have been collected including a Moore and Wright Braille micrometer and a Braille caliper gauge which was a joint venture between Moore and Wright and James Chesterman.

For example, height gauges, designed by Tom Bailey of James Chesterman, have specially sectioned columns that can measure heights up to 48 inches to an accuracy of one thousandth of an inch without any appreciable deflection taking place.

Saws

By the late 19th century most saws were made in Sheffield. Many were made for woodworking but the variety was incredible - and



Sheffield toolmakers worked in wood as well as metal. My Imperial two foot folding carpenter's rule is beautifully made. Here is a part of a large boxwood gauge.



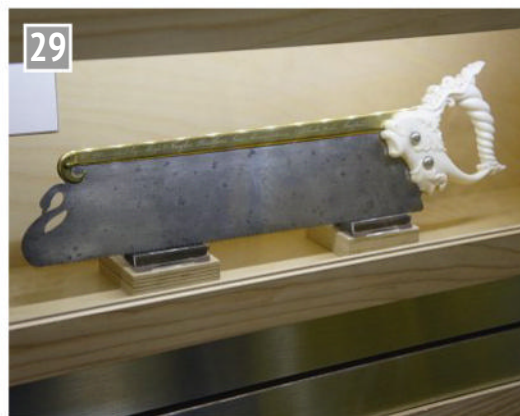
Filemaking was the Sheffield specialism. A museum video shows Ken Hawley demonstrating the use of a similar hammer in cutting file teeth. File cutting machines started to be used from around 1850.

enthusiastically pointed out by museum volunteers. They included artillery flexible saws, intended to be stored in a gun limber box for use when trees needed trimming or cut down, amputation saws and the so called 'Turkish' saws, intended to cut on the pull stroke.

A highlight of the collection is the Royal saw made by Taylors as a present for the wedding of Princess Victoria and Prince Frederick of Prussia in 1858. With a carved ivory handle, etched blade and a swan end it is a masterpiece of saw making that was never used. Of course, Taylors had an ulterior motive - to show off their products (photo 29).

File making

Files were once a Sheffield specialty and were hand cut. A fascinating film in the collection shows Ken Hawley demonstrating how filemakers used a specially shaped hammer and a triangular blade hammered into an annealed bar to cut the teeth. A good



The Royal saw was never intended to be used but it is a fine example of the quality Sheffield could produce, and good advertising for the manufacturers.



To show off their skills file makers made pictorial files like this one. Another depicts Chatsworth House!

file maker would work at about 80 blows per minute. The file would then be hardened (photo 30).

File makers rested the work on a lead block but as they worked this threw off small fragments of lead so causing lead poisoning among filemakers - one of many occupational hazards in Sheffield industries.

Although Leonardo da Vinci designed a file making machine it was never made. Instead file making machines were introduced from the mid-19th century but special purpose files were still hand made in Sheffield until the 1960s. Makers liked to show off their wares, some cutting pictures into files (photo 31). One displayed boasts a picture of Chatsworth!

Disposables

Most Sheffield tools were made to last. Some of us still cherish Sheffield made carpentry and engineering tools. However, Sheffield also made disposable

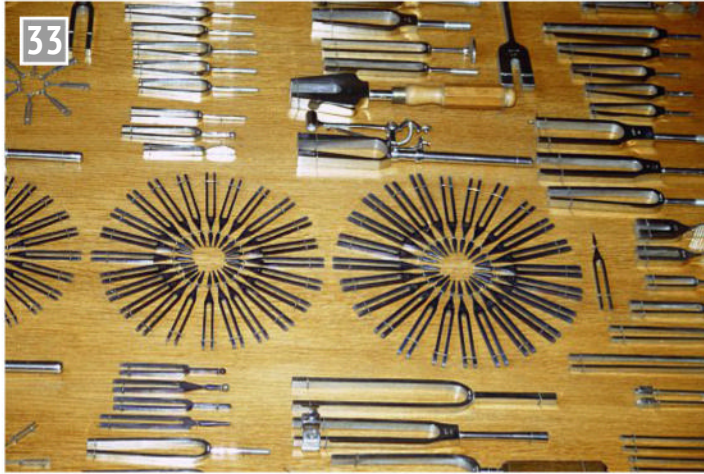


Sheffield also made disposable tools. Who could now believe that the city could produce all these brands of razor blade?

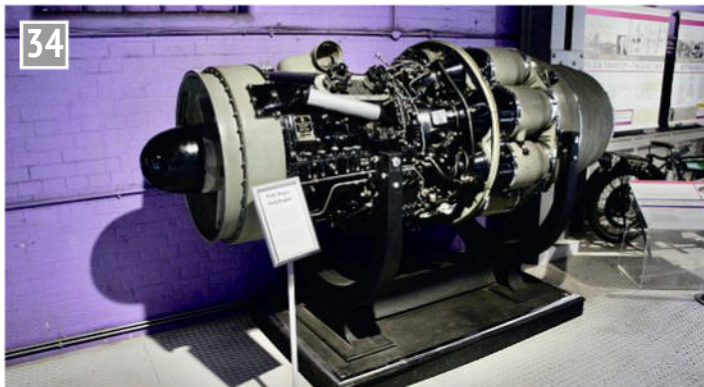
items like razor blades, which are well shown in a display of razor blade packs. Who could believe that such a variety once existed (photo 32)?

Tuning forks

No piano tuner would be without a tuning fork. Here are some example of those



Requiring high precision, these tuning forks were made in Sheffield. Every piano tuner would have at least one.



The Rolls-Royce Avon jet engine was the first axial flow jet engine made by the company and used Sheffield made special steels. Introduced in 1950, versions remained in production until 1974.



Fowler traction engine made in Leeds.

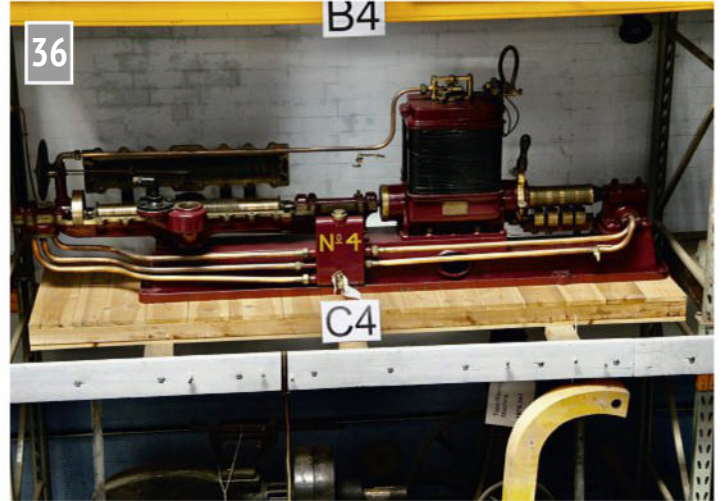
produced in Sheffield, another indication of the vast range of tools made in the city, all requiring precision making (photo 33).

Charlesworth transport gallery

Since my first visit the museum has opened a transport gallery with such vehicles as a stagecoach, Sheffield made

cars, a Rolls Royce Avon jet engine (photo 34) and motorcycles. There is a Fowler traction engine, made in Leeds, viewed from the gallery, along with items in the museum's stores (photo 35). As with most museums, what lies behind the scenes is as important as the objects displayed.

The first steam turbine electricity generator was made



An early Parsons steam turbine generator built in 1885. First used on the SS Earl Percy to generate electricity for lighting, it ran at up to 10,000rpm and produced about 2kW.



The Richardson light car was the nearest Sheffield came to automobile mass production. This example was made in 1921; it lacked frills like front wheel brakes and instruments but it was comparatively cheap and popular with drivers.



The London car maker of Brotherhood-Crocker was persuaded to move to Sheffield where they made the Simplex car, a quality vehicle of which only three examples survive. Here seen admired by members of York's Model Engineers.

by Charles Parsons in 1884 and the museum has an early example made by Clarke, Chapman Parsons and Co. in 1885. It was installed on the SS Earl Percy for onboard lighting. This generated 2kW

and ran at up to 10,000 rpm. After decommissioning it was sold to a Sheffield generating company and then donated to Sheffield University. They in turn donated it to Abbeydale Industrial Hamlet where it was



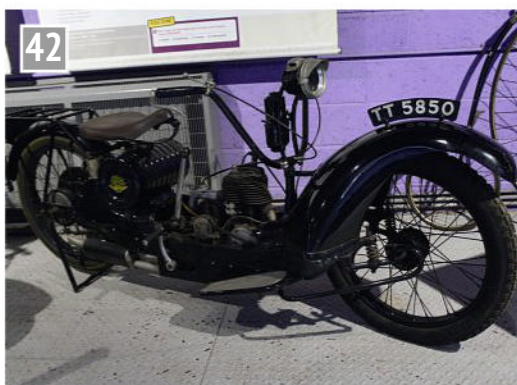
39 Simplex engine with six cylinders and 7778 cc capacity. It made 50hp. This was an expensive car for 1910. This model was built for a wealthy Australian.



40 An oddity of the Simplex was that a driver moved his foot from side to side to accelerate.



41 Charron-Laycock car - a light car resulting from partnership between the French company Charron and a Sheffield engineering company.



42 The 'Flying Mudguard'. This Ner-a-Car motorcycle was made under licence by Simplex in Tinsley in 1921.

restored at English Electric by AEI apprentices. From there it came to Kelham Island, a remarkable survivor (**photo 36**).

The Richardson light car was the nearest Sheffield came to mass production. It was built with no frills, lacking instruments and front brakes. Instead of a gearbox it had friction drive 'guaranteed for 3000 miles'. The museum example was made in 1921 (**photo 37**).

Another upstairs gallery with the Simplex and Charron-Laycock cars can be opened by arrangement. Proof that Sheffield once had a flourishing car industry, though it never reached the stage of mass production, the Simplex resulted from an initiative by the 7th Earl Fitzwilliam who persuaded the London based company of Brotherhood-Crocker to move to Sheffield (**photo 38**). They made around 1500 Simplex cars from 1907 to 1922 in a Tinsley factory. Only three examples survive (**photo 39**). Considered excellent cars for the time they had an unusual feature - instead of pressing the accelerator to

go faster the accelerator moved from side to side (**photo 40**).

The Charron-Laycock was a quality light car. The museum example is a two-seater from 1922 resulting from a partnership between the Sheffield manufacturer W.S. Laycock and the French car maker Charron (**photo 41**).

Sheffield manufacturers built motorcycles too. The Wilkin motorcycle was assembled from bought in components rather like the similar Sheffield-Henderson. However, the Ner-a-Car designed by the American Carl A. Neracher was made under licence at their Tinsley works by Simplex (**photo 42**). The museum example was built in 1921 but production soon moved to Kingston-upon-Thames in 1922. Affectionately nicknamed the 'Flying Mudguard' it was quite popular at one time.

Conclusion

Kelham Island is one of the best industrial museums in the UK and well worth visiting. Allow at least three hours for a visit, and longer if you can.

Why not take a group from your model engineering society? As much of the Ken Hawley collection is behind the scenes a guided tour may be possible that can cater for particular interests.

Thanks to Museum staff, and to Nick Duggan, Mike Pilkington and Keith Crawshaw of the Ken Hawley Trust for their help with this article and the tour.

Kelham Island Museum

Open Tuesday to Saturday 10-5. Sundays 11-4.

Admission FREE.

Lifts to all floors.

Cafe and bar on site and other catering nearby.

Website for Sheffield

Museums: www.sheffieldmuseums.org.uk

0114 278 2600

Website for Ken Hawley Trust:

www.hawleytoolcollection.com

Collection and research

0114 201 0770

Education and loan box

collections 0114 201 0613

Travel to Kelham Island

Address: Alma Street, Sheffield, S3 8RY

Sheffield Supertrams are FREE to holders of the English Freedom Pass. The nearest stop is Shalesmoor, then a ten-minute walk to the museum. Trams stop at the railway station. Take the blue route tram via the city centre (headed 'Malin Bridge').

Parking nearby and disabled parking close to the museum. Roads to the museum are in the city low emission zone though at the time of writing this does not affect passenger cars.

Other places of engineering interest in the area

Cementation furnace

Doncaster Street near the Shalesmoor tram stop. A key is available from Kelham Island Museum.

Weston Park Museum

Near the University of Sheffield Supertram stop. Tells the story of Sheffield and its people.

Abbeydale Industrial hamlet

Abbeydale Road South, Sheffield, S7 2QW
Thursday to Saturday 10-5,
Sunday 11-4 (winter hours may be different).

Once a centre for scythe making, a largely unchanged place with a tilt hammer, grinder's workshop and displays of crucible steel making. It also has 'Little Mesters' workshops.

Shepherd Wheel

Water powered grinder's workshop.
Open weekends only 10-4
Shepherd Wheel Workshop,
Whiteley Woods, Off
Hangingwater Road, Sheffield,
S11 2YE

Cutlers Hall

Address: Church Street,
Sheffield, S1 1HG
Archives and collection open by arrangement.
Email: admin@cutlers-hallamshire.org.uk
Tel: +44 (0) 114 272 8456

A New Workshop

PART 4

Peter Seymour-Howell

builds a new workshop before continuing work on *Flying Scotsman*



Continued from p.275
M.E.4723 August 11



Carcass for the drawers.



Fitting the first drawer.

Now this might seem a bit out of step and perhaps it is but sometimes one has to work around things the best that one can. For me, this means trying to build a workshop that is already full of everything from the old. I am basically building in three stages - new extension, rear, and front of the original garage

- this is so that I can clear the area being worked on without having to move stuff out of the building into the elements. Therefore, I have decided to build some of the drawers so that I can empty some of the old units brought with me which can then be scrapped to give me more room - at least that's what I'm trying to accomplish.

To begin with I'll tackle making some drawers using parts that my youngest son saved when his work moved from their old location to a new one. I gained some nice goodies during this time for which I'm most grateful. First up is a set of shallow drawers for tooling etc. These are heavy-duty items so perfect for the job. I began by making a wooden carcass from $\frac{3}{4}$ inch plywood and this will also act as the end support for this end of the bench.

Photograph 26 shows the carcass. Note that I removed some material from the top sides of the carcass so that I could manoeuvre it under the frame and then screw the frame into it. Note also that the front of the carcass sits out proud of the bench frame, which is so that when the worktop sits on top I will have an overhang which will be useful when clamping anything to the top. **Photograph 27** shows the first drawer in place.

I have fitted five drawers (**photo 28**). I have more but thought they could be used elsewhere and also that having some storage area below these



Five drawers are now fitted.



General view showing where the mill will live.

five drawers would come in handy once I have decided on what goes where. You will also see that I also have added two wooden drawers to the right and left enough knee space below for sitting underneath. These drawers were part of a chest that had been left by the previous owner in the garage with a few tools in it. I didn't want to keep the drawers as

they were but have made use of the two smaller drawers by cutting them off the chest and then screwing the resulting unit to the bottom of the frame. This has worked out very well and gives me two useful deep drawers - I'll work out what to put in those later.

Here are some further developments (**photo 29**). I now have the mill roughly

where it's going to live - it will be slightly to the left of where it is now but I can't do this until I have levelled the floor in that area.

In the past the mill has never had an oil tray but I have rectified this by adding a cheap oil drip tray which is large enough for the job in hand (**photo 30**). This is a much cheaper alternative to

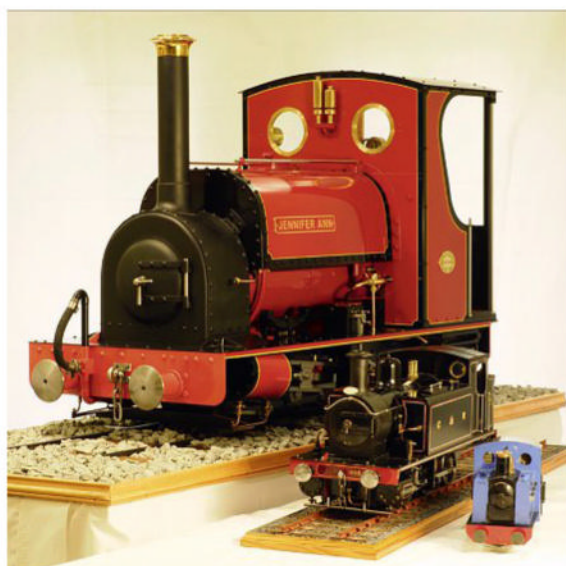


Brand new drip tray for the mill.

a purpose-made tray. I have placed the tray alongside the mill and once the boys are over I'll ask them to lift the mill for me to place the tray underneath and drill through.

●To be continued.

NEXT ISSUE



Content may be subject to change.

Elephants

Steve Goodbody completes his feast of elephants by describing the moment his narrow-gauge locomotive *Jennifer Ann* (née *Elidir*) sprang into life.

Wigan

John Arrowsmith finds himself in Lancashire and drops in on the Wigan Society's woodland track.

Valve Gear

Duncan Webster moves on from Joy's gear to describe two less well-known gears – Chas. Brown's and Heywood's.

LNER B1

Doug Hewson describes the various smokeboxes found on the LNER B1 locomotives.

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.

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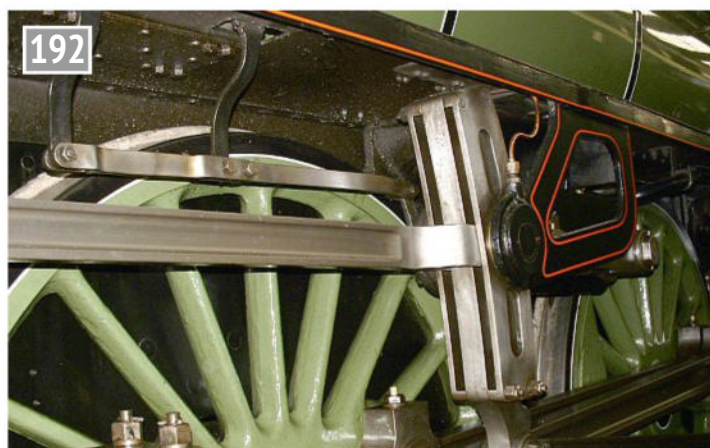
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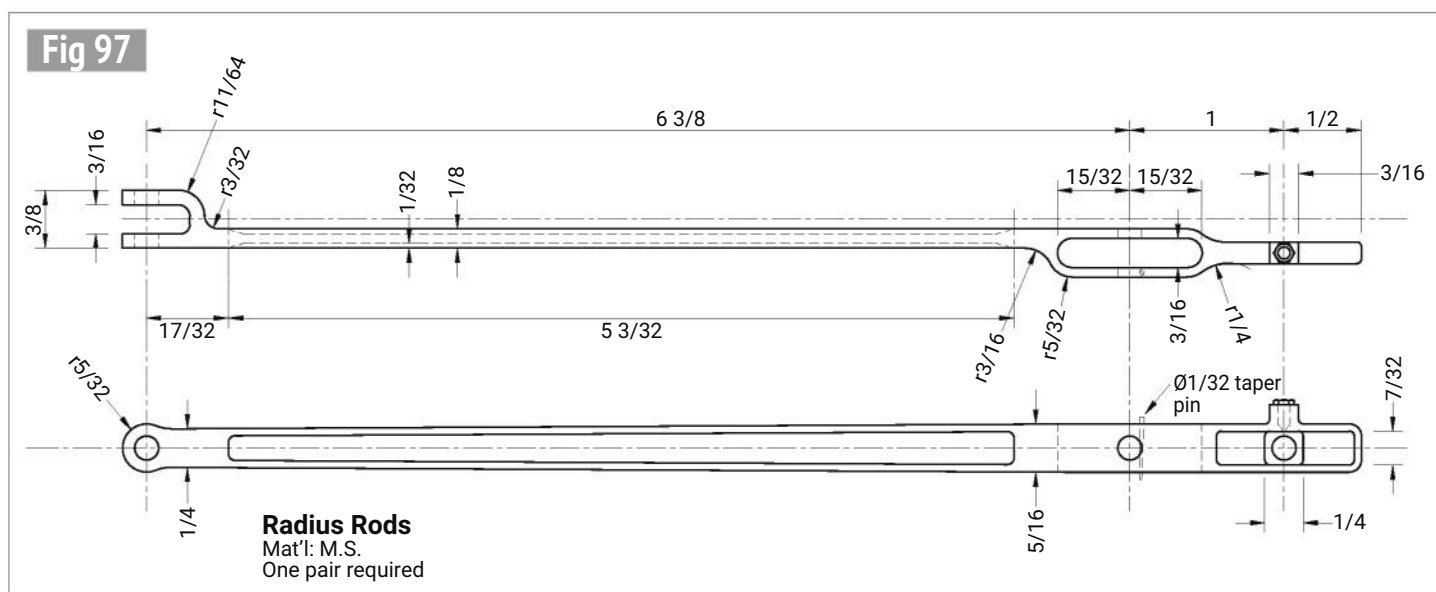
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Expansion link.



