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**THE MAGAZINE FOR MODEL ENGINEERS**

# **ENGINEERING in Miniature**

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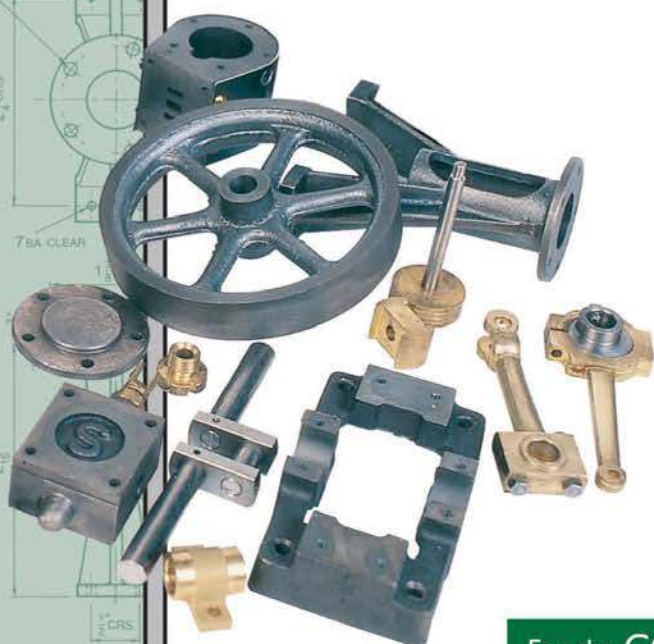
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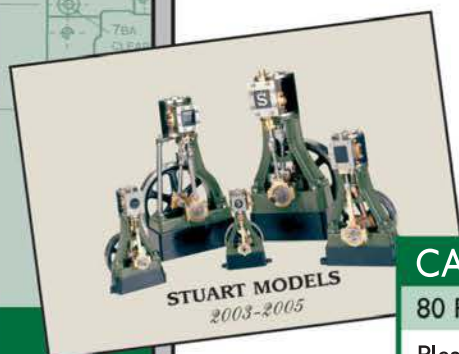
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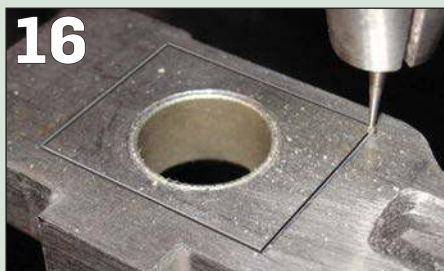
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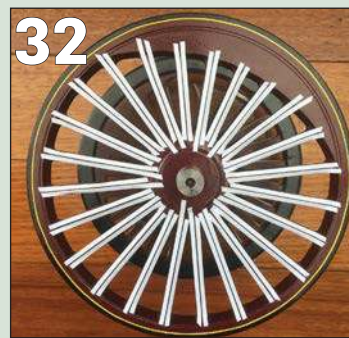
### FRONT COVER

The Harlington Locomotive Society brought a very different aspect to the display of part-built models to the London show – our full report begins on page 20.

Photo: Andrew Charman



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### EDITORIAL

## What's in a name?

Welcome to EIM and as I write this I'm thinking back to this year's London show, which I enjoyed at an Alexandra Palace uncharacteristically framed by deep blue skies.

From the comments of colleagues and friends afterwards it's clear there was some disappointment felt this year, one telling comment being "Where did half the show go?" Yes, it was smaller, that was a stark fact one could not get away from. Some notable names weren't there and it's pretty easy to notice when such major players are missing. But one has to have some sympathy for the organisers – it's absolutely vital that our capital has a major model engineering show, and this is the only one left. But London is such a difficult place, particularly in terms of cost, in which to both stage and attend such a show.

I still enjoyed a full day's entertainment, because as John Arrowsmith reports in this issue, there was no lack of quality on display, with some truly stunning models to spend time admiring. We're told there were plenty of visitors again this year and that's good to hear – it's vital to support our shows, and the more visitors they get, the more attractive will they be to some of those names that are currently holding back.

I do have a bee in my bonnet this month, and it involves that oh-so well-known model railway manufacturer Hornby, and plans to celebrate its centenary with some special limited edition models – even reproducing some of the early tinplate trains.

Included in these plans are a new range of Steampunk-themed models. We report further on page 37 but basically Steampunk is industrial-revolution sci-fi – weird and wonderful engineering creations using 'old-tech' and as a result striking a chord with some model engineers. Visitors to the 2019 London show will recall the Steampunk display that certainly had everyone talking, especially the fashion that goes hand-in-hand with the hardware.

Now I've always been a big fan of Hornby and – say it quietly – I'm actually rather drawn to the whole Steampunk thing and I think the model idea is great. So why am I so peeved? Because in seeking a suitable name to market its range under Hornby has pulled out of its bits box of owned brands – Bassett-Lowke...

I'm sorry, this is not any old name. Bassett-Lowke was model engineering royalty, the firm and the man's influence still felt in so many areas of the hobby today. If you are going to revive Bassett-Lowke in the 21st century, it should still be on something core to model engineering – not plastic electric trains...

**Andrew Charman – Editor**

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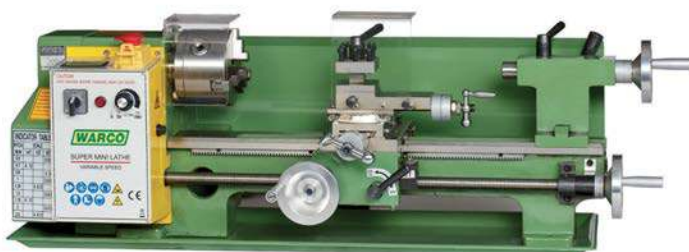
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| Setrack Curve - 6 Pack                                                                                            | ST605x6  | £48.00  | Brunel                                                     | MBrunelOG | £460.00 | Steam Regulator Kit                       | DSUPDLDL  | £29.00 | Toby the Tram                        | 91405 | £230.00 |
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**UK RRP £3200.00 for the kit and £4200.00 for the RTR**



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# A Muncaster double-acting oscillating steam engine

Following on from his simple Muncaster described in the January 2019 issue of **EIM**, Geoff returns with something a little more complex.

BY GEOFF WALKER Part one of two

The original design for this engine can be found in the book *Model Stationary Engines* written by Henry Muncaster in 1912. This book has for more than 100 years been popular with model engineers and features a wide range of models.

This is one of the simpler designs and is a single cylinder, double-acting oscillating engine. It is unusual in that the cylinder is inverted and has an overhead crankshaft and main bearings supported on a dual A framework. **Figure 1** is the drawing of the engine from the 1912 book.

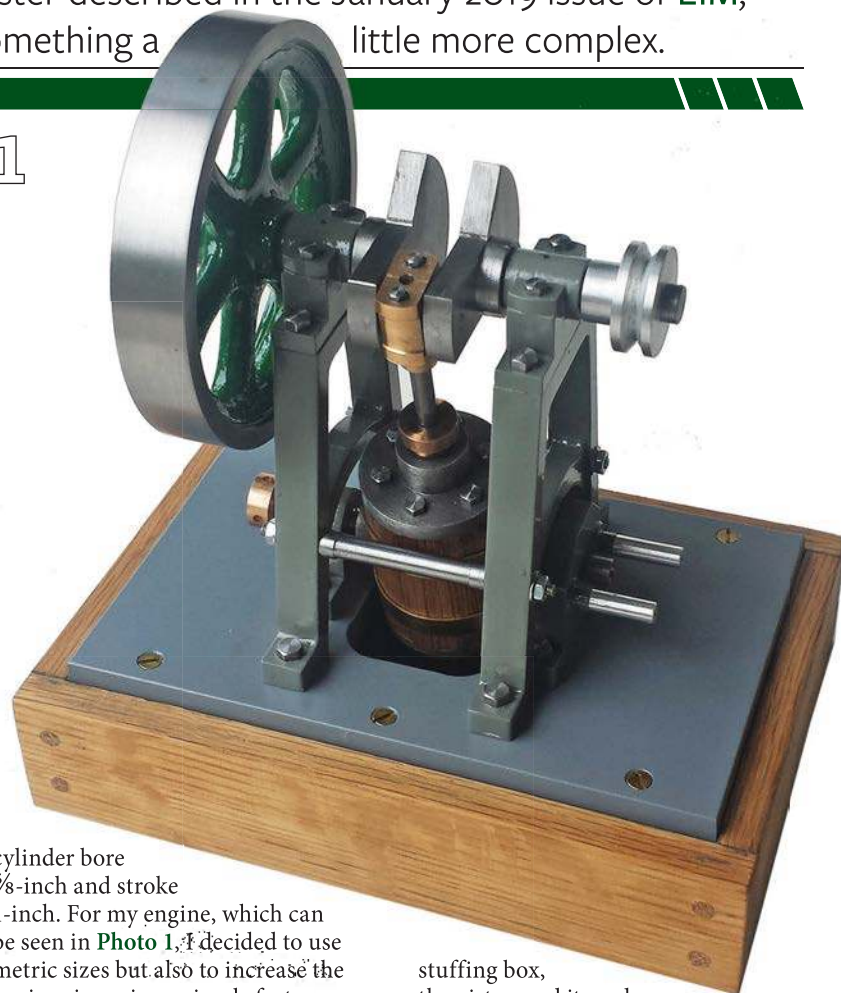
It is probably not a model for a complete beginner but would be suitable for an enthusiastic improver seeking additional skills, knowledge and experience. That was certainly the case for me as I completed a more basic single-acting oscillator before attempting to make this engine.

Equipment wise, a lathe, a drilling machine, a milling facility and a reasonable selection of hand tools and marking-out tools are required. A rotary table is also needed and for the purposes of this article I will assume you have or have access to one.

The principal sizes in Figure 1 are

Henry Muncaster's book 'Model Stationary Engines their Design and Construction' was first published in 1912 and described eight different designs. Today the book is still available from TEE Publishing – [www.teepublishing.co.uk](http://www.teepublishing.co.uk)

1



cylinder bore  $\frac{5}{8}$ -inch and stroke 1-inch. For my engine, which can be seen in **Photo 1**, I decided to use metric sizes but also to increase the engine size using a simple factor whereby each  $\frac{1}{32}$ -inch would be increased to 1mm. From this factor the bore is enlarged to 20mm and the stroke to 32mm. All the other sizes have the same conversion factor apart from a few minor exceptions.

It is not my intention to provide fully detailed build instructions and drawings for this engine. My aim is an article which will be of interest and provide enough information and hopefully inspiration for any prospective builder. Any machining or construction methods are just my way of working – there are of course always alternative ways. Any guidance will only be given where I feel it may be of real help. For any queries or specific build-related questions I would be more than happy to be contacted by email via the editor.

The article will be in two parts, in this issue covering the base, the framework, valve and pivot blocks, the main bearings and the flywheel.

Part two will cover machining the cylinder casting, cylinder caps and

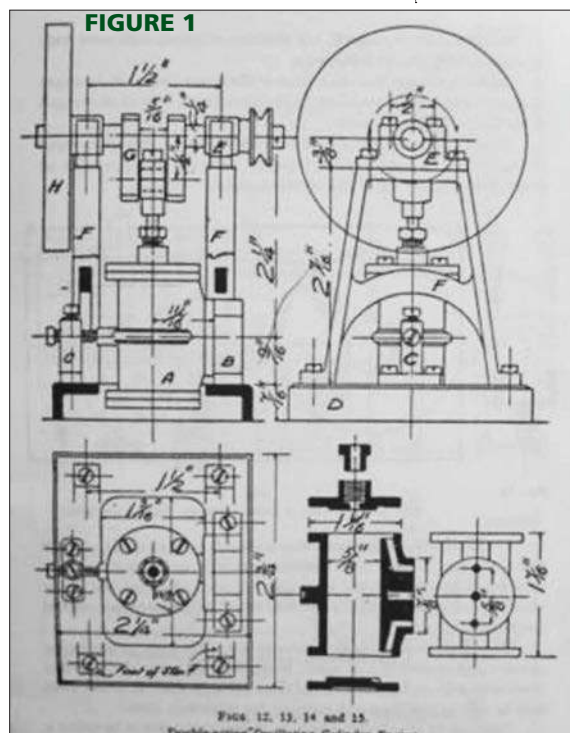
stuffing box, the piston and its rod, big-end bearing and the crankshaft.

The cylinder used in this engine is a cast-iron casting from my own pattern (**Photo 2**). I have a small batch of these castings which I can make available at a nominal cost to any prospective builder. The 90mm ( $3\frac{1}{2}$ -inch) flywheel casting is available from Stuart Models. ([www.stuartmodels.com](http://www.stuartmodels.com))

## Beginning construction

My general part assembly drawing, **Figure 2**, is intended to show the relative position of all the component parts of the engine. Now I must say that the drawing is somewhat disjointed and may not please the eye of the purist. These are part projections which are not complete but I do feel that the drawing conveys the basic information in a way that is easy to understand. Reference will need to be made to the additional drawings and text in the two parts for more information and sizes.

The mild steel base in the drawing





Muncaster Double Acting Oscillator  
20mm bore x 32mm stroke

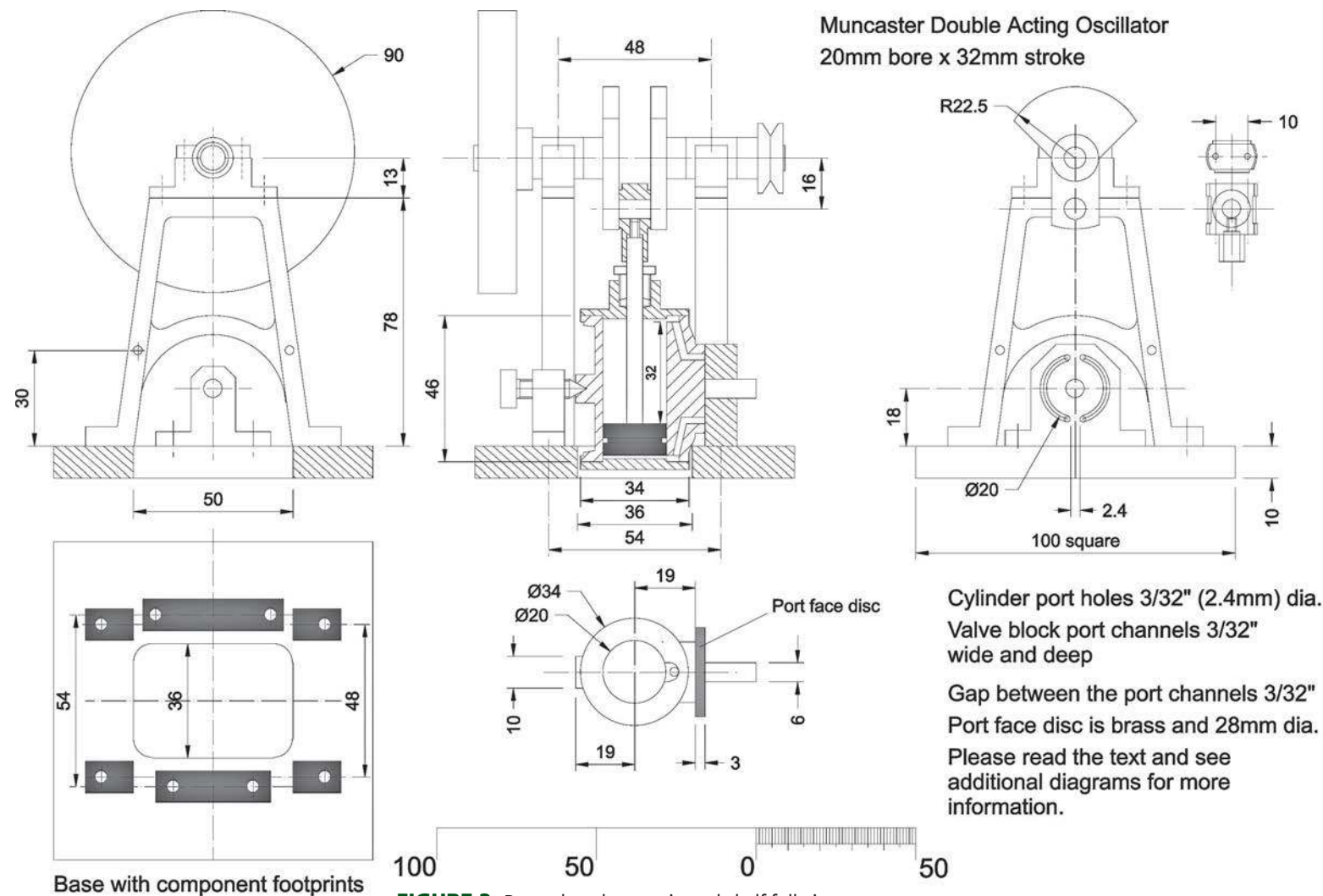


FIGURE 2 Reproduced approximately half full-size

is smaller than in photo 1, being 100 x 100mm in the drawing and 100 x 150mm in the photo. I used 10mm thick material because I believe a heavy-section metal base and the balanced cranks make the engine much more stable when under power.

The hardwood frame in the photos has dowelled corner lap joints and is rebated top and underside to accept the steel base on the top and a plywood base on the underside. A plain flat hardwood base with a recess in the middle would suffice if you wish to make it simpler.

The steel base in Figure 2 shows the footprints of the framework, the valve block and the pivot block, the fixing hole positions are also shown but no sizes are given. I would suggest drilling the fixing holes in each of the parts, then clamping each part in the footprint position using toolmaker's clamps and then spot-drilling through the holes to locate the hole positions on the base. The base holes can either be clearance holes for nuts and bolts or tapped holes for holding down screws. The machine screws used in this model are mainly BA but close metric screws would be fine. For the BA screws I use Macc Models in Cheshire – my only connection with

**PHOTO 1:**  
Finished engine.

**PHOTO 2:**  
Rough and partly fettled cylinder casting.

**PHOTO 3:**  
Machined and clad cylinder.

*All diagrams and photos by the author*

this firm is as a satisfied customer ([www.maccmodels.co.uk](http://www.maccmodels.co.uk)).

In the centre elevation the cylinder has been drawn in section with a plan view below. The cylinder is made from cast iron but the circular port face which bears against the cast-iron valve block is brass and is bonded to the casting with adhesive, in my case JB Weld. An unmachined and partly fettled casting is shown in **Photo 2**. My original plan was to design the cylinder casting pattern so that the port face is included in the casting. I decided against that as it was easier for

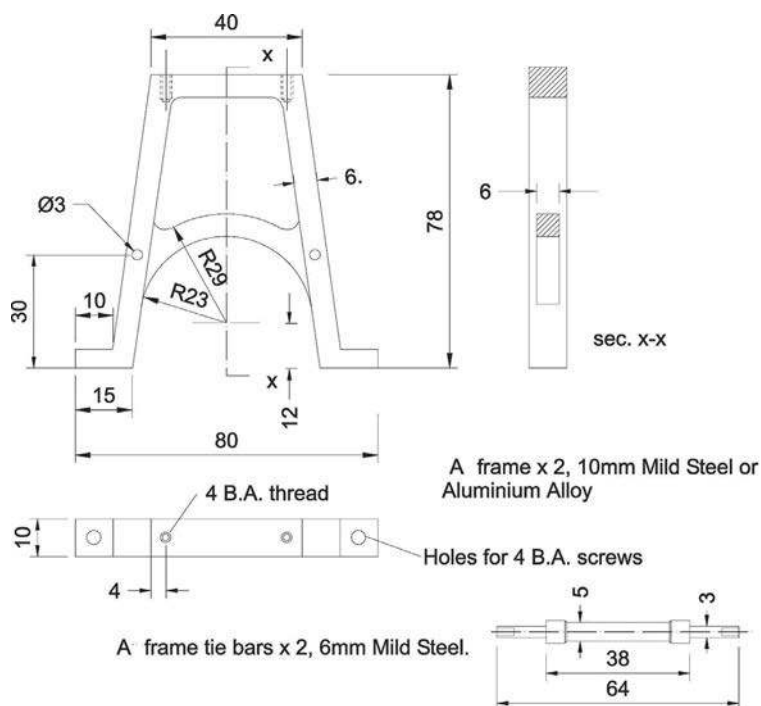
me to make the pattern and keep the pivot boss and trunnion boss accurately aligned by omitting the port face.

