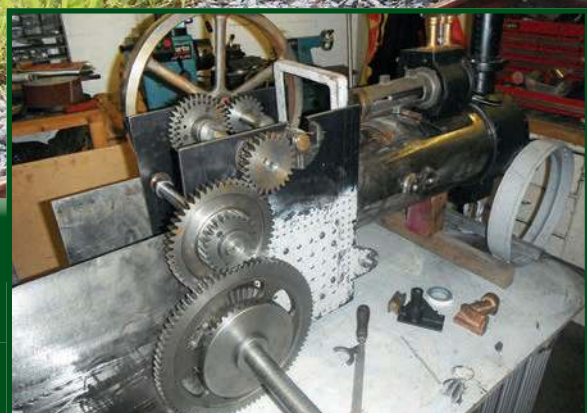


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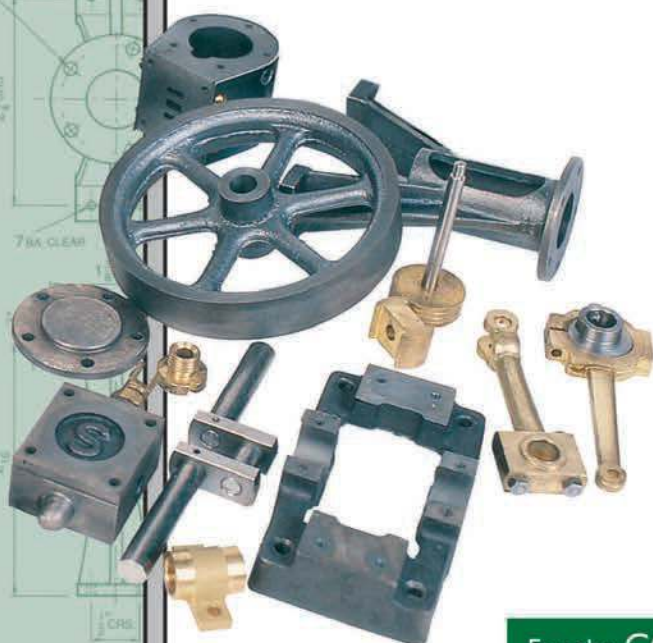
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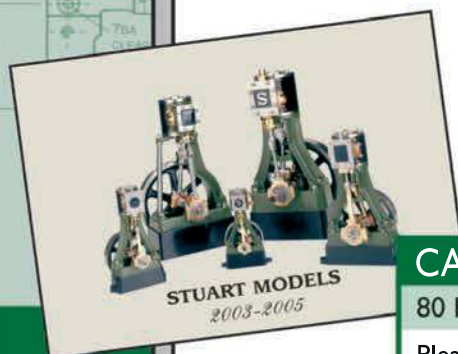
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FRONT COVER

The 70th anniversary celebration weekend at the Rugby MES included some impressive loco types, from a Shay to a Tasmanian Beyer Garratt, both seen here at the club's new station. *Photo: Andrew Charman*



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EDITORIAL

Out and about...

Welcome to EIM and for your editor it's been a most recent couple of weeks of getting out and about in the model engineering world. I was delighted to both be invited to and able to attend (not so easy for a man who combines editing this and another magazine with motoring and motorsport journalism!) the 70th anniversary weekend of the Rugby ME and the opening of the large new station at its Onley Lane track.

I had never previously been to Rugby's very impressive facility, so within minutes of arriving was jumping on a train driven by club member John Travis – in another, connected life I fire to John's driving on a Welshpool & Llanfair Light Railway footplate. The ensuing run showed me first hand how complex, and long, the track at Rugby is, and the new multi-road station adds to the facilities.

Equally impressive, however, was the clear involvement of the local community in the activities of the Rugby club. The new station was basically funded by a £12,000 grant from the Tesco supermarket 'Bags of Help' grant scheme, and as anyone who uses that particular supermarket will know recipients from this scheme are voted for by the shoppers.

Further evidence of this community support was the unveiling of a new wheelchair coach at the Rugby event, this funded by a donation from the local Lions Club. To your editor this appeared very topical, having just written a press release for a project improving wheelchair facilities at the Welshpool line. It is very gratifying to see the model engineering vocation taking the provision of such facilities for less-able visitors equally seriously.

This past weekend could not have been more different, well sort of. I attended a friend's open day – he has an extensive garden line in 16mm scale (definitely a worthy model engineering scale), plus a short 7¼-inch scale line created when he was offered some portable track at a bargain price! Talk about the best of both worlds – your editor much enjoyed pottering up and down at the controls of a Scamp petrol loco, a great way to lose an afternoon!

We hope that many readers have been getting out and about, if not running at their local track then at least visiting it – it's all very well spending hours in a workshop creating a model but you also need to get out and enjoy it when it's finished...

Enjoy your EIM, and don't forget to send in something for your fellow readers to enjoy!

Andrew Charman – Editor

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Rugby's higher station

The Rugby MES celebrates its 70th anniversary in style with the opening of a large new station at its already impressive track.

BY ANDREW CHARMAN

Spending the day in the company of an obviously thriving model engineering society is always a pleasurable experience, and it was patently obvious when your editor visited the Rugby Model Engineering Society on 20th July that this is indeed a thriving club, with impressive facilities including a ground-level 7¼-inch gauge track taking a looping, interesting course around the 12-acre site to give a run of a full mile.

EIM was present for a reason, joining the Society for its 70th anniversary weekend, the Saturday of which saw not only the official opening of a new station but also the commissioning of a bespoke bogie carriage designed to carry wheelchair-bound visitors.

Founded in 1949, the Rugby Society initially operated an elevated track at its headquarters at a community centre, before moving to its present, out-of-town Olney Lane site in 1991. Here the ground-level track, the Rainsbrook Valley Railway, was established and the Society turned itself into a limited company. A raised track was also built, catering for 5, 3½ and 2½-inch gauge enthusiasts.

Major expansion arrived in 2013 when the Society was able to add an extra field to its site, expanding the space available some three-fold, and this enabled a significant expansion of the ground-level line. Over a four-year period the line was extended to its current one-mile operating length,



ABOVE: How it was – the original Rugby MES station, still in use but no longer the centre of operations.

BELOW: And how it is – the new, much larger three-platform station on opening day.

and as the editor discovered on taking a ride within minutes of arriving at the track, it is no dull run.

Challenging route

The line not only runs to three corners of the site (leaving the other for car parking), but loops back on itself several times, incorporating a run through woodland, across a meadow, through a cutting, traversing a pair of bridges and along an embankment which gives superb views across the valley to the south. Locomotive drivers face a challenging route while visitors get a lot of value for their £1.50 train ticket.

Those riding on the 7¼-inch gauge not only pass close by the

station for the elevated track, but get a good view of the major extension that is currently underway on this line. This extension will more than double the run for the club's smaller locomotives from the current 1100 feet to 2500 feet.

That is for the future – the highlight of the 70th anniversary celebrations was the commissioning of the club's new ground-level station. Traditionally trains have set off from a station located close to the site entrance and the clubhouse, adequate when the track first opened but really too small for the number of visitors that now come to public running days. Acquisition of the extra land allowed something much larger to be planned.





Bagging a grant

Building the new station was expected to be a project lasting several years, but was greatly boosted by a £12,000 donation in 2017 from Tesco. The Society was declared a winner in the supermarket's 'Bags of Help' scheme, which sees the 5p charge legislated by the Government for plastic carrier bags donated to local groups. Shoppers vote in the supermarket for which local projects the money goes to, so the award was doubly pleasing to Rugby members, knowing they had the backing of the community.

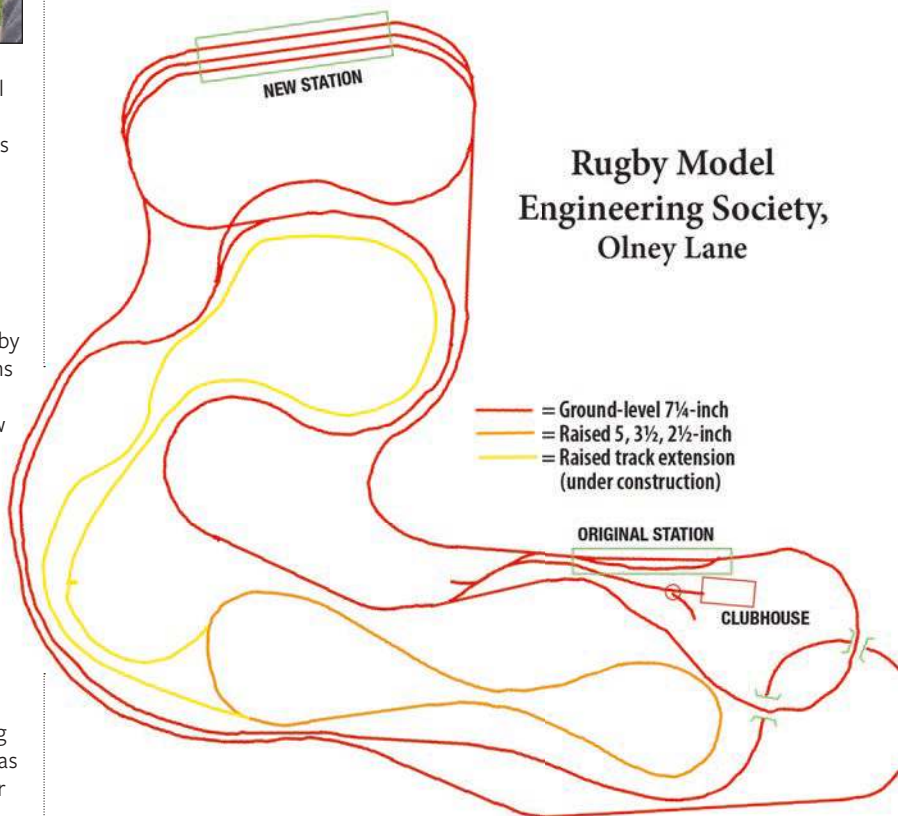
As a result a much larger, three-platform station has been created at the far end of the Olney Lane site, with each platform able to stable two trains at a time. Such capacity is certainly needed, judging by the number of visitors to the public running weekend – queues were forming for rides even before Rugby Mayor Bill Lewis had cut the ribbon to officially open the new station, and even with five trains running at once throughout the

ABOVE: Bill Lewis, mayor of Rugby, cuts the ribbon opening the new station.

ABOVE RIGHT: The sponsorship by the local Lions Club of the Society's new wheelchair carriage was welcome.

RIGHT: Simplified schematic of the Olney Lane tracks.

BELOW: Big machinery was rostered over the weekend...





afternoon, all controlled by a colour-light signalling system, there was little spare room on each service. The club's Edward Parrott told us later that 1000 more travel tickets than predicted had been sold...

Introducing the mayor, and with the musical backing of the Bilton Silver Band, Rugby MES chairman Aubyn Mee paid tribute to the members of the public who voted for the Bags of Help award, and to the many members and friends of the club who had contributed to a 'Sponsor a Sleeper' fundraising effort. Special thanks were also made to the members who had worked hard over many months to build the station, from concreting and tracklaying to creating the attractive flower beds.

Aubyn also revealed further plans for the new area of the site. "We hope to improve facilities at this end, with a new building for catering and such in years to come," he said.

Bespoke carriage

A second, equally important presentation on the day saw Gill Nelson, president of the Rugby Rokeley Lions Club, hand over a cheque for £1190, sponsoring the design and build of a bespoke carriage for wheelchair-bound visitors.

"We've been working at the railway for a few years now and we noticed the difficulties of manhandling a wheelchair-bound visitor onto a train," Gill said.

Following a special train for the VIPs, pictured departing from the new station on this month's cover, public train services ran through the afternoon, and as reported were pleasingly full. The same proved true on the following day – certainly this is one club that is going places!

■ The Rugby MES's remaining 2019 public running days are on 15th September and 20th October, with Santa Specials on 22nd December. For more details of the Society check out the website at <http://rugbymes.co.uk>



ABOVE: A contrast in gauges and two ride options for visitors.

LEFT: The impressive new wheelchair bogie carriage.

LOWER LEFT: Full trains were the order of the weekend.

BOTTOM

LEFT: More big hardware in the shape of a Tasmanian Beyer-Garratt.

BELOW: A driver's eye view – note the colour light signal.

All photos by Andrew Charman



Comparatively useful

A lesser-known tool features in this month's offering from our readers...

An extremely useful and somewhat unknown tool I have used frequently and rely on to both save time and increase accuracy is called a comparator (Photo 1). The one shown in the pictures on this page will work from 0.375-inch to six inches, although depending on how it is used, it can work perfectly well as a metric comparator too.

Having had to remove the back from this particular example when one of the legs got strained, I discovered that the inner workings are extremely delicate and complicated, to the point where without a couple of days spent working them through I would not be willing to say I understand exactly how the tool works, however I do know how to use one!

In this instance I was measuring the inside bore of a wheel that I had pressed off a somewhat tired axle to then machine a new axle to the correct press fit. This of course necessitates extremely accurate measurements, at several angles and depths to ensure that the bore is both round and parallel.

The legs of the comparator are sprung outwards, and they can be adjusted across the full range of motion by the small knurled knob on the very top. Once they are sprung into the bores, you can then use the knob to bring the needle to rest on the 0 point of the dial – this is in 0.5 thou'



Photos by
the author

increments so is extremely sensitive.

To measure the bore correctly, you gently rock the comparator perpendicular to the bore to ensure the needle comes to a rest at the 0 point at the narrowest part of its movement (Photo 2). Once this has been set, you can remove the tool from the bore and the legs will immediately spring out. You can then check the rest of the bore by ensuring that the comparator returns to the 0 point at every point on the bore.

To then take a measurement from the comparator, you pick up a micrometer and use the rotational dial to bring the comparator's legs together until the 0 point is reached (Photo 3), again gently rocking the comparator to ensure you are measuring truly across the legs. Once this has been achieved, read the micrometer as normal (Photo 4) and you have your extremely precise measurement. Simple!

Michael Thomas



Making track for the Apple Valley Railway

Simon describes how he constructed his own track and pointwork for the 7¼-inch gauge ride-on railway that he built in his garden.

BY SIMON MACE – Part two of six



LEFT: Apple Valley loco No. 2 is approaching the sprung points on the loop. The blades here are made from steel strip and pivot as a single unit.

BELOW: Standard Apple Valley trackwork. It is 21mm alloy rail laid on 3 x 2-inch sleepers and ballasted with 20mm granite chippings.

All photos by the author



Track laying in the ride-on gauges can easily be the biggest expense of even a very small railway, so making sure that an investment in timber and steel (or alloy) is going to produce a safe and sturdy track is important.

There has been a great deal written about how to lay out a small-scale garden railway, and there are plenty of engineers who make a good living from creating designs for full-sized lines. Similarly, commercial passenger-carrying miniature railways have to conform to very high standards of construction to keep the man from the HSE (Health & Safety Executive) happy.

Fortunately things are not quite so onerous for a ride-on garden railway. What we need is a track that is economical to build, safe to run on, and easy to maintain.

The first thing to consider is what you want to achieve from your track. Fine-scale models of standard gauge stock on 5-inch gauge track will need a different approach to heavyweight 7¼-inch narrow gauge trains.

Weighty issues

Axle loadings become important, just like on the real thing. This is usually determined by the design of your passenger-carrying vehicles; a typical bogie wagon carrying one adult passenger might have a load of 25kg per axle. Make that wagon a bit longer, and three adults will bring that figure nearer to 80 or 90kg. With this in mind, the rolling stock on my line is designed so that each passenger gets 'their own' bogie.

The lightest rail commonly used for passenger carrying is 16mm (⅝-inch) tall aluminium alloy. It has the advantages of being cheap, easily available, and easy to curve and shape. Its small profile makes it ideal for 5-inch, or smaller 7¼-inch gauge lines.

The downside to using such a small section is that sleeper spacing will have to be pretty close (perhaps down to a 2-inch gap in some cases) to prevent the rail from developing dips and kinks. Additionally, you might be limiting the possibilities for having

bigger locos come to visit.

Aluminium alloy rail is available in larger sections, up to 35mm tall for running really heavy stock. The most popular sections are 16mm, 21mm and 25mm (standard 1½-inch scale in the US). Track kits are available in these sizes, along with points, and cast/machined components for assembling your own points, crossings and the like.

Much of my line is laid with 16mm rail, but I now prefer to use the 21mm. This is mainly down to appearance, but I have also found it easier to achieve a smooth curve when using the larger section.

If you expect to have intensive operation on your railway, or are particularly concerned about wear, steel rail is available from the 21mm size up. The big advantage of using steel is its toughness. But this is also its downfall, as bending and shaping the rail becomes a lot harder. A couple of other bonuses to using steel are that more grip is available (aluminium alloy becomes very slippery when wet), and there is less thermal expansion than with aluminium. If you are planning long straights, this could become a significant issue on hot sunny days.

In the past, former British Railways point rodding, and aluminium window-frame channel were frequently used as rail. Probably the most common however, is rolled steel strip, laid on edge. This construction is popular with clubs, where its low cost (when bought in bulk) and vandal-proof nature are big advantages. For a home railway, I would suggest that the smaller quantity of track required swings the balance in favour of a more authentic rail profile.

Wood costs

Sleepers can be something of a hidden cost for track building. On my line, standard sleepers are 14-inch lengths of 2-inch x 3-inch timber, spaced approximately four inches apart. This means that for every 10 feet of track laid, I need to find 20 feet of timber. Fortunately I have access to a steady supply of waste timber from a local college. Choosing a standard size for your sleepers might help to save costs by scavenging offcuts from a local builder or carpenter.

For a smaller scale line, such as 5-inch standard gauge, a smaller sleeper is appropriate. Success has been had with sleepers as small as 1-inch square, but be aware that the less bulk there is to a sleeper, the quicker rot can set in.

A modern alternative is to use sleepers manufactured from recycled plastic. These have the advantage of



“Former British Railways point rodding... was frequently used as rail...”

ABOVE:

Some of the last remaining 16mm rail in use on the line.

BELOW:

A simple level crossing, made by bedding the track in concrete, and spreading pea shingle on top whilst still soft.

being impervious to rot and insect attack, as well as having a very good appearance for the smaller scales. They are available in a range of sizes from the suppliers listed at the end of this article.

Pressed aluminium, and steel, sleepers are also commercially available. They are ideal for temporary tracks, or getting things running quickly. The downside is that this can be an expensive way to build a railway, and the resulting track can be quite noisy. If you are looking to replicate a very light narrow gauge railway, the pressed sleepers look very much like those used on ‘jubilee’ portable track.

Fishplates (rail joiners) are available from the rail suppliers, and their low cost makes them an easy choice when compared to the amount of cutting and drilling that is required to produce enough for a whole railway, when making your own.