Expansion link and radius rod fork.



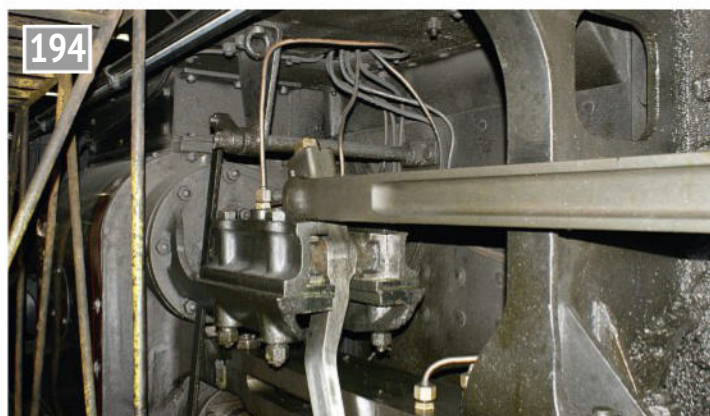
Radius rod.

first place. You will probably need several hands for this job anyway.

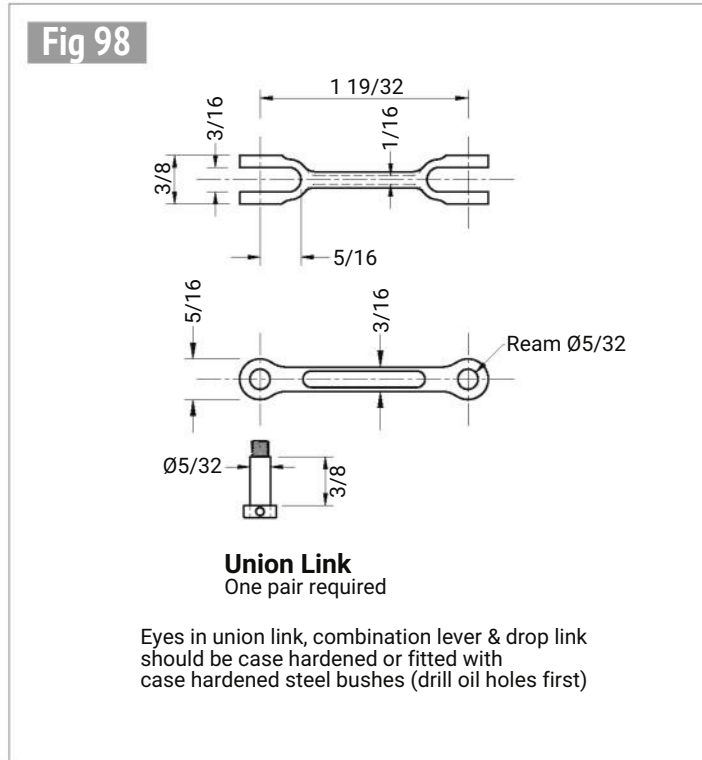
You will need a piece of 5/8 x 7/16 inch BMS about 8 1/2 inches long to comfortably fit round a radius rod (fig 97, photo 194 and photo 193). I think it would be an advantage to drill all of the holes for the combination lever, the expansion link and the die

block in the end first of all. This way you can then machine the profile of the rod but you will probably need to use some backing material to give it some lateral support unless you take very fine cuts. I would prefer to have it properly supported whilst milling is going on.

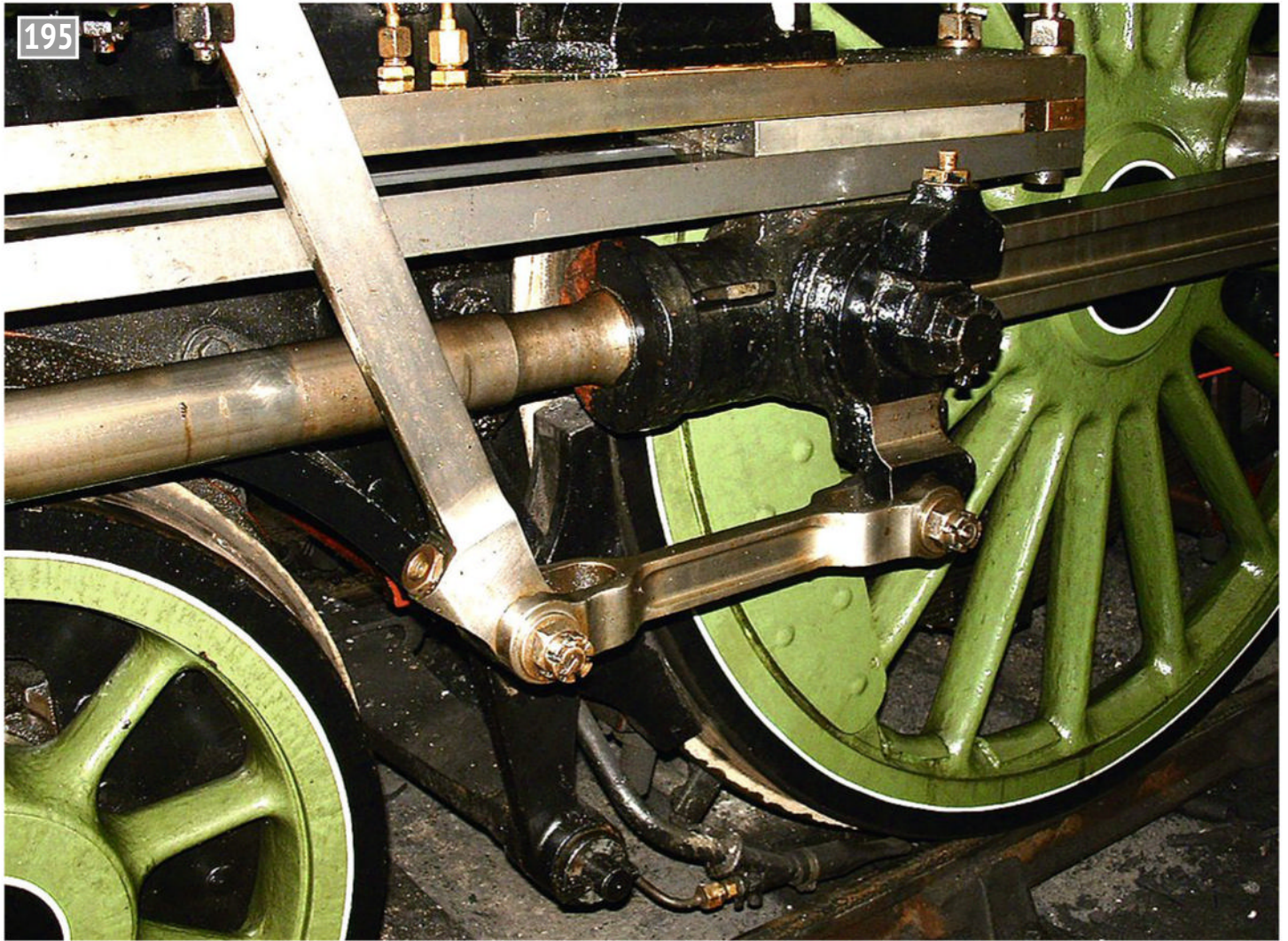
If you make the two union links (fig 98) next you will be



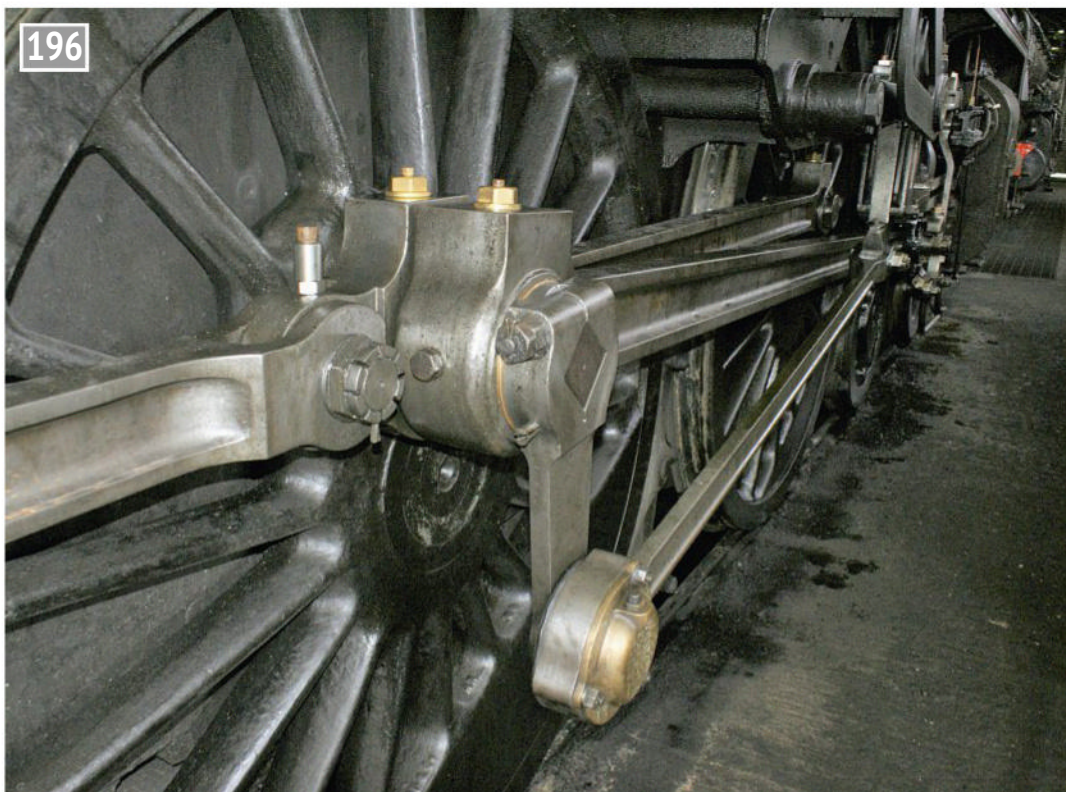
Radius rod and combination lever.



Union link.

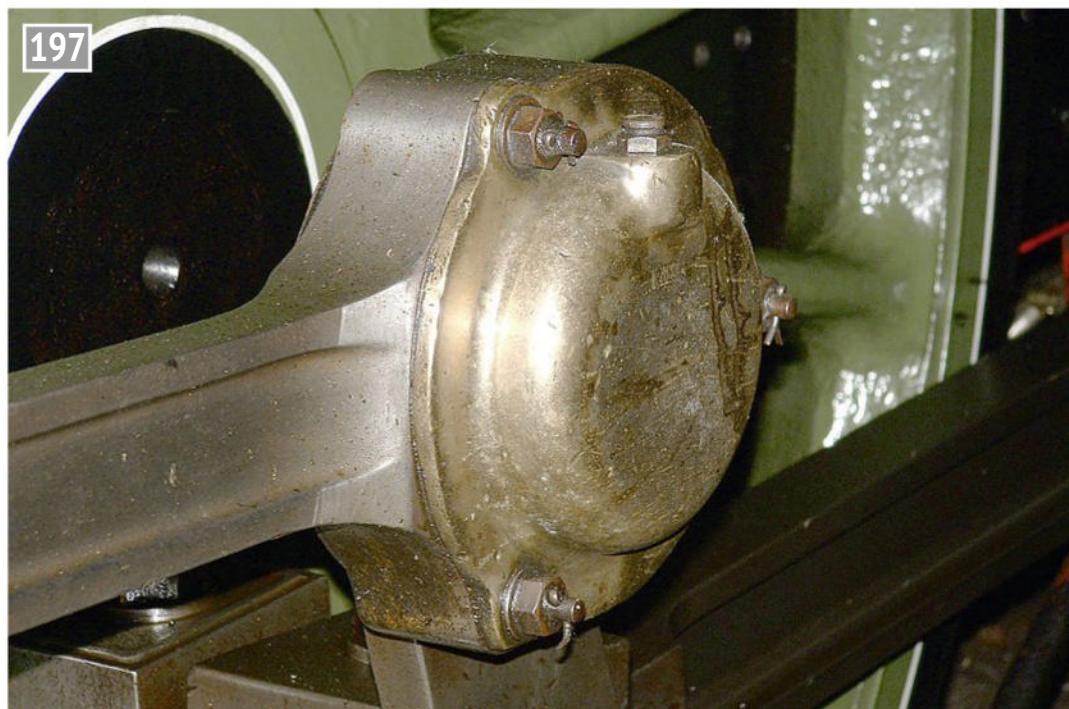


Union link (photo by John Thompson).



Return crank and eccentric rod.

well on the way to finishing off the valve gear. If you follow my drawing and **photo 195** you will see that it is quite an intricate design with all the curves and stops in it but well worth making like that, certainly if you wish to put your engine in any competition. You will also have to make the weighshaft and the arms which adorn it too. Once again this is a question of following the photographs and the drawing. The basis is an 8 $\frac{5}{8}$ inch length of 5/16 BMS bar with a $\frac{1}{4}$ x 40 x $\frac{1}{8}$ inch long thread on each end. There are three arms which need making and silver soldering on and also the vacuum operated brake band to make a good job of it. This was described in part 16 of this series (M.E.4713, March 24). **Photographs 196 and 197** are as good a view as I have of the eccentric rod (**fig 99**) but you can't make this until you finish the rest of the valve



Return crank cap.

gear and the weighshaft (**fig 100**). You will not be able to set the valves and determine the length of the eccentric rod, which may be slightly different on each side of the engine depending upon how accurate your work is.

To set the valves you need to clamp the expansion link so that the radius rod can be moved up and down without affecting the valve spindle. Set the driving wheels on front dead centre then with dividers check the distance from centre of the return crank pin to the centre of the tail on the expansion link. Turn the wheels over to back dead centre and do the same check. They are

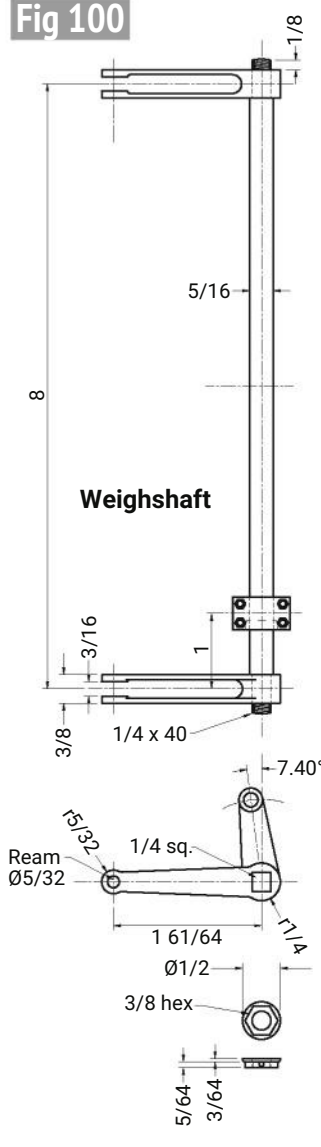
unlikely to be the same so you now need to adjust the return crank by half the error and then check both ways again, and again until they are as equal as you can get.

This is then the correct position for the return crank and the dividers now gives you the exact length required for the eccentric rod. You can now set the valves. If you set the locomotive in mid gear, turn the wheels over slowly and watch the valve. If you have fitted the plugs above the valve bobbins, you should just see the inside edge of the port crack at each end of the stroke. If you can't see the ports, then try it one

notch forward and similarly in reverse. The ports should open equally both ends. If the ports do not crack with the locomotive in mid gear it means that the valve is too short, so a shave needs taking off each of the insides of the bobbins to keep the exhaust port in the valve dead in the middle. When you turn the wheels and can see a crack at each end then both the gear and the valves are set correctly and the locomotive will start easily. This is standard practice for any locomotive with Walschaert's valve gear with piston valves.

●To be continued.

Fig 100

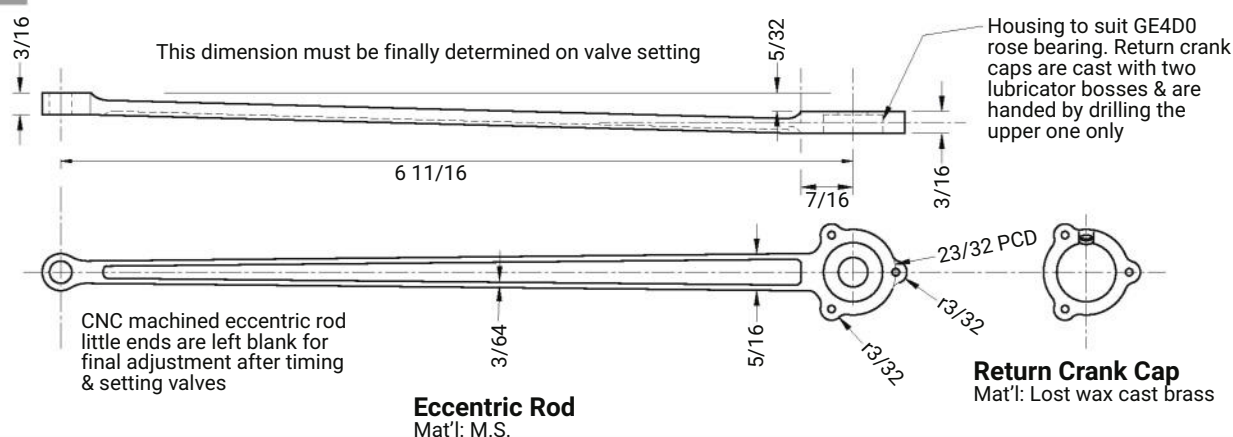


Weighshaft.

NEXT TIME

We deal with the smokebox.

Fig 99



Eccentric rod.

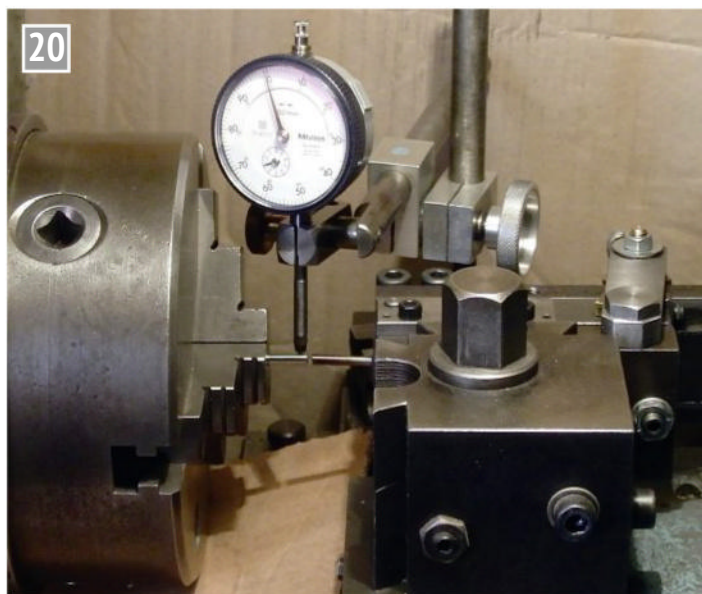
Slotting on the *Lathe*

PART 5

Jacques Maurel
makes a
slotting tool for his lathe.



Continued from p.139,
M.E.4721, July 14



A tool height setting method.

