MODEL ENGINEER

Vol. 201 No. 4341

19 December – 1 January 2009

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SER16K16	EXTERNAL	16MM SQ	£28.95
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Berwick House, 8-10 Knoll Rise,
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Email: customer.services@myhobbystore.com
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BACK ISSUES & BINDERS
Tel: +44 (0)844 848 8822
Email: customer.services@myhobbystore.com

EDITORIAL
Editor: David Clark
Tel: +44 (0)1847 821136
Email: david.clark@myhobbystore.com
Production Editor: Kelvin Barber
Assistant Editor: Michael Jones
Technical Editor: Roger Bunce

PRODUCTION
Designer: Yvette Masson
Illustrator: Grahame Chambers
Pre-Press: Brian Vickers
Production Manager: Richard Baldwin
Ad Production: Robin Gray

ADVERTISING
Senior Sales Executive: Duncan Armstrong
Email: duncan.armstrong@myhobbystore.com
Tel: 0844 848 5238

MARKETING & SUBSCRIPTIONS
Marketing Executive: Heather Morrison

MANAGEMENT
Creative Directors: Nikki Parker & Nikki Coffey
Subscriptions Director: Rebecca Blighton
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IN THIS ISSUE

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ON THE COVER...

Taken at Trevithick 2008 at Bridgnorth last summer, these five youngsters belong to The Black Country Live Steamers society. They are (top row from left to right) Michael Malpass, Chris Bromage, Leigh Hartshorne, lower left Tom Bromage and lower right Jack Daniels. (Photograph by Roger Bunce.)

PLEASE SEE PAGE 722 TO TAKE ADVANTAGE OF OUR LATEST SUBSCRIPTION OFFER

PRECISION WORKSHOP & LABORATORY EQUIPMENT SALE

17TH & 18TH JANUARY 2009

- **Hardinge KL-1 Super Precision Toolroom Lathe,** metric. Rebuilt by ZMT October 2003. Superb condition (mineral oil coolant used). Multifix toolpost.
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- **Aciera F4 Universal Mill.** Dedicated cabinet with comprehensive tooling including 3 way table, high speed head, ER32 collets,
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- **Clarkson Tool & Cutter Grinder.**
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- **Wolf 200mm Pedestal Grinder.**
- **Automator MB-205 Bench press.**
- **Arbor Press.** Approx' 4″ throat.
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- **Heavy duty 6ft x 2ft 'Welconstruct' workbench** with lower shelf, retaining lips and 1″ ply top.
- **Heavy duty 4ft x 2ft 'Welconstruct' workbench,** wooden top, with Record 4″ metalworking vice.
- **Heavy duty 4ft x 2 ft steel workbench**
- *2 OFF* **Heavy duty 4ft x 2ft 'Welconstruct' workbench,** wooden top.
- **Clarke** 8 Drawer Mechanics steel Combination **tool chest & cabinet.**
- **Storage racking** Approx 3ft wide x 1ft deep x 6ft high with 6 adjustable shelves.
- **Carbolite oven,** CWF 12/23, single phase 7.5KW.
- **Carbolite oven,** ELF 11/16, single phase 2.1KW.
- **Gallenkamp PlusII incubator.**
- *2 OFF* **Langford Sonomatic** S1800 **ultrasonic cleaning baths**
- **Urawa minitor hand held reciprocating laping and polishing system.**
- **Clarke rotary tool system.**
- **Mitutoyo PJ-A3000 Profile Projector.**
- **Vision Engineering Mantis Viewer** X4 & x10 lenses.
- Toolroom/Laboratory **binocular microscope.**
- **Engineers' microscope.** Carl Zeiss
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- 9″ x 8″ **webbed angle plate.**
- 5″ x 4.5″ **angle plate.**
- 3″ x 2.5″ **angle plate.**
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- **Block gauge 87 piece set** grade 2 metric.
- **Pin gauge set** 0.011″– 0.060″.
- **Pin gauge set** 0.061″– 0.250″.
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For further information and lists contact:

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Unit 4b, Fuller Road Industrial Estate,
Harleston, Norfolk. IP20 9EA.
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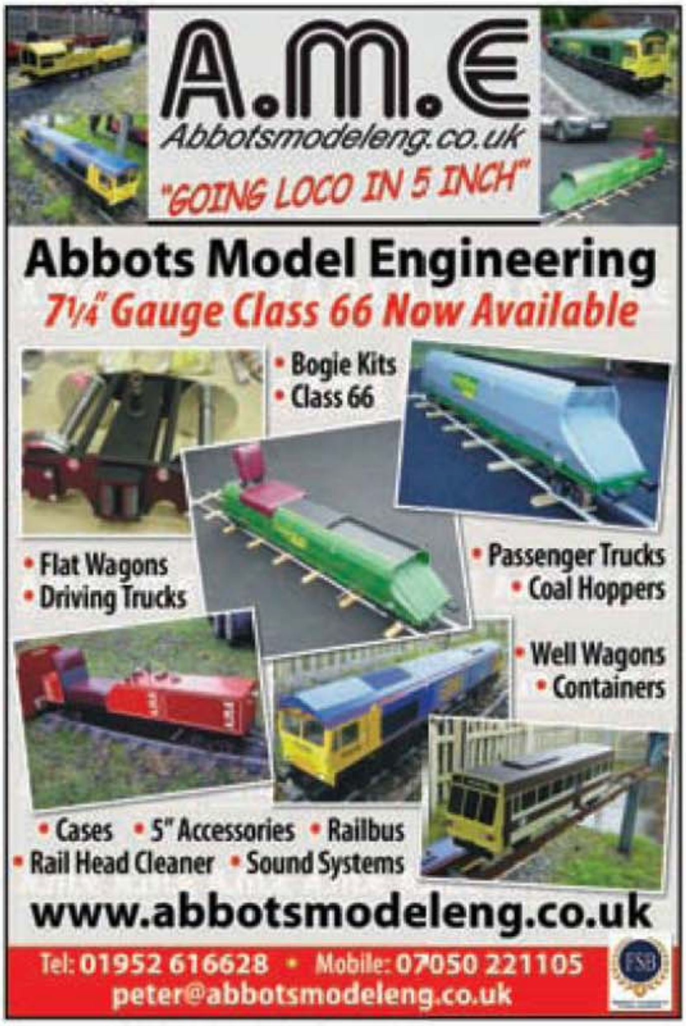
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- 3 Jaw chuck with inside/outside jaws
- Centre height 3 1/2"
- Distance between centres 12"
- Threading facility

WM-180 VARIABLE SPEED LATHE

- Centre height 3 1/2"
- Distance between centres 12"
- Infinitely variable from 0-1,250 and 0-2,500 rpm

WM-240 VARIABLE SPEED LATHE

- Centre height 4"
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- Infinitely variable from 0 – 1,250 and 0 – 2,200 rpm
- Large cross slide with two full length tee slots

Each lathe is supplied with two speed bands to allow maximum torque in the low setting, an accuracy test report, digital rev. counter, hardened bedways, face plate, four way tool post, swarf tray and rear splash back, thread dial indicator and reversible motor.
WM series lathes supplied with metric and imperial threading facility, 3 and 4 jaw chucks, fixed and travelling steadies

WM-250 VARIABLE SPEED LATHE

- Centre height 5"
- Distance vetween centres 22"
- Infinitely variable from 50 to 2,000 rpm
- Reversible leadscrew for left hand threading

WM-280 VARIABLE SPEED LATHE

- Centre height 5 1/2"
- Distance between centres 27 1/2"
- Infinitely variable from 50 to 2,500 rpm
- Large cross slide with two full length tee slots
- Reversible leadscrew for left hand threading

WM-280V-F VARIABLE SPEED LATHE

- Centre height 5 1/2"
- Distance between centres 27 1/2"
- Dedicated feed shaft for longitudinal/cross feed
- Separate leadscrew for thread cutting functions
- Large cross slide with two full length tee slots
- Reversible leadscrew for left hand threading

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- Variable spindle speeds 50 - 2500rpm
- Powerful 550w motor
- 3 morse taper with draw bar
- Available with either metric or imperial leadscrews
- Fine spindle feed
- Table size: 18 1/8" x 4 3/8"

WM-14 VARIABLE SPEED MILL

- Fine feed head elevation with calibrated dial
- Compact, rigid machine
- Table size: 16" x 4 1/2"

WM-16 VARIABLE SPEED MILL

- Rack and pinion drill feed plus fine feed for accurate machining
- Table size: 27 1/2" x 7"
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- Large capacity table

WM series mills are supplied with digital scale for spindle travel, 2 speed settings to allow high torque in low range. Accuracy test report. Infinitely variable speed range from 50 –2,250 rpm. Dovetail column ensures positive head location. Precision spindle supported on taper roller bearings. Head tilting 45° 0° 45°. Captive drawbar pushes tooling out of taper. Adjustable gibs to slideways. Locks to head, column and slideways. Available with either metric or imperial leadscrews. Interlock chuck guard. Swarf tray and stand available.