Fishplates serve two main functions, the first is to keep the rail ends aligned, and the second is to help transfer weight from one rail to the other. It is important that the bolt holes in fishplates are oval shaped – this allows for a little ‘give’ when the rail expands and contracts with

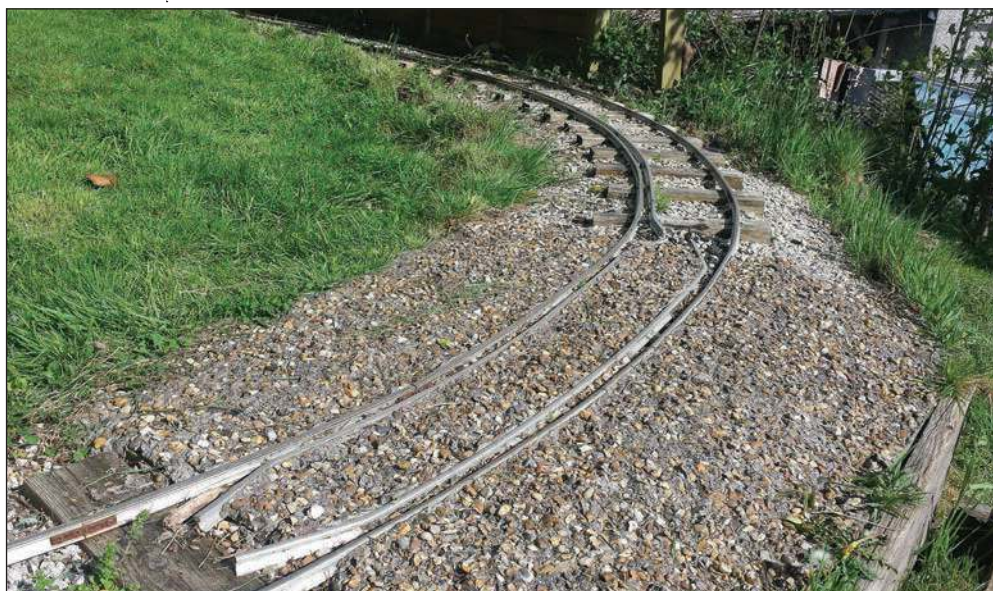
changes in temperature.

The simplest design is a flat bar with holes drilled to take the bolts, this is simple to produce, and is therefore usually very cheap. It is important that the height of the fishplate matches the measurement of the rail web. This ensures that the rail ends are properly supported, and cannot dip without bending the plate.

A stronger design has an angled lower edge that matches the shape of the rail foot; this now is my preferred style for any track building work I will be undertaking in future.

Rail can be supplied with holes for fishplates pre-drilled. I prefer to order the rail blank, then cut to length and drill in-situ. A useful tool for this is a cordless angle drill with a short bit, as it allows you to get right in between the rails. Failing this, a conventional pistol grip drill can be used, mounted at an angle.

To join different rail sections together, an adaptor fishplate can be made. This is a flat strip, with a step on the underside, made so that each end matches the web of the two rail sections. So far, I have cheated with this. Changes of rail section have been achieved by using the fishplate for the





“The vibration of passing trains actually seems to help vibrate the chippings, and lock them into place...”

ABOVE LEFT: A view of the home-made points showing how the aluminium rail has been ground to the finished shape.

BELOW: This is a long way from mainline practice, but just right for a disreputable narrow gauge backwater!

smaller size, and drilling the bolt holes a little higher than normal in the larger rail. I have made sure that sleepers are positioned closer than usual at these places for extra support.

Fixing the rail to the sleepers can be done in several ways. Moulded plastic chairs are available to suit 16mm, 21mm, and steel bar rail. Scaled-down dog spikes are also available in various sizes. My preference is to use M6 x 25mm coach screws, available from Screwfix (and

presumably other suppliers). These are driven in using a cordless drill to provide a secure fixing with little danger of loosening up over time.

Pointwork can be an expensive proposition; the good news is that on a small line, you probably won't need much of it! With money being needed for other railway building, I put together a simple point at home.

The only special part that I bought for my point was the cast frog. This was let into an existing section of

straight track, then the other rails cut and bent to fit. Some careful alignment was needed to ensure that the proper gauge was maintained through the point. Check rails were bent up from offcuts, and screwed down inside of the running rails.

The point blades are made up from steel strip, these are fitted with a spring that allows trains to back down the branch, without having to resort to getting off the train, or using complex operating mechanisms. The blades are welded together via steel strip sleepers, the point working very much like the old Hornby tinplate design for much smaller scales.

Select your stone

Good ballast is essential for reliable running. Some of my railway has a foundation of concrete blocks which although making a stable foundation, required much packing/adjustment to prevent derailments. I now use a shallow bed of 20mm granite chippings, laid onto a weed-proof membrane. After tracklaying further ballast is added around the sleepers, and adjustments made for levels.

The most important thing to be aware of when choosing ballast is its shape; what we need is sharp-edged stones that will lock into position and hold our track. Regular gravel is next to useless as railway ballast, though granite or limestone chippings seem to work well. The vibration of passing trains actually seems to help vibrate the chippings, and lock them into place. After a few weeks of use, the whole track is surprisingly firm.

Smaller-scale lines may use a correspondingly smaller-sized ballast to give a better appearance, but this can have a tendency to clog with dirt and weeds, in the process preventing proper drainage.

Building track in 5-inch or 7¼-inch gauge is not really all that difficult (my father even built a 15-inch gauge line with much less engineering than I have described above), and there is definitely a real satisfaction to be had. When you take a break, sitting on your own 'work truck', on your own railway, in your own garden, it's very easy to feel like a true railwayman – even without running any trains.

The following suppliers may be of interest to small railway builders:
www.miniaturerailwaysupply.com
www.pnp-railways.co.uk
www.maxitrak.co.uk
www.rideonrailways.co.uk

EIM

■ Part 1 of this feature describing the creation of the Apple Valley Railway appeared last month. Next month Simon describes the building of a battery loco for his line.

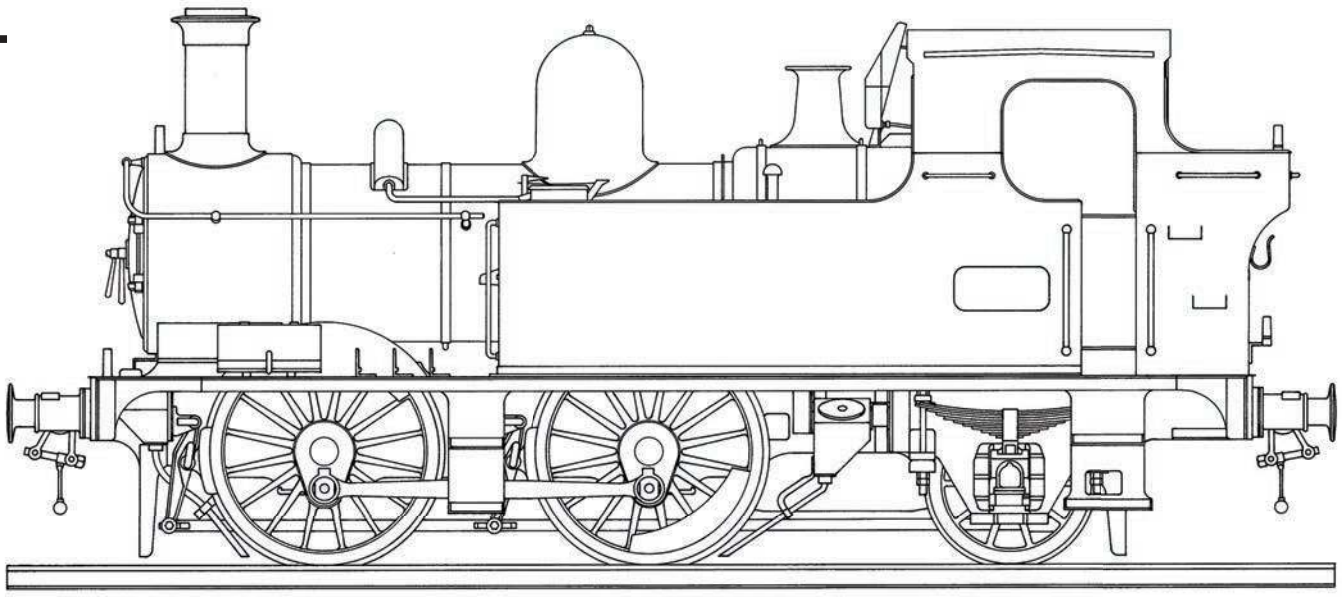


Learning to draw digitally

John encourages model engineers to 'bite the bullet' and embrace modern technology.

BY JOHN SMITH

1



I have spent hundreds of happy hours at my drawing board. A few years back it was given a new lease of life when I purchased, from the US, a new pair of rulers for the ADMEL drafting machine on it, which must be 50 years old. I've used the board for both engineering drawings and architectural plans, and have produced on it a complete set of drawings for a 7¼-inch gauge GWR 1400 class locomotive (**Drawing 1**).

Ink-on-paper drawings are certainly of sufficient quality for publication, but adding high-quality text is a challenge. Freehand printing is not sufficiently good for publication in my view, and stencilled lettering is time-consuming to produce and looks a little old-fashioned.

For my 1400 class series, I printed out every piece of text on the laser printer, cut it into strips and glued it onto the drawing. Batches of drawings were then taken to a specialist large-format scanning business for high-resolution scanning. After each visit, I drove happily home with a CD of PDF images. It was time-consuming, not totally satisfactory and the end result was less than perfect. And I do like perfection! I realised five years ago that, if I wanted to continue to write articles and books, I would have to move with the times and 'go digital'.

I was reluctant to spend a lot of money on a professional CAD package, so decided to try DraftSight from Dassault Systèmes as, in its

DRAWING 1:

Old way – ink-on-paper drawing of a GWR loco.

DRAWING 2:

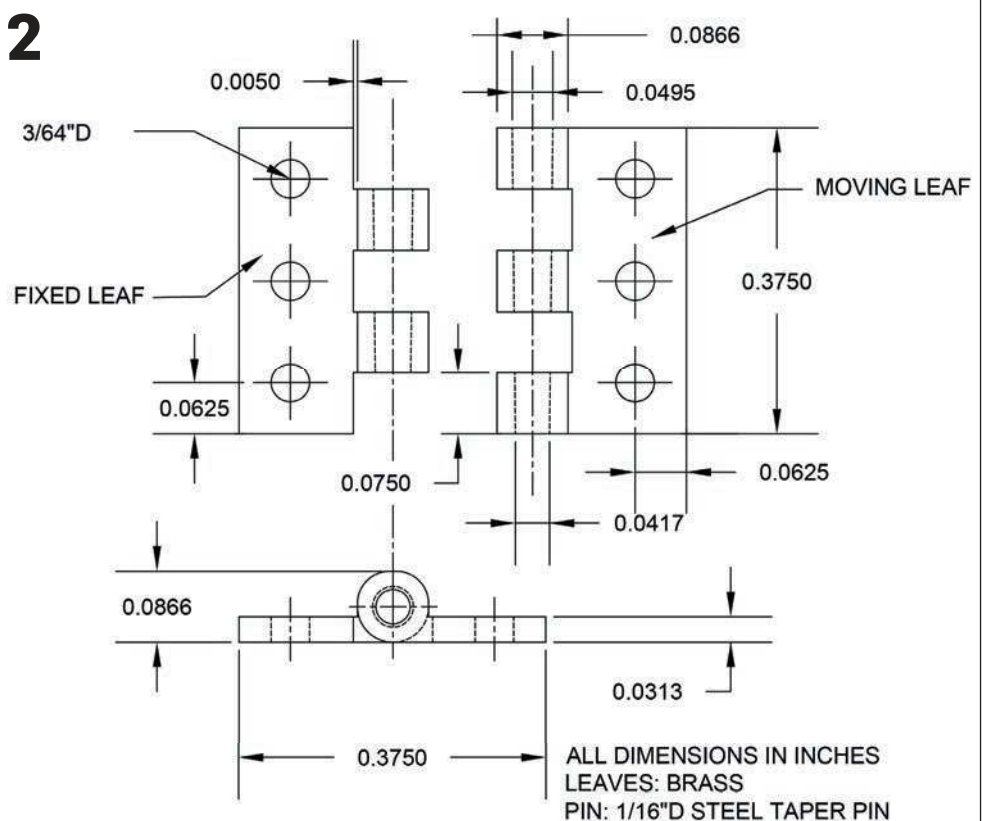
Simple drawing in DraftSight

two-dimensional form, it is totally free. You can download it and start using it straight away. A detailed 'Getting Started' instruction manual can also be downloaded, printed and bound, and the package has comprehensive help built in.

I can heartily recommend DraftSight (*usual disclaimer – Ed*). It

is a totally professional CAD package which is exceedingly precise, reliable and extremely function-rich. Having said that, I would be lying if I told you that it is quick and easy to learn, simply because its functionality is so immense. However, it isn't too hard to learn enough to produce drawings which are of sufficient quality for

2





Using such software is very different from drawing by hand. I imagined that it would be similar to Microsoft PowerPoint in that one would select a tool and then drag and drop a line or a shape onto the



Units and scales

You start by drawing a sketch and writing on it the start and end coordinates of every single line that you wish to draw, including centrelines. You choose the location of the origin of the Cartesian coordinates – normally bottom left of the drawing works well. **Photo 3** shows the sketch produced for the little drawing which appeared in my last Tip. It isn't pretty, but it does the job. I decided to use a scale of 10mm to $\frac{1}{16}$ -inch. The package can add dimensions to a drawing, complete with extension lines, dimension arrows and text. Or, you can choose to add these components yourself, which is what I did for this little drawing.

PHOTO 3:

DRAWING 4:

PHOTO 5:

PHOTO 6: A wire-eroded full-size GWR letter for a nameplate.

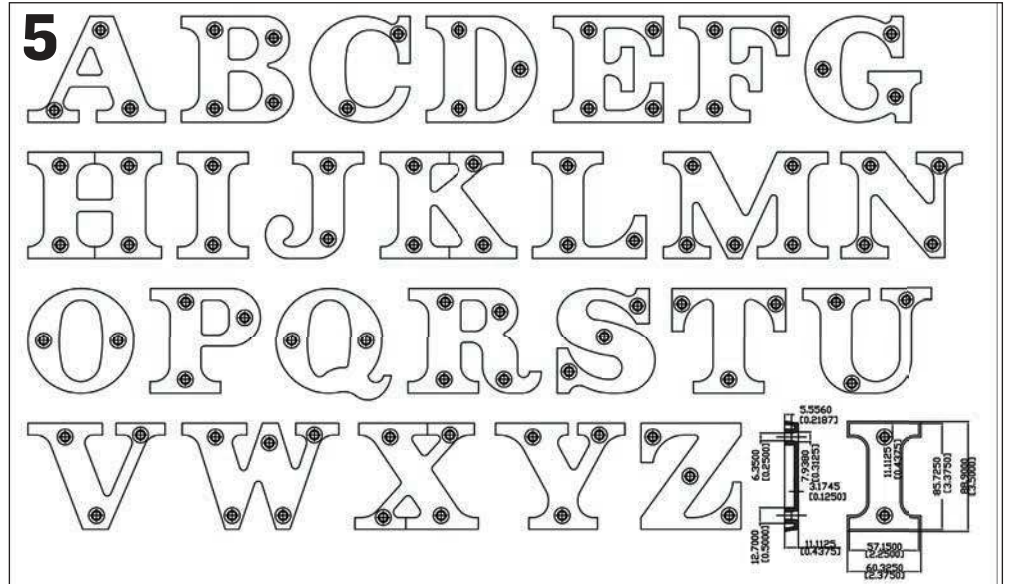
For the printed page

The second reason why you should bother learning such a technique is that it can help your model-making. **Drawing 5** is one of my first DraftSight drawings. It is a digitisation of a full-size dyeline print of the official Swindon drawing of GWR nameplate letters. It was easy to

see to which radius the draftsman's ink spring-bow compasses were set for every radius on every letter, so the end result is precisely accurate.

I have used the drawing to have $\frac{7}{16}$ -inch thick brass letters wire-eroded for a full-size GWR nameplate, complete with edge taper (Photo 6). I have also used it to have letters water-jet cut from $\frac{1}{16}$ -inch thick brass sheet for a $\frac{7}{8}$ -inch gauge Castle class loco. I have even used it to create a TruType font which modellers can use to prepare artwork for etched GWR nameplates; you just need to adjust the spacing of each character to achieve the right spacing – easy to do in Microsoft Word. If you would like a copy of the drawing or the font, feel free to email me via the Editor.

Go on! Bite the bullet! **EIM**



The Editor writes: John is quite right, digital drawings accompanying your article on your latest project make you

very popular with the editor! And we really want to see your latest projects and to share them with fellow readers.

John's *Tips for Model Engineers* have appeared in **EIM** since March 2018. Previous episodes include: effective workholding **Mar 18**; Have a plan **Apr**; Quality surface finishes **May**; Marking out **Jun**; Using toolmaker's buttons **Jul**; Measuring internal diameters **Aug**; Tapping **Sep**; Milling **Oct**; Rotary table on the mill **Nov**; Turning small convex and concave radii **Dec**; Large convex and concave radii **Jan 19**; Locating parts with dowels **Feb**; Turning perfect tapers **Mar**; Sacrificial cheeks **Apr**; Truing up brass or BMS angle **May**; Nut & Washer holder **Jun**; Annealing **July**; Making beading **Aug**.



START HERE

Time and motion study...

Automotive engines inspired the rarely-used Caprotti motion on locomotives.

BY ANDREW CHARMAN

Our next 'Start Here' piece was due to consider Stephenson's Link motion but that will require a lot more space than this half page allows, so will be in a future issue!

This time we take a brief look at a much more unusual, and rarely-used, form of locomotive propulsion – the Caprotti motion. In locomotive history this was very much the young upstart, first invented by Italian Arturo Caprotti during the First World War. However it was not widely used until British Railways decided to try out a developed version on some Standard class locomotives built in the 1950s.

Caprotti gear merges locomotive and automotive technology. The traditional steam valve chest makes way for a cambox, housing poppet valves operated by cams just like in a car. These cams are driven by means of shafts from the driving wheel of the locomotive, each shaft joined to the next by universal joints.

While Caprotti's original design

employed two inlet cams but a single exhaust cam, British Railways added a second exhaust cam, and the two sets could be moved mechanically in relation to each other, in the process changing the timing of the valves.

This process provided completely independent control of steam admission and exhaust to the cylinder. This variable valve timing was in use many decades before the automotive industry introduced it as a major advance in technology.

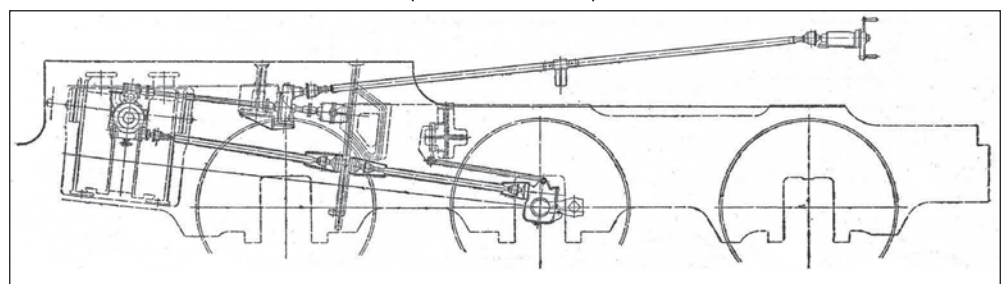
The Caprotti design had a further advantage in that the majority of its

BELOW:

The Caprotti motion, which combines locomotive and automotive practice, will take some understanding. This is a diagram of the system

components could be enclosed and thus suffer less wear from the elements. But it was considered an expensive option.

The best-known user of Caprotti motion is the unique BR standard class 8 Pacific locomotive no 71000 Duke of Gloucester, built in 1954. Effectively dubbed a failure during its working life of just eight years, this loco has proven far more effective in its preservation career, due to those who restored it having a much better understanding of the principles behind the motion. **EIM**



‘Phoenix’ – the engine built from scrap

Alan describes how John Macey’s first project, a 3-inch scale Foster traction engine, involved making good use of a whole lot of scrap metal.

BY ALAN BARNES



“It is hard to believe that a good many of the parts originated in the rubbish skips...”

Photos of built engine by Alan Barnes, build photos by John Macey

Encouraged by his metalwork teacher while still at school, John Macey developed a love of engineering which turned from schoolboy interest into a career. But while he has spent his working life as an engineer, his interest in scale modelling only developed later in life.

He worked at Lamberhurst Engineering in Kent until a couple of years ago and he is now ‘officially’ retired although he still spends a couple of days at the works helping out. As a retirement project John initially considered building a scale steam locomotive but in the end he opted to begin the construction of a traction engine.