I used brass for the port face because as a softer material than the valve block it is possible to create a good mating surface between the two parts. This is easy to achieve so long as the trunnion hole in the valve block and the trunnion and port face are truly square to each other. A fine lapping compound and oil can be used to hand lap the mating surfaces together. **Photo 3** is a machined and



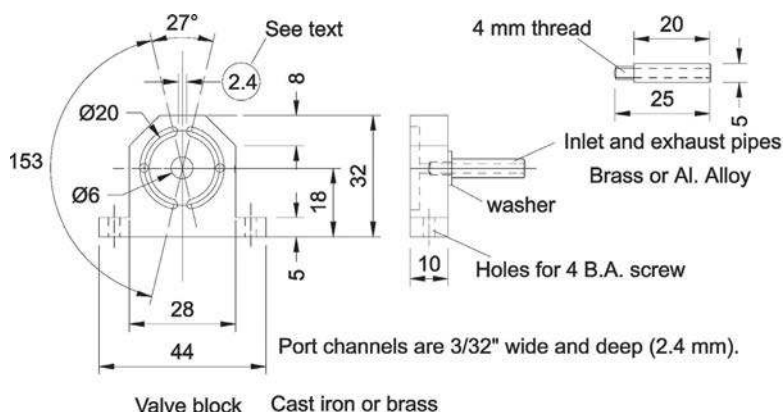


**FIGURE 3** All drawings on this page reproduced approximately half full-size

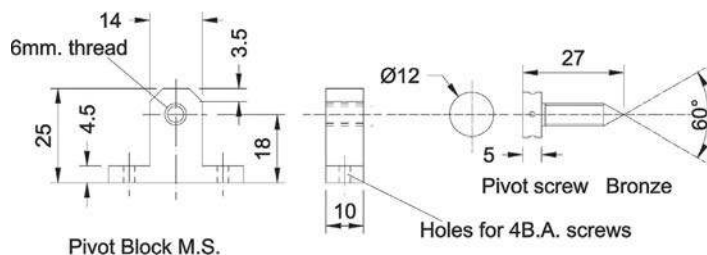


*"It is probably not a model for a complete beginner but would be suitable for an enthusiastic improver seeking additional skills, knowledge and experience."*

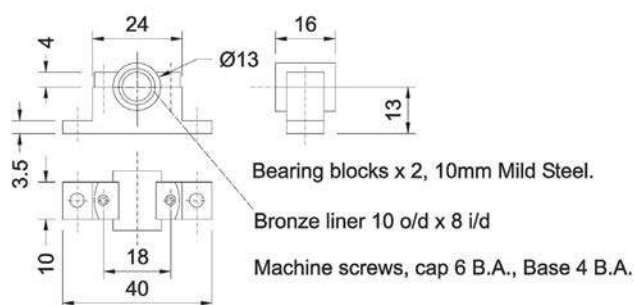
**FIGURE 4**



**FIGURE 5**



**FIGURE 6**



clad cylinder casting, with the brass port face fixed in place using JB-Weld.

### The A-framework

As can be seen in Photo 1 there are two A-frames which make up the framework supporting the main bearings and the crankshaft. These are linked together by two mild-steel tie bars. The tie bars are an addition of mine and not included in the original Muncaster drawing. I feel they add something to the design both structurally and visually. They certainly make for a stiff framework, converting the frames into a single unit and are helpful when assembling the resultant framework onto the base.

The A-frames in **Figure 3** are made from either aluminium alloy or mild steel, 80mm wide and 10mm thick. **Photo 4** shows the two frames prior to machining linked together with 6mm silver steel dowels. These keep the two aligned for initial machining operations.

The radius on the underside of the curved cross link can be formed by clamping the two frames to a lathe faceplate. With the radius origin centred, drill and then bore to the 23mm radius. The outside edges of the frames can be sawn roughly to size and then a milling facility used to finish them up to the marked lines. Drill the two holes for the tie bars and then separate the frames.

With the frames parted it will then be found easier to remove the enclosed material above the curved cross link. The straight inside edges can be finished with the side of an end mill, the curved edge by the same method using a rotary table, see **Photo 5**.

Having said all that I can tell you that I know of a model engineer who has made this engine to my sizes and had the frames laser cut by Model Engineers Laser of Doncaster ([www.modelengineerslaser.co.uk](http://www.modelengineerslaser.co.uk)). You may wish to buy them ready made and save the time and effort making them.

### The Valve Block

The valve block in **Figure 4** is made from cast iron, however brass could be an alternative – as the cylinder port face is brass, then brass for the valve block with a cast-iron trunnion would be a good combination.

The trunnion hole and the face must be dead square and the face should be lapped flat on Wet & Dry paper with the paper resting on a truly flat surface. The port channels are milled  $\frac{3}{32}$ -inch (2.4mm) wide and deep with a  $\frac{3}{32}$ -inch end mill (**Photo 6**).

The angular settings for machining the channels on a rotary table are shown in **Figure 5**. With

*"As the cylinder port face is brass, then brass for the valve block with a cast-iron trunnion would be a good combination"*



4



these settings the unmachined portion between the two channels top and bottom will be close to 2.4mm. Check this size with Vernier calipers and make whatever size is indicated the size of the port holes in the brass port face disc, or as near as you can but no bigger. When the piston is at TDC (top dead centre) or BDC (bottom dead centre) the holes should be covered and not exposed to the port channels so there can be no steam/air entering the cylinder.

### The Pivot Block

The pivot block in **Figure 5** is made from 10 x 25mm section mild steel and is 36mm long. The centre height of the hole from the base is 18mm and should be identical to the centre height of the valve block. This hole needs to be drilled and then tapped 6mm, dead square to the face of the block. The bronze pivot screw has four small holes drilled around the circumference which are for inserting a small lever to adjust the tightness of the screw. A knurled grip is an alternative to the lever holes.

### Aligning the blocks

The two blocks need be positioned accurately on their footprints and to assist with the alignment I would suggest using a short length of prepared 6mm silver steel. Take a piece about 75mm long and turn down one end for about 15mm to the tapping-size diameter of the hole in the pivot block. Insert this reduced end into the pivot block and the other end into the valve block. Now clamp the blocks in their footprints on the base and spot drill through the base holes to mark the position of each one. When both blocks are fixed to the

*“They are designed to look like a block in two parts with a base and a removable cap but they are one piece...”*

**PHOTO 4:**

The A-frames prior to machining.

**PHOTO 5:**

Milling an A-frame.

**PHOTO 6:**

Milling the channels in the valve block.

**PHOTO 7:**

Construction method for the engine's main bearings.

5



6



base you should then have a perfect alignment of the two holes.

### The Main Bearings

The main bearing blocks in **Figure 6** are made from 10mm thick mild-steel

bar. They are designed to look like a block in two parts with a base and a removable cap but as **Photo 7** reveals they are one piece with a 13mm or 1/2-inch (12.7mm) round bar held in place with Loctite.

7





8



**PHOTO 8:** The flywheel jig mounted on the lathe.

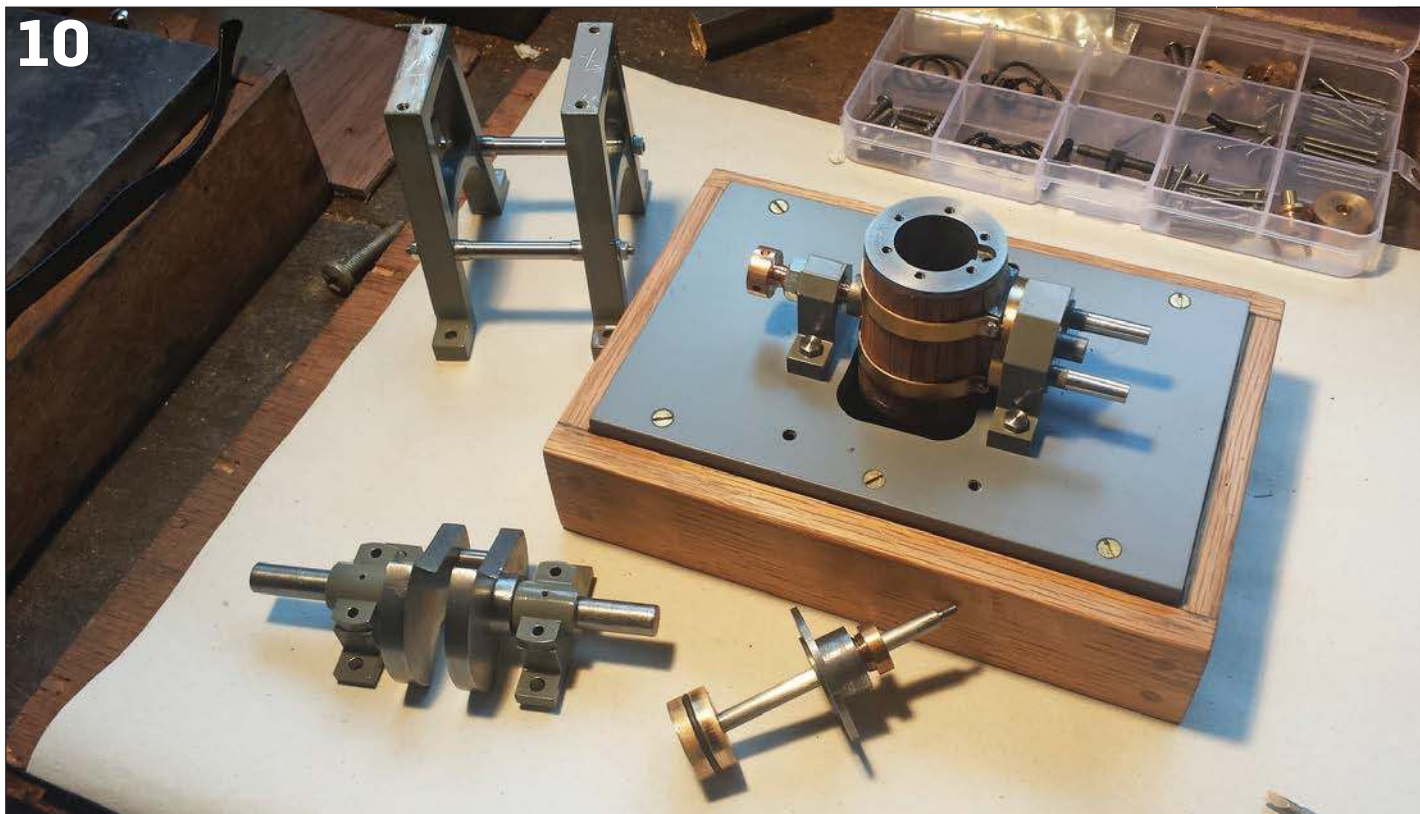
**PHOTO 9:** Machining the flywheel on the jig.

**PHOTO 10:** Assembling the base components.

9



10



The drawings show a bronze liner with an 8mm bore also held in place with Loctite. If you have some 12.7mm round bronze then they could be made from that with no need to add a liner. The centre height of 13mm should be identical on both blocks.

To attach each block to the top of the A-frames first link the two frames with the tie bars to make up the framework. Clamp each block centrally on the top of the A-frames and to ensure the alignment of the blocks pass a length of 8mm silver steel through the bearing holes. Spot drill through the four base holes to mark the hole positions on the framework. Then drill and tap each hole for 4BA screws or for studs and nuts if preferred.

## The Flywheel

The flywheel is a Stuart casting. I used the 3½-inch wheel as the size seemed about right for this engine. **Photos 8 and 9** reveal how I machined the wheel. Photo 8 shows a plywood jig which has a shoulder turned to the same diameter as the inner rim on the wheel. The rim fits snugly on the shoulder and the wheel is secured in place with the three coach bolts, nuts and plates, taking care to tighten each nut evenly to ensure the it runs true.

At this setting the circumference, the outer rim, the face of the boss and the bore can all be machined to size as in photo 9. I bored the crankshaft hole to a little under 8mm and finished the hole with a hand reamer using the tailstock centre as a guide.

The wheel can now be reversed

and held in the outside jaws of the chuck for machining the opposite outer rim and boss. Take care to protect the finished circumference from the chuck jaws using some protective alloy shims.

## Joining the parts

All the components made so far should be fixed centrally on the base and be set dead square to the base centre line in the marked footprints. **Photo 10** shows the valve and pivot block attached to the base with the cylinder casting in place. The fixing holes for the framework can also be seen in the photo. It would be helpful to have a datum edge on the front of the base and from this mark out a parallel centre line. A try square can be used from the datum edge to align each part square to the centre line.

Part 2 will cover machining the cylinder casting and related components, the crankshaft and the big end bearing, concluding with some brief notes on finishing, painting and assembly. **EIM**

■ Interested in this build but desire to make something a little simpler first?

Geoff's single-acting Muncaster engine was described in the January 2019 issue of **EIM**. To buy a copy call 01778 392484 or go to [www.world-of-railways.co.uk/engineering-in-miniature/store/back-issues](http://www.world-of-railways.co.uk/engineering-in-miniature/store/back-issues)





# Gas-fired vertical boiler for the EIM Steam Plant

The conclusion of the EIM Steam Plant project as Martin steams his newly-built boiler.

BY MARTIN GEARING – Part Seventeen of Seventeen

**■ Author's note:** My description of the boiler test procedure for this 'Below 3 bar-litre' steam boiler follows the 2012 test code (Green book), which has now been superseded by the 2018 Volume 1 'Below 3 bar-litre' test code (Orange or White book depending on the way you see it).

This current test code is in my opinion less demanding in the long term – but following the instructions below for the initial test procedure, which is identical in the first year, will guarantee compliance."

**B**efore the boiler can be given a valid boiler certificate to operate, it will need to be subjected to a 1½ times hydraulic test with all the fittings in place prior to a steam test, at which point the safety valve can be set to operate at the correct working pressure of 60psi. These two tests are usually carried out by a club boiler tester who will supervise the operations in the presence of a witness.

Note that as the copper boiler we have described is below the 3 bar/litre capacity the 1½ times working pressure hydraulic test is only required once to check all the fittings and not repeated unless the boiler has a structural modification carried out. For a copper boiler of above 3 bar/litre capacity, the 1½ time working pressure hydraulic test is required to be repeated every four years.

Preparation of the boiler for the test is as follows;

- 1) Disconnect the exhaust pipe connection to the smokebox cap and the steam supply pipe at both ends
- 2) Remove the safety valve, main stop valve and filler plug
- 3) Remove the smokebox cap
- 4) Replace the main stop valve
- 5) Fill the boiler with cold clean water using a small funnel
- 6) Replace the filler plug with a copper washer and tighten
- 7) Fit an adaptor to the safety valve extension. Fit the boiler tester's pump with a copper washer and tighten
- 8) Remove the three securing screws and remove the boiler from the firebox.

The boiler tester will then connect their test pump to the adaptor, and raise the pressure slowly in stages until a pressure of 90psi is achieved.

The boiler tester will examine the boiler and all the fittings, observing if there are any issues that will demand attention (**Photo B132**).

Assuming that all is well the pressure will be reduced slowly and the test adaptor removed. You then need to open the gauge glass blow-down valve and drain the water until the gauge indicates the water being just below halfway on its length.

Depending on circumstances it is usual that the boiler tester will take the pressure gauge and mark on the scale, with an indelible pen, a 'Red' line, the precise position of the needle when at the working pressure of 60 psi. If the gauge is already marked they will check that it is accurate.

## Steam (accumulation) Test

The following assumes the steam test follows on directly after the hydraulic test and the boiler has its water showing just below halfway on the gauge glass.

- 1) Replace the boiler onto the firebox and secure. Remove the main stop valve, filler plug and replace the smokebox cap
- 2) Replace the main stop valve, safety valve and filler plug with copper washers
- 3) Reconnect the two steam supply/exhaust and one hand-feed pump water pipes
- 4) Fit a length of flexible pipe onto the hand pump inlet stub and place the free end in a container of clean water
- 5) Operate the hand pump slowly and watch to see if the level of water in the gauge glass rises. If this is not the case find the cause and rectify. **Do not attempt to run unless you can feed water into the boiler using the hand feed-pump.**
- 6) Fit the control valve to the gas cartridge and connect the gas supply pipe to the mounted end fitting of the gas burner
- 7) Open the gas control valve half a turn, and ignite the gas by means of a source of ignition passed through the 13mm diameter ignition hole in the front of the firebox
- 8) When the burner has ignited allow it to warm for at least 30 seconds before opening the gas control valve a further 1½ turns.

The boiler tester will check every



This series builds a boiler suitable for powering the EIM Steam Plant, serialised in the magazine between October 2016 and December 2017

joint in the gas supply for leaks using a brush and soapy water.

After a short period the needle of the pressure gauge will move off its stop pin, eventually rising to a point near to the red line indicating the 60psi working pressure. The boiler tester will then adjust the safety valve so that it 'blows off' or 'relieves' at or just before 60psi, and having done so they will check that the pressure does not rise more than 66psi (working pressure plus 10 per cent) whilst continuing to be fired at the burner's maximum rate.

The firing rate is then dropped and the pressure allowed to fall. This is often speeded up by pumping in cold water to replace that lost by the safety valve blowing off using the hand-feed pump.

The firing rate is then increased to maximum again, to double check that the safety valve is in fact set correctly.

The boiler tester will check to see that the hand-feed pump is able to raise the water level in the gauge glass whilst the boiler is at working pressure.

Provided suitable results are obtained from the steam and pump test, the boiler tester will be able to issue a full certificate which is valid

## PHOTO B132:

Setup for hydraulic testing of the boiler.



**B132**



for one year allowing the steam plant to be operated.

Each subsequent year the steam plant will only require to have the pressure gauge red line checked against the master test gauge, followed by a steam test to ensure that the safety valve still blows off at the correct point, so is very much less demanding. This remains the case unless any major alterations to the boiler are carried out.

After the safety valve has been set you are normally free to run the engine and provided that there is steam oil in the displacement lubricator you may do so (Photo B133).

## Operating the steam plant

For those starting out I am providing more or less my standard check list of the points for starting, running and shutting down the steam plant.

### Setting to Run and operating

- 1) Remove the filler plug and pour water into the boiler with the aid of a small funnel, until water appears just below halfway up the length of the gauge glass. Replace the filler plug with a copper washer and tighten
- 2) Fit a length of flexible pipe onto the hand pump inlet stub and place the free end in a container of clean water
- 3) Operate the hand pump slowly and watch to see if the level of water in the gauge glass rises. If this is not the case find the cause and rectify. **Again, do not attempt to run unless you can feed water into the boiler using the hand feed-pump.**
- 4) Check to see that the displacement lubricator is full of steam oil
- 5) Lubricate the engine with light oil at the four oil holes in the port/bearing blocks, connecting rod bearing, along the length of the connecting rod and across the top edge of the port/cylinder face.
- 6) Move the reversing valve lever to the mid position
- 7) Fit the control

*"This small inconvenience will prevent a much greater inconvenience of having to rebore the cylinder to repair the damage caused by corrosion..."*

### PHOTO B133:

The completed boiler with its steam plant.

*All photos and drawings in this series by Martin Gearing*

valve to the gas cartridge and connect the gas supply pipe to the mounted end fitting of the boiler gas burner.

8) Open the gas control valve half a turn, and ignite the gas by means of a source of ignition passed through the 13mm diameter ignition hole in the front of the firebox.

9) When the burner has ignited, open the gas control valve a further 1½ turns

10) After a short period the needle of the pressure gauge will move off its stop pin, eventually rising to a point near to the Red line indicating the 60psi working pressure

11) Move the reversing valve lever to the direction in which you want the engine to run

12) Open the main stop valve quarter of a turn and if necessary turn the engine flywheel by hand to clear any condensation. When the engine begins to turn allow it to run for at least a minute to warm through before opening the main stop valve to achieve the revolutions required

13) Adjust the firing rate using the gas valve on the cartridge to maintain a pressure between 45 and 55psi, which is satisfactory in most cases

14) Check the water level continuously. If the level becomes obscured or appears to have a bubble of air with water above it, open the blow-down valve for the slow count of two (2 seconds) at the base of the lower gauge glass fitting, to clear any residues or air bubble in the glass tube. Repeat until a stable and clear water level is displayed

15) Maintain the water level between half and three quarters of the length of the gauge glass. – Try not to let it fall below half the length of glass.

### Operating for long periods

Should you wish to run the steam plant for a period lasting longer than one hour:

- 1) Reduce the firing rate, around every 50-60 minutes
- 2) Stop the engine by shutting the

main stop valve completely

3) Open the drain on the displacement lubricator and remove its filler plug

4) Wait until all the condensate has drained out

5) Close the lubricator drain

6) Refill the lubricator with steam oil and replace the lubricator filler plug

7) Lubricate with light oil at the four oil holes in the port/bearing blocks, connecting rod bearing, along the length of the connecting rod and across the top edge of the port/cylinder face

8) Open the main stop valve slowly and set the engine in motion again adjusting to give the speed required.