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- Digital rev. counter
- Fine feed to spindle
- Table size: 27 1/2" x 8 1/4"

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SMOKE RINGS

DAVID CLARK
Editor

MIKE JONES
Assistant Editor

ROGER BUNCE
Technical Editor

Erratum: Our sincere apologies to Dr. Philip Woodward. In the Clocks article (M.E. 4339, 21 December 2008), we wrongly addressed him as Peter Woodward.

Meet the new editor

Following the merger of the *Model Engineer* and *Model Engineers' Workshop* editorial teams I have been appointed Editor of *Model Engineer* and will also continue editing *Model Engineers' Workshop*.

Some readers' of *Model Engineer* may already know me. I have been editing *Model Engineers' Workshop* for almost two years. Some of you take both magazines so might find the following a bit repetitive but it is traditional that a new editor introduce himself to his readers'.

My name is David Clark and I have been involved in engineering most of my working life. I first started reading *Model Engineer* in the school library around 1965 but also read all the back numbers the library had on file. Although I knew little about machines, I learnt a lot by reading *Model Engineer*. This helped me in my future working life and enabled me to earn a very good wage for many years. So now the time has come to put something back into a publication I have a very high regard for.

I will give you a quick rundown of my working background but hopefully not enough to bore you. I was trained by an American company, Willcox & Gibbs to make components for industrial sewing machines. These sewing machines were more advanced than the normal Singer type home use machines having four needles, four loopers underneath the foot and a cross thread. The majority of the parts I machined were small and made to very tight limits. Very few parts did not have a tight limit of plus or minus 1 thou. and one part had a limit of 6 tenths of a thou. measured over four components. Working to these tight limits at an early part of my working life has enabled me to machine any component thrown at me over the years.

Following the demise of the Willcox & Gibbs factory, the manager purchased the machines and took on the lease and we looked for new customers. I managed to get asked to do a component for the British Seagull outboard motor company. The component was a crankcase made out of two aluminium die-castings. This crankcase was destined for the new Seagull 170 engine and had to be completed for the Boat Show in January. A well-known engine manufacturer had been asked to produce four crankcases at the same time as us; we were a standby in case the other company failed to produce.

We produced the crankcase but unfortunately, I drilled two holes ⅛in. too close together. I misread the drawing. We submitted the crankcase and were told not to worry about the misplaced holes, they would just file out the matching slots in the magneto mounting plate. The other company made a right pig's ear of their castings. They installed a CNC machining centre but still managed to cover the castings with deep 4-jaw chuck marks.

We got the contract to do the crankcases and went on to obtain contracts for cylinder heads, gearboxes, casing tubes (the upright drive tube) and various other components. We turned down the cylinder line. Too much filthy cast iron dust was produced from this operation. We continued with these contracts for several years until Seagull called in the receivers.

So, I learnt my milling with Willcox & Gibbs and my turning from British Seagull components. I have also done larger components and was involved with a replacement wing supporting jig (4 metre long beams) for the Airbus Super Guppy, the aircraft used to transport Airbus wings around the world.

I have been employed as a manual and CNC miller on subcontract work for many years and hopefully this knowledge will be useful when editing *Model Engineer*.

I will be supported by the remaining editorial team, Mike Jones, Assistant Editor, Roger Bunce, Technical Editor and Kelvin Barber, Production Editor.

Model Engineer contributors required.

I have inherited some articles submitted to *Model Engineer* but do need some more. If anyone has submitted an article to *Model Engineer* in, say the last three years and has not seen it in print or had it returned, I would like you to submit it again as long as it has not been submitted elsewhere. I won't promise to publish it but will read it and reply.

As of issue 4342 I have raised the minimum contributor's page rate by 25%. This is to bring *Model Engineer* into line with *Model Engineers' Workshop* page rates.

Please consider writing an article for *Model Engineer*. Share your knowledge with other readers. Guidelines are available on request. I will consider articles on all the traditional subjects as well as steam related articles. Are there any tramway modellers out there who could write articles? Can you write a series about building a traction engine or similar? With such a wide range of subjects, I am sure most readers could at least write a page or two about something that interests them.

Each time I go to an exhibition I see models that have been built but are probably not made to a commercial design. If you have designed a model, please write it up, either as a complete design with drawings or as a shorter article for the benefit of readers'.

I intend to include six to eight pages of tooling related articles in every issue of *Model Engineer*. I don't intend to make *Model Engineer* and *Model Engineers' Workshop* clones of each other. They will retain their own identity.

Christmas greetings

Finally, I would like to wish all readers the compliments of the season and a prosperous New Year.

P. S. Don't forget, it is still not too late to treat yourself to a subscription to *Model Engineer* for 2009. I am sure you will find plenty to interest you in the pages of 'Ours'.

The Trade Stands

MALCOLM STRIDE

Malcolm Stride reports on this year's trade stands and the range of items available.

Visitors to this year's exhibition had a good selection of trade stands to choose from. I have listed the traders in alphabetical name order and have included contact details.

Abbots Model Engineering (A.M.E.) (photo 1)

This company has become a regular visitor to the exhibition with their range of diesel outline locomotives and realistic riding cars. Their new 7 ¼in. gauge locomotive was on show.

16 Abbots Close, Telford,
Shropshire TF2 6HS.
T. 01952 616628.
E. **peter@abbotsmodeleng.co.uk**
W. www.abbotsmodeleng.co.uk

Allendale Electronics (photo 2)

Also regular show visitors, Allendale have an extensive range of digital readouts and other electronic measuring equipment for the model engineer.

43 Hoddesdon Industrial Centre, Pindar Road,
Hoddesdon, Herts EN11 0FF.
T. 01992 450780.
E. **sales@machine-dro.co.uk**
W. www.machine-dro.co.uk

Alutight Aluminium Soldering (photo 3)

Bjorn Ivholt had come over from Sweden to demonstrate the Alutight aluminium soldering process. This certainly generated interest from many visitors and those interested were able to inspect and test sample welds.

T. 0046 70 6276572.
E. **alutighteurope@hotmail.com**

Avanquest (photo 4)

Available from Avanquest was the ever-popular TurboCad computer draughting package, with some excellent show offers, including hard copy manuals.

Avanquest Solutions, Sheridan House, 40-43 Jewry Street,
Winchester, Hampshire
SO23 8RY.
T. 01962 835081.
W. www.avanquest.co.uk

B & B Engineering Services (photo 5)

The B & B Engineering stand was one of those which warranted closer inspection with some very interesting items tucked away including several different types of universal and flexible shaft couplings.

Unit 11, Bretton Street Enterprise Centre, Bretfield Court, Dewsbury WF12 9DB.
T. 07976539675.

