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MODEL ENGINEER

Vol. 203 No. 4361 • 25 September - 8 October 2009

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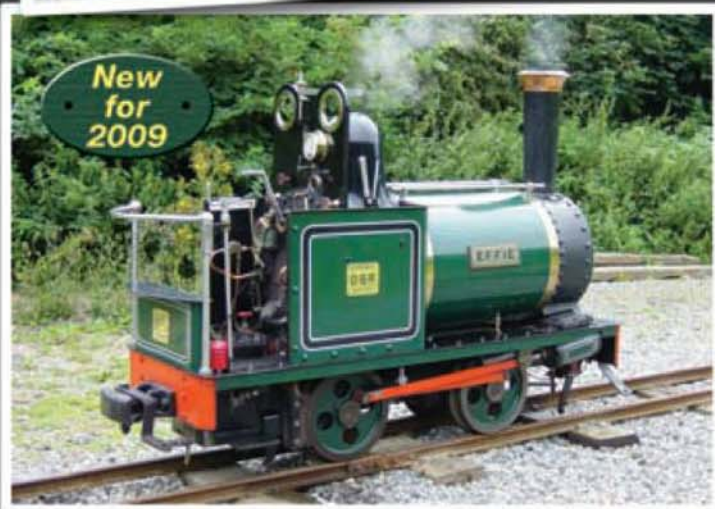
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ISSUE IN THIS ISSUE IN THIS ISSUE IN THIS ISSUE IN THIS

Vol. 203 No. 4361 25 September - 8 October 2009

383 SMOKE RINGS

Malcolm Stride
28/01/1944 - 27/08/2009

384 POST BAG

Letters to the editor.

386 STOCKPORT VACUUM ENGINE

Anthony Mount describes the wooden base and other small parts.

391 THE ENGINE THAT MADE RUDOLF DIESEL WORLD-FAMOUS

Johan van Zanten describes his model of an early diesel engine.

394 FOLLOWING ALONG BEHIND

Brian Baker builds and modifies a LNER/BR brake van kit.

398 CHARLIE - A SOUTHERN RAILWAY Q1 LOCOMOTIVE IN 3½in. GAUGE

Nick Feast makes the connecting rods.

402 SHAND MASON STEAM FIRE ENGINE IN 1:6 SCALE

Gunter Kallies makes the wheels.

404 THE MODEL ENGINEER EXHIBITION

A request from the editor.

405 BEGINNERS START HERE

In the workshop with the editor.

406 IMLEC 2009

Bernard North concludes his report on this successful event.

410 STEAM CALLIOPES, WHISTLES AND WIND CHIMES

Terence Holland looks at some LBSC projects from the 1950s.

414 KEITH'S COLUMN

Keith Wilson looks at filler caps and air-vents on tanks plus a look at scale headlamps.

417 HOW TO BE A MODEL ENGINEER IN SEVEN EASY STEPS

Andy Stait gives a step by step guide.

420 MODEL ENGINEER EXHIBITION ENTRY FORMS

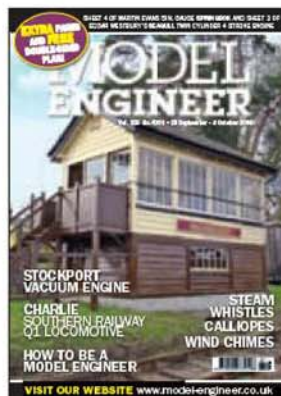
Send your entries in now.

422 STEAM RAILWAYS

A mini gala and the Steam Railway magazine photo competition.

424 DIARY

Forthcoming events.



ON THE COVER...

This signal box was originally at Raydon Wood Station on the Great Bentley to Hadleigh branch line. It was originally built in 1894. It has been moved and re-erected at Bressingham Steam & Gardens near Diss in Norfolk.
(Photo by Rosemary Martin)

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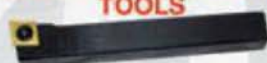
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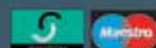
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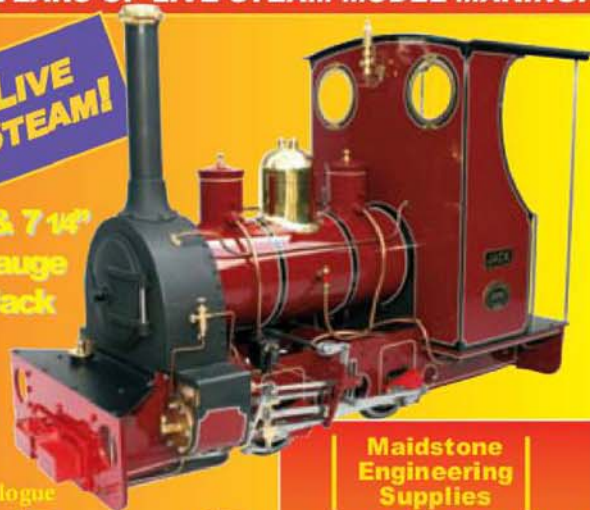
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DAVID
CLARK
Editor



Malcolm Stride

28/01/1944 - 27/08/2009

Malcolm Stride was an extremely popular freelance colleague and everybody at *Model Engineer* was shocked and upset to hear of his death and also of his partner Rosina Tillyer. Malcolm wrote extensively for the magazine for many years until just a few months ago when he told us he was ill and would have to give up his journalism.

Malcolm's special interest was internal combustion engines and he designed several engines which readers could build for themselves - and he was

delighted that many did. He also reported widely on model shows and events as well as penning one of the magazine's most popular columns. He had a good sense of humour in his writing and wrote his main column under the pen-name Nemett, which was a loose translation of the ancient Egyptian for 'Stride' - a little pun which Malcolm enjoyed as Rosina, his partner, was an Egyptologist. His engine designs also went under the name Nemett.

Malcolm started his working life as an engineer with Brush Electrical. Later he worked

for ICL, later Fujitsu, as an IT consultant. It was after retiring early from that, he started to write for *Model Engineer*, and was an irreplaceable contributor and Associate Editor until early this year. He continued to enjoy meeting up with former colleagues after leaving the magazine. His colleagues would like to extend their sympathies to Malcolm and Rosina's family. If you would like to make a donation to Remap in Malcolm's name, please send to MyHobbyStore Ltd. at the usual editorial address and we will be pleased to forward it on.



Two Nemett engines on display at the 2007 Ascot Exhibition. (Photo: Dave Fenner)



FIRST CLASS POST

Write to us

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Vale of Rheidol locomotive

SIRS, - After spending a considerable amount of time trying to find a supplier of drawings for 3½in. Vale of Rheidol locomotive *Owain Glyndwr* and being unsuccessful, I am hoping that you may be able to inform me of any suppliers that may be able to help me. I already have what I believe to be a partial set but need to purchase any missing ones. Can any reader help?

Ian Wilson, by email.

Springbok errors - a reply

SIRS, - I decided to use Martin Evans' drawings as a base from which to work and although I wanted a club track locomotive for frequent use, rather than a scale model used infrequently, I decided to add detail as I went along if I felt that the time and effort required was not disproportionate to my objective. I worked by comparing the Martin Evans' drawings with the general arrangement drawing of the full-size engine. I also took large numbers of photographs of the two surviving B1s and referred to them extensively. The modifications which I incorporated were:

- remove the running board mounted lubricator and fit two lubricators under the front valance in front of the smokebox driven by an eccentric on the front axle.
- add lamp brackets, number plate, maker's plates and shed code to front of locomotive.
- add cladding to cylinder end covers.
- reduce the size of the angle on the edge of the running boards to ¼in. to be closer to scale size.
- reduce running boards in width by ¼in. each side of locomotive. Similarly reduce width of tender baseplate, tank width and buffer beams.
- change angle of steam pipes to cylinders.
- reduce locomotive cab height and width.
- fit wooden window surrounds and glazed windows.

- raise height of running board to reflect full-size. This requires assessment of position of smokebox, top edge of saddle, height of front section of frames and top edge of driving wheel flange. I decided to raise the board about 0.340 inch.
- rework the piston valve guide to be like the actual. A trickier job but well worth the effort.
- rework the motion brackets to be like the actual.
- add the missing weighshaft supports to the inner expansion link support brackets.
- add scale size Wakefield lubricators on the running boards.
- add oil boxes to sides of locomotive for axleboxes.
- add sand box fillers for front and driving wheel sanders and sand boxes complete for rear wheels.
- add detail to brake hangers.
- rework the safety valves to a modern proven design. There is only one choice for me, that of Gordon Smith of Burton upon Trent whose 'mild pop' valves are legend. Make the outer shape as full-size.
- relocate injectors beneath cab floor so that they are not an unsightly alien feature below the cab sides.
- the tender toolboxes, water tanks, tender dome and coal space internals completely reworked to reflect the full-size variant I decided upon.
- add lots of rivets in the appropriate places!

Now to answer Mr. Harper's specific queries from *M.E.*
4360, 11 September 2009:

Tich

SIRS, - Would it be possible that some time in the future one of your construction series could be for the 3½in. Locomotive Tich.

I feel that this is still the locomotive that a lot of us beginners will make and having read the construction manual for Tich, I personally would benefit from this locomotive being brought into the 21st century.

I am like a lot of people in my 50s and as yet have not got the time or the workshop equipped to make anything, but if that time comes then I am sure that Tich is the one that I will be making.

Paul Chipchase, by email.

What do other readers think? Would an updated Tich appeal to readers? Ed.

1. "top drag beam" should have read "top of the drag beam", i.e. the plate at the rear of the frames to which the tender is attached. There needs to be an additional plate on top of the existing drag beam to bring the beam level with the top of the locomotive frames and also to support the rear edge of the cab floor. The cab floor needs to be level with the tender floor which itself is a raised platform only shown in outline on the drawings. The additional plate needs to be at least 0.5in. tall depending upon the precise level at which you set the floor and the actual construction of the floor plate. The floor plate should be easily removable for access to pipework etc. The new piece fits inside the sides of the cab and is thus shorter than the drag beam itself.

2. Bogie wheelbase: The original design seems to cope on tracks with a minimum radius of 70ft. or greater. However, a number of club tracks have radii less than this with some being as tight as 50 feet. At 50ft. there is a tendency for the bogie to rub the cylinder end covers. Adding ¼in. to the mid position of the bogie and relocating slightly the wheel arches on the main frames to suit eases the problem.

3. Type of regulator: A matter for much debate! I don't like disc regulators. If made to a high standard and lapped in well they may work satisfactorily and facing the disc with PTFE or similar material can lead to success. However, a screw or ball valve in my mind is

potentially a much more reliable option. A miniature locomotive could follow full size steam engineering practice and have the regulator wide open and the pressure drop and throttling taken across the piston valve only. This is an argument against using a screw regulator in a large powerful locomotive but in practice unless it is intended to pull very heavy loads and win IMLEC the screw regulator will pass plenty of steam and has supporters. Regarding ball valves there are two types to my knowledge. One design has a rod actuated stainless steel ball for the valve seat and was designed by Gordon Smith and was described in detail in *Engineering in Miniature* in May 2008. The second type of design has been used in several boilers within my own Club, although we are unsure of its origin. It utilises a commercially available 8mm bore miniature gas control valve. This high quality valve has a stainless steel ball and PTFE seats and is small enough to be inserted through the dome flange of a 5in. gauge locomotive. Connection to the operating rod and wet header require careful consideration but the end result gives reliable and precise control.

Geoff Shackleton, by email.

Night classes

SIRS, - **Scarborough & District Model Engineering Group** who meet at Yorkshire Coast College on Tuesday evening 7 - 9 are short of members for the autumn session. For further details: T. 01723 362537 or g4egb@yahoo.com Please do not contact the college direct.
Ted Fletcher, Scarborough.

Judging standards at ME - a reader's view

SIRS, - I was quite disturbed by both the contributors' comments in *M.E.* 4355, 3 July 2009. I've been mistaken all these years in believing the best Model wins the competition. As I see it, there is a means to an end, the end being the model and the means being how you arrived

at it. From comments it seems that not only are we favouring the means, not the end but, it would also appear that a person who uses this centuries skills and intelligence to produce a part, by computer aided design, turning it into machine files, and down loading to a 3D machining centre, or laser cutter, would be marked down against someone who 'did more work' and 'crafted' his parts on the kitchen table.

Surely this is a judgment based on which century you are judging the skill levels at.

Further, with regard to a readers view, it's the first time I've heard someone advocating that using a crafted inferior piece of work is preferable to using a commercial accurate piece?

It looks as though the locomotives of 99.5% of colleagues with laser cut frames, commercial couplings and back head fittings, lost wax moulding, etched numbers, i.e. using technologies from this century will not be entering for competition?

If I was told someone had spent 300 hours hand crafting their frames on the kitchen table against someone who had his laser cut, although I could admire the hand crafted skills, I would probably mark him down for having more time than sense and being a bad example to emulate.

We need to ascertain exactly what we think we are judging, and if it's to reflect current modelling attitudes and practices. 'Best handcrafted work 1898' or 'Best model 2010'. Time to catch up?

David White, Warwickshire.

Judging at the ME Exhibition

SIRS, - Judging from some of the correspondence that has appeared in the letter pages of *Model Engineer*, we feel that misunderstandings may exist in the principles behind the marking of competitors' exhibits at the Model Engineer Exhibition. It is basically quite simple. Marks are awarded for the quality and quantity of the competitor's own work. It

Excellent service

SIRS, - From time to time you report exceptional service from one of our respected suppliers. My experience today is well worth telling to your readers, if you have the space.

I phoned G.L.R Distributors Ltd., one of your regular advertisers, in search of a steel sheet, roughly 12in. square by 3/16in. thick and not of course listed in their catalogue. As they pointed out, this was going to cost an arm and a leg to cut from a large sheet, but they found their last piece of 6in. wide strip and suggested that with a bit of manipulation this would do the job. They posted it last night and it arrived this morning at 9.00am.

What makes the story of their service so remarkable is that I told them that I had found a forgotten credit note from them in a five year-old catalogue, and without hesitation they accepted my word for it.

Result: no charge and one delighted and most impressed customer. It is so nice to be trusted.

Allan Mountfield, Suffolk.

follows therefore that marks cannot be given for work not done by him; this is normal with any examination.

Thus, for example, a fine locomotive beautifully finished and all the competitor's own work may warrant a Gold Medal. Fitted with a purchased boiler, for which marks cannot be awarded, it would be difficult for the model to gain sufficient marks to warrant a Gold Medal, but it may receive silver. It is a matter of being fair to all competitors.

Quantity of work can be assessed objectively. Quality is more subjective, which is one reason for having more than one judge

Competitors are free to take any short cuts they may wish, such as commercial laser cut items, but they must declare this fact on the entry form and should not expect to receive as high a mark as someone who has used their skill to produce those items from basic materials.

For some years consideration has been given to the introduction of a section for kit built models in the competition listing, but should this be so, then using the criteria outlined above, they would be a great disadvantage when compared with the normal designed and built entries. The ME competition is known and highly respected for the high standards that it demands and it is the intention of all those connected with it to keep it that way. This does not mean

that the judges have little regard for exhibits that are not up to a high competitive standard, far from it. Everything must be done to inspire, encourage and enthuse these builders to improve their skills. It is from this section of the movement that tomorrow's Gold Medals and D.O.E. winners will emerge.

Ivan Law, Chief Judge and Dennis Monk.

Cutting gears

SIRS, - Somewhere in my collection of *Model Engineers* (Dating back to 1960) I recall an article on the machining of spur gears using fly cutters. The article also had details of how the cutters were profiled using a plate with two hardened buttons inserted into it with a groove between them. The buttons and the pitch between them were calculated to suit the D.P. required.

The material for the cutters (in its unhardened condition) was then mounted in a mandrel and rotated while the plate, mounted in the tool post was fed forward to form the profile of the cutter. This could then be hardened and mounted in a separate mandrel to fly cut gears.

Can anyone remember this article, and when it was published as I would like to have a go at making the gears for a 'Congreve Clock'? Any help in this matter would be very much appreciated.

Jim Robertson, Irvine.

Stockport Vacuum Engine



ANTHONY MOUNT

Anthony Mount describes the clamp plate, guide arm, wooden base and other small parts.

PART 6

*Continued from page 261
(M.E. 4359, 28 August 2009)*

Though threaded, the two parts of the guide block (Part 21) should still be silver-soldered together as firstly, the heat from the flame could, over time, destroy the Loctited and threaded joint and secondly, the thread could allow air to enter and destroy the vacuum; silver-soldering will stop both.

As the guide block is cast iron, instead of using silver solder Easy-flo No. 2 use either Argobraz 49H or Easy-flo No. 3 as described when silver-soldering the piston.

The block and guides are bolted to the column using the shouldered studs already in position. Use a semi hardening gasket material such as Red Hermetite between block and column. This will enable the removal of the block for refacing should it ever need it in the future.

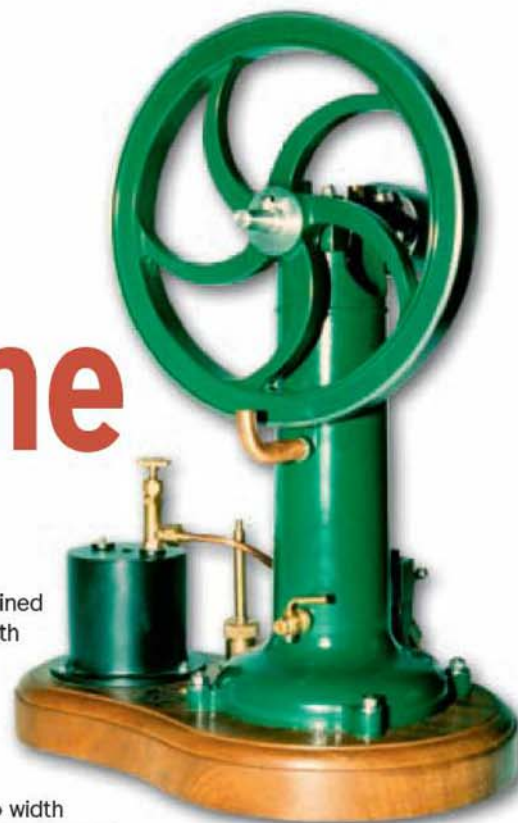
Clamp plate (Part 22)

This can be machined from another length of cast iron bar 3mm (1/8in.) thick. Clamp in the machine vice on the milling machine to mill to width and length. Drill the two stud holes and then another two holes at the ends of the slot joining them together with a slot drill as for the guide block. The upper section can then be sawn out to form the U-shaped cut out. Do not be tempted to use just a slot as the upper section will stop the flame curling over the top of the valve.

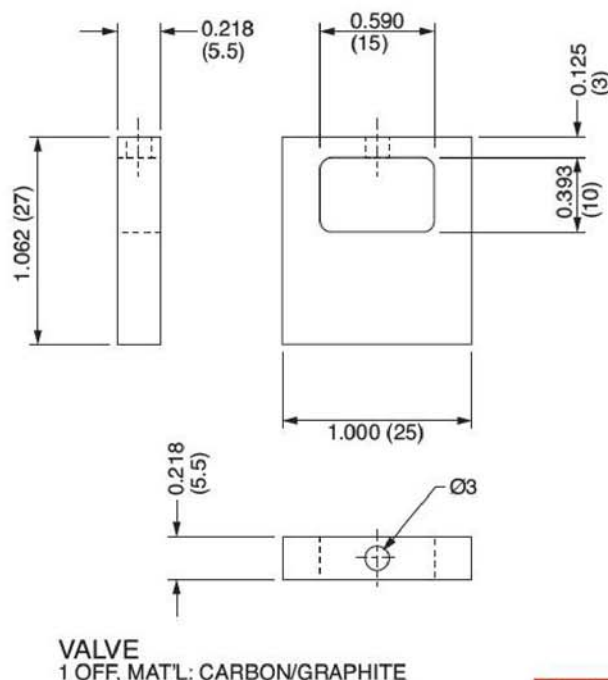
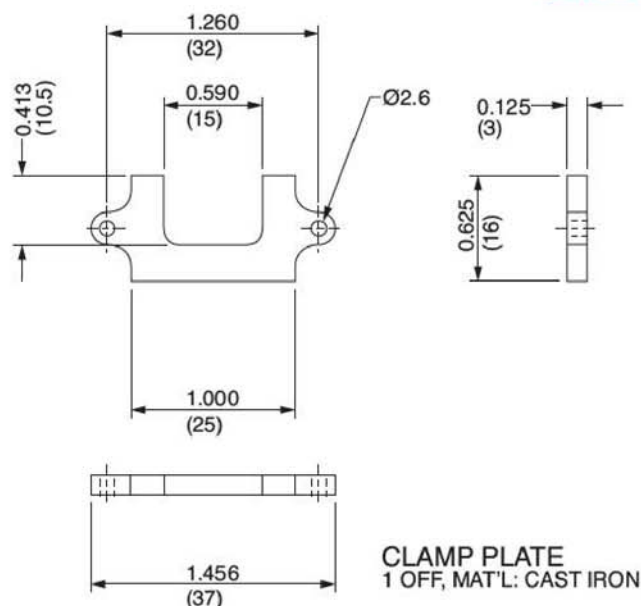
Mill the ends to form the ears around the stud holes; this can also be done in the machine vice with the plate held flat, the side of the end mill forming the top and bottom curves. The

ears can be rounded on the ends by filing or use a small vertical band sander. Finish off the plate by lapping both sides. It does not seal anything but it will allow the valve to slide more easily and looks better.

For parts 21 and 22 you may wonder at the use of cast iron instead of mild steel. Firstly, it is a better bearing material for the valve to slide on and secondly, some builders of hot air engines I have spoken to feel that cast iron does not 'cool' the gas flame to the same extent as

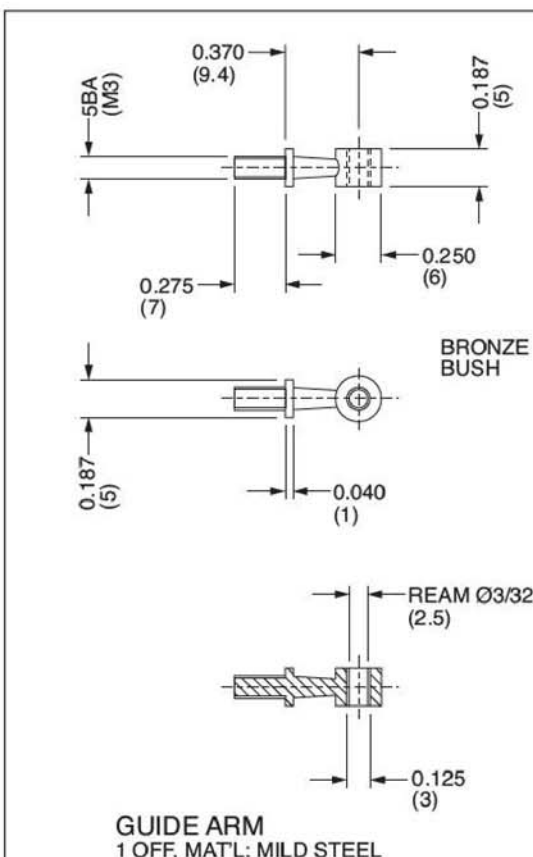
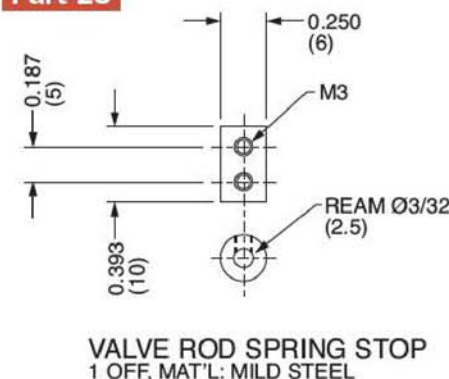


Part 22



Part 23

Part 25



Part 24

laid on a flat surface and this should suffice. Though it proved incredibly messy a wet surface gave the best finish without clogging the abrasive paper. The completed valve can be seen in **photo 44**.

Guide arm (Part 24)

As a little light relief the guide arm can be made next and is a small turning job. Drill and ream for the bush on the end of a length of stock material and then using the machine vice and edge finder to locate the hole centrally, cross drill and tap 7BA halfway through in the mill and then part off in the lathe.

Turn down and thread the stem 5BA, form the shoulder using a small parting tool and turn the rest of the stem to a slight taper. Recess for the end thread and part off, reverse in the chuck and thread 7BA to screw into the bush. Screw in then silver solder the two parts

together. A small bronze bush is added to provide a good bearing and sliding surface for the push rod. Pass a reamer through after pressing in the bush to give a sliding fit to the push rod.

It is tempting to use just a touch of Loctite to hold the two parts together but the thread is short and it would be easy to strip the thread when screwing the guide arm into the column. I would recommend that you screw the two parts together rather than just a pin in a hole as you will be sure by using a thread that the two parts will not fly apart with the expansion of the flux.

Valve rod spring stop (Part 25)

This is a simple drill, turn, part off, drill and tap job.

Springs (Parts 26 and 27)

A long quite light spring is required for the push rod and two shorter springs for the clamp plate. Hopefully they will be supplied with the kit and will come as one length in stainless steel. Cut to length using a fine carbide or diamond file. Do not attempt to ➤

mild steel does. I do not know if there is any truth in this but it seemed worth a try and the engine does work okay. If any of you try mild steel let us know how you get on.

Valve (Part 23)

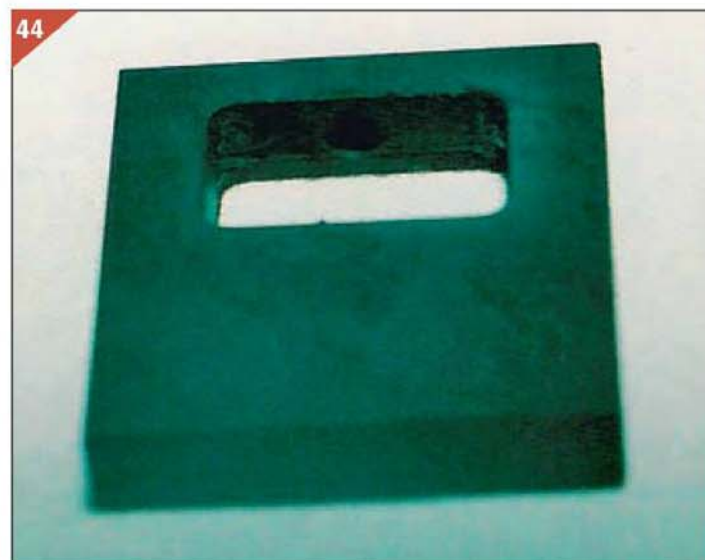
For the valve we are using a special material, carbon/graphite. This material slides nicely and is self-lubricating and as it wears, graphite enters the cylinder where it acts as a dry lubricant.

It machines easily but, as you can imagine, it is a very dirty material and emits a fine dust when machined, so it would be as well to wear a face mask during the machining operations. It is supplied as a block so first saw it almost to size then hold it in the machine vice on the milling machine to mill all over, and put in the slot.

The material is prone to chip on the edge so take shallow cuts with the cutter rotating into the edge. Machine the slot from both sides so as not to break the material when the cutter breaks

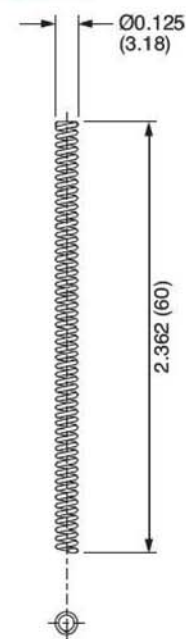
through. Up end and drill a clearance hole for the push rod. The thickness needs to be made a little oversize so that the clamp plate will be able to force the sliding surfaces together.