Slotting polygon holes

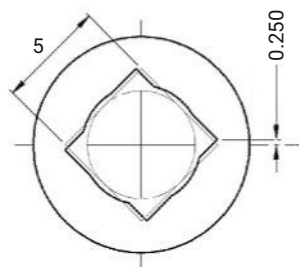
We have four problems to solve:

- 1 - tool height adjustment
- 2 - which roughing diameter
- 3 - which depth of cut to give
- 4 - work holding and indexing

1 - Tool height adjustment

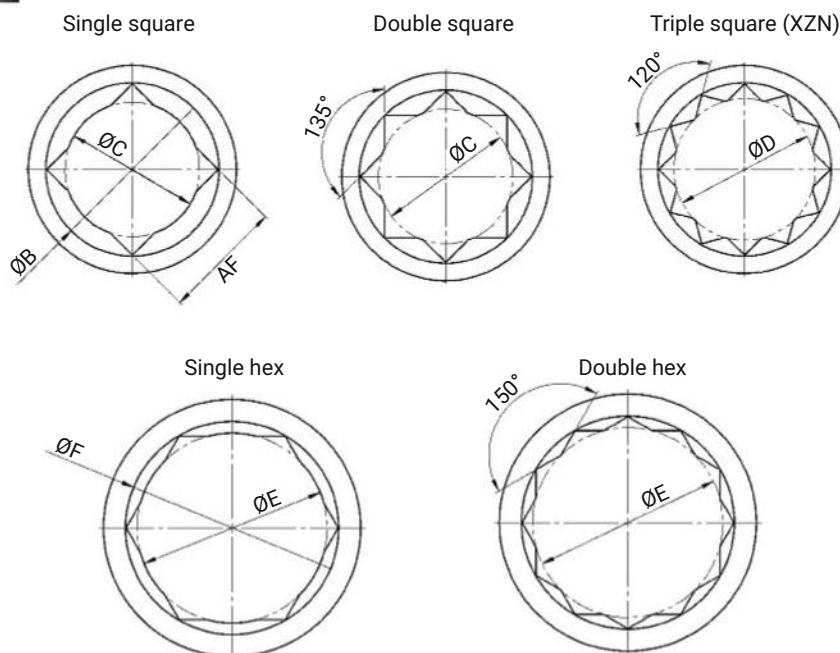
This is necessary (especially for the smaller dimensions) as the cutting edge must be in a horizontal plane cutting the spindle axis. See **fig 42**, which shows a slotted 5mm AF square, and the effect of the

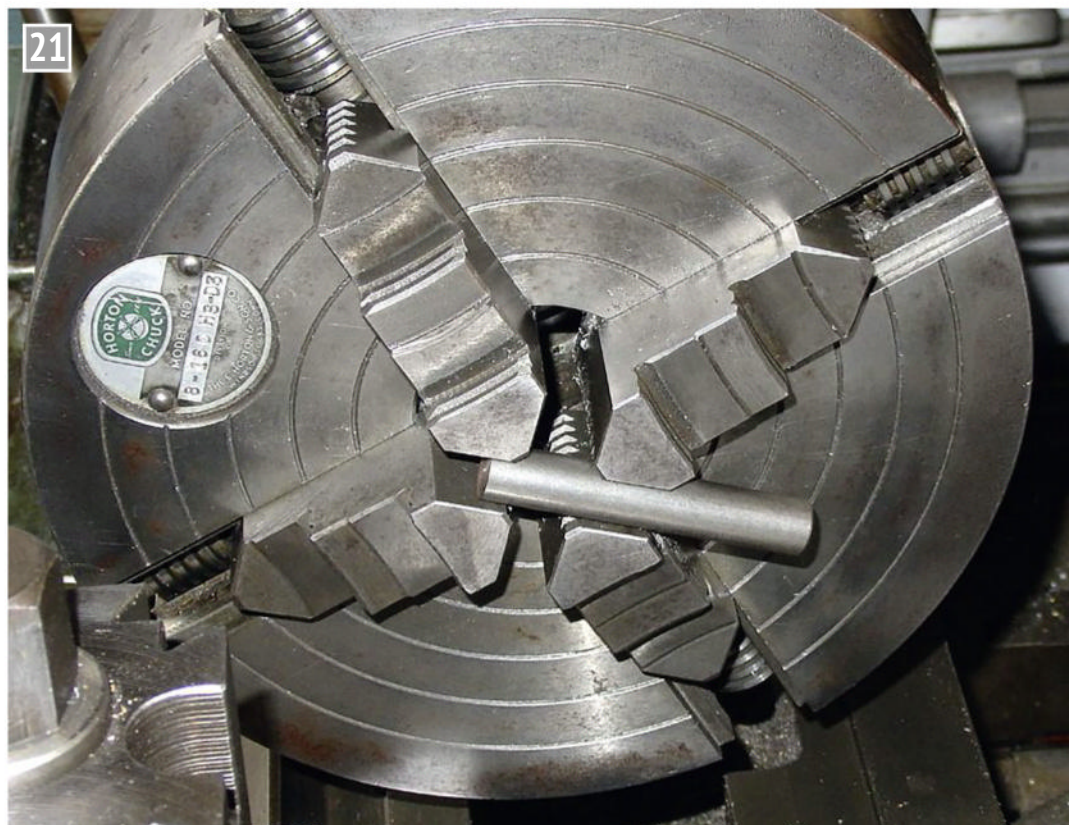
Fig 42



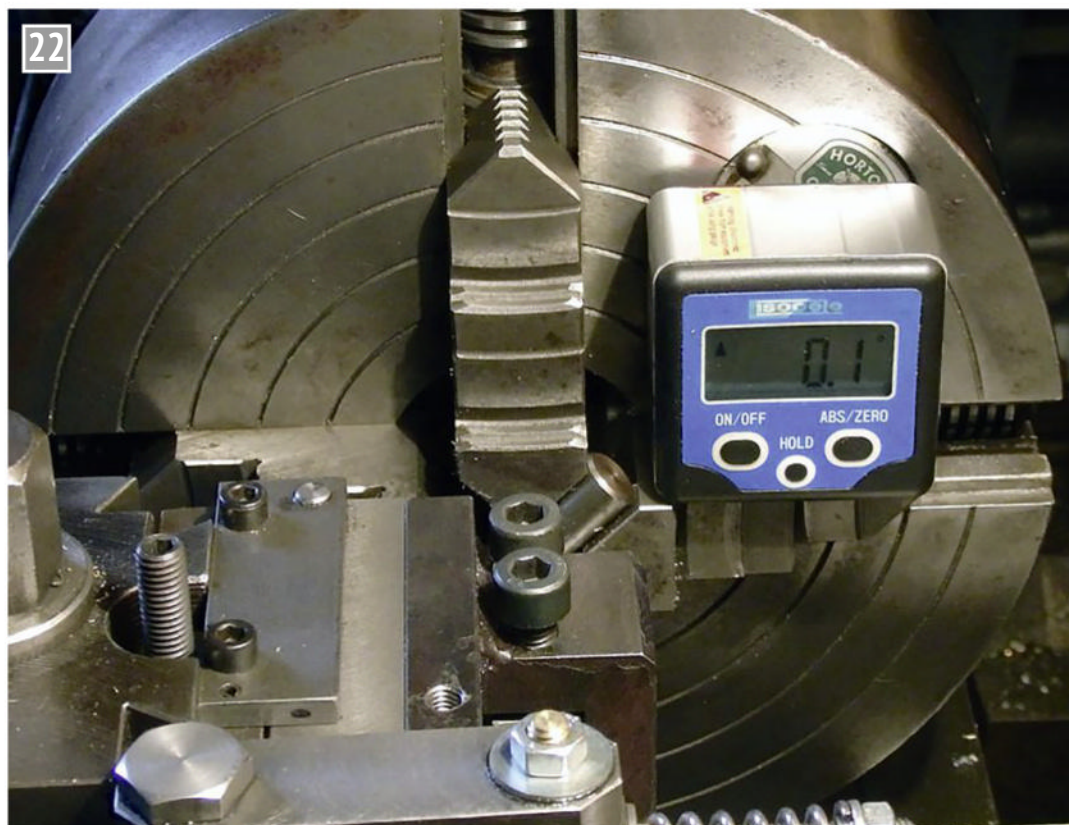
tool having a 0.25mm offset. The intended square is shown by the grey lines. See **photo 20** for a tool height setting method – in this example we are cutting a 5mm square hole with a 4mm diameter slotting tool (already described). A DTI set on a bracket able to slide on the cross slide is used to compare the tool highest edge height with a 4mm pin set in the three jaw chuck. Check first the pin run out and set the highest point in a horizontal

Fig 43





Holding a bar for slotting a square hole.



Dividing using an angle gauge.

plane for the best accuracy. Of course, the vertical distance between the cutting edge and the tool highest edge must be known. Good symmetry must be achieved on the tools when

sharpening, as stated before (the Di dimensions shown on fig 40 (Part 4, M.E.4721, July 14) must be identical and the Dt dimension taken into account).

2 - Roughing diameter

Use the same diameter as for rotary broaching (fig 43), as below.

Single square and double square

Diameter C = $1.1 \times AF$ (AF = across flats).

As stated on the Slater website, the smallest geometrical value would be $1.077 \times AF$ for a double square with sharp internal edges.

Triple square (XZN)

Diameter D = $1.158 \times AF$, measured on XZN wrench tips. The smallest geometrical value would be $1.143 \times AF$ for a triple square with sharp internal edges.

Single and double hex

Diameter E = $1.035 \times AF$. This is the geometrical value for a double hex with sharp internal edges and is the one given by Slater.

3 - Depth of cut

For a square hole

Rough out two successive edges and take a measure across flats, calculate the difference from the finished dimension and multiply this difference by 1.414 to calculate the depth of cut necessary for finishing. The theoretical radial depth of cut is $0.15 AF$ (for $1.1 AF$ roughing diameter).

For a hex hole

Rough out three successive edges and take a measure across flats, then calculate the difference from the finished dimension and multiply that by 1.154 to calculate the depth of cut necessary for finishing. The theoretical radial depth of cut is $0.0625 AF$ (for $1.035 AF$ roughing diameter).

4 - Work holding and indexing

Consider the example of slotting a square hole in a boring bar.

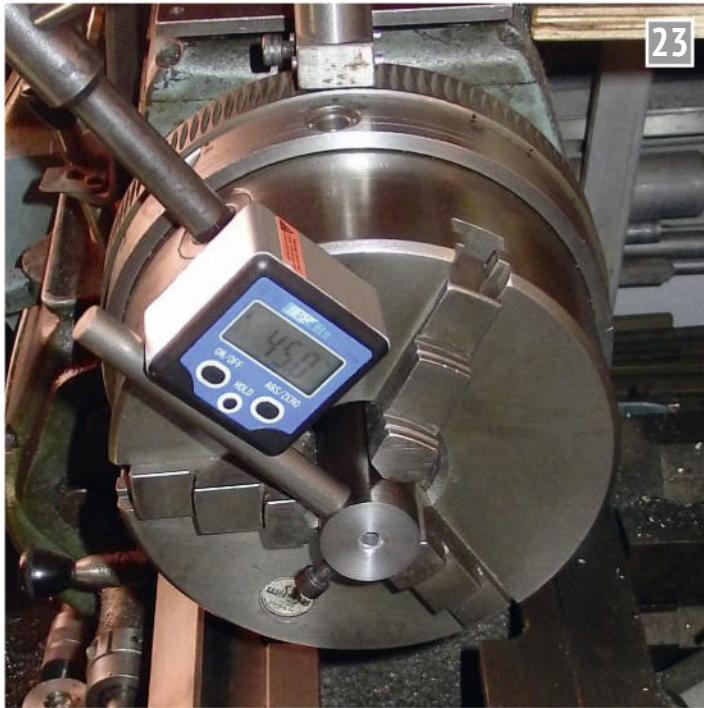
A 5mm square hole is machined in a 12mm diameter bar.

Using a four jaw chuck

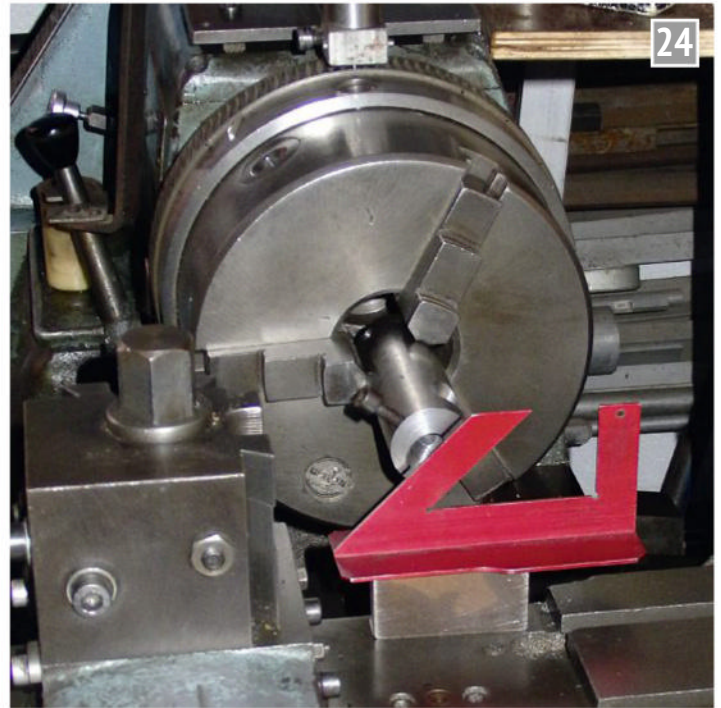
See **photo 21** for the holding method and **photo 22** for dividing with an angle gauge. No jig is necessary but some means of locking the chuck must be used and the tool height adjustment must be made previously with a three jaw chuck.

Using a three jaw chuck

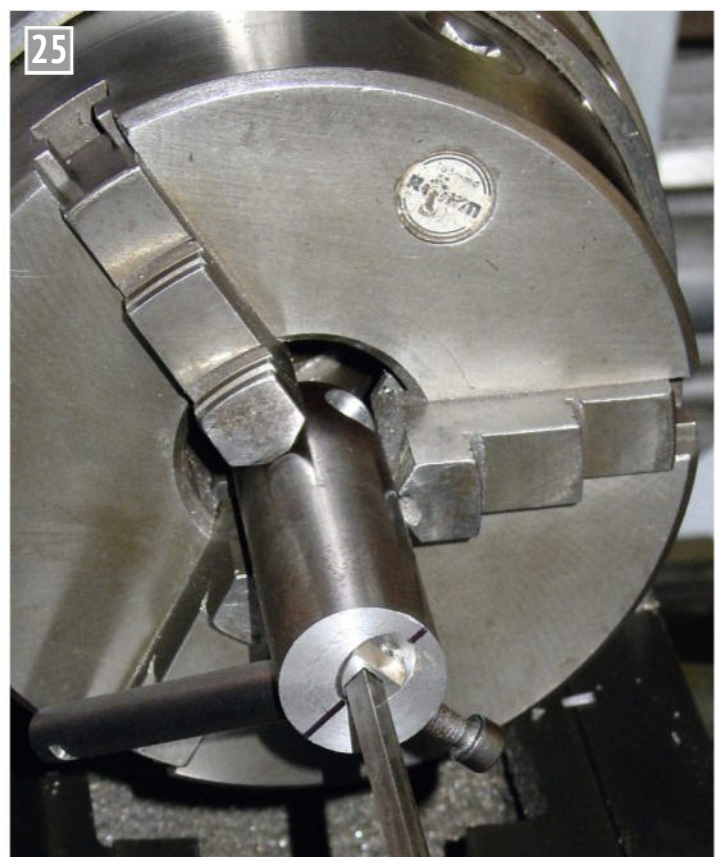
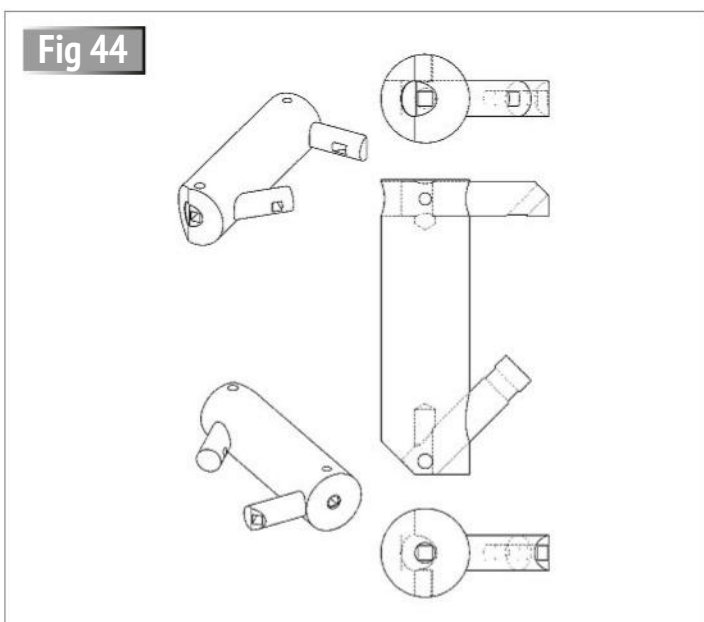
The lathe spindle must be equipped for dividing (ideally



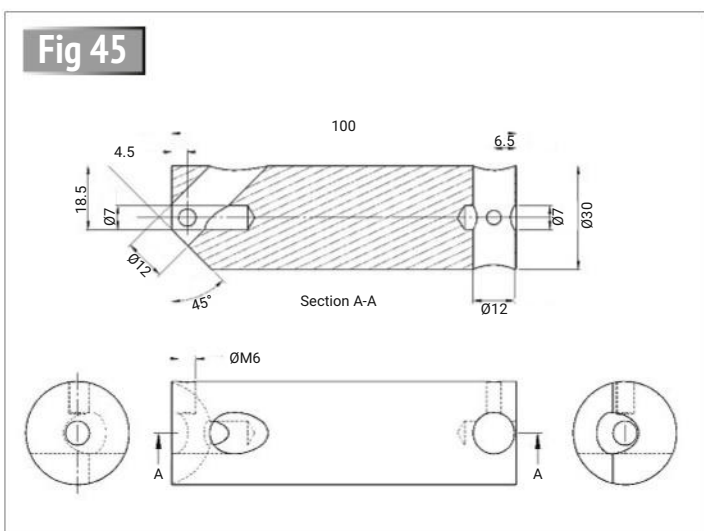
Using an angle gauge in a three-jaw chuck for dividing.



Setting up for a 45 degree slot.



Checking the finished 45 degree slot.



for 12 positions) - see **photo 23** and **figs 44** and **45** for the jig definition.

There is no problem for slotting a hole perpendicular to the bar - the starting position is set with an angle gauge as seen on photo 23. Slotting a hole set at 45

degrees to the bar axis is more complex. **Photograph 24** shows the angle setting for the starting position and **photo 25** shows the machined hole being checked with a 5mm square rod.

The Eating of Elephants

PART 21 – A ROSE, BY ANY OTHER NAME

Steve Goodbody finds some things are best tackled in small helpings



Continued from p.268
M.E.4723 August 11

The year is 2019 and, with *Elidir's* valves and fittings finished, her injectors tested and miraculously working, and two vacuum gauges stuffed into a single housing to become one, we descend upon the author's workshop once again to find him connecting everything together with length upon length of increasingly un-straight copper tube.

The lost art of tubulating

Isn't copper wonderful stuff? Alright, I know it costs a king's ransom these days and it can be a pig to drill and machine but, to this day, and despite knowing what's going on inside to make it happen, I am still secretly astonished when, after simply heating it with a blowtorch and quenching it in water, a stiff and unyielding length of copper is suddenly as flexible as a pipe cleaner. Simply put, it's the closest thing I know to real magic.

And, to me, piping-up the engine with copper tube is one of the greatest joys because (a) you know you're nearing the end of the project, (b) it's an intriguing three-dimensional puzzle to get it all in and be left with a neat-looking job at the end and (c) when everything is done, a quick polish and that grotty-looking tarnished surface instantly sparkles. I ask you, what's not to like?

Well, there is one thing that comes to mind and that's the vocabulary.

Did you notice? 'Piping-up the engine with copper tube...' - what a wholly mismatched and inelegant phrase! It's not 'pipe', it's 'tube', but thanks to our language conventions the more sensible 'tubing-up the engine with copper tube' just sounds silly.

Furthermore, were I to describe the physical form of

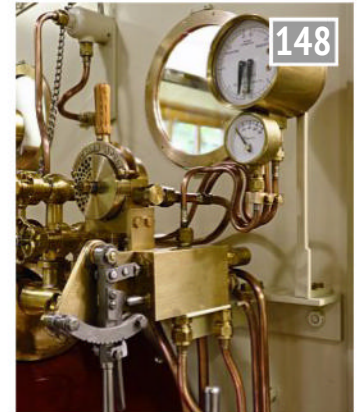


And on the backhead, nearest the camera, the left-hand injector check valve and the handpump check valve below, the water gauge blowdowns behind, and the right-hand injector check valve, a mirror-image of its left-handed cousin, is hidden on the other side.

the tube, I would probably use the word *tubular*, wouldn't I? So why not use the word *pipular* to describe the form of a pipe?

In short, if 'piping-up the engine with tubular tube' is a rational if somewhat redundant phrase, then 'tubing-up the engine with pipular pipe' should be equally acceptable. And when I run the world, it will be - mark my words!

However, on the basis that I may not come to dominate the globe any time soon, perhaps it's better to take smaller steps and simply invent a new word to describe the act of bending



Taken during final assembly with the right-hand cab side removed, the complexity of the steam and vacuum brake system's tubing is apparent.

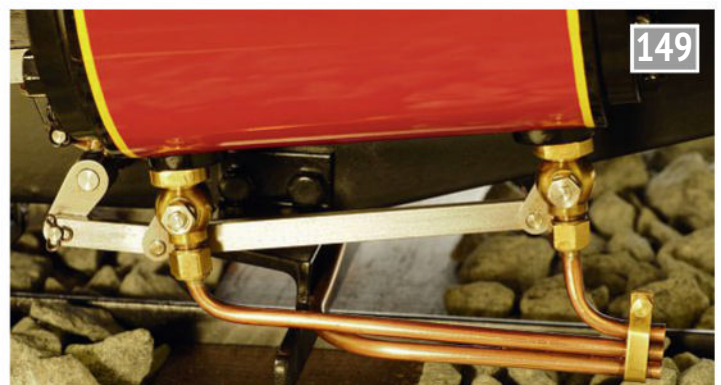
and assembling tubes. *Tubuling* perhaps? Or *tuburizing*?