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Beugler Pin Striping (photo 6)

Another regular at the show, the demonstrations on the Beugler Pin Striping stand made things look very easy.

Beuglar Paint Pinstriping, PO Box 183, East Grinstead, West Sussex RH19 1GJ.
T. 01342 317363.
E. **sgerber@beuglereurope.com**
W. **www.beuglereurope.com**

Bidwell (photo 7)

A wide range of pre-owned model engineering items was put on display by Bidwell, including this Myford lathe. It obviously proved too much of a temptation for one visitor, since it was sold very early on.

The Old Brickfields, Burnham Road, Woodham Mortimer, Maldon, Essex CM9 6SS.
T. 01245 222743.

Blackgates Engineering (photo 8)

One of the long established model engineering suppliers, Blackgates again had a wide variety of materials and other items for the visitor.

Unit 1 Victory Court, Flagship Square, Shaw Cross Business Park, Dewsbury WF12 7TH.
T. 01924 466000.
W. **www.blackgates.co.uk**

Chester Machine Tools (photo 9)

Chester had examples from their extensive range of machines as well as smaller items including this selection of digital readouts.

Clwyd Close, Hawarden Ind. Park, Hawarden, Nr Chester, Flintshire CH5 3PZ.
T. 01244 531631.
E. **sales@chestermachinetools.com**
W. **www.chestermachinetools.com**

College Engineering Supply (photo 10)

Always a popular stand with model engineers and this year was no exception with the staff always busy providing materials of all types and castings for various workshop accessories.

2 Sandy Lane, Codsall, Wolverhampton WV8 1EJ.
T. 0845 1662184.
E. **sales@collegeengineering.co.uk**
W. **www.collegeengineering.co.uk**

CUP Alloys (Modelling) Ltd (photo 11)

Keith Hale from CUP Alloys was busy dispensing free advice as well as silver-soldering supplies and equipment throughout the show.

15 Sandstone Avenue, Walton, Chesterfield S42 7NS.
T. 01246 566814.
E. **sales@cupalloys.co.uk**
W. **www.cupalloys.co.uk**

HJH Tools (photo 12)

With their range of machine accessories, HJH was another popular calling point for visitors. Eric Offen was seen taking a keen interest.

Southcroft, Chapmanslade, Westbury, Wilts BA13 4AU.
T. 01373 832756.
E. **hazelhjhtools@aol.com**

>>


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Home & Workshop Machinery (photo 13)

There's always a big display of machinery and accessories of all types on the Home & Workshop Machinery stand. This Sharp Mk. II milling machine featured a power feed to the table and looked to be well built.

144 Maidstone Road, Foots Cray, Sidcup, Kent DA14 5HS.
T. 0208 3009070.
E. **stevehwm@btopenworld.com**
W. www.homeandworkshop.co.uk

JB Cutting Tools (photo 14)

For those (like me) who are devotees of replaceable tip tools, this stand is always a must. In addition to a wide range of spare tips, there was also a very wide range of milling cutters, including some of the more unusual types.
The Cottages, Hundall Lane, Hundall, Sheffield S18 4BP.
T. 01246 418110.

LA Services (photo 15)

The range at LA Services is always large and very varied, ranging from various second-hand models to new kits for hot air engines and other larger items. Various items of workshop equipment were also available.

Bramcote Fields Farm, Bramcote, Warwickshire CV11 6QL.
T. 01455 220340.
E. **info@theengineersemporium.co.uk**
W. www.theengineersemporium.co.uk

Solar Laser Systems Ltd. (photo 16)

A new trader to the show, Solar Laser Systems had several examples of laser cut nameplates and other decorative work on the stand. The laser machine was busy producing locomotive nameplates when I visited. The company is the distributor for Universal Laser Systems.

Ham Lane, Lenham, Kent ME17 2LH.
T. 01622 851311.
E. **mail@solarlasers.co.uk**
W. www.solarlasers.co.uk

My Hobby Store Ltd. (photo 17)

As one of the sponsors of the show, My Hobby Store had a large selection of books, magazine back numbers and plans on offer. Visitors could also purchase the new Setting up a Workshop special. Chief Judge Ivan Law relaxed and enjoyed a joke after his judging efforts.

Berwick House 8-10 Knoll Rise, Orpington Kent BR6 0EL.


18


19


20


21

T. 0844 8488822.
E. **customer.services@myhobbystore.com**
W. www.myhobbystore.com

Myford (photo 18)

Myford devotees were able to find spares and accessories at the show, with those looking for new machines able to see the range in pristine glory.

Wilmot Lane, Chilwell Road, Beeston, Nottingham NG9 1ER.
T. 01159254222.
E. **sales@myford.com**
W. www.myford.com

Noggin End Metals (photo 19)

For those looking for short lengths of material for the new project, Noggin End has become one of the places to look. The selection of non-ferrous materials was very wide.

38 Peascroft Road, Norton, Stoke on Trent, Staffs ST6 8HG.
T. 01782 865428.
E. **mike@nogginend.com**
W. www.nogginend.com

Peatol Machine Tools (photo 20)

Peatol were displaying their very popular small lathe together with a range of accessories and cutting tools.

18 Knightlow Road, Harborne, Birmingham B17 8PS.
T. 0121 429 1015.

Power Capacitors (photo 21)

Variable speed control of machines is on the way to becoming a standard fitting and Power Capacitors had details and examples of several models from their extensive range at the show.

30 Redfern Road, Tyseley, Birmingham B11 2BH.
T. 0844 7700272
or 0121 708 4522.


22

E. **transwave@powercapacitors.co.uk**
W. www.powercapacitors.co.uk

Pro Machine Tools (photo 22)

For those looking for new machines, Pro Machine had various models and accessories from the popular Emco and Wabeco ranges at the show.

17 Station Road Business Park, Barnack, Stamford, Lincs PE9 3DW.
T. 01780 740956.
E. **promachuk@aol.com**
W. www.emcomachinetools.co.uk

>>

Proops Brothers (photo 23)

Always a magnet for those looking for small tools and other items, the Proops stand this year was no exception. New this year was a piloted tap wrench for use in the drilling machine.

Technology House, 34 Saddington Road, Fleckney, Leicester LE8 0AW.
T. 0116 2403400.
E. **care@proopsbrothers.com**
W. **www.proopsbrothers.com**

Rite Time Publishing (photo 24)

John Wilding was on hand at Rite Time Publishing with his extensive range of designs and construction manuals for the clock makers. Cherry Hill found time for a chat with John; perhaps she is going to build a clock?

18 Woolmer Way, Bordon, Hants GU35 9QF.
T. 01420 487747.
E. **sales@ritetime publishing.com**
W. **www.ritetime publishing.com**

S & M Tools (photo 25)

Another regular visitor for those wanting small tools is S & M with their wide range of items ranging from spanners to small machines by Proxxon. This airbrush compressor is apparently proving popular.

57 Leather Lane, Hatton Garden, London ECN 7TJ.
T. 0845 603 3365.
E. **smtools@hotmail.com**
W. **www.proxxondirect.com**

Tracy Tools (photo 26)

For those wanting drills, taps, dies and other cutting tools, Tracy Tools has become one of the regular stops and this year was no exception judging by the interest being shown.