The sliding surface needs to be made flat to mate against the guide block. The old standard as used for slide valves was to rub the surface on a very fine abrasive paper

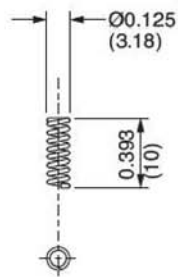


The finished valve.

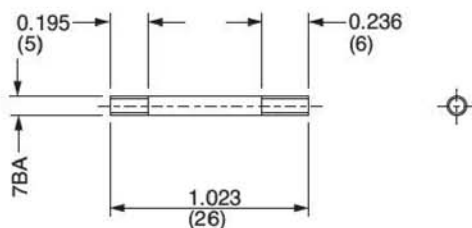
Part 26



VALVE SPRING
1 OFF, MAT'L: STAINLESS STEEL
1/8in O.D. x 30SWG

Part 27

CLAMP SPRINGS
2 OFF, MAT'L: STAINLESS STEEL
1/8in O.D. x 30SWG



CLAMP STUDS
2 OFF, MAT'L: STAINLESS STEEL

Part 28

grind the ends; the springs are very flexible and could easily be grabbed by the grinder.

Clamp studs (Part 28)

For the clamp studs, stainless steel rod can be used threaded each end 7BA. For appearance sake lightly dome the ends.

Wooden base (Part 29)

Now for a complete change we will make the wooden base. Nearly all model engines require a baseplate of some sort to make them stable. It is a big visible part of the engine and I think should be made to complement the model rather than just be an afterthought.

For my Benson engine, which had an engine bed plate of three intersecting disks connected with intersecting curves, I made a round wooden base which I felt was simple but followed the design principles of the engine. However, one visitor who saw my engine at an exhibition thought using a round wooden base was being pretentious.

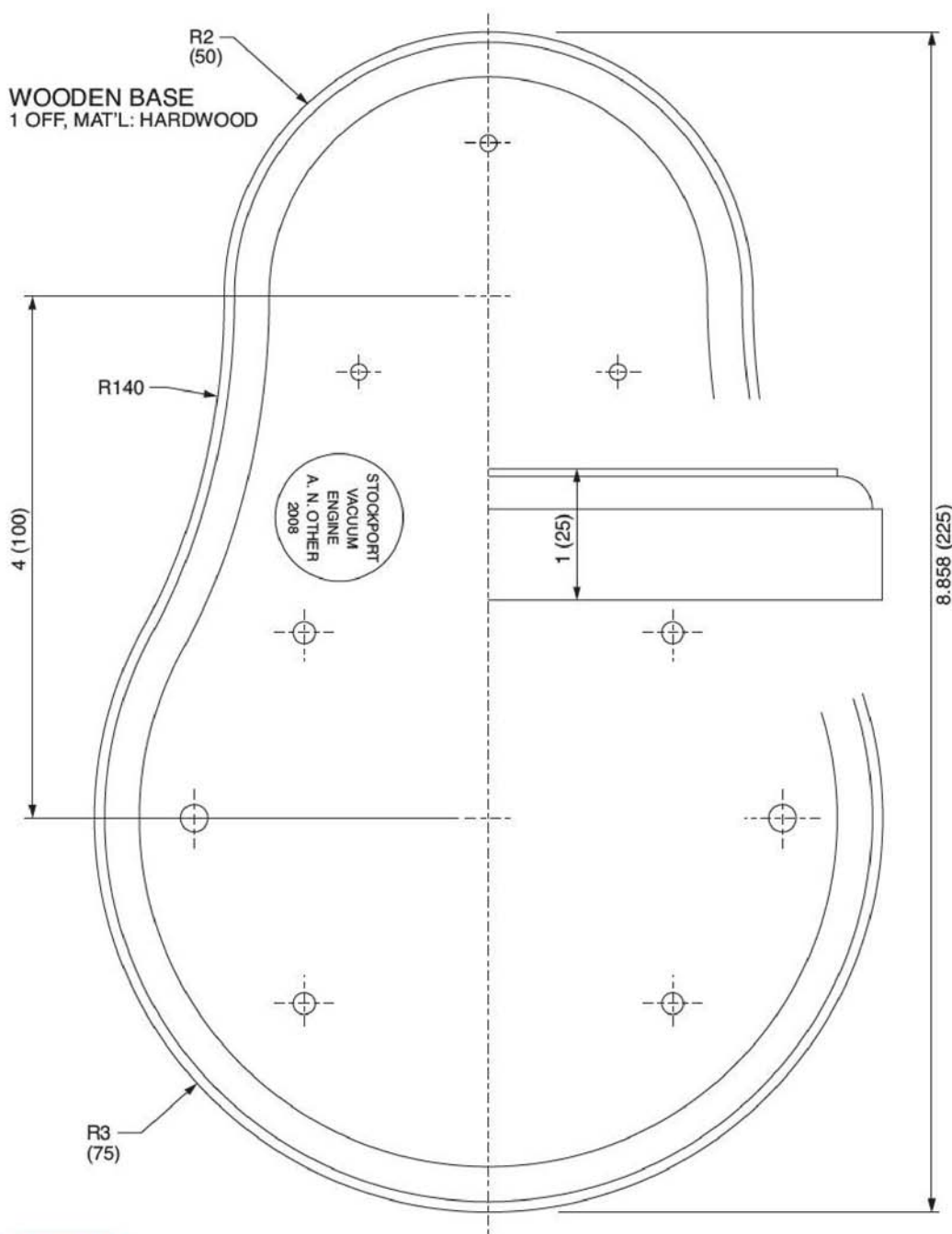
I do not agree with him and was pleased to see at a recent exhibition that a model of the Benson engine was presented mounted on a burr walnut wooden base profiled with intersecting curves to mirror the base plate of the engine, I thought it looked super.

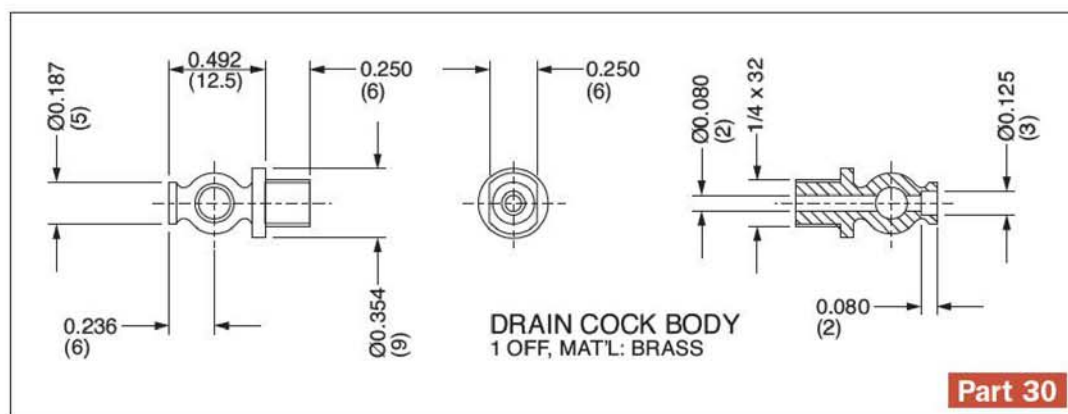
For the Stockport engine we have a round base casting for the engine and a round gas tank, so setting these two at a suitable distance apart it seemed logical to make the wooden base under these two pieces round as well, so it followed that to join them together two more curves would complete a very pleasant shape.

Obtain a suitable piece of hardwood from your local wood yard, an offcut will do and it can be stained and polished to the desired colour. Traditionally mahogany would have been used but in these days of care for the environment a home-grown hardwood would be just as suitable.

First, plane to the required thickness and then mark out the shape. I know that many model engineers have problems working with wood but it need

WOODEN BASE
1 OFF, MAT'L: HARDWOOD

**Part 29**



not be so. Do not forget many early engineers graduated from millwrighting which involved much use of wood.

You have all used a smoothing plane so planing the wood to thickness should not present any problems. Cutting out the shape requires a coping saw. This is like a piercing/fret saw only a bit heavier. To plane the edge requires a spokeshave, an easy tool to use.

The moulding is more difficult if done by hand but I expect there are not many who do not have an electric router or have access to one. A suitable moulding cutter can soon be run around the edge to finish off the base. If you are using a router then you can machine the base to profile by making up a suitable plywood template.

To be safety conscious the wooden base should be screwed down to the bench before you start work on it with the router. You could utilise a couple of the holes to be used to bolt the engine to the base, to save spoiling the wooden base with further holes.

Clean up the face and edge with glass paper and then stain and polish. Bear in mind that a water-based stain will raise the grain; it was traditional in fine class joinery to damp down the wood beforehand. The work was cleaned up with glass paper then wiped over with a damp cloth, this also raised the grain and when dry it was rubbed down again and a further wipe over with a damp cloth again raised the grain. It was once more rubbed down and this was usually enough to stop the grain from rising when the water stain was applied. An oil stain does

not raise the grain but is more likely to stay on the surface than penetrate into the wood.

It is a nice touch to make up a brass nameplate with a few details about the engine and your name and date. Who knows where your masterpiece will end up in say a hundred years? It looks even better if the nameplate is let in flush and this is easily done on the milling machine; an end mill cuts wood very nicely.

Place the nameplate in position and mark around it with a sharp knife to break the grain and avoid it chipping. Clamp down on the milling machine table and mill out the seating a little deeper than the thickness of the plate to allow for the thickness of glue. The rounded corners can be cleaned out with a sharp chisel. Araldite is a suitable adhesive.

Drain cock body (Part 30)

After you have finished running the engine you will want to drain

off the water from the water jacket and a little drain cock will do the job nicely and look good to boot. An alternative is to use a screw down valve and this and the lever operated valve are available ready made, but if you are using a commercial valve, check the thread before you tap the column as the threads used by different manufactures are not standardised.

Place a length of 9mm (3/8in.) dia. brass rod in the lathe and face off the end. Change to the milling machine and cross drill the lever hole, then using a taper reamer form the tapered socket.

Such a taper reamer is not available commercially so you will need to make one detailed as **Part 33**. Turn the 5deg. included angle on a suitable piece of silver steel; no need to go to a point, just a little under the size of pilot hole used.

Now file away to half the thickness along the length of the taper. A filing jig is most useful in cases like this as is

the ability to be able to lock the lathe headstock, try engaging back gear without disengaging the bull wheel.

A square can be filed on the end for the use of a tap wrench should the need arise. Harden and temper the tool and we are ready to start cutting tapers.

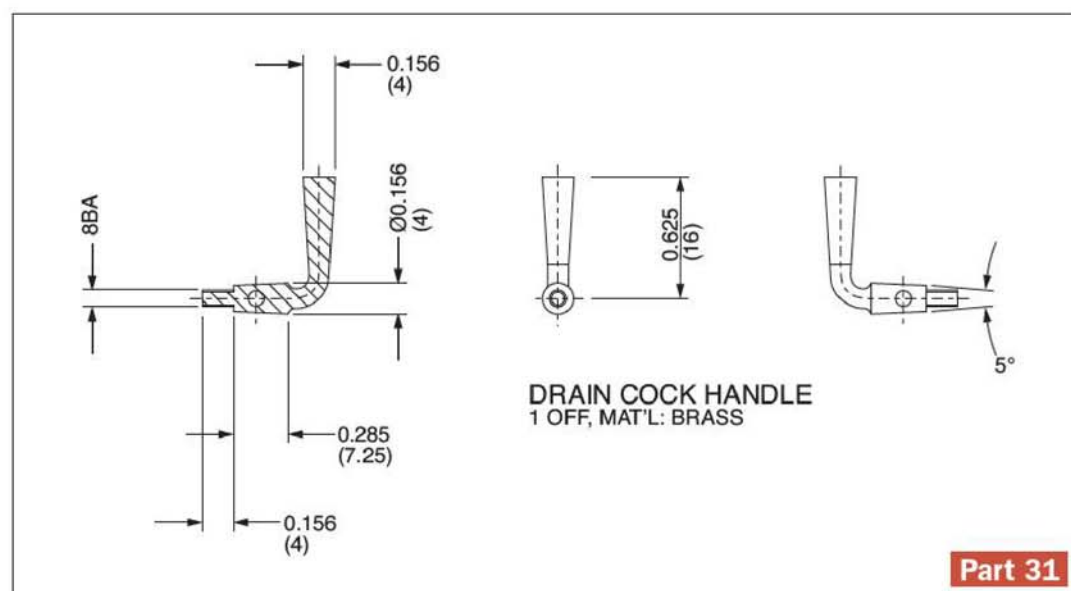
Replace in the lathe and turn a ball centred on the cross hole; a form tool will be the most convenient method of turning the ball. Turn down the end and thread 1/4in. x 32tpi, drill through and part off.

Drain cock handle (Part 31)

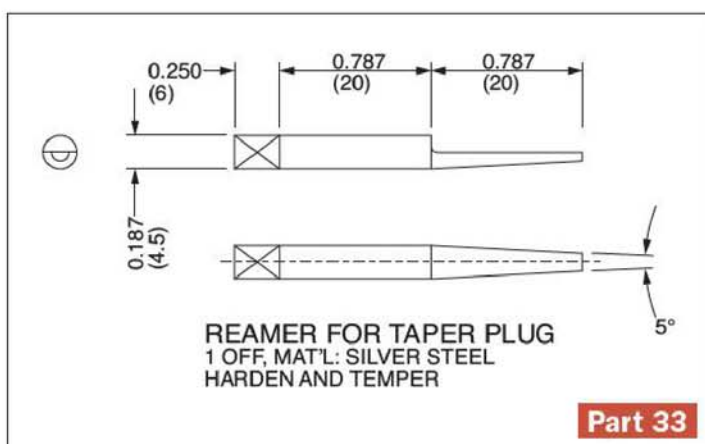
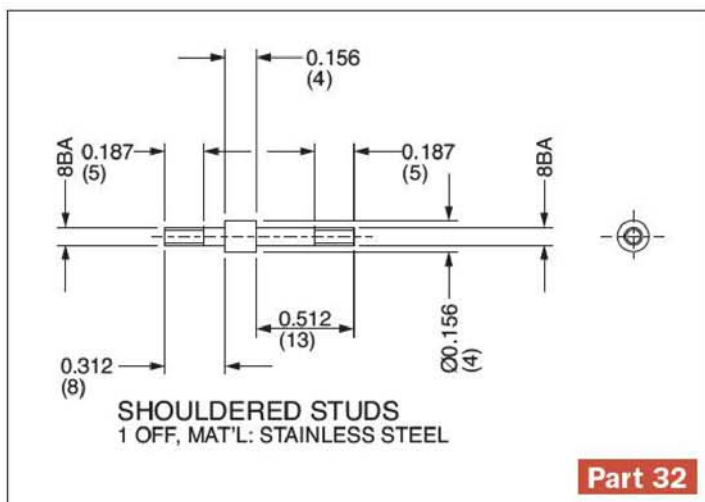
The drain cock handle is also made from brass. First turn down and thread the end 8BA, then set over the top slide and turn the taper. Turn down the neck to a smaller diameter to make bending of the handle easier, then turn the taper of the handle.

Using a short length of waste material drill through and use the taper reamer to form a socket for the handle, grip the socket in the bench vice and heat up the neck of the handle with a gas torch. Drop the handle into the socket and apply gentle pressure sideways to bend the handle over.

Due to the small area heated the heat will rapidly dissipate and the handle will stop bending. Reheat and continue the process until the handle has been bent over to 90 degrees. Do not rush the process or the handle will snap off.



VACUUM ENGINE



Saw off the handle from the parent bar and insert into the body where the cross hole can be drilled through the handle after locking it in place with a nut on the end thread. It is usual to have the valve open with the handle inline with the body of the valve. It will improve the appearance of the model if the drain cock is polished.

A short length of copper tube can be soldered into the cock and bent at 90deg. to bring the outlet position into a downwards direction.

Shouldered studs (Part 32)

Four shouldered studs in stainless steel are needed to fix the guide block to the column. They are simple turned items. Turn and thread the long part of the stud first, reduce the diameter behind the flange, then part off and reverse in the chuck to thread the other end.

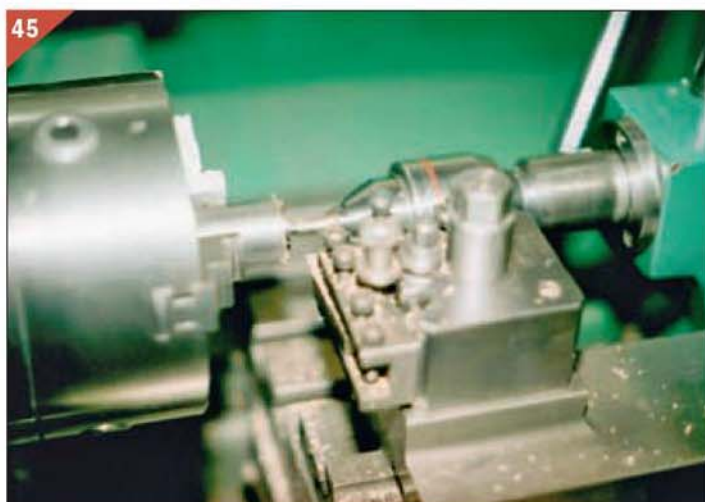
Engine nameplate (Part 34)

A small elliptical nameplate is fixed to the engine and replicates that used on the

original engine except that the word 'VACUUM' has been used instead of 'GAS'. It might be possible to supply this in the kit as an acid etched brass plate; failing this there are a number of advertisers in this magazine who will oblige. It is fixed to the column with two small round head screws.

Base nameplate (Part 35)

I have already mentioned fixing a nameplate to the engine when describing the wooden base. I do recommend it as I have in the past repaired a number of old models or been



Turning the outside of the nameplate to size.

asked to date them and without a nameplate or a distinguishing feature it is almost impossible.

Use engraving brass as it is far better than the half hard brass usually supplied to model engineers as it cuts so easily and crisply. I usually use material of 16swg thickness. If you do not have your own engraver, look in *Yellow Pages* for your nearest trophy supplier or jeweller. Prepare the plate, polishing it to remove all marks and type out the words you want to use to the same size as will be used on the plate, so that the engraver knows exactly what you want to achieve.

I have shown a round plate as there is only a small amount of spare space on the wooden base. It is also very easy to drill a shallow hole in the wooden base with a Forstner bit or even an end mill, with the wooden base clamped down of course.

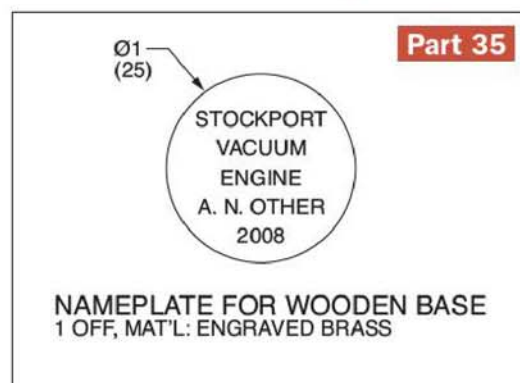
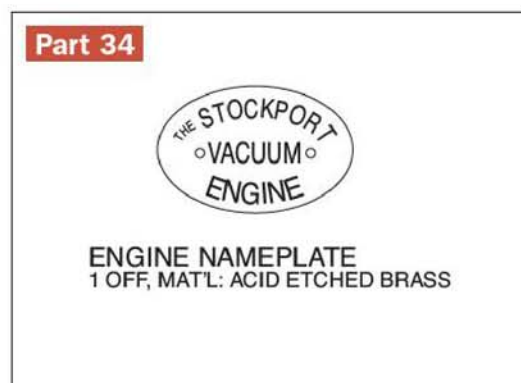
The engraver would much prefer a rectangular plate as it will be much easier for him to clamp it down against his stops, and to have the clamps clear the cutter.

Once you have got the plate home it can be made round by drawing in pencil around the words using a template and then cutting out with a saw and finally rounding it by file or band sander. Protect the polished surface with a cardboard cover or masking tape while working on the plate.

After sawing out it could be machined on the edge if you face off the end of a stub of 25mm (1in.) diameter mild steel and fix the plate to it with double-sided sticky tape. You cannot rely just on the tape to hold the plate in place but very lightly, with the end of a centre drill, just make a small centre with the point of the centre drill on the back of the plate and then use a running centre in the tailstock to push the plate against the double-sided tape.

The outside edge of the plate can now be machined to finished diameter, this operation being shown in **photo 45**. Take care in setting up that the wording is kept in the centre of the plate.

● To be continued.



The engine that made Rudolf Diesel world-famous



JOHAN VAN ZANTEN

Johan van Zanten of Utrecht in the Netherlands concludes the description of his early diesel engine model.

PART 2

Continued from Page 283
(M.E. 4359, 28 August 2009)

The experiments with injector and pumps took me about one year. Now only some small problems were left to be solved. The stroke of the printer pump was fixed to about 0.1mm by a set screw so it was impossible to regulate its capacity. This resulted in an over-speeding engine. I found that it was possible to slow down the engine by retarding the injection point. Only when starting from cold, do I inject at top dead centre. This gives a hotter engine but until now this did not appear to be a problem (cooling water temperature between 70 and 90deg. C). The second problem to be solved was the rather wet and smelly exhaust. Instead of normal diesel fuel, I was advised to use aromatic free lamp oil (from the DIY store) with an addition of 2%

15



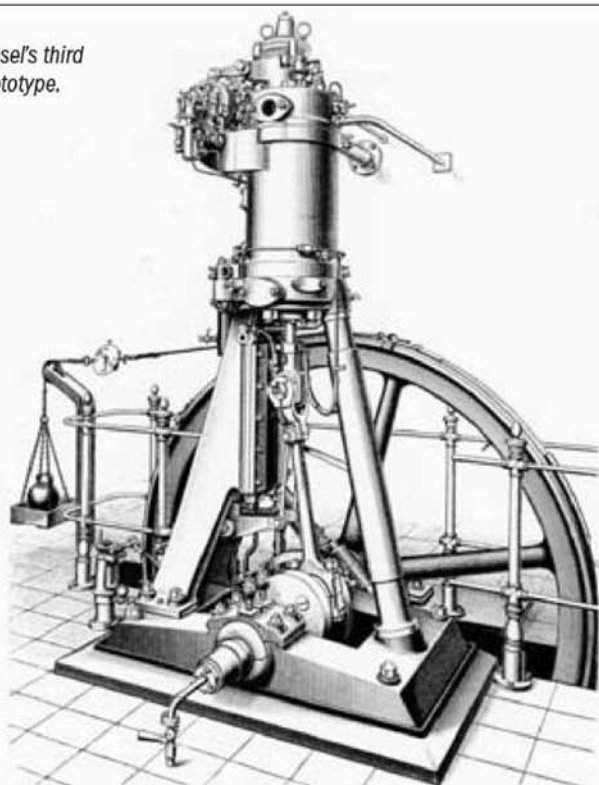
The finished engine.

16



The output shaft.

Diesel's third prototype.





The large drip lubricator.



The drip oilers.



The Molerup oil press.

Technical details of the model

Type of engine:	1 cylinder 4-stroke stationary diesel engine with supercharging
Scale:	1:10
Bore:	30mm
Stroke:	40mm
Swept volume:	28cc
Comp. ratio:	about 22:1
Cooling:	Tank cooling with plunger type cooling pump.
Fuel:	Aromatic free lamp oil with 2% Polypropylene Oxide.
Injection pump:	Modified electric pump from printing machine with fixed capacity.
Pump pressure:	I have been told over 150 bar.
Injector:	Home-made from propane torch.
Speed control:	By altering injection timing
Nominal speed:	25rpm (when warm.)
Max. speed:	600rpm
Power:	About 0.25hp
Building time:	Three years (in hobby hours)

Polypropylene Oxide. This gives a much better combustion, with a dry, smoke free, exhaust and does not smell so terrible.

Engine behaviour

The engine has run now for several days at model engineer shows and is problem free to date (photo 15). It uses 0.4 litres of fuel per day and starts the first time when warm. When cold I have to crank about 10 times before it picks up. The battery lasts for about eight hours on one charge. The normal speed is 350rpm when cold and 250rpm warm. When the engine freed up it

was becoming unstable. When I set it for a certain speed, say 250rpm, it very slowly dies until it stops. When I set it a bit faster, it very slowly over runs. I haven't found the reason yet (any suggestions?) but it can be cured by running the engine without supercharging. I made a small hole in the bottom of the receiver to let the charging air escape. When I start the diesel I close the hole with my finger to allow the supercharger to build up pressure. Diesel also removed the receiver and the valves of the supercharger later on in his experiments. My engine is not designed to do



A close-up view of the finished engine.

work and that means it has very conservative valve timing with no overlap. I like a soft running engine, which it is, and a brake is added because it is a model of a test engine. The full-speed (600rpm) output is about 0.25hp (photo 16). Lubrication of the bearings and crosshead is by drip oilers (photos 17 and 18). The cylinder is lubricated by a Molerupp oil press (photo 19). This is a cylinder filled with oil which is very slowly pressed to the working cylinder. After about 20 minutes the oil cylinder is empty and needs to be filled with fresh oil from the round reservoir.

Future experiments

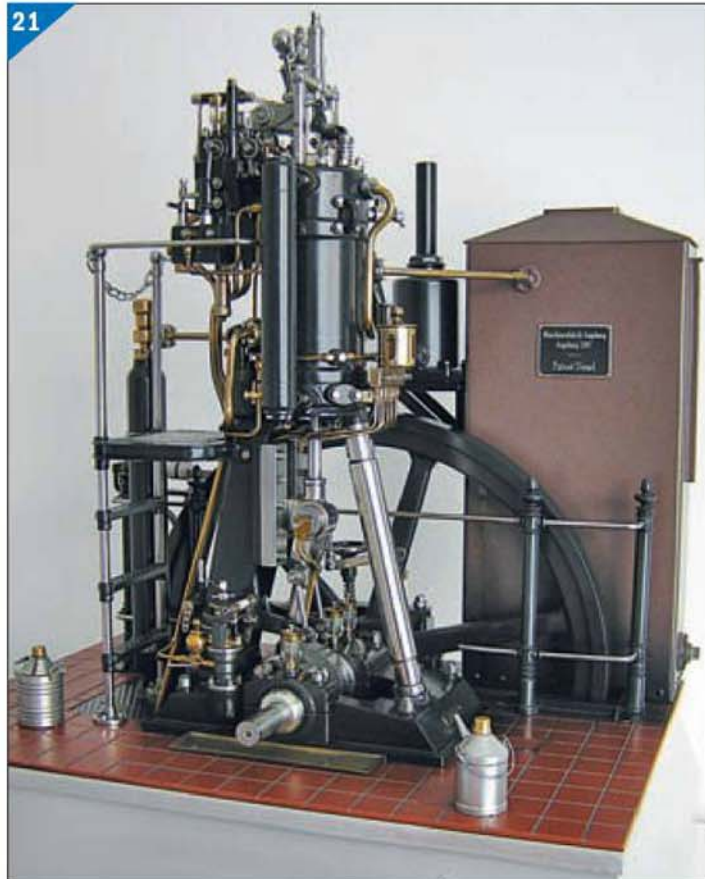
I am satisfied with the engine as it is now (photos 20 and

21). The last experiment which I have in mind is starting by air pressure. The compressor is ready and all I need is an auxiliary air bottle under the floor because the bottle on the stairs is much too small (photo 22).