But believe it or not, I don't have to invent a new word because one already exists, seemingly lost and unloved in both American and British English, and that is the truly wonderful verb *tubulate*, and its equally adorable derivative nouns *tubulation* and *tubulator*.

And therefore, literary Reader, let me inform you that I, as *Elidir's* tubulator, enjoyed the tubulating, although she took fully four months of part-time tubulating to tubulate as you presumably expected given my past performance, and I'll let you judge whether her tubulation is up to snuff (photos 146, 147, 148 and 149).



The tubulated valves and fittings, from left to right, are: injector valve, vacuum ejector steam valve, boiler pressure gauge, safety valves, whistle valve (above the top of the picture), steam chest pressure gauge, steam brake isolation valve, injector steam valve, blower valve, vacuum brake control valve, steam brake control valve, steam brake cylinder pressure gauge, and duplex vacuum gauge.



The right-hand cylinder's drain cock tubing. The bottom tube originates from the steam-chest drain cock.

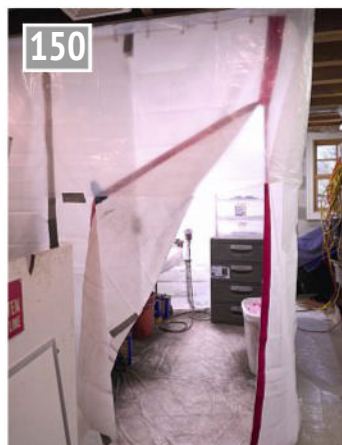
Painting, round 2

By the end of October 2019 *Elidir* was finished, at least to the point where the products of the previous nine years of labour could be readied for their protective coats of paint, the last part of the job. And so, just as in 2010, I began painstakingly removing and disassembling each component, taking several hundred pictures along the way as an *aide memoire* for when the time came for reassembly, and carefully bagged and labelled each and every one.

Then, having thoroughly cleaned the floors and ceiling and everything else in the vicinity, and after unearthing the storage boxes containing the spray gun and other painting paraphernalia, untouched for nearly a decade, the centre of the workshop was transformed into a painting booth once again (photo 150).

And, just like before, after reading *How (not) to Paint a Locomotive* several more times to refresh my memory, and then consulting my earlier notes to remind me of the specific nuances and needs of the paints and equipment which I would again be using, in late January of 2020 the long task began for the second time.

Very soon a pattern emerged, and, each weekend, as time allowed, I selected a new group of components, usually between six and thirty in total depending upon their size and complexity, all destined to end up the same colour. Then, having



Come into my parlour! The shower-curtained painting booth assembled in the middle of the author's workshop.

previously wrapped, boxed and removed the prior week's batch of finished items for safe keeping, the new batch was thoroughly cleaned, degreased, and transferred into the painting booth to be masked, mounted, and given two thin coats of self-etching primer.

Each evening thereafter, having allowed nearly twenty-four hours for the previous coat to dry, I would head to the basement after work, donning head sock, hooded painter's overalls, breathing protection and goggles on the way, turn on the extraction fans, unzip the entrance to the booth, and, after rubbing down the previous evening's effort, spray the next coat. And, with four or five coats of enamel to be applied in total, this would continue until the following weekend when that week's batch would be carefully wrapped and placed into storage, at which point the entire process would repeat for a new selection of items.

And this daily production-line, I am sorry to say, was only possible because, two days after spraying the first coat of paint onto the first batch of components, that most hated intruder of our age, Covid-19, entered our lives and confined us to our homes. And that, despite relieving me of a two-hour evening commute and expediting *Elidir's* painting as a result, was not something I would ever have wished to happen.

Turn! Turn! Turn!

One of my better decisions, it transpires, was to choose bog-standard, off-the-shelf, Rustoleum paints for *Elidir*, and if you, incredulous Reader, are of North American origin and are reading these words over breakfast then please accept my apologies because I bet you've just choked on your morning coffee.

For those culturally and contextually unfamiliar with the name, let me explain that Rustoleum, seemingly available in every hardware store in North America whether big or small, major or minor, is ubiquitous and any sheepdog

with an old English accent, inexplicably finding itself in New Jersey and unable to locate its favourite brand, would undoubtedly select it as the logical alternative.

But despite its omnipresence, Rustoleum is not the model engineer's typical choice and, whenever I'm asked about her paintwork, the questioner, on hearing the answer and laughing at the presumed joke, usually follows up with: "No really, what did you *actually* paint it with?". American model engineers would, I believe, be less surprised were they to discover that *Elidir* was painted with ketchup.

Now, in defence of the disbelievers, oil-based enamel paints are certainly not the easiest to apply, and Rustoleum is no exception. If brushed, unsightly streaks will probably result, and if sprayed it must be well thinned, further increasing its already lengthy drying time and magnifying its propensity for sags, runs and the gathering of innumerable dust specks. In short, it takes a lot of care, practice and patience to get a reliably decent finish with Rustoleum and I suspect that most people simply can't be bothered.

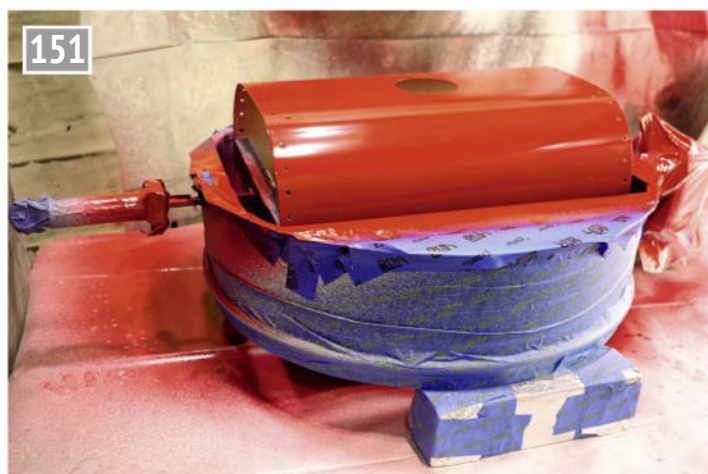
So why am I so glad I chose it? Well, the answer is fourfold but remarkably simple. Firstly, in 2020, and indeed today, I could buy the same paint, in identical colours, as I had in 2010 and with the assurance that the colours would match perfectly - and they did. Secondly, I could obtain those exact same colours in quick-drying spray cans which, while a rattle can finish certainly isn't good enough for larger areas, makes life far simpler when painting screws, brackets, and other small items. Thirdly, the paint could be sourced with ease, even during a pandemic, and, last but by no means least, once fully dry, the paintwork is commendably durable, shrugging off the occasional knock or slipped spanner without a mark, which has certainly been a godsend in the dozen or so years since I painted the chassis and boiler.

But, despite these advantages, the fact remains that it isn't easy to get a decent finish when spraying enamel paints and that's especially true when the surface to be painted is not flat, because runs and sags are very likely on anything other than a horizontal surface. And as I worked my way through batch after weekly batch of components, the time drew near when I would have to face the single-most challenging item on the engine, *Elidir's* curved and unwieldy outer saddle tank and I didn't have a good idea how I was going to do it.

Now, to take a brief step backwards, a decade earlier, in order to paint *Elidir's* curved boiler cleading which presented a similar challenge, I had rigged up a contraption, driven by a cordless drill, which slowly rotated the items while the paint was being applied and while drying, and this had successfully kept the runs and sags at bay. However, while this had worked well at the time, it was a rather Heath-Robinson affair and the rotation speed had been difficult to control and maintain consistently, leading to a few tut-tut moments when the speed either suddenly increased, flinging wet paint in all directions, or ground to a halt causing the paint to sag. And so, while I knew the saddle tank would need to rotate in order to get a good finish, its larger size and more awkward shape would make this an even more challenging proposition.

Furthermore, unlike the boiler, which is mostly hidden on the finished engine, the saddle tank is by far the most visible part of the locomotive, and any mistake or flaw would stand out like a sore thumb. In short, I needed a better and more reliable solution to rotate the outer tank if I was to have any chance of success, and this knowledge became increasingly present in my mind as the remaining quantity of unpainted components reduced.

And so, one Saturday afternoon in late May, having



Inside the booth, the saddle tank's outer wrapper is mounted on the painting rotisserie.

prepared and etch-primed the latest batch of items in readiness for the following week's session, I carefully exited the paint booth, removed my protective overalls and mask, and headed outdoors to light the barbeque for our evening meal. And, with a glass of beer in hand and charcoal smoke wafting gently around, I pulled out my phone and idly flicked through the news headlines, trying hard to ignore the pop-up advertisements vying for my attention.

But advertisers are clever and I'm sure they must know me personally, because on that warm spring Saturday in the late afternoon, knowing I would be standing beside a barbeque, quaffing a drink, mellow and peckish, they clearly realized that, were they to present me with a picture of a succulent and steaming roast chicken, I would be unable to avoid glancing at their advertisement. And, sure enough, they did, and I did, and the bronzed fowl certainly looked good, but I was about to cook our own dinner and wasn't concerned about someone else's, especially when it would undoubtedly cost me money, and so ignored it and continued browsing the news.

A few minutes later however, my subconscious mind began to niggle and fight for attention. 'Take another look at that ad', it seemed to say, 'you've missed something important'. Not one to argue with my inner self, especially in the matter of food,

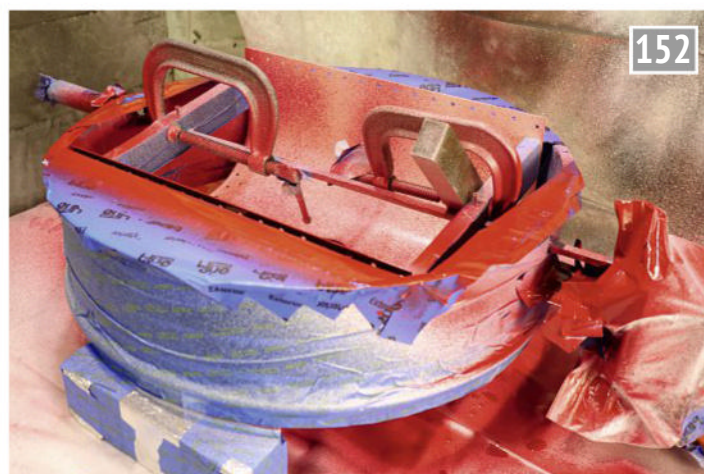
I obediently scrolled back to the advert in question, which surely made the marketer's day, and took another look. Yes, there was the well-tanned bird, looking just as tempting as before, sitting beside a barbeque identical to our own. Looking closer, I realized that, although the barbeque was the same, it had a strange looking contraption sitting on top which ours did not. 'That's interesting' I thought, 'I didn't know you could get one of those for it' and scrolled back to the news once again.

In a corner of my mind, my subconscious checked its watch and waited for the penny to drop.

And, eventually, drop it did. Setting aside my glass, I dashed to the workshop, grabbed a measuring tape, and began checking dimensions. 'Yes', I thought excitedly, 'that just might work!'

Later that evening, with supper finished and dishes washed and put away, Jenny and I sat on the deck, wine glasses in hand, as the sun dipped slowly beneath the horizon. "I've been thinking" I announced, preparing the opening gambit and sensing the time was right. "Why don't we get a rotisserie for the Weber? We all like a good roast, and with a spit it's just as easy to cook two birds as one, so we would have cold chicken for the week which will be useful as we're all at home thanks to the virus."

Jenny was clearly interested



A block of steel and two G-clamps balances the rotating wrapper. Half an inch of clearance lies between the wrapper's corners and the rotisserie housing!



With apologies to any vegetarian or vegan readers, Weber's painting rotisserie, obviously designed primarily for the spraying of Hunslet saddle tank wrappers, can be repurposed to spit-roast a couple of chickens on a charcoal barbeque. Who would've guessed?

but I could see that further incentive was needed and so, after a pause to avoid seeming too keen, I played my trump card. "You know, cooking roasts on the barbeque will also avoid all the mess and washing-up in the kitchen, it'll make life much easier".

Jenny nodded approvingly, and I sensed victory was near. "How much?" she asked, practically.

Raising the glass near my lips, I quickly mumbled the figure.

"How much?" she asked again, not sure she had heard correctly. I repeated the figure.

"Alright, but at that price it'll also be your Father's Day present, so I hope those chickens are darned good",

she responded after a long moment's consideration.

"Don't worry, they will be" I affirmed, silently adding the word *eventually* to the end of the sentence.

And, sure enough, several weeks later, after masking and mounting my Father's Day rotisserie on a couple of well-wrapped wooden blocks to provide clearance underneath, and with the saddle tank wrapper attached and balanced with the aid of a substantial lump of steel and a couple of G-clamps, around it went at a perfect three revolutions per minute, with barely half an inch of clearance to spare at each corner, all ready for the first coat of paint (photos 151, 152 and 153).



Within the painting booth, a floor-standing shelving unit, fully enclosed by yet more shower curtains, protects larger items from dust and damage between coats.



The inner and outer saddle tanks sit side-by-side, ready for assembly.



Two layers of ceramic-fibre boiler insulation are glued to the inner tank to help keep the water cool.



Hidden underneath, heavy-duty aluminium foil provides an additional thermal barrier and helps prevent fibres from shedding.



The cover plates lightly pinch the insulation and aluminium foil, holding everything in place.

The end draws nigh

By mid-September 2020, everything that needed to be painted was, thankfully, painted

(photo 154). And, as I drew my Beugler stripping tool along the tank one last time, and carefully inspected the resulting line for



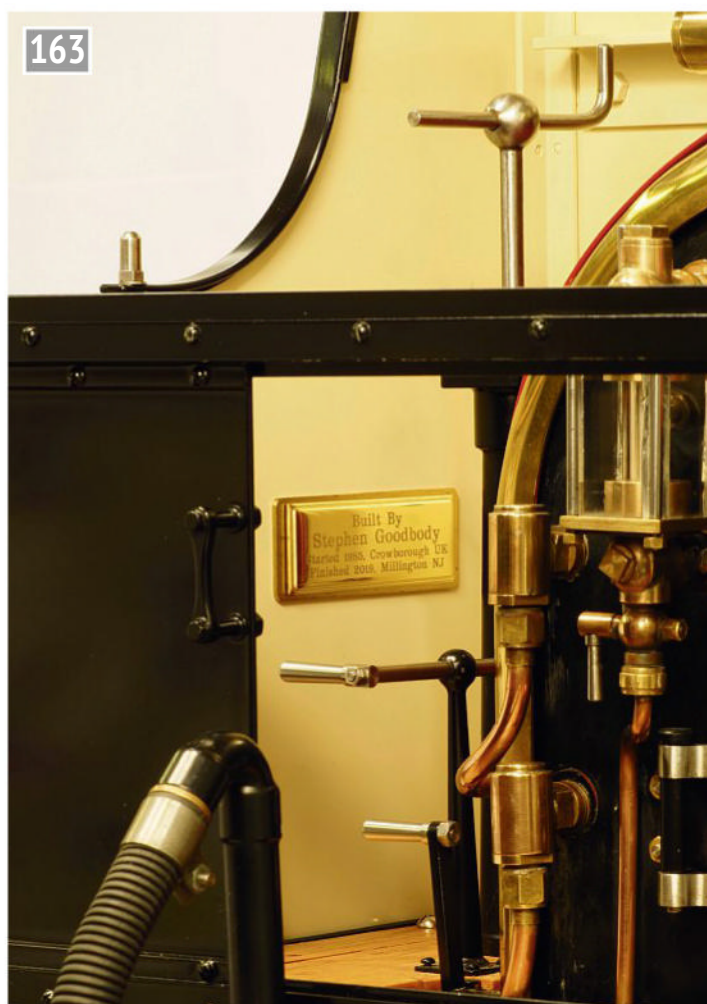
On the left, covered by a large plastic box to banish dust, the freshly painted tank wrapper continues to rotate while drying. In the middle, the spray gun sits cleaned and ready for the next job, and, to its right, the grey drawers contain paint tins and painting tools while the upper transparent drawers hold and protect smaller items between coats. LED lights shine through the walls and ceiling to provide bright but diffuse illumination, and three exhaust fans in the ceiling above help keep the air clear. The drying shelves are to the left of the camera, out of shot.



The water filler secures the tank and shell together at the top and completes the assembly.



With Diane Carney's lovely nameplates installed, *Elidir* is finally transformed into Jennifer Ann, namesake of the author's ever-patient wife.



A gold plated yet inaccurate builder's plate provides the final touch.

waviness, gaps, bleeds and smudges, found none, and covered everything with a large plastic box to keep the dust off while that final yellow line dried (**photo 155**), it dawned on me that, nearly a year after beginning her disassembly, all

that now remained was to put everything back together and see if she worked. Therefore, with frequent reference to the many pictures taken during her dismantlement, over the course of the next six weeks *Elidir* slowly regained her



The Hunslet works plates, another Diane Carney masterpiece, contain a further reference to the author's wife, although she hasn't yet realised it!

shape as more and more parts were carefully unwrapped and screwed or bolted into place.

Eventually the time came to assemble her double-skinned saddle tank (**photo 156**) and, with two layers of ceramic-fibre boiler insulation lightly glued in place (**photo 157**), I gingerly lowered the inner copper tank into the newly painted and carefully lined outer steel shell, fastened the two securely together, added several layers of heavy-duty aluminium foil to the underside for good measure (**photo 158**), installed the cover plates to hold it in place (**photo 159**), and finally added the water filler and its lid to finish the job (**photo 160**).

And, with tank, plating, valves, fittings, tubing and anything else not falling within those categories installed and carefully touched-up where necessary, I polished the superb brass nameplates and works plates, secretly purchased sixteen years earlier from our talented Deputy Editor (thank you, Diane), and carefully attached them in their rightful places for the first time (**photos 161 and 162**)

And, just like that, thirty-five years after her frames were first marked-out in a small shed in East Sussex, *Elidir* completed

her final transformation in New Jersey to become *Jennifer Ann*, namesake of the ever-patient Mrs. Goodbody, and I'm not sure who was the more surprised of the two.

Postscript to Part 21

Now in truth, while the addition of *Jennifer Ann*'s nameplates makes for a nicely poetic conclusion to this episode, they were not actually the last item added. And so, at risk of spoiling the episode's arc, if you, retentive Reader, were wondering about the last of the *What If?* suggestions of those dratted Wonderland dragons in Part 19, then **photo 163** will hopefully put your mind at rest.

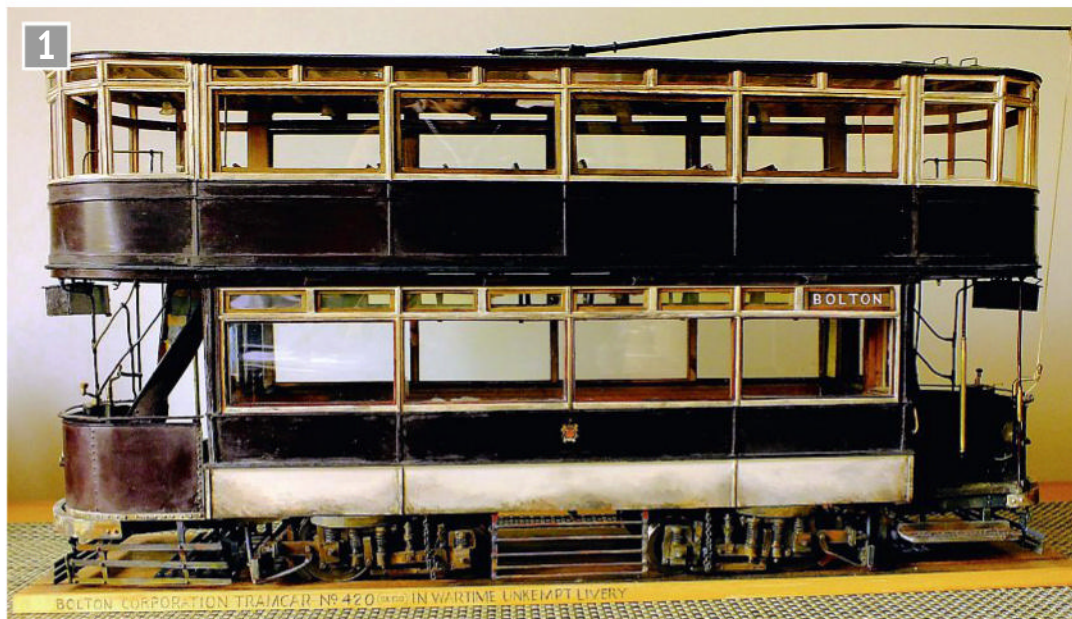
And yes, I know that the completion date is wrong but *Jennifer Ann* took a whole year longer to finish than I had assumed when I ordered the builder's plate from the engravers and, thanks to those insidious dragons, the darned thing is indeed gold plated so I wasn't about to order another one!