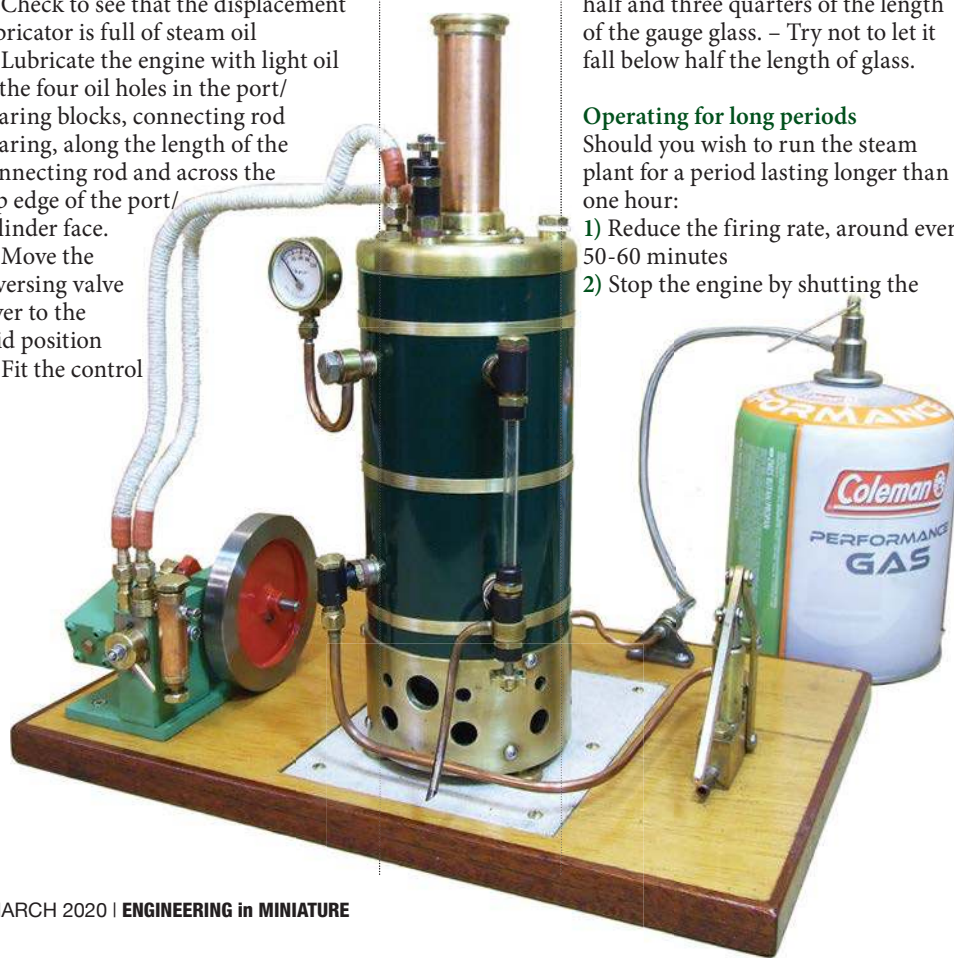
### Shutting down

When you decide that the steam plant has run for long enough:-

- 1) Turn off the gas control valve on the gas cartridge
- 2) Close the main stop valve to stop the engine
- 3) Blow down the gauge glass to remove any build-up of residue. Leave open until all the water has been discharged and the remaining pressure is released
- 4) Disconnect the gas supply pipe to the mounted end fitting of the boiler gas burner, and the flexible water supply pipe from the hand-feed pump
- 5) Drain the lubricator and replace its oil following steps 3 to 6 above
- 6) Slacken both the exhaust and steam pipe fittings on the engine, and move the pipes slightly away from the stubs
- 7) Using an oil can, squirt light oil into the inlet stub whilst the flywheel is rotated by hand, until evidence of oil is seen at the outlet stub. Replace both pipes
- 8) Lubricate the engine with light oil at the four oil holes in the port/bearing blocks, connecting rod bearing, along the length of the connecting rod and across the top edge of the port/cylinder face
- 9) Wipe down the whole steam plant removing all traces of oil and water and any lime scale residue on the chimney, smokebox cap, filler plug, safety valve, main stop valve, boiler, boiler fittings, firebox, copper pipework and hand pump and base.

## Maintenance and Troubleshooting

- If the start-up and shut-down routines are followed the steam plant will remain a reliable performer.
- Just like full-size steam engines regular lubrication during and after running, without fail, will produce a long life by reducing wear to the absolute minimum.
- The 'flooding' of the piston and cylinder at the end of a running session with oil, as described in the





# A 15-inch gauge discovery

BY HARRY BILLMORE

'Shutting Down' section above, is essential to prevent corrosion and this small inconvenience will prevent a much greater inconvenience of having to rebore the cylinder to repair the damage caused by corrosion!

- Keep an eye on the seal of the cylinder block to the port block and tighten the Nylock nut only sufficient to remove all slack – whilst still allowing free movement. A just-visible wisp of steam at the port face is acceptable when the plant is under load at speed. This method of sealing the ports is to be preferred to the more traditional 'Cheap and Cheerful' use of a spring – this by its very nature consumes power continuously.

- Should the reversing valve cease to remain in the position selected, tighten the Nylock nut to increase the 'stiffness' but still allow the valve to be moved throughout its range.

- In the event of the gauge glass appearing slow to respond to changes in water level, remove the top plug and check that the glass tube is not too long, has moved up or been installed incorrectly and that it is covering the communicating hole to the steam space.

## Conclusion

That brings to an end my description for the construction of a basic steam plant. I make no apology that it is intended primarily as a vehicle to give practical experience and build confidence. The description has tried to include sufficient detail, enough to provide a glimpse of the major processes required to build or maintain in principle any steam-operated piece of equipment. All that has been described in this series is able to be undertaken, using traditional basic tools, in the workshop of an amateur given sufficient motivation.

It is my hope that the EIM Basic Steam Plant as presented in its entirety, might become the basis for enhancement and/or development, as it would have been if it had been presented to me when I started.

To my eyes areas crying out for further exploration and development are: A pipework adaption to allow flushing the engine with oil at the end of a run without having to remove and replace two pipes each time; An engine-driven feed pump; Automatic firing for the gas burner; A V-twin engine and a remote-controlled steam road vehicle. I shall watch with interest! **EIM**

**Editor's note** – We know that some readers have been building models by following this series – please send in a picture or two of your build once you have completed it!



On a recent visit to Sri Lanka, specifically to the main railway works at Ratmalana, I came across a beautifully made model, supposedly of the first main-line broad gauge locomotive on the Asian island and built to 1/4-scale, which works out to 16.5-inch nominal gauge.

However I believe this to be a model of B1 class number 30, as this was the first 4-6-0 tender locomotive (as opposed to a tender tank) on the island. The profile also fits better as the first Sri Lankan loco was a 4-4-0 built by Stephenson in 1864.

The engine and its three carriages are brought out on special occasions to run on temporary track wherever it is wanted across the island. The works steam foreman said that if anyone wanted it to run, then they just had to ask and pay the appropriate fee.

The loco is a fascinating combination of true-scale model making and engineering in miniature. Studying the pictures you can see the steamroller tyres fitted, which allow the loco to pass over track of extremely varying gauges. Bits I measured varied from 15 to 17 inches between the rail head. Yet the motion is beautifully proportioned and a true-scale representation of the original.

The boiler too, while the to the correct scale size, has been manufactured to non-scale standards – the size of the bolts holding the top of the dome down indicate this. The engine is also kerosene fired, there being no coal in Sri Lanka. It is therefore very expensive, even for such a small engine.

I think the carriages bear a slight resemblance to those used on the Ravenglass and Eskdale Railway in its early days, just with bogies and doors!

Another interesting find in the shed was a rolling road – this device with three rollers for three wheelsets had me intrigued for a while until I realised the driving wheelset is lifted slightly over the others, while the outer rollers sit on the outer edges of the leading and trailing driving wheels.

As an interesting aside, the model is believed to be the first steam loco built in Sri Lanka, in the works at Ratmalana, though for whom I was unable to find out! **EIM**





# Building a Ten-Wheeler

Jan-Eric looks at alternative metal-cutting methods for his latest 7¼-inch gauge project.

BY JAN-ERIC NYSTRÖM Part two of a series

In addition to laser cutting as described in the opening feature last time, parts can be machined by water-jet cutting, EDM wire-cutting, and, of course, CNC machining. Many hobbyists with more extensive budgets have invested in CNC equipment, and some even enjoy building their own – which can turn into a hobby by itself! Since I prefer to concentrate on designing and building locos (as well as running them) I've chosen not to diverge into that aspect of the hobby, however fascinating it may be.

EDM wire-cutting is a process by which extremely high accuracy can be achieved. Tolerances to within 0.01mm are routinely obtained, and the surface finish is usually extremely smooth, even better than 'RMS 15', which looks (and feels) like a precision-ground surface.

This process, first developed in Switzerland in 1969, can be described as 'path-controlled electrical discharge machining', where a thin, otherwise stationary but continuously advancing wire functions as one electrode, while the moving workpiece is the second electrode. High-voltage sparks are generated between these, which erodes both the wire and the metal of the workpiece. Since the wire is constantly renewed, the cutting accuracy can be sustained.

The process takes place in de-ionized water or another suitable dielectric fluid, as in **Figure 10**. This process is one of the most expensive ways of machining – the costs are calculated per square millimetre of the cut surface! According to a quote I got, a simple cube, 25mm on a side, would cost £150 to machine on all sides with wire-EDM!

If, however, the parts are small and intricate, and need to be made to very tight tolerances, this method may be useful even to hobbyists. **Photo 7** shows a couple of sample parts cut with wire-EDM. Note the very thin flange on the part at right – 0.5mm thick. Dove-tailed parts can be made to a very accurate fit by EDM machining. Just for fun, I took a photo of a piece of spent wire through my microscope – it is only 0.25mm thick!

## Splashing around

Water-jet cutting can, in certain circumstances, be a cost-effective way of machining somewhat larger parts for a live-steam loco. I planned my valve gear so that a single thickness of 10mm steel plate could be used for almost all parts. Most of them are visible in **Figure 9** (*printed last month, Ed*) – there is also at least one spare of each part, anticipating future mistakes in machining...

I have no photos of the actual cutting with a water jet – I didn't want to damage my camera, since there's a lot of water splashing around the machine! The process is extremely effective: hardened steel, several inches thick, can be cut with a millimetre-thick stream of high-pressure water – albeit very slowly.

An abrasive, such as carborundum or diamond powder, is added to the water, so the water jet will almost act like one of those jigsaw blades that cuts in any direction. The thicker the metal, the lower the cutting speed is, a few centimetres per minute – rather than per second, when laser cutting thinner materials.

It would have been impossible to cut the combination lever for my loco, seen in the middle of **Photo 8**, with a



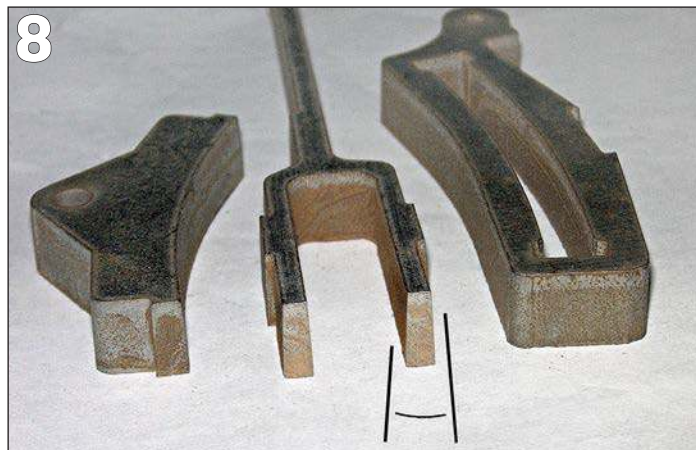
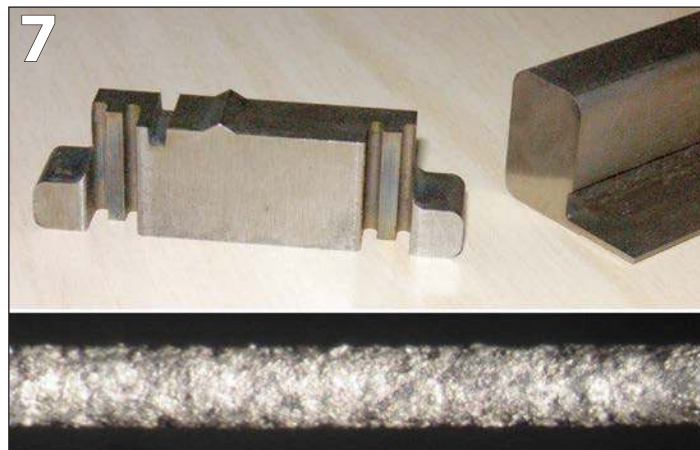
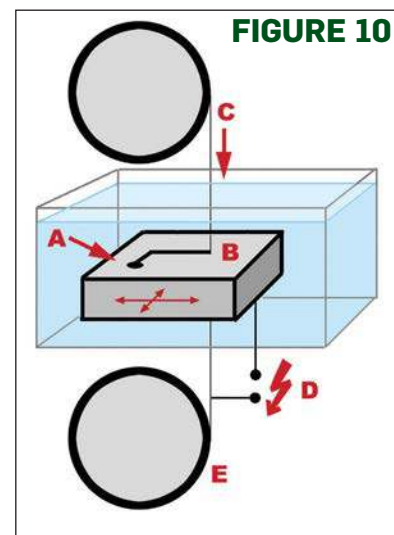
**FIGURE 10:**

Wire-EDM machining: Workpiece A submerged in liquid and moves horizontally. Cut has here proceeded to point B, where continuous sparking erodes workpiece and wire. Fresh wire supplied from C, while high voltage is fed to system at D. Spent wire wound up at E.

**PHOTO 7:** Two parts about an inch in size, machined to fine finish by wire-EDM. Spent wire in microphoto is 2.5mm long and only 0.25mm thick. Finish on cut parts looks and feels like precision ground surface.

laser – very thin sections (less than the thickness of the plate), may melt or deform due to the high power needed to cut a thick plate.

One important consideration regarding water-jet cutting – most surfaces will later have to be machined to a better finish. **Photo 8** shows why: there is a slight taper to all cuts, due to the diminishing cutting power of the jet as it penetrates deeper into the steel. The taper is around 2 degrees – which, by the way, is just perfect for a brake shoe, seen at left in the photo!





“Hardened steel, several inches thick, can be cut with a millimetre-thick stream of high-pressure water...”

**PHOTO 8:**

Water-jet cut valve gear parts. Note slight taper, indicated by black lines. All surfaces will have to be machined, or at least cleaned from rust.

**PHOTO 9:**

Inner edge of horn block ground in small milling machine.

**PHOTO 10:**

Finished horn block with corresponding axle box.

**PHOTO 11:**

Roll pins keep horn block securely fastened to plate frame.

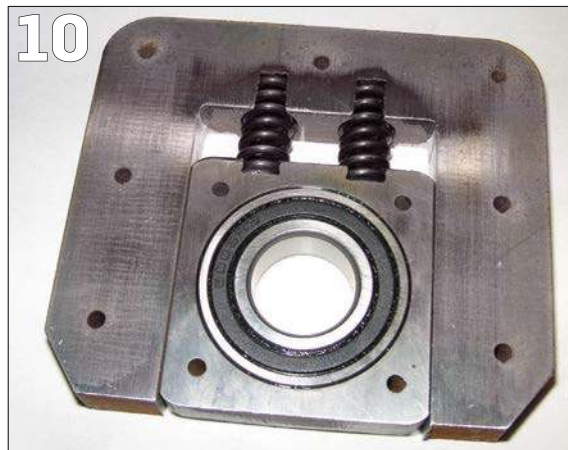
**PHOTO 12:**

Simple design of axle box and springing evident.

**PHOTO 13:**

Slitting saw used to fork end of a connecting rod. Note hole previously drilled into rod.

All photos and diagrams in this series by the author



There's also some 'overshoot' of the cut in sharp corners, so a slight machining allowance of a millimetre or so should be left in the design where appropriate. Since the parts are cut with water, you can also assume they'll have some surface rust when delivered.

### Machining to size

I used water-jet cut horn blocks in my frame, and due to the aforementioned taper, I had left a 1mm machining allowance. How do you best get rid of that? Well, milling is maybe the most 'natural' way of doing it, but since my mill is small (only a 1/3hp motor), I was loath to mill a 10mm thick piece of cold-rolled steel to tight tolerances.

However, the mill is capable of a high speed (some 2500rpm), so in the lathe, I turned a mandrel onto which I mounted a cupped angle-grinder disk. Taking light cuts, I was able to machine the sliding surfaces to a nice smooth finish in just a few minutes, **Photo 9**. I had placed a piece of aluminum plate between the workpiece and the dove-tailed column of the mill, to protect the latter from abrasive dust, and to catch the flying sparks.

**Photo 10** shows a finished horn block, with an axle box incorporating a sealed ball bearing. The outer edges of the horn block were left unmachined, since they will be hidden inside the loco's frame. Note the recesses in both box and block; they keep the springs in place.

**Photo 11** shows how a horn block is secured to the frame: in addition to the four bolts (M4 size), there are three 'roll pins' forced into 3mm holes through the frame plate and the horn block (at the arrows). These pins ensure a dependable assembly; even if a bolt loosens (which it hardly will, since I used a thread-locking fluid...), the pins will keep the horn block firmly in place.

In **Photo 12**, the entire bearing assembly is seen – the axle box is sandwiched between two plates that will be attached to the equalizing members of the suspension. The coil

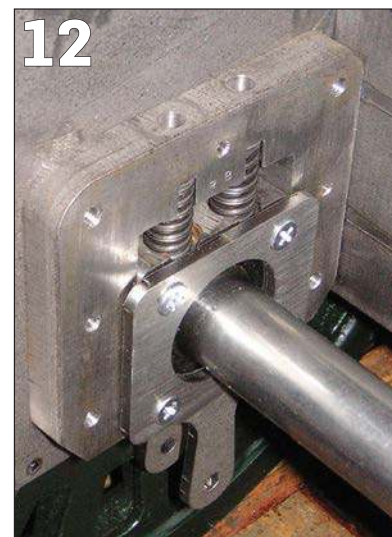
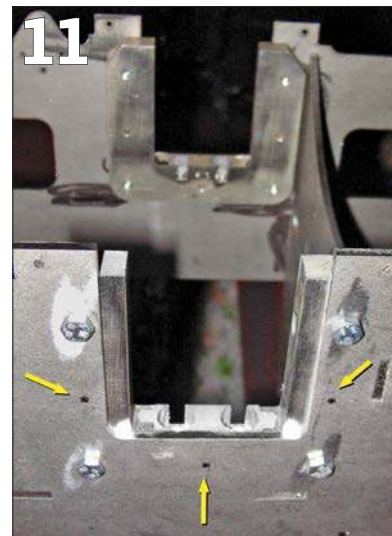
springs are hidden between the axle box and the horn block – clearly seen in this photo, shot from inside the engine frame.

The main and connecting rods needed machining of all surfaces, as well as some work on the ends that take the bearings. In **Photo 13**, I'm using a slitting saw in the mill to cut a fork in the end of one of the connecting rods. In order to fit in the fork, the other rod is thinned with a mill bit, as seen in **Photo 14**.

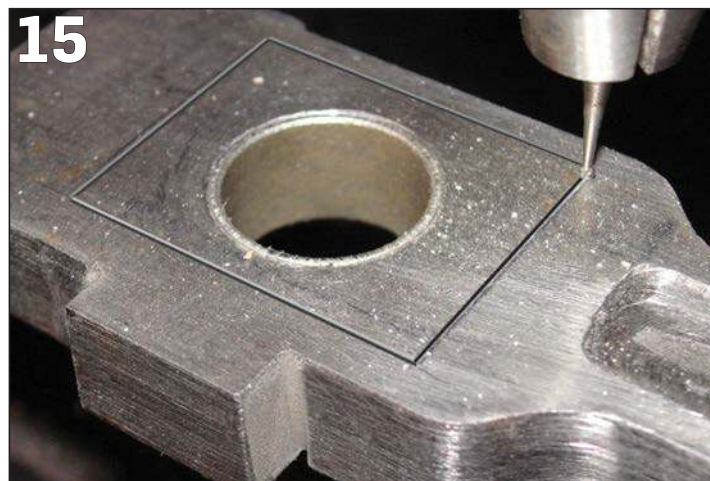
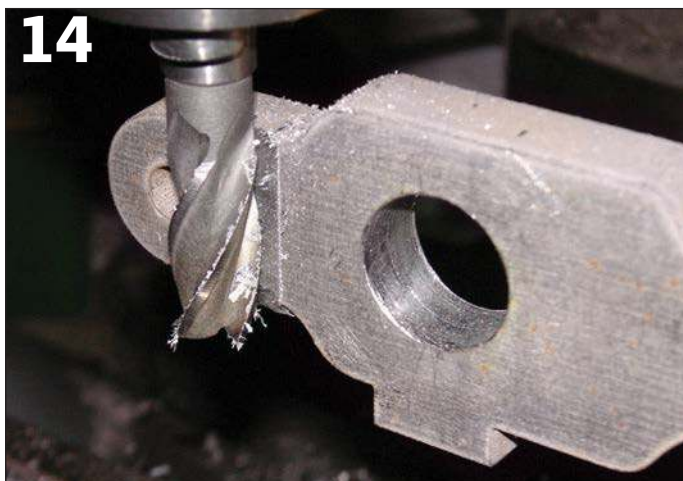
The big-end bearing of the main rod is built from several parts in the full-size engine, but I prefer simple designs; using a PTFE-coated bearing sleeve I only needed to drill and ream the hole before pressing it in, and simulate the construction of the big end by engraving!

Using a tiny dental burr (which my dentist kindly provided), I was able to engrave lines into the steel by taking a very light cut, **Photo 15**. Since the eccentric crank will almost cover the entire big end of the rod, I considered this little 'cheat' permissible...

I also used the engraving technique to 'fake' all the leaf springs of the prototype locomotive. Since I'm using hidden coil springs exclusively in my model, I needed a way to simulate the leaf springs, even though they are mostly hidden behind other parts of the engine. **Photo 16** shows the result on the front bogie – this will be all but covered by the cylinders. **Photo 17** shows one of the main leaf springs, ▶







only partly visible behind the spokes of the driving wheels.

Let's have a closer look at the Walschaert's link and the link bearing – these were cut by water-jet and machined on all surfaces, and the link slot, left with a machining allowance, was milled to a very tight tolerance, using the rotary table.

The valve motion plate, extending downwards at left in **Photo 18**, is 6mm thick, and made from two identical pieces cut from 3mm plate, TIG welded together at the edges (actually only 'fused', no filler was used). This got around the need to use an additional, fourth thickness of raw material, thus simplifying the work for the cutter. There is a depression milled in the side of the link bearing in order to simulate the look of the cast part on the full-size prototype.

## Opportunity seized

Any idea you might have for something else that can be made from laser-cut plate is worth including in your plans, before taking the CAD files to the laser cutter! I sneaked a

few extra components into my files, which were not to be used in the locomotive at all – a quick look at **Figure 11** reveals what I had in mind: a weather vane! Welding a few pieces of round steel to form a suitable mast, I was able to erect a little 'landmark'

on the top of my loco shed, **Photo 19**.