ME

Bibliography

Diesel's Engine by Cummins ISBN: 0-917308-03-4, 1993.
Geschichte des Deutschen verbrennungsmotorenbaues by Sass, 1920.
Internal Fire by Cummins ISBN: 0-917308-05-0, 2000.
Beautiful Engines by Grayson ISBN: 1-928862-03-9.
Diesel's Powerful Idea by Bahr (free MAN publication), 2008.
Verbrennungskraftmaschinen by Gultner 1920.



An overall view of the finished engine.



The air bottle on the stairs.

Following along behind



BRIAN
BAKER

Brian Baker assembles, modifies and details a 7 $\frac{1}{4}$ in. gauge LNER/BR brake van from a Phoenix Locomotives kit.

PART 2

Continued from page 269
(M.E. 4359, 28 August 2009)

The Vee hanger brackets are shown in **fig 4**. The brake hanger brackets (**fig 5**) are simply turned from 12mm ($\frac{1}{2}$ in.) hexagonal mild steel, and you will need four of them. They are screwed into 6mm tapped holes in the frames, located as shown in **photo 10**. The brake hangers are made from 5mm ($\frac{3}{16}$ in.) mild steel as shown in **fig 6** and in **photo 11**, which also shows the brake shoes and the retaining pin. The pin is a 12mm long piece of 5mm ($\frac{3}{16}$ in.) mild steel, gently tapered at one end with a smooth file whilst turning in the lathe. The file, used in this way, must have a handle, to



10 This centre punch mark locates the 6mm tapped hole in the frames into which is screwed the brake hanger bracket.



11 The components that make up one brake shoe assembly together with an undrilled shoe.

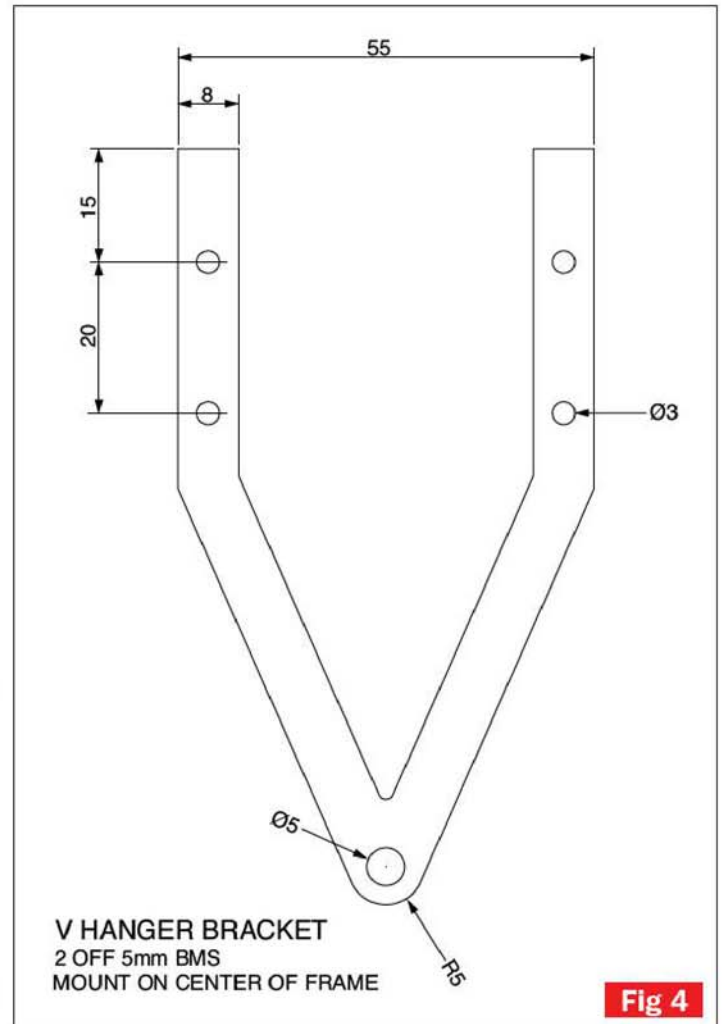


Fig 4

alleviate a visit to your local casualty department!

The brake shoes have a 4.9mm hole drilled right through both sides, and one side only is opened out to 5mm to allow the pin to be push fitted into the shoe.

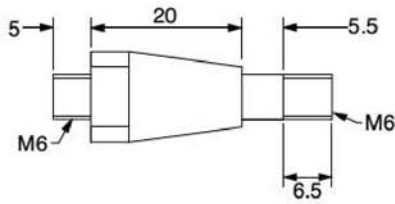
Don't forget to put the pin through the brake hanger as well as the shoe, or be prepared to push the pin out again! I have used this method of securing this type of shoe for many years and it works fine. You could use a nut and bolt instead if you wish. The shoe must be free to pivot about the pin, so that it can take up the best position when rubbing against the wheel. The completed hanger is secured to the hanger pin with a 6mm nut and I prefer Nyloc nuts

to stop the assembly being vibrated undone over the years.

Photograph 12 shows this assembly in place.

Next we need the forks (**fig 7**) and push rods, (**fig 8**) as shown in **photo 13**. The push rods are threaded 6mm as are the forks, and are attached to the cross shaft with a clevis pin, and a split pin. They can be adjusted by screwing the push rods in and out of the forks to give even contact of all four shoes on the wheels, when we complete the chassis assembly.

The other end of the push rod is attached to the cross shaft eye (**fig 9**). This too is threaded 6mm, and can be adjusted in the same way (**photo 14**). Both ends of the push rod should be secured with a locknut. Finally, we need two brake hanger



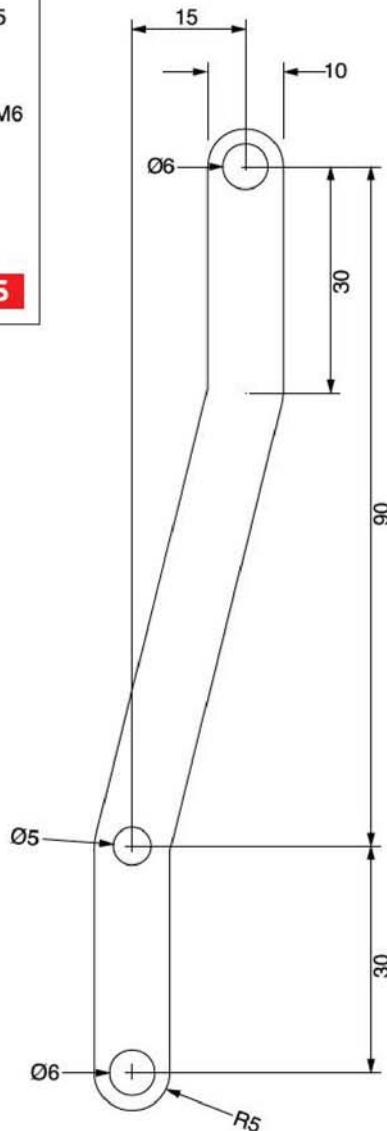
BRAKE HANGER PIN
4 OFF, MATERIAL 12mm BMS HEX

Fig 5

cross beams (**fig 10**). These are pieces of 8mm ($\frac{5}{16}$ in.) dia. BMS round, with one end turned down to 6mm and threaded, and the other end tapped 6 millimetres. These pass through the clearance hole in the end of the cross shaft eye and are secured in the lower hole of the brake hanger with a 6mm Nyloc nut, and short 6mm bolt at the other. The fastenings need not be tightened too much since the cross beams need a little float to allow brake equalisation.

Now we need a bracket for the vacuum release valve (**fig 11**). This can be attached in a suitable place, mine is on a buffer beam, and that seems to be easily accessible. This bracket is attached with 3mm (5BA) bolts. The plastic hose tail is screwed onto the release valve, and this keeps it in position.

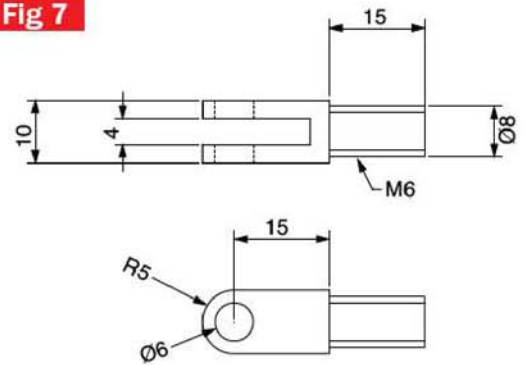
We need a vacuum connection at each end of the van. On the earlier vans, this was a swan neck type, whilst later vehicles had the carriage type connection. I made two



BRAKE HANGER
4 OFF, MATERIAL 5mm BMS

Fig 6

Fig 7

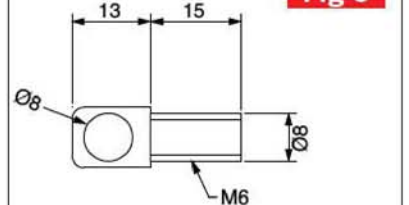


PUSHROD FORK END
2 OFF, MATERIAL 10mm SQUARE BMS

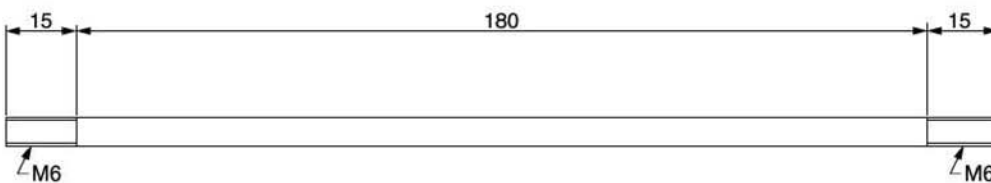


The complete hanger assembly in place, secured with a 6mm Nyloc nut.

Fig 9

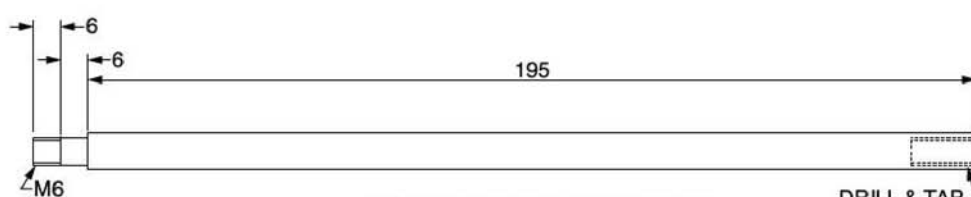


PUSHROD END
2 OFF, MATERIAL 10mm SQUARE BMS



BRAKE PUSHRODS
2 OFF, MATERIAL Ø6mm BMS

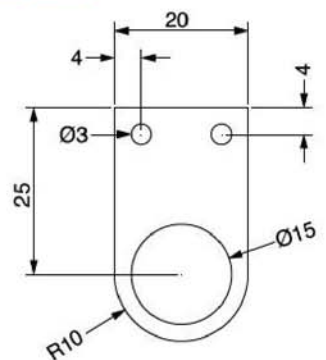
Fig 8



BRAKE CROSS PUSHRODS
2 OFF, MATERIAL Ø8mm BMS

Fig 10

Fig 11



VACUUM RELEASE VALVE BRACKET
1 OFF, MATERIAL 3mm BMS



13 The push rod forks, attached with clevis pins to the central operating shaft.



14 The push rod eye, through which is passed the brake cross beams.



15 The two swan neck brake connections. The stub on the left closes the open end of the brake pipe when not in use.



16 The vacuum system piped up with reinforced plastic tube.

swan necks from copper pipe, but these are not quite correct because there should be an elbow fitting at the bottom end, at the bracket, as well as the top (**photo 15**). This would allow the upright pipe to be supported by the bracket, and not left waving in the wind as I have made it. I will probably replace them soon. The vacuum reservoir is attached to a bracket screwed onto the main chassis, and its drainpipe clip attached to it. I piped up my brake system after final assembly and painting of the chassis and I used cable ties to secure the plastic pipework (**photo 16**).

side cutters so that they just protruded through the frames, and fixed them in place with Loctite 638 retaining compound. I know that many will raise their hands in horror at such a suggestion, but I have used this technique before with complete success. However, if you want to, you could countersink the holes and fit them by hammering the ends into the countersink. This would be quite a task, and "life's too short". **Photograph 17** shows some rivets in place, as well as the coupling reinforcement plate. These plates, and the buffer stocks, can be bolted in place.

Photograph 18 was taken after the chassis was primed and also shows the masking tape used to protect the few places, such as the inside machined bore of the buffer stock, where paint is not wanted.

I decided to use Epicote metal primer, and gloss black aerosol cans from my friendly DIY store to paint the chassis. The many nooks and crannies of the chassis did require a bit of touching in, since missed bits kept appearing, but this job was soon completed, and I went on to complete the running gear, which was assembled with the components supplied.

Wheels

These were nicely CNC turned, with tapered wheel treads and it did seem a pity to paint all that shiny steel but that's exactly what I did after Loctiting the axles into the wheels. Again some people are nervous of this method of fixing, but again I have used it with success for many years. Firstly, use the correct Loctite cleaner, not some odd solvent from the workshop, and definitely NOT petrol. Because of the method of manufacture, fractional distillation, most solvents have tiny traces of heavier oil present, and this will remain on our surfaces to reduce the strength of the Loctite bond after the solvent has evaporated. I used Loctite 638 retaining compound, but several types are available.

Another problem found with Loctited wheels is that they wobble after gluing. This is because a clearance has to be left for the adhesive, and thus the wheel can flop whilst the joint is curing. Phoenix get round this problem, by leaving a register at each end of the wheel seat, on which the wheel sits, keeping the wheel square, but machining away the centre of the axle seat to allow clearance for the adhesive. When you fit the wheels, don't touch the cleaned surfaces. Apply sufficient adhesive to completely coat the joint, spin the wheel to spread the adhesive evenly, then push the wheel right up to the register. Leave undisturbed for 24-hours, preferably with the axle vertical, after which they can be painted. However, unless you specify otherwise, Phoenix Locomotives

Rivet counting!

If you have decided not to fit vacuum brakes then you can start assembling the kit directly, and the first task is to fit all the dummy rivets into their pre-drilled holes. Because the process of laser cutting leaves a slightly tapered cut, I found one or two of the holes needed clearing with a 3.3mm drill to take the rivets supplied. Then I shortened them with



17 The buffer beam with some of the dummy rivets in place.



18 The chassis after the second primer coat had been applied.



19 The door with hinges fitted, and the glazing bead visible as a brown edge to the windows.

will carry out this wheel/axle gluing task for you.

I used Phoenix Precision Paints two-pack etch primer and gloss black as primer and topcoat for the wheels and other loose items. Isn't it strange how most of my suppliers have 'risen from the ashes'.

Axleboxes

The ball races can be secured into the axleboxes in the same way, but you have to make a decision about the axlebox clearance. As supplied they are a close fit in the frames, and Keith makes them this way because, he tells me, some customers suggest that the machining quality is poor if he allows the axlebox more clearance to float. Me, I like the axleboxes to slide freely in the horns to allow the wheels to follow the undulations of our tracks so I filed some more clearance in the axlebox slot, as much as ½ millimetre.

After painting the axleboxes, they are Loctited to the axles, but only after checking their correct position, and that they slide freely in the frames. The springs supplied fit onto pegs in the top of the horns, and which serve to locate the springs correctly, after which the previously painted horn stays hold the axleboxes in position. The dummy springs screw into holes in the frames. Some of these later brake vans were fitted with Timkin roller bearing axleboxes, so if you wish to fit dummy covers, this is the time to do so. The draw hooks are retained with a bolt. Some of



20 For photographic purposes I used blue masking tape.

these vans had triangular shaped instant coupling chains, and a few had screw couplings. With the buffers and their springs screwed into position, our chassis is complete.

Doors and windows

I had decided to hinge my doors, and fit glazing to the windows. Small brass hinges from B&Q were fitted to the door (**photo 19**). I struggled to find very thin wood to act as a glazing bar, but eventually my local model shop came up with some 3mm by 5mm hardwood strip used in the production of model boats. This was glued onto the window edges with waterproof PVA woodworking glue. Some 1mm Perspex sheet from the same source was carefully cut to fit each window and I could then start assembling the body.

Body

This is laser cut from 9mm plywood, a very strong material. This fact, coupled with the rigid construction produced by the use of tabs, convinced me that this vehicle would be fine as a ride-on van. However, the choice of adhesive might affect the overall strength and the van's durability. It could be glued together with waterproof PVA woodworking glue, and I have heard of some bodies being assembled with UHU. Because I wanted to be sure of the joint, I decided to use an epoxy adhesive of the type normally used on yachts and boats. This would also give me the

opportunity to reinforce the joint internally with some fibreglass woven cloth. I feel this is belt and braces, but I am a bit overweight, so the Soup Dragon says anyway!

So epoxy it was, and I used SP 106, made by Curit UK on the Isle of Wight, from my friendly yacht chandlers, but I have included the address of a supplier of the West System, which would work just as well.

The big problem with using epoxy is that it can be very messy, and overspill would look out of place on the wooden body, as well as taking paint badly. So to keep the glue where it should be I put masking tape where I didn't want epoxy staining the plywood. This was done after a dry run assembly which enabled me to GENTLY sand the tabs,

and remove any 'nibs' that might stop the body going together well. These are usually found where the laser has started/finished cutting. **Photograph 20** shows the blue masking tape applied, and cut with a sharp knife around the locating holes. **Photograph 21** shows the whole body trial assembled.

● To be continued.

Suppliers

Brake van kit:

Phoenix Locomotives Ltd.,
1 Colchester Road,
Southport PR8 6XJ.
T. 01704 546957.
W. www.phoenixlocos.com

Vacuum Brake components:

Paul Norman Plastics Ltd., Unit
S5, Inchbrook Trading Estate,
Bath Road, Woodchester,
Stroud, Glos. GL5 5EY.
T. 01453 833388.
W. www.pnp-railways.co.uk

Railway Paint:

Phoenix Precision Paints Ltd.,
PO Box 8238, Chelmsford,
Essex CM1 7WY.
W. www.phoenix-paints.co.uk

CYB Ltd.:

2 Mulberry Road, Canvey Island,
Essex SS8 0PR.
T. 01268 696094.
Can supply a West System
Junior Epoxy Adhesive pack by
mail order, and can also supply
small amounts of fibreglass
reinforcing if required.



21 The van body assembled for a dry run standing on polythene to catch epoxy drips.



NICK
FEAST

Nick Feast tackles
the coupling rods.

PART 6

Continued from page 274
(M.E. 4359, 28 August 2009)

CHARLIE

A Southern Railway Q1 for 3½in. gauge

Now that I have checked the dimensions of the full-size Q1 in the NRM at York, I have found that the rods I have designed for this locomotive are slightly over scale. **Photograph 64** shows the left centre crankpin arrangement of C1 at York seen from the rear. I have made the fork in the rear rod symmetrical for simplicity but it could be made offset by a little redesign. Walking forward a couple of metres gives this view (**photo 65**). I imagine the large vertical bolt secures the bronze bush in the rod. We will rely on a press fit.

At the time of building the prototype model, C1 was in daily use on the Bluebell Railway so measuring oily rods was not practical. **Photograph 66** shows the full-size locomotive while at the Bluebell Railway. As well as the rods this photo shows useful pipe information for the detail enthusiasts. We shall be fitting the whistle in the space above this plumbing. Accurate scale rods would be too flimsy for the power of our locomotive and it would have the potential for fierce slipping if not driven with care.



The left centre crankpin at York seen from the rear.



This view is of the large vertical retaining bolt.

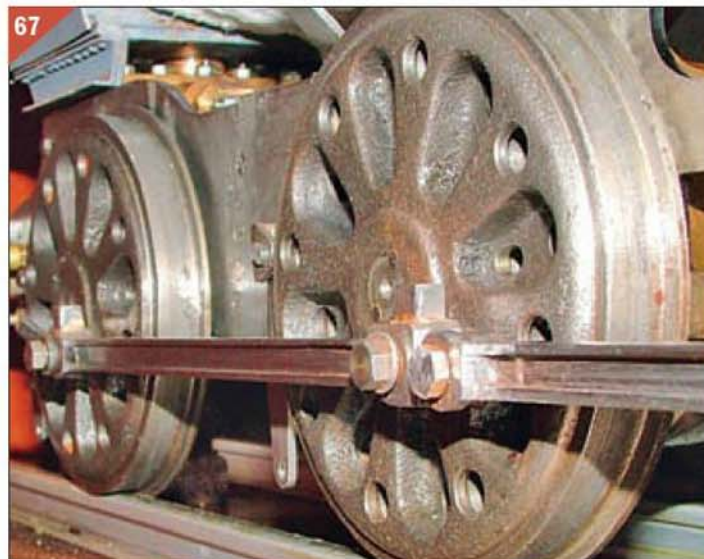
Anyone wishing to build finer scale rods should reduce the thickness of the rods to 4.5mm and the crankpin joints to 6 millimetres. The knuckle joint is true to scale at 8mm overall width. I think the heavy rods look in keeping with the locomotive and give us some useful extra bearing surface. If you're planning to give your engine real work then stick with the heavier rods. **Photograph**

67 shows a view of the first locomotive I built with the oil bosses not the full width of the rod. The drawings now show the correct arrangement of the full width boss.

If you have decided to purchase laser cut blanks, a lot of time is saved but not much money. A set of laser cut blanks with blind bushes pressed in is shown in **photo 68**. It is not really necessary



The full-size locomotive while at the Bluebell Railway.



The first locomotive I built with narrower oil bosses.

68



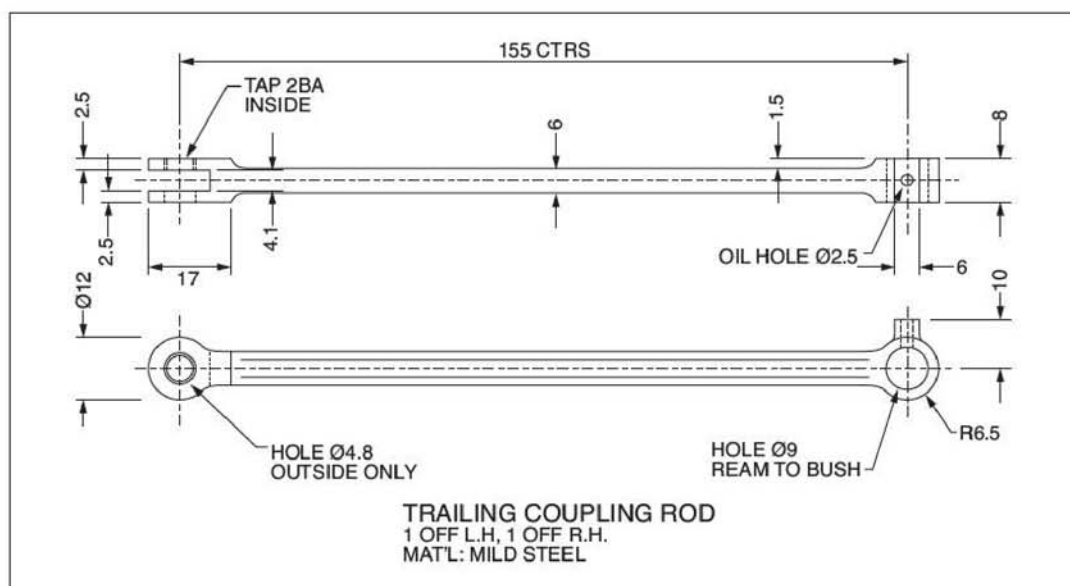
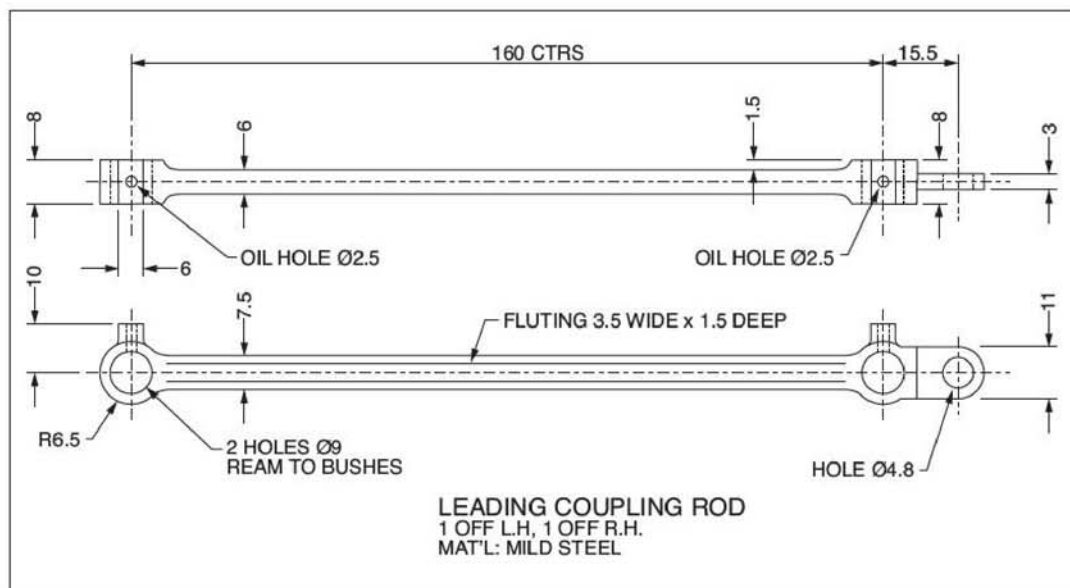
The set of laser cut blanks.

to bush the knuckle pin joint. Once the centres have been marked out the remaining holes can be drilled.

There is still plenty of work to do in the profiling, fluting, bushing and finishing. If you want to start from first principles then the process of milling the rods will require a jig to take the section down to the required depth. The same jig will serve for other operations on the rods later on. You will save a lot of time and metal by silver-soldering the oil bosses on rather than milling the whole profile.

I noticed the correspondence in the magazine about the 'honesty' of a model built using laser cut items. In fact full-size locomotive rods for the Brighton Atlantic project have now been produced using water jet cutting and even in the days of steam, forgings of the approximate finished shape were used. There is plenty of opportunity to show your skill, or lack of it, during the finishing operations required on laser cut blanks. Building a complete tender from laser cut parts 'tabbed' together is a different argument I feel.

I had some rods cut with just one hole burnt out as a bit of an experiment. I shouldn't have bothered really because the laser hardened the surrounding area making it difficult to finish the hole to size. While on the subject of laser cutting, don't assume that you need to have electronic drawings to have parts made. My local company will scan hand drawings and produce excellent quality items at a very reasonable price, I am sure there are plenty of others around the country looking for work at the moment. The only snags are that you get what you draw, so your drawing needs to be good, and there is usually a minimum order charge. As this



can be £100 or so you need a significant requirement for parts.

As with all other parts on the locomotive it is best to stamp them up at an early stage as left and right. Then with the wheels installed in the locomotive take the measurement from the back edge of each axle, i.e. the join between the axle and the wheel. Of course the measurements should be the same each side, but a small discrepancy can be tolerated, perhaps 0.1 - 0.2 millimetres.

The front rod is simplest as the measurement can be transferred straight on from the locomotive. It should be 160mm but I convinced myself it was 158.8, marked out the rod, drilled the holes, fitted and reamed the bushes and

then tried it on the locomotive.

The tightness in the midway position showed the centres were short. I pushed out a bush and fitted a new one, drilled at 160mm centres and you can guess the rest.