●To be continued.

A Dirty Tram - a Bit of Nostalgia

PART 1

Ashley Best tells it as it was.



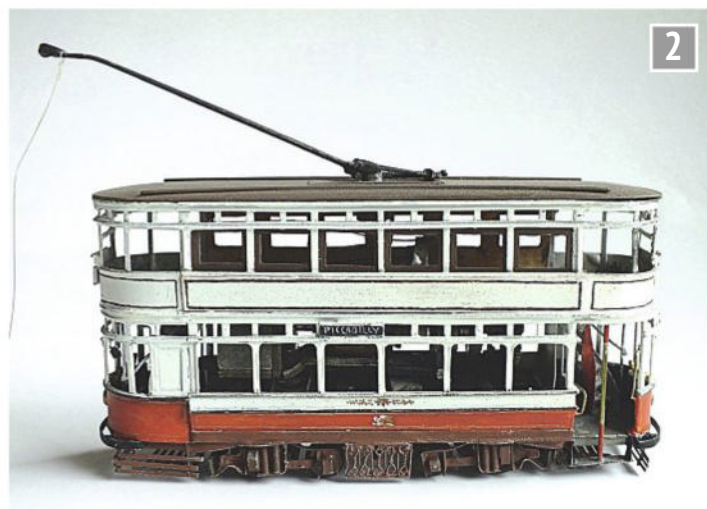
A well-worn tram.

Modellers in the smaller scales frequently 'weather' their efforts in the quest for realism. This process is rare indeed in the larger scales, particularly with regard to tramcars. The description that follows is therefore of a different and arguably more realistic approach (**photo 1**).

I am now 'getting on a bit' and belong to that diminishing group able to recall the last days of the first generation of tramways in Britain. Obviously, these recollections came from a time when we were young and impressionable and, as such, remain vivid to this day. For me, all the earliest memorable experiences of trams concerned the final years of the once large network in South Lancashire and in particular Bolton Corporation Tramways. I was at an impressionable

age, becoming captivated by tramways from that time onwards. Nostalgia is, I suppose, responsible for the subsequent urge to build model tramcars. I started in the days before kits and 3D

printing with scratch built small scale models and made a layout on which to run the developing fleet. I chose 3mm/foot as my standard without particular reason (**photo 2**). Then, at some time in the early



Scratch-built 3mm scale model.



3 Bolton 68; my first large scale model.

1970s, I read an article in the *Model Engineer* by E. Jackson-Stevens about making proper, realistic model-engineered 1/16 scale trams. That was an inspiration, as the scale made possible a realistic miniature tramcar with correct details – under floor motors, brakes, springs, lights and life guards; I was hooked. So in 1973-5 I built my first large scale model; a Bolton car, of course, No. 68, one of the standard bogie cars (**photo 3**). I went on, over the next 40 years, to build my Manchester Project which included representative cars from all the systems surrounding Manchester and these were shown in 2011 at the Sandown Park Model Engineer Exhibition.

After this project was completed, I decided to go back to my first inspiration, Bolton, and started to build a fleet of representational tramcars. This has now grown to six cars, including the 1973 model, No. 68. All these cars were researched for livery details and are finished in their



5 Enclosed balcony end.

splendid, 'between the wars' liveries – fully lined out and, of course, clean. Although I must have seen them in such a condition, I have no memory whatever. It was not until at the age of 11, after having spent the war years in Maidstone – with its wonderful trolley buses – that I returned, in 1945, to Bolton to be, at once, enthralled by the tramcars. They had only two years left and were in many ways a sorry sight, but for me it was part of their charm. The point here is, though, that my lasting ingrained impression and memory is of trams that were rundown and grubby – some incredibly so (**photo 4**). Excursions to what remained of the few surviving neighbouring systems showed that their trams were mostly equally scruffy.

For a long time, I had followed the unwritten rule that the tramcar models should be presented 'as new'. This always bothered me as I didn't remember them like that in Bolton, although I DID see clean trams in Liverpool and especially Sheffield and Blackpool.

Eventually, I decided to make a model that encapsulated the way I remembered things. Before embarking on a description of the model, it might be interesting to say a little about the background history and research involved.

Bolton's trams

Bolton's tram fleet, during and immediately after the war, had



4 Tram near the end of its life.

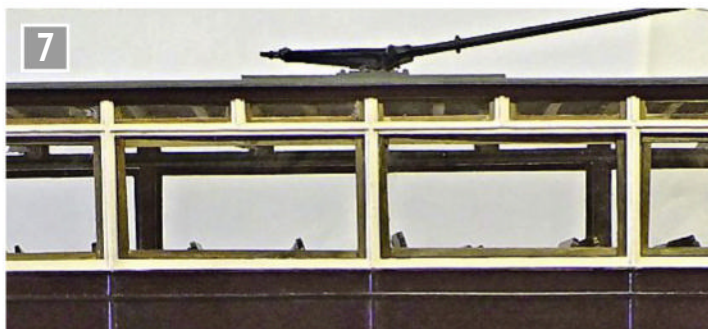
already been reduced as a result of a tram replacement policy, so had become sensibly standardised. Mostly it was made up of large bogie cars with just a few surviving four-wheelers. There was also a small number of second-hand trams. All of the original Bolton cars had been built by English Electric or its forerunners. All the cars were double deck, the remaining four wheelers had some still with open balconies, as did the few remaining ex-South Lancashire bogie cars. Apart from these ex SLT cars, all the bogie cars' covered top decks had the ends enclosed by standard Bolton-designed ends (**photo 5**). Only the last 15 cars acquired in 1927/8 were totally enclosed. All the others had open platforms. Trucks

and electrical gear were largely standardised with four wheel cars using Brill 21E trucks and the bogie cars Brill 22E bogies – even the final enclosed cars used these trucks – the last to do so in Britain.

The bogie cars were interesting as they showed a development process common to many tramways. The first cars, from 1901, were open-topped vehicles which were subsequently fitted with covered top saloons, at first with open balconies and later enclosed by the addition of standard Bolton-designed balcony ends. All these original cars could easily be recognised by the eight full height drop-windows in the top deck saloons (**photo 6**). In the early twenties, further



6 Full height drop windows.



English Electric design of upper saloon windows with top-lights.

batches of double deck bogie cars were acquired from English Electric and these were typical company products with top saloons having four large windows and top lights above (**photo 7**). At first with balcony ends, later all were given standard Bolton enclosed upper saloon ends. Open drivers' platforms remained, as it was considered too expensive to rearrange the platform brake gear to enclose the lower deck ends.

The prototype

The research necessary to make any model is considerable and for this project it would be much coloured by personal memory. However, I decided, eventually, to go ahead. There was the small problem of selecting a prototype. I have a reasonable

collection of photographs of Bolton trams with many of them dating from the last days of the system and also some books about the history of the undertaking. These sources of reference would have to be a main area of research. I was also in touch with the late Derek Shepherd of the Bolton 66 group who had been responsible for the preservation of the sole remaining Bolton bogie car, which is now part of the heritage fleet in Blackpool (**photo 8**). Derek was of enormous help. Eventually my selection was made easy as a suitable tram became an obvious choice. The chosen vehicle was number 420. I decided on this car, one of the 1921 built English Electric bogie cars as it was typical of the survivors in 1945 and



No. 66, the preserved Bolton tram.

also it had a rather interesting history. It was not just another decrepit survivor.

In 1941, it was involved in a serious accident when, after

a collision, it turned over, slid along on its side, smashed into a traction pole destroying the front end of the top saloon and causing much damage to the rest of the saloon. At that time, the Corporation could not afford to lose a tram, so it was extensively repaired in the workshops and subsequently emerged in 1942 in structurally unaltered form. The repairs almost amounted to a rebuild so it became, in effect, Bolton's newest tram. Although structurally unchanged, it was turned out in plain livery with just basic colours and no lining (**photo 9**). All rocker panel lettering had gone and the only indication of ownership was the coat of arms on the waist panel. Its clean introduction lasted only a short time as the Lancashire climate, industrial pollution and shortage of staff soon allowed it to acquire its layer of grime, bringing it in to line with the rest of the fleet.



Clean ex-works Number 420.

●To be continued.

Radial Valve Gears Again

PART 7 – JOY VALVE GEAR

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



Continued from p.280
M.E.4723 August 11

Introduction

Having investigated the fundamental principles of radial gears and the shortcomings of Hackworth gear in the last episode, it is now time to see how these shortcomings can be overcome. There are at least three remedies and the most common, in the UK at least, was Joy gear.

David Joy is described by the Institute of Mechanical Engineers as 'not only an inventive engineer, but also a fine draughtsman' (ref 14). He presented a paper on this valve gear in 1880. It was widely used on the LNWR and the LYR and, whatever else anyone might think about the LNWR, their non-compound locomotives had tremendous haulage capacity for their size and worked the heaviest and

some of the fastest express trains of their day, so the valve gear can't have been all bad. I have failed to find a decent photograph.

Principle of operation

Imagine for a moment Hackworth gear (Part 5, fig 19, M.E.4722, July 28) with a telescopic vibrating lever gh such that when the crank had rotated 90 or 270 degrees (die block fully up or down) gh was lengthened.

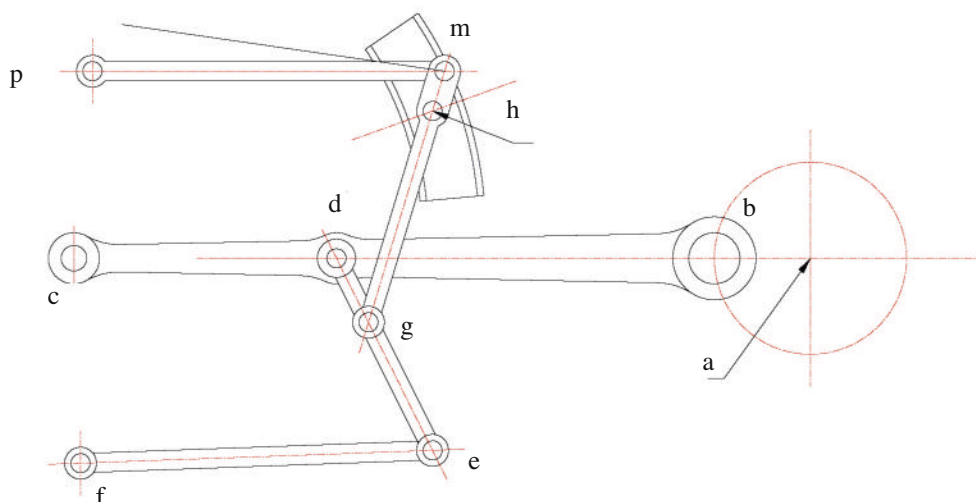
We obviously cannot have a telescopic vibrating lever, but there are several straight line linkages to try. Joy's valve gear uses the Scott Russell linkage formed by members fe , dge and gh . The layout of the gear is shown in fig 32.

It will be noted that instead of being connected to a return

crank, the vibrating lever ghm is connected to the correcting link dge , which is itself driven from a point d part way down the connecting rod. Thus point g , the bottom of the vibrating lever, moves in the same direction as the piston instead of in the opposite direction as before. Therefore, to make point m move in the opposite direction to the piston, it has been positioned above the connection to the die block h . Locomotives fitted with Joy gear and piston valves had either a rocker to reverse the valve motion, or had h above m . The bottom of the correcting link is constrained to move in an approximately straight line by the anchor link ef .

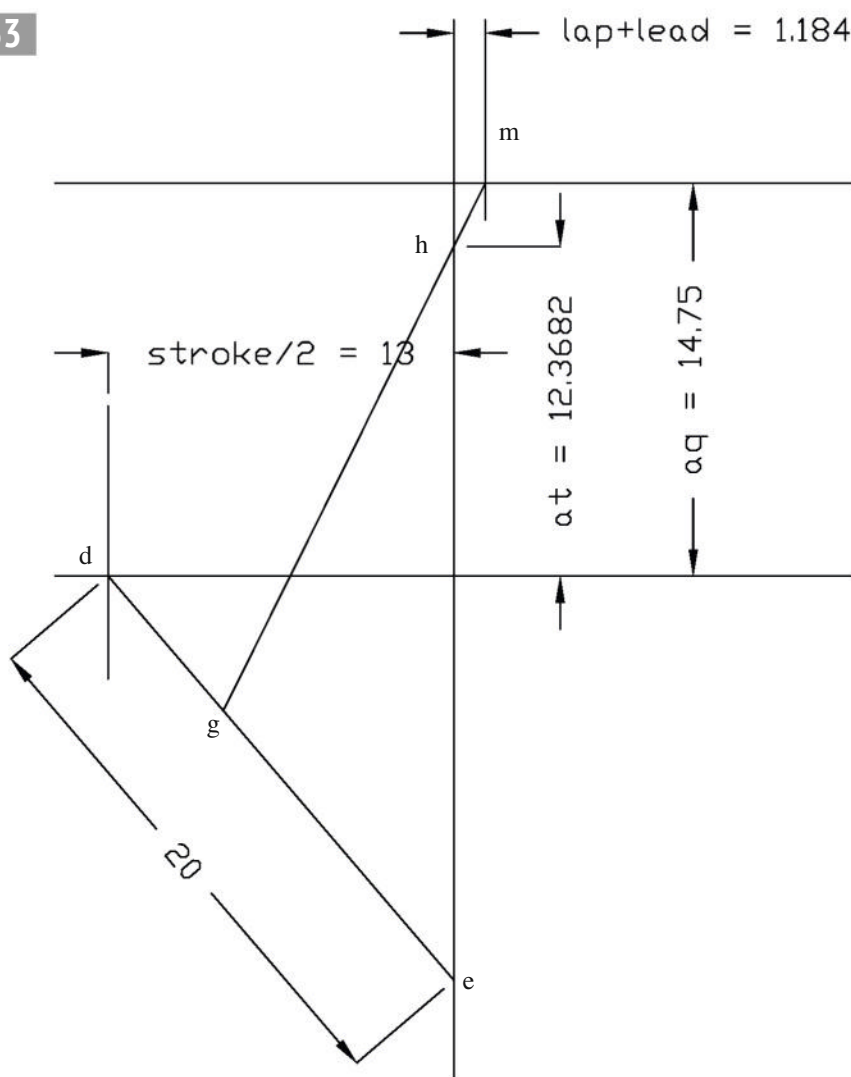
As the crankpin moves along its imaginary horizontal line, it has been arranged that the

Fig 32



Joy gear with curved slide.

Fig 33



Joy gear geometry.

angularities of *dg* and *gh* just cancel each other out, and so point *h* stays on the slide axis as required. When the connecting rod is connected to the crankpin, the die will rise and fall equally.

As with Hackworth gear the angularity of the connecting rod will impose a distortion onto the valve events. There is not much that can be done about it, and as locomotives fitted with Joy gear usually drove onto the front axle, they had relatively short rods.

Design

Working out how to achieve this and finish up with the valve rod horizontal at dead centres is not easy, to put it mildly. I wrote a program which could do it but it would need to be rehashed to work on Windows 10. Happily

there is a dodge. The only guidance I have found is in **ref 15**, which recommends that the correcting link *de* should not swing by more than 45 degrees either side of vertical, and the vibrating lever *ghm* should not swing more than 25 degrees. Using the CAD, set out the horizontal lines through the valve spindle and cylinder and three vertical lines as shown, a centre through where the slide rotate axis will be, one line offset from that by half the stroke and a second offset the other side by *lap + lead*. This shown in **fig 33**. Now pick a length for *de* such that it is less than 45 degrees to the vertical. Draw line *de* and mark off a point *g* a third of the way along. Join *g* to *h*. Where this line crosses the centre gives the height of the slide. Note that *dg* is NOT the

correct length yet. The input dimensions are for the L&YR standard Joy gear

at (the height of the slide above the cylinder centreline) comes out at 12.368". The computer generated value which gives a horizontal valve rod is 12.162 inches, so this fiddle has arrived at a pretty good answer, at least in this case. This is not what the LYR used - they chose 13.3125 inches. This is not the most important dimension in the world, so let's use their value from now on.

We now need to change *dg* (and with it *gh*) to get the straight-line motion. The derivation of the following equations is detailed in **ref 2** (Part 1, M.E.4718, June 2). The numerical answers are achieved using the known dimensions of the LYR gear.

$$\alpha = \text{asin}(\text{stroke} / (2 * de)) = 40.54 \text{ degrees}$$

$$dg = (de * \sin(\alpha))^2 / (2 * (at + de * \sin^2(\alpha) - at * \cos(\alpha))) = 7.256 \text{ (LYR actual 7.250)}$$

$$gh = at + dg = 20.568 \text{ (LYR actual 20.5625)}$$

$$mh = gh * ((lap + lead) / ((de - dg) * \sin(\alpha))) = 2.94 \text{ (LYR actual 2.934)}$$

Once *dg* is known, *gh* and *mh* can be derived from a CAD drawing, but the sums are not too difficult. There is a little program which does it for you (JoyDesign.py) - details later in the series on how to get hold of all this software (I'm trying to persuade #2 son to make a website). It is also recommended that the swing of the vibrating lever *ghm* should not exceed 25 degrees either side of vertical. If this is not achieved the only recourse is to increase the height of the slide.

The calculated values are very close indeed to the values used on the real engine. Coincidence? I doubt it, the LYR under Aspinall were quite a scientific bunch and I wouldn't be surprised if they had performed exactly the same analysis, with the same results.

We now need to find a lengthwise position for the slide. Having it more towards the crank will increase the vertical travel of the die block, and so reduce the slide angle required, hence the load on the block. Recommended value for maximum slide angle is 20 degrees, so the recommended distance from little end to *d* can be calculated from

$$cd = (2 * \text{outphase} * cb * gh) / ((mh + gh) * \tan(20) * \text{stroke}) = 25.122 \text{ inches}$$

Again the derivation is in **ref 2** - the LYR used 25 inches.

The next point to consider is the fixing of the anchor link, point *f*. It will be remembered that the purpose of the anchor link is to make the bottom of the correcting lever, point *e*, move in an approximately straight, vertical line. Obviously then, the anchor link should be made as long as possible, but its length will probably be dictated by finding somewhere to support it, point *f*. It is very tempting to think that point *f*

Fig 34

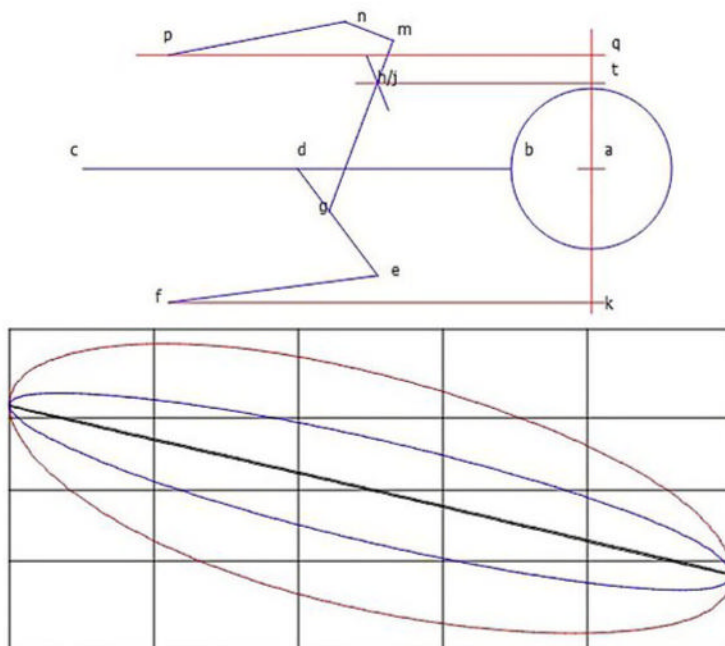
Joy's valve gear

```
default
ab = 13.000
bc = 74.000
lap = 1.000
pw = 1.250
cd = 25.000
de = 20.000
dg = 7.250
gh = 20.562
mh = 2.938
jt = 49.000
aj = 13.312
mn = 0.000
pn = 43.500
fk = 76.585
fe = 28.000
slideRad = 43.500
aq = 14.750
slideValves
slideMid = 1.6
```

any key to continue

```
+ve forward (acw)
99 to quit
```

slide	front lead	front pw	front cut	back lead	back pw	back cut	die up	die down
1.600	0.184	0.184	7.3	0.184	0.184	7.6	4.382	4.397
20.000	0.186	1.048	71.8	0.183	1.006	74.1	4.328	4.435
10.000	0.185	0.359	37.7	0.183	0.402	37.9	4.362	4.391



Joy gear – forward.

should be horizontally in front of point *e* when the gear is on front and back centres. However, a moment's thought will show that point *e* does not rise and fall equally about its dead centre position because of angularity of the correcting link, so not only would the path of *e* be curved, but it would also not be even approximately vertical - the error due to point *e* not moving in a straight line would not be equal at the mid stroke positions. If we put *f* below the cylinder centre line by *de*, then on centres the anchor link will slope down towards *f*, but the error will be equalised. The horizontal distance forward of the axle can then be chosen as convenient, and the length of *fe* derived from CAD.