Next time, we'll take a closer look at the tab-and-hole design and assembly of laser-cut parts, and see how a pilot 'cow-catcher' can be built from nothing but flat parts, cut from 3mm thick, hot-rolled steel plate. **EIM**

■ Part 1 of this series was published last month – to obtain a back issue turn to page 15.

**PHOTO 14:** Milling the joint end of a connecting rod. On a small mill, it is important to take light cuts, especially in a setup like this.

**PHOTO 15:** Engraving lines with a tiny dental burr to simulate a built-up main rod end. The PTFE-coated sleeve bearing is already in place.

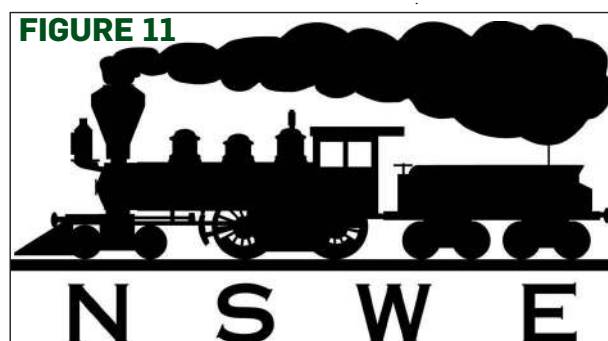
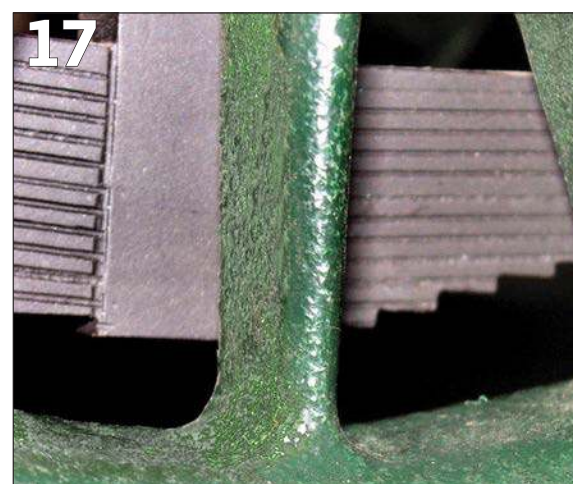
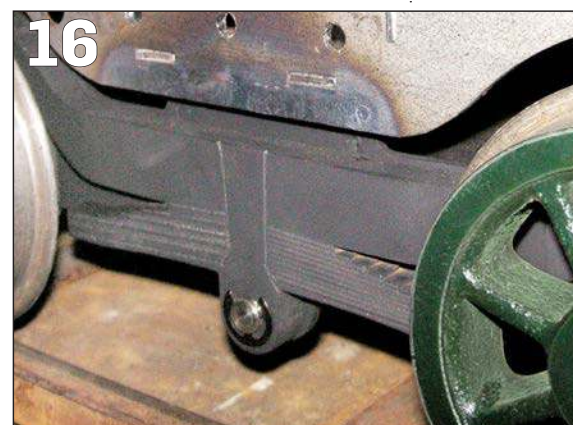
**PHOTO 16:** The equalizing lever is designed as one piece together with an 'engraved' dummy leaf spring.

**PHOTO 17:** A close-up of the rather coarse engraving on the dummy leaf spring behind a driving wheel – from a couple of metres away you can hardly see it's a fake.

**PHOTO 18:** Walschaerts gear parts made from steel plate by laser and water-jet cutting. Small sleeve bearings are used in all pivots. Their PTFE coating makes them practically self-lubricating, needing only occasional oiling.

**FIGURE 11:** Laser-cut parts to make a wind vane.

**PHOTO 19:** You'll always know which way the smoke will blow!





# The universal motion

Walschaerts, probably the best-known loco propulsion system, and older than you may think...

BY ANDREW CHARMAN

Stephenson Link motion, which we described in *Start Here* in the October 2019 *EIM*, remained the dominant form of locomotive propulsion systems until the start of the 20th century, when it was superseded by Walschaerts motion, which is surprising, as Belgian engineer Egide Walschaerts actually came up with the idea in 1844, just three years after the emergence of the Stephenson system.

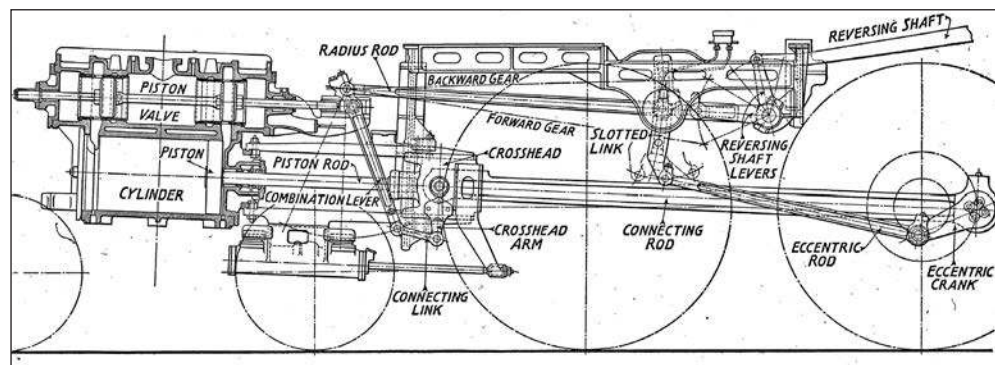
Walschaerts offers a major advantage to the locomotive designer as it can be mounted either on the inside, or much more commonly entirely on the outside of the locomotive, and requires no space between the frames – for articulated locomotives in particular this is a real boon and it's no surprise the system first appeared on such engines. But once it was fully understood, the gear became virtually universal on the European railway scene while it was also the most common gear in the US.

## Twin factors

There are two major elements to Walschaerts gear – take a look at the drawing on this page. The first element is a pair of rods (the **Union Link** and **Combination Lever**) connected between the crosshead and the valve spindle. Movement back and forth of the piston and crosshead in turn moves the valve spindle back and forth in the steam chests, a movement equivalent to twice the lap plus the lead of the valve (see *EIM* November 2018 for more on lap and lead).

The second element consists of a crank mounted on the loco's driving axle – on the rare occasions the gear is mounted between the frames an eccentric does the same job. This crank revolves around the centreline of the axle at a set radius.

The motion created is passed through a rod, the **Eccentric Rod**, to



the bottom of the expansion link that is curved and slotted rather like that in the Stephenson Link motion. However whereas in Stephenson link motion the entire expansion link can move up and down, in Walschaerts its location is fixed, pivoting centrally about a bracket that is mounted on the frames. The joint at which it pivots is known as an **Expansion Pivot**.

From the rear of the valve spindle another rod, the **Radius Rod**, joins to the expansion link by means of a connection called the **Die Block**, which can slide up and down in the expansion link. Controlling this movement from the reversing lever in the cab, alters the geometry of the gear and the position of the valve in the steam chest, the process providing the different levels of power and reversing ability that we have already seen with Stephenson Link motion.

## Die cast

If the die block is positioned at the central point of the expansion link, then the link will not pivot and will not pass on a movement through the radius rod to the valve spindle – this is 'Mid Gear' or standstill. As the die block moves up or down the expansion link, the amount of movement transmitted to the valves increases, thus controlling the point at which steam is cut off in the cylinder – with

### ABOVE:

Diagram of the Walschaerts motion – see text for details. For clarity the coupling rods are omitted.

### BELOW LEFT:

Walschaerts motion on a BR Standard class loco at the Bluebell Railway.

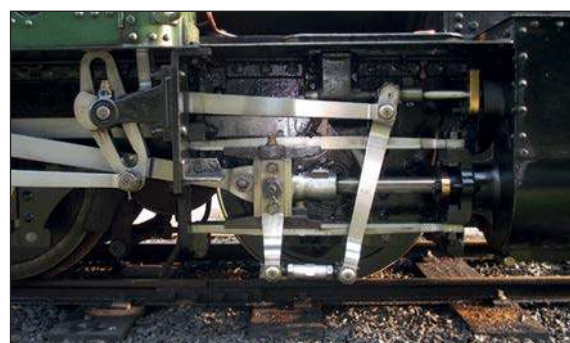
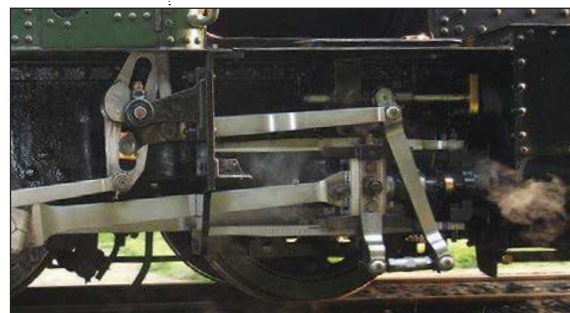
### BELOW:

Note how the angle of the expansion link changes dependent on the direction of travel.

the die block close to the centre steam is cut off early, at either the top or bottom of the link steam is cut off at the last moment possible – for example when the most power is needed for starting a train.

It sounds quite complex and the best way to understand it is to actually watch an example in operation. While complex to describe, the process is quite clear to see – study the photos on this page of a Walschaerts-equipped locomotive, with the reverser in different position and compare the position of the expansion link of the radius rod.

Whole books could be written, and have been written, concerning the theories around Walschaerts motion and indeed we recently ran a series in *EIM* on the subject, starting in the June 2018 issue and continuing in the August, October, January 2019 and May 2019 issues. **EIM**





# 24th London Model Engineering Exhibition

John describes the highlights from the latest Alexandra Palace extravaganza.

BY JOHN ARROWSMITH



**PHOTO 1:**

Club Shield winner was the Harlington Locomotive Society with this superb workshop.



**PHOTO 2:**

West London Meccano Guild, second in the club shield included this 1:100 scale model of the USS Missouri.



**PHOTO 3:**

Eastleigh Young Engineers took third in the Club Shield competition.

**PHOTO 4:** A fine display by Maidstone SME.

**PHOTO 5:** This 5-inch gauge GWR 28XX was part of the Maidstone SME stand.

*All photos by the author unless stated*



The latest London Model Engineering and Modelling Exhibition opened on 17th January for many visitors to enjoy another fine presentation of all things model engineering and modelling.

As is the way things are at present the amount of model engineering on show was a little down on previous years but the quality remained. Almost 50 clubs and societies took part of which the model engineering section was by far the largest group with lots of good things to look at as well as a wide range of other modelling and active pursuits to enjoy.

## Full works

The competition for the best club stand was keenly contested and voted for by all the stand holders – the organisers play no part in this process save to count the votes. This year the Harlington Locomotive Society took the award with a superbly built locomotive workshop. A wide range of activities underway, including a welder busy on one of the workbenches, created much attention particularly on Friday when the 'Press' were literally all over it (Photo 1, and see page 25).

The display of the second-placed West London Meccano Guild included guest builder Steve Briancourt of the South West Meccano club, with an exceptional model of the USS Missouri battleship in 1:100 scale, the original of which still exists as a museum in Pearl Harbour. All the guns operate with recoil when fired and with its four working propellers, radar scanners and anchors it was a real eye catcher. Even the paint was specially mixed for Steve, the authentic 'Haze' grey used by the American Navy. The model took 6000 hours to build over a period of 6½ years, including nine months of research and planning (Photo 2).

Third place went to the Eastleigh Young Engineers (Photo 3) the display containing several award-winning models including a 6-axis robot arm built by 16-year-old Angus French

Focusing first on the core model engineering displayed on the excellent selection of club stands, the Maidstone Society of Model Engineers display (Photo 4) again provided a wonderful range of top class locomotives in





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mixed gauges which had not been exhibited before. An excellent example of a GWR 28xx Class 2-8-0 in 5-inch gauge adorned the top level of the stand (Photo 5) along with a superb BR 9F 2-10-0 and a well-made example of a 15XX 0-6-0. On a lower level a rare 5-inch gauge 4-8-2 model of a Romney, Hythe and Dymchurch-style locomotive 'Duke of York' attracted a lot of attention (Photo 6).

The Sussex Miniature Locomotive Society exhibited almost a full-house of BR Standard locomotives (Photo 7), the only major exception an example of the 8F 'Duke of Gloucester'. A super model of a BR Standard 4-6-0 Class 4 tender engine with double chimney (Photo 8) made an impression as did the chassis of another rarely modelled prototype, a 2-6-2 Class 3 tank loco designed by Mike Jack. Excellent workmanship and attention to detail showed what a fine loco this will be when completed. This group also had a number of their young engineers in attendance at the show but these will be the subject of a separate article.

## Large scale

One of the largest models in the hall was displayed by the 10¼-inch gauge Society, a streamlined LMS Coronation class Pacific (Photo 9). This veteran loco has a long history – it was completed in 1946 after a 10-year build by Ernest Dove and ran on a temporary track at different locations. From 1950 it worked at the Pontins holiday camp in Hampshire for 20 years before moving to various lines around the country. Finally it was acquired by the South Downs Light Railway where it currently awaits yet another overhaul.

Another large loco on the Northolt Model Railway Club was the 7¼-inch gauge Big Boy 4-8-8-4 under construction by Alan Antiss (Photo 10, 11). He is making excellent progress on this loco and has used a new to me material to assemble the tender components – the adhesive used to join modern car bodies. He told me it has adequate strength and is easy to use so long as you have everything to hand, as it cures in 25

**PHOTO 6:** A Romney Hythe and Dymchurch style loco in 5-inch gauge from the Maidstone club.

**PHOTO 7:** Part of the display of the Sussex Miniature Locomotive Society.

**PHOTO 8:** A BR Standard Class 4 4-6-0 built by Geoff Whittaker on the Sussex MLS stand.

**PHOTO 9:** This veteran streamlined Coronation Pacific was part of the 10¼-inch Gauge Society stand.

**PHOTO 10, 11:** The US 4-8-8-4 Big Boy under construction in 7¼-inch gauge by Alan Antiss. The tender has been assembled using adhesive from the automotive industry.



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11



minutes, so you have to work quickly. Some 2900 rivets have been used in the impressive tender.

Also on the stand was a well-made chassis for a 5-inch gauge Pannier with an unusual provenance, recovered by a club member from a skip at the local recycling depot (Photo 12).

Last year's club stand shield winner, the Chelmsford SME, again had so much to see on its display that I could do a report on this stand alone. The many exhibits included a nice grouping of traction engines under construction demonstrating good workmanship and detail (Photo 13).

## Take the regulator

A novel feature on the Chelmsford stand was a steam engine driving simulator designed and built by Paul Leech (Photo 14). Made of wood this machine contained water and pressure gauges and a simulated fire which was linked to the steam pressure and water level. A driver could build the fire up and correspondingly see the pressure increase while at the same time watching the water decrease, while opening the regulator made the driving wheels turn and the speed increase. It provided a very visual and educational feature for any aspiring engine drivers among the visitors.

Both the Northern Association of Model Engineering Clubs and the Southern Federation put on small but informative displays of membership paperwork and activities accompanied by good modelling exhibits.

Two excellent locos adorned the 7¼-inch Gauge Society stand. One was a Bassett Lowke 0-6-0 Practical Tank Loco built by P. Waring in 1967 for the Kings Newham Light Railway, the other an LNER N2 0-6-2 with condensing gear (Photo 15) – a previous show exhibit, this has been progressively completed by builder Bruce Harvey over the years.

The Society of Model and Experimental Engineers (SMEE) always shows interesting, superbly built models and the large display this year was no exception. It included the first model made by Cherry Hill in



**PHOTO 12:** A 5-inch gauge Pannier chassis that was rescued from a skip at a recycling depot.



**PHOTO 13:** Several part-built traction engines on the Chelmsford SME stand.

**PHOTO 14:** The Driver simulation engine on the Chelmsford SME stand.

**PHOTO 15:** The 7¼-inch Gauge Society display featured a pair of very different locos.

**PHOTO 16:** John Clarke's elegant Elliot Bros Simplex Indicator on the SMEE stand.

1956, a bronze medal winner, and a fine spring tester built by John Clark (Photo 16). Multi-cylinder aero engines (Photo 17) provided another excellent presentation while the regular demonstrations on a centre lathe were once again popular as was the working wire-eroding machine.

In addition to the Meccano displays mentioned above George Illingworth provided a large display of fire engines built from the modelling material, demonstrating the large range of prototypes once seen on active service. It was a very popular display as no doubt it revived many schoolboy memories (Photo 18).

On the Ickenham & District SME display Peter Partington showed the







**PHOTO 17:** A 1:6 scale model of a Pratt & Whitney R985 Wasp Junior Radial engine circa 1929 built by Ron Harris.

**PHOTO 18:** George Illingworth's amazing display of Meccano Fire engines.

**PHOTO 19:** On the Welwyn Garden City Society stand, an informative board of injector building tools.

**PHOTO 20:** This Mississippi Stern Wheeler steamboat was part of the Harrow & Wembley stand.

**PHOTO 21:** A busy shed scene as a logging train passes on the 16mm scale Ridgmont Layout.

**PHOTO 22:** Part of the extensive G-scale White Leaf Light Railway.

**PHOTO 23:** Spot the trains! The Gauge 1 layout always had lots of spectators.

**PHOTO 24:** The Gauge 3 Society stand.

progress being made with his Foden Steam lorry – the front axle assembly was on the stand alongside a very nice 2-inch scale traction engine built by Brian Hoare. A display board showing various jigs, fixtures and reamers to make small injectors was another interesting exhibit (**Photo 19**).

The Harrow & Wembley Society display featured a well-made example of a Mississippi stern-wheeler boat (**Photo 20**) alongside some good locomotives and stationary engines.

Smaller gauge railways and locos are a well-supported feature of this exhibition. The 16mm Association's East Surrey Group Ridgmont Railway layout provided plenty of trains and movement to entertain visitors (**Photo 21**), the Buckinghamshire Garden Railway Society with its Whiteleaf Light Railway G-scale layout attracted an attentive audience (**Photo 22**) while the Gauge 1 Model Railway Association's extensive Invicta layout was always busy with large crowds of spectators (**Photo 23**).

Lots of detail and realistic finishes on the Gauge 3 Society's display of locomotives and rolling stock (**Photo 24**) showed the delights of the scenic version of 2½-inch gauge railways. Meanwhile more operating displays included the diminutive models of the OO Live Steam Club (**Photo 25**) and the ever-popular train rides on the Polly Owners Group portable track (**Photo 26**). The repair desk run by the OO group was an interesting feature.

The Welwyn Garden City Society display included some eye-catching





25



26



models, the 1:72 scale Fleet Auxiliary ship 'Blue Rover' owned by Paul Chilcot showing excellent detail (Photo 27). Derek Atree displayed a well-made and proportioned kit of a German Antitank PAK43 gun which looked very authentic (Photo 28).

The exhibition had some sizable displays this year, none more so than the Large Model Association's aircraft. A 1/2-scale Tiger Moth was designed and built by John Greenfield while a 1928 Beardmore three-engined experimental bomber attracted a lot of attention (Photo 29). Adjacent to this display was the British Model Flying Association with simple aircraft building activity for anyone who wanted to try their hand.

The activity area was always busy, especially the complex Lego stand with

lots of young people building simple structure or working model. This material now has a serious adult following known as AFOLs – Adult Fans of Lego and they produced a working model that went round three sides of their stand – it was a constant area of interest for younger visitors.

It was pleasing to note the age profile among visitors on Saturday – considerable numbers of youngsters and their families attended which augers well for the future. Popular with the young especially were regular participants the Tamiya Trucking Club with their large active display of working radio-controlled models.

Amongst the various boat and marine displays the Surface Warship Association can always be relied upon for its wide range of British and

#### PHOTO 25:

Live-steam OO gauge trains passing, an A4 to the fore.

#### PHOTO 26:

Train rides for all on the Polly Owners Group portable track

#### PHOTO 27:

Fleet Auxiliary ship in 1:72 scale on the Welwyn Garden City display.

#### PHOTO 28:

German PAK43 anti-tank gun also on the Welwyn Garden City stand.

#### PHOTO 29:

Three engine experimental bomber from the LMA. Photo: Andrew Charman

International Naval craft, all beautifully made and finished, while on the Blackheath Model Power Boat Club stand was a veteran engine designed by Edgar T. Westbury in 1941 for an 1831 rail locomotive. It is a twin cylinder 4-stroke petrol engine of 30cc capacity and was designed to drive the loco via a friction drive. This model was built in 1942 and recorded in Vol. 84 of *Model Engineer* magazine of that year. It is now owned by Phil Abbot. (Photo 30).

High speed and flash steam-powered craft featured on the Model Hydroplane Club of Great Britain stand including a working sectioned engine showing how these fast machines operate (Photo 31). Other marine exhibits included an eclectic mix on the Victoria MBC stand and a quartet of fine sailing boats from the Hanwell & District Model Society alongside radio-controlled heavy goods vehicles.

On the St Albans & District MES stand a radio-controlled tracked tractor with a hydraulic operating system built by Geoffrey Greeves created a lot of interest when he operated it on the stand (Photo 32).