John has his own workshop, a large shed at the bottom of his back garden and over the years this has been equipped with a vast array of equipment and tools, much of which can be used for model making. There



FACING PAGE: The finished 3-inch scale Foster, resplendent in its Ramsomes Green and John Deere Yellow paintwork – not the first option tried...

ABOVE & ABOVE RIGHT: John in his workshop, well-equipped for building a scale traction engine.

RIGHT: John found building the boiler, from rolled steel, one of the most straightforward elements of the build. Here the hornplates and cylinder block are in place.

BELOW RIGHT: Crankshaft and flywheel, with a start made on the gearing.

BELOW FAR RIGHT: Continuing with the gearing.

is a Clarke Metalworker four-speed lathe and a Draper post drill which proved big enough to make most of the components for the engine that he had in mind.

Scaled down

Drawings for a 3-inch scale Foster agricultural traction engine were obtained from Live Steam Models in 2010. The drawings had been scaled down from the firm's 4-inch scale version and John considered that for his first attempt at miniature steam engineering the 3-inch model would be more suitable. The original drawings had been based on the 6NHP Foster agricultural engine works number 14422, built in 1924 and which has survived into preservation.

Some castings were obtained from Live Steam Models and these included the cylinder block, chimney base, crankshaft, flywheel and the rear





wheel hubs. For the rest of the engine John had decided that he would make as many of the parts as he could in his own workshop. This would be quite an undertaking as he was also planning to make the boiler himself, a task that many would shy away from.

In fact making the boiler, from a piece of rolled steel, proved to be relatively straightforward for this experienced engineer although it did take him a while to adjust to working with small parts in confined spaces.

Some of the work which required specialist services was contracted out to R & N Engineering in Rochester. The firm machined the cylinder block, provided the gear blanks and cut and machined the gears, and all were completed to a very high standard.

Rubbish recycled

Looking at the completed engine it is hard to believe that a good many of the parts originated in the rubbish skips at Lamberhurst Engineering. The firm had given John permission to take any odd bits of metal and any broken machinery before it went to the scrap man. Much of this would probably have looked like rubbish to you and me but John had other ideas and could recognise the potential of a seemingly useless lump of metal.

A discarded garden strimmer

"John trialed a number of different colours over the following weeks but none of them looked right..."

ABOVE:

The build progresses – John has reached the stage of trying the front wheels in place.

LEFT: The steering rod and worm, the later sourced from a rotavator!

BELOW: Slightly earlier than in the picture above, front wheels are complete but rear wheels await their spokes and hub.

which had seen better days was recovered and dismantled and the steel shafts used to make the connecting rods for the Foster. Amongst the discarded machinery John also found a broken Hayter self-propelled mower and this provided steel parts which were used for the driveshaft.

An old John Deere scarifier provided parts used to make the front axle while the worm on the steering gear came from an old rotavator. An old hydraulic ram proved to be useful, its parts being used to make the hubs on the front wheels while the bottom section of a 40-gallon drum was transformed into the gear guard. Scrap brass and steel was also recovered and turned into the fittings and boiler bands while a piece of old stair tread was used to make the cover on the water inlet.

The use of all the old discarded metal and machinery led to John deciding to name his new traction engine 'Phoenix' as a good part of the engine is made from scrap which has 'risen' again, just like the legendary bird in Greek mythology.

No schedule

John had set no deadline for the completion of the Foster and worked on the engine in his spare time. Rather than spend day after day making parts for the engine he would tackle the jobs that he fancied doing at the time and sometimes a few weeks would pass in between 'modelling sessions'. He found building the boiler himself immensely satisfying especially when the finished unit passed all the tests and inspections without any problems.

The first stages of the build progressed very well with the 'slow and steady' approach resulting in the completion of the boiler, smokebox, tender and the wheels, and the engine now standing on its own 'feet' in the workshop. However the pipework presented a few problems and John decided to enlist the services of experienced miniature steam engineer Mick Harrington to sort out the 'plumbing' for him. At a later stage of the build Mick also helped with the valve timing to ensure the engine ran smoothly.

By 2017 the Foster was nearly finished and John was pleased with the way his engine had come together. However there was still work to complete particularly the painting, and so the whole engine was dismantled into its main components. All the parts were thoroughly cleaned and those that would require painting given coats of primer and undercoat.

Of many colours

Initially John spray painted the Foster



in red but he was unhappy with the 'look' and decided that another colour would be more suitable. The red paint was duly stripped off, the parts cleaned again and the primer and undercoat re-applied.

John trialled a number of different colours over the following weeks but none of them looked right until he sprayed the engine in Ransomes Green. He was happy with the result and to contrast with the bright green livery of the main engine he elected to use John Deere yellow for the wheels, although the wheels also underwent a few colour changes before he decided on the yellow.

Once all the parts were painted and thoroughly dry the work of re-assembling the Foster began and by the end of 2017 the Foster was more or less finished – though John is reluctant to use the word 'finished' about his engine as he continues to refine various components to improve its performance.

The Foster subsequently passed its tests and made its public debut at a local event, the Kilndown Gardening Club's Spring Show in April 2018. Friends and family were delighted to see the completed engine on show as they had known it only as a pile of assorted bits and pieces for the previous eight years.

Weighty matters

The Foster showed some initial tightness but according to John now steams very well and from cold, steam can be raised in under an hour. He has decided against fitting a driving seat on the back as there would be too much weight on the rear end of the engine. Instead he is planning to build a four-wheel trailer which will combine a seat with storage space to hold tools, coal and water. This will be very useful when he takes the engine to rallies and on road runs.

John's first venture into the world of miniature steam engineering has proven very successful and he is rightly pleased with the result of his labours. Apart from the castings the Foster has been largely built from scrap metal – a commendable exercise in recycling!

Having 'finished' the Foster John is currently working on another scale traction engine, a 2-inch scale Burrell showman's road locomotive 'Quo Vadis'. This model was started by his brother's father-in-law some 45 years ago but he passed away before the project was completed. John and his brother, Kevin, are now working together to complete what I am sure will be another excellent model.

My thanks to John for providing information and photos about the building of this very fine engine. **EIM**

RIGHT: The cylinder block with Foster markings cast in.

BELOW

RIGHT: The gearing, with their selector

BELOW FAR

RIGHT: The handbrake, the neat cab step and injector water valve with fine pipe runs.

BOTTOM:

John is well pleased with his fine first effort at building a traction engine, as he should be.



Gas-fired vertical boiler for the EIM Steam Plant

Making and assembling smokebox and tubeplate fittings for the EIM Steam Plant project.

BY MARTIN GEARING – Part Twelve of a series

Next up are the smokebox and tubeplate fittings and adaptors. In addition to the threaded mandrels that were made when constructing the oscillating engine and lubricator you will need a similar threaded mandrel threaded $\frac{1}{4}$ -inch x 40 ME for the machining of boiler fittings and adaptors to length and chamfering.

Cut a 32mm length from the 19mm diameter aluminium supplied in the metal pack. Hold in a self-centring chuck, face off, centre drill, drill 5.7mm diameter x 15mm deep, tap $\frac{1}{4}$ -inch x 40 ME 12mm deep. Mark the outside to identify the thread. Put to one side.

Tubeplate Extension

Item B28, 2 off – 10AF Brass

Refer Drawing B28

Hold in a self-centring chuck with 35mm protruding, face off, centre drill, drill 3mm diameter x 25mm deep, withdrawing frequently to clear the swarf. Turn 6.35mm diameter x 8mm. Using a 1mm wide parting tool set with its left-hand edge against the turned face, undercut 0.5mm (1mm on a diameter dial) into the 6.35mm diameter. Thread $\frac{1}{4}$ -inch x 40 ME x 8mm. Chamfer the hexagon 30 degrees x 0.5mm. Part off 30.5mm long overall.

Screw into the $\frac{1}{4}$ -inch x 40 ME

mandrel and hold in the chuck. Face off, bringing the length between the mandrel and end face to 22mm. Centre drill, drill 5.7 diameter x 10mm deep taking care as the drill breaks into the 3mm hole drilled in the other end. Thread $\frac{1}{4}$ -inch x 40 ME x 10mm. Turn 10mm diameter x 10mm, this should just remove all traces of the hexagon, if not go to the bottom tolerance of 9.9mm diameter. Machine a 30-degree x 0.5 chamfer where the diameter meets the hexagon and a 45-degree x 0.2mm (0.4mm on a diameter dial) on the end face. Remove from the mandrel and put to one side. Repeat for the second extension.

Safety Valve Extension

Item B28A – 12mm diameter Brass

Refer Drawing B28A

On a lathe, hold in a self-centring chuck with 35mm protruding, face off, centre drill, drill 3mm x 25mm deep, withdrawing frequently to clear the swarf. Turn 6.35mm diameter x 8mm. Using a 1mm wide parting tool set with its left-hand edge against the turned face, undercut 0.5mm (1mm on a diameter dial) into the 6.35mm. Thread $\frac{1}{4}$ -inch x 40 ME x 8mm. Part off 30.5mm overall.

Measure the overall length of the 12mm diameter section and note how much it is in excess of 22mm. Hold on the 12mm portion with the solid end



protruding 5mm. Face off, removing the amount calculated to bring the 12mm section to length. Centre drill, drill 7.1mm diameter x 12mm measured from when the drill cuts full diameter. Thread $\frac{5}{16}$ -inch x 32 ME x 10mm deep. Chamfer the edge 45 degrees x 0.5mm.

Transferring to the mill, set a self-centring chuck to run true on a rotary table or dividing head with its axis vertical. Clamp the extension with the male $\frac{1}{4}$ -inch x 40 ME threaded end face protruding 20mm from the chuck jaws. Position the work immediately in front of an end mill of 10mm diameter or larger, and with the end of the cutter just below the top edge of the 12mm diameter body.

1) With the cutter rotating, move the work so the 12mm body just contacts the cutter when passing the cutter on the X axis. Zero the Y axis.

2) Move the work to the left clear of the cutter on the X axis, and lower the cutter clear of the body on the Z axis.

3) Feed the work on the Y axis towards the column by 1mm and clamp the slide.

4) Move the work towards the cutter on the X axis until the edge of the 12mm body is below the cutter. Raise the work on the Z axis until the cutter just touches the body. Zero the Z axis feed dial.

5) Move the work to the left clear of the cutter on the X axis.

6) Raise the table 10mm on the Z axis and lock the slide.

7) Feed the work slowly past the cutter on the X axis until the cutter is clear of the work and then return the work past the cutter to the start position to the left of the cutter.

8) Index the chuck around 60 degrees.

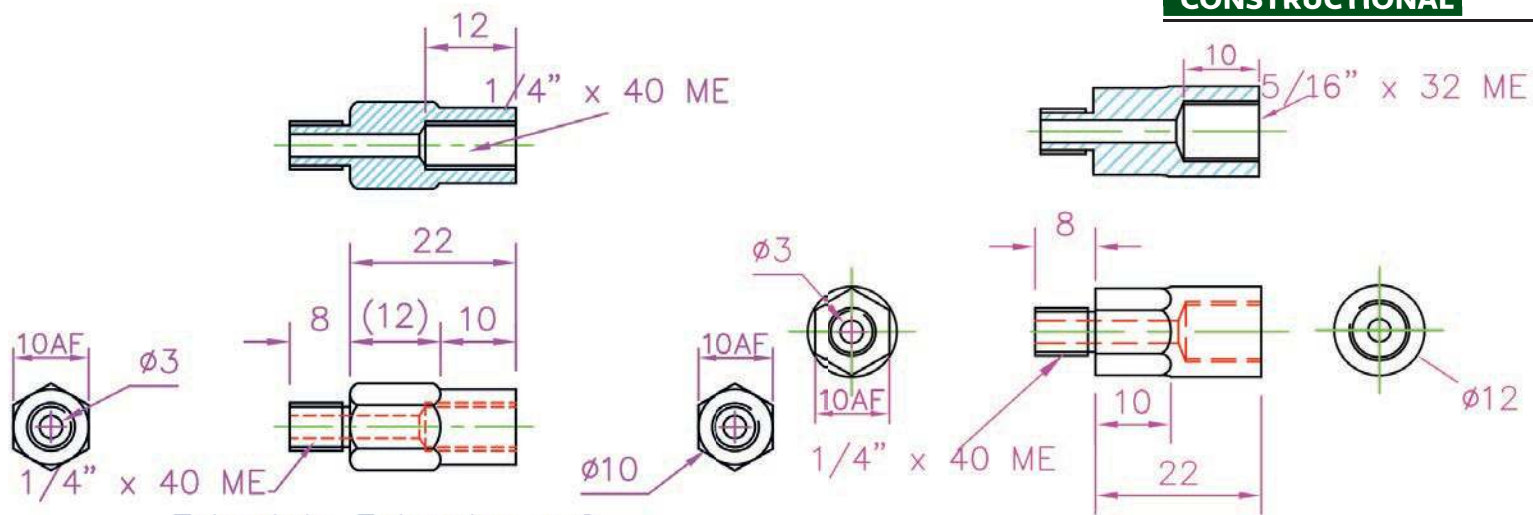
9) Repeat a further five times, which will leave a 10mm AF hexagon

(Photo B100).

10) Remove, deburr the piece and put to one side.

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

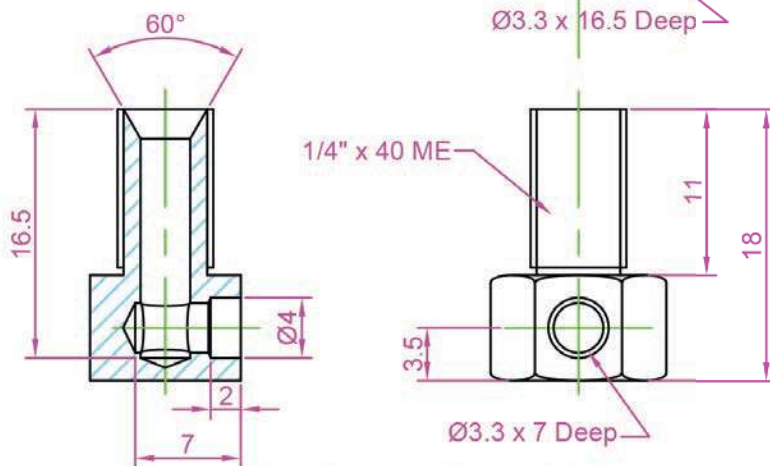




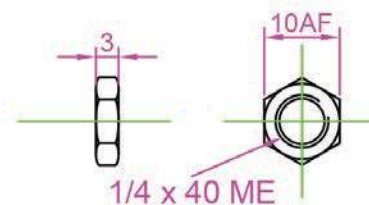
Tubeplate Extension x 2
10 AF Brass
Item – B28

Safety Valve Extension
10 AF Brass
Item – B28A

Drawn Twice full Size



Cap Exhaust Fitting & Nut
Item BF29



Cap Exhaust Fitting Nut
Item B30

Cap Exhaust Fitting

Item B29 – 10 AF Brass
Refer Drawing B29

Using a lathe, hold in a three-jaw chuck with 25mm protruding, face off, centre drill, drill 3.3mm diameter x 16.5mm deep from when the drill tip just enters the work, withdrawing frequently to clear the swarf. Turn 6.35mm x 11mm. Using a 1mm wide parting tool set with its left-hand edge against the turned face, undercut 0.5mm (1mm on a diameter dial) into the 6.35mm.

Chamfer the hexagon 30 degrees x 0.5mm. Thread 1/4-inch x 40 ME x 11mm. With a centre drill having a pilot of less than 3.3mm diameter drill into the face, stopping when the cone formed is just short of the core diameter of the thread.

Screw into the 1/4-inch x 40 ME mandrel and face the hexagon to 7mm

length measured from the mandrel face. Chamfer the hexagon 30 degrees x 0.5mm.

On the mill, screw a union nut onto the 1/4-inch x 40 ME thread to protect the coned face. Position the body in the centre of and near to the top of the vice jaws using a suitable parallel placed under the flat section of the hexagon, with a flat face against the fixed jaw. Centre the spindle to the middle of the body on the X axis and to the fixed vice jaw on the Y axis. Clamp the X axis and zero the Y axis. Move the work towards the column 3.5mm, clamp the Y axis.

Centre drill, drill 3.3mm x 7mm deep, breaking through completely into the 3.3mm hole. Drill 4mm x 2mm deep, measuring from when the drill just cuts full diameter. Alternatively you can use a short series centre cutting slot drill (Photo B101). Remove, deburr and put to one side.

PHOTO B100:

(facing page)
Machining the hexagon on the safety valve extension.

All photos and drawings in this series by Martin Gearing – drawings reproduced approx full size unless stated

Cap Exhaust Fitting Nut

Item B30 – 10 AF Brass
Refer Drawing B30

Hold with 15mm protruding, face off, centre drill, drill 5.7mm x 5mm deep after the drill cuts full diameter. Chamfer the hexagon 30 degrees x 0.5mm. Thread 1/4-inch x 40 ME x 5mm. Part off 3mm overall, feed slowly to achieve a good finish. Thread the end of a piece of 1/4-inch diameter material 1/4-inch x 40 ME for a length of about 10mm. Hold the threaded rod in a self-centring chuck with 3mm protruding. Screw on the nut chamfered face first and chamfer the hexagon 30 degrees x 0.5mm. Remove and deburr. Put to one side.

Assembling & fitting smokebox cap to boiler

Install using plain annealed copper sealing washers to seal each joint – the two tubeplate extensions for the Filler and Stop Valve (threaded 1/4-inch x 40 ME female), and the one tubeplate extension for the Safety Valve (threaded 5/16-inch x 32 ME female) after deciding your preferred location of these items.

Fit the smokebox cap, easing any conflicts between the holes and the extensions if needed with a fine round file, only removing sufficient to allow the cap to fit. Fit the M3 securing bolt



shortening them as required so they don't bottom out in the blind thread of the upper stay nuts. Again if there is any misalignment ease the drilled holes in the cap with a fine needle file until they enter the thread freely.

Once the smokebox is able to be fitted and secured without undue force remove it and fit the chimney using six M2 bolts. For a more realistic appearance un-slotted roundhead bolts are available in this size which gives the impression of rivets externally.

Cut a 70mm length of $\frac{5}{32}$ -inch (4mm) copper tube, squaring up the ends and removing any burrs with a fine file, before cleaning one end

bright using wire wool. Immerse the tube and the cap exhaust fitting in the pickle for 10-15 minutes, rinse in cold clean water and dry. Make up a ring of 0.7mm diameter 55% LT silver solder to fit snugly around the copper tube. Push the ring onto the cleaned end of the tube, flux the 4mm recess in the fitting and the end of the tube before inserting the tube into the fitting, pushing the ring into contact with the fittings and applying additional flux to cover the ring.

Place on a fire brick with the tube vertical – supporting it if necessary and using a small burner to apply heat to the body of the fitting with an occasional pass over the length of the

PHOTO

B101:
Drilling the cap exhaust fitting for the pipe.

tube but avoiding direct contact with the silver solder ring. The flux will become transparent, the ring will 'slump' and flow forming a fillet, at which point direct the heat over the joint briefly, to ensure even heating which will promote full penetration. Allow to cool before pickling for 10 minutes, then washing thoroughly and brushing away any residue.

The pipe may now be bent so that when the fitting is installed in the smokebox cap the pipe curves round from the fitting and points directly up the chimney. When this is achieved the length of the pipe may be reduced so that only 20mm extends up the chimney. The extra length was to enable bending. The fitting may then be secured to the cap using the nut.

The assembled smokebox cap can now be refitted to the boiler, and the boiler secured to the firebox using M3 stainless bolts shortened to a suitable length to ensure that they do not conflict with the lower stay nuts.

"The flux will become transparent, the ring will 'slump' and flow forming a fillet..."