Last thing to work out is the slide radius. This is the issue that has given me the most trouble of all. The traditional approach is to make the radius of curvature equal to the length of the valve rod pm . This is not, I think, the optimum, although even a straight slide results in a fairly small error, so one curved to not quite the best value will result in an even

smaller one. However, we've got to make a slide, so it might as well be to the optimum shape. To ascertain what this correct shape is, it is necessary to once again consider the two components of motion of the

crank pin. If this time we think of the crank pin moving in a vertical line through the axle centre, the inphase component of the valve motion would not be driven and so, with the slide vertical, we require that the

valve does not move. Point m should therefore move in an arc of radius pm , whilst point e is moving in an arc of radius ef . It will be seen immediately that h will move in an arc of some radius but that it is unlikely that this radius will be pm . A way of calculating this is given in the reference (ref 2), but it is tedious. The calculated value for the LYR engine is 45.946 inches against the valve rod length of 43 inches. With the computer model it is very easy to see what the results are like with the radius equal to pm and increase it a bit to see if it improves and so on, but it has just, as I write, dawned on me that the optimum radius could be derived from a CAD drawing. This can be done by drawing link ghm anchored by ef at the bottom and pm at the top and moving it up and down by the die block travel (scaled from the crank radius by cd/bc). Mark the up/down/middle points of h and then use the 'three points on a circle' facility.

Results

Having gone through all this pain, how good are the results? See **figs 34** and **35**. I reckon this is reasonable by anyone's standards.

Fig 35

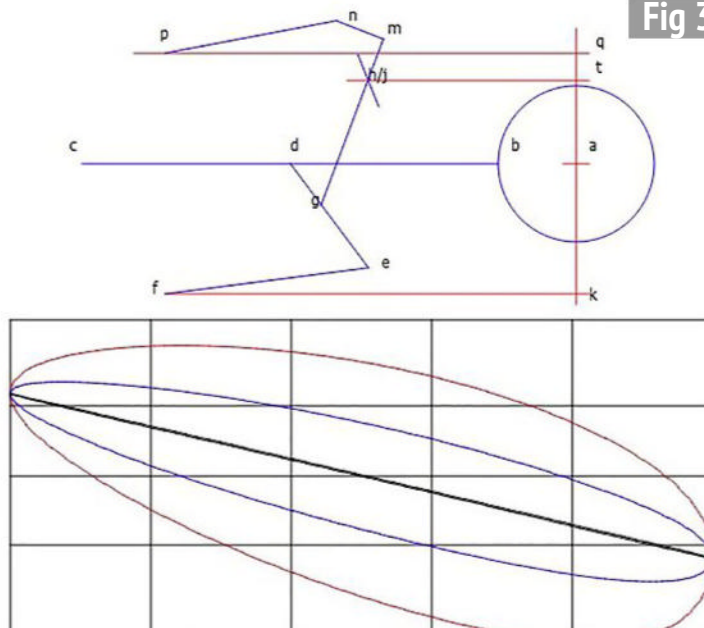
Joy's valve near

```
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mn = 0.000
pn = 43.500
fk = 76.585
fe = 28.000
slideRad = 43.500
aq = 14.750
slideValves
slideMid = 1.6
```

any key to continue

```
+ve forward (acw)
99 to quit
```

side	front lead	front pw	front cut	back lead	back pw	back cut	die up	die down
1.600	0.184	0.184	7.3	0.184	0.184	7.6	4.382	4.397
-17.000	0.183	0.881	74.8	0.186	1.400	69.2	4.405	4.573
-7.000	0.183	0.356	37.7	0.185	0.521	41.3	4.396	4.440



Joy gear – reverse.

Fig 36

The diagram illustrates a mechanical linkage system. It features several links: a horizontal link 'p' on the left; a curved link 'm' with two joints labeled 'h' and 'g'; a horizontal link 'c' below 'p'; a horizontal link 'd' to the right of 'c'; and a long link 'a' connecting joint 'g' to a joint on link 'b'. Link 'b' is a complex assembly on the right, including a circular component and a pivot point 'f'. A large red circle is centered on the pivot 'f'. Red dashed lines represent the paths of points 'h' and 'g' as the mechanism moves. A horizontal red dashed line passes through joints 'p', 'c', and 'd'. A vertical red dashed line passes through the center of the red circle and joint 'f'.

Outside Joy gear.

Outside Joy I am aware are the original fixed point on the frame by the be at least as good as inside

Whilst the vast majority of locomotives fitted with Joy gear had inside cylinders and valve-gear, a few had them outside. The ones of which

locomotives on the Lynton & Barnstaple, and a rather nice crane tank seen at the Keighley & Worth Valley. Instead of point *e* being connected to a

anchor link *fe* (fig 32), point *g* is connected by link *gf* to a return crank *bf* fastened to the main crankpin (fig 36).

Results have been found to

on the one example studied, I suspect because point *f* goes up and down in sympathy with point *d* and so the angularity of the anchor link is much

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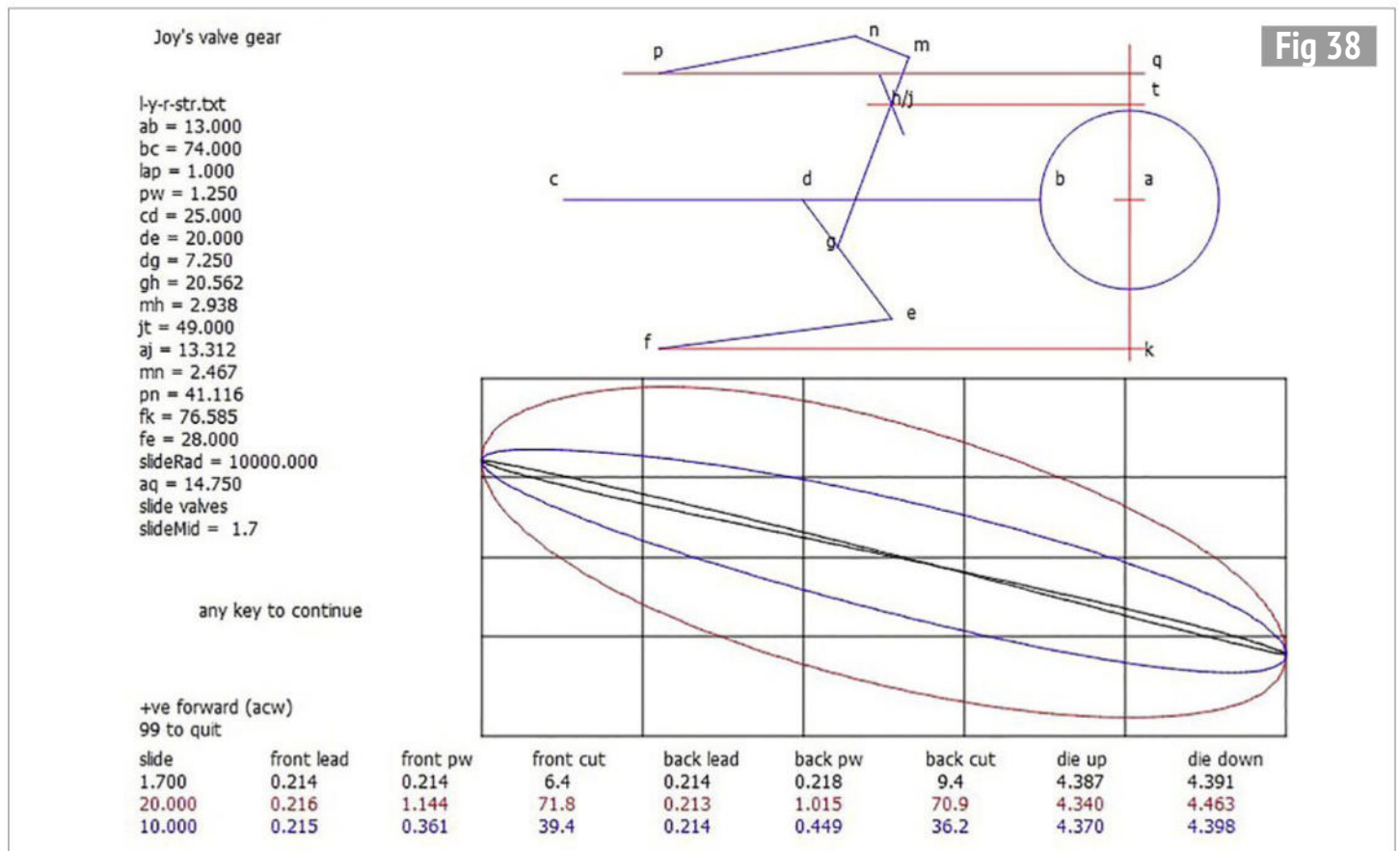
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Results have been found to

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Fig 37

Joy gear with straight slide.



Straight slide – forward.

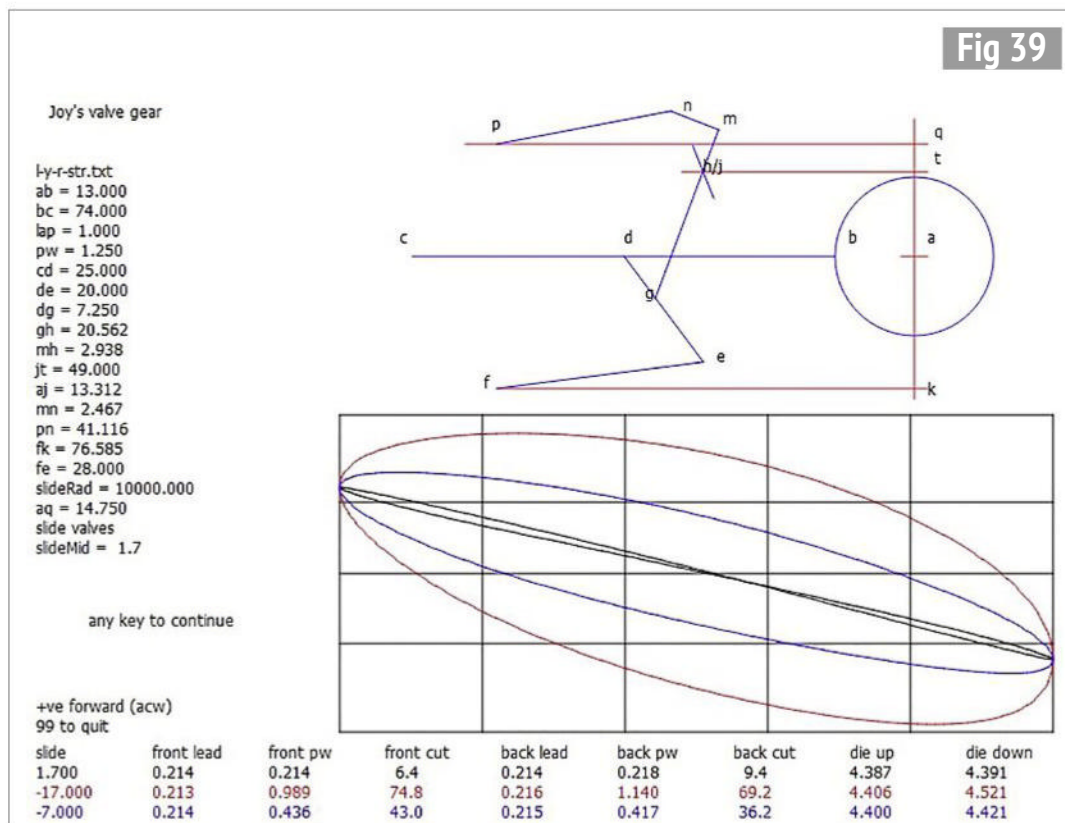
reduced. Design is fairly straightforward. Firstly, design the gear as though it were as shown in fig 32. I have not

fully investigated the effect of angularity of the anchor link and suggest that, until someone does, it be ignored. The

radius of the return crankpin 'f' is equal to the horizontal motion of point 'g':

$$af = ab * (de - dg) / de$$

and the length of the anchor link can be derived from CAD. By the time this is published I might have translated the program for this variant from its original BorlandC.



Straight slide – reverse.

Offset top joint

The Greenly offset top joint and straight slide can be used with this gear (figs 37, 38 and 39) and it gives quite good results but on other implementations a curved slide has proved better. Horses for courses. Note that it seems to increase lead, so further tweaking might be needed (reduce mh).

Enough for this instalment, next time we can examine Chas. Brown's and Heywood.

●To be continued.

REFERENCES

- Ref 14. archives.imeche.org/archive/railways/david-joy - well worth a visit to see Joy's journal.
- Ref 15. *Radial Valve Gears*, K.N. Harris, Model Engineer, 7 Jan 1972 et seq.

Book Review

Ephraim

Peter Scott

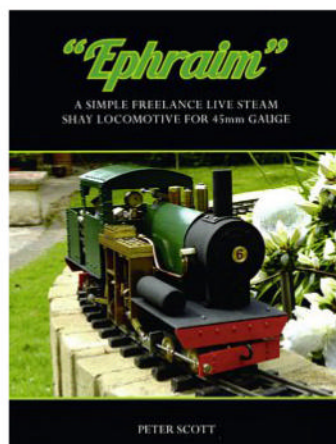
Published by Camden
Miniature Steam Services,
2021
ISBN 978-1-909358-52-2
£18.95, 160pp, 30 drawings,
paperback (order through the
website camdenmin.co.uk)

During a very pleasant barbecue with my dear friend Martin Evans I happened to mention a book I had purchased titled *Ephraim, A Simple Freelance Live Steam Shay Locomotive for 45mm Gauge* written by Peter Scott. Martin encouraged me to write a review hence these few words.

I must confess to being a bit of an armchair model engineer spending too much time thinking about my next projects - very often they never get started or, when started, they never get finished. Gardening, car maintenance and weekend away days often send me off on an unrecoverable tangent.

I have always fancied making a small locomotive and to that end purchased Kozo Hiraoka's *Building the Shay*. Sadly, this was a big mistake, no way is this beautiful book a starter project and even for the seasoned engineer it would present something of a challenge. So, it was to my great delight to discover Peter Scott's *Ephraim* available from Camden Miniature Steam Services. Flicking through the pages it immediately became apparent the layout is an ideal starter embodying all the unique details that make the Shay such an interesting locomotive. My mind started racing thinking about how I could add detail to replicate the more complex machines you can watch on YouTube chugging along the North American heritage railways - lo and behold, Peter has included a brief history and extra detailing on the last few pages.

The book is divided into 17 chapters and adopts an almost paint by numbers approach offering someone who has very little knowledge of engineering a way into this fascinating



hobby. The majority of the components can be made on a small lathe similar to the Emco Unimat or other lathe and milling combinations. The cost of materials for larger scale locomotives can be prohibitive, but 45 mm gauge will reduce material and postage cost and because the parts are small will allow a material stock to be built up for the next project. Camden Miniature Steam Services can provide laser cut parts for many of the sheet metal components and a boiler with pressure test certificate convenient for those that do not have club facilities. Of course, there are those with CAD who can produce the files to be sent off for laser cutting at little more than the cost of the material.

I had a bit of good luck regarding procuring materials for the project. After receiving notice from the council about a planning application for some nearby house builds, looking at the plans I noticed a small sheet metal company located in the forest and enclosed by the proposed estate. It's amazing what a packet of Hobnobs can do, gaining entry to the company scrap metal store and guillotine. I hope the company is not engulfed by the new estate and my new supply of material

there for 25 years does not disappear.

Working through the chapters, most of the parts are fairly easy to make but there are some components and assemblies needing a higher degree of accuracy including three of the major assemblies, being the steam chest and two bogies, requiring careful machining and assembly. To make things easier Peter has devised a common jig system to ensure the parts can align accurately for correct meshing of the bevel gears within the steam chest. For those not wishing to machine these parts Peter has utilized Meccano gears readily available on eBay. For the bogies, off the shelf gears are available from Reely. As an adjunct, I could not find the number of teeth required for the 3:1 bevel gears used but by blowing up the picture on page 64 counted 45/15t.

Throughout this book it is obvious that, like a driving instructor with his foot hovering over the brake pedal whilst his blissfully unaware student is approaching a pedestrian crossing, the chapters are laid out in a way that all avenues are covered including safety, guiding the novice and rewarding him or her with a very unique and interesting model and, like an old Delia Smith cook book, you can be confident the end result will work.

Will I make it? Very likely - after all I have ordered the boiler and enough material together with a supply of Hobnobs. Will I record the build? Well no, because it's all there in the book, every single step, but if I finish it I will send Martin a photograph - he will probably fall off his chair or possibly even worse spill his gin and tonic.

Chris Hibberd

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

PART 10

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



Continued from p.291
M.E.4723 August 11

Some notes on the valve gear

The valve gear is of course the Stephenson valve gear which was the latest and greatest at the time. The fact that the lifting link was below the expansion link has confused more than a few Internet locomotive 'experts'. When designing the linkage based on the original locomotive, a couple of interesting facts came to light. For one, you would expect the very short lifting link to cause considerable die slip but the long eccentric rods combined with the rocker

proportions dampened some of this geometric delinquency. The original locomotive had the lifting link pivot on the centre line of the expansion link, which I moved slightly to further improve die slip. One notable outcome of the valve gear proportions is that 'back notching' will have marginal effect on lead, which is beneficial for the model because it has a screw reverser (I'm lazy, and I have no doubt I'm going to forget which direction to turn the wheel while driving).

Something that stands out on the full-scale beauty is the expansion link, which is polished brass on the current display. I had no intention of casting the link in a high tensile bronze to get the required strength. Besides, the laser cut expansion links I have used previously have worked very well and I didn't want to mess with a winning formula. I had to find a way to brass plate components in my back yard without going through the hassle of explaining to a chemist I just want to make a working steam train and the chemicals will not be used for anything nefarious.

The expansion link

The laser cut expansion links required very little machining; basically, only the drilling and reaming of the pins, and some minor polishing of the die block bearing surface. The lifting link bracket holes were spotted and tapped using the bracket as a drilling jig but what of the brass plating?

In the end, the answer to my brass plating conundrum came from an old blacksmithing technique. In principle, the component is heated to a dull red and brushed with a brass brush. It takes a minute or two to get going, but once the metal starts plating it actually goes quite quickly. The build-up is considerable and impressively strong (photos 97 and 98). You do need to make sure the brush is in fact a brass brush and not the cheap plated variety.

The links finishing off the bottom valve gear were all laser cut, with any bosses brazed into place with an undersized hole and holding screw. These holes were then drilled and reamed to size after the usual beautification (photo 99). I made the rocker arm assembly at this point but



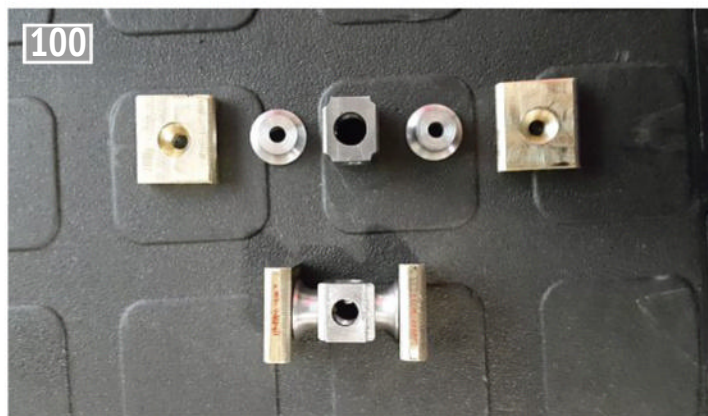
An unconstrained holding jig for heating and brass plating.



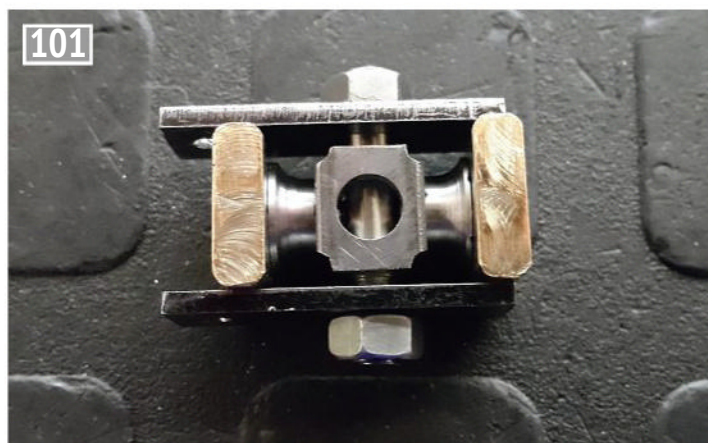
A plated and un-plated expansion link.