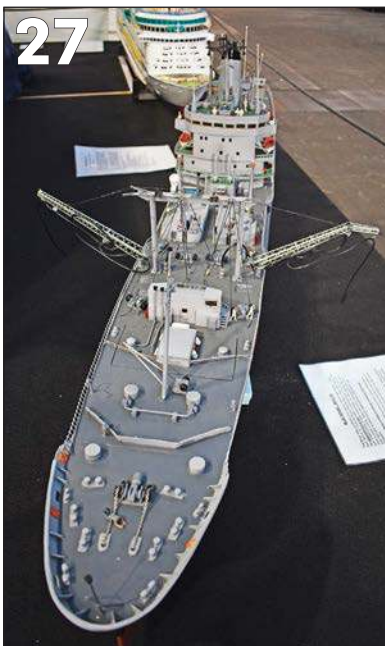
### Underground arrival

New to the exhibition was an interactive stand from Transport for London, with several different aspects to entertain visitors. A small shunting exercise gave anyone the chance to sort out a train into the correct wagon sequence, while there was also a signalling task and a chance to drive an underground train simulator. Combined with the London Transport Museum display it provided a wide range of interesting material.

Finally the Institute of Plastic Modellers again provided a wide range of models of many different types – the team managing the displays always seemed to be busy answering questions or demonstrating the details of the models.

That just about sums up the exhibition, again a well-attended event and one notably trying very hard to encourage young people to get involved. The Imagineering Foundation was busy promoting engineering and offering one-to-one

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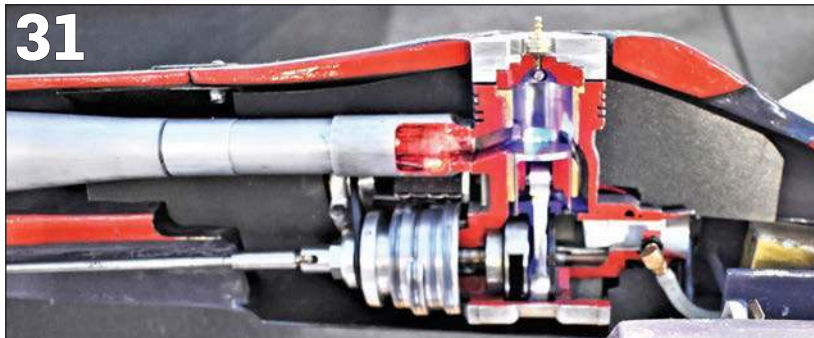


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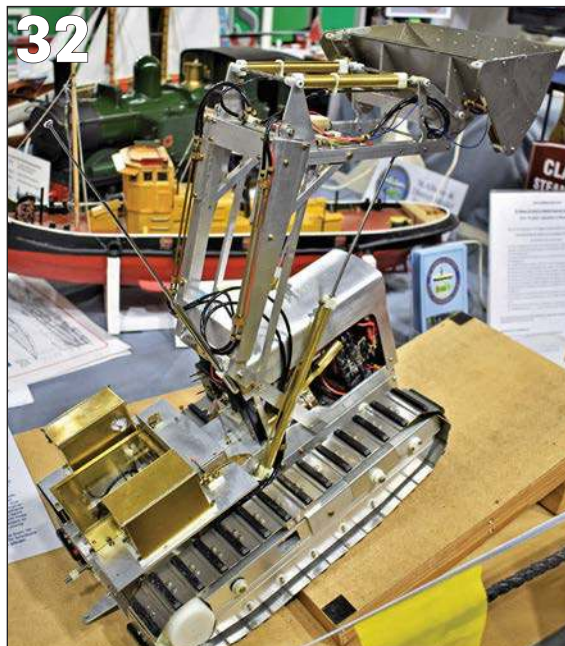


**PHOTO 30:** Edgar T Westbury designed 30cc twin cylinder 4-stroke petrol engine.

**PHOTO 31:** The working sectioned model of a high-speed hydroplane engine.

**PHOTO 32:** Geoffrey Greeves built this R/C controlled hydraulic excavator

32



tuition on different subjects while also interesting as the Alexandra Palace 'Little Inventors' display – I will present a separate article about all these ideas in the near future.

My thanks as ever to everyone who contributed to the show, your support was much appreciated and the organisers look forward to greeting you all again next year. **EIM**

## Editor's choice – the Harlington Locomotive Society

■ The Ed is lucky at shows – John Arrowsmith does the work and Andrew C gets to stroll around, meet readers and admire the displays at length.

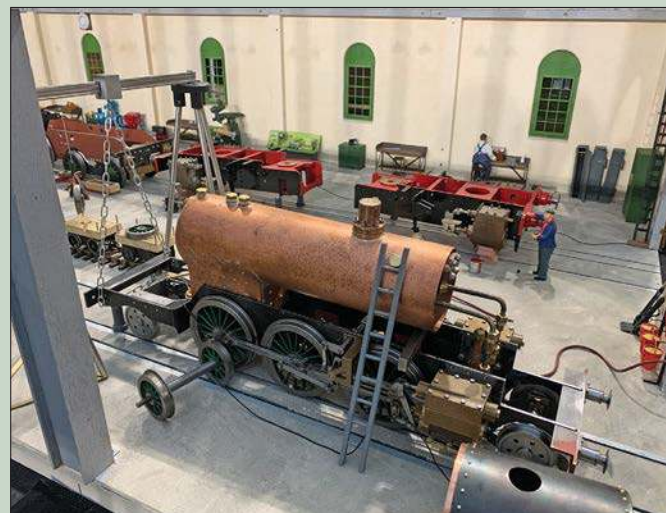
This year, he kept returning to the Harlington Locomotive Society display, deservedly taking the best club stand award. We are all used to club show stands featuring lines of locos in various states of completion, but it's good to see

some now trying to make a bit more out of their displays – the Chelmsford SME has made quite an effort, while the Harlington group has been working on its loco works for a couple of years now and as you can tell by these pictures, has now perfected a very good means of displaying part-built locomotives. Well done on a superb effort.

*Andrew Charman*



*Photos by Andrew Charman*





# Milling in the Lathe

Jan-Eric makes a couple of vices to make milling without a mill an easier task.

BY JAN-ERIC NYSTRÖM

When building my very first loco (described in EIM in the November 2015 to January 2016 issues), I didn't then own a mill – purchasing the lathe had all but exhausted my hobby budget at that time! Thus, I decided that I would have to use my lathe for any milling work.

**Photo 1** shows the top slide of my lathe with its toolpost removed. In order to be able to mill, I had to get the necessary x-y-z movements relative to the chuck, and this is not possible with just the lathe's own slides. So, how to do it? By changing

the top slide to a vertical slide!

I accomplished this by making a sturdy angle bracket of 10x16mm 'key stock', a great material for building small assemblies that need exact dimensions. I won't state any other dimensions here, since lathes and their slides do vary in size, but you'll get the general idea from the photos.

I drilled and tapped the pieces of key stock so that I could bolt them together, as seen in **Photo 2**. I then used silver soldering for the final assembly – welding is not recommended for key stock, as it can distort and become brittle.

I checked that the parts were correctly aligned with a 90-degree precision-ground square. Then, I placed the assembly on a couple of firebricks and used a substantial propane flame in order to heat up the material to the required 'low red heat' for the silver solder.

In **Photo 3** you can see the finished angle bracket mounted on the cross slide – I drilled and tapped four M6 holes in the cross slide for it. The top slide is mounted vertically onto the bracket, facing the chuck. Note the bracket's silver soldered diagonal brace – it is absolutely necessary to ensure rigidity.

In order to fit a vice to the top slide, I had to modify the toolpost tightening bolt. As visible in **Photo 1**, the bolt was sticking up from the slide. After modification, the bolt is attached to the handle instead, and the nut is in the slide, **Photo 4**. The nut is protruding a bit, but not so much as to interfere in use.

## A vice for the slide

Next, I needed a suitably sized vice to attach to the vertical slide – again, I made it of key stock of a couple of different sizes. The finished vice is shown in **Photo 5**. I built it to the

### PHOTO 1:

Toolpost removed from lathe topside.

### PHOTO 2:

Key stock bolted to form angle bracket.

### PHOTO 3:

Angle bracket mounted on cross slide.

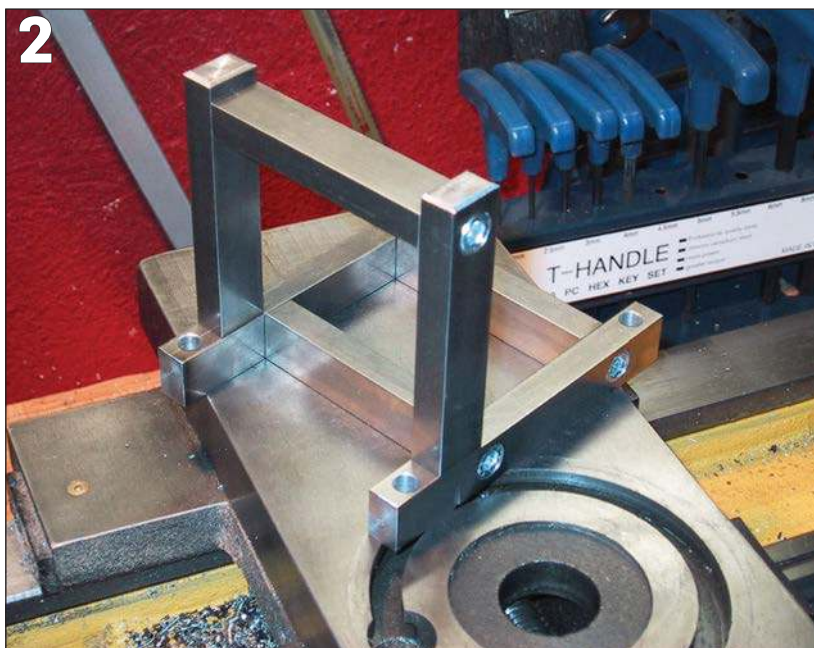
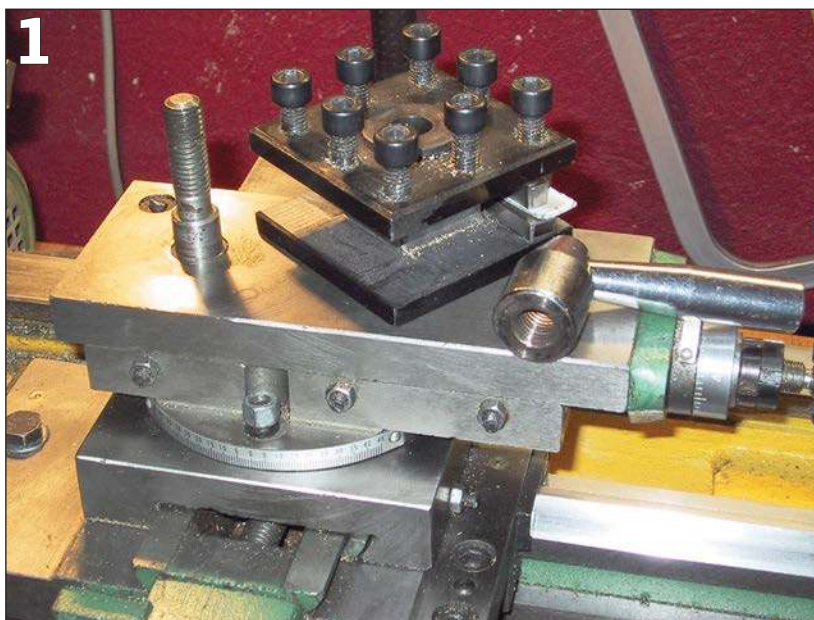
### PHOTO 4:

Tightening bolt modified for new use.

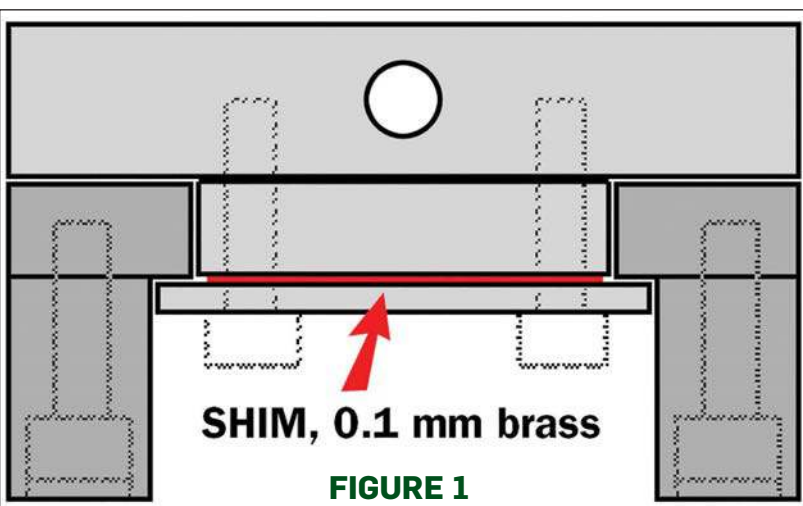
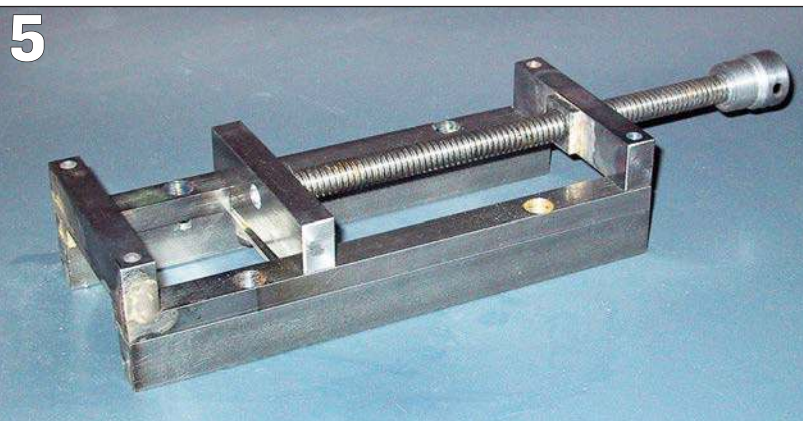
### PHOTO 5:

Vice also made from key stock.

*All photos in this feature by the author*







same length as the lathe slide, so I can clamp rather large (but not too thick) pieces in it.

The tightening bolt is 10 mm diameter, 2 mm pitch trapezoidal ('Acme') thread, but of course an ordinary bolt and nut would work, too. The vice is attached to the vertical slide in **Photo 6**, holding a tiny piece of brass being milled.

The 'rails' and jaw of the vice are designed as seen in **Figure 1**, showing a cross section at the moving jaw. Note the thin shim marked in red – this allows the jaw (light grey) to slide freely over the side rails (dark grey). The four 'corners' of the vice 'frame' were bolted M6, and then silver soldered to exactly 90 degrees, again checking using the precision square.

I sunk in and silver soldered an Acme nut into the rear end of the vice. The trapezoidal thread gives a nice tightening action. When using an ordinary bolt, the hole can be threaded with a tap – but carefully, using a cutting fluid, since key stock is quite a bit harder than ordinary hot or cold-rolled steel.

The knob at the end of the bolt has a through hole, for a removable handle pin, so that the moving jaw can be properly tightened. The holes you see in the rails in **Photo 5** are for fastening the vice to the slide with four M6 screws – countersunk, so they do not interfere with the moving jaw.

### Little brother

I have also made a similar, smaller (60 x 80 mm) vice, and this has proven to be excellent for holding small objects that need to be clamped vertically. In **Photo 7** you can see a 'double-header': a vice in a vice! With this setup I was able to split a block for link hanger

**FIGURE 1:**  
Design for vice rails and jaw.

**PHOTO 6:**  
Vice attached to the lathe vertical slide.

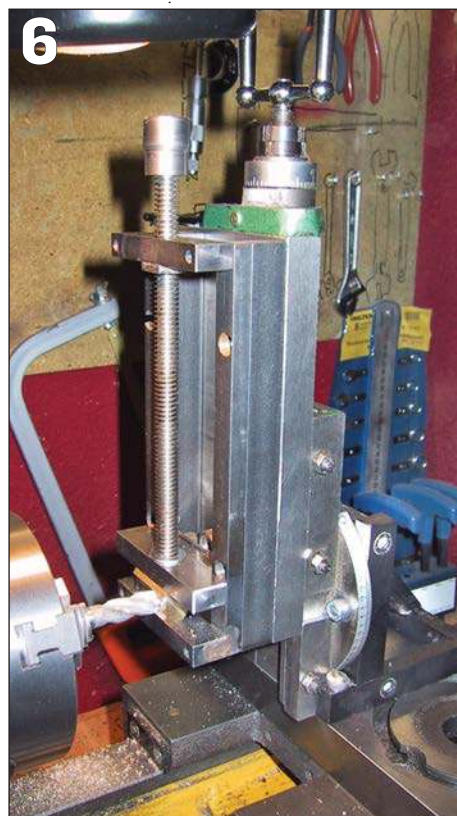
**PHOTO 7:**  
Two vices, of different sizes, in use together for milling on the lathe.

arms in two – impossible to do horizontally due to the small diameter of the slitting saw.

Using key stock to suitable dimensions enabled me to build these vices in just a couple of hours each. In fact, taking the photos, making the

drawing and writing this article took me longer... **EIM**

■ Have you made a tool to ease life in your workshop? Why not write it up for your fellow readers? Contact details are on page 3...





# Dougal – a 5-inch Barclay

Making a vacuum brake system occupies young Sussex engineer Andrew this month...

BY ANDREW STRONGITHARM – Part Twenty-Two of Twenty-Four

I never originally intended going to the trouble of fitting working vacuum brakes to my model and strictly speaking I didn't. This is because the full size 'Dougal' only has a vacuum ejector and a brake valve but no brake cylinder fitted, meaning the locomotive only has its basic hand-operated brake when running light engine or working trains consisting of unfitted stock.

The vacuum equipment was added in preservation and enables Dougal to haul passenger trains on the Welshpool & Llanfair Light Railway. It was my mentor Andrew's bright idea to attempt to recreate this on my model and since it had been successfully achieved on larger 5-inch gauge locomotives at our club, there was no reason why it couldn't be done on a small locomotive such as Dougal. Rather than buy an ejector from a commercial supplier, I had the chance to make my own thanks to the generosity of a fellow club member who kindly agreed to let me borrow his set of tapered reamers to make the special internal cones.

I began by making the two-part ejector body from a 1-inch length of  $\frac{5}{16}$ -inch diameter PB102 bronze. Initially, I turned a  $\frac{1}{4}$ -inch length on both ends of the bronze to a diameter of  $\frac{1}{4}$ -inch and externally threaded them  $\frac{1}{4}$ -inch x 40 tpi. I continued by drilling out the full length of the body to 3.8mm before reaming it 4mm to ensure that when I pushed the cones in they were concentric with each other.

The connection to the train pipe side of the vacuum system, which also incorporates a non-return valve that is screwed on underneath, is soldered to the middle of the main ejector body

and this was made from a further  $\frac{1}{2}$ -inch length of  $\frac{5}{16}$ -inch PB102 bronze. I turned down and externally threaded a  $\frac{1}{4}$ -inch length of one end  $\frac{1}{4}$ -inch x 40 tpi and drilled a  $\frac{1}{8}$ -inch hole all the way through. I then screwed these threads in to an internally threaded  $\frac{1}{4}$ -inch x 40 tpi fitting and used this to hold it in the vertical slide to machine a  $\frac{3}{32}$ -inch deep slot with a  $\frac{5}{16}$ -inch ball-nose slot drill.

To finish off, I had to carefully machine a slot across the threads to prevent the ball from lifting off the seat and blocking the hole through the top of the fitting. I used the same internally threaded piece as above to mount my fitting but this time the opposite way round in the vertical slide. By holding it in the lathe chuck and pushing it in to the vice jaws I was able to ensure the fitting was both straight and square in the vice.

After unscrewing the mounting adapter I was able to set the centre height of the vertical slide and proceed to machine a  $\frac{1}{16}$ -inch deep slot across the work using a  $\frac{1}{16}$ -inch end mill. This allows air to be drawn out of the train pipe by going around the ball even if it is blocking the main hole. Finally, this piece could be silver soldered to the centre of the ejector body and put back up in the vertical slide in order to drill through in to the main chamber.

Next, I made the non-return valve which screws on to the bottom of the fitting described above. The ball in the non-return valve should lift and allow the ejector to draw air out of the vacuum system but crucially it must sit back on the seat and seal again to prevent dirt and debris from getting



The prototype 'Dougal' loco is a 2ft 6in gauge Barclay 0-4-0 built in 1946 for the Provan Gasworks in Glasgow and today resident on the Welshpool & Llanfair Light Railway in mid Wales.

drawn back down the pipe. The ball also isolates the ejector from the rest of the system should the need arise to run the locomotive in a formation whereby it is not required to draw the vacuum (Photo 1).

## Critical cones

The success of any ejector is largely down to the two specialist cones inside the body which direct the steam supply to draw a vacuum. Both cones were turned out of  $\frac{1}{4}$ -inch diameter brass bar and I began by turning a length of 484 thou' to a diameter of 4mm followed by a further  $\frac{1}{16}$ -inch to a diameter 210 thou' which formed the outside flange of the steam cone. The specific length of the cones is critical as when they are both inserted, there should be roughly a  $\frac{1}{32}$ -inch gap between them. This spacing can be altered to improve the performance.

Very carefully, I drilled a number 70 hole (28 thou') through the centre and then created a 24-degree cone at the end using one of the tapered reamers to angle the hole as the steam exits the cone. The depth of this tapered hole was about  $\frac{1}{16}$ -inch and following this I turned the cone around and opened out the entry hole to a  $\frac{1}{16}$ -inch diameter by a depth of  $\frac{3}{8}$ -inch.