■ Parts 1 to 11 of this series appeared in the October 2018 to August 2019 issues of **EIM**. Digital back issues can be downloaded or printed versions ordered from www.world-of-railways.co.uk/engineering-in-miniature/store/back-issues/ or by telephoning 01778 392484.

WORKSHOP EXTRA

Cutting keyways in parts using the lathe

Another useful workshop tip from a reader – why not send in yours?

BY WILLIAM MOORE

I found myself needing to cut a keyway in a part, but not having a broaching press, or a slotting head for the mill I decided to use the lathe, which presented an interesting couple of problems.

The first was overcome by grinding a piece of tool steel to the correct size of the keyway, with a roughly guesstimated rake angle and a small amount of waisting to make sure it was only cutting on its leading

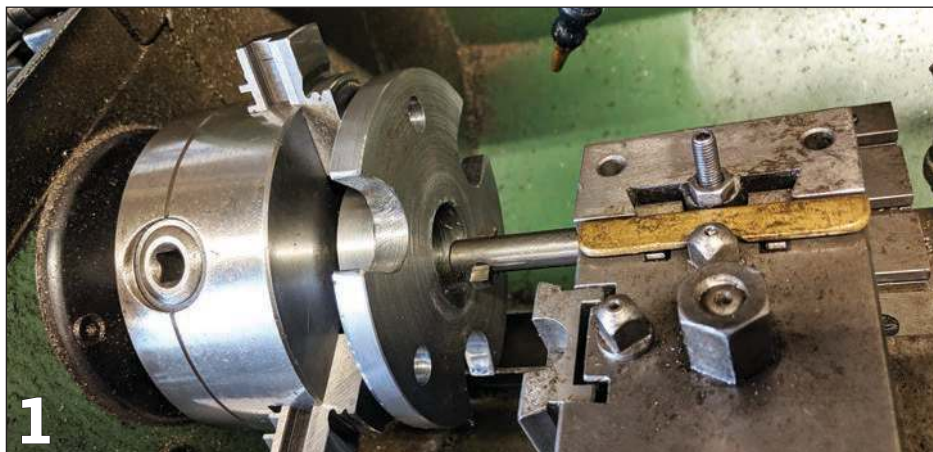
edge. This was then fitted into a boring bar attachment (**Photo 1**).

The second problem required a little more thought and creativity, unlike a number of earlier machines, the Myford 254 does not have an indexable spindle with a ready-made stopper and angles marked on it. I got around this by using a small G-clamp on the geartrain for the power feed (**Photo 2**).

Clamping two of the gears together using

a single clamp prevents the spindle turning, locking it in place. If you require indexing, a little maths and a bit of paint on the gear will give you reasonably precise figures.

Obviously this process requires the lathe not to be running. I recommend unplugging it to prevent unfortunate accidents! **EIM**



A diesel-outline battery loco

Jan-Eric turns to the electrics for his easy-to-run battery loco project, and explores some digital possibilities...

BY JAN-ERIC NYSTRÖM Part four of a short series



A battery-powered locomotive can of course be built very simply, with no more than an on-off switch for the motor. My previous diesel-outline engine, 'Quickie' described in the September to November 2016 issues of *EIM*, did have a few switches and two meters of the old 'analog' type, with just a needle showing the volts or amps. This time, I decided to play around a little with the possibilities provided by low-cost digital display electronics from eBay. As we will see later on, this may not have been the smartest move...

The engine's two 24-volt, 20-Amp, 1/2hp motors and their controllers were originally intended for electric scooters, but work just as well as a power source for any other 'light conveyance' – this loco included! The Chinese-made motors are of the 'brush' type, in other words they have a permanent magnet stator, and a rotor wound with copper wire. The motors cost around £35 each, the controllers around £15 each – not bad, really. I bought everything from the UK vendor Petrolscooter (there are other UK vendors, too), so there were some additional, but nevertheless reasonable, freight costs to Finland.

The controller has several inputs, among them a speed control (three wires), and a brake input (two wires). The latter was useful; I could design a 'fool-proof' circuit, preventing the driver from making serious errors while running such as reversing the direction at speed – more on this later. In order to get an 'interface' between the driver and the controller (which is just a black box), I needed other electric (as opposed to electronic) components: switches, connectors, a few relays and push buttons.

My shopping list grew pretty long, in **Photo 56** you can see what I brought home from my local auto-parts store, all spread out on the dinner table. The large number of small boxes contain flat-tab



"The motors were originally intended for electric scooters, but work just as well as a power source for any other 'light conveyance' including our loco..."

PHOTO 56: How Jan-Eric's dinner table looked after a shopping spree in the local auto-parts store...

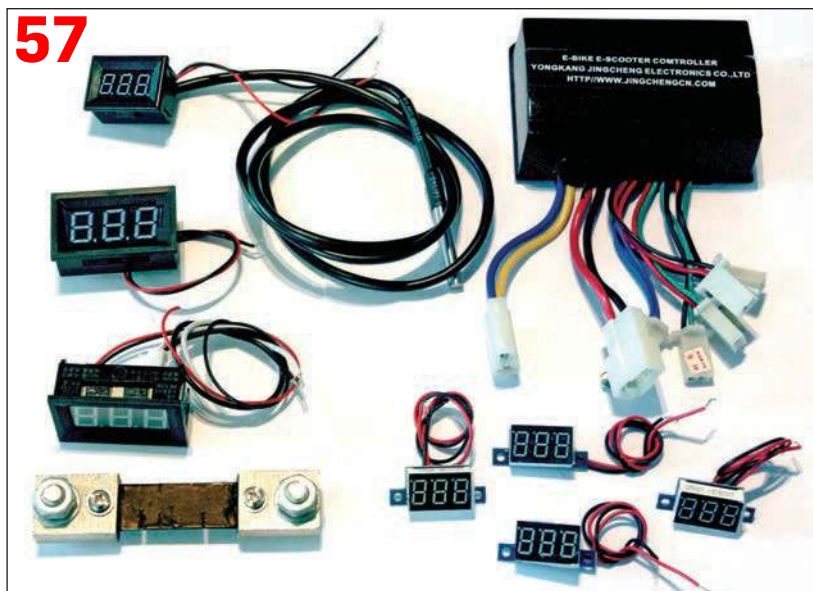
PHOTO 57: Electronic components for the engine.

Photos and drawings by the author.

connectors of different types, some fully insulated, some for thick cables. These are handy for any wires that may have to be disconnected at one time or other. A few rolls of coloured cables can also be seen, above the yellow-handled connector crimping tool. Top left is a bag of heat-shrink tubing, ideal for insulating cable joins that never need to be disconnected.

Photo 57 shows all the electronic components I could not obtain locally, including one of the two motor controllers (top right), capable of powering a 500-watt, 24-volt DC brushed motor. Continuing clockwise

we have; four simple digital volt meters, 3-30 volts, one for each 12-volt battery in the loco; a 100-ampere, 75-millivolt shunt for the ampere meter (more about this later); a 0-100 ampere current meter; a larger volt meter for the 24-volt supply, and finally a digital temperature sensor and meter, which will display the motor temperature. I bought all the digital displays from a couple of Hong Kong vendors on eBay for a total cost of only £35, including airmail freight. A local electronics store may carry similar meters, but probably at a somewhat higher price.



In **Photo 58**, at right you can see the home-built 'Remote Box' which the engine driver holds while running. The little 'Dead-man's switch' on the right is pressed by palm or fingers while holding the box. If the button is released, the loco will stop. The main power switch (top left) is of very sturdy construction. Under it are two mechanically connected 'DPDT' ('double-pole, double-throw') switches, each capable of handling the maximum current of one motor. They are used for reversing the engine. Three small 24-volt, DPDT relays used in the circuit are also shown.

The Schematics

People who are familiar with electronics and reading schematics should find no problem in deciphering my circuit diagram for the loco (**Diagram 59**). Just one comment: I've used the modern practice of drawing crossing lines; there is a connection only if there is a dot in the crossing. No dot means no connection – this is sometimes drawn as a little loop 'jumping' over the crossing line. Keep this in mind, and everything should read correctly.

For those not used to reading schematics, I'll explain it in more detail below. Note the four batteries – they are ordinary automotive batteries, 12 volts/60 ampere-hours. They are used two at a time, chosen by the main power switch, and fit perfectly into the loco; two in the cab, two inside the front hood. In addition, they weigh almost 20 kilograms each, a plus, providing more adhesive weight to the loco. They cost me 75 euros (about £65) apiece, including our recycling charge in Finland. They are of the 'silver-calcium' type, slightly more expensive than the common 'standard' lead-acid type, but they do carry a four-year warranty.

Each battery has its own, individual charging socket, capable of handling a 10-ampere charging current. It is important to choose a socket type that does not short-circuit when the charger plug is inserted or removed! I used 2.5 mm coaxial DC power plugs. I use 'intelligent' chargers, in other words electronic ones, of a type that checks the battery condition, de-calcifies ('refurbishes') it if necessary, then charges the battery, and after noting it is fully charged, switches over to a 'maintenance' or 'trickle' charge that can be left on indefinitely.

These chargers cost about £40 each, and are definitely worth the price. One is actually enough, since you can charge each of the four batteries in succession, but I bought two. For a loco in very frequent use, you might want to have four chargers,

enabling you to charge all four batteries simultaneously overnight. It is important to keep the charge level the same in the two batteries that are used for running the loco, otherwise the battery with a higher charge will try to charge the other battery!

In the schematic, the little upside-down 'T' ending many of the conductors is a ground connection, a common, sturdy wire connecting all points of 'zero voltage', connections 15, 26 and 36. you can use the chassis as ground if you wish, but I have every ground wire connected to a 'ground distribution block' available through eBay and others.

Note, however, that the ampere meter I've used necessitates a somewhat unusual connection; the minus pole of the battery is not equal to ground – this is because the meter needs a 'shunt', a high-power, low-resistance resistor, marked red in the schematic, inserted in the ground circuit. No meter mechanism, be it mechanical or electronic, could stand a current of 100 amperes! Instead, it measures the millivolts across a shunt resistor. A mechanical ampere meter could have its shunt inserted in series with the positive voltage (at point 3 of the main power switch), instead of in this uncommon way.



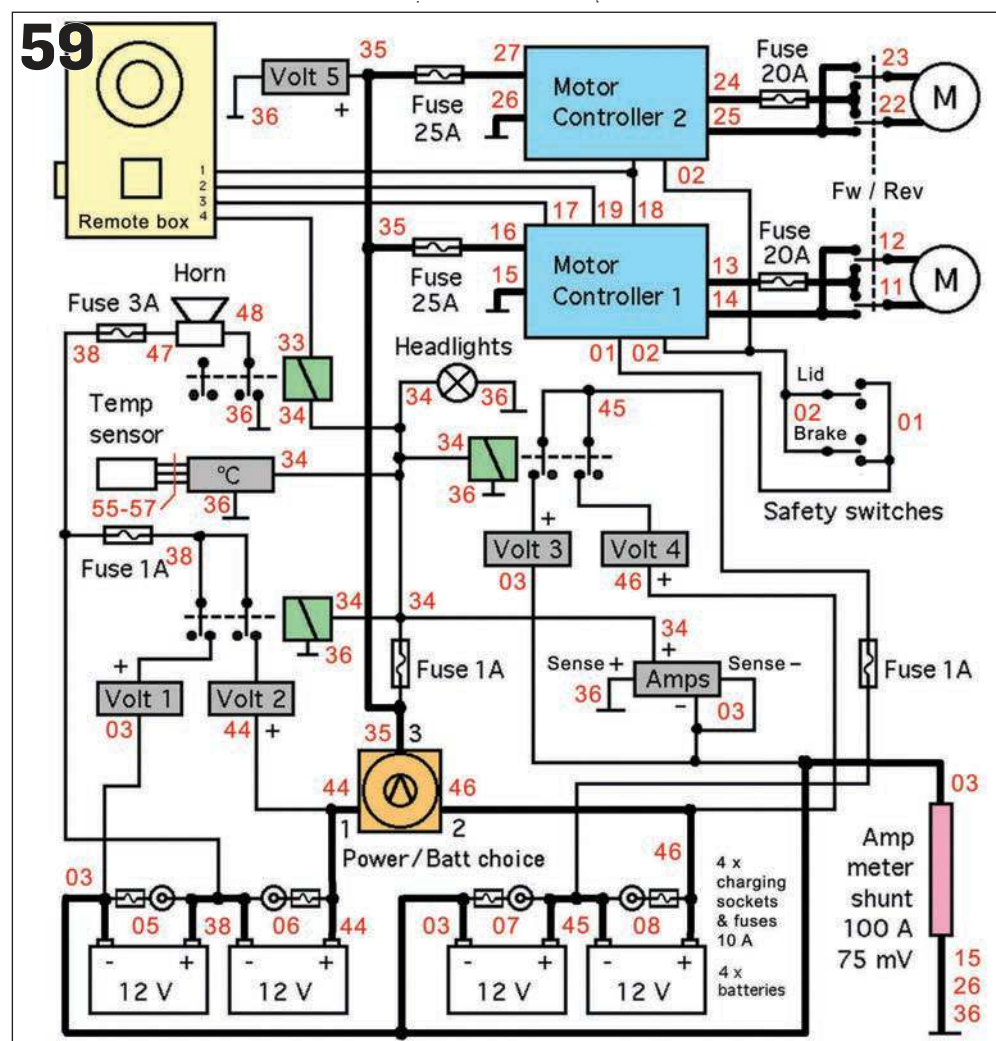
PHOTO 58:

Switches and relays, and the 'Remote Box'.

DIAGRAM

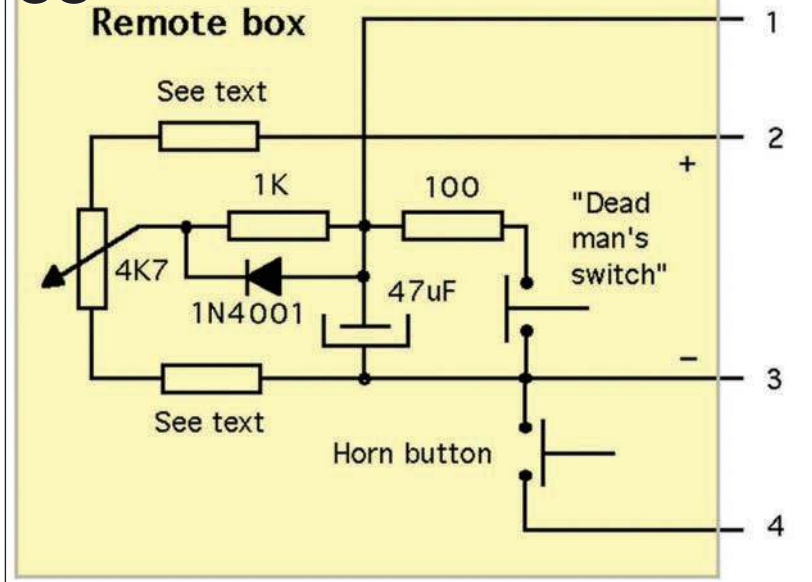
59: Schematics of all wiring inside the loco, explained in the text.

Carefully check the connection instructions of any electronic meter you obtain – if it is connected the wrong way, it will probably be destroyed! Also note the thicker lines in the diagram – they indicate wiring that has to be able to carry the high current, of up to 50 Amperes. Ordinary household extension cord wire won't do here! For these heavy currents, I've used automotive cables with a copper area of 6 mm². All wires should be properly secured with



60

Remote box



cable ties, so that no short-circuits can occur!

The grey rectangles in the circuit represent the seven different digital meters viewable through the cab windows – the aforementioned ampere meter, four individual meters (numbers 1 to 4, one for each 12-volt

battery), one larger volt meter (no. 5) showing the actual 'running' voltage of nominally 24 volts, and finally, a meter showing the temperature of one of the motors (mine displays in degrees C). If the temperature rises too high, you'll know that the loco has been overloaded, and you need to take

"If there was ever a short circuit, the powerful batteries could cause the connecting wires to melt or even vaporize..."

a break from running and let the motors cool down.

The main power switch (orange in the schematic) is a type intended for maritime use. It can handle a continuous load of 250 amperes. With it, I can choose which group of batteries to use. The 24-volt positive voltage goes to the control relays (green) and other low-power components via a 1-amp fuse, while the two high-power parts of the circuit (the controllers (blue) and their motors), are protected with one 25-amp main fuse each. In addition to those, each motor has an individual 20-amp fuse, which will blow before the main fuse. This can happen if, for some reason, the motors are stalled at full power.

Note the two DPDT switches between the controllers and the motors; they are mechanically connected, and will switch over simultaneously. To prevent this from happening when the loco is running, there are two safety switches included in the circuit; one is activated if the brake is on, the other if the lid of the rear hood is opened. This ensures you can't overload the motors by braking and running at the same time, or switch direction at speed; since the direction switch is under the lid; the power will be cut off even before you have a chance to change direction!

The controllers I use have a dedicated 'brake' input line, but if yours don't, the safety switches can just as well be connected to the speed control line (wire 1 of the remote box); when the brake is on, or the lid is open, the line becomes grounded, just as if the 'dead man's switch' is released, and the motor power is switched off.

Let's get back to the relays in the schematic – they operate on 24 volts, and have DPDT contacts. The two lower ones in the diagram simply connect the four battery voltage meters to their respective batteries when the loco is powered on. The upper relay pulls whenever the horn button on the remote box is pressed – the little coiled phone cord connecting the remote to the loco could hardly handle the horn current, thus a relay is needed. Note that the horn is a 12-volt model, so it is connected to only one of the batteries, and has a separate 3-amp fuse. A 24-volt horn could be connected directly to the 24-volt, fused supply.

The Remote Box

Now, the most important part of the whole system – at least from the driver's point of view: the 'remote box', marked in yellow on the schematic. The exact circuit for this may vary, depending on the

DIAGRAM

60: Circuit for remote box.

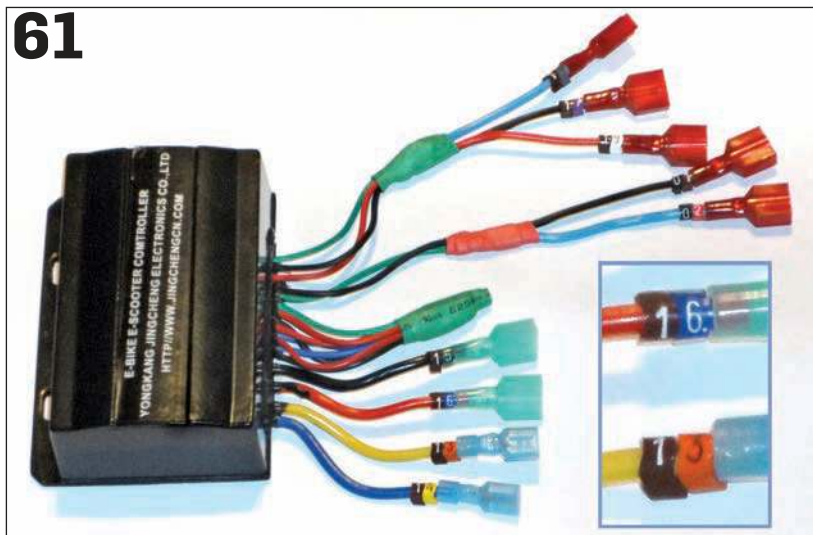
PHOTO 61:

Controller's original connectors replaced with flat tab plugs and sockets. Note markers on the wires, enlarged in the inset.