Various valve gear links with the bosses brazed in place, prior to the drilling and reaming of the pin holes.



Components making up the crosshead.



Holding jig used to keep the centre hole parallel to the outer bearing sections during brazing.

it required some minor bending later on to line up with the valve connecting rod, which still needs to be made.

The crosshead

The crosshead is about as close to scale as you can get without using Dorothy's shrinking elixir. It's a very odd geometry to model, exacerbated by the strength issues with such a slender midriff. For my model I decided to make the assembly a brazed assembly using specifically suited materials for the sliding bearing surfaces and the mid-section.

The individual components aren't that difficult to make using HSS forming tools. The hole positions for the centre square need to be accurately drilled to get the crosshead to match properly with the piston rod. A special tool was ground from a broken milling cutter to machine the rounds on the bronze ends, similar to a wood router. Finally, the individual parts were screwed together using brass countersunk

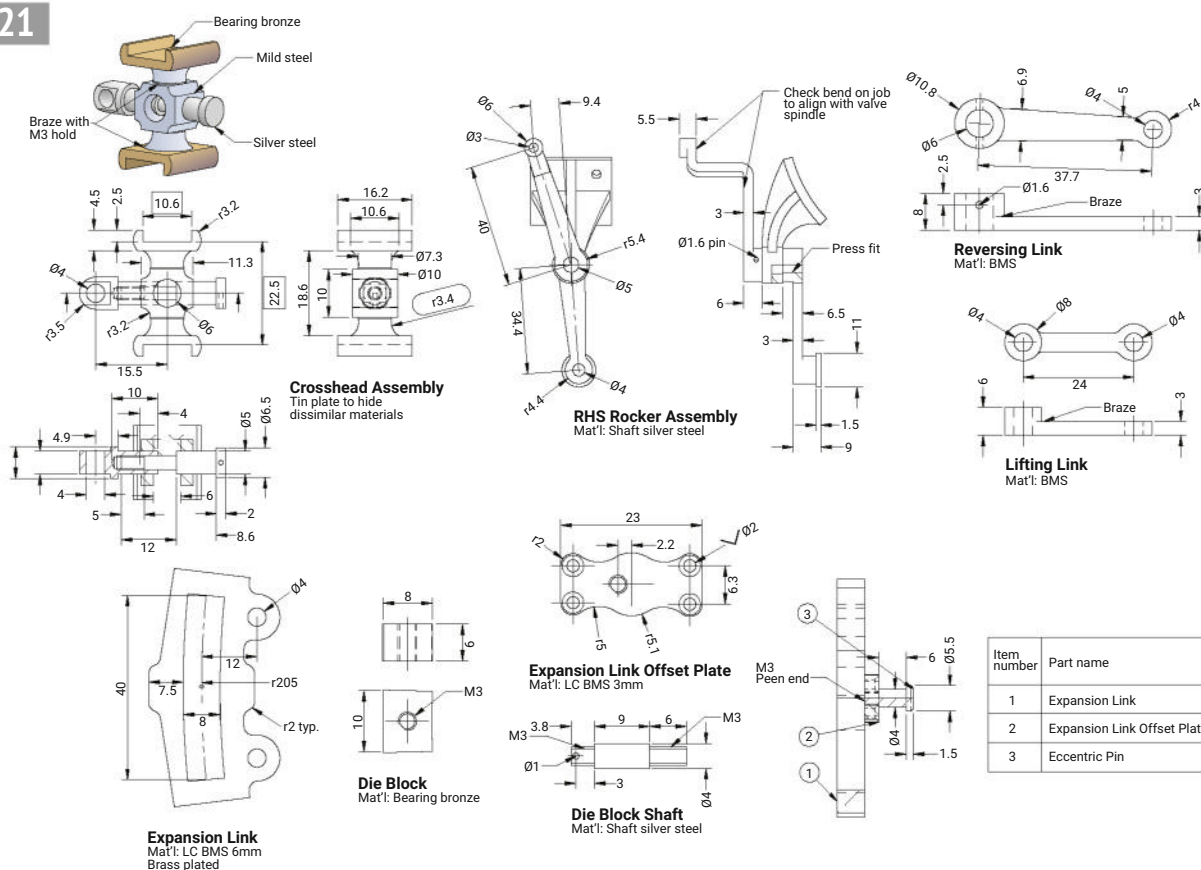
screws for brazing (photo 100). To keep the bronze ends parallel to each other and the centre square section, a rod was slipped down the corresponding hole and two flat plates pulled up to align the lot (photo 101). A little Tippex on the components you don't want the solder to join is a good idea; this is not shown in the photograph.

If everything is fluxed properly and the solder runs like it should, the components will be more than strong enough and all the fillets will look the part (photo 102)!

If a good sliding surface were to be achieved on the bronze ends this needed to be aligned to the piston shaft hole reasonably accurately. My milling machine table is relatively accurate, so two piles of similar packing on either side of my trusty vice with a bar through the middle will line everything up for accurate machining (photo 103).

Now that the crosshead is aligned to the piston shaft hole, all that is left is to machine the

Fig 21



Crosshead and valve gear.



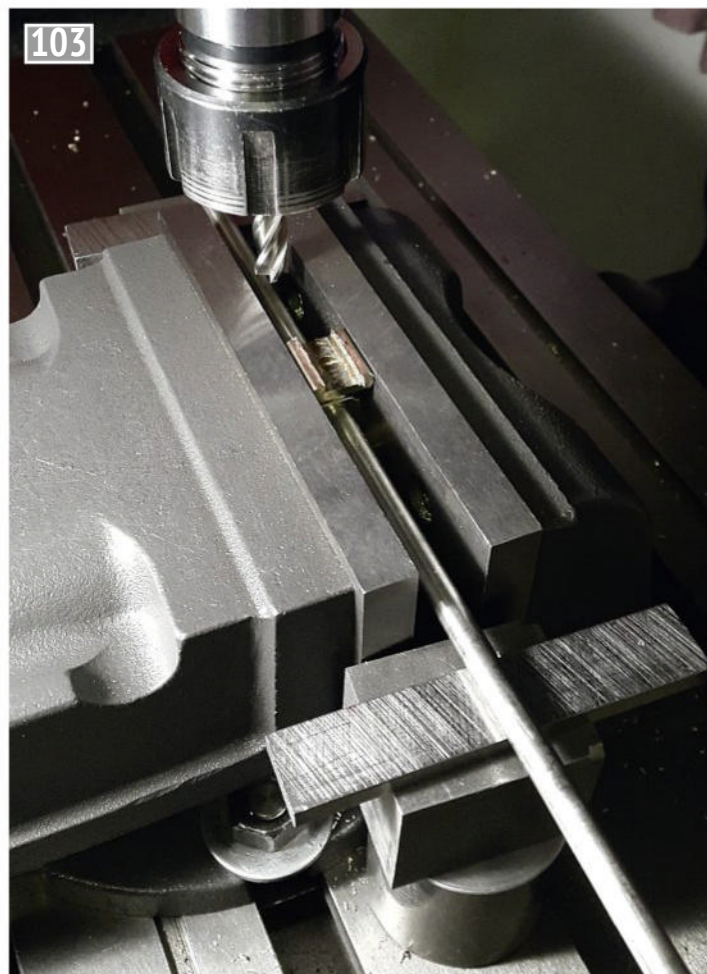
Brazed crosshead assembly.

guide bar slots accurately to the centre line, relative to the sides and perfectly symmetrical. To do this you need to use the same philosophy used for any symmetric machining or drilling operation. My method is as follows: I machined the slot by only traversing in one direction, flipped the component and repeated the cut. The slot is now perfectly centre and parallel relative to the fixed jaw of the vice. If the part is placed with the cut slot upside down and given the same treatment the depth of the slot will be perfectly centre to the centre line of the cross head. Now getting the two slots to size was just a matter of repeating that process; always cutting on the fixed jaw side traversing in the same direction until the component is on size. All cuts need to be half the required depth because material is being removed from both sides, same as when turning a bar on a lathe. Of course, the vice needs to be set up properly for this to work by running a DTI along the fixed jaw.

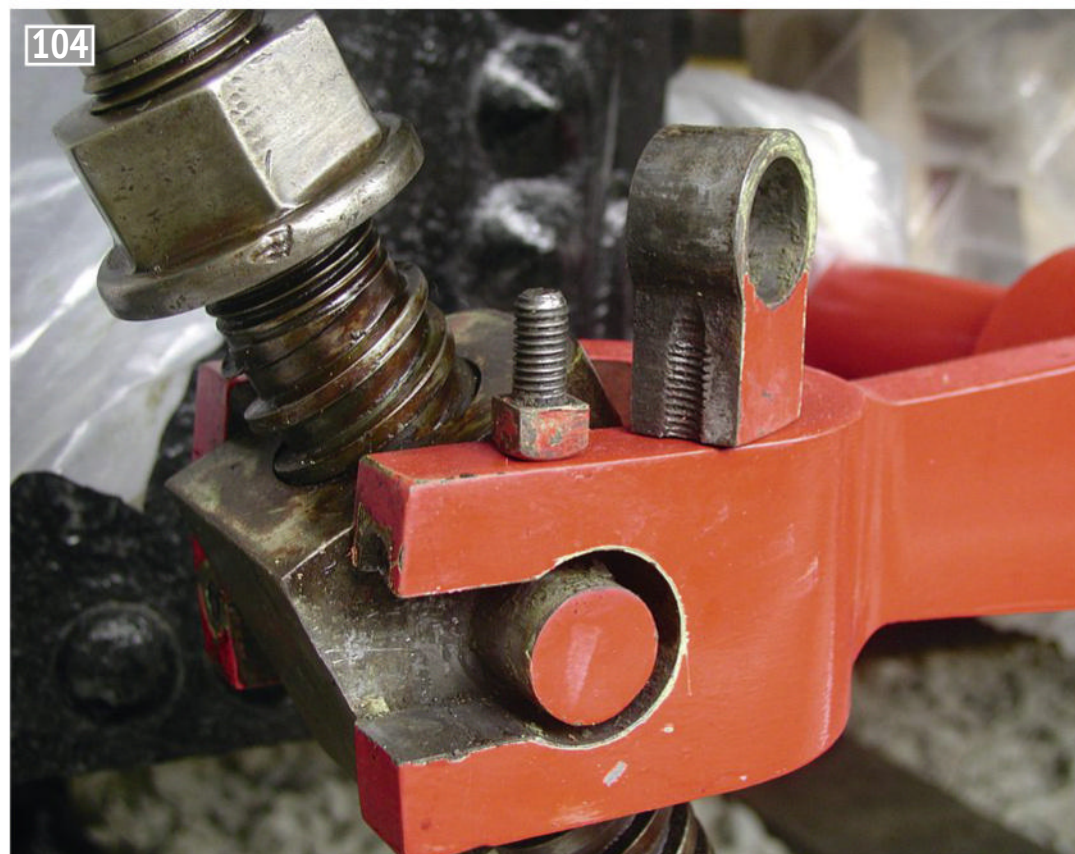
Reversing arm and other bits

The reversing arm on the large-scale locomotive had a similar square pivot block as used for the model. The larger locomotive keyed in the block from the front with the rest of the link the normal forged process used

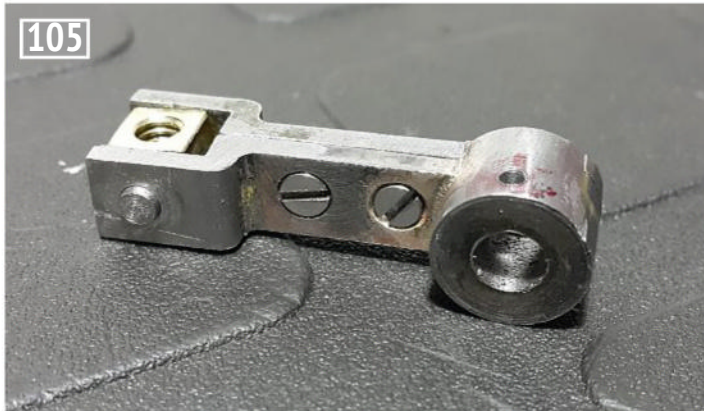
on many locomotives of that era (**photo 104**). Scaling this exactly would result in a weak point that in all likelihood would not be strong enough for our track, so I moved the split line to the centre of the link which allowed the block and link to stay very close to scale without sacrificing strength. The choice of materials also improved the overall strength as with the crosshead.



Machining the guide bar slots with special emphasis on alignment to the piston rod hole.



Reversing arm on the large scale locomotive (photo courtesy E. Lander).

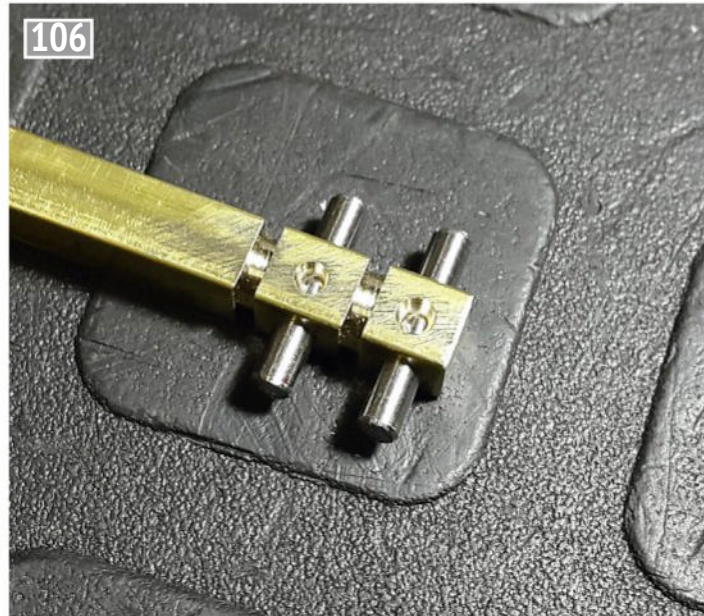


105
Reversing arm and block assembly before painting. The screws will be on the inside away from any judging eyes.

On the little *Fire Queen* the reversing arm is a simple milling and soldering process with the standard Tippex trick to prevent the solder from running into gaps where it's not wanted. Once the assembly is screwed together a little filing on the mismatching corners will hide the fact that this component is a cheat (**photo 105**). I went a step

further and painted the arm as an assembly which blended the assembly even further. This, of course, required the reversing arm block to be completed (**photo 106**).

This little part is actually tricky to make, because once the side pins are soldered in place and the centre hole is drilled and tapped there's not much holding the lot together.

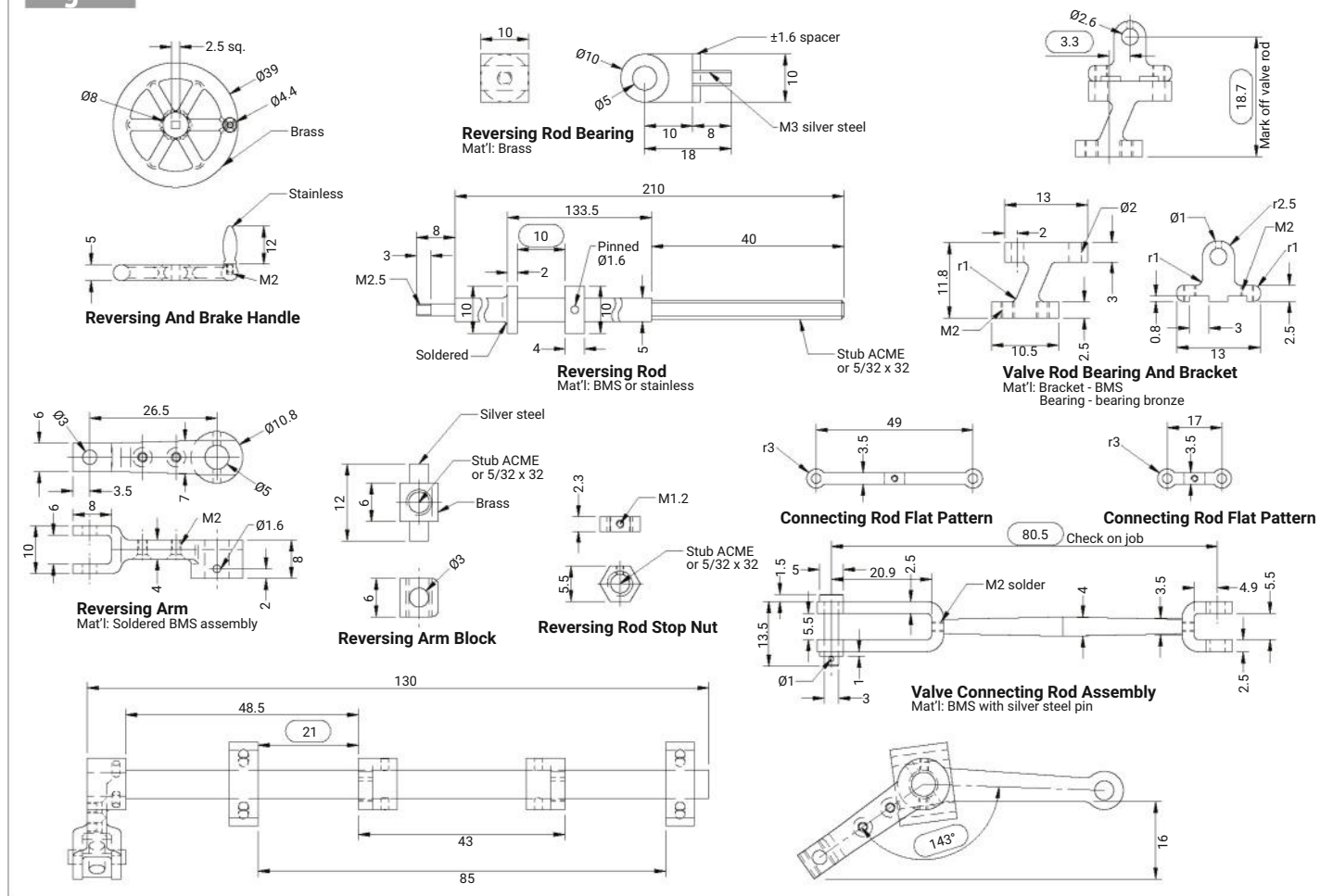


106
Reversing arm block (and spare) before soldering the end pins into place.

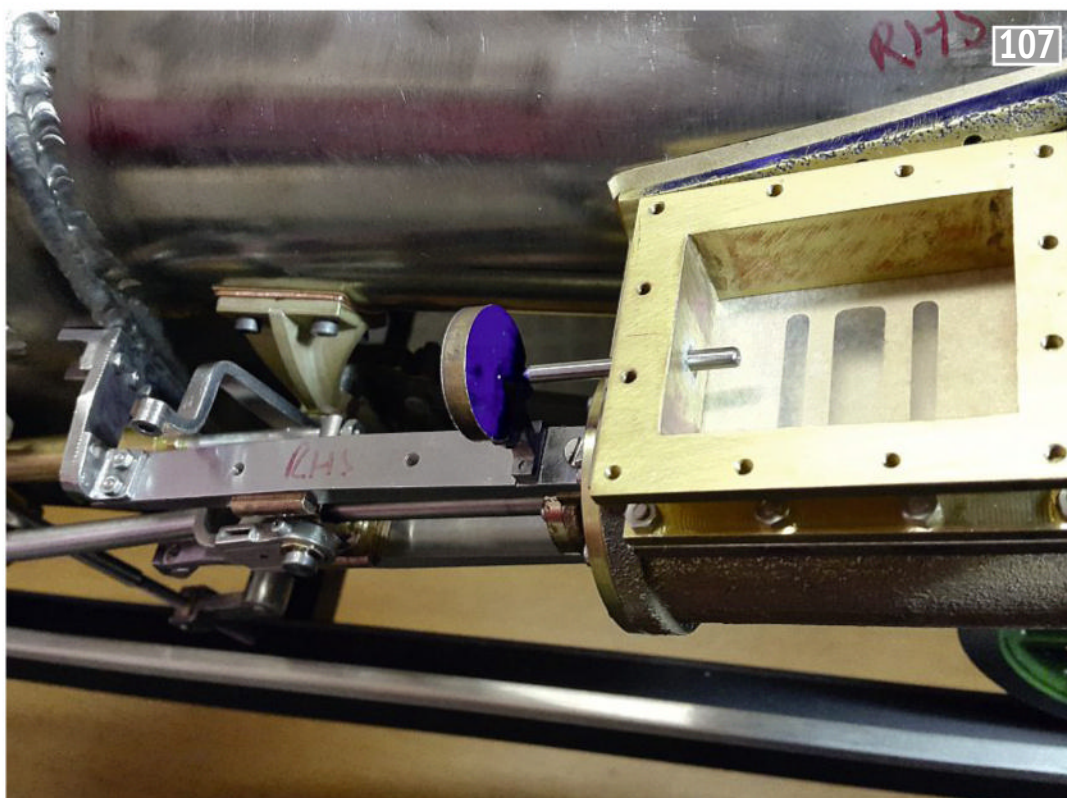
The component is more than strong enough for the track but any shortening of the pins in the lathe, after soldering, is probably pushing things a little. In the end, I assembled the

block to the arm and placed thin washers over the end pins to file them to size. The whole lot was then painted and a little oil applied to get the block moving freely again.