Unit 1, Parkfield Industrial Estate, Barton Hill Way, Torquay, Devon TQ2 8JG.
T. 01803 328603.
E. **info@tracytools.com**
W. **www.tracytools.com**

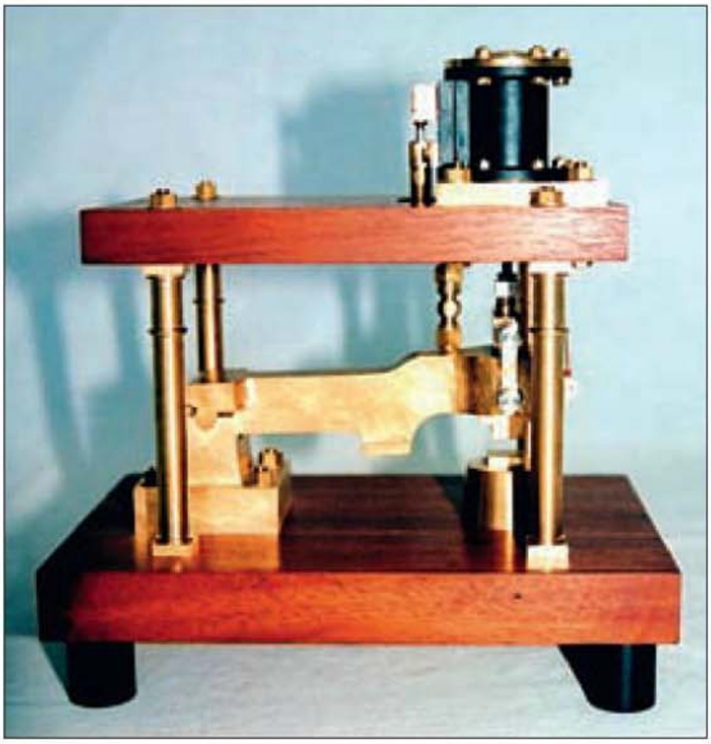
Yorkshire Supplies (photo 27)

First time visitors to the show last year, Yorkshire Supplies were back with a wide range of fittings and accessories to tempt the steam enthusiasts.

Hull, Yorkshire.
T. 01482 786534.

ME

Hague's atmospheric hammer



GEORGE DIMELOW

George A. Dimelow builds a model tilt-hammer which works by vacuum.

In the 1835 edition of the *Engineer's and Mechanic's Encyclopedia* various devices were described involving the use of a steam driven air-pump to produce a vacuum line which was to operate over a distance to power machinery. Amongst these was an engraving and details of an atmospheric tilt-hammer designed by John Hague. This appeared to be an interesting change for me from models of stationary steam engines.

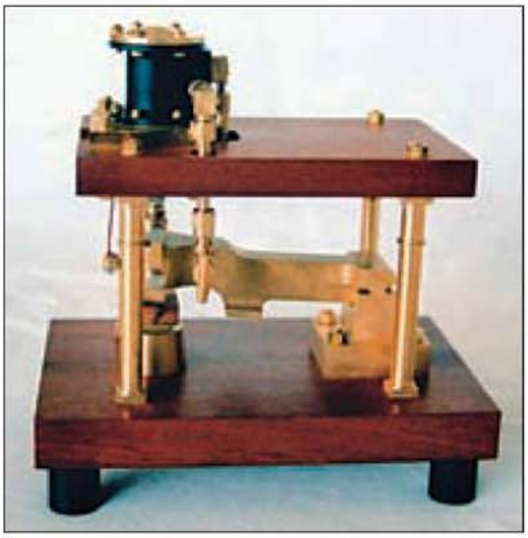
Hague's hammer was based on earlier tilt-hammers and may have been intended as a modification of those which already existed. He positioned a single-acting cylinder with a conventional slide-valve over the top of the hammer. A vacuum line was connected through the valve to the top port of the cylinder causing the piston to be drawn upwards. As the piston, with the hammer linked to it via the piston rod and the slings, reached the top a projection on the piston rod struck a lever which pushed the valve down and opened the top port of the cylinder to the atmosphere. Air rushed in, thus relieving the vacuum and allowing the piston and hammer to fall by gravity. Just before it struck the work a cord linking the front of the hammer to the valve lever pulled the slide-valve back up into the position linking the vacuum line again with top port and the cycle was repeated. A cock is fitted to start and stop the hammer as required. The engraving shows the cylinder without either a valve chest or a valve chest cover. Whilst these were not needed for the mechanism to work, operating it under dusty and dirty conditions would mean that grit could be sucked into the cylinder with the incoming air. Perhaps a valve chest could have been fitted with an air-filter in the cover?

In model form

As the model was to be a one off, castings were not used and the whole thing was machined out of brass with stainless bright work. As well as saving on cost, by carefully milling the complicated shapes all of the problems that come with commercially-made castings were avoided. The ⅝in. bore cylinder was turned as a bobbin with the port face silver-soldered on. The base and the floor on which the cylinder was mounted were both made from mahogany and finished with Danish wood oil.

When the work was finished and the time for testing had arrived a vacuum pump was required. Since it was only necessary to demonstrate the action, a simple syringe without any valves was made for the job. Coupling it to the inlet with a plastic tube and pulling back on the syringe piston resulted in the hammer bursting into life and striking half a dozen blows.

It was not clear whether the full-size hammer was ever built to these specifications, but the model shows that it would have worked. **ME**



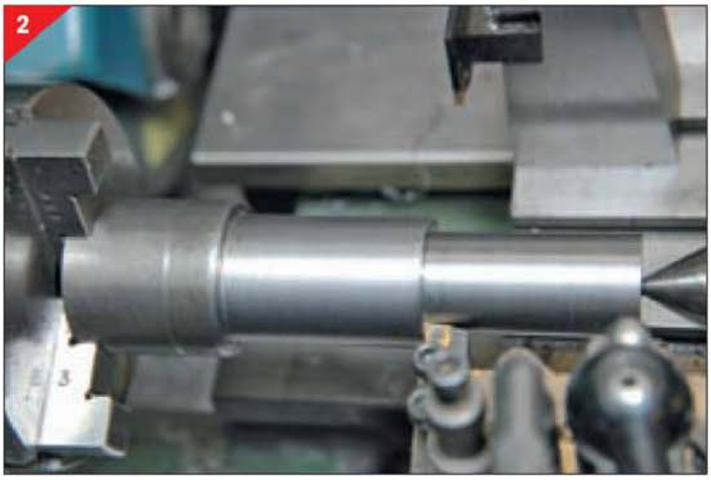
Don't fly off the handle!

DAVID HAYTHORNTHWAITE

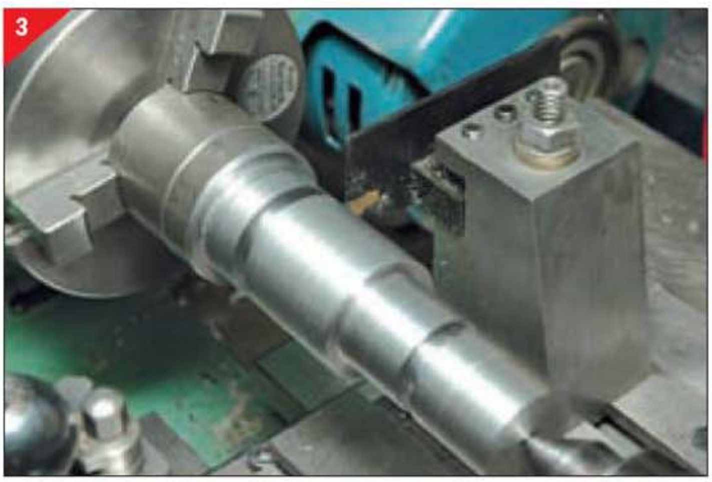
David Haythornthwaite turns his lathe mandrel safely with this pretty balanced handle attachment.

Many years ago I saw some scrapyard breakers smashing-up an old lathe with sledgehammers and I rescued the cross slide handle for the price of a pint of beer. On taking it home, I found it to be an ideal size for turning the mandrel on my Myford Super7B and it simply looks as though "it grew on the Myford". Our noble Editor spotted it on my website www.Haythornthwaite.com and suggested that I write it up for the magazine. That would have been easy if I had made the original, but he spotted the one thing that I had not made myself. I have now made a second identical handle (**photo 1**) and found it to be an interesting turning exercise which would benefit many lathe owners.