It is essential to hold the piece in a vice when centre drilling the bushes (photo 69). The position of these holes needs to be precise. One of these centre drills whizzed past my ear during this sequence, they seem to disintegrate more violently than British ones when they find a hard spot, it shattered, and sent miniature shrapnel in my direction, so as with all drilling and milling, safety first, wear eye protection on any and all machine work. During my training in the pump industry in the 1970s I spent some



Centre drilling the bushes.

months on the test plant. Water and electricity were in close proximity but provided earthing was sound everybody survived. Unfortunately an apprentice was ➤



The milling jig is secured to the table.



Files are used to tidy up the rough slot.

given the job of wiring up the temporary leads used to connect 3-phase motors to the test rig and connected the earth wire to a live feed. I was looking straight down the cable gland of a pump motor as the power was turned on to this booby trap, and got molten solder in the face at high velocity. The bang brought the works manager out of his office at high speed but fortunately for all concerned the only permanent damage was a chip out of the middle of one of my spectacle lenses. It was still some years before safety glasses became the norm in industry.

The rear rod is trickier as there is a knuckle joint to set out involving a 15.5mm

distance from the centre bush. I made blind bushes and pressed them into the rods so that the centres could be positioned later. It is possible to bore all the holes in the rods and make the bushes on the lathe, but sooner or later you will need to make a bush with a hole not quite in the middle and lathes don't do this very well. **Photograph 70** is of the jig for much of the milling and is simply a piece of at least 6mm plate with tapped holes at the appropriate centres to fix the rods, secured to the table with nuts, studs and Tee Nuts.

I like to get all the bushes fitted and get the rods assembled onto the locomotive



Cutting out the forked end of the rear rods.



The knuckle joint bolt before silver-soldering.

before the fluting and tidying up. We need to cut the slot for the tongue of the knuckle joint, which I did with a saw this time (**photo 71**). Cutting out the forked end of the rear rods is a good test of your hacksawing skills. First drill a hole where the end of the fork will be and carefully make two cuts down to it.

A variety of files are used to tidy up the resultant rough slot, again because the laser cutting hardened the rod and I didn't fancy breaking an expensive thin milling cutter, which I would rather use for steam ports etc. (**photo 72**). We are still in austere times!

These abrasive coated mini files came from the local street market for a few pounds and are less likely to clog up than ordinary files. Make sure you get ones with handles fitted.

We have a small turning job next to make the bolts for the knuckle joint. This is basically a 2BA stud with a bored out 4BA nut silver-soldered on to form a fixed nut. **Photograph 73** shows the knuckle joint bolt before silver-soldering the head. The thread should be almost flush with the bolt head after finishing. (See photo of the centre driving wheel in the article on the wheels, page 271, M.E. 4359, 28 August 2009.)

Cut the thread just long enough to screw into the threaded inside part of the forked end of the rod. We cannot fully tighten this bolt or the joint will bind. Therefore we need to use locking compound on final assembly and I also centre punch the end of the thread for good measure. This is one bolt on the locomotive we want to stay put.

The geometry of a locomotive suspension is a terrible compromise as for it to work at all there needs to be slack in the rod joints. Ream the bushes very slightly oval in the vertical plane to allow the wheels to rise and fall without binding. The full-size needed some clearance here and it was better to make a bit of noise than have a failure with a seized rod. Those of us that were around at the end of BR steam all remember the terrible



74 Heavy duty Dexion was adequate to hold the rods.

din from certain locomotives coasting to station stops. BR standard 4 2-6-0s seemed particularly bad, creating a sound like two men with sledgehammers hitting a very large steel girder. These are the sounds you will never hear in preservation!

Fortunately on the locomotive being built for this series the wheels rotated with just a trace of tightness at the 3 o'clock position on one side but with no perceptible play in the rods. This tightness will disappear during running in. This is as much the result of using jigs wherever possible to set the critical distances as to any skill on my part. If you have unacceptable binding check the following. If it is with the crankpins at 3 o'clock and 9 o'clock on either side you have got the centre distance wrong somewhere so dismantle the front and rear parts of the rods and see which pair of bushes is at fault. You should be able to see a small amount of movement of the axlebox in the horn guide to indicate if the distance is too long or too short. If the binding is at any other position try reaming a little more out of the bushes, and check that all the crankpins are dead square to the wheels. It is possible to bend them when pressing them in.

Once we are happy that the wheels will rotate with the rods fitted we need to give the rods their distinctive appearance. The first operation is to relieve the front face and a simple bracket is needed to hold the rod vertically in the mill.

A piece of heavy duty Dexion seemed adequate to hold the rods for this operation (**photo 74**). I felt I had made enough jigs for the moment!

We need to take 1.5mm of this face, leaving a rounded profile at each end.

You will produce some evil metal shavings, which will inevitably become embedded in your fingers. Short sighted people like me have no difficulty in seeing these tiny spears with specs removed but for those with normal eyesight you will need a magnifying glass, and of course a pair of flat bladed tweezers.

Next we need to mill the slot in the face of the rod and do the finishing touches to get the correct appearance to the ends of the fluting. Some care is needed here to match everything up (**photo 75**).

I made two or three passes to get down to about 1.5mm deep with a two fluted end mill just below the 3.5mm width required. It can be tricky to position this in exactly the right place, so just lower the mill carefully onto the



75 Care is needed at the ends of the fluting.

rod somewhere near the mid point to see if the cut is in the middle. I am sure it is possible to set this up on the lathe also, but as I have said earlier in the series if we are serious about building model locomotives, a mill is well worth the expense. I notice that the mini-mill that I have is now less to buy new than it was six years ago!

Don't go right to the end of the fluting, as we need to finish off with a cutting wheel to get the correct profile. We could do the whole job with this tool but my end mill seemed to cut better.

The final job is to set the rods up in the mill vertically again to relieve the small amount of metal off the backs. We leave this till last as it helps stop the rods shuffling about during the fluting operation.

Once all the swarf and cuttings have been cleared away the oil holes can be drilled. The holes have two diameters and as long as there is a restricted flow to the bearing it doesn't matter how you achieve this.

The rods can be given a cursory polish with emery cloth, not a mirror finish please as this is not a royal train engine. **Photograph 76** shows a finished pair of rods, lightly polished with the sharp edges removed.



76 A finished pair of rods lightly polished.

I used my recently acquired liner to get rid of most of the burn marks on the edges of the rods. An abrasive wheel in a hand held battery drill would also work but if using the Dremel type mini drill beware that they run at very high speed even on the slow setting. Debris is shot everywhere at high velocity so do be aware of the risk to the lungs and eyes during this operation, not to mention anything else within range.

● To be continued.

Shand Mason Steam Fire Engine in 1:6 scale



GÜNTER
KALLIES

Günter Kallies continues the description with the wheels for his horse-drawn fire engine of 1890.

PART 5

*Continued from page 141
(M.E. 4357, 31 July 2009)*

The wheels for the full-size engine are made of wood with an iron tyre in the old tradition of coach wheel making. Personally I prefer to do it in a similar manner, but with some exceptions due to scale limitations. This work is somewhat outside the normal run of model engineering operations but will give a large amount of satisfaction when finished. The main components of the wheel are the rim, spokes and hub. I have made all these parts of wood as per the original. However, readers may decide to make all the components from aluminum alloy or even brass. After all, upon completion when the model is fully painted nobody will see the difference. (Drawings for the wheels were in M.E. 4357, 31 July 2009.)

In normal wooden wheel construction the components are the hub, also known as the nave, individual formed spokes, and felloes, or circumferential



A view of the finished model.

segments. The parts are fitted together by mortise and tenon joints. The full-size assembly is held together by a shrunk-on iron or steel tyre.

One can build the wheels in the same way as the original or, as I have decided, make it somewhat lighter, because the model version is not planned for hard street application, therefore the construction can be simplified.

Nave (307)

This is made from well-dried hardwood and may be a small section of mahogany from any old piece of furniture that can be found. First of all drill the hole, turn to length and fix to a suitable mandrel. Now turn the outside contour carefully according to the drawing. Make sure that the portions where the spokes will be installed are slightly tapered. The naves for

the forward wheels need 12 mortises, or dowel holes, while in the nave for the rear wheels 14 are needed. Use some sort of dividing attachment on the lathe setting this to 87deg. out of centre. The holes can now be easily drilled with a 3mm bit as shown in the drawing.

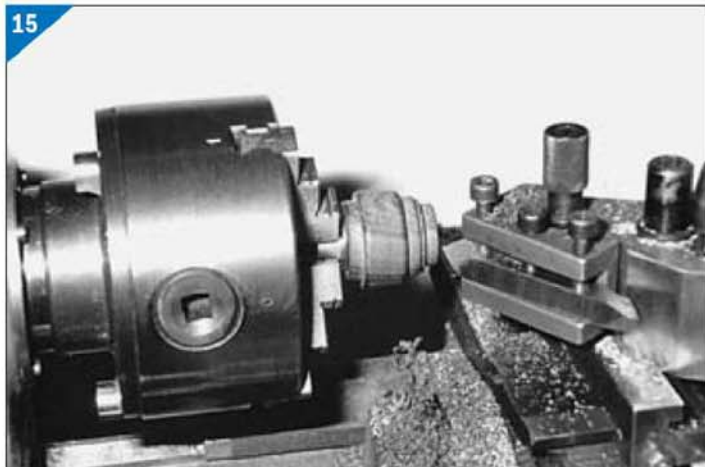
The rims can be reproduced from multi-layered plywood. This mostly water-resistant glued plywood is typically very fine grained and can be turned on the lathe rather well. The rings should be sawn out roughly and glued on a circular carrier of waste plywood or similar. A layer of paper, e.g. from a newspaper, in the glue joint makes later removal much easier.

The circular carrier is fastened with screws to the faceplate of the lathe. With high speed and a sharp lathe tool the rim can be turned to size. Please notice the slightly



A pair of finished wheels.

15



Turning the nave.

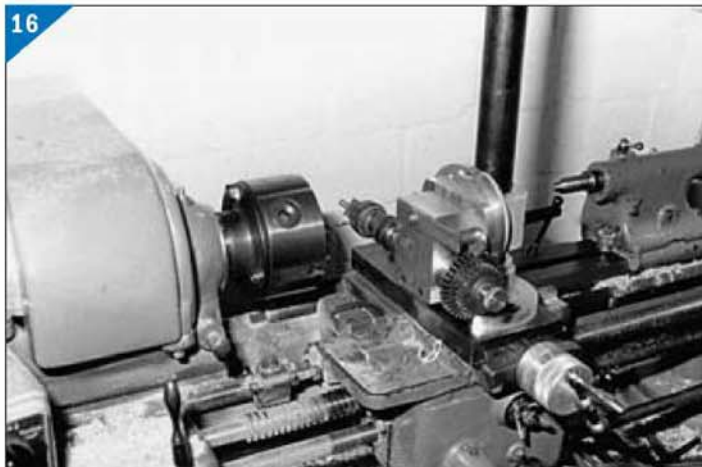
tapered shape. At the same setting a centre hole of 30mm dia. should be turned in the carrier plate. The hub will be inserted into this hole later for assembly of the wheel; this will help with exact centering.

The spokes are slightly stronger than they would be with a correct scale reduction. This additional strength is strongly recommended and will not destroy the overall model's effect. The spokes are cut precisely to length from a strip of fine-grained hardwood with a 6 x 8mm cross section. Each spoke has a 3mm dia. dowel hole on both sides.

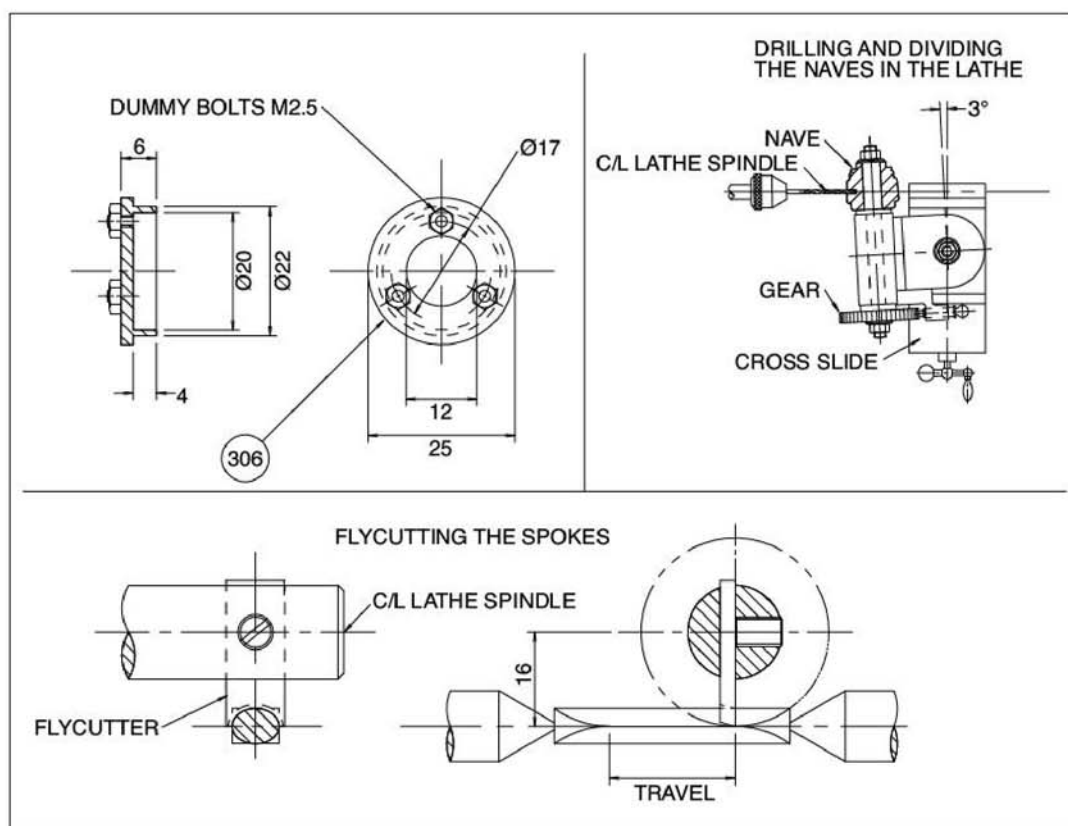
To provide a realistic appearance for the spokes, these must be profiled. The middle area of the spokes should receive a lozenge shaped cross section that changes over at the ends to a square cross section. This work can be carried out, either laboriously by hand with a file and emery, or with a profile cutter in the lathe. In the latter case a simple device is needed to hold the spoke temporarily to the milling device on the lathe. The middle area is removed with a flycutter, or any other sort of form cutter, by moving the cross slide. Stops should be installed to limit the cross slide travel. This will generate equal spokes with smooth arched shaped run outs at the spoke ends.

To prepare the wheel assembly insert a 3mm hardwood dowel at one end of each spoke with a drop of glue. It should stick out approx. 4 millimetres. This

16



Drilling the nave for spokes.



17



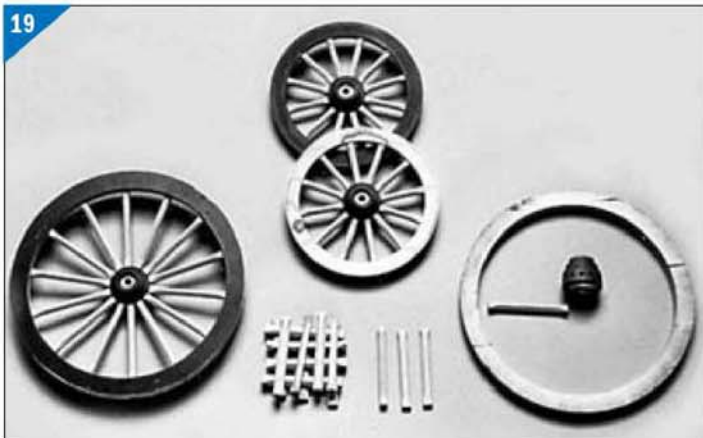
Milling the spoke profile.

18



Turning a wheel rim.

19



Wheels and components.

end will be glued into the holes of the hub like a star. If everything is precisely made the rim will fit exactly over the spokes. Other hardwood dowels are now fitted with a drop of glue from outside of the rim through the spokes and the excess ends sawn off. If the outside diameter of the rim was made slightly oversized it can now be machined down to final diameter, though it is wise to produce the tyre first as described next. With the tyres in hand one is able to make the wheels to a really good fit. Carefully remove the wheel

from the support board using a sharp knife to split the bond line where the paper layer was inserted.

Tyres (302 and 303)

Some 1.6mm thick stainless steel sheet metal is specified for these and I asked a small local company to cut 10mm wide strips on their guillotine for me. The length of the strips can be determined from the formula 'diameter multiplied with pi'. (From memory: the number 'pi' corresponds to about 3.14.) The strip should be somewhat longer because this can be helpful with the bending and

20



A finished rear wheel.

forming process. The tyres are best formed in a 3-roll bending machine. However, they can also be bent with a mallet or plastic hammer on a piece of round steel material. The formed strip must be cut to precise length and accurately squared at the end faces using a file. Either welding or brazing the joints is suitable.

The tyre should fit the rims as close as possible without forcing them on. In this case it is permissible to make the

rims slightly tapered to make fitting easier.

Bush (305) and Hubcaps (306)

Finally, the nave receives a bush and a hubcap, which are made out of gunmetal, bronze or from brass. They should be installed with a small amount of 2-part epoxy resin adhesive. It is recommended you install the hubcaps after painting the wheels.

● *To be continued.*

THE MODEL ENGINEER EXHIBITION

A request from the editor

I have started to receive entries to the Model Engineer Exhibition. Please supply your phone number so I can phone you to say your entry has arrived. I will be sending out information packs to all entrants a bit closer to the Exhibition. You should hear from me within two weeks to say your entry has arrived. (I say two weeks because the entries are forwarded to me from the office.) If you don't hear from me within two weeks feel free to phone me.

Where photographs have been supplied, several have been from a computer printer. Although they are often superb photos, usually these are not very suitable for reproduction

in the magazine. This is because printers print out as thousands of tiny dots. The photo to the right is probably from a printer rather than a photograph. It is included here as a test to see if it reproduces okay.

If at all possible, please supply a selection of photos on CD (or email them to me) to accompany your entry. They may be used in the magazine or show guide prior to the exhibition. We will, of course, be taking photographs of all the entries during the exhibition.

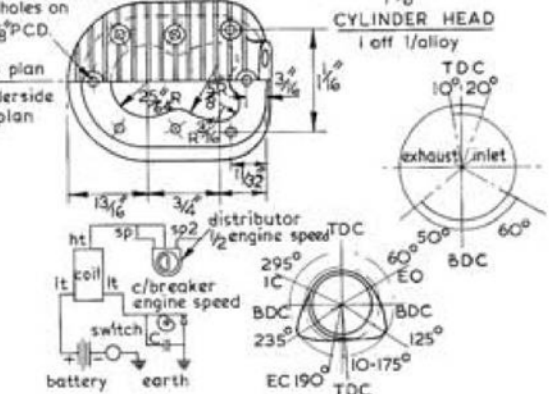
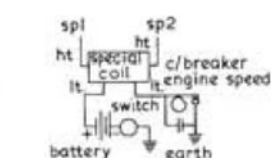
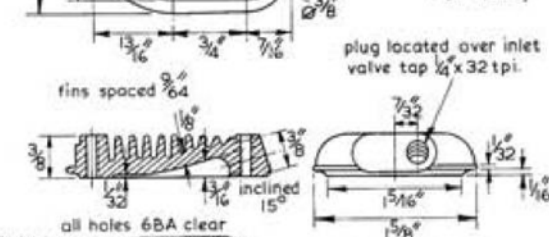
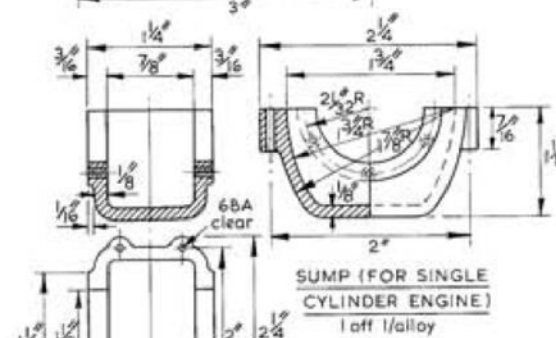
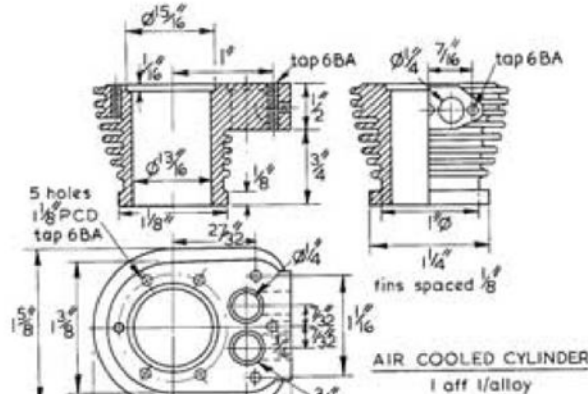
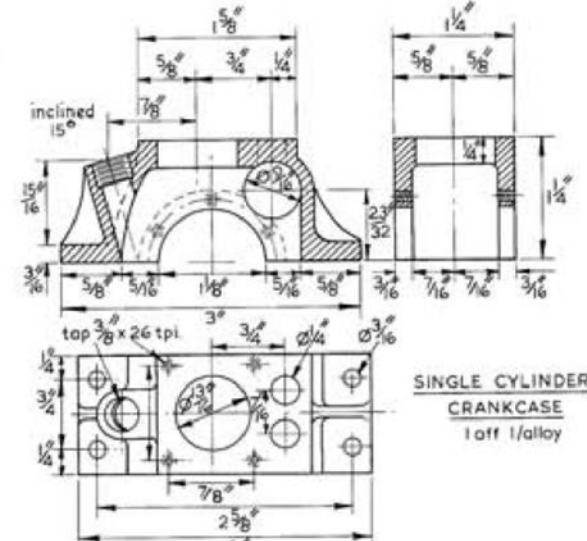
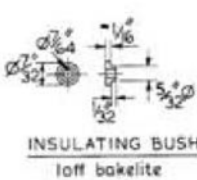
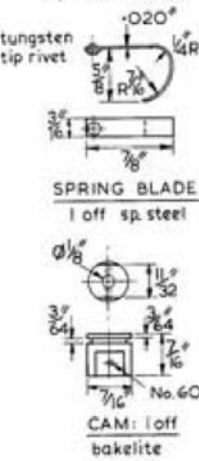
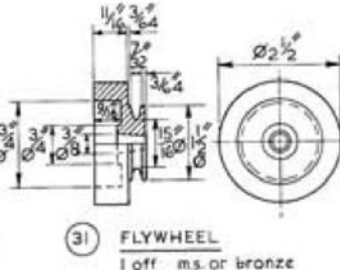
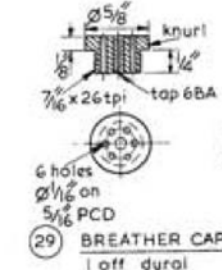
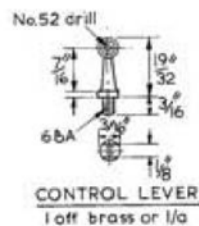
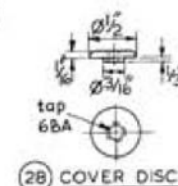
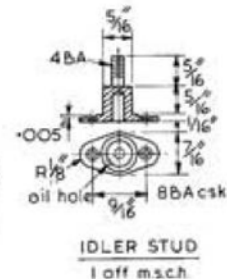
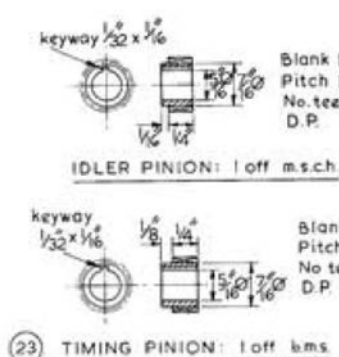
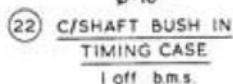
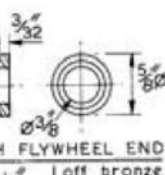
Please send in your entries as early as possible. As you can imagine, there is a lot of paperwork to do and judges like to see all entry forms



about two weeks before the exhibition so they can research the model if necessary.