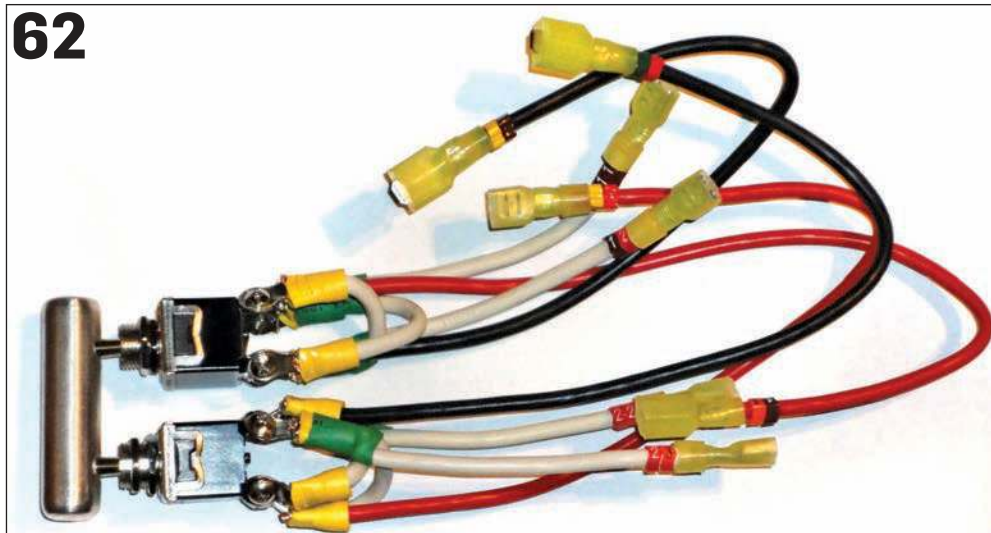
PHOTO 62:

The wiring on the dual reversing switch is quite a bundle...

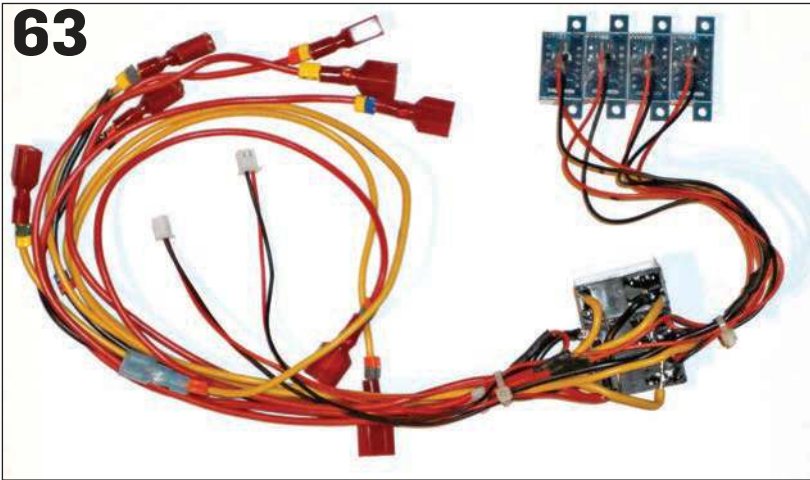
61



62



63

**PHOTO 63:**

Three relays and the four individual battery meters wired together.

PHOTO 64:

Display panel with meters installed. Cable ties hold wire harness

PHOTO 65:

Quite a tangle of wires on Jan-Eric's living room floor, checking that all wires do connect as intended...

PHOTO 66:

Almost like Christmas lights – display colours help differentiate the meters.

PHOTO 67:

Recess in rear hood contains all necessary controls for Remote box and its cord can be stored here, too.

PHOTO 68:

The loco is ready for its inaugural run!

controllers used. **Diagram 60** shows the schematic of my remote box. Most controllers use an analog 5-volt signal to set the speed of the motor; at zero volts, the motor doesn't run, at the full five volts, the motor runs at full speed. This signal is carried through wire 1 in the coiled cord. The controller's 5-volt supply is connected to wire 2, while wire 3 is 'signal ground'.

The motor speed is controlled

with the 4.7 kilo-ohm potentiometer knob (arrowed symbol). Turning it to the right the speed increases, and vice versa. The two resistors marked 'see text' have to be experimentally determined, since they depend on the controller type. Some controllers may not even need them. Mine are between 1 and 3 kilo-ohms. Adjusting these resistors will ensure that the potentiometer knob is active over the

entire angle of movement, in other words it does not have 'dead space' at either end. The four remaining components – two resistors, a diode (almost any silicon type can be used, including the 1N4001 series of rectifier diodes), and a 47 microfarad capacitor – prevent a too fast increase in motor speed, while ensuring that cutting the power to the motor will be almost instantaneous.

The 'dead man's switch' must be kept pressed whenever the engine is run. This is of the NC, 'normally closed' type, so if released, it shorts the capacitor to signal ground via the 100-ohm resistor, thus the control signal on wire 1 drops, and the power to the motor is immediately switched off by the controller.

Some controllers may even offer 'dynamic braking', charging the batteries whenever the loco is coasting; the motors then generate power instead of consuming it. My controllers don't have this feature. I rely on a mechanical brake, and the additional mechanical resistance of the motor when it is spun by the loco wheels – that gives a rather substantial braking force.

The horn button has already been mentioned, it momentarily connects wire 4 to ground when pressed, thus actuating the horn relay.

Wiring it all up

When a circuit is relatively complex, such as this, it is important to keep the wiring clear and tidy. The wire colours enable me to distinguish between ground (black), plus voltage (red), or something else (yellow, blue or white). The tab connectors crimped to the end of all removable cables also help a lot – I can group several wires into a bunch, and use either male or female connectors together with different wire colours; this gives me a choice of six alternatives in a bunch of wires.

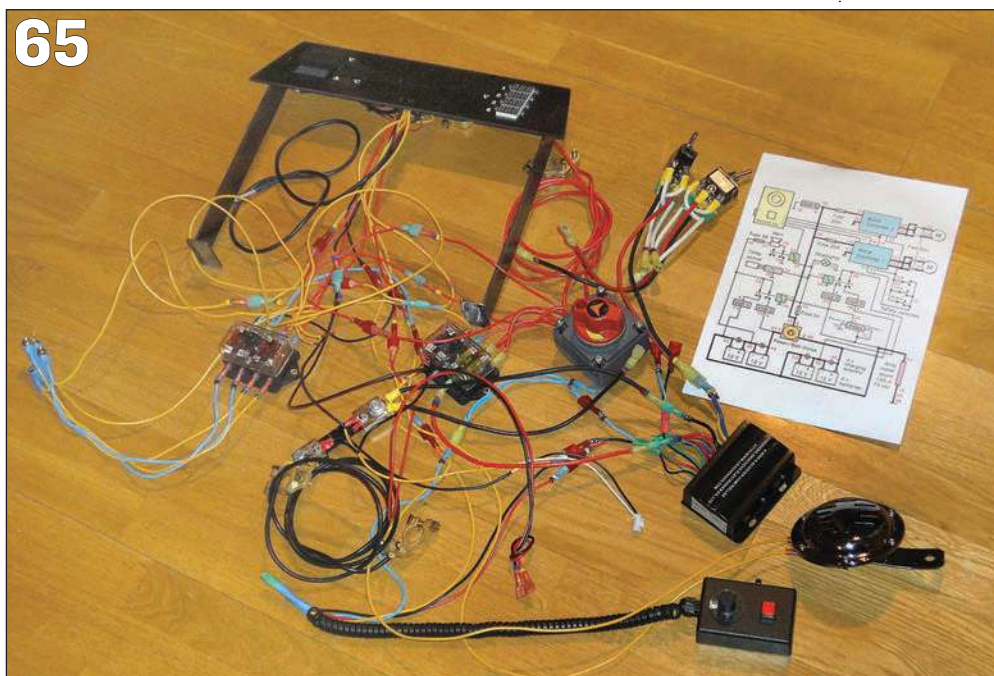
It is of course important to ensure that none of the cables have un-insulated connectors (either male or female), they should all be of the type insulated with plastic sleeves all the way to the connector tip. In this way, there is no risk of short circuits if you ever forget to disconnect the batteries while plugging or unplugging any parts... but the precaution of disconnecting the batteries before doing anything else should always be kept in mind! If there was ever a short circuit, the powerful batteries could cause the connecting wires to melt or even vaporize!

Yes, I've seen this happen – a friend of mine once demonstrated it. He took a one-foot piece of ordinary door-bell wire, held the ends with a couple of pliers, and touched them to the poles of a motorcycle battery; in

64



65



less than a second, the wire's plastic insulation vaporized in a puff of smoke, and the wire glowed white-hot and melted. Car batteries pack even more power, so do be careful! Also, ensure that all components are specified to handle at least 30 volts, preferably more; freshly charged batteries can provide 10 to 15 per cent above their 'nominal' voltage!

Photos 61, 62 and 63 show some of my wiring, as attached to the controller and the reversing switch. The tab connectors (both male and female) are all insulated. Note in the inset how I have identified the different cables by pushing on coloured and numbered marker rings. These are available in auto-parts and electronics stores, and are much more permanent, and thus safer in use than just a piece of tape with a number written on it.

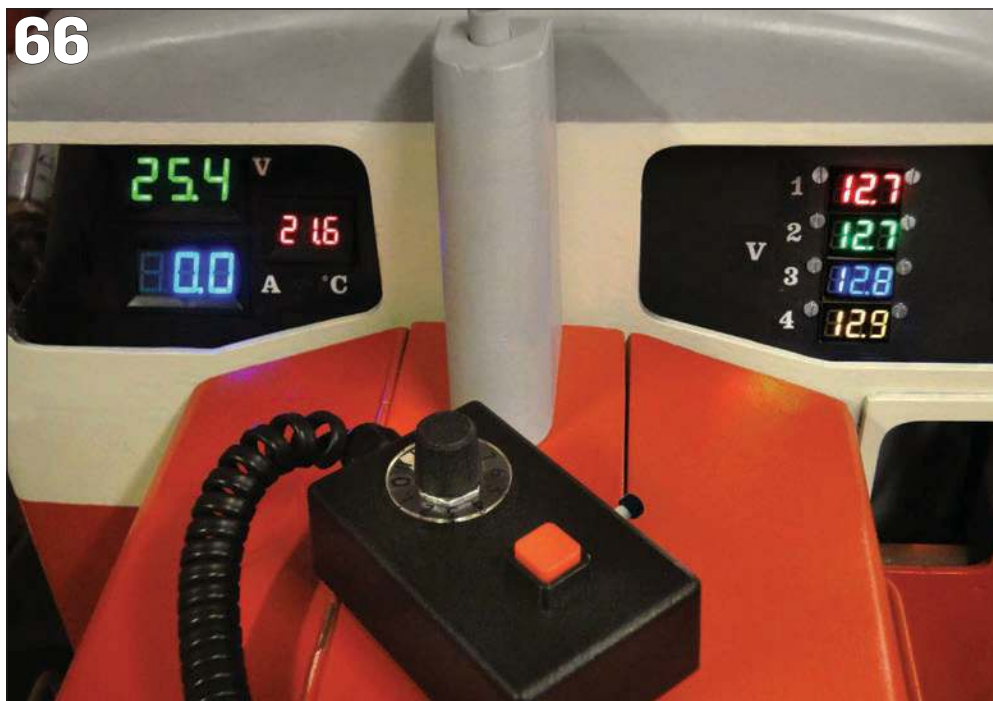
I have never used two sets of the same number/colour, such as 12 and 21 – this could cause a mix-up of the wires. With just two rings, there are enough combinations without duplication anyway (55, to be exact). These marker numbers are indicated in red on the circuit diagram.

Installing it all

All these wires, connectors and components need to be installed in the loco. There is plenty of space inside the front hood, but not much to go in there, except for the two batteries. Most of the electronic components are inside the cab and the rear hood. The display panel, a piece of plasma-cut steel plate, is welded to two vertical 'feet', keeping the panel at the correct height behind the cab windows, Photo 64.

The meters are grouped according to their function – the actual 'running' information on the left: volts, amperes and motor temperature, while the individual battery volt meters are on the right. They are all easily visible to the driver, sitting in the first car coupled to the engine. Photo 65 shows all of the wiring, and all components except the motors and a second speed controller, which hadn't yet arrived when I took the photo.

In Photo 66, all the meters are illuminated after being powered on. The hand-held remote box, here placed on the loco's rear hood, has a spiral cord, which, together with the remote box itself, can be stored in a compartment under the hood's hinged lid. This compartment, Photo 67, also contains the main power switch, the two reversing switches (coupled together with a short aluminium bar), and four battery charging sockets. As soon as the compartment lid is opened, the power to the motor is cut



off. That microswitch can be seen in the rear, at left. To the right of the switch is a magnetic cabinet door lock, which keeps the lid firmly closed. Note the small cutout at lower right, the spiral cord exits the compartment at this point.

Now, after a few more details were added, and the buffer bar was painted with the classic black/yellow stripes, all was set for the first test run of the engine, Photo 68! The annual Mini-Train meeting at our railway museum was just a month in the future as this was written. In the next issue, I'll describe the inaugural run of the loco, as well as some serious problems and their solutions. **EIM**

■ Parts 1-3 of the series appeared in the June to August issues. For back issues go to www.world-of-railways.co.uk/engineering-in-miniature/store/back-issues/ or call 01778 392484.



Dougal – a 5-inch Barclay

More backhead fittings and in particular a whistle for Young Sussex engineer Andrew's entry-level locomotive construction project.

BY ANDREW STRONGITHARM – Part Sixteen of a series



When I built the boiler, I made provision to incorporate a blow-down valve on the bottom of the backhead by adding an extra bush, as the published design did not include one. Like the steam valves on the manifold, this valve was also made to my own design and involved various lengths of $\frac{3}{8}$ -inch round bronze threaded and silver soldered together to position the valve in an easy to access area beneath the cab floor. This ensured that it was visible through the cut out in the locomotive's frames and readily accessible to operate with a nut runner at the end of a day's running.

The valve was designed in such a way that it could be unscrewed from the locomotive without the need to remove all of the associated $\frac{3}{8}$ -inch bronze pipework described above which connected it to the boiler. This pipework had a minimum bore of $\frac{1}{8}$ -inch and finished with a 90-degree elbow pointing towards the outside of the locomotive, which I externally threaded a $\frac{1}{4}$ -inch length $\frac{1}{4}$ -inch x 40

The prototype 'Dougal' is a 2ft 6in gauge Barclay O-4-O today resident on the Welshpool & Llanfair Light Railway in mid Wales.

tpi ready to accept the valve.

The valve body was $\frac{7}{8}$ -inch long and unlike the manifold valves, the steam supply comes in from the back rather than halfway down one side. To start with, I drilled a 3.1mm hole through the whole body and threaded this 4mm to a depth of just over $\frac{5}{16}$ -inch. Next, I turned the valve round and using a $\frac{7}{32}$ -inch slot drill I counterbored the opposite end to a depth of $\frac{5}{16}$ -inch. This was then internally threaded $\frac{1}{4}$ -inch x 40 tpi to screw on to the mounting pipework. However you may noticed that the mounting threads were only $\frac{1}{4}$ -inch long as this dimension also allows provision for an O-ring to be inserted behind these threads to seal the valve.

I used a $\frac{7}{32}$ -inch outside diameter x 1.78mm section silicone O-ring, but before this could be fitted I inserted a further $\frac{5}{32}$ -inch counterbore beyond the first one to a depth of $\frac{1}{4}$ -inch. This second counterbore formed the chamber in which the cone on the end of the spindle would move up and down as the valve is opened and closed as well as providing the location for the outlet pipe.

It was the latter that I made and silver soldered into the valve body next and this consisted of a $\frac{1}{2}$ -inch length of $\frac{3}{16}$ -inch copper pipe. I held the valve body horizontally in the vertical slide on the Myford lathe and using a $\frac{3}{16}$ -inch drill, drilled a cross hole $\frac{7}{16}$ -inch in from the end which had the counterbore, to push the outlet pipe in to. It is important to ensure that the outlet pipe is a push fit in this hole as this will make it easier to solder if it is held securely.

The valve spindle was made from a length of 4mm stainless hexagon, which I started by turning down a 1-inch length until it was round and cut 4mm threads along it. I then cut it off the bar and on the other end of the spindle, I turned a 45-degree taper using an angled tool on the lathe, which would form the cone to seal against the O-ring on the valve seat. I originally inserted an O-ring on the spindle itself directly behind the cone intending for it to act as a gland and prevent steam from leaking down the spindle threads when the valve was open. I found however that this gave the valve a spongy feel and that it didn't seal the threads at all.

I have therefore removed the O-ring and left the threads without

any sort of gland. A small amount of steam and water does come round them when I'm blowing the locomotive down, but since the intention is to drain the boiler it doesn't really matter where the steam comes out from!

Rather than pinning a handwheel on to the valve spindle, I instead chose to Loctite a pair of 5mm AF stainless nuts to the spindle that had been tightened and locked together. For each blowdown a nut runner could be used to simply open the valve and drain the boiler of water, steam and other dissolved debris.

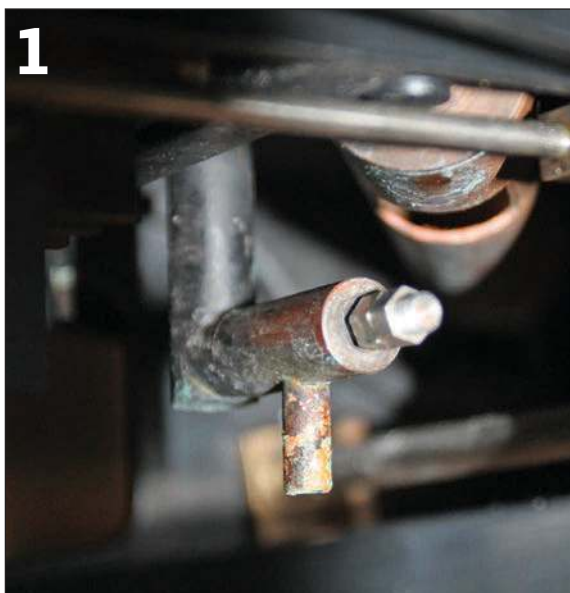
One adaptation that I had to make was to machine a slot in the cab floor using a $\frac{3}{8}$ -inch ball-nosed slot drill to fit snugly around the newly installed blowdown valve. Luckily, this slot would be covered over by the brass chequer plate that I used to clad the running plates and cab floor in. (Photo 1).

Making the whistle

When it came to the whistle, my initial idea had been to try and replicate the design and location of the full-size prototype which has its whistle positioned in front of the spectacle plate (Photo 2). However, after making a miniature replica it soon became apparent that a scaled-down $\frac{3}{8}$ -inch diameter brass tube was not going to produce the desired sound. This was retained and used as extra detail in front of the cab, while the associated fittings and pipework were used to bung the end of the valve body as well as to hold it firmly against the spectacle plate. It was therefore decided to place the real whistle diagonally beneath the cab floor, as this was the only location available where I could hide a sizeable diameter copper tube.

The whistle valve took inspiration from photos of the prototype, with its spring-loaded T-handle (Photo 3). The valve body was made in three separate sections and was supported at the front by the spectacle plate with the dummy whistle in front of it.

I began by making the front part first and like the other two pieces this was made from $\frac{3}{8}$ -inch diameter bronze. This incorporated the steam supply from the manifold together with the valve seating and was initially cut and faced to $\frac{23}{32}$ -inch long. I then bored in from one end using a $\frac{7}{32}$ -inch slot drill to a depth of



$\frac{3}{16}$ -inch. This counterbore was threaded $\frac{1}{4}$ -inch x 40 tpi and due to the lack of depth I used a flat-bottomed tap to ensure the threads reached the full depth. Next, I drilled a $\frac{1}{8}$ -inch hole throughout before the other end was turned back by $\frac{3}{32}$ -inch to a diameter of $\frac{1}{4}$ -inch and externally threaded $\frac{1}{4}$ -inch x 40 tpi.