1. The finished handle in situ on the lathe.



2. Roughing out.



3. Making the grooves.

Handle details

As already stated, I first used this design of handle simply because it was there and of the correct size. However, when I started to use the handle, the fact that it was almost perfectly balanced proved to be a massive advantage. Although I cannot officially recommend the practice, when you are alone in the workshop, it is very nice to be able to spin the lathe up to full speed, with the balanced handle still in place, but do take measures to keep others away if you do this. On the Myford ML7 the handle also looks as though Myford had designed it themselves. It looks like a fitted handle as opposed to a workshop made accessory.

Order of machining

As the handle is comprised almost totally of curves and tapers, it is an interesting and challenging item to make, but I do suggest that you use leaded free cutting mild steel and not just any piece of metal which was lying around, as I did. I apologise for the fact that the measurements are mostly imperial, but I was copying the handle of an old imperial lathe.

The main (radial) part of the handle is made from a 5.5in. length of 1.625in. dia. mild steel and needs to be machined in a carefully controlled sequence, otherwise you will finish up with no means of holding the item for the final sections. Cut off a length of bar just over 5.5in. long, face one end and put a small centre in this end. I used a fixed steady for this. Remove from the chuck, fit the other end in the chuck and face the second end, bringing the length to 5.5 inches. Centre this end again with a small centre drill. I did consider making this item without centres in the ends, but centering the bar makes machining so much easier and a small centre does not detract from the finished appearance at all, in my opinion.

Roughing out

First of all turn the bar down to a thou. or two over 1.3in. diameter for a length of 4.0 inches. This will reduce most of the bar to the diameter of the middle ball, but leave a piece on the end to make the large ball. Then turn the end of the bar down to a 1.0in. for 2.11in. i.e. reduce to the diameter of the small ball in order to form the small ball and the thinner tapered part. At this stage it should look like **photo 2**. Now it is necessary to make grooves in the bar down to the points where the spherical parts of the item will adjoin the tapered parts. This will give space for the ball turning attachment tool to swing round to complete the edges of the balls.

First make a cylinder 1in. wide and 1in. diameter on the end of the bar in which to make the 1in. ball. Line up a the left edge of a parting tool with the end of the bar and then move the saddle down the lathe bed by 1in. plus the width of the parting tool. Lock the saddle and make a groove with the parting tool until the diameter at the bottom of the groove is 0.510 inch. This will leave you a cylinder 1 x 1in. for the small ball and a section that is just larger than the diameter of the small end of the taper where it meets the small ball. I actually then widened this groove by taking a second cut to a slightly larger diameter. Release the saddle and move it left so that the left side of the parting tool is now 2.11in. from the end, i.e. the parting tool is up against the previously made shoulder. Lock the saddle and make another groove with the parting tool at this point until the groove diameter is 0.63in. which is the diameter of the tapered section at the junction with the middle ball. In the same manner make a groove of 0.72in. dia. with the tailstock edge (right edge) of the parting tool 3.41in. from the end of the bar and a final groove of 0.78in. dia. that has its left edge 4in. from the end of the bar. The process is illustrated in **photo 3**, but you will see that I did not follow the same order, having just cut grooves 1 and 3 at this stage.

Turning the balls

The first ball to turn is the small ball, so leave the bar in the 3-jaw and fit a fixed steady so that the end is left clear to use a ball turning attachment. I used my boring head (described in *Model Engineers' Workshop* issue 133) to turn all the balls. I do not use suds on my lathe being frightened of rust, but I drip neat cutting oil onto the work instead. Some sort of cutting oil or suds is definitely recommended for a good finish. **Photograph 4** shows the setup and for all those readers who feel upset when looking at photos of clinically clean lathes, when they, themselves, are actually knee deep in swarf! I have left some of the swarf in place in the photo to illustrate that ball turning makes lots of fine swarf.

You can use either an 'up and over' attachment or a 'round the houses' (vertical axis) type of ball turner, but I shall describe the procedure using an up and over type as illustrated. First of all set the ball turning attachment exactly at centre height. Do this by adjusting the ball size of the tool in the ball turner so that the tool just touches the top of the work. Move the saddle right, swing the ball turner 180deg. so that the tool is underneath the work and return the saddle. If the ball turner is exactly at centre height, the tool will just touch the underside of the work. If not, then adjust the height of the tool, adjust the 'ball size' of the tool and test again until it is correct. Once you have set this correctly, rotate the ball turner 90deg. and move the saddle so that the tool just touches the end of the work. You have now proved that the centre of rotation of the tool is ½in. below the top of the work, ½in. above the bottom and ½in. from the end of the work. This is the correct position for turning a 1in. ball. If you get this position wrong vertically, you will turn oval balls. Wrong horizontally and they will be in the wrong place.

Lock the saddle and cross slide. Open up the jaws of the ball turner to allow the tool to clear the shoulders of the work and begin the satisfying work of turning the ball. Take the size of the ball to a few thou under 1in. diameter for reasons explained later.

Once the first ball is finished, bring up the tailstock to support the end of the bar and remove the fixed steady. Using either dials or, in my case, the DRO, move the saddle left by 2.26in. to bring the centre of rotation to the centre line of the middle ball. Turn the middle ball in the same manner ensuring that you do not cut too deep at the ends of the 'swing' as you will cut into the tapered portion of the handle. From the photos you will see that I left the middle ball until later, but it is possibly best to do it now.

Having formed the two smaller balls, reverse the work in the 3-jaw chuck, as shown in **photo 5**. You will see from the photo the reason for making the small ball a couple of thou under 1in. - it will pass into the centre hole of a 4in. Pratt Burnerd scroll chuck, so that the work can be held by the 1in. diameter section that you have left just behind it. Bring up the tailstock to support the work, and bring the end of the bar to a diameter of 1.5in. in readiness to form the large ball. Remove the majority of the metal between the large ball and the middle ball by turning it down to 0.8in. diameter and the result should look like **photo 6**, although you may have the centre ball already formed.

Set up for the large ball as you did for the small one and turn as before. I left the middle ball until last, so that I could use a fixed steady. However, I actually found that it was less cluttered if I used a fine rotating centre to support the end for most of the turning, and that the bar was secure enough to withdraw the centre and take light cuts when finishing off the end of the ball as in **photo 7**.

Turning the tapers

We are now ready to turn the tapered parts of the handle. However, with a ball on each end, it is difficult to hold the item. I turned a steel tube, 0.75in. long, 1.61in. O/D and 1.501in. I/D so that it was a sliding fit over the large ball. I then wrapped a strip of 80gm paper around the large ball and used the tailstock to press >>

4. Turning the small ball.
5. Holding the work for turning the large end.
6. Ready to turn the large ball.
7. Finishing the large ball with tailstock withdrawn.

8. Turning the smaller taper.
9. Milling the flats and reaming the holes.
10. Using a hand turning rest.
11. Using a profiling tool.

it into the tube with the tube against the chuck. The result was as shown in **photo 8** which allowed me to drive the work. The walls of the tube were thin enough to ensure that they deformed in the chuck jaws and gripped the work. This worked well as the paper ensured that the work was not marked by the tube and gave grip. A calculation of the original taper showed it to be 2.4deg. so set the top slide - or taper turning attachment to the correct angle and turn the tapers as shown in photo 8.

When using a taper turning attachment, do remember, first, to disconnect the cross slide lead screw. Also, I always push the top slide to the back of the lathe when starting the cut to take up the backlash in the taper turning device. Of course if you are cutting with the smaller taper on the left, you have to pull the top slide to take up the backlash. Use a round nosed tool with side angles sufficiently acute to ensure that it will clear the sides of the balls and will cut right into the corner. You will note that the larger taper is only roughed out at this stage. Eagle-eyed readers will note the diecast box on the lathe behind the middle ball. This is a B&W DRO for the cross slide. Unfortunately, this device is no longer made, which is a shame as it is very compact, does not interfere with the taper turning attachment, and is great on a smaller lathe, such as the ML7.