Oh, the photograph. It is a 1:8 scale model of a Buda Velocipede manually propelled

track inspection vehicle (Circa 1900) the originals of which are at the NRM in York. It has been entered by Roger Curtis of the **Guildford Model Engineering Society.** **ME**



PLAN: **SPRINGBOK**
5inch GAUGE 4-6-0 B1 LNER LOCOMOTIVE
by Martin Evans

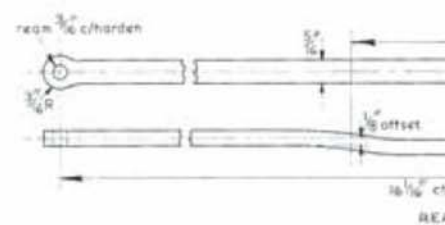
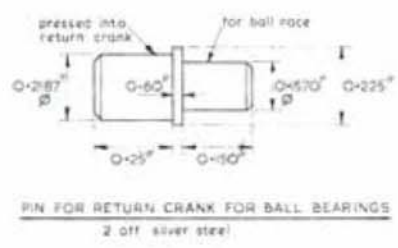
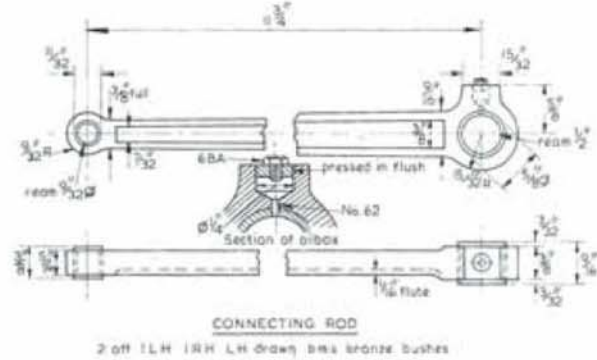
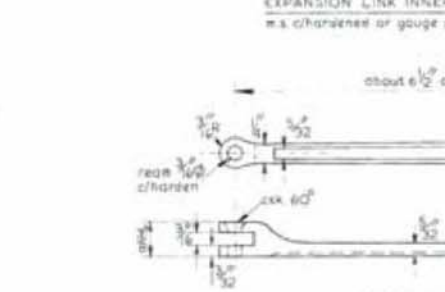
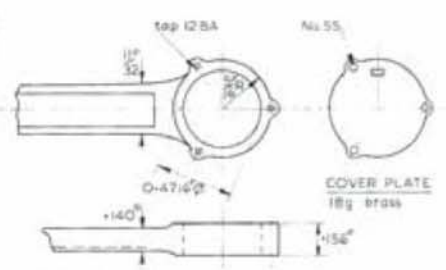
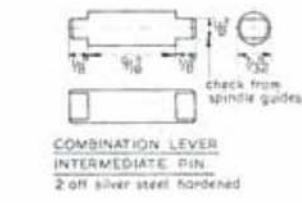
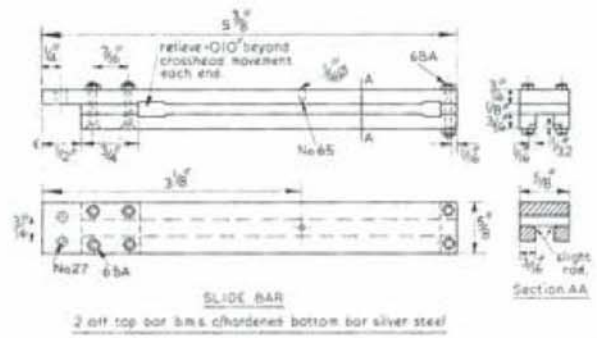
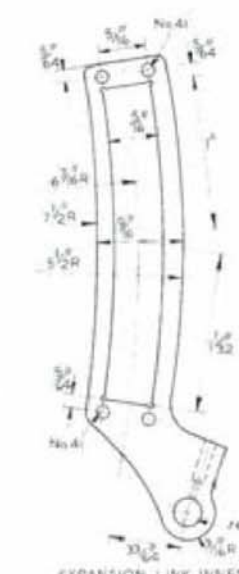
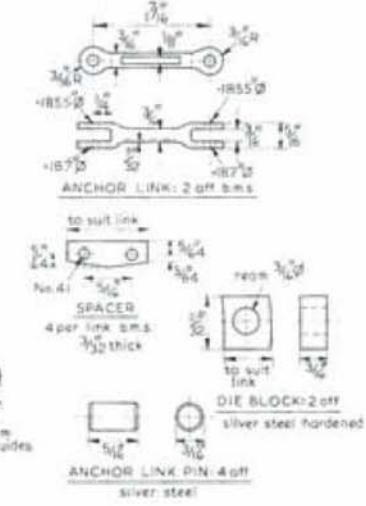
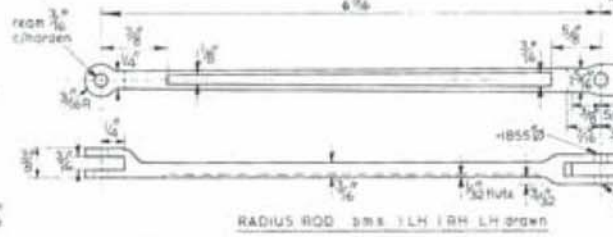
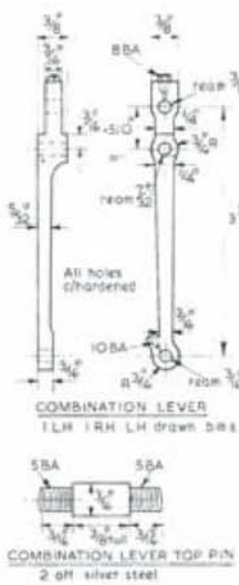
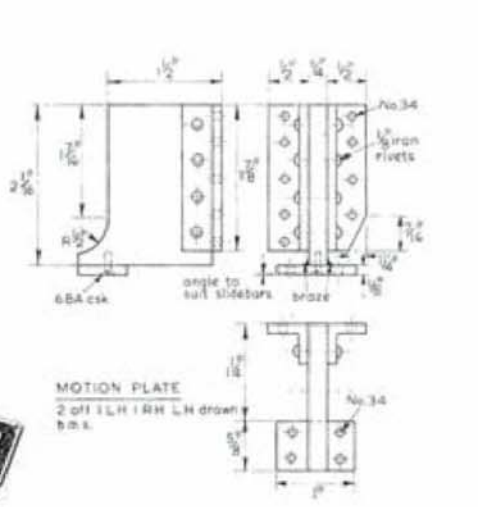
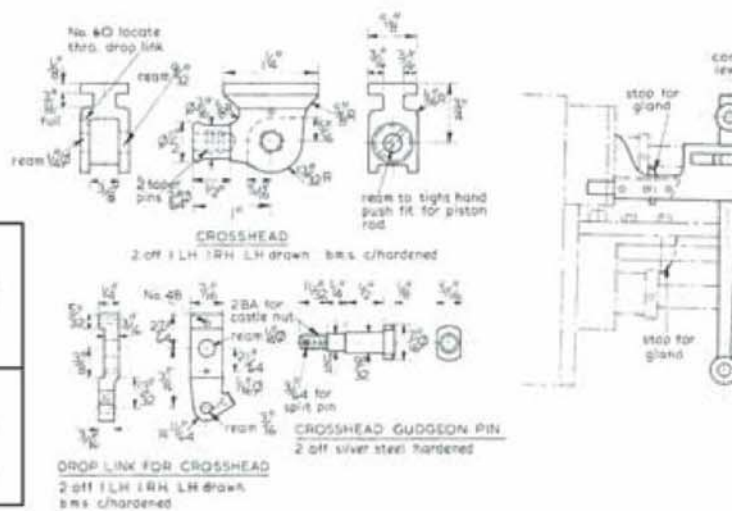
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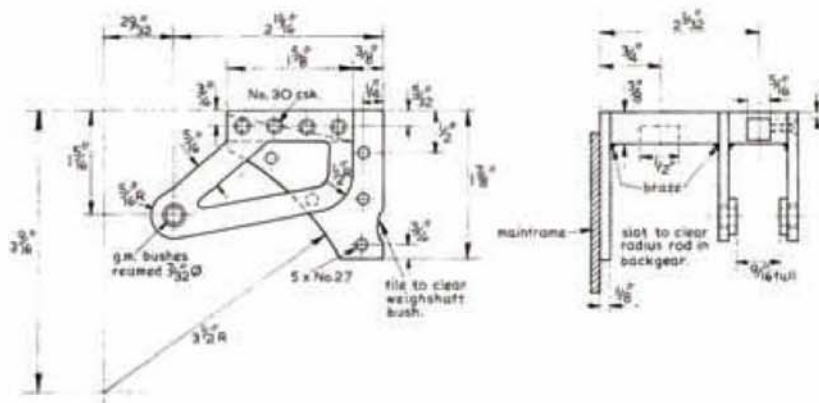
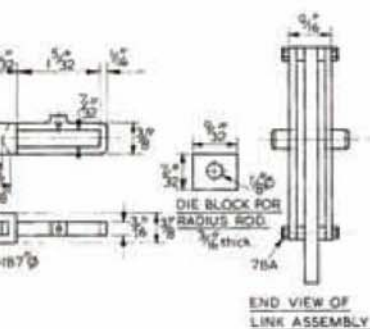
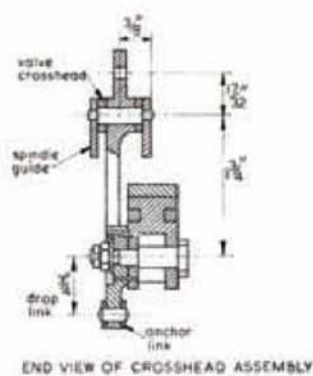
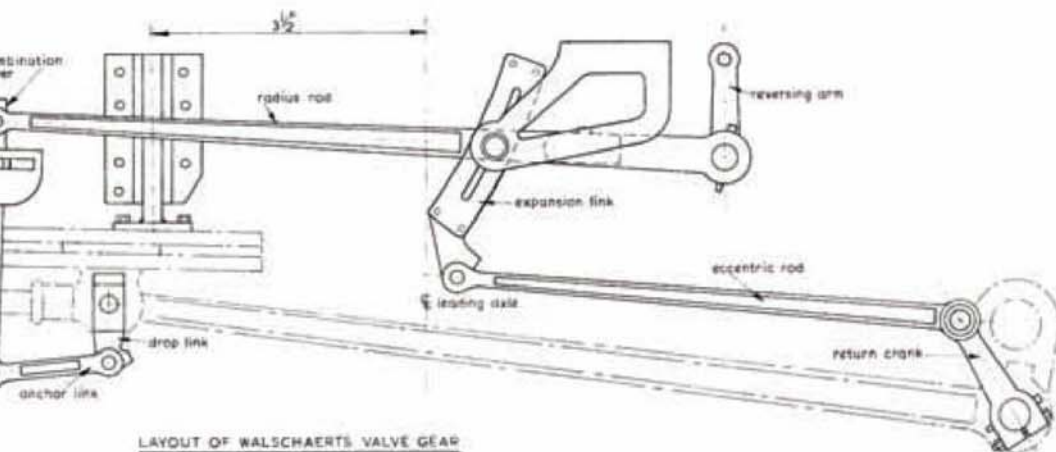
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Beginners start here



DAVID CLARK
Editor

In the workshop
with the editor.

PART 4

Continued from page 213
(M.E. 4358, 14 August 2009)

This time we make a start on machining the bearing blanks then we set the 10H bedplate and soleplate castings true on the mill. I was going to machine the bearing housings in the soleplate but due to an accident (hand in plaster) I can't tighten the cutter up or turn the machine handles.

Photograph 16 shows the bearing blank held in the vice to true up the sides. First, lap the top of the bearing on a sheet of wet and dry to clean it up and ensure it is flat. Then deburr carefully all over. Place the bearing on a parallel and up against the face of the vice. (I actually placed a thick parallel up against the vice jaw for the bearing to back onto.) You need a piece of material to rest against the front of the bearing on the radius to push the moving vice jaw against. Lightly tap the bearing blank down onto the parallel. If the parallel won't move the bearing should be touching the parallel all the way along.

You need to clean the underside of the bearing blank up so you have a clean true face but you don't need to take much of the side of the bearing. Aim just to clean up the underside face and take a scraping of the side to ensure a sharp edge where the two faces join. Then turn the blank over, deburr the edges just machined and tap it down onto the parallel and machine the other side. If you are lucky, the underside will clean up. I machined two blanks at the same time; one cleaned up but the other needed another 10 thou. off the underside so I turned it back over and remachined the first side. It is important that both underside faces are the same size. I checked the width over the main bearing part and they both measured 0.437 ($\frac{7}{16}$ in.) which is drawing measurement. It won't matter if they are slightly undersize (up to 5 thou.) for reasons I will mention next time.

Next we need to set the bed plate and soleplate true on the milling machine table. The

soleplate needs to be central on the bed plate and square to the mill travel. I did this by putting a central clamp through the two castings to clamp it lightly to the mill. I placed a parallel against the side of the bedplate with the other side of the parallel at the edge of a Tee slot. I checked by using my fingertips that the parallel was in line with the edge of the Tee slots. It is amazing how accurate you can get something by using the feel of your fingertips. I consistently used to get a 6in. machine vice true to 2 thou. over 6in. (I still clocked the vice up to a tenth of a thou but 2 thou. was a good starting point.) Then I gently tapped the soleplate casting so it was centrally placed on the bedplate. I measured the offset with the vernier until it was within 5 thou. This will be near enough as there will be slight clearance in the holes when finally clamping down. Then I clocked the side of the soleplate to make sure it was true with the machine table. Tap the soleplate gently until it is. Check the soleplate is still central then clamp down at the ends of the soleplate (**photo 17**) and then remove the central clamp.

Now we need to centralise the mill spindle to the centre of the soleplate casting. To do this is easiest with a digital readout. If you don't have a readout, it can still be done but more about this next time.

Right, now we will set zero using a readout. Wobble off the back of the casting (**photo 18**) and zero the readout. Use a stop for the depth as the casting is tapered. Wind to the front of the job and wobble of the front (**photo 19**). This gives you the exact width of the casting plus the wobbler diameter on the readout. Halve the measurement and wind to the halfway reading. Zero the readout and you are exactly on centre line. Do the same using the outer sides of the bearing lugs and you will be on the exact centre in the X and Y axes.

● To be continued.



Machining the underside of the bearings.



Clocking up the vertical base and soleplate.



Wobbling up the back of the casting.



Wobbling the front of the casting.

Run 21



Charles Weatherly for A. Britton - Worthing & District MES.

Run 22



Tony Guerrier - North London MES.

IMLEC 2009

BERNARD
NORTH

Bernard North concludes his report on this year's International Model Locomotive Efficiency Trials hosted by Bristol SMEE.

PART 3

Continued from page 357
(M.E. 4360, 11 September 2009)

Charles Weatherly of the **Worthing & District MES** was **Run 21** driving fellow club member A. Britton's 5in. gauge freelance 2-4-2 Tender Engine *The Columbian*. This locomotive was originally built by Al Thorpe of the Beechurst club. Construction started in Canada in 1961 and the locomotive has an Anglo Canadian flavour to its design. The locomotive has piston valves driven by Walschaerts valve gear. The cylinders were originally sold by Wilwaugh for a 5in. gauge *Doris* and there is also some added weight to increase adhesion. Nigel Gettings acquired the locomotive in 1989 and fitted a new boiler and Mr. Britton bought the locomotive from him in 1997.

Storm clouds were gathering as Charles' run commenced and very shortly after the start, the heavens opening and the rain poured down. The passenger load at the start was eight including the driver but after a difficult first lap, Charles dropped three passengers and things settled down to a more regular pace despite the rain. Towards the end, the rain eased off, but clearly this run was compromised

Run 23



Roy Gregson - Prescott & District MES.

by the weather. Charles did well to keep going in the conditions.

Run 22, Tony Guerrier - North London MES
5in. gauge GWR 4-6-0 Manor Class 7801 Anthony Manor

Built to Martin Evans classic Torquay Manor design, this locomotive had a major rebuild last winter and a repaint in GWR colours to a fine exhibition standard. Boiler feed is from two injectors, crosshead pump and a tender hand pump.

Tony took a modest load of eight passengers which was probable a wise move as the track was still wet from the downpour during the previous run. The run soon settled into a steady rhythm with very regular

lap times. A total of 12 laps were completed in fine style, but the coal consumption was a little high for the total work done and Tony returned an efficiency of only 0.68%.

Run 23, Roy Gregson - Prescott & District MES
5in. gauge LMS 4-6-2 Princess Coronation Class Princess Alice

This locomotive is one of four Duchess locomotives built by Geoff Gregson from Urmston (no relation to Roy). Built as a 'Semi', the smokebox has the characteristic shape from its earlier streamlined days. The locomotive uses some of Michael Breeze's drawings and patterns and is well finished and

Photographs by Clem Culverhouse and Bernard North.

Run 24

Andy Siddall - Harlington Locomotive Society.

nically detailed. It was painted in BR experimental blue livery which the prototype carried for only a very short time in its life between 1950 and 1952.

The run commenced in fine style for the first three laps with a load of 18 passengers. However, water feed was a significant problem as the high pressure injector failed to work and Roy had to rely on the low pressure injector and had to keep the boiler pressure down. Roy told me that he had taken off the injectors during the week previous to IMLEC to clean them and with hindsight wishes he had left them alone.

After a long stand during the fourth lap in the middle of the long straight trying to recover water and pressure, Roy eventually dropped off all his passengers and proceeded with just the passenger cars back to the station to complete the run.

Run 24, Andy Siddall - Harlington Locomotive Society 5in. gauge LNER 4-6-0 B1 Class 'Springbok'

Another of Martin Evans classic designs, this engine was built by Mr. A. Baker. It was acquired a couple of years ago by Andrew and was extensively rebuilt over the past winter and finished in LNER Apple Green livery. It has been in IMLEC on a couple of occasions before finishing in 2nd place at Northampton in 1999 and 3rd place at Southport last year.

Based on the previous success of this locomotive, this run also showed lots of promise in the early stages. However, the run was blighted by a blocked water gauge and the attendant uncertainty of the boiler water level. A particularly long stand during lap 6 used up a lot of time and the run was finally concluded after eight laps.

Run 25, Alan Crossfield - Leyland SME 5in. gauge GWR 41XX 2-6-2T Large Prairie No. 4156

Alan is another of the veterans of the IMLEC competition having won the Martin Evans Trophy on three previous occasions in 1985, 1986 and 1996 with two other locomotives. Alan has finished this particular locomotive over a 9-year period and finally completed it in 2005. It won the award for the Best Exhibit in Show at Harrogate in 2005. This engine has the loudest and clearest whistle I have ever heard on a model.

The run was also blighted by a very heavy shower of rain which lasted for about 2/3rds of the run. Not to be out done by the weather, Alan put in a storming run after a slightly shaky first lap and some reductions in load. Alan completed 12 laps with lap speeds in the high 8 to 9mph. Despite the difficult conditions, Alan was very careful with the coal and finished with an

Run 25

Alan Crossfield - Leyland SME.

efficiency of 1.28% which put him into 3rd place.

Run 26, John Hurley - Kinver & West Midlands MES 5in. gauge LMS 4-6-0 Rebuilt Royal Scot Class No. 6141 The North Staffordshire Regiment

John is another of the IMLEC regulars and whilst he has never won the competition, he has been placed on a number of occasions. John has been a lifetime railwayman and was a fireman out on the 'big railway' working on both LMS and Western engines. He was also a driver on the Severn Valley Railway for a number of years.

John's entry this year was his Royal Scot which he built

from measurements taken from the full-size engine Scots Guardsman. Fitted with three double pass radiant superheaters and a double chimney, the locomotive is finished in post war LMS livery.

After a slow first lap, John dropped off four passengers and the run then settled to a more regular pattern with lap speeds around the 8mph mark. This run also suffered from wet rails due to the rain during the previous run which certainly compromised the engine's performance. The run completed a total of 9 laps and returned a respectable efficiency of 1.18% being one of the few to top 1% this year. ➡

Run 26

John Hurley - Kinver & West Midlands MES.

Run 27, Brian Remnant - Romney Marsh MES 5in. gauge Narrow Gauge Sweet Pea 0-4-2 Lady Margaret

This locomotive is based on Jack Buckler's Sweet Pea design but has many modifications from the original design made by Brian. It has a larger firebox with 32sq. in. grate area, 1½in. bore cylinders with outside Bremme valve gear. The engine has no axle or hand pumps and relies entirely on two injectors. The engine has appeared in IMLEC on a number of occasions and was the winner of the Martin Evans Trophy last year.

As last year's winner, it is now traditional that this becomes the last run of the event, just to add some tension to the finish! Brian elected to carry a total of 16 passengers, a mighty load for this engine type. However, the combination of driver and locomotive tackled the task admirably to complete a total of 12 laps without a stop. Apart from one slow lap towards the end, the train lapped the track in the 8 to 8.5mph speed range. There were some signs of slipping coming up to the crest of the two major climbs on the track, particularly the climb up to the station. The rain just about stayed off for this run, although there were a few spots about half way through.

Presentation of Awards

We were pleased to have Mike Chrisp in his role as President of the **Society of Model and Experimental Engineers** to be our guest of honour and to present the prizes. Mike is well known to the model engineering world and has been a supporter of IMLEC for many years. Introduced by club President Geoff Sheppard, Mike made a short address to the assembled masses at the end of the competition. His kind words of encouragement were most gratefully received by all the competitors and his thanks to the host club spoke volumes to all who had been at the 'sharp end'. Specifically he thanked the Bristol Club on behalf of everyone for the superb and seamless organisation of the



Brian Remnant - Romney Marsh MES.

event. The ladies of the catering team came in for a special mention as did the exhibition which included a collection of previous Bristol SMEE entries in IMLEC over the years.

So finally the awards were presented as follows:

First Place and Winner of the Martin Evans Trophy:

Neil Mortimer from Ickenham & District SME driving his Polly III locomotive.

Second Place:

Paul Tompkins from Guildford MES driving Dave Tompkins LNER B1 Class 'Gazelle'.

Third Place:

Alan Crossfield from Leyland MES driving his GWR 41XX Large Prairie No. 4156.

Best 3½in. gauge Entry:

Andrew Giffen from Reading SME driving his SAR Class 15F 4-8-2 locomotive. (Not present at award ceremony)

Best of Previous Winners:

Len Steel from Guildford MES driving his BR Britannia Class locomotive Coeur-De-Lion.

Comment

The results will provoke some debate as ever I am sure, but I think we have to take everything in context. This is not really a true scientific test, there are just too many variables and the unpredictable nature of things

conspires against too much serious analysis.

The results are affected by a number of factors, not least of all the weather. It was unfortunate that this year some of the runs were in the rain and I am sure it had an affect on the overall result.

The locomotive and driver combination is equally as important. Within our own club, we have run trials with the same engine and different drivers, the results can be significantly different depending on the skill of the driver and the load carried. A good driver will not win with a mediocre engine and vice versa.

Then there is the subject of coal. I am sure that since we ceased the full-scale mining of coal in this country, the quality of the coal we buy has varied enormously. That used in power stations is not necessarily suitable for locomotive type boilers either full-size or miniature. The noticeable downward trend in efficiencies I think is primarily due to this factor alone. The amount of coal used is possibly the most sensitive part of the calculation. Accuracy is required in the measurement and just one extra shovel full can make a noticeable difference to results.

Finally there is the selection of load. The choice of load is particularly important to the end result. Too little load and the engine does not work hard

enough to create a good overall work done figure. Too much load and the engine is always struggling and usually ends up coming to a stand on one of the rising gradients losing valuable time and wasted energy. It is my impression that drivers often opt to carry too much load with the view that it is a heavy haulage rather than an efficiency competition. The load should be just enough so that the locomotive can comfortably handle it and keep the train moving up to the speed limit throughout the run. Distance travelled as well as drawbar pull make for a good work done figure. It is down to the skill and judgement of the driver on the day to select the right load for the locomotive, the track and the conditions of the run.

As for dynamometer cars, we opted to use our own car for a number of reasons. Primarily we were familiar with our own piece of kit and we thought that it was right to use it on such an occasion. If the club owns a car then why not use it provided that it is reliable and accurate. Before the event some considerable time was spent calibrating the car and making sure that it gave reliable and accurate readings. We were extremely grateful to the Guildford MES for the loan of their car as a back up facility.

At the end of the day whilst there are prizes and kudos to be won, IMLEC provides an opportunity for some light-hearted banter with a competitive element. It provides good camaraderie between clubs and it is a thoroughly enjoyable weekend. Our thanks from the Bristol SMEE go to all the competitors and the folk that supported the event in whatever way either as spectators or helpers.

So that's IMLEC for another year. Here's to next year at Bournemouth, when it will be good to be back with the spectators, or maybe even competitors again? My own SR Bullied Pacific West Country class locomotive is approaching completion and, with a Bournemouth Belle headboard, who knows?

ME

IMLEC 2009 - Martin Evans Trophy - Final Results and Placings

Place	Run No	Owner/Driver	Society	Locomotive Description	Gauge	Wheel Arrang	Load	Run Adults	No. of Laps	Work Done (ft lbs)	Coal Used (lbs)	Distance (ft)	Ave DB Pull (lbs)	Ave DBHP	SFC	Efficiency (%)
1	1	Neil Mortimer	Ickenham & District SME	Freelance Polly III	5	0-6-0T	9	30.80	11	195,900	1,323	18084	10.83	0.198	13.372	1.35
2	4	Dave Tompkins/ Paul Tompkins	Guildford MES	LNER Class B1 "Gazelle"	5	4-6-0	12	28.15	10	243,800	1,653	16440	14.83	0.264	13.425	1.34
3	25	Alan Crossfield	Leyland SME	GWR 41XX Large Prairie No. 4156	5	2-6-2T	14	32.00	12	208,400	1,477	19728	10.56	0.197	14.033	1.28
4	10	Geoffrey Symes	Worthing & District MES	Hunslett NG Dholpur "Bolivia"	5	2-8-4T	22	34.17	12	693,100	5,104	19728	35.13	0.618	14.581	1.24
5	5	David Gregson	Private Entry	SR Maunsell Class S15	5	4-6-0	12	27.10	10	254,100	1,874	16440	15.46	0.285	14.603	1.23
6	26	John Hurley	Kinver And West Midlands MES	Mixed Traffic Engine	5	4-6-0	12	27.10	10	254,100	1,874	16440	15.46	0.285	14.603	1.23
7	12	John Cottam	Chesterfield MES	LMS Rebuilt Royal Scot No.6141	5	4-6-0	17	29.05	9	401,400	3,086	14796	27.13	0.419	15.222	1.18
8	24	Andy Siddall	Harlington Locomotive Society	"The North Staffordshire Regiment"	5	4-6-2	15	30.93	12	428,400	4,123	19728	21.72	0.433	19.056	0.95
9	2	Stuart Duncan	Bristol SMEE	"Peninsular & Oriental S N Co."	5	4-6-0	12	27.75	8	224,200	2,238	13152	17.05	0.252	19.765	0.91
10	14	Andrew Giffen	Reading SME	LNER Class B1 "Springbok"	5	4-4-0	9	31.33	13	252,200	2,646	21372	11.80	0.247	20.774	0.87
11	7	Keith Tilbury/ James Tilbury	Urmston & District MES	LNER D49 Hunt Class "The Percy"	3 1/2	4-8-2	17	30.75	11	364,300	3,803	18084	20.14	0.368	20.67	0.87
12	6	Ben Healey/ Karl Midgeley	Gravesend Model Marine ES	Freelance Polly V	5	2-6-0T	9	32.00	12	205,800	2,249	19728	10.43	0.195	21.638	0.83
13	16	James Duncan	North Wilts MES	Freelance Tank "Tom King"	5	4-6-4T	10	32.67	11	209,300	2,423	18084	11.57	0.198	22.922	0.79
14	17	Ben Pawler	Southport MEC	American Switcher "Upsy"	3 1/2	0-4-0	6	29.62	8	174,900	2,006	13152	13.30	0.183	22.709	0.79
15	22	Tony Guerrier	North London MES	GNR Atlantic "John C Bailey"	3 1/2	4-4-2	5	31.27	12	111,500	1,323	19728	5.65	0.109	23.494	0.77
16	19	Fred Matthews/ Matthew Byatt	Harrow & Wembley SME	(Maise) GWR Manor Class No. 7801 "Anthony Manor"	5	4-6-0	8	28.80	12	197,100	2,634	19728	9.99	0.213	26.46	0.68
17	8	Paul Pawler	Southport MEC	Caledonian Railway Shunting Locomotive	5	0-6-0T	6	30.70	8	119,000	1,715	13152	9.05	0.12	28.535	0.63
18	18	Ken Parker	North Wilts MES	LMS Jubilee Class	5	4-6-0	8	33.98	8	125,100	2,039	13152	9.51	0.115	32.272	0.56
19	23	Roy Gregson	Prescott DMES	GWR 45XX Small Prairie No. 4588	5	2-6-2T	14	28.18	5	115,100	2,172	8220	14.00	0.125	37.364	0.48
20	21	A. Britton/ C S Weatherley	Worthing & District MES	LMS Princess Coronation Class No. 46223 "Princess Alice"	5	4-6-2	18	29.80	4	140,000	3,175	6576	21.29	0.146	44.904	0.4
21	13	George Winsall	Rugby MES	Freelance Tender Locomotive "The Colombian"	5	2-4-2	8	27.78	8	100,000	2,425	13152	7.60	0.112	48.015	0.38
22	9	Ian Grinter	Taunton Model Engineers	GWR 45XX Firefly	3 1/2	2-6-2T	3	31.87	10	49,950	1,279	16440	3.04	0.049	50.699	0.36
23	15	Marcus Peel	Wigan MES	LMS Rebuilt Royal Scot No. 46107 "Argyll and Sutherland Highlander" LNER Class B2 "Royal Sovereign"	5	4-6-0	14	31.33	5	115,200	3,702	8220	14.01	0.113	63.628	0.28
					3 1/2	4-6-0	Retired									

IMLEC 2009 - Previous Winners Competition - Final Results and Placings

1	20	Len Steel	Private entry	BR Britannia Class No. 70007	5	4-6-2	16	30.40	13	438,900	2,601	21372	20.54	0.443	11.734	1.54
2	27	Brian J. Remnant	Romney Marsh MES	"Coeur-De-Lion"	5	0-4-0	18	29.57	12	383,300	2,513	19728	19.43	0.401	12.981	1.39
3	11	Les Pritchard	Harlington Locomotive Society	NG Sweet Pea "Lady Margaret"	5	0-6-0	9.5	31.08	11	228,200	1,620	18084	12.62	0.223	14.056	1.28
4	3	Jim Elliott	Hgh Wycombe MES	Lancashire & Yorkshire Aspnall A Class GWR 57 XX Pannier Tank (Speedy)	5	0-6-0T	9	27.23	7	126,800	1,367	11508	11.02	0.142	21.346	0.84



TERENCE HOLLAND

Terence Holland revisits some of LBSC's interesting projects from the 1950s.