Steam passage

I designed the steam supply to enter from underneath as this valve would be mounted above the manifold. A further $\frac{3}{4}$ -inch length of $\frac{3}{8}$ -inch bronze was cut to size and one end was machined with a $\frac{3}{8}$ -inch ball-nose slot drill to fit over the front piece of the whistle valve. A $\frac{1}{8}$ -inch hole was then drilled all the way through before I put this piece on its side in the vertical slide on the lathe and $\frac{1}{8}$ -inch in from the end; I drilled a $\frac{3}{16}$ -inch hole in the centre until I broke through into the steam way which I had just drilled. This fitting could then be silver soldered in the middle of the front part of the valve body and the steam passage could also be drilled through.

I found an offcut of $\frac{1}{8}$ -inch material to place under one side of the down pipe to ensure that the $\frac{3}{8}$ -inch down pipe was soldered centrally to the $\frac{5}{8}$ -inch long section of whistle valve. Once this was complete, the hole in the end of the vertical part of the fitting had to be blanked off so I threaded it 4BA and screwed in a bronze bolt about three turns to avoid blocking the cross hole. I then pushed a short length of $\frac{3}{16}$ -inch copper pipe together with an olive and a $\frac{1}{4}$ -inch x 40 tpi brass nut into this cross hole before silver soldering it and the 4BA bolt to the vertical fitting. The head and any extra threads of this bolt were then cut off and filed flat.

The centre part of the whistle valve began life $\frac{13}{32}$ -inch long and similarly to the front piece, the first $\frac{3}{32}$ -inch was turned back and externally threaded $\frac{1}{4}$ -inch x 40 tpi. Next, I drilled a $\frac{1}{8}$ -inch hole all the way through before I turned it round in the lathe chuck and counterbored the other end $\frac{7}{32}$ -inch to a depth of $\frac{1}{4}$ -inch. About half the depth of this counterbore was duly threaded $\frac{1}{4}$ -inch x 40 tpi.

I then turned my attention to the side fitting which the steam delivery pipe for the whistle screws on to. This was a $\frac{1}{4}$ -inch diameter x $\frac{5}{16}$ -inch length of bronze and the first $\frac{1}{4}$ -inch was externally threaded $\frac{1}{4}$ -inch x 40 tpi. I then drilled this out with a $\frac{1}{8}$ -inch drill and inserted a 60-degree countersink that would accept the olive of the pipe which screws on to those threads.

I radiused the opposite end using a $\frac{1}{4}$ -inch ball-nose slot drill to a depth

of $\frac{1}{16}$ -inch and I could now silver solder the side fitting on to the centre part of the whistle valve body, ensuring that it was positioned central about it.

The back piece, which included a guide for the stem of the handle, was $\frac{1}{2}$ -inch long and I drilled a $\frac{1}{8}$ -inch hole all the way through it before I bored out one end to a depth of $\frac{13}{32}$ -inch using a $\frac{7}{32}$ -inch slot drill. This left $\frac{3}{32}$ -inch at the end to guide the stem. I then cut a $\frac{3}{32}$ -inch length of $\frac{1}{4}$ -inch x 40 tpi threads in the opposite end for this part of the valve body to screw on to the centre piece.

The pull handle was made from two pieces of $\frac{1}{8}$ -inch stainless steel rod which were silver soldered at right angles to each other to form a T shape. The pull handle was $\frac{5}{8}$ -inch wide

while the stem was $1\frac{3}{8}$ -inch long and I threaded the end of this 5BA by a length of $\frac{5}{8}$ -inch. I then turned the last $\frac{3}{16}$ -inch of these threads down to 0.086-inch and threaded this 8BA which would be used to screw a $\frac{3}{16}$ -inch viton ball on to.

I drilled the ball using a small jig which clamped it in a counterbore with a pre-drilled hole already through both halves. This ensured that the ball was held tightly whilst it was being drilled and I could use the pre-drilled holes in the jig as a guide for the drill to follow. I made two or three different-sized ball-drilling jigs during the build and for this particular application I used a $\frac{1}{16}$ -inch drill. I then proceeded to screw the ball on to the end of the 8BA threads which self-tapped



PHOTO 1:

Blowdown valve installed in its position under the cab floor.

PHOTO 2:

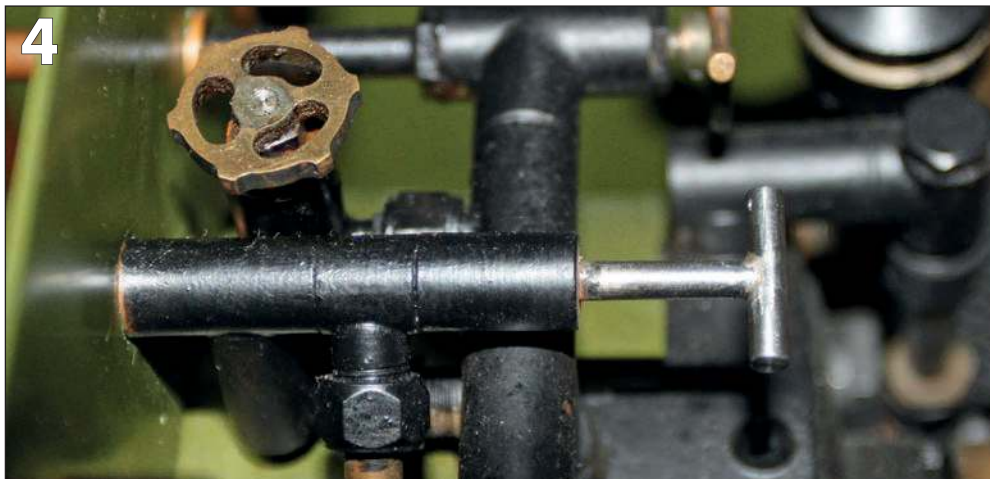
The full-size 'Dougal' has a tiny whistle mounted on the front of the spectacle plate. Photo: Andrew Charman

PHOTO 3:

The T-shaped handle that blows the full-size loco's whistle can be seen in this footplate view. Photo: Andrew Charman

All photos by the author unless stated





themselves to the inside of the ball.

The 5BA threads were used to secure a $\frac{1}{16}$ -inch thick x 0.210 thou' diameter stainless steel washer which was screwed on tight against the end of the threads. This formed the stop for the spring which closes the valve again after the valve handle is pulled and after pushing the handle through the back piece of the valve body, I slipped a $\frac{1}{4}$ -inch length of $\frac{1}{8}$ -inch x 26 SWG stainless steel spring over the stem. Next, I wound the washer on until it bottomed out on the 5BA threads before screwing the whole assembly in to the centre part of the valve body. You should find that the spring is now slightly compressed within the back section of the valve body.

The viton ball could then be screwed on to the smaller 8BA threads and the front section of the valve body screwed in to the centre section to complete the whistle valve (**Photo 4**). When you pull the handle backward you should feel the resistance of the spring and as you let go, it should instantly return to the closed position. The spring that I used was designed for safety valves so I have found it is a bit too strong which makes my handle slightly harder than desired to pull. The action of the handle is also sometimes not particularly smooth, which I believe is a combination of a too-strong spring and a relatively short guide for the handle to slide through.

Proven design

The whistle itself was made to a design which was developed by my mentor Andrew and it involved using an angled piece of copper pipe instead of the traditional curved voice slot inlet. Due to the deep note of the whistle of the full size 'Dougal', I used a piece of 1-inch outside diameter x 26 gauge copper tube and filed an $\frac{11}{16}$ -inch long voice slot about $\frac{3}{4}$ -inch in from one end of the tube.

I cut the tube to a length of $4\frac{1}{4}$ -inch as this was the longest that I could fit mounted diagonally beneath the cab floor (**Photo 5**). All the measurements were worked out by 'trial & error' until I achieved a note that was deep enough, or that wasn't likely to get any better! I used an air line with a thin nozzle to direct a jet of air toward the voice slot, mimicking the angle of the copper pipe.

I then turned a $\frac{1}{8}$ -inch thick brass bung which contained a $\frac{1}{16}$ -inch step to locate inside the tube and silver soldered this in to the end furthest away from the voice slot. I made a special bung for the opposite end which incorporated a $\frac{3}{16}$ -inch x 40 tpi conical fitting for the steam supply pipe. I drilled a $\frac{1}{8}$ -inch hole through this before inserting a $\frac{3}{16}$ -inch x $\frac{1}{8}$ -inch deep counter bore in the other end that I pushed a $\frac{5}{8}$ -inch length of $\frac{3}{16}$ -inch x 26swg copper pipe in to.

I then silver soldered this pipe in

with high -temperature C4 solder (Silver Flo 24) and carefully bent it at roughly 45 degrees so that it pointed towards the outside wall of the whistle tube and just behind the voice slot.

I could now insert the whole fitting into the whistle tube and silver solder this in with Silver Flo 55 solder that melts at a lower temperature than the C4 solder to prevent disturbing the previously soldered joint. I know some model engineers use soft solder on their whistles, and other fittings, however I have seen first-hand when soft solder comes in to contact with high steam pressure it can melt with the fitting falling apart halfway around a track.

I found that the angle and positioning of the internal steam pipe in relation to the voice slot was critical to whether the whistle worked successfully. If you choose to make the whistle by this method, you may require a certain amount of trial and error to succeed. Take my word for it, this unorthodox approach to making a whistle does work if you follow the outline design described above.

The only caveat is that my whistle and others that Andrew has previously made by this method of construction do not tend to be effective below about 40psi. I think it would be fair to say that the whistle on my Dougal is mid-range on the standard scale; however the exact note is unknown. The diameter and length constraints underneath the cab floor meant that I could only achieve a certain depth of note, which is not as deep as the full size I was trying to replicate. That said, I am pleased with the end result. **EIM**

PHOTO 4:

Andrew has neatly replicated the handle on his model loco.

PHOTO 5:

A proper whistle sound required a very un-scale whistle so it is concealed under the cab floor.

Drawings in this series reproduced by kind permission of A J Reeves. Drawings, castings and material for this project available from A J Reeves.

Tel: 01827 830894 E-mail: Sales@ajreeves.com
Web: www.ajreeves.com



Previous Episodes of the build...

Introducing Dougal, April 2018; Building the boiler, May 2018; Frames, axleboxes, June 2018; Wheels, eccentrics, July 2018; Rods, boiler saddle, August 2018; Machining the steam chest, September 2018; Adding the eccentrics, November 2018; Machining cylinders, December 2018; Cylinder covers & slide bars, January 2019; finishing the motion, February 2019. First run on air, March 2019; Building the brakes, April 2019. Smokebox pipework, May 2019; Making the regulator, June 2019; Backhead fittings, August 2019

Digital back issues can be downloaded or printed versions ordered from www.world-of-railways.co.uk/engineering-in-miniature/store/back-issues/ or by phoning 01778 392484.

Next Month...

"The chimney was machined from solid - I thought this would be easier than machining a casting and I was donated a piece of 2-inch hexagon brass..." Andrew crowns his loco.



Soft jaws in seconds

Having only just celebrated his 14th birthday, Matthew is showing not only prowess but innovation in the workshop. Here he passes on a useful tip.

BY MATTHEW KENINGTON

Since I started as a young engineer at the Hereford SME, lathes have become an essential part of my life – they take up most of my weekends and I spent last summer restoring one. One of the problems I have found, however, is that once a surface has been machined, the challenge of gripping it securely for further work increases as it is usually desirable to retain the beautiful finish one has just spent much time achieving.

Lathe soft jaws are the easy solution as they are designed for that purpose but (sadly) I do not have such luxuries and my pocket money doesn't stretch to even one set of soft jaws for our two lovely Pratt Burnerd chucks. On the other hand, I do have access to a decent amount of raw materials, both at home and at the Hereford SME.

A few months ago I came up with the idea of producing a slip-on soft jaw that could be made from the abundance of thin copper sheet that lies around our workshop (my dad works in the radio frequency sector and uses this to make antenna bits and pieces – he won't miss a few bits, if we don't let on...).

The basic idea was simple: a set of slip-on copper jaws that could fit over our existing Pratt Burnerd chuck jaws, ideally staying in place on their own without having to mess around with fitting the soft jaws and the workpiece at the same time. This goal is surprisingly easy to achieve as will be outlined here.

Not precision measuring

The first step is to measure the chuck jaws on the lathe (Photo 1). The measurements don't need to be made to a high degree of precision as the bending process will be forgiving of small errors.

The basic shape of the new jaw can now be cut from a suitable piece of scrap copper (or brass) sheet, according to the dimensions in Figure 1 and based upon the measurements taken from your chuck. The copper offcuts I used were 0.6mm thick but anything close to this should do equally well. Note that if using brass sheet instead of copper, it may be necessary to anneal the material before bending – I've not needed to try out annealing yet,



"My pocket money doesn't stretch to even one set of soft jaws for our two lovely Pratt Burnerd chucks..."

ABOVE: The finished Soft jaws holding piece of brass for threading

PHOTO 1: The measurements needed on the chuck jaws – see Figure 1 over the page.

Photos and diagrams by the author

but it's on my 'need to learn' list (and it's a long list...).

After cutting out the basic shape you will need to bend it to fit the shape of the jaws (see the bend table in Figure 1 for details). An easy way I found to do this was by placing the part in the chuck, as shown with another piece of scrap in Photo 2.

Make sure that the centre of the part lines up with the 'V' in the chuck jaws and then tighten the chuck slightly (Photo 2) – readjust if necessary and then tighten the jaws fully (Photo 3); the part will form naturally into the perfect V of that particular jaw.

Next, the rest of the part needs to ►

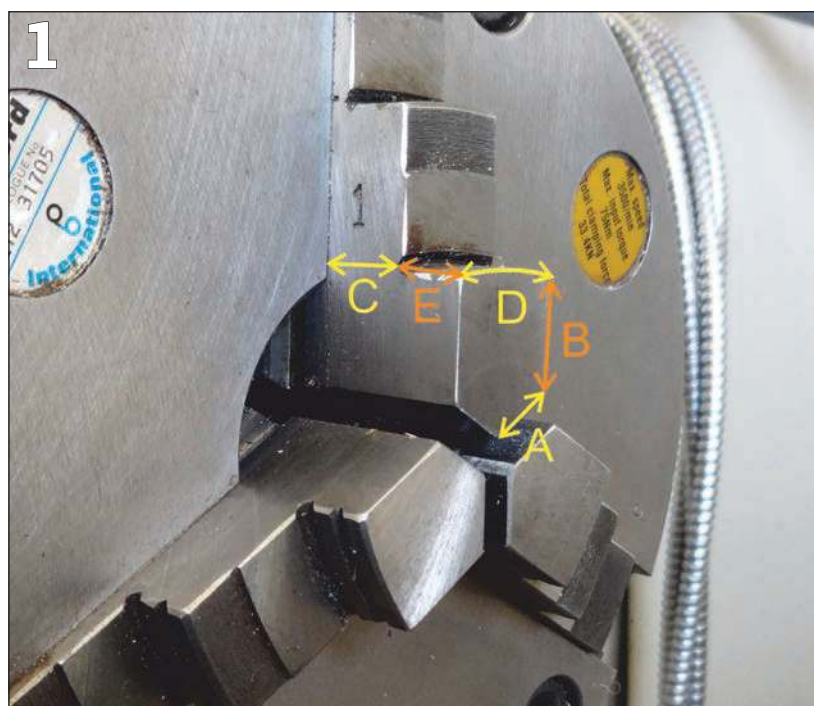
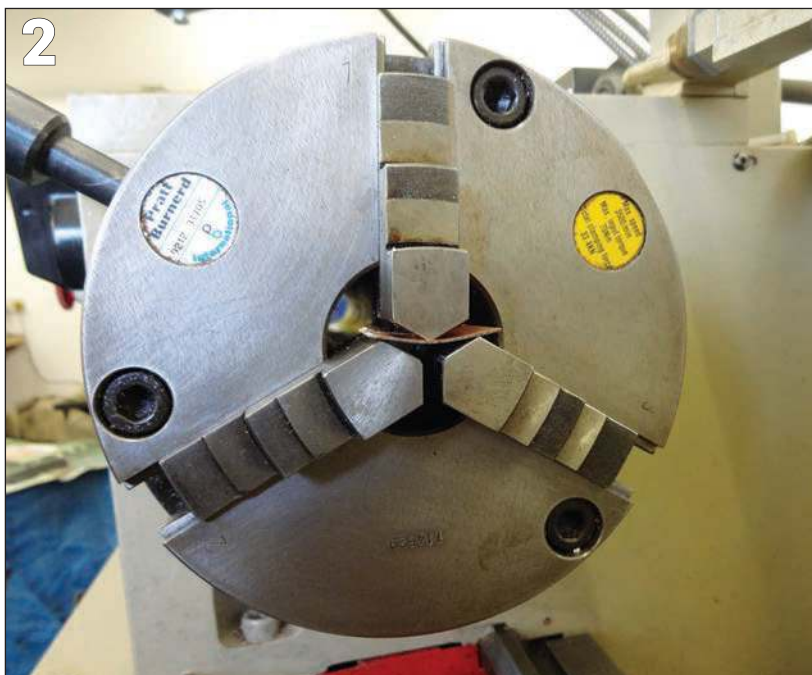
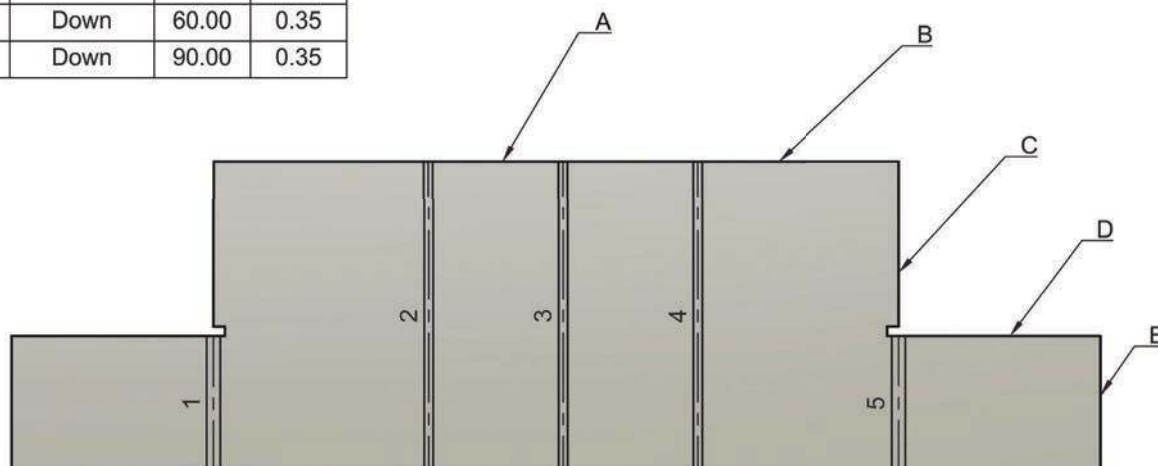


FIGURE 1

Bend Table			
ID	Direction	Angle	Radius
1	Down	90.00	0.35
2	Down	60.00	0.35
3	Down	60.00	0.35
4	Down	60.00	0.35
5	Down	90.00	0.35



be bent around the jaw. This can be easily achieved using a small hammer and a little time and patience, or by employing a suitable clamp arrangement to squeeze the sides into shape, followed by gently hammering the upper lugs into position.

Finally, the two upper lugs can be soft-soldered together so that the soft jaw does not fall off easily when fitted. I also stamped on a number, corresponding to the chuck jaw, to identify the soft jaws as a set.

Once you have completed these steps, you should end up with a part which looks like the diagram **Figure 2** and, ultimately, a full set looking like **Photo 4**.