Remember that we are only interested in the aesthetic appearance here providing that we are able to ensure a correct balance at the end of the job.

Milling and drilling

Once the ball turning and taper turning is finished we now need to mill the flats on the centre ball and to drill holes for the centre spindle and the axial handle. Leave the work in the chuck and transfer both work and chuck to the rotary table or dividing head on the milling machine table, supporting the end with a tailstock. Alternatively, if you have a drilling/milling spindle on the lathe, you can use that but a ½in. hole is asking a lot of most of these devices.

Touch the milling cutter onto the top of the middle ball and zero the Z-axis dial/DRO. Gradually mill a flat, dropping the cutter until your Z-axis reads 0.1825 inch. Rotate the work by 180deg., lock the dividing head and carry out the same operation on the other side. This should leave a centre boss of 0.935in. thickness.

Drill a hole through the centre of the boss either 12.5mm or $^{31}/_{64}$in. depending on your drill set and ream ½inch. Do the same with the small ball, but making a blind hole 0.7in. deep, as in **photo 9**.

Turning the axial handle (Part B)

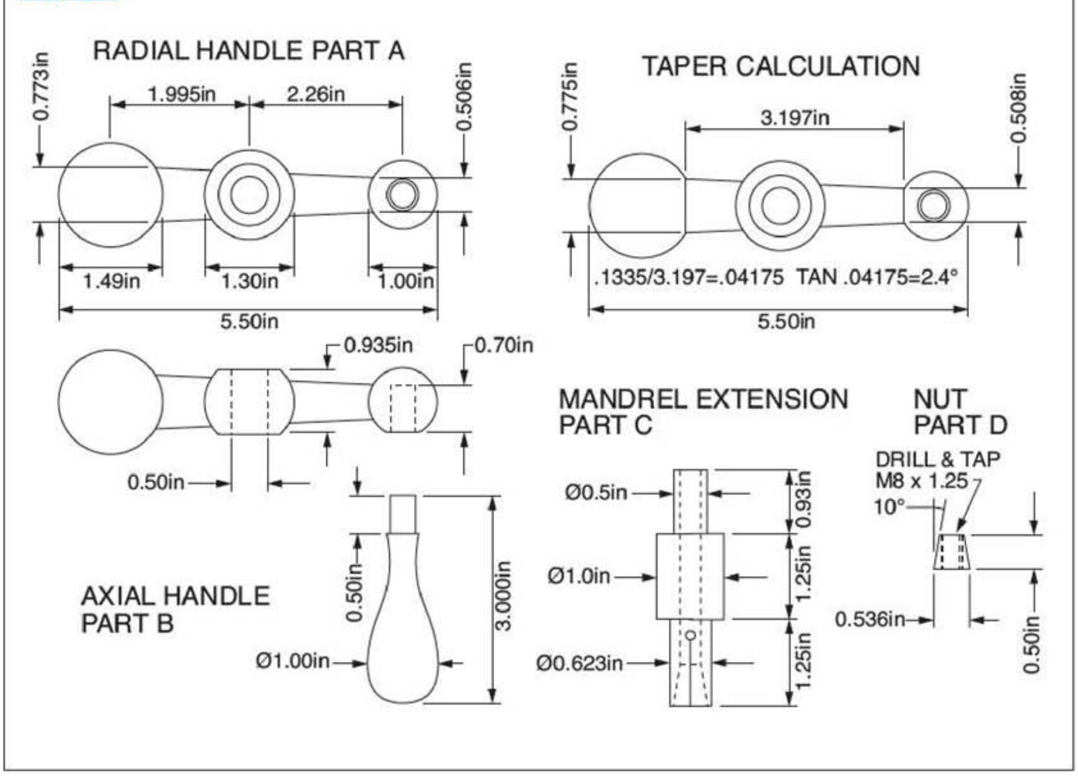
Turning the axial part of the handle proved to be one of those jobs where scratching my head only caused splinters in the end of the fingers! I did it by a combination of various techniques, including hand turning and turning with a profile tool. Both worked okay, but in the end I preferred using the profile tool and executing much coordinated "knob twiddling", **photos 10** and **11** illustrate the two methods. Start with a piece of 1in. dia. FCMS of around 4in. long and then reduce the diameter in appropriate places as much as possible by normal turning methods. I also part-made the ½in. spigot at this stage to remind me where the end of the handle was to be. Once you arrive at the need for curved surfaces, then the fun begins.

The hand turning rest that I used is one made from the George Thomas design and from a Hemmingway kit. The hand graver is fitted into a long handle and the left hand is guiding the tool across the work, or pivoting it, whilst the tool handle is held in the right hand. This is quite satisfying to do, but slow going with light cuts. Using the profiling tool in the top slide required careful coordination of the left hand on the cross slide handwheel and the right hand on the saddle handle. If you falter for a moment and don't keep cutting, then the result will be chatter - and consequentially "mutterin" as you have to get rid of the chatter marks! - so be positive with your feed rates. Once you are happy with the shape, finish the spigot to 0.498in. diameter and part off. I regret to say that I resorted to emery paper to finish this item after carefully covering the lathe bed and slide ways.

Balancing

The balance is not critical, but the better it is balanced and the smoother it will run at speed if you (inadvertently) run it at speed. Temporarily fit the two parts together, put a ½in. bar through the centre hole and balance it between two horizontal parallels (vice jaws if horizontal). I recommend that you make the axial handle heavy as it is easy to return this to the lathe and take another few thou. off the diameter, or to drill a hole down the centre of the spigot to lighten it. I was not pleased to find that mine was heavy at the large ball end. Faced with making another (heavier) axial part or filling it with lead, I decided to make a tube to hold the small ball, put the radial part back in the lathe, with a steady on the tapered section, and take a few thou off the large ball - twice actually. Much to my surprise it worked fine, but it would probably have been easier to have used tailstock support and reduce the taper on the large end. Once balanced, fit together with Araldite Epoxy Resin, clamp and leave in a

Fig 1



warm place, or, with permission from the domestic authority, cook at 50deg. C to cure.

Making the mandrel extension (Part C)

The initial part is a straightforward turning job. Cut off a 3.5in. length of 1in. dia. FCMS bar, chuck in the 3-jaw, face and centre the end, and clean up the outside for 2.75 inch. Turn down to 0.5in. diameter for a distance of 0.92in. (just less than the thickness of the centre boss of the handle.) Chamfer the shoulder. And then drill though the centre as far as you can with an 8mm drill for the 8mm bolt.

Turn the item in the chuck and hold by the section you have just turned. I used a ½in. collet to ensure concentricity. If you are using the 3-jaw chuck and it is worn, I suggest that you start with a 4.5in. length and try to turn the whole thing at one chuck setting. Turn the second end to 0.623in. diameter for 1.25in. which will leave a boss in the middle of around 1.25in. long. Chamfer the shoulder. Drill 8mm from this end to meet up with the already drilled hole from the other end. My Myford always meets up perfectly when I do this, but I know that some lathes struggle to drill long centre holes straight. If yours is such a lathe, you will have to drill smaller and tackle a very fiddly boring job, or finish with a reamer or D bit.

Now set the top slide over to 10deg. and bore the inside taper until the mouth of the bore is 0.536 inch. You will remember to use the top slide handle for boring won't you? If you once use the saddle handle out of habit then you are making another piece. Transfer the chuck/collet to the dividing head on the milling machine and cut the four slits with a slitting saw as in **photo 12**. If you are better than me with a hacksaw, you can use that as there are four slits. Finally, finish off the end of each slit with a drilled hole as in **fig 1**. Clean up the slits with a triangular needle file both inside and out.

Tapered Nut (Part D)

With the top slide still set over at 10deg. from boring the taper, chuck a short length of 0.625in. silver steel and turn a taper, large at the end, until the end diameter is 0.536 inch. Using the same setting of the top slide ensures a good fit into the tapered socket. Drill from the tailstock 6.9mm and tap for an 8mm bolt. Measure ½in. from the end and part off.