Steam calliopes, whistles and wind chimes

Table 1 - Pipe frequencies and lengths

Musical note	Name	Frequency (Hz) cycles per second	Pipe length inches uncorrected
D sharp		1244.51	3.20
D6		1174.66	3.39
C sharp		1108.73	3.59
C6	Soprano C	1046.50	3.81
B5		987.77	4.03
A sharp		932.33	4.27
A5		880.00	4.53
G sharp		830.61	4.80
G5		783.99	5.08
F sharp		739.99	5.38
F5		698.46	5.70
E5		659.25	6.04
D sharp		622.25	6.40
D5		587.33	6.78
C sharp		554.65	7.18
C5	Tenor C	523.25	7.61
B4		493.88	8.07
A sharp		466.16	8.55
A4		440.00	9.05
G sharp		415.30	9.59
G4		391.99	10.16
F sharp		369.99	10.77
F4		349.23	11.41
E4		329.63	12.09
D sharp		311.13	12.80
D4		293.66	13.57
C sharp		277.18	14.37
C4	Middle C	261.63	15.23
B3		246.94	16.13
A sharp		233.08	17.09
A3		220.00	18.11
G sharp		207.65	19.19
G3		196.00	20.33
F sharp		185.00	21.53

Rummaging through old copies of the *Model Engineer* recently I noted that for Christmas 1952, LBSC offered a design for a steam organ otherwise known as a calliope. If you are familiar with old American films featuring Mississippi river boats you will probably have seen and heard one being played - the instrument is very spectacular with puffs of steam escaping all over the place and it has a very pleasant and distinctive mellow sound. Curly called his scaled-down version a 'Calliopette' and the article was published in the *Model Engineer* in mid-October 1952 - "with plenty of time for the average worker to make the box of tricks set out below"! - His words, my exclamation marks - and all that before Christmas Day... The job consisted of a copper boiler with fittings and plumbing, a spirit burner (poison gas plant!) and a whistle manifold with 25 steam valves! And, of course, a similar number of carefully tuned steam whistles of various lengths and diameters. Further to that "the operator should be able to play simple tunes after only a few minutes practice"! (again my exclamation marks). Typical LBSC - who was capable of a prodigious work output unlike many of the rest of us. And all this in just four pages of text!

I don't intend to provide a complete description of how to make a modernized version of the Calliopette, but will give some guidelines before moving on to something which is also musical but much easier to make - life's too short as they say and wind chimes are fun to

make and listen to on a breezy summer's day. They also make ideal presents for friends and relations - soon the local hills will be alive with the sound of music! This reminds me of my octogenarian Uncle Victor in Australia who is a wind chime fanatic - he ended up having so many in his garden that he got an ASBO from his neighbours and had to take them down. The last time I saw him he gave me a couple and got me hooked on the things. It's all his fault!

Calliopette

To be honest, Curly's article was very brief and referred to his 'regulation' items such as valves, whistles etc. previously published, without going into any great detail. I doubt if many Calliopettes were actually made and would be surprised if he himself had made one. Musically, he proposed a full octave of eight notes along with five semitones - with five or six additional notes above and below the range of the octave. This amounts to about 25 notes in all - a mammoth piece of metalwork, but it also demonstrated Curly's comprehensive knowledge of subjects other than the construction of miniature railway locomotives.

Now, Curly's article included the construction of a boiler and "poison gas plant" (his words for the spirit burner, not mine) but I don't propose to reiterate this because in this 21st century most of us model engineers have a workshop steam plant or, if not, some engine or other which will be able to supply the necessary steam or failing

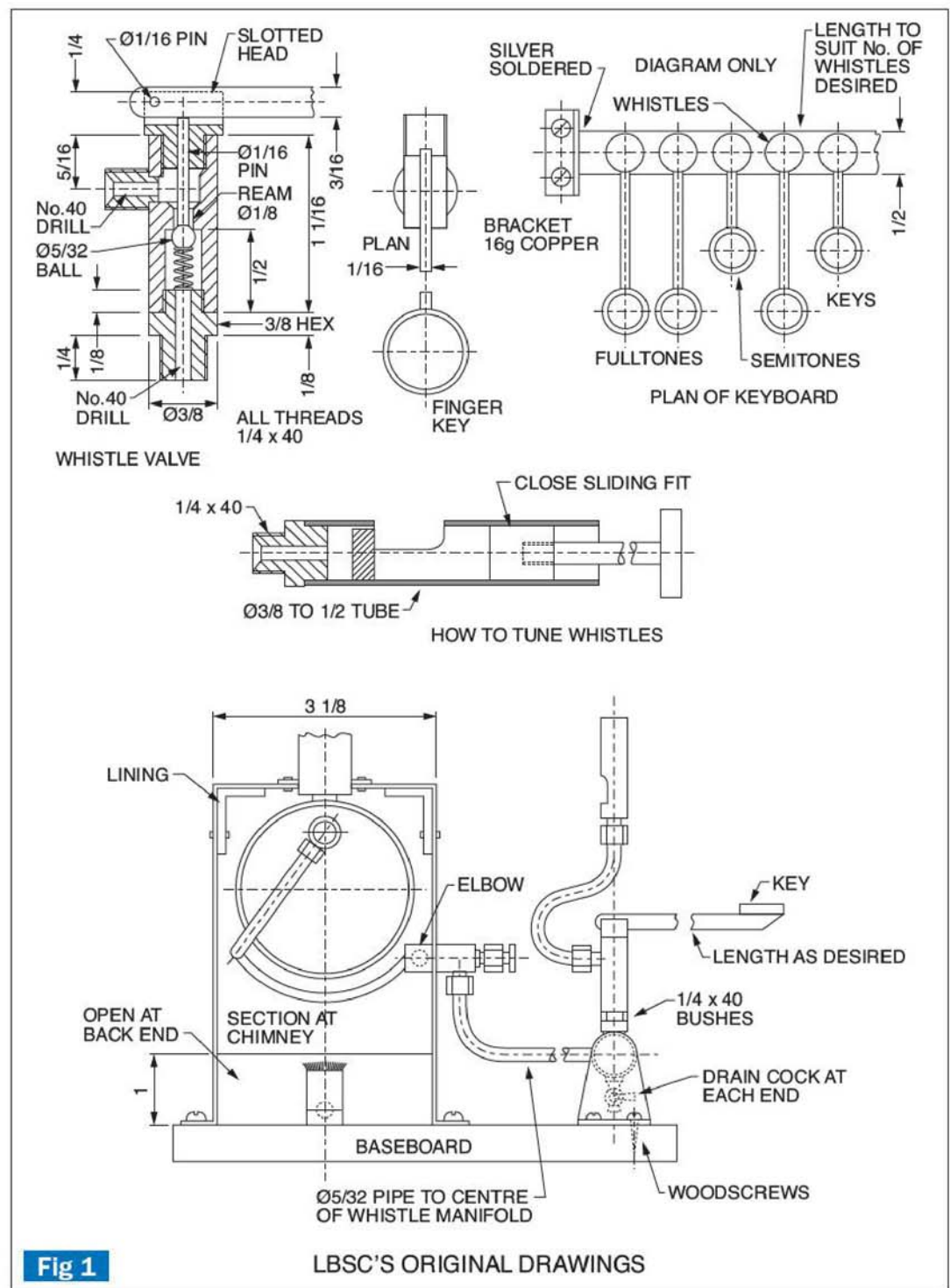
Table 2.- End corrections for various pipe diameters

Pipe diameter inches	End correction inches
$\frac{3}{8}$	0.11
$\frac{1}{2}$	0.15
0.59in. (15mm)	0.18
$\frac{5}{8}$	0.19
$\frac{3}{4}$	0.23
0.87in. (22mm)	0.26
1	0.30
1.5	0.45
2	0.60

that a small air compressor. **Figure 1**, taken from Curly's original article, gives a general idea of the main components. Curly's distinctive general arrangement drawing entitled 'Chimney end of the calliope - how to connect up', shows the relative positions of the boiler, the keyboard and the steam whistles. Figure 1 also show his design for the steam valves which would most certainly benefit from PTFE washers fitted between the stainless ball and the main body of the valves. These could quite easily be made in bulk from a length of $\frac{1}{4}$ in. dia. PTFE stock but would need to be a tight push fit in the body. Apart from this slight modification the design should be quite adequate today.

Steam whistles

Figure 1 also shows his rudimentary design for the whistle or pipe entitled 'How to tune whistles'. He provided little other detail but I have shown a more detailed design in **fig 2**, with some suggestions as to the proportions and **Table 1** gives details of the frequencies and lengths required for a suitable range of pipes. If piano-based 'middle C' (or C4) is taken as the start of the octave then the pipe will need to be about 15in. long, taking the end correction into account, so it might be better to base the Calliopette around 'Tenor C' (or C5), which is the next highest octave, in which case the pipe will be about 7in. long. The biggest pipe in this case (six notes below C5, that is F sharp) would be about



10in. long. You pays yer money and you takes yer chance! Note that these data are for steam in closed pipes and the lengths would be a bit shorter for organ pipes operating in air as the speed of sound in air is less at 13,510in. per second.

A closed pipe has a fundamental frequency which is an octave lower than that of an open pipe; that is, half the frequency. The formula for the acoustics of a closed pipe is as follows:

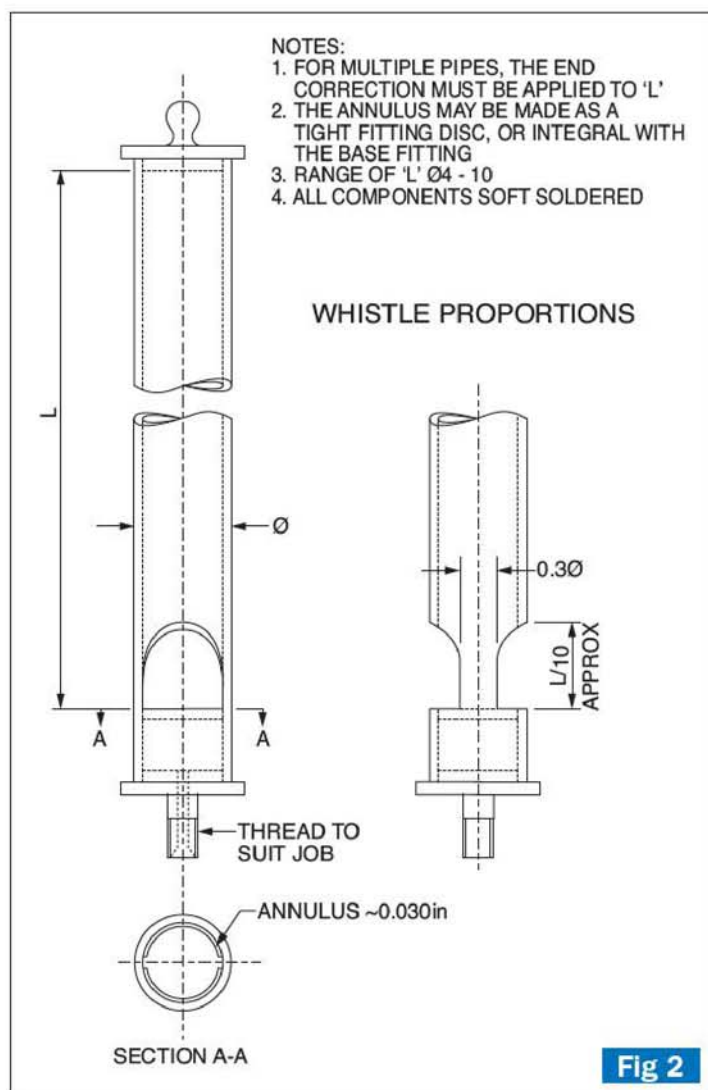
$$f = nv/4l$$

where f is the frequency in hertz (cycles per second), v is the velocity of sound in steam (15,936in. per second), and l is the length of the closed pipe in inches, without taking the end correction into account. For our purposes we can ignore the harmonics and n therefore becomes unity for the fundamental frequency; that is $n = 1$. Higher values of n relate to the harmonics which in a closed

pipe are odd numbers; i.e. n is 1, 3, 5 etc. (note that steam whistles do have harmonics and that harmonics are responsible for the characteristic sound of any musical instrument). The length of the closed pipe for the fundamental is therefore as follows:

$$l = v/4f$$

An end correction must be subtracted from the figures in Table 1 according to the pipe



diameter chosen. This end correction is equivalent to the tube diameter multiplied by 0.3, as detailed in **Table 2**. An end correction is necessary because the air immediately outside of the open end of the pipe takes part in the acoustic oscillation. This makes the pipe appear to be acoustically longer than its physical length. The end correction must therefore be subtracted from the calculated length to achieve the correct frequency.

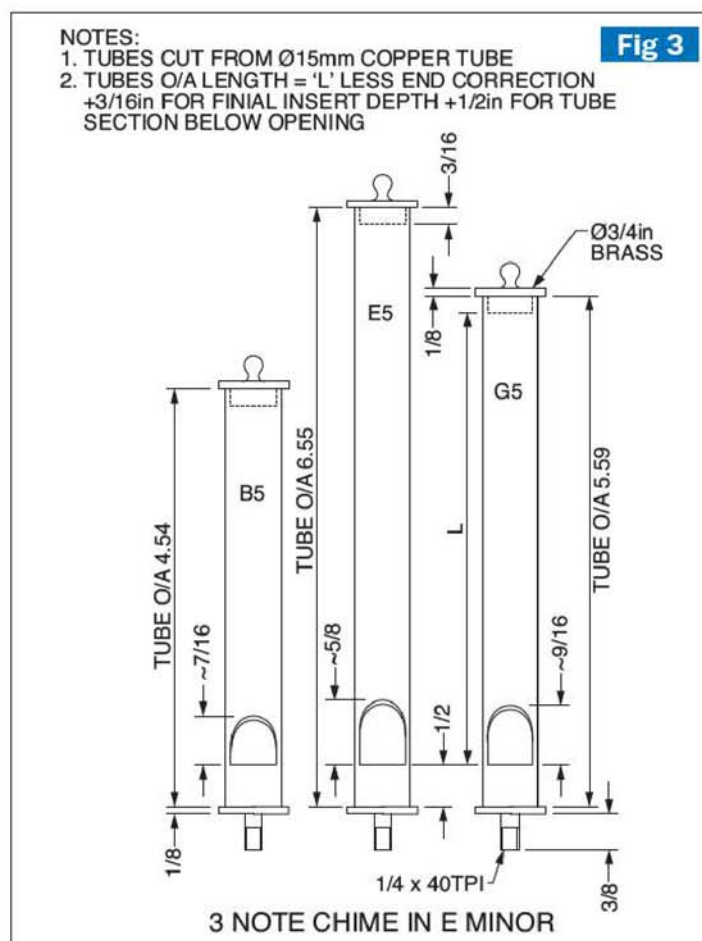
Details of pipe length and other parameters for closed pipes are presented in fig 2.

The data in Tables 1 and 2, of course, would be of value to anyone wishing to reproduce an authentic locomotive sound, providing that the original note is known. They also allow the manufacture of twin or multiple chime whistles which would be musically in tune.

As a matter of interest, the White Star liner RMS *Titanic* was provided with a chime consisting of three separate whistles of 9, 12 and 15in. diameter. These pipes have been salvaged and a video of them operating on compressed air is viewable on YouTube. Typical musical note combinations for a selection of chords are presented in **Table 3**.

Table 3: - Typical chords

Chord	Major	Minor
C	C, E, G	C, D sharp, G
D	D, F sharp, A	D, F, A
E	E, G sharp, B	E, G, B
A	A, C sharp, E	A, C, E



These would provide a suitable starting point for making chime whistles. A three-note chime, based on the chord of E minor, is detailed in **fig 3** and shown under test in **photo 1**.

Before leaving steam whistles, I would like to mention the subject of tuning whistles to give a good note. As far as I can see any frequency is acceptable for a single note. I remember having a Swanee (Suwannee or slide) whistle as a child and that gave a clear, constant note throughout its range. Any length of pipe must therefore be acceptable as a whistle, unless of course you wish to be at 'concert pitch'; but how many steam locomotives ever got involved in the Proms at the Royal Albert Hall? Musical notes are relative to each other, and as long as you are not playing with other musicians all will be okay.

It is, however, important to take the end correction into account when constructing a series of pipes, as the end effect will be greater proportionately for a shorter pipe than the correction for a longer one. I also note that



the diameter of a pipe does not affect the pitch, it merely changes the volume; the bigger the pipe diameter the louder the volume. But if a pipe is long and of too small a diameter, it is possible for the harmonics to take over. The pipe will then be 'over blown' and will screech, with loss of the fundamental. The ideal ratio is that the pipe should be about four times longer than the diameter, although there is much leeway in this and lengths of up to about ten diameters are acceptable.

Table 4: - Lengths for 22mm copper chimes

Musical note	Frequency Hz	Tube length mm	Hang point mm	Musical note	Frequency Hz	Tube length mm	Hang point mm
C7	2093	222	49.8	F4	349.3	544	122
B6	1975.5	229	51.3	E4	329.6	561	126
A sharp	1864.7	236	52.8	D sharp	311.1	577	129
A6	1760	243	54.4	D4	293.7	594	133
G sharp	1661.2	250	55.9	C sharp	277.2	611	137
G6	1568	257	57.6	C4	261.6	629	141
F sharp	1480	264	59.2	B3	246.9	647	145
F6	1397	272	61.0	A sharp	233.1	667	149
E6	1318.5	280	62.7	A3	220	686	154
D sharp	1244.5	288	64.5	G sharp	207.7	706	158
D6	1174.6	297	66.5	G3	196	727	163
C sharp	1108.7	306	68.6	F sharp	185	748	168
C6	1046.5	314	70.3	F3	174.6	770	173
B5	987.8	324	72.6	E3	164.8	793	178
A sharp	932.3	333	74.6	D sharp	155.6	816	183
A5	880	343	76.8	D3	146.8	840	188
G sharp	830.6	353	79.2	C sharp	138.6	864	194
G5	784	363	81.3	C3	130.8	890	199
F sharp	740	374	83.8	B2	123.5	916	205
F5	698.5	385	86.2	A sharp	116.5	943	211
E5	659.3	396	88.7	A2	110	970	217
D sharp	622.3	408	91.4	G sharp	103.8	999	224
D5	587.3	420	94.2	G2	98.0	1028	230
C sharp	554.4	432	96.8	F sharp	92.5	1058	237
C5	523.3	445	99.7	F2	87.3	1089	244
B4	493.9	458	103	E2	82.4	1121	251
A sharp	466.2	471	106	D sharp	77.8	1154	259
A4	440.0	485	109	D2	73.4	1188	266
G sharp	415.3	499	112	C sharp	69.3	1222	274
G4	392	514	115	C2	65.4	1258	282
F sharp	370	529	118	B1	61.7	1295	290

Wind chimes

Continuing with the subject of 'model-engineered music', I think we'll leave the Calliopette for the time being (the maths are too complicated for one thing!) and we will proceed with constructing the wind chime. It's far less work than a calliope and you don't have to learn how to play it! Ah! *Music of the Spheres* I hear you say - well *Tubular Bells* actually!

I have always fancied one of those really big wind chimes like the ones you see in the garden centres (not to annoy the neighbours of course!) but found it difficult to part with the money to buy one, when the same money would buy an awful lot of model engineering materials. Eventually I gave a thought to making one myself from copper and brass, which are materials that most of us are familiar with handling.

Using conventional model engineering techniques it proved quite easy and I have since made several of various sizes. The key to making a wind chime with a pleasant sound is, surprise, surprise, to get the thing in tune and this is not difficult as long as the tube lengths are correct and the tubes are suspended at the correct point on their length - more of which later. As only individual notes are played, it makes little difference which notes are chosen. However, longer tubes tend to produce a mellow, more interesting sound, as they are influenced more by the harmonics than the shorter lengths; that is, pipes in the range C2 to C4 will produce the best sounds but will be more expensive to make because of their extra length.

Wind chime construction

Now the ideal sized tube for a big one is about 1in. dia., but the nearest I had was a couple of lengths of 22mm copper plumbing tube left over from that last central heating job. Most of you DIYers out there probably have a small stock of this which 'will come in handy one day'. If not, it's fairly cheap and easily available at the local DIY store. My first port of call in my quest for knowledge was the internet where I found a wealth of

information about construction and, most importantly, tube length and tuning information.

The wind chime design I propose to describe consists of a set of tubes, a suspension plate, a striker, two support spigots, a wind vane and the suspension cord.

The lengths of the tubes are taken from **Table 4** which presents data for 22mm dia. copper tube. There are no hard and fast rules about which sizes to use except that, as stated above, the longer sizes make for a better sound.

Table 4 lists the sizes required for a series of chimes along with the point at which the

chime should be suspended. This suspension point is at a node and therefore the sound of the chime is not damped when suspended at this distance from the top. Note that there is a node at each end of the tube and therefore it would be possible to make a double chime with two sets of five or six pipes and two strikers. The bottom set of pipes would be suspended from the bottom node point of the top tube. I don't know what this would sound like as I have yet to make one. The node points are situated at 22.4% of the total length from each end. The suspension holes in the base of the top tube and the top of

the bottom tube would need plastic bushes to prevent the suspension cords from touching the pipes.

The lengths are specified in millimetres, as it is much easier to mark out the copper tubes using metric dimensions and plus or minus 0.5mm is plenty accurate enough; particularly with the longer tubes.

Other metals can, of course, be used and chimes have been made from steel conduit and aluminium tube with each metal, apparently, contributing its own characteristics. However, note that Table 4 is specific for 22mm copper tube.

● To be continued.



KEITH
WILSON

Keith Wilson looks at filler caps and air-vents on tanks and water scoops.

WILSON'S WORDS OF WISDOM

As long as human beings divide themselves into groups marked off by trivial culture differences and consider these differences worth dying for... we shall have wars.

Isaac Asimov.



Bob Symes' Electric Garratt/Swiss 'kroc' on the gauge 1 track.

I mentioned a little time ago that all prime numbers (numbers indivisible except by 1 or themselves) were in the form $(6 \times N) \pm 1$. But, being almost human, I missed the one exception. The prime number 3 is the exception. I would like to think that most readers noticed this. Sorry! In some ways, 2 could be an exception too, but since the series of natural numbers is infinite and 2 is the only even prime, it follows that the odds against it are $1/\infty$, showing that 2 cannot exist for the odds against its existence are infinite! You just can't win!

The formula works out as Six times N plus or minus 1 where N is any whole number.

So if we take N as the number 5, six times 5 is 30. Add or subtract 1 and we get 29 and 31; in this case both are primes.

Taking N as 4 we get 24 plus or minus 1, giving 23 and 25. 25 is not prime, but 23 is.

N as 7 gives $42 = \pm 1$, and this gives 41 and 43, both primes.

N as 20 gives 119 and 121. Neither is prime. 121 is the square of 11 while 119 is 7×17 .

The point is that if a possible prime (primes must all end in 1, 3, 7, or 9, apart from the first few; 2, 3, 5 and 7) and if the

possible prime is of the form $6N \pm 1$ then it may be a prime but if it is not, then it cannot be prime.

As you will note from the above examples, all primes are $6N \pm 1$, but not all $6N \pm 1$ are primes.

"Next train's gone"!

Mathematics and astronomy are about the only two sciences where amateurs can be materially useful. Incidentally, the famous film comedian Will Hay was an amateur astronomer. His most famous film (to railwaymen) was *Oh, Mr. Porter!* together with Graham Moffatt and Moore Marriott. A notable scene in this film is when the heroes are trapped in a windmill and escape by clambering out onto the sails. Just once, all four sails can be seen one after the other, and all four are showing bodies on them! The opening scenes (on the 'lead-in') were taken from the back of a train, and then shown back-to-front so it looked like looking ahead, on the wrong line! Some scenes on the 'chase' before the end took some very careful posing of rolling stock; in fact one scene was shot and shown six times (from different viewpoints). In none of them can the camera(s) filming the other five be seen.

Not that it matters, but one of Will's films (*The Goose Steps Out*) just before WW2 had the first ever screen appearance of the late Peter Ustinov.

Tender topics

The matter of filler caps and air-vents on tanks arises itself. On tanks the vents are not so important for tank locomotives were not generally fitted with water scoops. The experiment was a failure, not so much of the need for scoops to be 'two-way' but for the fact that either vents were not fitted, or were too small. One or two cases occurred where tanks suddenly grew much bigger and at least in one case exploded. Twenty gallons per second requires adequate provision of a way-out for entrapped air! However, it can result that without a vent the extraction of water from the tanks by the injectors requires some ventilation for it is possible (although not very likely!) that the tender or tanks could be airtight or nearly so.

On GWR tenders, as the size increased - 2,000 gallons; 2,500 ditto; 3,000; 3,500; 4,000 from 3,000 upwards the vents increased in size (I don't know about the two smallest sizes); 3,000 vents were round, 3,500 were round but larger, the big 4,000 gallons had semi-rectangular vents. I don't know the reason(s) for this but possibly the belief that bigger engines had the bigger tenders and travelled at higher speeds might have applied.

Many years ago I had a car that would go steadily for many miles (I think it was about 50) and then pack up. I eventually

traced the problem to lack of vent, but it was not apparent at first. For on short trips the tiny air-leaks in the petrol tank would have time to equalize pressure; for longer trips this would not be sufficient. Drilling a small hole in the filler cap solved the problem.

Around about 1955, somebody, not over-brilliant in mathematics, wrote in these pages that for a scoop to work the speed must be over 18 miles per hour. Therefore, to attempt using scoops and troughs is impossible for our sizes. However, the effect is scaleable, for operation depends on speed as well as size. Fluid dynamics are mighty queer cattle, but an approximation suggests that the critical speed for a 7.25in. tender is about 5mph. This is only a guess, empirical methods must prevail. Empirical - basically, suck 'em and see - try it out.

Anyway, they are probably unnecessary for us, but they look well and are easy enough to make. They could be dummies, but there is hardly much point as it is not hard to make them work.

Filler caps are self-evidently essential. Some had clamps of a sort to hold the lids down, but I have only noticed these on tanks. I have noted two types on the big tank locomotives; one with a screw handle and one with a form of toggle lever which was much quicker to operate. On the big Prairies, the filler caps were oval in shape, on tenders some had two fillers;

one each side at the back. They were 'Squircular' in shape; later one round one on the centre-line of the tender was common. As far as I know, tender filler caps had no locking devices. In the case of that ugly Great Bear tender, there was an access plate, in theory bolted down, that was located immediately over the top of the scoop. Need I say more, but 'oops'?

In some cases (our sizes now) a large filler unit can well be used - I write here mainly of narrow-gauge locomotive tenders - about 4in. diameter is not rare - and in such a case no hinges are really necessary because the weight of the cap is sufficient to hold it down, but for 'scale' or main-line locomotives the hinge type is not only 'scale' but advisable - it would be only two easily 'lost' for not all people have non-stick fingers.

Scale headlamps

The same argument applies to headlamps - they look very nice - especially when made with LEDs and a small battery. Many GWR lamps had attachable coloured glasses available to show white or red so they could be used for head or taillights. I understand that all headlight 'codes' could be displayed with two lights, the exception being four lamps for a Royal train. I forget when I started supplying lamps with locomotives, but it must have been at least by the late 1970s. It paid off once; a King in Los Angeles was running with public trains, when the British



Some 10 1/4 in. gauge locomotives.

Ambassador had a ride. Since he represented the Queen, the driver and a friend used all four lamps in front to be a Royal Train.