The exhaust cone was initially made in the same way and to the same external dimensions as the steam cone, however internally I drilled a  $\frac{1}{16}$ -inch diameter hole throughout and used two different-length tapers. The first was a mirror image of the one which I machined in to the end of the steam cone (24 degrees to a depth of  $\frac{1}{16}$ -inch) but since the initial hole was a  $\frac{1}{16}$ -inch rather than 28 thou' the opening of the cone was much greater. The entry diameter should be  $\frac{3}{32}$ -inch on the exhaust cone whereas on the steam cone the exit diameter is only  $\frac{3}{64}$ -inch.

I then turned the exhaust cone around and proceeded to machine the

**PHOTO 1:**  
External fitting  
for the vacuum  
ejector feed .

*All photos in  
this feature by  
the author*





¼-inch long exit taper using a 12-degree reamer. This completed both cones which therefore meant the ejector could now be assembled and tested using compressed air. It is important to note that any steam turbulence within the ejector could result in poor or no functionality.

The size of the associated pipework is also important; especially the pipe for the exhaust steam, because if the diameter is too small, it can create back pressure and reduce the level of vacuum drawn.

For my ejector, I used ⅛-inch x 26swg for the steam supply and ⅜-inch x 26swg for the exhaust and train pipes. During steam tests, this seemed to work fine and I'm pleased to say the ejector draws about 12 inches of vacuum.

A friend owns a vacuum-fitted driving truck so after a bit of adjustment to the operating range, I was able to run Dougal around the club track using my ejector and brake valve to stop the train.

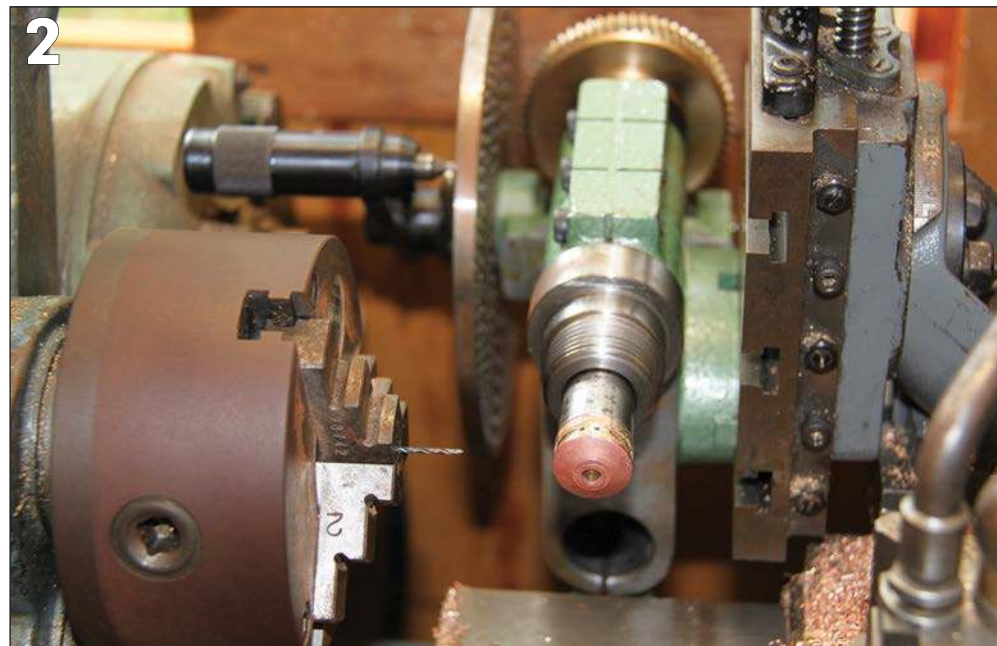
## Diesel provenance

During a visit to see the full-size Dougal in Welshpool, I was reliably informed the driver's brake valve was in fact an ex-DMU (Diesel Multiple Unit) one and once back in Sussex, I found a suitable example on a class 108 DMU at the nearby Lavender Line to measure. The external dimensions were scaled down to produce a visually identical valve, however I simplified the internal mechanism in order to create a working brake valve within the available space.

The full size valve has three positions, apply/lap/release whereas mine consisted of a lifting ball valve actuated by a thread with no lap position. So that my valve would admit air/apply the brakes by rotating the handle in the same clockwise direction as the full-size example, I used a left-hand thread to make the ball lift up off the seat. This adaptation of the mechanism means that the driver's handle lifts up by about 10 thou' when the valve is being used, but this is not very noticeable.

The body of the valve was ¾-inch in diameter and I began by turning down the outside of a piece of bronze to this size before drilling a ⅜-inch hole through the middle of it to a depth of just over ⅛-inch and parting it off ⅛-inch thick.

Next, the dividing attachment was set up on the Myford lathe and holding my disc in a chuck, I drilled six 1.7mm holes around the periphery on a PCD of ⅝-inch which is clearance size for the 10BA bolts that I would be using to hold the two halves together. A piece of ⅜-inch copper pipe was cut to 1½-inch in length and



I made a custom olive which I silver soldered on to one end before turning it to the finished size. The other end was then silver soldered in to the base of the valve body, not forgetting to put a ¼-inch x 40 tpi nut over the pipe first! This would screw on to the brake valve stand (still to be constructed) thus allowing me to easily remove the brake valve with one nut.

The top half of the valve body was the same ¾-inch external diameter as the bottom half and I began by boring out the centre to an internal diameter of ½-inch by a depth of ⅝-inch. I then inserted a 3.9mm drill beyond this bore until I reached a total depth of just over ½-inch which I then proceeded to thread with a left-hand 2BA tap.

Using a ⅛-inch thick parting-off tool, I machined the recess for the air inlet holes around the circumference. This was ⅛-inch in from the end of the material and I used the full width of the tool to take a single ⅜-inch deep cut which made the outside diameter of this recess ⅝-inch.

I then machined a 45-degree taper on what would become the top of the valve body. This involved machining away more material because it was still attached to the bar that I had originally turned it from.

The diameter at the smallest part of the taper was ⅜-inch and the final job left to do before cutting it off the bar was to drill and tap the holes which mount it to the bottom half of the valve body and stand. Using the invaluable dividing attachment again, I drilled six 1.4mm holes on a ⅝-inch PCD to a depth of ⅜-inch which matched the corresponding holes in the base piece. These were carefully threaded 10BA and I finished with a plug tap each time to ensure that as many threads as possible were cut in

the shallow holes. Before a trial assembly of both halves could take place, I cut six 10BA brass bolts to just under ⅞-inch in length.

### PHOTO 2:

Drilling the holes in the circumference of the driver's brake valve was a delicate operation using a dividing attachment on the lathe.

## Delicate drilling

The air inlet holes were very delicate to drill as I used the smallest possible size that I could hold in the chuck on my Myford lathe, which was a 1.2mm (48 thou'). The dividing attachment was set up this time at 90 degrees to the chuck with the body of the brake held on a tapered mandrel. Two rows of holes were drilled, totaling 30 in all and the second row was offset by 50 per cent to the first (Photo 2).

### PHOTO 3:

The completed brake valve.

Inside my simplified brake valve there is a bronze shaft that has a







$\frac{3}{16}$ -inch viton ball secured on one end and a hexagon for the driver's handle on the other. The shaft was made from a length of  $\frac{3}{16}$ -inch diameter material and I initially threaded the first  $\frac{3}{8}$ -inch of the bar with a 2BA left-hand thread before I drilled out the top 1.8mm to a depth of  $\frac{1}{4}$ -inch and internally threaded this 8BA.

Next, I cut the shaft off so that it was  $\frac{5}{8}$ -inch long, turned it around and machined  $\frac{1}{4}$ -inch of the other end down to a diameter of 66 thou' which I then threaded 10BA. I drilled a  $\frac{3}{16}$ -inch viton ball using a custom-made fitting – this clamps the ball between two pieces that screw together and contains a pre-drilled hole through the centre. In this instance I drilled a 1.4mm hole through the ball ready for it to be screwed on to the 10BA threads along with a locking nut on the end.

Next, I screwed a bronze 8BA bolt into the top of the shaft and silver soldered this in place, whilst trying not to get too much solder around the head of the bolt. The bolt was a shop-bought one which was made from 4mm hexagon, luckily this is the same size as the internal AF of a 4BA Allen cap bolt.

A start was made on the driver's

handle by skimming the head of a 4BA Allen cap bolt until I was left with a clean finish. This was roughly  $\frac{1}{4}$ -inch in diameter and I then turned the length of the head back until the internal depth was the same as the thickness of the head of the 8BA bolt in the top of the shaft.

Next, I cut the threads off and carefully silver soldered the head to a strip of  $\frac{3}{16}$ -inch x  $\frac{1}{16}$ -inch brass which was butted up against it. Silver soldering to a high-tensile bolt such as this requires special flux and I used Tenacity 5. Following the soldering operation, the brass strip was well annealed so I was therefore able to bend it to mirror the shape of the valve body before finishing with a tighter bend vertically downwards. This allowed me to screw the handle in which was simply made from a  $\frac{1}{2}$ -inch length of  $\frac{3}{16}$ -inch round brass with a short length of 8BA threads cut at one end (Photo 3).

### Brake stand

The final component to make for the vacuum system was a stand for the brake valve to screw on to together with all of the associated pipework which runs the length of the locomotive. The stand was made from

*“During a visit to see the full-size Dougal in Welshpool, I was reliably informed the driver's brake valve was in fact an ex-DMU one..”*

a  $\frac{3}{16}$ -inch length of  $\frac{5}{16}$ -inch diameter PB102 bronze and I began to form the top by turning  $\frac{1}{4}$ -inch to a diameter of  $\frac{1}{4}$ -inch which I externally threaded  $\frac{1}{4}$ -inch x 40 tpi and inserted a 60-degree countersink.

Following this, I drilled a 3.2mm hole the full length of the bronze and internally threaded the bottom 4BA into which I screwed a bolt to seal the end. Three side fittings were then made from another piece of  $\frac{5}{16}$ -inch bronze; these were each  $\frac{5}{8}$ -inch long and drilled throughout 3.2mm. One end was then internally threaded 4BA to a depth of  $\frac{3}{16}$ -inch to accept a bolt which I would use to bung up the hole. The opposite end was machined with a  $\frac{5}{16}$ -inch ball-nose slot drill to a depth of  $\frac{5}{32}$ -inch which matched the outside radius of the stand once it was soldered on the side.

I then externally threaded a piece of bronze  $\frac{1}{4}$ -inch x 40 tpi and internally drilled it 3.2mm before countersinking the end and cutting it off  $\frac{5}{16}$ -inch long. I repeated this three times and finally faced off the cut ends in the lathe.

Using the vertical slide, these pieces were screwed in to the bodies prior to being silver soldered at the same time as the side fittings were attached to the main stand. These were spaced with one flush to the bottom whilst the next one was 1-inch further up and the third one 2-inch higher than that. Importantly the first fitting faced the opposite way to the second and third ones, as this formed the connection to the rear vacuum hose.

To support the brake stand, I made a bracket from a piece of  $\frac{1}{2}$ -inch square x  $\frac{3}{32}$ -inch thick brass through which I drilled a  $\frac{5}{16}$ -inch diameter hole to slide over the stand and a pair of 2.2mm clearance-size holes that enabled me to screw it to the front of the cab floor with a couple of 8BA brass bolts.

### Special fitting

As stated earlier, I used  $\frac{3}{16}$ -inch x 26swg copper pipe for the exhaust and I made a special fitting which screwed in to the side of the smokebox to take the used steam from the ejector up the chimney. The body of this was a  $\frac{3}{4}$ -inch length of  $\frac{5}{16}$ -inch diameter PB102 bronze with one end turned down, externally threaded  $\frac{1}{4}$ -inch x 40 tpi and countersunk to take the nut and olive from the exhaust pipe. This was drilled 3.6mm throughout and the far end was threaded 4BA to take a shortened bolt to bung the end up.

I then cut  $\frac{3}{8}$ -inch of  $\frac{1}{4}$ -inch x 40 tpi threads on another piece of bronze together with a countersink on one end which I screwed and silver soldered in to the side of the body. I would use this to screw through the

**PHOTO 4:** Fitting on side of smokebox, designed to ensure pipe is as close to chimney exhaust as possible to avoid affecting loco steaming.

**PHOTO 5:** Rubber brake hoses and dummies add the final visual touch to the buffer beams.





copper wall of the smokebox and I made it long enough to attach a short length of pipe to on the inside.

I carefully measured where I wanted this fitting to be positioned on the outside of the smokebox before drilling a small hole which I gradually opened out until it was  $\frac{7}{32}$ -inch. The benefit of making the boiler and smokebox from the same piece of  $\frac{1}{8}$ " thick copper tube was now apparent as I then threaded the wall of the smokebox  $\frac{1}{4}$ -inch x 40 tpi.

Next, I silver soldered an olive on to one end of a 2-inch length of  $\frac{3}{16}$ -inch x 26swg copper pipe and screwed this on to the fitting on the inside of the smokebox before carefully bending it to point up the chimney. It is important that this pipe is as close to the side of the chimney as possible as any disturbance to the

*"It is important that this pipe is as close to the side of the chimney as possible – any disturbance to the blast of the loco could affect its steaming..."*

blast of the locomotive could affect its steaming capabilities (Photo 4).

I then ran a pair of  $\frac{3}{16}$ -inch x 26swg copper pipes to both ends of the locomotive from the brake stand. The one to the rear ran underneath the footplate while the front one ran between the boiler and side tanks on top of the right-hand running plate.

On both buffer beams I adapted a number of commercially available  $\frac{1}{4}$ -inch brass elbow fittings to mimic the placement of the vacuum hoses on the real Dougal. I cut the threads off on a couple and internally threaded them  $\frac{1}{4}$ -inch x 40 tpi instead so that another elbow could screw in to them. To add a finishing touch, I also bought a pair of rubber vacuum hoses and made a couple of dummies to push the end of the hoses over when not in use (Photo 5). **EIM**

Drawings in this series reproduced by kind permission of A J Reeves.



Drawings, castings and material for this project are available from A J Reeves.

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### Next Month...

"I ran the loco on several occasions during the first year, always coming away with a list of problems needing sorting..." Andrew closes on completion.

## CURIOSITY CORNER

# A rather unusual drill...

Tech-ed Harry loves being made aware of unusual tools, and this simple item certainly fits the bill...

BY HARRY BILLMORE

A very good friend gave me a curious hand drill for Christmas, leaving it with the words, "you'll either find this fascinating, or terrible."

In fact I found it a fascinating tool – it is a beautiful piece of minimalist engineering design, created with the aim of producing something that is functional, but also good looking with an absolute minimum of processes involved in its construction.

As far as I can tell there are only three machined items in the entire assembly, while the rest of the drill

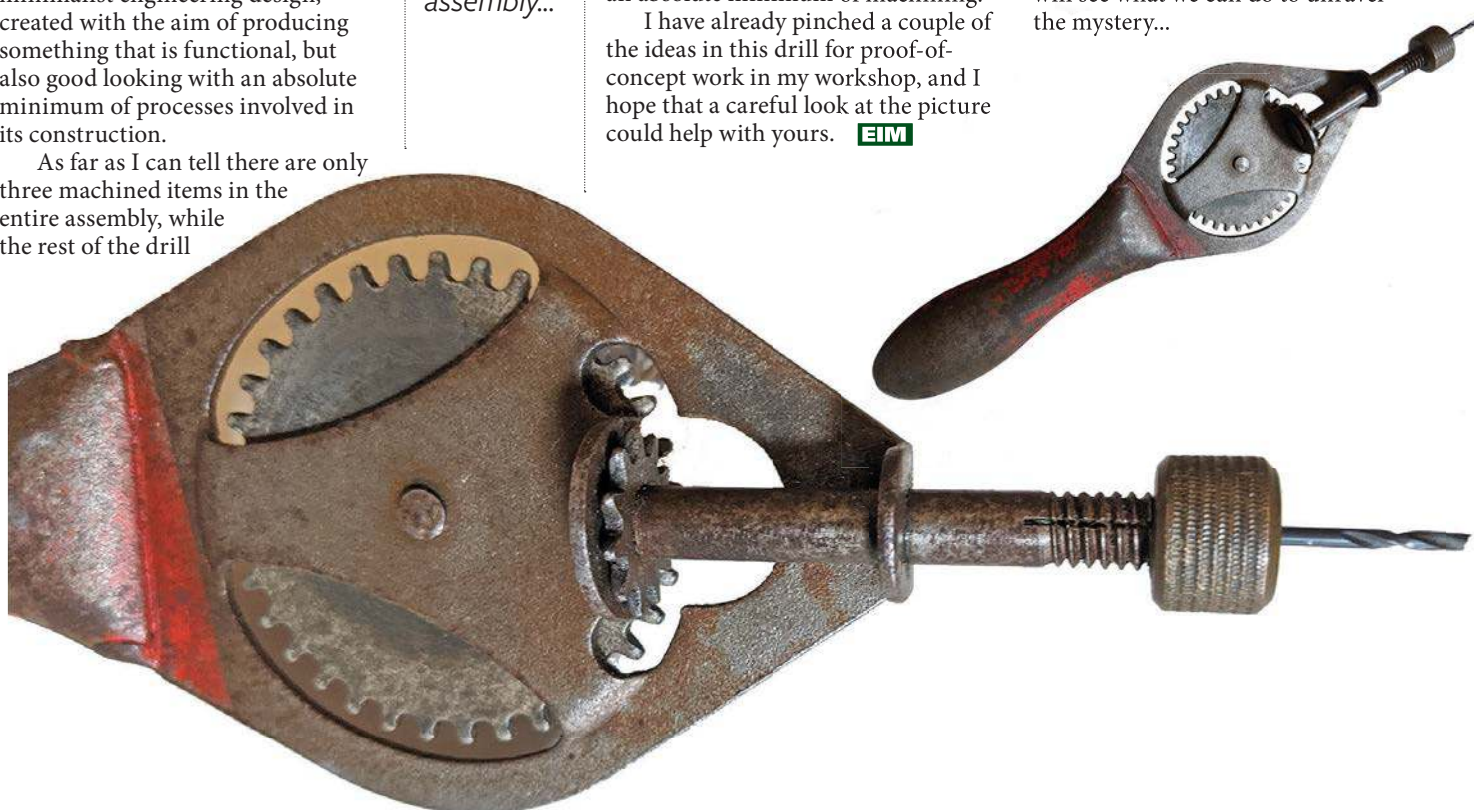
*"There are only three machined items in the entire assembly..."*

has been formed from pressed and stamped sheet steel, with a couple of tack welds and rivets to hold everything all together.

The machined components comprise the two-piece chuck and the drive handle, and even these have an absolute minimum of machining.

I have already pinched a couple of the ideas in this drill for proof-of-concept work in my workshop, and I hope that a careful look at the picture could help with yours. **EIM**

■ Do any of our readers have an old tool that they are fascinated by the simplicity, or complexity of? Or something that they have picked up along the way that they have no idea what it is? Send a few photos into the editorial office and we will see what we can do to unravel the mystery...





# A Midland 115 Class 'Spinner' in 5-inch Gauge

Bruce concludes his first-ever live-steam loco build with the all-important painting.

BY BRUCE BOLDNER Part five of five

And now to the painting. The National Railway Museum was able to advise that the paint to restore the LMS streamlined Coronation Class had been provided by J & L International Paints in the UK, using the original pigments which a former LMS worker had thoughtfully stashed away in his attic.

J & L was happy to sell me some paint at a reasonable price. However, the customs costs of exporting a tin to Australia were simply ridiculous.

So a friend of a friend in the UK purchased a tin, brushed some onto a plastic CD cover and posted it to us. I then obtained an excellent match at an automotive paint company here.

I had used an airbrush for years to paint my P4 models, but never an air gun. I decided to ask the paint company here to put the crimson lake paint into aerosol cans, as at least the ratio of thinners to paint would then be consistent. I had found with my smaller models that too much thinners could give a matt finish.

For the black areas, I decided to use VHT auto engine enamel, again in spray cans. I realise that ordinary enamel paint could probably take the heat of a smokebox. However, once baked, VHT was also claimed to have good resistance to oil and such.

Before priming, I sandblasted all the brass surfaces except for the tender, as the latter had been completed and was too large to fit into a sand cabinet. But I also did not wish to chance any sand entering the water tank, from where it would plague my injectors for years to come!

I then primed all the surfaces, whether brass, bronze, steel or stainless steel with spray cans of Dulux Metalshield etch primer, which was a light grey. I sprayed outdoors in warmish, balmy weather and waited only 15 minutes after spraying primer to spray the colour coat.

I found that if I held the spray nozzle at the 8 to 10-inch distance recommended by VHT, the paint partially dried by the time it reached the surface, resulting in a grainy finish. Too close and the result was a splattered orange-peel finish.

Each coat had to be applied within 10 minutes of the previous coat, over a total time of one hour maximum.

After this hour, a week had to pass for the solvent to evaporate sufficiently for another coat to be applied without resulting in bubbling, according to the instructions on the paint.

I found it best to keep layering on coats, perhaps four or five, one after the other, starting with a couple of mist coats, then continuing until the paint looked really wet, at which time I walked away and let it settle. I would not respray any more coats, regardless of the time elapsed, even after baking.

## Oven ready

VHT specified that its paint **must** be baked at 200 degrees F (94 degrees C) for one hour to develop its resistance qualities. I in fact baked all the paint, crimson lake included. Club member Stephen Gael showed me how he used a small round convection oven to bake his paint. So I purchased one (it cost me around \$60 from eBay) and made up an oven from MDF sufficiently long to accommodate the locomotive frames and such like.