Fig 22



Reverser components and valve connecting rod.



Marking of the bearing hole position for the valve rod bearing.



Valve connecting rod and valve rod bearing coming together. Note the slight jog in the valve connecting rod.

Again, we come to the recurring theme of tolerance take-up. With all the assemblies on an angle to the round boiler shell, certain components

need to be left until last for final adjustment. The valve rod bracket and bearing need to be made and aligned to the valve spindle. Thankfully,

there shouldn't be too much deviation from the drawing (offset from the guide bar centre line). In all honesty I never even measured or

marked out the bearing, it was all made relative to the assembly on the locomotive.

I machined a disk with the bottom skimmed to fit the bracket, then this was assembled to the guide bars and a piece of silver steel with a point was used to mark the position of the bearing hole (**photo 107**). The shape of the bearing was guided by the position of the hole, so on the model it looks perfect but it may be slightly offset to one side. This single component has taken up any assembly tolerance of the valve chest alignment to the centre line of the cylinder.

The alignment of the rocker and the valve connecting rod to the centre line of the valve chest needs to be taken up by the rocker with the height taken up on the connecting rod (notice the slight kink in the connecting rod, **photo 108**). The connecting rod length may need to be adjusted for the long clevis to clear the valve rod bearing on full stroke. There's a little trial and error here to get the lot to work properly, with an adjustable threaded rod between the connecting clevises of the connecting rod the way to go!

Getting everything to fit properly sounds like considerable work but limiting the adjustment points to a few components and sticking to the design on all the others actually made life easy. When fitting the valve gear above the guide bars I didn't even have the eccentrics in the final position; it just wasn't necessary. Before the valves and timing can be set the full stroke of the valve connecting rod needs to be determined and you only need to be on the far side of the expansion link with the eccentric at any random position.

● To be continued.

CLUB NEWS



John Arrowsmith
reports on the latest
news from the clubs.

Well, here we go again, Geoff is taking his well-deserved holiday so you will have to put up with my ramblings! I hope everyone has been enjoying the good weather and getting out and about as there have been some great events on offer. I understand the Annual Sweet Pea Rally at the Sheffield SME was well attended and enjoyed by all. One of the next events will be the Dreaming Spires Rally at the City of Oxford SME in July. The Bristol Society is hosting this year's IMLEC so I expect that competition to be keenly contested. It is an excellent track at Bristol for this type of event so hopefully it will be a good weekend (*it was! Ed.*).

The summer edition of the **National 2½" Gauge Association** magazine begins with an appeal by the editor, Cedric Norman for more material for the magazine as his cupboard is now bare; however, the current offering has lots of interesting bits and pieces within its pages and includes a detailed description of the cab regulator operating mechanism on a Gresley A4. Because the regulator on these locomotives can be operated from either side, the cross shaft connecting the two operating levers together is subject to flexing. To overcome this problem a small central gearbox was fitted so that this potential flexing could be eliminated. The application to a model was a clever piece of

model engineering.

This year marks the 125th Anniversary of both the **Society of Model and Experimental Engineers (SMEE)** and *Model Engineer* magazine. In the latest issue of the *Journal*, chairman Allen Berman thanks the retiring chairman, Alan Wragg for all his hard work in maintaining the Society's work in the model engineering world and promoting its aims whenever it was possible. There have been some other changes to the directors and committees with Norman Billington stepping down as programme organiser and he was thanked for all his sterling work over the recent years. The SMEE are planning some events to commemorate this remarkable achievement with one of the presentations at the Midlands Model Engineering Exhibition. Here they will have a much larger stand than usual where they will showcase a much wider selection of models from their collection. That should be worth seeing! Like every other society, however, they would appreciate some help on the stand during the show which takes place from 12 to 15 October. If you can help please contact Ralph Thompson at the Society for further details. The SMEE have also embarked upon the use of 'Zoom' - an online meetings platform - for their regular meetings and activities so that members who cannot easily get to Marshall House in London can be included. So far it seems to have been a

successful venture for them. To help these meetings even further, the lighting in the main meeting room has been replaced and updated.

There have been changes, too, at the **Nottingham Society** where Nick Harrison has stood down as chairman and Dave Parks has taken over the role. He states in his first club magazine address that one of the main reasons he joined the club was to enjoy himself and he states that, as chairman, he wants to ensure everyone feels the same and that every new member is made to feel welcome in the hope that they will want to join the team. On their Easter Sunday running day they had a variety of locomotives in operation, including a very nice looking 5 inch gauge Maid of Kent driven by Dan Fisher and Steve Andrews was driving an excellent example of a 5 inch gauge 2-6-2 LNER V2 (**photo 1**). Members here have been busy replacing sleepers on the 7¼ inch gauge ground level track as the wooden ones are 'life expired'. Plastic replacements are being fitted. Some new insulated fish plates are also being tried out to try to improve the signals' operation. A great deal of work is also being undertaken on the Garden Railway Gauge 1 layout. The club's Class 20 locomotive is also in the paint shop having a major re-paint. Some members also attended the Sweet Pea Rally at Sheffield to enjoy all the activities there (**photo 2**).

The Prospectus is the club news magazine from the **Reading Society of Model Engineers** and in the July issue, chairman John Billard notes the new cladding on the clubhouse has been completed and below budget. Two new lamp posts have been erected on site and they await the trenches to be dug and the cables fitted. The club members are also planning to refurbish the workshop and are considering the layout and the provision of storage of the existing contents. Discussions are taking place with Reading



Nottingham running day: Steve Andrews and his LNER V2.

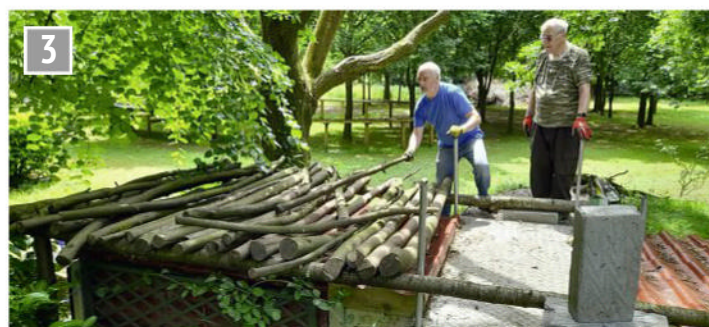


Nigel Ball with his 7 1/4 inch gauge Sweet William locomotive at the Sheffield Sweet Pea Rally.

Council regarding a new lease and a new 10 year deal is being explored by the legal team. Of course, this length of lease would give them a better level of security of tenure - which they would like - but they have been told it will take some time for the Council to reply. They attended the Stoke Row Rally in June which provided a good opportunity to show to the general public what the club could offer and which hopefully might attract some new members. They have an interesting evening lined up for 24 August when Simon Bowditch will present a talk about the restoration of the Welshpool and Llanfair tank locomotive No. 823.

In the **St Albans & District**

Model Engineering Society's July Newsletter, chairman Mike Collins is asking members to provide all the help they can in the organising of the club's annual exhibition in the Townsend School on the weekend of the 23/24 September. This is a major event for the Society and all members are asked to contribute. Some trees at their Puffing Field track site have been identified as probably being unsafe so they have had to postpone public and club running for the moment. The Newsletter shows a good photo of the precautions the club have taken to try and prevent any damage to their track while these arboreal operations take place (photo 3). Secretary, Guy



Tree protection at the St. Albans Puffing Field track.

Keen writes that the club have applied for planning permission for some storage containers to be installed along with a new bridge and a 45mm track layout but they have been advised that it may be some months before they get a reply. Roy Verden, the previous secretary has been awarded Honorary Membership of the club in recognition of all his dedication and hard work over many years. I am sure it is a well-deserved accolade. Guy Keen has also written a very useful and interesting article about reamers following a sale of such tools at the club recently. He breaks them down into four categories and gives a brief description and diagrams of each type and how it might be used. Roger Stephen has now taken over as the club's boiler inspector and will be assisted by Neil Byrne. Members and their wives enjoyed a day out at the Fawley Hill Railway recently and thoroughly enjoyed the experience. The club has a full and varied activity program listed right through to December.

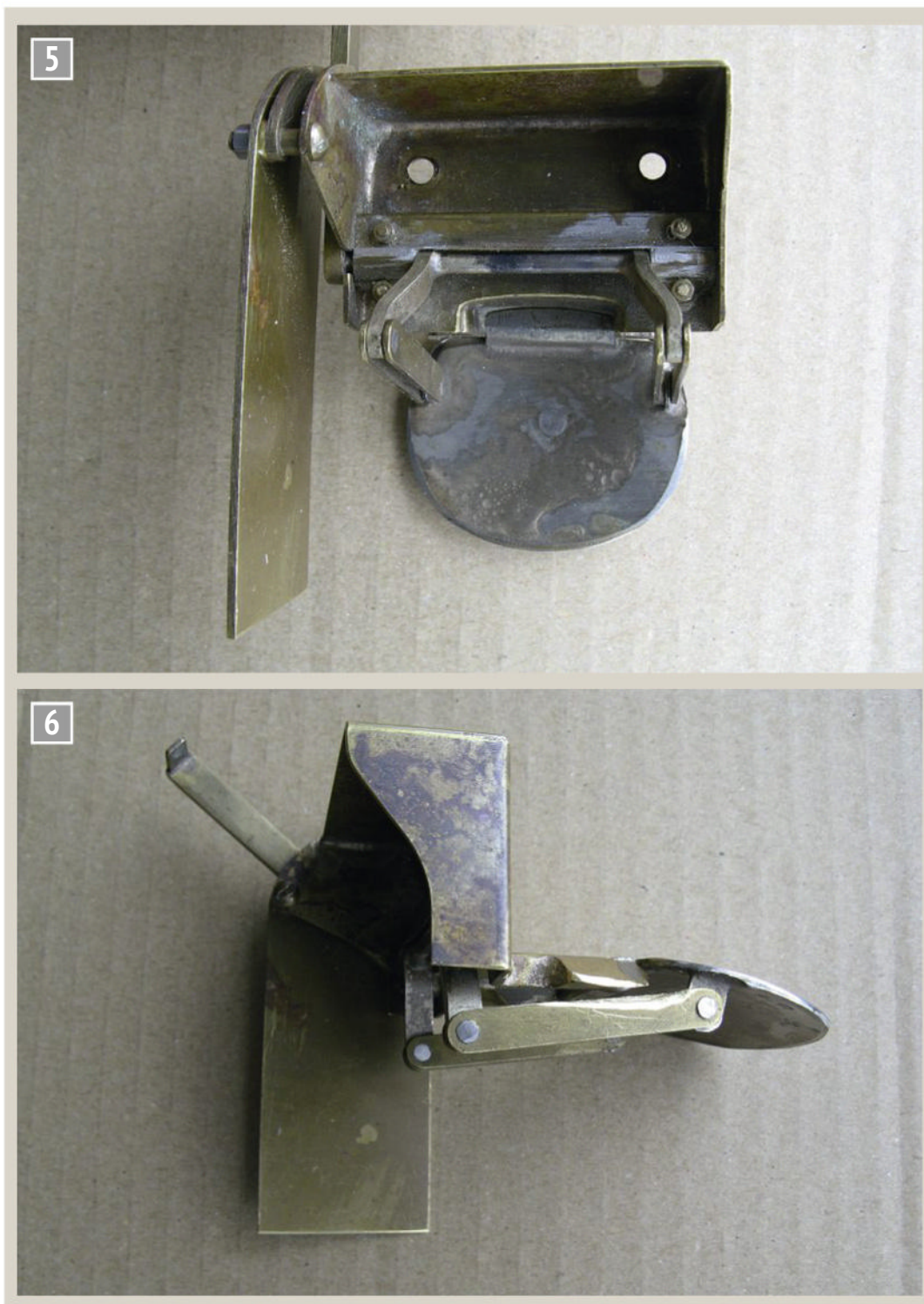
At the **Leeds SMEE** editor Geoff Botterill reflects how pleasant it is to be outside enjoying our hobby without having to wear layers of warm clothing. The club's boating lake is so full that there is no problem with running aground when approaching the island and the rescue boat is rarely launched at the moment. The

club are still searching for a suitable area of land on which they could re-establish their track and club. They do have quite a busy summer program though, with the portable track out and about at different events. A very sad obituary is also noted; one of their younger members, 22 year old James Adderway passed away in May. James had just completed his engineering apprenticeship and was looking forward to a promising future. I would like to offer ME's condolences to his family and the club for their sad loss. Another member has been busy restoring a Railway Block instrument which made him scratch his head. He noted that it looked like it started life as a single line instrument but had been modified to cover two lines by adding a further 4 inches to the casing. The finished instrument looks a fine job (photo 4).

The current issue of The Newsletter from the **Bristol SMEE** contains a great little story about a blue tit's nest found in their traverser mechanism adjacent to the steaming bays. Needing to do some work on the traverser they found a nest with 10 eggs tucked away by the locking pin support. It was not disturbed but they carried on working, expecting that by the following week the nest would have been abandoned. Not a bit of it! In that week the eggs had hatched and they found 10 little



Collage of the block instrument repair.



Two views of the LNWR firehole door fitting built by Peter Everet for his new locomotive.

chicks all with their beaks open wanting food. The parents were very active and proceeded to feed the chicks in between the gaps of the trains running over the top of them. They have now all fledged successfully and work can now continue on the traverser re-alignment. Chairman, Steve Birch remarks how the improvement in the weather over recent weeks has enabled the club to put

all the finishing touches in place ready for the IMLEC competition event. They had 33 locomotives booked in which was a 32% increase over last year, so hopefully it was a good weekend. It was certainly well supported this year. This year also sees the 50th Anniversary of the Ashton Court Railway and they are trying to get a display of as many locomotives as they can that have operated

on the railway. Richard Pearson is preparing a photographic display of the railway over the years to show recent members what has happened over that time. A suitable birthday cake is also being arranged. The club held an 'On the Table' night in April and there were some interesting models and parts on show. John Whale is building a 5 inch gauge model of a little Peckett 0-4-0

locomotive which, although standard gauge, had only 2 feet diameter driving wheels. He is using Tich wheels and boiler with a modified Juliet chassis. The original was built in 1909 and lasted until 1961 working in the Surrey Yorktown Gas Works. One member, Peter Everet who is building a 5 inch gauge LNWR George the Fifth class engine, has built the traditional LNWR Firehole door which opens inwards into the firebox and provides an internal baffle over the aperture. I hope the photos explain it in more detail (**photos 5 and 6**). Derek Todman gave a description of the work he has done on lining out his 3 inch scale Fowler A3 traction engine and his message to the meeting was 'you need lots of practice to produce a proper job!' The club have been invited to visit Stephen Wessel's 5 inch gauge Garden Railway in August.

The June Newsletter from the **Gauge 1 Model Railway Association Yorkshire Group** contains lots of information about future gatherings and events, for example the Warley National Model Railway Exhibition at the NEC on 25/26 November. There are the regular meetings at the Drax Sports & Social Club and if these are of interest contact secretary@gauge1north.org.uk for more information. It also contains a good range of models and equipment for sale by members.

The **Stockholes Farm Railway** news sheet lists lots of activities at the railway and in June they held their first full rally for 16 years when they held an event to commemorate the 100th Anniversary of the LNER. Three visiting locomotives combined with the club's own fleet made for some interesting trains and running. A commemorative cake was baked and suitably decorated in LNER colours by Ivan's wife, Barbara and then consumed. On that happy note I will return you to the very capable hands of Geoff Theasby for the next instalment of Club News.

ME

Club Diary 24 August– 4 October 2023

August

24 Newton Abbot and District MES

Track evening at club site. See nadmes.org.uk

24 Sutton MEC

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

26 Brandon and District SME

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

27 Canterbury MES

Public running. Contact: ginapearson@btopenworld.com

27 Warrington and District MES

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

27/28 Bristol SMEE

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

27/28 North Wilts MES

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

31 Guildford MES

Open day, 10:00-13:00. See www.gmes.org.uk

September

2 Bromsgrove SME

Open Day – all gauges welcomed, 5, 3½, 2½, G1 and 16mm. See www.bromsgrove.co.uk Contact : Doug Collins, 01527 874666

2 Tiverton and District MES

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

2/3 Canterbury MES

Open weekend. Contact : ginapearson@btopenworld.com

2/3 Sale Area MES

Open weekend at Walton Park, M33 4AG, from 10:00. See www.waltonparktrains.co.uk

3 Canterbury MES

Public running. Contact: ginapearson@btopenworld.com

3 Newton Abbot and District MES

Autumn BBQ at club site. See nadmes.org.uk

3 North Wilts MES

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

3 Taunton Model Engineers

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

3 Warrington and District MES

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

5 Taunton Model Engineers

Meeting, West Buckland, 'bits and pieces', 19:30-21:30. See www.tauntonme.org.uk

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 and 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 and 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 and District MES

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

17 Warrington and 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 and 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 and 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 and District MES

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

28 Newton Abbot and 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 and 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



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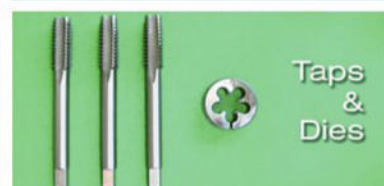
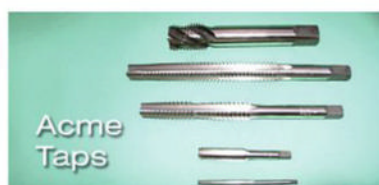
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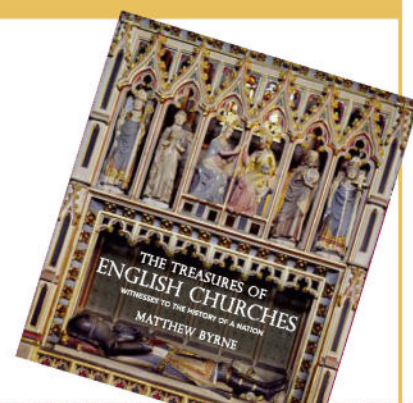
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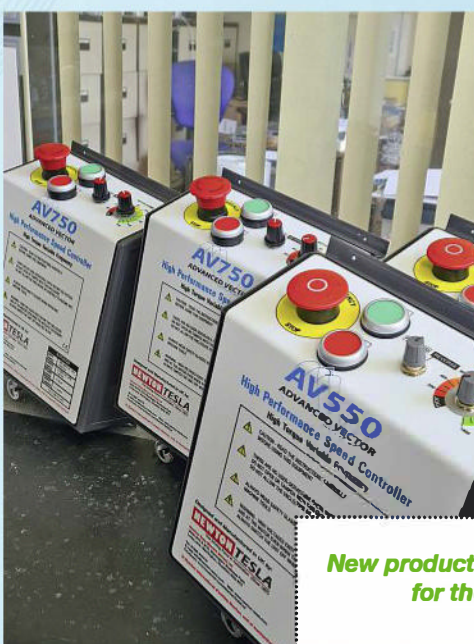
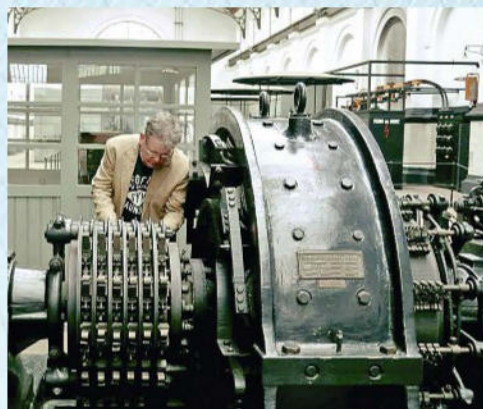
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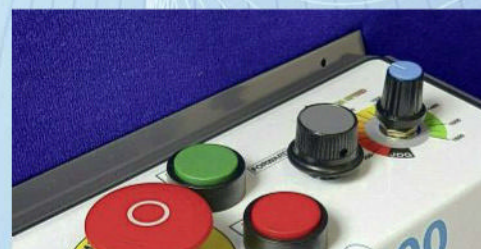
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