Whilst I am at it; when you make Perspex or similar lenses for your lamps do not paint the outsides red or white, but after polishing outside and inside paint the inside red or white as desired, they will look infinitely more realistic.

Headlamps can 'grow legs' quite easily; there are two fairly obvious 'cures' for this. One is a bolt from underneath the running plates; the other is to drill a small hole through the bracket and the lamp 'mount'. A split cotter through this hole makes it somewhat harder to 'come loose'.

This reminds me of a little incident at Walsall Arboretum. I had uncoupled from the train

prior to turning the engine round. An interested member of the public complete with obnoxious son was looking closely. As I opened the regulator to drive to the turntable obnoxious leant forward and tried to push the engine over. This was very short-lived, for he pushed hard against the smokebox with both hands! Oops! Father told him off in no uncertain terms! The locomotive was my own largest Prairie.

'Scale' day at Leyland

Weather was very fine - no blazing sunshine to cause ultra-violet skin burning and very little wind. Ideal for 'playing trains' and for giving rides to the public, who surprisingly were present in queue-forming numbers. Whilst on the matter ➤



A 15in. big one!



A GWR/ British Rail Prairie tank.

5



The GWR, LNER and LMS working together.

of the public, the coming of the £1 coin has been a godsend to public running, for you can charge for rides of course or give them free, with two or three 'donation' boxes prominently displayed - locked and fixed firmly to a railing or something similar. From my experience at various tracks - it pays.

I would like to have pictures of all locomotives operating, but could hardly ask for six pages. Even with that privilege, it would take up a lot of space that would probably be better used. Also, when one can only get around on an electric chair, finding the right place to get reasonable photos without filming against the sun, or with highly distracting backgrounds is not quite as easy as writing about it is. I took one shot of a nearly-finished locomotive that looks much unfinished because the dark green of leaves in the background complete with 'black holes' between leaves made the chimneys very hard to see. This was not obvious at the time of photographing.

Pulling passengers on the main line (7½in. gauge) were a Tinkerbell, a well finished B1, a Royal Scot, an 0-8-0 (not sure of prototype, but could be an American switcher), a good looking Isle of Man 0-6-0 'Caledonia' and running but not generally taking passengers

(under test) two good-looking 'Dean Goods'. They did not run at the same time (double-heading) but were none the worse for that. Near the end of the day all steamers went down to the yard to clean up, but many potential passengers were still queuing so a couple of diesels took over.

Pulling passengers on the 'el' (elevated 3½ and 5in.) were some very interesting locomotives, of types not often seen. A Garratt in 3½in. gauge took my attention, a couple of Metropolitan 'Growlers' (5in.) did their stuff, and what looked like two of Edgar T. Westbury's 1831 Diesel Shunters (0-6-0) were running in tandem (double-heading) controlled by one person. A Saint, a B1, some big prototype Diesels, a Prairie (not GWR), a 'Jeannie Deans' and even that number of engines does not complete the list.

I only managed to get a distant picture of the Garratt; alas when I got to it one of the pillars of the steaming-bay's giant parasol was smack in the viewfinder; in the few seconds it took for me to move for a good shot the locomotive was in two parts, seconds later it was in three!

On the matter of the 'growlers' it might not be too well-known that Hornby did one of these for gauge 0. What is possibly less well-known is the fact some early

ones were for full mains voltage, 240 volts! I can visualize the HSE foaming at the mouth at the very idea! How many were sold is unknown to me, how many severe burns resulted is also not known, perhaps just as well. Complete electrocutions were not too likely because the two poles of the voltage were only about ½in. apart and unless two hands landed, one on each rail, then shocks and burns were more probable.

A little matter that amuses me is the use of 'scientifically proved' that so-and-so is the best in TV advertising. Apart from some mathematical matters, Science does not and cannot 'prove' anything; it can verify matters indefinitely, getting

the same result every time, but that is not proof. Science can sometimes disprove something, but never the other.

A little puzzle

I have been intrigued by a little mathematical 'puzzle' that has been going around emails for a few weeks. You are invited to choose a two-digit number, subtract the sum of the two digits, then think of your number for a while, when the screen will flash up a small picture that somehow or other is relevant to your number. It seems incredible at first.

However, an alert mind will notice that every two-digit number $(10a+b)$ minus the sum of its digits $(10a+b)-(a+b)$ results in $9a$, a multiple of 9. So all the composer needs to do is to put the same picture on each multiple of 9 and that's it.

Another mathematical trick of similar style is to write down the first 9 digits omitting the 8, and then ask someone which digit they find hardest to write. Silently multiply this digit by 9, then tell them to multiply those first 9 less the 8 by the number you have just calculated. They will be only too pleased to find that the result is a line of their difficult digit! Example, $7 \times 9 = 63$. $12345679 \times 63 = 777777777$.

The key in this case is that $\frac{1}{9}$ is .11111111, and this number again divided by 9 is .012345679. The multiplication by 9 hides the 'secret'. .111 etc. being a repeating decimal, the trick could be carried on indefinitely.



Bob Symes' large Great Western tank locomotive.

How to be a model engineer in seven easy steps



ANDY STAIT

Andy Stait looks back to when he started model engineering.

As someone who has taken up model engineering comparatively recently, I thought my experiences might help potential beginners avoid some of the mistakes I have made. These are obviously my own personal opinions and may court controversy, but I can't see why some of these ideas won't be applicable to other readers.

As our traditional manufacturing industries have disappeared from the UK, a model engineer may no longer be a time served, tool room engineer. You may be like myself and have an electronics/IT background and the only metalwork you have done was 40 years ago at school.

I've always had an interest in British steam locomotives and was aware at an early age, that my father had a cousin who built live steam models. This

seemed to be a quite incredible achievement, but I kept alive the dream of one day owning or building my own locomotive. I had dabbled with OO model railways and moved on to scratchbuilding in brass and solder. A desire for something bigger made me briefly consider O gauge, but I thought it better to go for a larger live steam model, like those I had seen at fetes in my childhood.

A step in the wrong direction

Like a lot of people with a young family, money was always tight, so I became adept at car repair and pretty handy at DIY. I thought my extensive collection of tools would only need supplementing with a lathe. About 15 years ago a Myford ML4 was advertised in our local paper. Remembering that I had used Myfords at school, it seemed just what I needed and a bargain at £200, especially as two of the three chucks were still in the packing grease. I now thought I was a model engineer.

I know that good work can be done on an ML4, but not by someone as inexperienced as myself. I tried some simple metal cutting exercises, but in the end only used it to machine some bolts to length for a lawn mower repair - a job I could have done with a hacksaw! It might be a case of a bad workman blaming his tools, but I couldn't cope with the lack of any graduations on the handles.

I didn't know how to get started. The few books in the local library seemed very advanced and most dealt with clock making. I was aware that there was a magazine called *Model Engineer*, but I presumed that it had ceased publication as I could never find it in the newsagents. I bought a copy of LBSC's *Simple Model*

Locomotive building - Tich, from a model railway shop and this seemed to tell me some of what I needed to know, but I had no idea where to get materials from, especially the castings that were called for.

Help

I realised I was never going to get anywhere without some help. An engineering course at an evening class would have been nice, but where can one find these nowadays? A house move 10 years ago, made me determined to join a local model engineering group, but even this wasn't easy. There was nothing in the society list at my local library. The local model shop thought there was a group in Hereford, but didn't know where. There was nothing at the time in the Hereford library. Of course this should now be a lot easier with the widespread use of the internet.

It was only by chance that I saw an advertisement in the local paper for an open day at the **Hereford Society of Model Engineers**. I went along and was made to feel very welcome. At the first Friday evening meeting I went to, I was introduced to Stan, who readily acts as a mentor to newcomers to the hobby. He invited me to his house, showed me around his workshop and discussed suitable projects to get me started.

It was immediately apparent that a more suitable lathe was required and that amongst my tool collection, two files, a centre punch and a hacksaw isn't much of a metalworking shop!

First lesson learned

If you have little or no metalworking experience, join your local model engineering club. You will have access to a huge source of knowledge that most members will readily share. ➤



A full-size GWR handrail.

Workshop upgrade

I subsequently found a Myford Super 7 for sale on a website bulletin board. The cost of this was offset by selling the ML4 for what I had paid for it and I kept the two new chucks.

Shortly after I had joined the Hereford SME, the club put on a coach trip to the Model Engineer Exhibition in London. This was a revelation. It was here that I realised what model engineering was all about. It provided inspiration, a source of materials and I was able to build up a good collection of tools at a very reasonable price.

Second lesson

I make no apology for repeating an oft-quoted adage: *"buy the best tools you can afford"*. More of this later.

Making a start

I was given a locomotive chassis to get me started and I bought the wheel castings and some axle material. I quickly foresaw that I wouldn't make much progress with the free time I had available, so I bought a nearly completed LBSC *Molly*. I had this for about a year and made very little progress. It wasn't until I had a broken leg

and managed to spend four weeks perched on a bar stool in the workshop that it began to look any different. I had kind of assumed that having a workshop was enough and models and locomotives would almost make themselves. I hadn't factored in the time required. I was told very early on, that it takes 1,000 hours to build a locomotive i.e. 10 hours a week for two years. I think that only applies to small models built when you are experienced; be prepared to put in some hours.

I also discovered that you can't complete someone else's model just by following the drawings. When I make a part, I always mark any small error on the part with an indelible pen; you can then make a corresponding allowance on the mating part.

Third lesson

Make time. Most weekday evenings, I come home from work and now go straight into the workshop for about two hours. This still leaves me time and weekends for the family and the normal household duties and has become an accepted part of my daily routine.

Building up experience and knowledge

I'm a great believer in reading. Since joining the club I have become aware of vast amounts of literature on model engineering. When you are a beginner, if you are not in your workshop, use any free moments you have to read about techniques and constructional projects. My favourites are the early editions of *Model Engineers' Workshop* (No offence David, it is still a great magazine!). I think these are a winner, because everything was new at the time. A new magazine with new writers writing about new experiences. They are full of tips and the articles have more of a bias towards beginners.

Reading also helps you plan to be productive with your precious workshop time. I like to go into the workshop with the intention of knowing exactly what I am going to do. But, more important is to do something. If I can't produce what I intended i.e. because I discover I don't have the correct size material, I will do something else, rather than waste time.

I have found that I make the best use of time, when I go into

the workshop to perform the next operation on a piece I was working on yesterday.

Fourth lesson

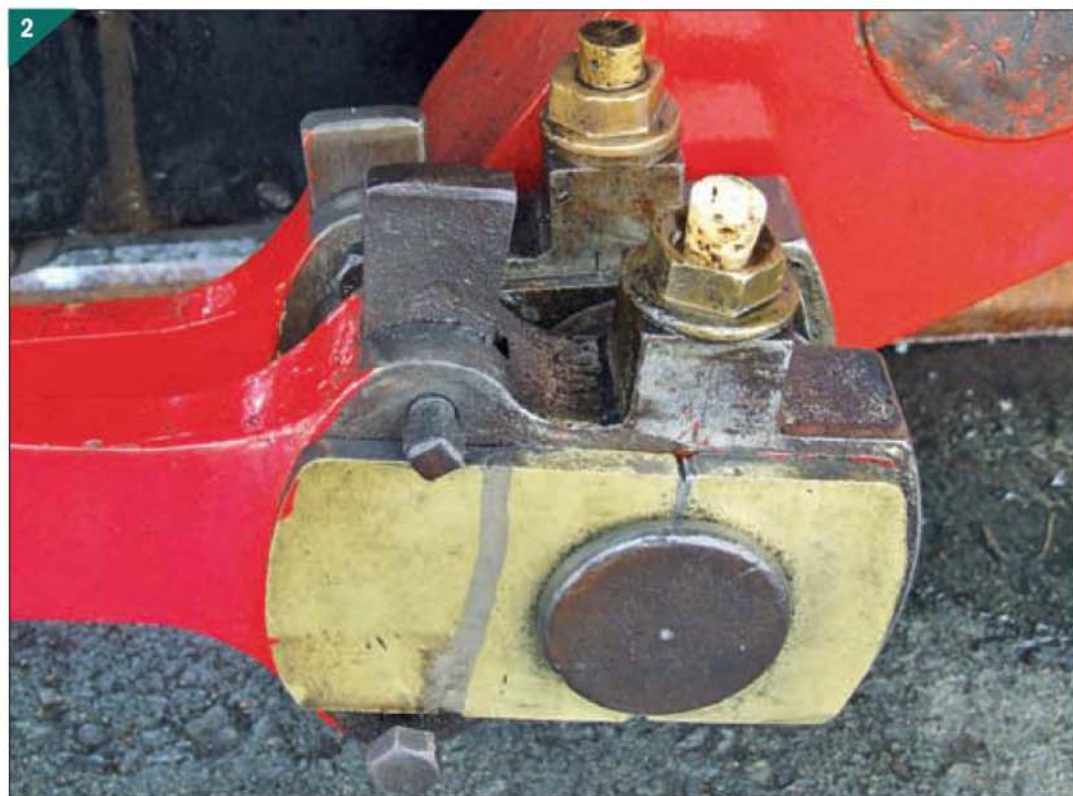
Do something every time you go into the workshop, even if it is only to tidy up and prepare for the next job. Don't be disappointed by how long some operations take - it can sometimes take two hours to drill one hole.

Making the same mistake - again!

I got to the point, four years ago, where a milling machine would be useful, but fell into the same trap that I'd made with the ML4. I bought a small milling machine that had been converted from a small horizontal machine. It quickly became apparent that it wasn't suitable for anything but the smallest workpieces. I wasted no time in looking for a bigger machine. I considered the popular Far Eastern machines but discovered that a dealer could provide a fully equipped Bridgeport for similar money. At £600 plus £20 for delivery, it became the most expensive machine I own. I get a real sense of pleasure every time I use it and now I can't blame my tools.

For my money, I think a quality second-hand, British made tool or machine, beats an oriental offering nearly every time. There are a couple of exceptions; the universal bandsaw is a very useful machine as long as you modify the stand, either to your own design or copy one of the ideas published over the years. Tools by Vertex seem to be very well made and offer very good value. I think it is a question of recognising quality when you see it; experience and visits to model engineering shows is invaluable here. Anything by Mitutoyo, is to be highly recommended. A £10 pair of digital callipers are a great asset and they are cheap enough to add to machines as DROs.

Car boot sales are the place to get the best tool bargains, particularly if the seller does not appreciate their worth. Ebay is another good source, but expect to pay more. If you can



A full-size connecting rod bearing.

find a bankruptcy auction, all
your dreams will come true.

I once went to a clearance sale of a small engineering firm, where I was bidding against a few enthusiasts and dealers. Dealers are looking at their mark-up, so won't want to pay as much as an amateur. Most lathes, fully equipped with chucks and collets sold for around £150. Not a single machine cost more than £200 and these weren't all large industrial machines either, some would have been very at home in a small workshop. Smaller tools, like vices and grinders went under the hammer for between £10 and £20.

Fifth lesson

Learn to recognise quality in tooling. Expect cheap tools to have limited life and precision. If you have the space, industrial machines offer the best value.

Standards

Model engineers seem to have their own etiquette and are never critical of your work; at

least not to your face! Don't be too disappointed of the quality of your earlier work, we all have to start somewhere and we aren't going to produce work to exhibition standard immediately unless we discover a latent talent. To make progress, you need to accept that a part you have made is 'good enough'. I have a very small scrap bin, as most of what others would regard as scrap is on a model somewhere. It may not look pretty, but it functions okay. There is a danger of being 'too close' to a part whilst it is being manufactured. Parts I was disappointed with when completed, now look perfectly acceptable a year later. You have only to look closely at a lot of models to see that these have imperfections. Remember, most of the prototypes we try to recreate were made in Victorian times with techniques closer to Blacksmithing. **Photograph 1** shows detail of a handrail on a full-size GWR locomotive; look at the neck. These tool marks are very easy to recreate as

most readers will be aware. It is not too difficult to improve on this finish.

Sixth lesson

There is no right or wrong way to make a part. By all means take advice, but at the end of the day do whatever works for you and the facilities you have to hand.

Rectifying mistakes

It is very frustrating to spend hours making a part, only to wind the milling machine handle in the wrong direction or even turn the wrong handle as I have done in the past. Likewise, too much cut can easily be put on a tool. Don't be ashamed to use some car body filler to cover these mishaps; that nice shiny paint finish on your lathe has only been obtained by covering the castings in filler.

If the part is finished as bare steel, a welder is very useful for putting a bit of metal back. I once obtained some laser cut connecting rods that had a deep wound

at the end of the cut. I should have returned them, but time and postal costs dictated it was expedient to put a blob of weld over the mark. As long as there are no slag inclusions or you use a MIG welder, this technique is surprisingly versatile. I have also used it for fabricating parts, rather than perform a lot of machining from a solid billet.

Bronze and brass parts are easily built up or repaired with silver solder or even soft solder if it isn't taking a load. **Photograph 2** shows a connecting rod bearing on a full-size quarry Hunslet. This again is the sort of repair that any modeller could improve upon.

Seventh lesson

The only standard you have to work to is the one that gives you satisfaction. We are all in this fascinating and rewarding hobby for our own pleasure. Any appreciation we get from our peers is an added bonus, but most importantly enjoy yourself.

ME

ISSUE NEXT ISSUE NEXT ISSUE NEXT ISSUE NEXT I
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- *Northumbrian* locomotive
- Empire Building - making the tender
- Edwardian Elegance
- *Fair Rosamund* GWR 0-4-2
- Shand Mason fire engine
- Gun Drilling
- PTFE piston valves
- A knife sharpener for Christmas



Dave Fenner builds a basic tram engine.

Tony Meeks makes headlamps for a 5in. gauge *Princess of Wales*.



ON SALE 9 OCTOBER 2009

Contents subject to alteration

To help you get the best from The Model Engineer exhibition

These notes are written purely for guidance. Full information is contained in the Competitors' Information booklet which is sent to every entrant as part of the information package. If you have an item and are unsure as to the Class into which it should be entered, leave that section blank and we will take care of it. The Judges have the right to move any competition exhibit into another class if they feel that by doing so its chances of gaining higher marks or a more appropriate award are improved.

If the item is offered as a Loan exhibit please indicate this by writing Loan on the form in the box identifying the Class. Loan models are not judged but carry all other privileges associated with competition entries.

Part built models are particularly welcome in the Loan Section; visitors like to see work in progress, and entry does not preclude the item being entered in competition when completed.

The classes listed below are those associated with mainstream model engineering.

Club exhibits

Where a club is exhibiting, each model should be entered on a separate entry form and clearly identified as a club exhibit by entering Loan/Club in the class section box. This ensures that we have a full record of all models on display during the show and facilitates matters of administration and insurance.

Additional forms

If you do not wish to deface your copy of the magazine we are happy to receive photocopies of the entry form, one for each model. We will be pleased to send out extra forms if required, so if you know of a modeller who is not a reader of one of our magazines but who you think may wish to participate, please advise them to contact our Exhibitions Office, or simply photocopy the entry form for them. The success of the show depends largely on the number of models on display. Your work could well be the stimulus which inspires someone else to start in the hobby. There can be no doubt that this event is our showcase on the world of modelling in all its aspects. Every modelling discipline needs more and more participants, and it is by displaying not only the crème-de-la-crème, but also examples of work of a more achievable standard, that people are encouraged to join into the wonderful world of modelling, in whatever aspect. We look forward to seeing a sample of your work at the show!

Engineering Section

- A1 Hot air engines.
- A2 General engineering models (including stationary and marine engines).
- A3 Internal combustion engines.
- A4 Mechanical propelled road vehicles (including tractors).
- A5 Tools and workshop appliances.
- A6 Horological, scientific and optical apparatus.
- A7 General engineering exhibits – not covered by the above

Railway Section

- B1 Working steam locomotives 1" scale and over.
- B2 Working steam locomotives under 1" scale.
- B3 Locomotives of any scale, experimental, freeform or based on any published design and not necessarily replicas of full size prototypes, intended for track duties.
- B4 Scratchbuilt model locomotives of any scale, not covered by classes B1, B2, B3, including working models of non-steam, electrically or clockwork powered steam prototypes.
- B5 Scratchbuilt model locomotives gauge 1 (10mm scale) and under.
- B6 Kitbuilt model locomotives gauge 1 (10mm scale) and under.
- B7 Scratchbuilt rolling stock, gauge 1 (10mm scale) and under.
- B8 Kitbuilt rolling stock, gauge 1 (10mm scale) and under.
- B9 Passenger or goods rolling stock, above 1" scale.
- B10 Passenger or goods rolling stock, under 1" scale.
- B11 Railway buildings and lineside accessories to any recognised model railway scale.
- B12 Tramway vehicles.

Marine Models

- C1 Working scale models of powered vessels (from any period). Scale 1:1 to 1:48
- C2 Working scale models of powered vessels (from any period). Scale 1:49 to 1:384

- C3 Non-working scale models (from any period). Scale 1:1 to 1:48
- C4 Non-working scale models (from any period). Scale 1:49 to 1:384
- C5 Sailing ships and oared vessels of any period – working.
- C6 Sailing ships and oared vessels of any period – nonworking.
- C7 Non-scale powered functional models including hydroplanes.
- C8 Miniatures. Length of hull not to exceed 15in for 1:32 scale, 12in for 1:25 scale, 10in for 1:16 scale; 9in for 1:8 scale. No limit for smaller scales.
- C9 For any model boat built from a commercial kit. Before acceptance in this class the kit must have been readily available for at least 3 months prior to the opening date of the exhibition and at least 20 kits must have been sold either by mail order or through the retail trade.

Scale Aircraft Section

- D1 Scale radio control flying models
- D2 Scale flying control-line and free flight
- D3 Scale non-flying models, including kit and scratch-built
- D4 Scale flying radio controlled helicopters

Model Horse Drawn Vehicle Section

- G1 Carriages & other sprung vehicles. (Omnibuses, trade vans etc.) Wagons, carts and farm implements. Caravans.

Junior Section

- J1 For any type of model, mechanical or engineering work, by an under 14 year old.
- J2 For any type of model, mechanical or engineering work, by an under 16 year old.
- J3 For any type of model, mechanical or engineering work, by an under 18 year old.

All entries will be judged for standard of craftsmanship, regardless of the modelling discipline, i.e. a boat will not be competing against a military figure. Providing a model attains sufficient marks it will be awarded a gold, silver or bronze medal.

Model Vehicle Section

- K1 Non-working cars, including small commercial vehicles (e.g. Ford Transit) all scales down to 1/42.
- K2 Non-working trucks, articulated tractor and trailer units, plus other large commercial vehicles based on truck-type chassis, all scales down to 1/42.
- K3 Non-working motor bikes, including push bikes, all scales down to 1/42.
- K4 Non-working emergency vehicles, fire, police and ambulance, all scales down to 1/42.
- K5 Non-working vehicles including small commercial vehicles (e.g. Ford Transit), scale from 1/43 or smaller.
- K6 Any available body shells including Concours, in any scale or material, to be judged on appearance only.
- K7 Functional model cars/vehicles which must be able to move under their own power of any type. Can be either free-running, tethered, radio controlled or slot car, but must represent a reasonable full size replica.

DUKE OF EDINBURGH CHALLENGE TROPHY

Rules and Particulars

1. The Duke of Edinburgh Challenge Trophy is awarded to the winner of the Championship Award at the Model Engineer Exhibition.
2. The trophy remains at all times the property of MyHobbyStore Ltd.
3. The name of the winner and the date of the year in which the award is made will be engraved on the trophy, which may remain, at the discretion of MyHobbyStore Ltd., in his/her possession

- until required for renovation and display at the following Model Engineer Exhibition.
4. Any piece of model engineering work will be eligible for this Championship Award after it has been awarded, at The Model Engineer Exhibition, a Gold or Silver medal by MyHobbyStore Ltd
5. No model may be entered more than once.
6. Entry shall be free. Competitors must state on the entry form:
 - (a) That exhibits are their own bona-fide work.
 - (b) Any parts or kits which were purchased or were not the outcome of their own work.
 - (c) That the model has not been structurally altered since winning the qualifying award.
7. MyHobbyStore Ltd. may at their sole discretion vary the conditions of entry without notice.

COMPETITION RULES

1. Each entry shall be made separately on the official form and every question must be answered.
 2. Competition Application Forms must be received by the stated closing date. LATE ENTRIES WILL ONLY BE ACCEPTED AT THE DISCRETION OF THE ORGANISERS.
 3. Competitors must state on their form the following:
 - (a) Insured value of their model.
 - (b) The exhibit is their own work and property.
 - (c) Parts or kits purchased.
 - (d) Parts not the outcome of their own work.
 - (e) The origin of the design, in the case of a model that has been made by more than one person.
- NOTE: Entry in the competition can only be made by one of the parties and only their work will be eligible for judging.
4. Models will be insured for the period during which they are in the custody of MyHobbyStore Ltd.
 5. A junior shall mean a person under 18 years of age on December 31st in the year of entry.
 6. Past Gold and Silver medal award winners at any of the exhibitions promoted by MyHobbyStore Ltd. are eligible to re-enter their model for the 'Duke of Edinburgh Challenge Trophy'. Past winners at any of the exhibitions promoted by MyHobbyStore Ltd. will not be eligible for re-entry into the competition unless it has been substantially altered in any way.
 7. MyHobbyStore Ltd reserve the right to:
 - (a) Transfer an entry to a more appropriate class.
 - (b) Describe and photograph any models entered for competition or display and to make use of any such photographs and descriptions in any way they may think fit.
 - (c) Refuse any entry or model on arrival at the exhibition and shall not be required to furnish a reason for doing so.
 8. Entry into the competition sections is not permitted by:
 - (a) Professional model makers.
 - (b) Anyone who has a financial interest in the direct supply of materials and designs to the public.
- NOTE: If unsure, please contact the Competition organisers prior to the show.
9. The judges' decision is final. All awards are at the discretion of the judges and no correspondence regarding the awards will be entered into.
 10. Exhibitors must present their model receipt for all models collected at the end of the exhibition and sign as retrieved.
 11. The signed release for each model must be presented to security staff when leaving the exhibition complex with display model(s) after the close of the exhibition.

IMPORTANT NOTE: PLEASE MAKE COPIES, INCLUDING PHOTOGRAPHS, OF ALL INFORMATION RELATING TO YOUR MODEL, AS MYHOBBYSTORE LTD WILL NOT ACCEPT LIABILITY FOR ANY LOSS.

CLOSING DATE 20th NOVEMBER 2009

THE MODEL ENGINEER EXHIBITION

11th – 13th December 2009

Please return completed form to:
 Model Engineer Competition,
 MyHobbyStore Ltd., Berwick House,
 8-10 Knoll Rise, Orpington, Kent BR6 0EL

ENTRY NO.

OFFICE USE ONLY

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CLASS	ENTRY NO.
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ENTRY FORM - COMPETITION & LOAN MODELS

PERSONAL DETAILS (Please print)

Surname _____ Forename(s) _____ Age _____

Address _____

_____ Post Code _____

Home Tel No _____ Daytime Tel No _____

Model Club or Association _____

Have you entered before? Y ☐ N ☐

Do you purchase or subscribe to a MyHobbyStore Ltd magazine? Y ☐ N ☐

How many years have you been a modeller? _____

Mail Order Protection - please tick this box if you would prefer not to receive mail from other companies which may be of interest to you ☐

MODEL DETAILS – PLEASE TICK BOX IF MODEL IS FOR LOAN ☐

Entry Class (competition entries only) _____

Model Title (to be used for catalogue and display card) _____

Model Description _____

Model Scale _____ Length _____ Width _____ Height _____ Weight _____

Type of construction _____

Parts not made by you and commercial items _____

Have you supplied a photograph? Y ☐ N ☐

Are you supplying Judges Notes? Y ☐ N ☐

Value of Model (MyHobbyStore Ltd will not insure the model unless a value is entered) £ _____

Name and address of your local newspaper _____

Steam Railway magazine

Engineering news from the big railway



DANNY HOPKINS

Danny Hopkins,
Editor of *Steam
Railway* magazine.