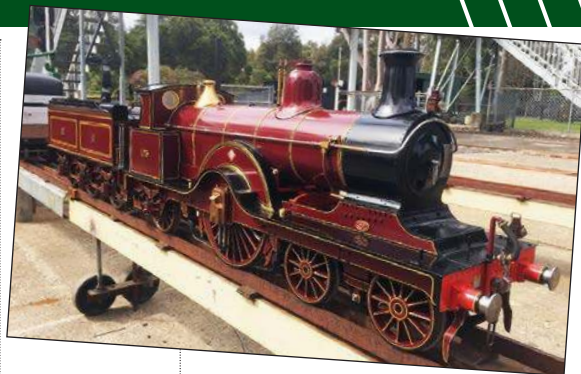
I drilled holes at either end of the oven through which rods could pass to support such components as the cladding. The convection heater constantly cycles the air throughout the box, extracting the solvent vapour. I also mounted an old computer cooling fan at one end of the box to ensure the heat was more evenly dispersed throughout the length of the box (Photos 69, 70).

I set the timer on my oven for one hour and inserted a thermometer through the lid and found it took around 30 minutes to heat to around 185 degrees F. I could have set the oven higher, but considered this sufficient.

However, after spraying the inside of the locomotive frames with VHT red (I decided it looked like a nice pinkish vermilion) I left the frames overnight, then baked them and let them sit for a fortnight. But I was shocked to find that the red bubbled up after subsequently spraying a wet coat of VHT black over a section of it.

You can hand-brush neat paint over these sprayed paints (for lining and such like) but it is a risk to respray because of the thinners involved.

I purchased a Beugler pinstripping wheel and Bob Moore lining pen after reading Christopher Vine's book *How*



For his first project Bruce has built a model of the Midland Railway 115 class 4-2-2 designed by Samuel Johnson.

**PHOTO 69:** Baking cabinet made from sheets of MDF.

**PHOTO 70:** Convection oven was an inexpensive purchase on eBay.

*All photos in this feature by the author*



*Not To Paint a Locomotive.* I didn't end up using the Beugler wheels at all and only used the Bob Moore pen with the standard plus head (0.02-inch) for the very fine black and yellow lines around the edges of the buffer and drag beams and spring buckles. I also used the large head (0.04-inch) (1mm) but sparingly, as it produced a rather large line.





## Plastic fantastic

By far the greatest implement for lining was the discovery of Tamiya soft plastic masking tape. Available from hobby shops, it comes in 2, 3 and 5mm widths. The 2mm width is the handiest as it can be curved into a circle of ½-inch diameter or less and yet remain flat, even though it is low-tack and will rarely dislodge paint when removed. I used it freehand to paint the double circles in the wheel centres and the lines around the wheel rims, as well as the yellow lines along the spokes (I used the Bob Moore pen standard plus head to paint the arrow heads at the ends of the spokes.)

The procedure to produce the black and yellow lining was to first lay the masking tape an appropriate distance from the edge of an item, then paint the item black from the tape to the edge. I peeled the masking tape away almost immediately (slowly!).

After leaving overnight to dry, I laid a new strip of tape over the black, then left a gap and laid another length of tape alongside. I painted the area between the two tapes yellow, continuing layers until the yellow was thoroughly opaque. Then after the minute or so taken to clean the brush, I removed both tapes to reveal the yellow line alongside the black line.

I used Humbrol no. 69 gloss yellow and black one-shot signwriter's paint.

### PHOTO

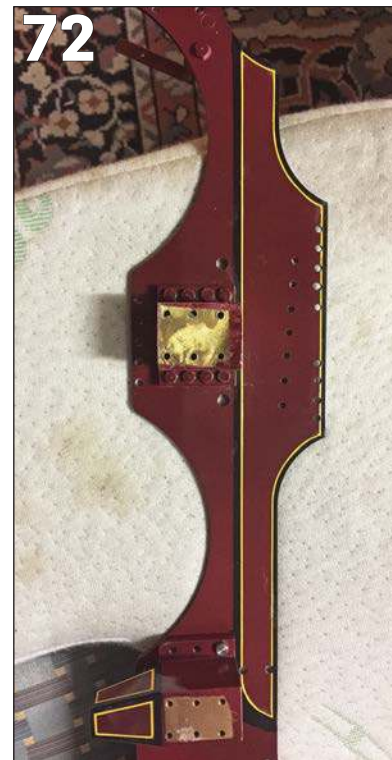
**71-72:** Using plastic kit masking tape to line out the loco frames.

### PHOTO 73-

**74:** A similar process was employed to good effect on the main driving wheels.

### PHOTO 75:

Finished wheel valance – careful painting and lining makes all the difference.



Both were used neat, whether through pen or brush. **Photo 71-74** show the masking tape in use and **Photo 75** one of the driving wheel valances.

The procedure was as follows:

- 1) The brass beading (watercut) was first glued on with J B Weld – attaching it after all was painted would have removed a subsequent need to mask it. I believed a metal-to-metal bond would be stronger.
- 2) The brass beading, including the area within it, was masked off with Scotch brand low-tack masking tape.
- 3) VHT black was sprayed over both footplate and valance top covers.
- 4) The masking tape was removed from the area within the brass beading and the beading itself.
- 5) The beading was painted with

Micromask liquid masking medium – I found this USA brand peeled away more cleanly than the Japanese Mr Masking Sol Neo brand.

6) All black areas were masked off and the area within the beading sprayed crimson lake.

7) The liquid masking medium was peeled off the beading.

8) The yellow and black lines around the crimson lake perimeters were hand painted using the 2mm wide Tamiya masking tape.

On the full-size Spinners the upper half of the inner cab sheets were painted to simulate an oak wood grain. As luck would have it, my local model railway shop suggested I try Humbrol Clear Colour no. 1322 to achieve this effect. The cab had been







etch primed in the Dulux light grey. It was essential to have this base colour of light grey underneath, otherwise the Clear Colour would have been virtually invisible.

The Clear Colour must be well mixed then loaded into a hand brush with a sufficiently large bristlehead to hold enough paint to paint a vertical stroke from top to bottom with one pass. If you stop midway to reload, a visible break line will result.

To achieve a good layer, two passes can be made, each full length and each application immediately after the other. The orange pigment within the Clear immediately stretches and coagulates into vertical wood grain-like formations. Try to continue stroking over the same area and the paint will ball up and tear.

I am extremely happy with the result – **Photo 76** shows my model and for comparison **Photo 77** the full-size cab (Yes, that's me at the controls).

The most difficult parts to paint on the tender were the round-cornered yellow/black/yellow lining panels. The two panels on each side are not the same size, the central vertical beading being aligned over the centre wheel, not at the midpoint of the tender tank.

To centralise each panel within its beading, fellow Steam Locomotive Society of Victoria member Mike Boddy drew up dimensioned drawings, the outside borders of which

#### PHOTO 76:

Model cab with interior painted to represent wood – this is known as a scumbled finish.

#### PHOTO 77:

Equivalent on the full-size loco at the NRM – Bruce dares to dream!

#### PHOTO 78:

Centre points on tender side for lining template.

#### PHOTO 79:

Tamiya masking tape comes to the fore again.

#### PHOTO 80:

Finishing touch – engraved works plates.

#### PHOTO

**81-84:** The completed loco – Bruce is justifiably proud of his work.



fitted exactly within the beading.

We took these drawings to a chap who made adhesive-backed vinyl signs and lettering. Two vinyl templates were cut for the four tender side panels and two for the rear tender panel.

The first template included a cut-out to the width of the two yellow lines (including the width of the black central line). The second template included a cut-out to the narrower width of the black line only.

The first template was applied and the entire cut handbrushed with Humbrol yellow. When the template was lifted centring points remained. The purpose of these was to enable the second template to be positioned accurately over the yellow lines. **Photo 78** shows the centring points.

The second template was then applied – if the centring points of this template were aligned exactly over the centring points left on the tank side from the first template, then the narrow slot in the second template would be positioned centrally within the yellow line. This slot could be painted black and when the template was removed, there would be a black line exactly centred in the middle of the yellow line.

### Too tough to part

In practice, this didn't work. The adhesive on the templates was very strong and it was impossible to align the second template accurately across

the entire area. As soon as any part of the template touched the tender side, it could not be removed without the masking area separating from the clear adhesive film.

All was not lost, however. I simply cut out the rounded corners of the second template and stuck those down. Their small size made them easy to align. I then linked the corner pieces with Tamiya masking tape to create the straight lines between the corners (**Photo 79**).

The 115 class was constructed in two batches. The first five were built during 1896/7 with the inner frames forward of the smokebox (and the lifting tail-rod covers between) shaped in a downward curve to the footplate. It is one of these locos, originally number 118, later renumbered 673 which is the sole preserved example at the NRM.

The second batch of 10 were built during 1899 and for some reason, the curved front frame sections reverted to a sharp edge from which followed a concave line to the footplate (the tail-rod covers were of course also concave, to conform to the frame outline). As my frames from Reeves featured the latter shape, I decided to build number 125 of the second batch.

When painting my Spinner, I had to keep in mind that number 673 has been preserved in the simplified Deeley livery. In this version the boiler bands were simply painted crimson





80



lake, the brass beading over the driving wheel was painted black, the Johnson smokebox door was replaced with the Deeley pattern, the brass numerals were removed from the cab side and replaced with large gold decals on the tender and the new Midland Railway crest was affixed to the cab side.

The tender beading was also painted black, with the yellow lines running along the inside edge of the beading. Number 673 has also been preserved with a 3250-gallon tender, where the coal chute runs the full width of the tender. This happened simply because the smaller tender had been paired with the locomotive at the time of preservation. My research informed me that this locomotive had run with a 3500-gallon tender throughout its working life, as did all of the 115 Class.

### Not too shiny

The editor of *EIM* mentioned in the December 2018 edition that he had overheard someone saying the 5-inch gauge 'Princess of Wales' displayed at the Midlands Model Engineering Exhibition was too shiny. From all I have read, these Midland locomotive express passenger engines shone like glass when they first left the works, and every effort was made by the crew to preserve them as such during their working lives. My locomotive is therefore painted in full gloss!

To complete the livery, I had some exquisite maker's and capacity plates engraved by a company called Tiger Corp here in Richmond, a Melbourne

suburb. Tiger Corp also cut the cabside numerals in the Midland font from brass sheet (Photos 80, 81).

### A rewarding build

I will conclude with some views of the completed engine (Photos 82-84), complete except for the M R lettering on the tender sides. Precision Transfers are out of stock of the serif letters in 5-inch gauge and the firm does not intend to obtain any more, but I'm delighted to learn as I write this that Custom Hobby Decals here in Brisbane, Australia will soon supply me with some (email – [geoff@customhobbydecals.com](mailto:geoff@customhobbydecals.com))

And yes, I realise that there should be an additional smaller whistle behind the safety valve cover in front of the spectacle plate. I made it up ages ago, but mistakenly installed the larger whistle on the boiler centreline. If I installed the smaller whistle now, it would be offset too far to one side.

You may also notice the vertical copper tube extending downwards from the right-hand handrail, before connecting to a horizontal tube into the smokebox saddle. I had intended to direct steam pressure along the right-side handrail into the hydrostatic oil tank, but decided to get the steam for the oil tank from the whistle turret.

The vertical copper pipe from the handrail should simply go down below footplate level, then connect up to the front brake hose. Maybe one day I'll fix this. Mike would like me to connect this handrail to the steam chest and use the vacuum gauge in the

81



Parts one to four of this series appeared in the November 2019 to February 2020 editions of *EIM*. To obtain back-numbers go to [www.world-of-railways.co.uk/engineering-in-miniature/store/back-issues/](http://www.world-of-railways.co.uk/engineering-in-miniature/store/back-issues/) or call 01778 392484.



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cab to monitor steam chest vacuum. Sorry, but the cab vacuum gauge is just there for looks!

Thank you for reading the construction history of my Spinner. I know it's been overly long. I was never a master of the short story! And thank you to all those members of the Steam Locomotive Society of Victoria, without whose generous advice I would never have been able to build my beautiful Spinner. **EIM**

83



84





# Mystery engine a mystery no more....

■ **Editor's note:** In last month's *Club News* we repeated a plea originally published in the *SMEE Journal* by Roger Backhouse of the York SME. Roger had been contacted by a York resident whose son had discovered an engine in the loft of his house in Bedfordshire, and was trying to identify it with a hope of discovering its provenance and sourcing parts to bring it back to working order.

Well this engine is a mystery no longer, thanks to our knowledgeable readers! We had a whole host of mails in on the subject, of which the following is a small selection...

The 'Mystery Engine' featured in the February 2020 issue of *EIM Club News* was designed by Basil Harley and featured in *Model Boats* magazine from July to October 1983 along with his 42-inch long steam launch 'Miranda'. This boiler differs slightly in having a level gauge and filling plug hole added.

Plans for both are still available from Sarik Hobbies (MM1349 – engine, MM1348 – launch).

This was my first scratch-built model boat though mine was made half-size, and won a silver medal at the 1996 Model Engineer Exhibition – photo enclosed. **Chris Allum**

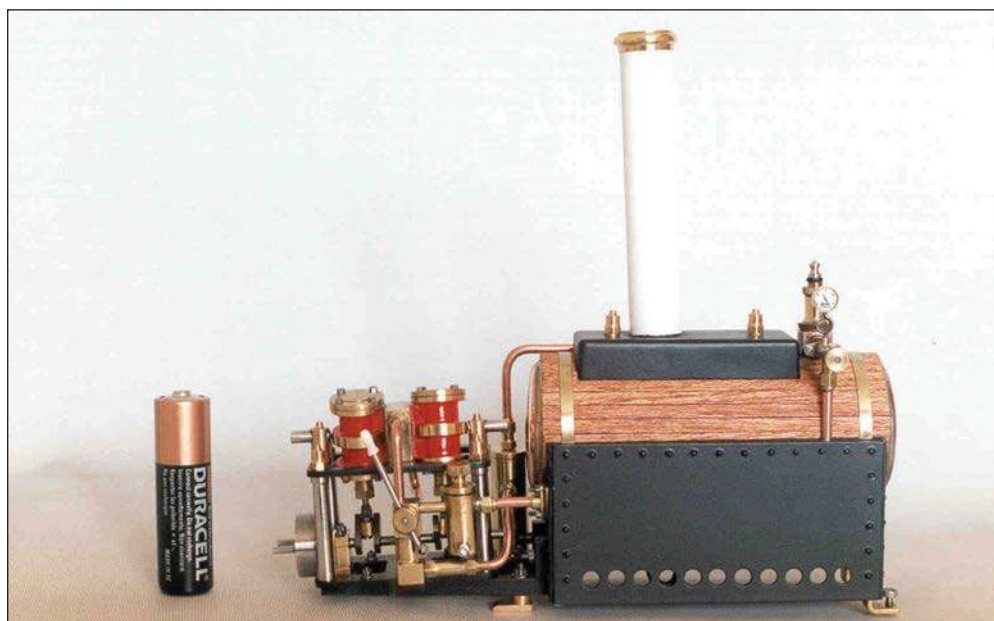
With regard to the mystery engine pictured on page 39 of the February issue, it looks very much to me like the engine designed for the Miranda steam launch, both designed by Basil Harley, construction of both being serialised in *Model Boats* magazine in the 1980s.

The launch was actually depicted on the cover of the *MAP Model Boats & Model Cars Plans Handbook* 1983/84. Plans for both engine and launch are still available.

I have enclosed a picture of the engine that I started a while ago but have yet to complete! **Mike Smith**

We received several more letters in similar vein – our thanks to all who replied. The owner of the engine that started all this has since been in touch both to thank *EIM* readers for their efforts, describing you as "a great community" and to ask advice on how to proceed with restoration. I have sent off for the plans as kindly the ref has also been supplied.

He has sent off for the plans and once these are digested he intends to get the engine back up and running if possible. But describing himself as a novice, our reader asks if anyone would be willing to offer specific advice on the engine, in particular



## TOP AND ABOVE:

Chris Allum's silver-medal winning boat and the 'mystery' that powers it.

## RIGHT:

Mike Smith is still working on his version of the Harley marine engine.

## FACING PAGE, TOP:

Patrick Cubbon's first engine, made when he was just 15, is an ingenious little device.

with regard to finding some of the parts currently missing, short of making them. If you have any answers, send to the usual address...

## Veteran Mamod spares

I got the latest *EIM* today and am enjoying it. The first article I read

was the one on the vintage Mamod stationary engine.

The article was interesting but (possibly because the writer does not live in the UK) it could have included mention of the fact that there are a number of companies in the UK who supply spare parts for Mamods.







The main ones would be Dream Steam, [www.dreamsteam.co.uk/](http://www.dreamsteam.co.uk/) and Forest Classics, [www.forest-classics.co.uk/](http://www.forest-classics.co.uk/) Both sell parts such as safety valves and gaskets, so engines can be restored without having to make all the parts yourself. **Sean Cullen**

### Recalling a first engine

What a pleasant surprise it was to see my Bourne engine article in print ('Not always a happy ending...', **EIM** Feb 2020).

Reading the rest of the issue I noticed in the editorial a request for readers' first engines. The picture, which is self-explanatory, shows mine, which I had at an age of about 15 in 1954.

The flywheel is a clock gear with the spoke gaps filled in with lead. The boiler was a Nescafé metal tin,

and the press-down lid acted as a safety valve.

The engine would only just run at an inclined angle with the flywheel uppermost. This was also the time of my first workshop, which was in the loft under the rafters. I had a 3.5-inch flat bed Drummond lathe with centre leadscrew.

**Patrick Cubbon**

*The Editor adds...* First workshops! There's an idea, anyone have any tales to tell?

Model engineering query to have answered or a point about our vocation to make? Email [andrewcharman@warnersgroup.co.uk](mailto:andrewcharman@warnersgroup.co.uk) or write to the editorial address, 12 Maes Gwyn, Llanfair Caereinion, Powys SY21 0BD

## GENERAL NEWS

# Bassett-Lowke returns, but not as you'd know it...

One of the most famous names in model engineering is to be revived – but we don't think many **EIM** readers will be happy where they next see the title Bassett-Lowke...

Founded at the end of the 19th century in Northampton by Wenman Joseph Bassett-Lowke and initially a toy company, Bassett-Lowke became renowned for its live-steam locomotives, from 7mm scale O gauge right up to 15-inch gauge – the storied history of W J and colleagues such as Henry Greenly includes taking over the 3ft gauge Ravenglass & Eskdale Railway in the Lake district and converting it to the 15-inch gauge line we know today.

Bassett-Lowke declined after the Second World War and eventually closed in 1965. The company name went through several owners, eventually acquired in 1996 by diecast car model maker Corgi, which in turn was bought by model railway manufacturer Hornby in 2008. And it is Hornby that is reviving the name, on a new range of OO gauge (4mm scale) Steampunk-themed railway models.

What is Steampunk? Well it's described as a sub-genre of science fiction in a historical setting featuring steam-powered machinery rather than advanced technology.



The fashion side of the genre is certainly popular – a Steampunk display at the 2019 London Model Engineering Exhibition raised eyebrows, while a Steampunk-themed entry in the 'Great Model Railway Challenge' TV show perhaps gave Hornby the idea.

As you'll see from the photos the concept basically seems to involve adding lots of industrial revolution-style cranks and cogs to standard model items. You can't fault Hornby for being willing to try something new, but using the Bassett-Lowke name? We

suspect many readers will agree with the Ed's views on page 3... *Photos: Phil Parker*



## Show for the garden scales

Model Engineering's smaller scales are highlighted in the annual Midlands Garden Rail Show which takes place this year on Saturday 14th and Sunday 15th March at the Warwickshire Event Centre.

Open from 10am to 4pm each day the show focuses on the traditional garden scales, O Gauge, Gauge 1 and the narrow gauges of G Scale and 16mm. The scales are of course a major proponent of live-steam propulsion, gas, spirit and coal fired.

Organisers Meridienne Events are expecting more than 2,000 enthusiasts from

all over the UK and Europe, with 15 layouts and displays and more than 30 leading suppliers awaiting them.

A full list of confirmed layouts, clubs and trade exhibitors attending is on the website at [www.midlandsgardenrailshow.co.uk](http://www.midlandsgardenrailshow.co.uk) and the show guide will be available to download in advance from the site.

Advanced ticket discounts are also on offer, tickets booked online before midnight on Tuesday 10th March will cost £8 adults, £7.50 seniors and £3.50 accompanied children aged between 5-14. On the day prices will be £1 more per ticket.





# Winter warmers at the tracks

The clubs no longer hibernate at this time of year, out for some seasonal fun...

COMPILED BY ANDREW CHARMAN



We start this month's club round-up having just returned from the London exhibition, and once again the clubs present put on a great show, so we make no apology for giving some space on these pages to a couple of the pictures squeezed out of John Arrowsmith's show report.

Heading this page is the **Chelmsford SME** – stars of the London show last year the club produced an equally packed and innovative stand this year. I

particularly liked the steam engine simulator – encouraging more recruits to the footplate is always a good idea! And as the picture below of the **Maidstone ME** stand demonstrates, there really is no better place than a show in which to see a very wide variety of model engineering.

Turning to this month's selection of club newsletters, the overwhelming theme is of course of trains wrapped in tinsel, their drivers in red suits with long white beards – Santa Specials have again proved a big success for so

*“Our membership is stable at over 160 and we have applications for membership every committee meeting...”*

many clubs this winter season.