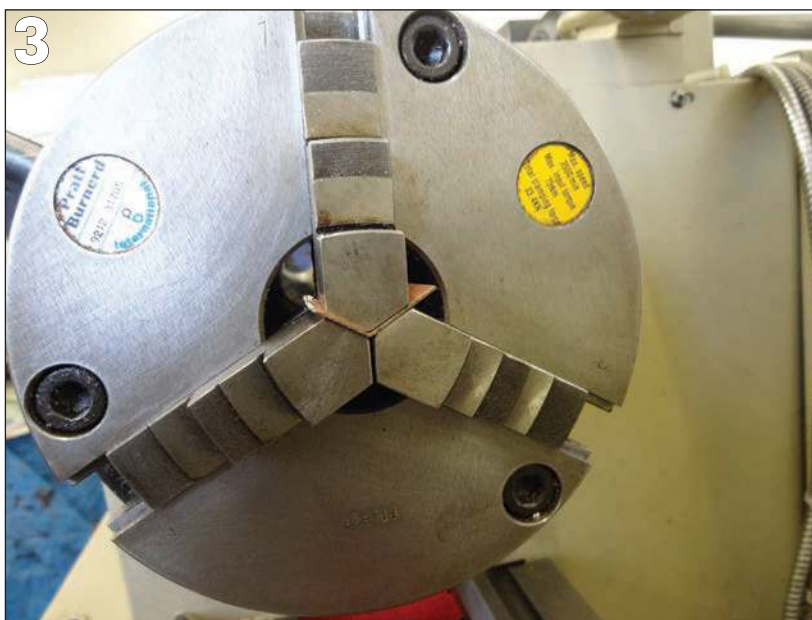
For the 160mm three-jaw Pratt Burnerd chuck on our Harrison M300 lathe, the approximate dimensions are as follows: A = 10mm, B=15mm, C=13mm, D=20mm and E=10mm. Note that dimension D can be made shorter if a smaller overlap is desired (as I employed see Photo 3).

Four-jaw option

The bend table shown in Figure 1 is based upon a three-jaw chuck implementation. If you wish to make a set of soft jaws for a four-jaw chuck, the bend table changes to that shown in **Table 1**.

Photo 5 shows the soft jaws fitted to the chuck – and a nice snug fit they are. Note that the soft jaws do not cover the entire length of the original jaws – this was deliberate since a longer V-section would cause problems as the jaws were opened beyond the diameter of the centre hole of the chuck. It would, of course, be possible to make a variant of the jaws which did cover the entire

“This can be easily achieved using a small hammer and a little time and patience...”



Found a useful workshop dodge? Write it up for your fellow engineers reading **EIM** – we pay for material used...

TABLE 1

Bend Table			
ID	Direction	Angle	Radius
1	Down	90.00	0.35
2	Down	45.00	0.35
3	Down	90.00	0.35
4	Down	45.00	0.35
5	Down	90.00	0.35

length of the existing chuck jaws, for use on smaller diameter workpieces.

The heading photo shows me using the jaws to hold a brass workpiece whilst threading its end-section after machining. The (already machined) section, held in the soft jaws, came out unmarked!

So does the process live up to the 'seconds' claim in the title? I think it should be possible to make three soft jaws inside of 30 minutes, which my pre-GCSE maths calculates to be 1800 seconds – there aren't many pieces of useful workshop tooling which can be made in that time! **EIM**

■ Thanks to Matthew for eloquently describing a simple and budget addition to the workshop equipment that all model engineers will find useful – not just the young ones! Meanwhile are you a young engineer with some model engineering you have done and are proud of? Write in and tell us about it! The address is on page 3.

"It should be possible to make three soft jaws inside of 30 minutes, which my pre-GCSE maths calculates to be 1800 seconds..."

FIGURE 2

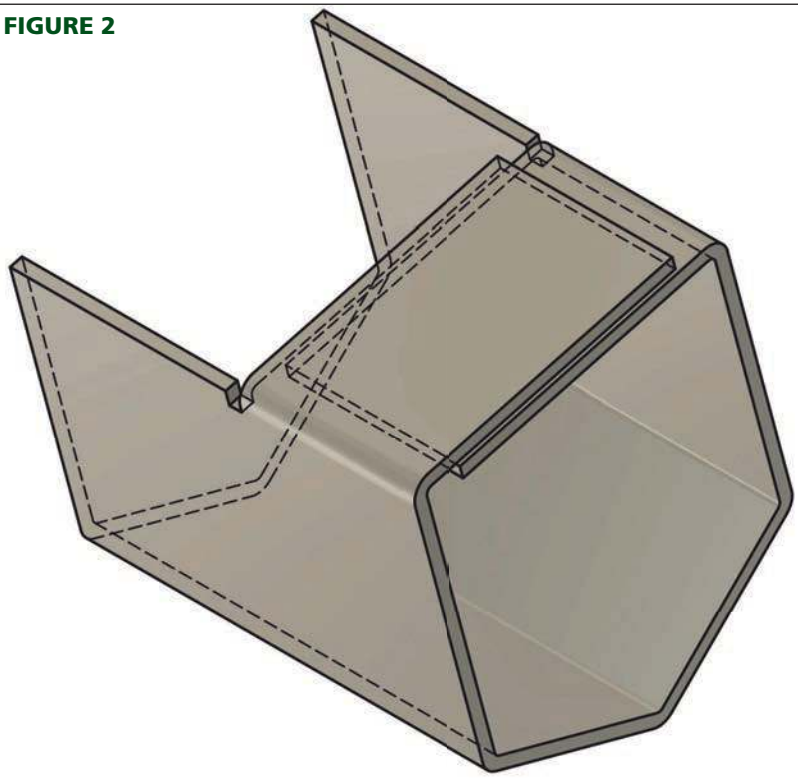


FIGURE 1: The flat view of one soft jaw – measurements taken as according to Photo 1.

PHOTO 2: The correct technique to shape the 'v' in the copper sheet, here demonstrated with a piece of scrap.

PHOTO 3: As the jaws are tightened a perfect V is formed in the copper sheet.

TABLE 1: Bending table for using the soft-jaw build on a four-jaw chuck.

FIGURE 2: The finished product; designed using the sheet metal function in the Fusion 360 CAD package.

PHOTO 4: The finished soft jaws (after a little use!).

PHOTO 5: The finished jaws mounted on a Pratt Burnerd chuck.



Sweet Pea Rally 2019

John reports from this ever-popular annual event for the equally popular narrow gauge 0-4-0 and its various derivatives.

BY JOHN ARROWSMITH



PHOTO 1: Not seen together very often, the three gauges of Sweet Pea. 3½-inch, 5-inch, and 7¼-inch.

PHOTO 2: Winner of the June Drake Trophy, Brian Holland concentrates on the road ahead as he comes off the shed road.

All photos by the author

This popular annual event was held this year at the headquarters of the Sheffield & District SME, the locos showing their pace on the club's superb Abbeydale track over the weekend of the 8th/9th June. It was a weekend of mixed weather with rain and dampness on Saturday and a fine early Summer day on Sunday, but even the damp bits did not put off the regular visitors who enjoy the event no matter what the elements throw at them.

The facilities at Sheffield are second to none and the site was soon a hive of activity as the various Sweet Pea locos were prepared for the day's operations. I think this year the first loco steaming on the track was the 7¼-inch gauge 0-6-2 Sweet Rocket owned by Nigel Ball of the Nottingham Society, and he was closely followed by Dave Dick from the Urmston club and Malcolm High from the Wakefield Society. Nigel and Dave were on the ground-level track while Malcolm started on the raised track.

As further visitors arrived the steaming bays became a very busy place but such was the organisation

that whatever anyone needed was almost instantly provided. Sheffield's track is a real test for drivers, it is in a great location with serious gradients on the outward run and particularly on the return section outer loop on the ground-level track. Here drivers were faced with a 1 in 37 downward gradient which really tested their ability to match the braking needed to control the train with the need to keep moving and not cause hold-ups.

All the drivers who went on this section thoroughly enjoyed themselves and there were no real problems throughout the weekend, or none that I saw anyway.

The club has recently installed a new heavy-duty turntable as part of its ground level services. Well made, it operated very easily and will be a great help for the heavier engines.

Young members

It was good to see the Sheffield young engineers fully involved with the rally. Three were in their final training to use the very sophisticated signal box, which they did without any mishaps, others were driving and one was acting as the recovery driver should any visitor loco fail – it was all excellent experience for them.

During the rally chairman of the Sheffield Club Bob Potter presented passing-out certificates for young engineers who had been training in use of the signal box. These people are a credit to the club and they showed lots of skill in both their work in the box and driving all the track circuits.

What is Sweet Pea?

Of course every model engineer knows what Sweet Pea is? Not necessarily it seems...

Sweet Pea is a narrow gauge locomotive design in 5-inch gauge, penned by Jack Buckler and originally serialised in EIM in its earliest years, between October 1981 and July 1983. Jack came up with an 0-4-0 saddle tank, with Hackworth motion and a marine-type boiler.

The loco proved highly popular as a first project, and a great many have since been constructed, many as per the original design while others have modified the design to their own ends – with leading or trailing trucks, six-coupled wheel arrangements, side tanks instead of saddles... And the loco has also spawned a 7¼-inch version, dubbed 'Sweet William', and a 3½-inch gauge variant, 'Sweet Violet'.

Today full sets of castings for both Sweet Pea and Sweet William remain available from Blackgates Engineering (www.blackgates.co.uk/sweet_pea.html), as is the original series of EIM articles in the form of a book.



PHOTO 3: Phil Owen from Blackgates Engineering brings 7¼-inch gauge 'Jacquie O' off the downhill gradient to bypass the station.



PHOTO 4: Dave Holland teaches seven-year old Martin Holland how to drive his 7¼-inch gauge 'Sir George'. Note the very different look to the standard Sweet Pea.



PHOTO 5: Nathan Mills with the Sheffield club's 5-inch gauge 'Hobgoblin' fitted with Joy valve gear.

PHOTO 6: Nigel Linwood has 'Sweet Jay' going well as he starts the long climb up towards the top of the circuit.





PHOTO 7: Bob Pearce comes off the shed line towards the station with Phil Owen's 'Jacquie O'.

PHOTO 8: Worthing member Jim Alderman runs under the bridge with his 5-inch loco.

PHOTO 9: Sheffield member Dave Griffiths drifts Bob Potter's 7¼-inch gauge example through the station.

PHOTO 10: Paul Godin from the North London club has his 0-6-2 going well on the raised track.

PHOTO 11: Ron Smith from Butterley Park Railway with his 5-inch gauge 'Clara'.

PHOTO 12: Nigel Ball from Nottingham opens the regulator as Sweet Rocket tackles the grade.

The one award presented at this event is of course the June Drake Trophy, presented in memory of the late June Drake who was the originator of the Sweet Pea Rally 27 years ago. June's husband Ron was on hand once again to present the fine glass vase to Brian Holland from the City of Oxford Society, for his 7¼-inch gauge version 'Susan Margaret.' This locomotive has taken Brian 20 years to complete but the wait was worthwhile as he has made an excellent job of both the building and finish.

I would like to thank Bob and all the Sheffield members for their excellent hospitality and help during the rally. I must not forget the ladies who provided a constant supply of tea and coffee on both days along with a good selection of food all with good humour with nothing being too much trouble.

Next year's rally will be at the Broomy Hill track of the Hereford Society of Model Engineers over the weekend of the 6th /7th June. Further details and information will be available in due course. **EM**





PHOTO 13: Plenty of steam for regular EIM correspondent Martin Gearing as he passes the steaming bays.

PHOTO 14: Malcolm High on the ground-level track, starting the climb to the summit.



PHOTO 15: Yes it is a Sweet Pea! Phil Brien's double electric 5-inch gauge loco runs well.



PHOTO 16: The newly installed turntable at the Sheffield track.

PHOTO 17: Henry McDonald, a 14-year-old Sheffield member, at work in the signal box.



PHOTO 18: Brian Holland receives the June Drake Trophy from Ron Drake.

PHOTO 19: Chairman Bob Potter with the three young engineers who received their signalling certificates.



What an Eiffel at Midlands show

It's that time again, to start thinking about the Midlands Model Engineering Exhibition. Long established as one of the big three shows of the year, the 2019 event will take place in its traditional venue of the Warwickshire Event Centre from Thursday 17th to Sunday 20th October.

The Midlands show is the second longest-running of its kind in the UK and organisers Meridienne Exhibitions claim with some justification that at four days in duration it is a comprehensive and full exhibition for everyone to enjoy.

As is traditional we will be publishing our four-page pullout guide to the show in next month's issue. Highlights among the attractions this year will include a replica of the Eiffel Tower, built in Meccano,

celebrating the French national icon's 130th anniversary and standing some 12 feet tall!

Perhaps of more core interest to EIM readers will be a display of 5-inch gauge Pullman Cars, seven identical vehicles each more than six feet long and presented by Brent Hudson and Ben Lyons.

Show organisers promise that more than 45 of the leading suppliers to the model engineering world will be present, alongside hundreds of models from nearly 40 societies and clubs.

There will also be the usual outside attractions, such as the well regarded 5-inch gauge outdoor track, operated by the Coventry Society of Model Engineers and the Polly Owners Group. The Fosse Way Steamers will also return with a

varied display of model traction engines.

Meanwhile a full programme of demonstrations and lectures will include foundry work, gear cutting, 3D printing and modelling and an EDM machine. Full details of the programme will be published in September on the event's website.

"The exhibition remains focussed on the core model engineers who have a real passion for what they do – whether they be new to the hobby or experienced and acknowledged modellers," a Meridienne spokesperson told EIM.

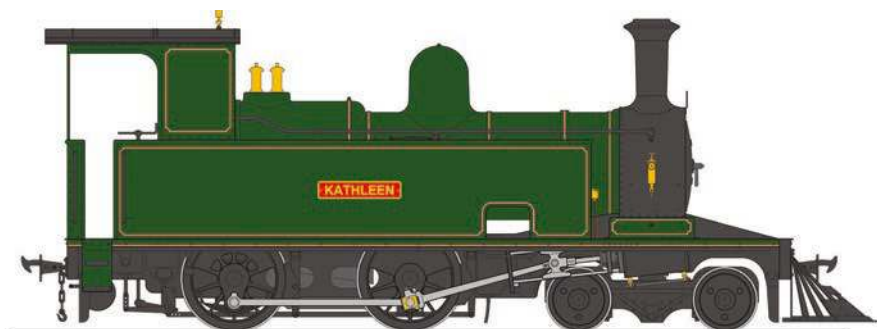
A core part of the show are the competition and display classes for modellers, and entries are now being invited for these. Entry is free and there are 32 classes of which 16 are competition and 16 are display. Classes include Locomotives, Rolling Stock, Stationary and Internal Combustion Engines, as well as several others – details are on the website.

Models still under construction can also be entered in the display classes. A commemorative plaque and exhibitor's certificate will be presented to every entrant, with trophies and cash prizes awarded to winners..

More details, competition entry forms and discounted advance ticket booking are available on the website, www.midlandsmodeleengineering.co.uk or by calling 01926 614101. See you there?



Small-scale wood sawing was an outside attraction at the 2019 Midlands show. Photo: Andrew Charman



Irish 45mm gauge from Accucraft

Those not averse to a ready-built loco to run on the smaller-scale 45mm tracks now part of many model engineering society facilities, and who have an interest in the Irish narrow gauge, will be interested to hear that prolific live-steam manufacturer Accucraft UK is to expand its offerings to stock from the Emerald isle.

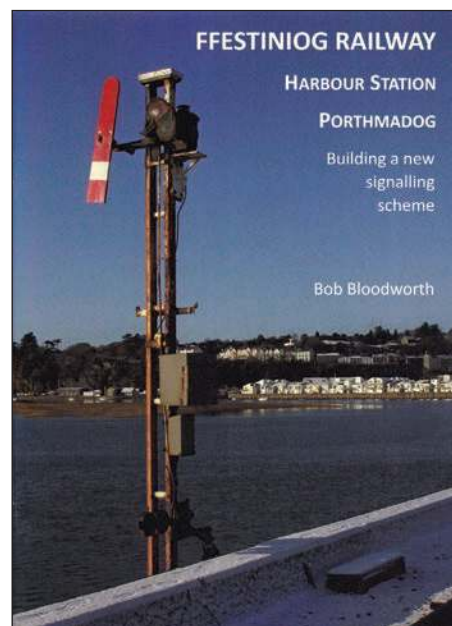
The firm has already produced several Isle of Man locomotives in 1:20.3 scale (representing 3ft gauge on 45mm track), and now plans to release models of the elegant Cavan & Leitrim 4-4-0 tank locomotives.

The two surviving Robert Stephenson locos will be offered in their final form, No. 2 'Kathleen' in 'tram' condition with the extended cab roof and tram-style cab (albeit without full skirts) and No. 3 'Lady Edith' in 'main line' form without these additions.

The models follow typical Accucraft practice – internally gas-fired boilers and piston-valve cylinders, together with the usual cab controls and a lubricator. Each will be available in either fully-lined Cavan & Leitrim green, un-numbered GSR grey or plain satin black, with nameplates provided for both locos but not fitted.

Target UK retail price for each loco will be £1950.00 and Accucraft is planning to donate the retail profit from Northern Ireland sales of Kathleen to the Ulster Folk & Transport Museum where the full-size loco is preserved. Similarly the Cavan & Leitrim Railway Preservation Society at Dromod will benefit from Irish buyers of Lady Edith.

Accucraft UK, 01981 241380, www.accucraft.uk.com



■ Many a model engineer is into signalling and will likely find this new inexpensive softback from the Ffestiniog Railway of interest. Costing £9.99, running to 56 pages and packed with colour photos, tables and diagrams it describes the creation of the new signalling scheme when the FR's Porthmadog station was extended, described by the author as 'a very large project.'

More details can be had online at www.festshop.co.uk, email shop@ffwhr.com, phone 01766 516034.

Anniversary time down south

Two clubs mark significant birthdays, the youth take over another in this month's round-up...

COMPILED BY ANDREW CHARMAN

This month's round-up of the ever vibrant club scene has a distinct southern slant, and starts in celebratory mood with two clubs making the most of chalking up significant anniversaries.

Formed in 1969, the **Romney Marsh MES** is actually one of the younger clubs around, but the Kent coast club has now reached 50 years old and celebrated with special events in May. Chief among these was a 50th Anniversary Open Weekend at the club's Rolfe Lane track on 18th-19th May – this was opened in style by the newly elected Mayor of New Romney, Paul Thomas, on his first public engagement. A keen railway enthusiast, Paul took the controls of a Class 58 diesel loco, driving it through a ribbon stretched across the track. A visitor from the Canterbury club, the recently completed loco was on its first outing away from its home track.

The club had aimed to have 50 locomotives at the track over the two days – in the event more than 60 turned up as well as 200 visitors, other Societies represented including the Oxford, Canterbury, Worthing, Maidstone, Tonbridge, Gravesend and even the Oignies Club, based near Lille in France.

Earlier the same month Romney members had enjoyed an outing to the rather better-known railway in the district, the Romney, Hythe & Dymchurch. A special anniversary train on the RHDR was driven by club member Alistair Coney and adorned with a large headboard, while the day included a lunch at Hythe, speeches and the cutting of an anniversary cake, specially donated by Yvonne Carter, wife of the late Cyril Carter who had founded the club in 1969.

Federation rally

Staying in Kent and another club is celebrating a big birthday, with the **Maidstone MES** clocking up 90 years. As part of the celebrations the club is hosting the annual Southern Federation Rally on 7th September, and looking forward to welcoming a host of visitors to its demanding 1826-foot long, raised-level track in the scenic location of Mote Park.

Offering both 3½-inch and 5-inch gauges, the track is described as a demanding drive, climbing from the first bend and varying in grade until the exit of the far loop, then making ▶

RIGHT: The Romney club's 30th birthday weekend was opened by New Romney mayor Paul Thomas, at the controls of a class 58 loco. Photo: Bobby Jones, Romney ME

CENTRE RIGHT: The Romney club members also enjoyed a special train on the Romney, Hythe & Dymchurch Railway as part of the celebrations. Photo: Jackie Jones, Romney ME

Below: The Maidstone MES will host the Southern Federation Rally this month. Photo: Tony Parham, Maidstone ME





the long drop back to the station.