Steam Railway readers' engine No. 70013 *Oliver Cromwell* will be back at the Great Central Railway for its three-day 'heavy metal' autumn gala from October 9-11 and *Steam Railway* can reveal that it will be banked by Fairburn No. 42085 passenger turns over the weekend. A 'first' since 1967, this end of steam recreation will be added to by the expected presence of 'Black Five' No. 45767 *George Stephenson* on shed at Loughborough after its overhaul.

The 'Brit' and 'Fairburn' will be sharing services with 'WD' 2-8-0 No. 90733 on its first visit from the Keighley & Worth Valley Railway, and David Shepherd's '9F' 2-10-0 No. 92203 *Black Prince* from the Gloucestershire Warwickshire creating with resident Stanier '8F' No. 48305 a North West end of steam gala that was sorely missing from 2008. With Robinson 'O4' No. 63601 double-heading with the 'WD' on freight duties, the event will also feature the Lakeside & Haverthwaite's Fairburn 2-6-4T No. 42085 on two-coach local services. **Photograph 1** shows the 'Fairburn' 2-6-4T No. 42085 and GNR 0-6-2 tank No. 1744.



Both the GNR N2 and Fairburn tanks have undergone major repairs and paintwork at the Great Central Railway and a mini gala was held to celebrate their return to service. Both engines were doubled up on the final departure of the day on Saturday August 15. (Photo: Rick Eborall)



The first replica Mountsorrel Granite Company private owner wagon is seen outside the shed at Rothley on September 6. (Photo: Steve Cramp)

Steam Railway Gala - Photographic Competition

We are running an informal photography competition at this year's Steam Railway Gala. Simply send in your three favourite shots by email or surface mail to: Steam Railway, Bauer Media, Media House, Lynchwood Business Park, Lynchwood, Peterborough PE2 6EA. E. danny.hopkins@bauermedia.co.uk Please mark your entry '30th Gala competition'. Also, please state whether you are over or under 16 years of age.

The under 16 winner will receive a year's subscription to the magazine, a goody bag and a footplate ride on one of the GC's fleet - as well as having their image reproduced in the magazine. The over 16 winner will get dinner for two on the Great Central legendary Sunday lunch dining train, a free subscription and their shot used prominently in the magazine.

Entries by October 16 please - and good luck!

"It's certainly an exciting line up" said GCR president Bill Ford. "We've extended the event to three days and on Saturday night we'll have our usual twilight steam show. We have made a number of improvements to the railway's infrastructure this year including a canopy at Leicester North and a new lift and wheeled access toilet at Loughborough. Naturally we're delighted to be continuing our partnership with *Steam Railway* magazine."

Plans are in hand to arrange tours of the newly-ballasted

Mountsorrel branch line which, we are told might have some track down by the time the gala takes place. Visitors can take a bus shuttle to the branch and take a guided tour on foot with project volunteers. What will be on view is a newly painted original Mountsorrel mineral wagon (**photo 2**).

The shed band will play in the evening on the Saturday night at Quorn and the Steam Railway quiz will also be taking place. Get a team together.

ME

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■ Southbend 4 1/2 in. lathe with 4-jaw self centering chuck, tailstock chuck and set of change gears, perfect condition, £280. **T. 0161 7989478 Manchester.**

■ Edwards 4ft. pedestal guillotine model 4' x 16G in good condition, £575 ONO, buyer collects. **T. 01270 568506 Crewe.**

■ Emco Unimat 3 with four x chucks, taper tool post, V.slide, steady, face and clamp plates ETC. Perfecto Shaper 230V 6 x 6 table with powered cross travel to left and right, best offer secures. **T. 0191 2764073 Newcastle upon Tyne.**

■ Myford ML10 lathe on cabinet stand, imperial and metric screwcutting, 3 and 4-jaw chucks, faceplate, drill chuck, live and fixed centres, only had light use and in very good condition, £850, buyer collects. **T. 01525 875595 Bedford.**

■ Clarke 6in. hand shear and 24in. bench folder, hardly used, £60 the pair. **T. 01789 778174 South Works.**

■ Complete contents of workshop, S/C lathe, milling machine, 5/8 in. capacity drilling machine, nuts, bolts, materials, small tools etc. **T. 01330 824162 Aberdeenshire.**

■ Capstan turret to fit Harrison M300 lathe, Akron No. 720 with 6 tool stations, as new, £495. **T. 01744 612119 St Helens.**

■ Eagle Surface grinder with Eclipse magnetic chuck, single-phase, buyer collects, £325. **T. 01603 702456 Norwich.**

■ Warco BV20-1 screwcutting lathe with imperial and metric change gears, in near new condition, £400 ONO. Portass lathe on cast iron stand, offers? **T. 0161 4392021 Stockport.**

■ Senior horizontal milling machine, table 15in. x 6in., single-phase with coolant, vice and clamp kit, £4,650 ONO. **T. 01582 529287 Luton.**

■ Myford ML2 3 1/2 in. lathe with 3-jaw and 4-jaw chucks, faceplate, change gears, drill chuck, fixed steady and travelling steady, 6 speeds, £275. **T. 01279 723088 Harlow.**

■ New leadscrew and half nuts for Conquest lathe, new 4in. 3-jaw chuck with internal and external jaws and backplate for Conquest lathe, £35 + P&P. **T. 0161 6522404 Oldham.**

Machines wanted

■ Lienen lathe model LZ4S with accessories. **T. 01603 787834 Norwich.**

■ Cutter grinder that will sharpen milling cutters, any make, type including homemade considered. **T. 01206 393420 Colchester.**

Models offered

■ Burrell 2in. traction engine castings including cylinder (26) + fittings (25). **T. 01493 369269 Great Yarmouth.**

■ 7 1/2 in. gauge 0-4-0 narrow gauge locomotive and driving truck, air cooled diesel engine coupled to Eaton hydraulics. Vacuum braking on locomotive and truck, battery charging system, lights and horn, £4,000 ONO. **T. 01245 401326 Chelmsford.**

■ LBSC Speedy, full set of drawings, chassis complete and run on air, boiler 80% complete, photocopies of words and music, £1,200. **T. 01293 519087 Crawley.**

■ Simplex castings, chimney, water pump, brake shoes, coupling and

connecting rods, best offer.

T. 01962 734696 Hampshire.

■ 7 1/2 in. gauge sit in diesel outline locomotive powered by a Villiers 2-stroke engine complete with 4 seat double bogie carriage, both in good condition. **T. 0161 2859053 Stockport.**

■ Minnie boiler kit, £70. No. 9 injector for Charles, £90. No. 8 injector £40. All + P&P. **T. 01257 793379 Chorley.**

■ GWR small Prairie and BR 07 shunter, both 5in. gauge with electric drive, new, test driven only, with driving and battery car. **Tel. 01302 773556 Doncaster.**

■ Stuart boiler feed pump kit for D10, complete and unused, £48.50 post paid. **E. patzak@primus.ca T. 1 250 656 5953** (Note Canada 8 hours behind UK.)

■ 10 1/2 in. gauge locomotives, LNWR 0-6-0 coal locomotive, chassis working on air, freelance narrow gauge 0-4-0 locomotive, chassis working on air, offers? **T. 01827 713663 Coventry.**

■ Set of drawings for 5in. gauge Dougal, Welshpool and Llanfair 0-4-0 plus wheel castings and outer dome casting, £50 + P&P. **T. 01949 842958 Grantham.**

Models wanted

■ GWR 5700 running chassis or more for 5in. gauge. **T. 01652 688408 Lincolnshire.**

Models Wanted

■ Paddington 7 1/2 in. gauge tank locomotive. **T. 0114 2693950 Sheffield.**

■ Drawings for 5in. gauge 0-4-0 Ajax tank locomotive. **T. 01923 670162 Watford.**

■ Midland single Princess of Wales, drawings, castings, boiler and any other parts. **T. 01926 511570 Kenilworth.**

Miscellaneous offered

■ 15in. x 9in. surface plate, unused. Wartime steel 5 pint blowlamp with flexible extension for burner, both free to a good home, collection only. **T. 01275 845010 Bristol.**

■ Variac 0-275V @20 Amp, £85. Rotary Switches from £5. **T. 01582 529287 Luton.**

Books & magazines offered

■ Model Engineer magazines, approx. 400 will not split, buyer collects, £30. **T. 01493 369269 Great Yarmouth.**

■ The Model Steam Locomotive by Martin Evans. **T. 0292 0639353 Cardiff.**

■ Simplex tank locomotive book by Martin Evans, £30 inc. P&P. **T. 0785 2115947 Barnsley.**

■ Rob Roy and William book by Martin Evans and complete set of Rob Roy drawings, both as new, £25. **T. 01253 738631 Blackpool.**

■ Model Engineer 1950 to 2007, virtually complete set of Engineering in Miniature 1980 to 2005, free to collector. **T. 01473 255676 Ipswich.**

■ Model Engineer magazines Vols. 113 to 117 1955 to 1958, Vols. 145 and 146, 1979 and 1980 plus 57 miscellaneous copies from 1955 to 1978, £40. **T. 01252 874622 Camberley.**

■ Model Engineers' Workshop magazines, from Nos. 20 to 99, £25. **T. 01275 375398 Somerset.**

■ Model Engineers' Workshop magazines, Nos. 7, 13, 14, 26, £25 + P&P. **T. 01245 321457 Chelmsford.**

Books & magazines wanted

■ Model Engineers' Workshop No. 132 in good clean condition. **T. 0161 4375666 Stockport.**

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SEPTEMBER

- 24-28 **Leyland SME.** 7½" Gauge Society AGM. Contact A. P. Bibby: 01254 812049.
- 25 **Hereford SME.** Stan Compton: My Tower Clock. Contact Nigel Linwood: 01432 880649.
- 25-27 **Isle of Wight MES.** Exhibition at the Riverside Centre. Contact Malcolm Hollyman: 01983 564568.
- 25 **Newton Abbot & District MES.** AGM. Contact Graham Day: 01626 72739.
- 25-28 **7½" Gauge Soc.** AGM. Contact John Nicholson: 01274 564215.
- 26 **Brighton & Hove SMLE.** Public Running. Contact Mick Funnell: 01323 892042.
- 26 **Maxitrac Owners Club.** Factory Open Day & AGM. Contact Eric Penn 0208 979 4335.
- 26 **Romney Marsh MES.** Boiler Testing. Contact John Wimble: 01797 362295.
- 26/27 **Saffron Walden DSME.** Public Running. Contact Jack Setterfield: 01843 852165.
- 26/27 **St. Albans DMES.** Annual Club Exhibition at Francis Bacon School. Contact Roy Verden: 01923 220590.
- 27 **Adelaide Miniature SRS.** Public Running. Contact Peter Cooper: 8264 3471.
- 27 **Bristol SMEE.** Annual 3½" Gauge Rally. Contact Trevor Chambers: 0145 441 5085.
- 27 **Chichester DSME.** Steam on Sunday. Contact Bill Gage: 01243 824473.
- 27 **Hereford SME.** Public Open Day. Contact Nigel Linwood: 01432 880649.
- 27 **Lancaster & Morecambe MES.** Running Day. Contact Mike Glegg: 01995 606767.
- 27 **Leicester SME.** Public Running. Contact John Lowe: 01455 272047.
- 27 **MELSA.** Sunday in the Park. Contact Graham Chadbone: 07 4121 4341.
- 27 **Nottingham SMEE.** Running Day. Contact Pete Towle: 0115 987 9865.
- 27 **Ryedale SME.** Public Running. Contact David Myers: 01388 661255.
- 27 **Stockport South MES.** Running Day. Contact Mark C Pybus: 0161 973 2086.
- 27 **Taunton ME.** Public Running. Contact Nick Nicholls: 01404 891238.

- 27 **Worthing & District SME.** Public Running. Contact Brian Trickey: 01903 235102.
- 27 **York City & DSME.** Running Day. Contact Pat Martindale: 01262 676291.
- 28 **Bedford MES.** Meeting. Contact Ted Jolliffe: 01234 327791.
- 28 **Canterbury & District MES (UK).** Pub & Inn Signs. Contact Gina Pearson: 01227 830081.
- 29 **Romney Marsh MES.** Track Meeting. Contact John Wimble: 01797 362295.
- 29 **Stafford DMES.** David Bradbury: History of Fodens. Contact Chris Dobbs: 01889 270533.
- 29 **Wigan DMES.** Bring & Buy. Contact John Chamberlain: 01744 882255.
- 30 **Hull DSME.** Members' Current Projects. Contact Tony Finn: 01482 898434.

OCTOBER

- 1 **Bournemouth DSME.** Tech-Chat. Contact Dave Finn: 01202 474599.
- 1 **Cardiff MES.** Bring & Buy. Contact Don Norman: 01656 784530.
- 1 **Leyland SME.** Meeting. Vic Whittaker: Photography Hints & Tips. Contact A. P. Bibby: 01254 812049.
- 1 **South Lakeland MES.** Contact Adrian Dixon: 01229 869915.
- 1 **Sutton MEC.** Bits & Pieces. Contact Bob Wood: 020 8641 6258.
- 1 **Warrington DMES.** Malcolm High: Laser Cutting. Contact Duncan Webster: 01925 262525.
- 2-4 **Auckland SME.** 50th Jubilee Model Engineering Exhibition. Contact Brian Cotton: 820 3381.
- 2 **Romford MEC.** Competition Night. Contact Colin Hunt: 01708 709302.
- 3 **Hereford SME.** Club Running Day. Contact Nigel Linwood: 01432 880649.
- 3 **Ickenham DSME.** Public Running. Contact Phil Wimbush: 07759 275353.
- 3/4 **Nottingham SMEE.** Traction Engine Rally. Contact Pete Towle: 0115 987 9865.
- 3/4 **Ryedale SME.** Driver Training. Contact David Myers: 01388 661255.

- 3/4 **Saffron Walden DSME.** Public Running. Contact Jack Setterfield: 01843 852165.
- 3/4 **7½" Gauge Soc.** Diesel Gala. Contact John Nicholson: 01274 564215.
- 3 **SM&EE.** Gareth Jones: Steam Cars. Contact Maurice Fagg: 020 8669 1480.
- 3 **Southern FMES.** Welling & District MES - Autumn Open Day. Contact Brian Thompson: 01920 830629 (eve).
- 3 **Welling DMES.** Open Day & Gauge One Get-together. Contact Bob Underwood: 020 8859 6919.
- 3 **York City & DSME.** Andrew Carter: George Newey Clockmaker. Contact Pat Martindale: 01262 676291.
- 4 **Ascot Locomotive Society.** ALS Members' Steam-Up. Contact Derek Alford: 01344 482485.
- 4 **Bristol SMEE.** Running Days. Contact Trevor Chambers: 0145 441 5085.
- 4 **Frimley & Ascot LC.** Public Running. Contact Bob Dowman: 01252 835042.
- 4 **Leicester SME.** Public Running. Contact John Lowe: 01455 272047.
- 4 **Model Steam Road Vehicle Soc.** Prescott Hill Climb. Contact John Bagwell: 01452 304876.
- 4 **Northampton SME.** Public Running. Contact Pete Jarman: 01234 708501 (eve).
- 4 **Norwich DSME.** Public Running. Contact Shirley Berry: 01379 740578.
- 4 **Pinewood MRS.** Members' Running. Contact Paul Archer: 0118 989 4516.
- 4 **Reading SME.** Public Running. Contact Ian Fothergill: 0118 9421679.
- 4 **Steam LS of Victoria.** Public Running. Contact Graham Plaskett: (03) 9750 5022.
- 4 **Taunton ME.** Public Running. Contact Nick Nicholls: 01404 891238.
- 4 **Warrington DMES.** Running Day. Contact Duncan Webster: 01925 262525.
- 4 **Welling DMES.** Public Running. Contact Bob Underwood: 020 8859 6919.
- 5 **Lancaster & Morecambe MES.** AGM. Contact Mike Glegg: 01995 606767.

- 5 **Leicester SME.** Mike Cobley: Loco 61264. Contact John Lowe: 01455 272047.
- 5 **Peterborough SME.** Bits & Pieces. Contact R. A. Meek: 01778 345142.
- 6 **Romney Marsh MES.** Track Meeting. Contact John Wimble: 01797 362295.
- 6 **Taunton ME.** F. Stops & D. Hartland: Screw-Cutting. Contact Nick Nicholls: 01404 891238.
- 7 **Bradford MES.** Michael Gray: Continuing 100 years of BMES. Contact John Mills: 01943 467844.
- 7 **Bristol SMEE.** David Cheesley: The Railways of East Bristol. Contact Trevor Chambers: 0145 441 5085.
- 7 **Guildford MES.** M. Burt: Paint Your Model. Contact Brian Jones: 01483 531485.
- 7 **Leeds SMEE.** David Beale: Building 3 Locomotives. Contact Geoff Shackleton: 01977 798138.
- 7 **Tyneside SMEE.** Bits & Pieces. Contact Linda Nicholls: 01670 816972.
- 8 **Cardiff MES.** Chris Tuthill: Victory to Vanguard 6. Contact Don Norman: 01656 784530.
- 8 **NW Leicestershire SME.** Work in Progress. Contact Jamie Wilde: 01530 273270.
- 8 **Sutton MEC.** Stan Holwill: The First Business Computer. Contact Bob Wood: 020 8641 6258.
- 8 **Worthing & District SME.** Meeting. Contact Brian Trickey: 01903 235102.
- 9 **Chichester DSME.** Talk: Steaming Through Essex. Contact Bill Gage: 01243 824473.
- 9 **Polegate & District MEC.** John Bishop: Black Sea Discoveries. Contact D. F. Pratt: 01323 645872.
- 10 **Glasgow & S.W. Rly Ass'n.** Ian Lothian: 12 months of the camera lens. Contact Bruce Steven: 0141 810 3871.
- 10/11 **Nottingham SMEE.** Diesel Gala. Contact Pete Towle: 0115 987 9865.
- 10/11 **Saffron Walden DSME.** Public Running. Contact Jack Setterfield: 01843 852165.
- 10/11 **7½" Gauge Soc.** East Herts MR Autumn Steam-Up. Contact John Nicholson: 01274 564215.

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- The aircraft and marine models
- The boat pool organised by The Surface Warship Association



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Please note all attractions are correct at time of going to press but may be altered or withdrawn without notice due to unforeseen circumstances.

11-13 December 2009

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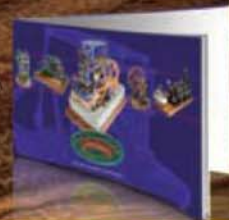
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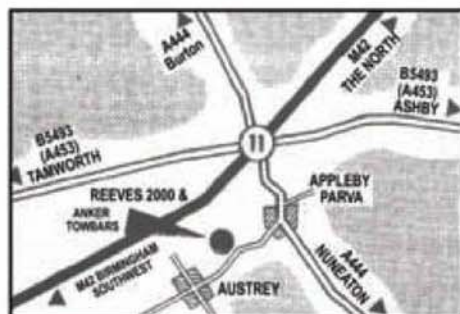


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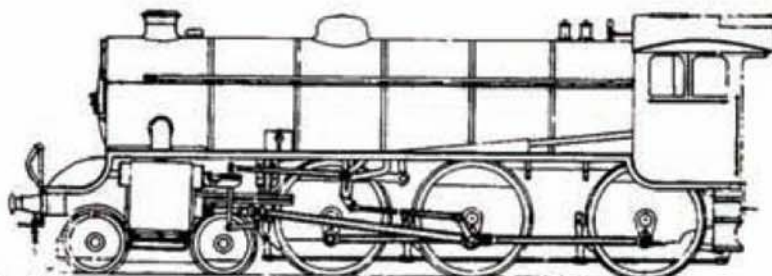


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THE DESIGNS OF KOZO HIRAOKA

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In our totally biased opinion, Kozo Hiraoka is the best model locomotive designer writing today. Because English is not his native tongue, Kozo makes extensive use of drawings, rather than text, to show machining or assembly operations and these make his books extremely clear, especially for the beginner. All his designs are for 3 1/2" gauge, but the books include aids to help building them in larger gauges, and the geared engines do not require castings. The Switcher design calls for wheel castings, but these can be fabricated. All of the books include full drawings, albeit in half size. Four of his five designs are based on American logging geared locomotives, but one is a conventional rod engine. Even if you have only just bought your first lathe, drilling machine and (ideally) milling machine, and have never used them before, with patience and time you can build a working model steam locomotive from any of these books. All are very well laid out and printed hardbound books, but it is the quality of the contents that sets them apart. Kozo's five designs are:

Building the Shay • £46.85

The author's home is a flat where hobby space is limited, which influenced his choice of gauge and prototype - a Shay consists of a number of small sub-assemblies, with the boiler being the largest individual item. Kozo also wanted a prototype that could be built without castings so everything on this engine is fabricated, or turned from the solid. The drawings are very detailed, but what sets this book apart are the instructions on how to build individual parts, often using a series of drawings to illustrate sequence etc. The main drawings are metric. 194 pages. Drawings, numerous photos of set ups, and numerous sketches.



Building the Heisler • £46.85

A geared engine like the Shay, the Heisler differs in that the power unit is a V twin driving a central drive shaft to the outer bogies, the axles of which are connected by driving rods. In quality and extent this book is the same as the Shay one - Great! Full drawings (Imperial measurements), numerous photos and sketches of set ups.



Building the Climax • £46.85

This is Kozo's manual on building the third (and prettiest) of the three geared engines - the Climax. Usual incredibly high quality presentation, and here including a description of how you can make your own skew-bevel gears - an operation previously thought impossible on an amateur model engineers equipment. The drawings are metric.



Building the New Shay • £46.85

In his latest book, Kozo comes full-circle, returning to his first locomotive type - the Shay geared locomotive. However this design is based on a much later design of Shay, from the 1920s, and is both slightly larger than his first design, but includes the improvements which were brought in during the 30 or so years since the previous prototype was built. If it is possible, this book is even more detailed than the earlier ones, and it also includes extra chapters on building the design in 7 1/4" or 7 1/2" gauges, the safety of copper boilers, safety valves, tube joints, O-rings for live steam use, and making small hexagonal screws. 326 pages in all, including a number of fold out ones. Hardbound



The Pennsylvania A3 Switcher • £46.85

This design is a conventional locomotive, based on a small American prototype - an 0-4-0 tender locomotive the Pennsylvania Railroad used for shunting tightly curved locations. It shares common characteristics with Kozo's other designs in that it is designed for 3 1/2" gauge, but can be scaled up to 7 1/4" gauge, involves no castings other than possibly the driving wheels, everything being built from the solid or fabricated. The drawings are imperial, and the descriptions are, as always brilliant, being mainly illustrative drawings rather than text. This engine is a great first project for the beginner, but will also be of interest to all model locomotive builders. 264 pages. Full drawings and numerous photographs. Hardbound.



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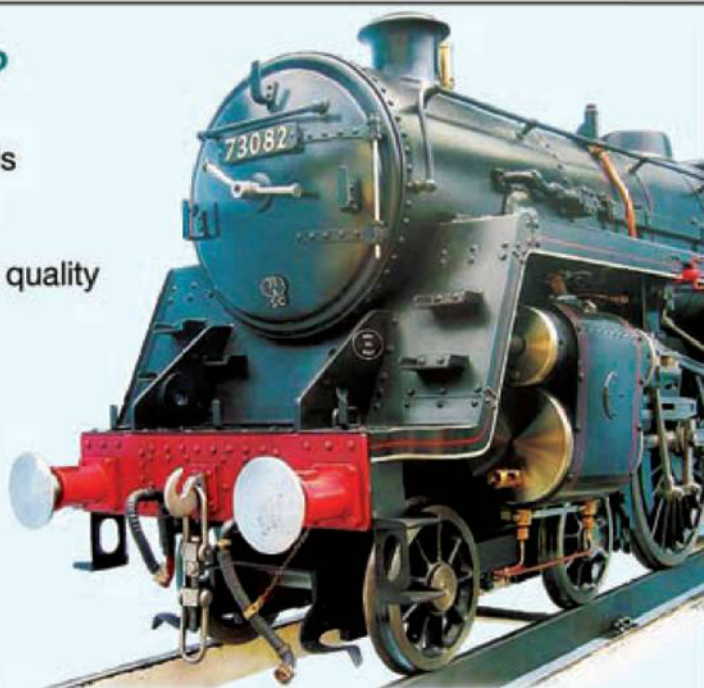
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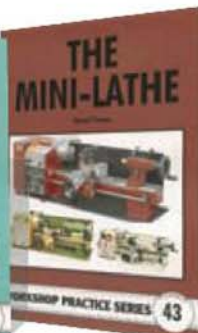
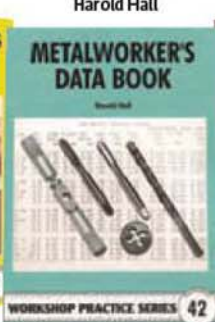
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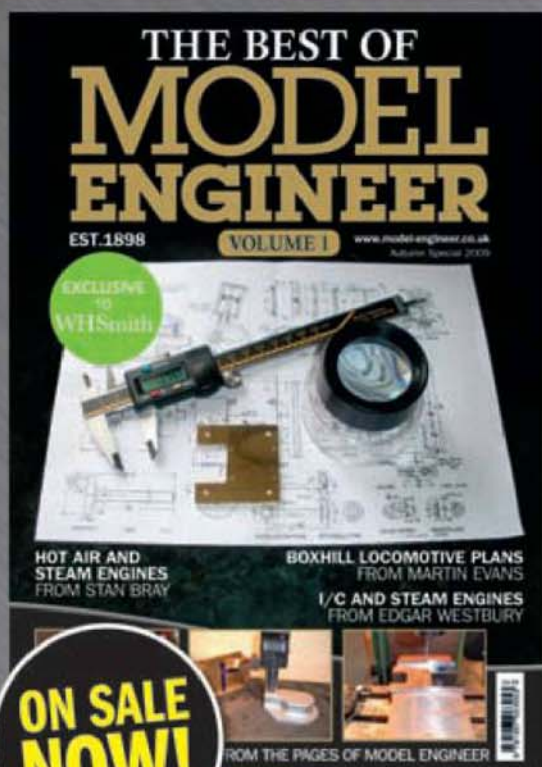
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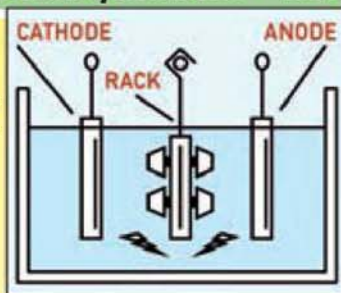
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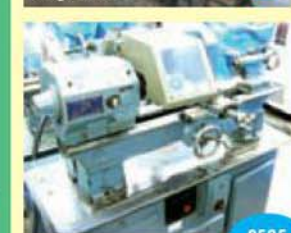
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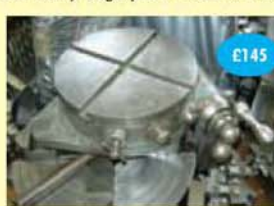
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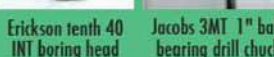
Smart and Brown 3 1/4" dividing head

£175



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£145



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