Before hardening this item, select a piece of fine piano wire, or a fine moulding pin, that will fit through the slots in the mandrel extension and drill a small radial hole in the nut so that a short length of the wire can be epoxied into the side of the nut, after hardening. In use, this pin will engage with one of the slots, to stop the nut turning when tightening or slackening the bolt. Finally, heat up the nut to 770deg. C and quench in oil. I also tempered my nut by heating in the domestic oven at 200deg. C. A standard 8mm heavy-duty washer would suffice between the bolt head and the handle, but I preferred to turn a shaped washer, 23mm diameter, with a nice bevel that finished off the job. **Photograph 13** illustrates the various parts.

Assembly

Fit the pin into the nut with Epoxy or Loctite. Opinions vary as to whether turned steel objects benefit from polishing, but personally I spent a few minutes buffing the parts on the buffing wheel and I consider the result to be most satisfying and in keeping with a handle of this type. I used epoxy resin to fit the two parts of the handle together and fitted the handle onto the mandrel extension with the help of a little nut lock, in case I needed to separate these at some time. The bolt is a standard 8mm plated bolt 95mm in length.

Ed. Safety note: handle must always be removed before switching on the lathe. **ME**

12. Slitting the mandrel extension.

13. The finished parts.

I/C TOPICS

Nemett continues his look at the benefits of 3D CAD systems in I/C engine design with particular reference to the use of Alibre Design before revealing how a Nemett engine is motivating students and responding to some reader comments.

Once the model has been created and refined, basic 2D drawings can be created very easily using a simple selection process. The basic drawing is then dimensioned and annotated to suit. There is an option to transfer the dimensions that were used to generate the model but I have found it best to ignore this because the requirements at that stage are not the same as those for the 2D drawing.

The 2D drawing facilities are very comprehensive and include such things as drawing templates, dimension styles, layers, various dimension options, notes and options such as hole call-outs, and weld and surface finish options. Those users who have been used to a good 2D package, as I have, will find that there are some restrictions in the 2D part of Alibre. These are there because the design work is carried out on the 3D model and the 2D drawings are linked to and kept in step with that. This means that some changes cannot be applied directly to the 2D drawings because of the link to the 3D model. This is not a problem, but does take getting used to at times.

Additional views such as sections, auxiliary and broken views can be generated automatically from the standard views as required.

Parameters such as default scale, projection (1st or 3rd angle), dimension styles, hatching style and other defaults are set for a drawing using the properties option in the File menu. This means that if a drawing master is not set up, the user must open a blank drawing and set these before adding any part views.

In use the new drawing screen is selected and the first thing that happens is that the small new sheet properties window opens. The sheet template, default scale and sheet name are set at this point. Note that the default scale does not fix anything; individual part scales can be set now or changed later. The user can also choose to create an empty drawing or go to the select part screen.

When this screen is confirmed, the user is presented with another small window (**fig 16**) which will ask for one or more pre-defined data fields to be completed. These fields can be set up by the user and can contain default information to save repetitive typing. If you set up your own drawing template, it is worth setting up these fields at that time.

The next screen is the insert part window (**fig 17**) for selecting the part to be drawn, together with the new empty drawing sheet. The part is selected from a displayed file list and once this is done the standard views creation window (**fig 18**) is shown. This screen allows the user to select from a wide range of options, the most important being the views (and their orientation) to be included. The views will be linked on the drawing and can be deleted later, or extra views added.

In addition to the selection of views, the user can select various other options including scale, the display of centre lines, hidden lines and hole call-outs. All these options can be changed later.

Centre lines can be added or deleted within each view but I have not found a way of doing this with hidden lines. These seem to be 'all or nothing'. It is not possible to display just

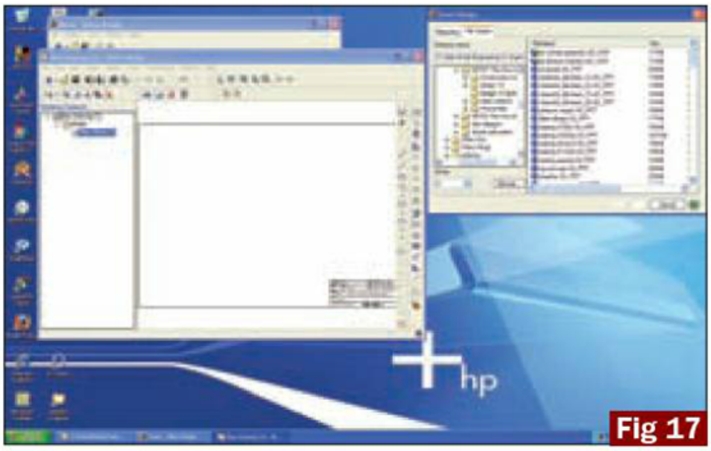


Fig 17

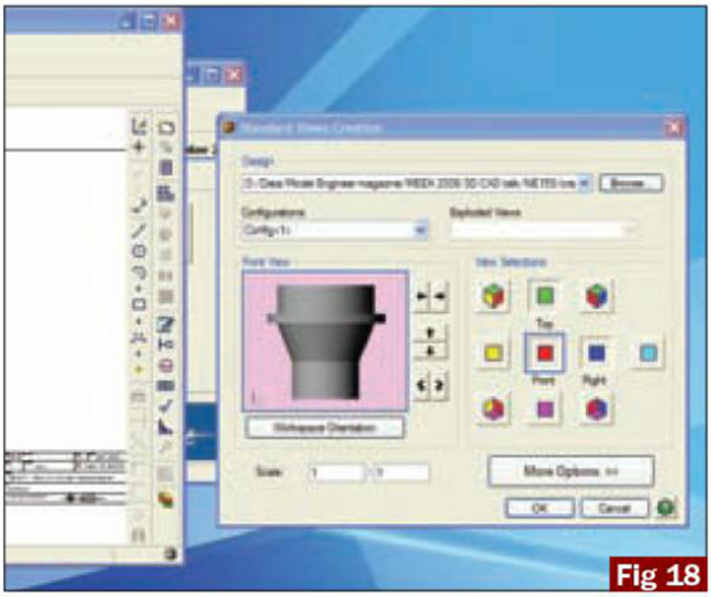


Fig 18

Fig 16

Fig 16. One of the drawing creation windows which allow user data to be entered.

Fig 17. The insert part window ready to select the part to be drawn.

Fig 18. This is the views creation window which allows the orientation of the base view to be set and the required views to be selected.

some of the hidden lines which can reduce complexity on things like cylinder heads.

Additional views (auxiliary, detail, section, partial, and broken) can be created based on the existing views. Because of the restriction on controlling hidden lines, I make use of section views as an alternative for complex parts.

Once the views are created, they are dimensioned (**fig 19**) and annotated using the dimension and notes tools. Dimensioning is generally easy, with the system working out if linear, circular or angular dimensions are being set and operating accordingly, but sometimes I have found that the interface can be slightly limiting in that it tries to impose particular styles which may not suit the user. They can be changed, but it would be nice if there were more options on the style screen. An example is circular dimensioning where the radius and diameter arrow layout defaults are fixed with double arrowheads for diametric dimensions and a single arrowhead for radial. This means that if something different is required, they must be changed for each occasion. If dimension styles have been set up, they can be changed for individual dimensions at any time. A drawing (**fig 20**) shows hole call-outs, sectioned views and other dimensions.

If a view is selected, some drawing can be carried out within that view. This is mainly used for creating some of the other additional views. For example, a straight line is used to define the cutting plane for a section and a circle defines the selection for partial and detail views (which are referenced to the main view).

Notes can be added using the relevant tool and images and bills of material (**fig 21**) can also be inserted. One limitation is that text files cannot be inserted, so in my case it is difficult to insert a table of valve milling offsets. I got round this using the notes facility, but it was more difficult and not as flexible.