One of the better such pictures graces the cover of the latest *Goodwin Park News* from **Plymouth Miniature Steam**, while inside club chairman Ian Jefferson describes a very successful running season on the club's track. More than 6,000 rides were provided, eight per cent up on the previous year, but this did put a strain on the club's locos, the interestingly-named Kerr Stuart Wren 0-4-0 'Hernia' eventually failing after more than 30 years service. The loco has now been stripped right to the frames for a major overhaul which includes reboring the cylinders.

One very laudable aspect of the Plymouth club's activities is its apprentice scheme, now running for more than 25 years. Apparently those signed up to this scheme have ranged in age from adult to just 12, which is very positive for the future.

## New Year success

I was immediately drawn to a couple of pictures in the **Grimsby & Cleethorpes ME** *The Blower*, both taken by member Phil Haith on New Year's Day and therefore free of Christmas trappings – though Paul Gilby appears to have a very long beard as his train emerges from the tunnel! During the New Year's Day services visitors were simply invited to make donations for their rides, and the club raised £250, following on from a similar exercise on Boxing Day which netted £200.

Unfortunately the festive period also brought sad news for the G&CME with the passing of Mick Askwith, one of the club's longest-serving members, on 29th December.

Members of other clubs couldn't wait to get back out to the track (and



**ABOVE:** You won't pass by this stand in five minutes – excellence from the Chelmsford SME at the London show. Photo: John Arrowsmith

**LEFT:** You are seldom short of variety at a show, here on the Maidstone stand at the London event. Photo: Andrew Charman



away for visiting relatives?) after Christmas, the **Bradford ME** among those staging 'Mince Pie' runs. However, reports the club's latest *Monthly Bulletin*, there was a distinct lack of steam locos at this year's event, the only steam coming from the mince pies and copious amounts of tea drunk! The i/c locos made their presence felt on the track however.

The cover of the latest **York ME** newsletter pays tribute to the High Speed Trains that will no longer run past the club track on the East Coast Main Line, having been withdrawn over the winter.

Inside the newsletter York chairman Dave Wood, who when not heading the affairs of the society is leading a project to recreate the full-size original Festiniog Railway original locomotive 'Mountaineer' ([www.1863mountaineerloco.co.uk](http://www.1863mountaineerloco.co.uk)) paints a positive picture of the Society's fortunes. "Where other model engineering societies are struggling to survive, York is doing fine," he says. "Our membership is stable at over 160 and we have applications for membership every committee meeting."

He adds, however that the club must not sit back and rest on its laurels. "We have to invest in the future – we are submitting the plan for the new workshop/store for planning permission."

Also interesting in the York newsletter is a piece concerning the club's annual exhibition, this year scheduled for 21st June. It will be called 'Changing Perceptions', because apparently there is a perception that York is a railway club and not a model engineering club, so organiser Kevin Dick intends to showcase as much of the club's varied model engineering activities as possible.

Variety is certainly evident on the cover of the latest **St Albans & District ME** newsletter, featuring a remarkably detailed and properly proportioned model of a ship by Japanese artist Atsushi Adachi, built entirely in paper.

St Albans members are given a mystery object to identify each month in the newsletter, and this issue features a wild concoction of metal curves and shapes which is apparently a machine for cutting metal discs, working on a similar principle to a tin opener with two wheels for shearing the metal operated through the handle and gears.

## Vandalism frustration

Definitely not very seasonal are the challenges facing the **King's Lynn & District SME**. Under a headline 'Vandals could drive us out, model group warns', local media the *Lynn News* reports that the club is being



affected so badly by persistent vandalism attacks at its Lynnsport Miniature Railway that it might be forced to disband.

The latest incident, in the first week of January, saw the ticket office damaged and other infrastructure tipped over.

Club secretary Jim Stollery is quoted as saying the around 30 members have reached the point of considering whether it was worthwhile continuing at all.

"It would be a disaster if we were forced out," jim adds. "It would really be giving in to this sort of behaviour and we don't want to do that. But it's just going on and on and on – we turn up on a Wednesday and the first thing we do is check if there has been more damage."

Frustrating times for the club which has only been operating from its current site for two years after being forced to relocate by housing development – let's hope the publicity can help identify and stop the perpetrators of this mindless damage.

Thinking of the future is on the mind of many a club member – it's the time of year when many societies are staging their annual general meetings, and this is certainly true of the



## ABOVE:

Always time for tea in the eyes of Grimsby's Tom Burton.

## BELOW:

Does Grimsby's Paul Gilby need a beard cut? Photos: Phil Haith/G&CME

## BELOW LEFT:

Southern Fed chair Bob Polley wants to hear from clubs.

## Southern Federation of Model Engineering Societies (SFMES).

Ahead of its AGM on 14th March, SFMES chairman Bob Polley has been considering how the services provided by the volunteer organisation to more than 200 affiliated clubs have traditionally been concerned with boiler testing, club insurance and health and safety matters. SFMES has recently been conducting a review of the longer-term prospects for the organisation, and necessarily of the hobby it supports.

Bob points out that everyone is aware of changes in the hobby, from negatives including reduced numbers of home workshops and training classes and increased legislation







affecting both club and individual members' management and conduct, to positives such as the increased use of and interest in modern processes and products and improved communications through the use of computers and the internet.

The Federation believes no organisation can afford to be static, especially in the face of such change as our hobby has experienced and which will doubtless continue. And so it is recognising the need to take stock of its own activities, the way it carries out its business and the need to reflect the interests of modern clubs and their membership as well as those of the more traditional societies.

Basically, the Federation wants input from its members at the AGM which will be held at the STEAM

**ABOVE:** New techniques employed on this Stirling Single by Southampton member John Barrett will feature in next month's issue.

**BELOW** Rugby club is looking forward to the summer.

**BELOW LEFT:** They really need to be told?

Museum in Swindon. These views will guide its future direction and ambitions and for this to be effective, as many affiliated clubs as possible need to be individually represented at the AGM. Affiliated clubs should respond to the distributed invitation and try to attend but the views of those not currently affiliated are welcome to – they can contact Bob at BobPolley@SFMES.co.uk

Basically, be there and make your point – it's vital for the future health of the hobby.

Looking to a closer future is the **Rugby MES**, the first of the posters for the 2020 versions of the club's popular themed weekends arriving in the editorial office, for the Narrow Gauge Rally in July. Others planned for this year include a weekend focusing on articulated locos, of which more details soon.

Back to the newsletters, and the quarterly publication of the **Southampton SME** features many pictures of another successful Santa Special event. One of the most interesting pieces in these pages, however, is by member John Barrett, describing how he has been using a selection of very modern techniques and materials in his model engineering, and wondering why "the mere mention" of anything not traditional can "send certain ME types into fits of apoplexy."

John has been enjoying making use of such techniques as 3D printing and materials such as titanium, even on a part-finished Stirling Single loco he has recently acquired. We are delighted to say he will be describing these techniques for us in next month's issue of **EIM**.

## Track options?

The uncertain times for the **Leeds SMEE** continue as the club looks for a new track site due to planned redevelopment at their current Eggborough power station venue, but the news in the latest edition of club newsletter *LeedsLines* sounds positive. In the same week that an initial offer of a site was made by a golf club at which Leeds members host their speaker evenings, the developer of the power station has identified a site for the club and intends to include the track in their planning application. Watch this space...

Whoops, we are out of space again. Just time for an 'And Finally' and a notice that tickled the Ed when he spotted it on a stand at the London show – that's what you call educating the public... **EIM**

## Narrow Gauge Rally



Running models of 2 ½", 3 ½", 5" and 7 ¼" gauge, with an exhibition of other scales and part built locomotives.

If you wish to submit your engine to run, be part of the exhibition or if you have any questions, please email: [ngevent@outlook.com](mailto:ngevent@outlook.com)  
Exhibitor camping available upon request.



Rugby Model Engineering Society  
Onley Lane, Rugby, CV22 5QD  
[www.rugbymes.co.uk](http://www.rugbymes.co.uk)

11<sup>th</sup> & 12<sup>th</sup>  
July 2020  
10:00- 17:00

You are welcomed  
to our special  
event for  
Narrow Gauge  
Engines event.  
Free admission.





# MARCH DIARY

## EVERY SUNDAY

(Weather permitting)

Bournemouth SME public running, Littledown Pk, BH7 7DX, 11am-3.30pm

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

Fylde SME Public running at Marsh Mill, Thornton Cleveleys, FY5 4AB from 1pm.

Kings Lynn & District SME public rides, Lynnsport Miniature Rly, PE30 2NB, 11am-3pm

North Wilts ME public running, Coate Water Railway, Swindon, SN3 6AA

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

Tyneside SME Members Day, Exhibition Pk, Newcastle NE2 4AA

Urmston DSME Running Day, Abbotsfield Pk, Manchester M41 5DH 11am

Wigan MES public rides, Haigh Woodland Park, School Lane, Haigh, PM

Vale of Aylesbury ME running day, Buckinghamshire Railway Centre.

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

## EVERY WEDNESDAY

(Weather permitting)

Bournemouth SME public running, Littledown Park, BH7 7DX, 11am-3.30pm

Kings Lynn & District SME public rides, Lynnsport Miniature Rly, PE30 2NB, 11am-3pm

Tyneside SME Members Day, Exhibition Pk, Newcastle NE2 4AA

Wigan MES public rides, Haigh Woodland Park, School Lane, Haigh, PM

**1** Frimley & Ascot LC public running, Frimley Lodge Mnt Rly, GU16 6HT, 11am-4pm

**1** Wagga Wagga SME public running, New South Wales, Australia, 10.30am

**2** Lancaster & Morecambe ME Engineering Night, Cinderbarrow, Tarn Lane, near Yealand Redmayne, 7.30pm

**3** North Wales ME meeting, Members Forum, Craig y Don Community Centre, Llandudno LL30 1TE.

**3** Romney Marsh ME meeting, Update on 'Clan Line' by Colin Clark, Rolfe Lane, New Romney, Kent, 7.30pm

**4** Bristol ME meeting, Turbine model building by John Beddis, Begbrook Social Club, BS16 1HY, 7.30pm

**4** Leeds SME meeting, Jumble Sale, Mid Yorkshire Golf Club, Darrington, WF8 3BP, 7.30pm

**4** Southport ME monthly meeting, Rotten Row, PR8 2BZ

**5** Bradford ME AGM, Saltaire Methodist Church, 7.30pm

**5** Wirral ME meeting, Railway Safety & Cultural Change by David Maidment, WI Hall, Thornton Hough, CH63 1JL, 7.30pm

**6** Maidstone ME AGM, Hilton Hotel, Maidstone, Kent, 7.30pm

**6** Portsmouth ME meet, 'Fuel for the Navy', Tesco Fratton Comm Ctr, 7.30pm

**6** Rochdale SME meet, sale of items from Richard's workshop, Castleton Community Centre, OL11 3AF, 7pm

**7** Isle of Wight ME Open Afternoon, Broadfields, Cowes PO31 7NN, 2-4pm

**7** SMEE AGM, Marshall Hse, London SE24 0HW, 2.30pm

**7** Tiverton ME Running Day at Rackenford, Contact Chris Catley 01884 798370

**8** Andover ME members running day, Wherwell, SP11 7HT, 7.30pm

**8** High Wycombe ME Sunday Morning Steam-up, Holmer Green HP15 6UF

**8** York ME members running day, North Lane, Dringhouses YO24 2JE

**11** High Wycombe ME meeting, The Liverpool Overhead Railway by Colin

Brading, Rosetti Hall, Holmer Green, HP15 6SU, 8pm

**11** Southport ME meeting, Bits & Pieces, Rotten Row, PR8 2BZ

**11** St Albans ME meet, Building a lifeboat by Jeff Carter, Christchurch Ctr, High Oaks, AL3 6DJ, 7.30pm

**13** Tiverton ME Meeting, George & Robert Stephenson by Jonathan Edmunds, Old Heathcoat Comm Ctr, Tiverton, 2.30pm Contact Chris Catley 01884 798370

**14** Southern Federation MES AGM, STEAM Museum, Swindon, for more details contact Bob Polley, BobPolley@SFMES.co.uk

**14** Midlands Garden Railway Show,

**15** Warwickshire Exhibition Centre, full details and tickets at www.meridienneexhibitions.co.uk

**15** Frimley & Ascot LC club running, Frimley Lodge Mnt Rly, GU16 6HT, 10am-4pm

**15** Wagga Wagga SME public running, New South Wales, Australia, 10.30am

**17** Model Steam Road Vehicle Society meet, Tewkesbury's first and forgotten rail station by John Dixon, Longford Village Hall GL2 9EL, 8pm

**17** Romney Marsh ME meeting, Products of the winter workshop, Rolfe Lane, New Romney, Kent, 7.30pm

**18** Bristol ME Spring Auction, Begbrook Social Club, BS16 1HY, 7.30pm

**18** Leeds SME meeting, The First Train in Spain from Warrington by Richard Gibbon, Mid Yorkshire Golf Club, Darrington, WF8 3BP, 7.30pm

**18** SMEE visit to London Cinema Museum. Reserved places, contact Norman Billingham at SMEE

**18** Southport ME meeting, Bismark in 1/100 scale, Rotten Row, PR8 2BZ

**19** Wirral ME Quiz Night, WI Hall, Thornton Hough, CH63 1JL, 7.30pm

**20** Rochdale SME meet, members' projects & problems, Castleton Community Centre, OL11 3AF, 7.30pm

**21** Isle of Wight ME Members' Day, Broadfields, Cowes PO31 7NN, 10am-4pm

**21** York ME meet, Art on or about the Line by Bob Lovett, North Lane, Dringhouses YO24 2JE, 7pm

**22** Grimsby & Cleethorpes ME running day, Waltham Windmill, DN37 0JZ

**22** Portsmouth ME Bugs out tuning/tweaking, Bransbury Pk, PO4 9JY, 10am-2pm

**22** Tiverton ME Running Day at Rackenford, Contact Chris Catley 01884 798370

**25** Andover ME meet, HMS Glamorgan's War by Jim Butterfield, Wherwell, SP11 7HT, 7.30pm

**25** Southport ME meeting, Inventive Victorians, Rotten Row, PR8 2BZ

**28** Romney Marsh ME Track meeting, Rolfe Lane, New Romney, Kent, noon

**28** Tiverton ME Boiler Testing Day at Rackenford, Contact Chris Catley 01884 798370

**29** Bristol ME public running, Ashton Court Railway, BS8 3PX, noon-5pm

**29** Cardiff ME public running, Heath Pk, CF14 4AW, 1-5pm

**29** Grimsby & Cleethorpes ME running day, Waltham Windmill, DN37 0JZ

**29** Lincoln ME public running, North Scarle playing field, LN6 9ER, 8am-noon

**29** Maidstone ME public running, Mote Pk, ME15 7RN, 2.30-5pm

**29** Portsmouth ME public running, Bransbury Pk, PO4 9JY, 10am-2pm

**29** Southampton SME public running, Riverside Pk SO18 1PQ, 1-4pm

**31** Romney Marsh ME Track meeting, Rolfe Lane, New Romney, Kent, noon

**31** Wigan DME meeting, Free & Easy Night, Methodist Church, Wigan WN1 3HB, 7pm

NOTE – if you have sent in dates for inclusion this month and they have not appeared please accept our apologies. This was due to an unavoidable last-minute editorial issue – normal service will be resumed next month.

Details for inclusion in this diary must be received at the editorial office (see page 3) at least EIGHT weeks prior to publication. Please ensure that full information is given, including the full address of every event being held.

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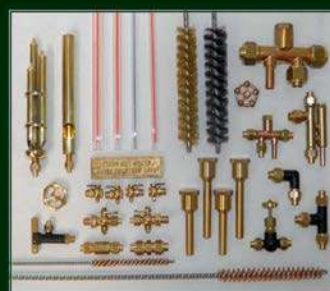
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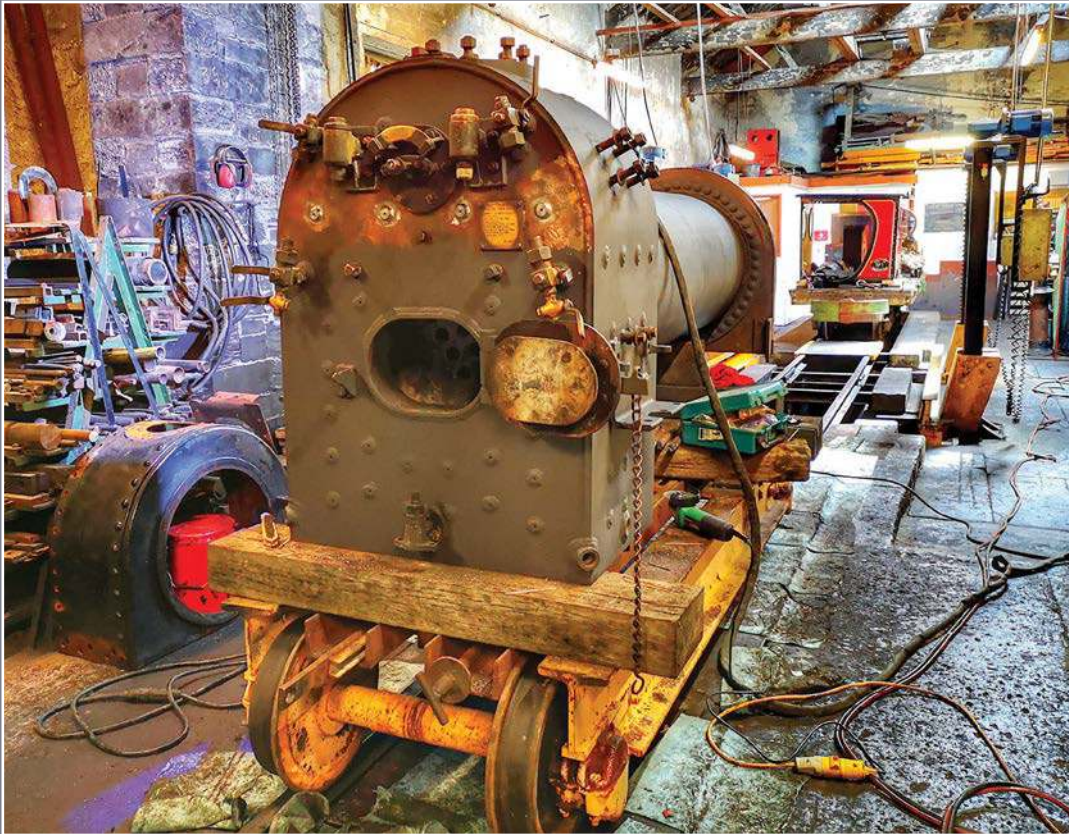
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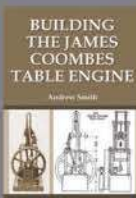
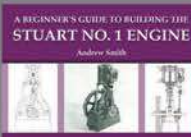
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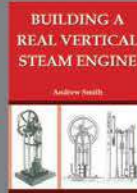
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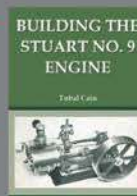
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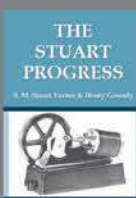
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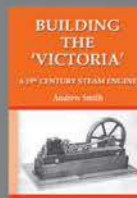
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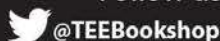
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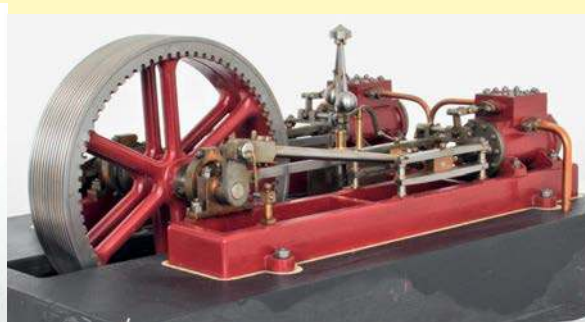
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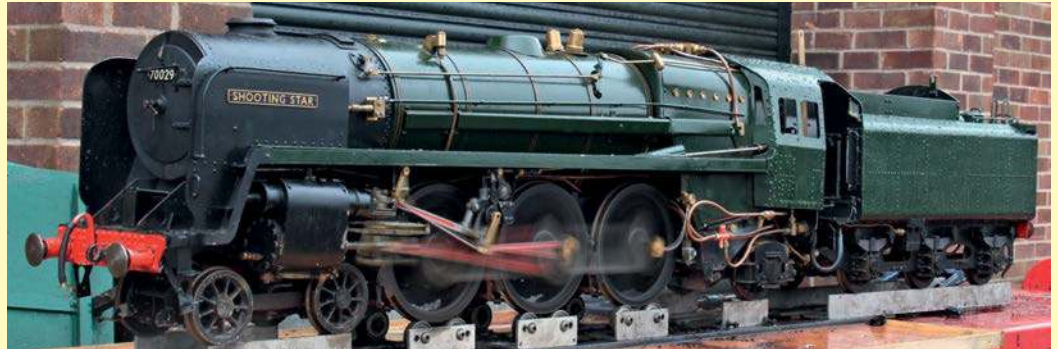
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#### 5 INCH GAUGE BRITANNIA

A 5 inch gauge kit built Britannia "Shooting Star" that runs in a fairly asthmatic way, we see this as a "running restoration" project. Complete with two binders containing the original assembly instructions, along with manufacturer's boiler certificate.

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