Maidstone is hoping to attract a wide variety of locos and with a large park to explore, traction engines too. Food will be provided for visitors on Saturday lunch time, and with running planned into the evening, there is a plan to send out for fish and chips for those who order in advance.

Visitors are also welcome to attend on the Sunday when the club will be running for the public in the afternoon. Sounds good, if you want to take part get in touch with the Maidstone chairman Tom Parham on tom_parham@hotmail.co.uk or call him on 07754 281280.

Young take charge

Still in the south but moving across the county, and the big celebrations above would not have meant much to the participants in an event at the **Sussex Miniature Locomotive Society's** Beech Hurst Park, Haywards Heath track on Sunday 30th June.

On that afternoon the railway was entirely operated by members aged 30 or under – nine of the club's younger

ABOVE:

The younger members were very much in charge at the Sussex Miniature Locomotive Society on 30th June. Photo: SMLS

BELOW:

Full steam ahead into the next 90 years for the Maidstone club. Photo: Tony Parham, Maidstone ME

members carried out all the necessary duties including station master, traffic controller and of course driving.

It is also interesting to note in the picture on this page that out of the eight members pictured, three are committee members, one is the current chairman and another, Andrew Strongitharm who is currently serialising his 'Dougal' build in this magazine, is the club secretary.

"I think the presence of younger members helps to attract more and the railway certainly couldn't operate as it does today without them," Andrew said. We are delighted to hear that at **EIM**, as readers will know we have always supported young engineers.

Further success for the Sussex club came from its charity day on 28th July, which raised £402 in takings for The Yews, a local community centre in Haywards Heath.

Saffron seeks a home

Still in the south and some less positive news, of another club looking for a new home. The **Saffron Walden & District SME** has for 30 years been

based at Audley End House, running its Picnic Field Railway next to the 15-inch gauge Audley End Railway. A 400ft-long raised track was relocated from the club's previous site in 1989 and a ground-level line added in 2003.

Now, however, the club is looking for a new home as the owners of Audley End have decided to develop the 15-inch gauge line including building a new cafe, and they need the space. Potential new sites in the Saffron Walden area are being sought, and the last public running weekend at the current site will be on 7th-8th September followed by a very final day for members only on the 14th.

Leaving an established site is always a wrench for a club and especially one based alongside such rail interest. We hope the Saffron Walden SME can establish itself in a new location soon.

A welcome new arrival to the expanding selection of club magazines and newsletters received in the **EIM** office is *Kingpin*, the magazine of the **Nottingham SME**. Browsing the pages it is good to see much progress being made on the extension to the club's 7¼-inch gauge ground-level track at its site alongside the standard-gauge Great Central Railway (Nottingham) in Ruddington.

Nottingham members have been working for a year to complete the trackwork and while the rails are now all connected, much remains to do, including such matters as reinstalling vital fencing, before the extension can be passed for public running. And there are plans for further development – including the installation of an impressive double slip, built for an exhibition a few years ago and which will be used to access a proposed shunting yard. We hope to have some pictures from this project in our next issue.

Another new addition to the club newsletters received goes a lot further south – to South Africa! The **Centurion SME** is based in Zwartkop, near Pretoria, and browsing their *Smokebox* newsletter it is clear that narrow gauge prototypes are popular with members – there are pictures of solid progress by members on construction of 'Aquila', a 2-6-0 narrow gauge tender-tank in 5-inch gauge, and an impressive 7¼-inch gauge Simplex.

The newsletter also reports of progress on the club's 32mm/45mm gauge garden railway – many clubs now have such lines as part of their facilities and the editor particularly liked the description of the garden scales in *Smokebox* – "Garden railways is where railway modelling is meeting railway engineering. Although there are many commercial variants



available from manufacturers such as LGB, Bachmann, USA Trains, Marklin, K1, Aster, Accucraft etc., scratch building is not uncommon, and most matches engineering art."

The newsletter adds that there are several full-time and part-time builders in these scales in South Africa, utilizing processes varying from hand cutting to laser cutting, 3D printing, resin and metal castings to chemical milling (etching) and mechanical milling. Of course the same is true in the UK, where the garden scales are showcasing a great deal of engineering in miniature, just a little more miniature!

Grimsby's extensions

As if to demonstrate, the garden scales also feature in the latest *Blower* from the **Grimsby & Cleethorpes ME**, always a newsletter with much interest. This club is making great progress with its new garden scale line, the appearance of which has been greatly improved by the building of an impressive retaining wall, built by members Colin Carlile and Colin James at the front of the steaming bay area. According to Colin J the aim is to make the garden line "a showpiece for the club."

There is certainly extension fever at Grimsby, with progress on an extension to the main running track being aided by the employment of a contractor with some impressive earthmoving plant. We look forward to following the further progress on this extension.

One of the newest clubs to feature in these pages is the **Cambrian ME**, based around the Newtown area of mid Wales and only in its second year. The club's current recipe of meeting at the homes of members on every second Monday is still proving a success, and currently plans centre on a second display at the Gala of the Welshpool & Llanfair Light Railway on 30th August to 1st September.

At last year's event Cambrian members served up an excellent display of their work in the former Colinette Yarns building now owned by the railway, and this year they will be alongside the line's new pop-up visitor centre 'Llanfair Connections' which is due to open at the Gala. More details of the Gala are at www.wllr.org.uk, and meanwhile anyone interested in joining the Cambrian Society can email secretary Robin King on robinking@newbury.net

Fell for a loco

The eye of your editor is always taken by unusual locomotives and one leaps out of the pages of the latest monthly newsheet of the **Ryedale SME**, based in Gilling East, York. At the club's

"I think the presence of younger members helps to attract more and the railway certainly couldn't operate as it does today without them..."



public running day on 9th June, much interest surrounded the 5-inch gauge Fell locomotive that was run by member Mike Aherne.

As the pictures on this page show this engine is certainly not normal! Remarkably it is based on a full-size prototype, built by the LMR works at Derby for British Railways, emerging in 1950. As detailed in the newsletter, that engine was powered by four 500hp diesel engines, two mounted side by side in each nose, and there were also two 150hp variants covering auxiliary functions. These were mounted amidships along with the huge gearbox, the function of which was to allow any combination of engines to propel the locomotive.

The model has a 4-D-4 wheel arrangement, and is powered by a Honda 50 single-cylinder motorcycle engine. There are three forward and a reverse gear. Mike ran it without its cladding for testing purposes, with several members lending a hand to make improvements as the day went

on. It will be fascinating to see this in action once finished...

Finally an appeal to all club members – the big show, the **Midlands Model Engineering Exhibition**, is fast approaching – we have details on page 40 and we will publish our usual pull-out preview next month.

As ever, there are a host of model engineering classes to enter at the show with awards on offer to the winners. Some competitive classes at the shows have suffered from a lack of entries in recent times and we support the show's efforts to rectify that, so if you have built a model, or a piece of workshop equipment, that you are proud of, why not enter it and allow fellow model engineers to admire it too? You may end up with more than just the appreciation of show visitors...

■ Send your club news to andrew.charman@warnersgroup.co.uk or to the postal address on page 3. Please include a photo if possible!

ABOVE & BELOW:

Ryedale member Mike Aherne's remarkable Fell locomotive, in its 'naked' form for testing. Photos: Bill Putman, Ryedale SME



SEPTEMBER 2019 DIARY

EVERY SATURDAY

(Weather permitting)

Burnley & Pendle MRS public running, Thompson Pk Rly, BB11 2AA, 12-4pm

South Lakeland MES public running, Lightburn Pk, Ulverston, pm

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

EVERY SUNDAY

(Weather permitting)

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

Bradford MES public running, Northcliff Woods, Shipley, 1.30-4pm

Burnley & Pendle MRS public running, Thompson Pk Rly, BB11 2AA, 12-4pm

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

Chingford MES public running, Ridgeway Pk, 2-5.30pm

Fylde SME Public running at Thornton Cleveleys from 1pm.

Grimsby & Cleethorpes MES public rides, Waltham Mill, DN37 0JZ, 12-4pm

Harrow & Wembley SME public rides, Roxbourne Park, Eastcote, 2.30-5pm

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

Kinver MES public running, Marsh Playing flds, High St, Kinver DY7 6ER.

Lancaster Morecambe ME public running, Cinderbarrow Railway, Tarn Ln, nr Yealand Redmayne, from 10am

Leicester SME, public running, Abbey Pk, LE4 5AQ, 1-5pm

Maidstone MES public running, Mote Pk, ME15 7SU, 2-5pm

North Wilts MES public rides, Coate Water Railway, Coate Water Country Park, Swindon, 11am-5pm

Norwich SME public running, Eaton Pk, 1-5pm, NR4 7AU

Nottingham SME public running, Great Central Rly (Nottingham), Mere Way, Ruddington, NG11 6JS,

Portsmouth MES public running, Bransbury Park, PO4 9JY, 2-5pm

Rochdale SME public running, Springfield Park, Bolton Road (A58), Rochdale, pm

Southampton MES public running, Riverside Pk, SO18 1PQ, 1-4pm

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

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

Urmston MES Public running in Abbotsfield Pk 11am – 3.30pm

Vale of Aylesbury MES Public rides, Quainton Rly Centre, from 12 noon.

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

Wigan MES public rides, Haigh Woodland Pk, School Ln, Haigh, Wigan, PM

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

Ryedale SME public running, Village Hall, Pottergate, Gilling East, YO62 4JJ 12.30-4.30pm

EVERY TUESDAY

(Weather permitting)

Bromsgrove SME public running, Avoncroft Museum of Historic Buildings, B60 4JR 11.30-3pm

Romney Marsh MES Track meeting, Rolfe Ln, New Romney from 11am

EVERY WEDNESDAY

(Weather permitting)

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

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

1 Bedford MES public running, Summerfields' Railways, High Rd. Haynes MK45 3BH, 10.30am-3.45pm

1 Bristol SMEE Club Day, Ashton Court Rlwy, Bristol, BS8 3PX 7.30pm

1 Cambrian MES model display at Welshpool & Llanfair Light Railway Steam Gala, Llanfair Caereinion station, Powys, SY21 0SF (also 31/08), 9am-5pm

1 City of Oxford SME public running, Cutteslowe Park, OX2 8NP, 1.30-5pm

1 Northampton SME Public Running, Delapre Park, Northampton, NN4 8AJ, 2-5pm

1 Plymouth MS public running, Goodwin Pk, PL6 6RE, 2-4.30pm

1 Sale Area MES Open Weekend, (also 31/8) Walton Park, Sale M33 4AT

1 Tyneside SME public running, Exhibition Park, Newcastle NE2 4AA, 11am-3pm

1 Wimborne DSME public running, Wimborne, Dorset, BH21 3DA, 11am-4pm

2 Lancaster Morecambe ME engineering evening, Cinderbarrow Railway, Tarn Ln, nr Yealand Redmayne, 7.30pm

4 Bradford MES meeting, 19th century warships by Michael Hawkridge, Methodist Church, Saltaire, 7.30pm

4 Bristol SME meeting, Noggin & Natter Night, Begbrook Social Club, BS16 1HY, 7.30pm

5 Leeds SME meeting, '750cc Austin racing cars pt 2' by Keith Taylor, Drax Power Station Sports and Social Club YO8 8PJ, 7.30pm

5 South Lakeland MES meeting, Pavilion, Lightburn Pk, Ulverston, 7.30pm

6 Portsmouth MES meeting, 'Dividing made easy', Community Room, Tesco, Fratton Way, Portsmouth PO4 8FD, 7.30pm

6 Rochdale SME meeting, talk tba, Castleton Comm Cntr, Rochdale OL11 3AF, 7.30pm

6 7.25-in Society Gala & AGM, City of Newport MES, south Wales

7 Bromsgrove SME open day, Avoncroft Museum of Historic Buildings, B60 4JR 11.30-3pm

7 Ickenham SME public rides, Coach & Horses pub, Ickenham, UB10 8LJ, noon-5.30pm

7 Isle of Wight MES open afternoon, Northwood Cricket Club, Park Road, Cowes, PO31 7NN

7 Leyland SME National 3½in rally, Worden Pk, Worden Lane PR25 1DJ

7 North Wales ME public running, West Shore, Llandudno, from noon

7 North Wilts MES public rides, Coate Water Railway, Coate Water Country Park, Swindon, 11am-5pm

7 Nottingham SME Friends Visitors Day, Great Central Rly (Nottingham), NG11 6JS.

7 Southern Federation Rally, Maidstone MES, Mote Pk, ME15 7RN

7 SMEE Talk, loco wheel balancing little & large by Bob Bramson, Marshall Hse, London, 2.30pm

7 Tiverton MES Running day, Rackenford, contact Chris Catley, 01884 798370

7 York ME Bits & Pieces Evening, North Ln, Dringhouses YO24 2JE, 7pm

8 Andover MES Open Day for club visitors, Wherwell, SP11 7HT

8 Bracknell RS public running, Jocks Ln, Binfield Road, RG12 2BH, 2-6.30pm

8 Bristol SMEE public running, Ashton Court Railway, Bristol, BS8 3PX 7.30pm

8 Cambridge MES Public Running, Fulbrooke Rd, CB3 9EE, from 1.30pm

8 Canterbury MES public running, Brett Quarry, Fordwich, 2-4pm

8 Harlington Loco Society Exhibition Day, High St, Harlington UB3 5ET, 2-5pm

8 Hereford SME public running, Broomy Hill, noon-4.30pm

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

8 Leeds SME public running, Eggborough Pwr Stn, DN14 0UZ, from 10am

8 Plymouth MS members day, Goodwin Pk, PL6 6RE, 12-4pm

8 Welling MES public running, electricity station, close to Falconwood rail station, Kent 2-5pm

8 Worthing SME Charity running, 11am-5pm Field Pce, Durrington Worthing, BN13 1NP, 11am-5pm

SEPTEMBER 2019 DIARY

- | | | |
|--|---|--|
| <p>11 High Wycombe ME meeting, 'Holt Thomas – the man who built AIRCO by Dave Scott, Rossetti Hall, HP15 6SU, 8pm</p> <p>12 TIME meeting, Pipers Inn, 70 Bath Road (A39), Ashcott, Somerset TA7 9QL, 7pm</p> <p>13 Tiverton MES meeting, Old Heathcoat comm ctr, contact Chris Catley, 01884 798370. 7.30pm</p> <p>14 Cardiff MES Steam Up & Family Day, Heath Park, 1pm-5pm</p> <p>14 Grimsby & Cleethorpes MES public rides, Windmill Heritage Open Day, Waltham Mill, DN37 0JZ, 11-4pm</p> <p>14 Lancaster Morecambe ME 40 year anniversary party and exhibition, Cinderbarrow Railway, Tarn Ln, nr Yealand Redmayne, from 2pm</p> <p>14 Southampton MES Electric Day, Riverside Pk, SO18 1PQ, 1-4pm</p> <p>14 York ME Club Maintenance Day, North Lane, Dringhouses YO24 2JE</p> <p>14 Nottingham SME running for Great Central Rly (Nottingham) diesel event, NG11 6JS.</p> <p>15 Bristol SMEE Club Day, Ashton Court Rly, Bristol, BS8 3PX 7.30pm</p> <p>15 City of Oxford SME public running, Cutteslowe Park, OX2 8NP, 1.30-5pm</p> <p>15 Guildford MES Stoke Park Railway open day, Stoke Park, Guildford GU1 1TU, 2-5pm</p> <p>15 15 Plymouth MS public running, Goodwin Pk, PL6 6RE, 2-4.30pm</p> <p>15 15 Rugby MES public running, Onley Ln, CV22 5QD, 2-5pm</p> <p>15 Wimborne DSME public running, Wimborne, Dorset, BH21 3DA, 11am-4pm</p> <p>16 Lancaster Morecambe ME meeting, Cinderbarrow Railway, Tarn Lanen, nr Yealand Redmayne, 7.30pm</p> <p>17 Grimsby & Cleethorpes MES members meet, Waltham Mill, DN37 0JZ, 7.30pm</p> | <p>17 Lancaster Morecambe ME members running, Cinderbarrow Rly, Tarn Ln, nr Yealand Redmayne</p> <p>17 Model Steam Road Vehicle Soc Meet, IK Brunel by David Harrison, Longford Vill Hall, Longford Lane, Gloucester, GL2 9EL, 8pm</p> <p>18 Bristol SME meeting, Autumn Auction, Begbrook Social Club, BS16 1HY, 7.30pm</p> <p>19 Leeds SME meeting, 'The LMS 1831' by Malcolm High, Drax Power Station Sports and Social Club YO8 8PJ, 7.30pm</p> <p>20 Bristol SMEE Brean Steamers, Ashton Court Railway, Bristol, BS8 3PX 7.30pm</p> <p>20 Rochdale SME general meeting, Castleton Comm Cntr, Rochdale OL11 3AF, 7pm</p> <p>21 Pimlico Light Railway junior training, Pimlico, Brackley, NN13 5TN</p> <p>21 Lincoln & District MES Open Weekend, North Scarle LN6 9ER details www.lincolnmes.co.uk</p> <p>22 Bedford MES public running, Summerfields' Railways, High Rd. Haynes MK45 3BH, 10.30am-3.45pm</p> <p>24 Bristol SMEE public running, Ashton Court Railway, Bristol, BS8 3PX 7.30pm</p> <p>22 Cardiff MES Open Day, Heath Park, 1pm-5pm</p> <p>22 Harlington Loco Society public running, High St, Harlington UB3 5ET, 2-5pm</p> <p>22 Northampton SME Club run, Delapre Pk, NN4 8AJ, from noon</p> <p>22 Pimlico Light Railway public running, Pimlico, Brackley, NN13 5TN</p> <p>22 Tiverton MES Running day, Rackenford, contact Chris Catley, 01884 798370</p> <p>22 Welling MES public running, electricity station, close to Falconwood rail station, Kent 2-5pm</p> <p>22 York ME Open Day, North Lane, Dringhouses YO24 2JE</p> | <p>24 Wigan MES meeting, Deltic Engine Rebuild by P Mills, Ince Methodist Church, Manchester Road, Ince, Wigan, WN1 3HB 7pm</p> <p>28 North Wilts MES memorial day, Coate Water Rly, Coate Water Country Pk, Swindon, 11am-5pm</p> <p>Romney Marsh MES Track meeting, Rolfe Ln, New Romney from 12 noon</p> <p>28 York ME Evening Talk, North Lane, Dringhouses YO24 2JE, 7pm</p> <p>29 Bristol SMEE Club Day, Ashton Court Rly, Bristol, BS8 3PX 7.30pm</p> <p>29 City of Oxford SME public running, Cutteslowe Park, OX2 8NP, 1.30-5pm</p> <p>29 Hereford SME public running, Broomy Hill, noon-4.30pm</p> <p>29 Worthing SME public running, Field Pce, Durrington, Worthing, BN13 1NP, 10.30am-4.30pm</p> |
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Details for inclusion in this diary must be received at the editorial office (see page 3) at least EIGHT weeks prior to publication. Please ensure that full information is given, including the full address of every event being held. Whilst every possible care is taken in compiling this diary, we cannot accept responsibility for any errors or omissions

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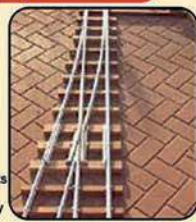
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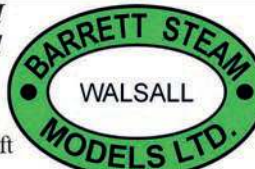


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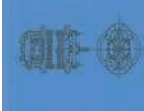
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