It is worth emphasising that the big advantage is that if the part model is changed, the drawings will automatically be updated next time they are opened. The user is prompted and can choose not to update if preferred.

There are many other tools and facilities in the package and I have only covered the basic principles here.

The verdict

So do I like Alibre Design? The answer overall has to be a resounding yes. The 3D modelling interface is very easy to use and I felt in control of it at all times right from the first use. I also always knew where I was, which is not true of some other packages. I think this is for two reasons, the design explorer window, which gives visibility of all parts of the model, and the fact that the view changes as the user moves through the process, such as when selecting one of the extrude options, the view switches to an isometric type view and shows the effects of the current extrude parameters. My only small gripe is that sometimes the automatic constraints can get in the way, but overall they are a benefit and like every package, you get used to the way they work.

I have to say that the 3D modelling is one of the easiest of such programs I have seen and gives the user confidence from the start.

The 2D drawing facilities are not quite as good, but they are still more than adequate and do a good job of producing drawings very easily from the models. Some of the selections are not obvious because they require a particular view to be selected before they work, but once these things have been discovered, life becomes easier. Also as I have mentioned, some of the style options could be made more comprehensive to avoid having to carry out repeated changes. I think users with no previous experience of 2D packages will find the facilities excellent but those who have used other specialist 2D packages may find them slightly restricting in the areas I have mentioned. Some of this is undoubtedly due to the need to maintain links to the 3D model and also that changing from one package to another is always more difficult than starting from scratch.

I would have liked a printed hard copy manual. I have to say that this is a common trend these days but I think users buying a complex software package for several hundred pounds deserve a proper manual. In this case it is even more puzzling since the PDF manual available on the web is laid out for printing, but at around 650 pages would be expensive for a user to print.

All in all I would recommend Alibre if you are designing complex engineering assemblies, it does make life much easier. If you are just doing the occasional set of 2D drawings it is expensive although in terms of the facilities it offers, it is a bargain compared to most of its competitors. Those wishing to check out the trial version can download it via the Alibre (www.alibre.com) websites.

Fig 19

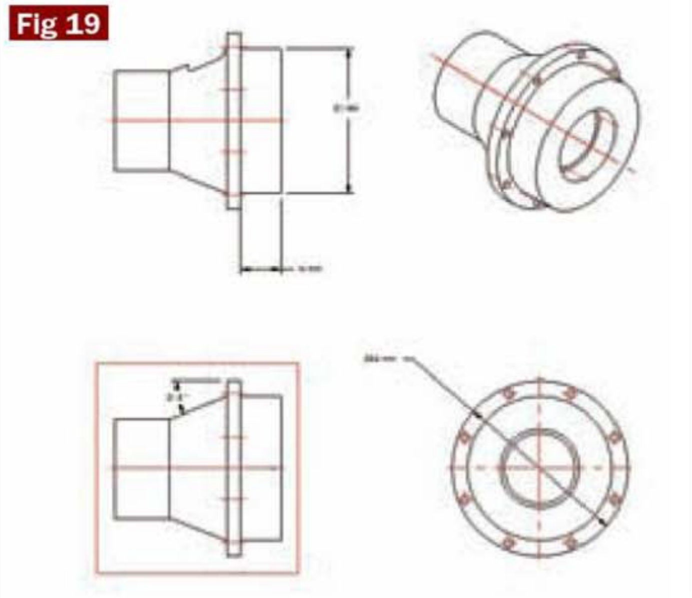


Fig 20

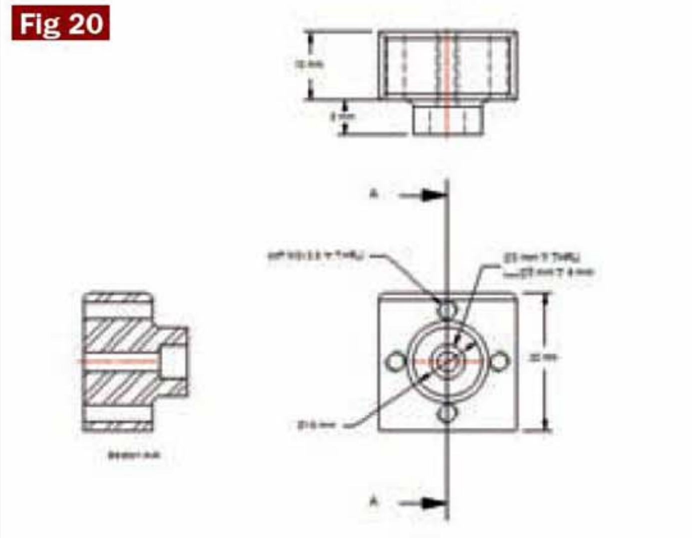


Fig 19. The set of views resulting from the selection made in fig 18.

Fig 20. Another drawing showing two standard views, a section and a series of dimensions.

NE15-S motivates students

Regular readers will remember that the Carlow Institute of Technology in Ireland decided >>

Item Number	Part Name	Quantity	Material	Sheet
1	Crankcase	1	aluminium alloy	1
2	crankcase nose	1	aluminium alloy	2
3	sump	1	aluminium alloy	2
4	engine mount	4	aluminium alloy	2
5	cam shaft cap	1	aluminium alloy	2
6	tappet guide	4	phosphor bronze	2
7	breather	1	brass	2
8	plug	2	brass	2
9	timing base plate	1	aluminium alloy	3
10	timing case	1	aluminium alloy	3
11	sensor mount	1	nylon/delrin/tufnol	3
12	magnet mount	1	aluminium alloy	3
13	sensor retainer	1	spring steel	3
14	retainer bush	1	brass	3
15	gear retainer	1	mild steel	3
16	air jacket	2	Aluminium Alloy	4
17	water jacket	2	aluminium alloy	4
18	cylinder liner	2	cast iron	4
19	water pipe	4	stainless steel	4
20	cylinder head	2	aluminium alloy	5
21	rocker support	2	aluminium alloy	5
22	rocker shaft	2	silver steel	5
23	connecting rod	2	aluminium alloy	6
24	big end cap	2	Aluminium alloy	6
25	piston	2	aluminium alloy	6
26	piston ring	4	Cast Iron	6
27	gudgeon pad	4	bronze	6
28	gudgeon pin	2	silver steel	6
29	crankshaft	1	mild steel	7
30	marine crankshaft	1	mild steel	7
31	balance weight	3	Mild Steel	8
32	prop driver	1	aluminium alloy	8
33	split collet	1	aluminium alloy	8
34	bearing spacer	1	Mild steel	8
35	flywheel	1	brass/steel	8
36	prop washer	1	steel	8
37	cam	4	mild steel	9
38	cam shaft	1	silver steel	9
39	cam long spacer	1	mild steel	9
40	push rod	4	music wire	9
41	cam short spacer	1	mild steel	9
42	tappet	4	mild steel	9
43	timing spacer	1	mild steel	9
44	timing gear stud	1	silver steel	9
45	valve	4	stainless steel	10
46	valve guide	4	phosphor bronze	10
47	rocker LH	2	aluminium alloy	10
48	rocker RH	2	aluminium alloy	10
49	valve spring cap	4	aluminium alloy	10
50	valve spring	4	spring wire	10
51	rocker pivot	4	silver steel	10

Fig 21. An automatically generated Bill of Materials.

to use the NE15-S design as a practical project in an engineering degree course.

I am pleased to report that course director Gerard Gibbs has informed me that students are now busy working on the engine (**photo 1**). The college has also invested in some mini-lathes for machining the smaller parts.

Gerard comments, "The students are really enjoying building your engine. One of the lecturers has used Solidworks to help the students visualise the engine. It's the only class where the students are queuing early for the workshop to get access to the lathes etc. I am looking forward to seeing the twin in *Model Engineer* soon".

There seems to be a message here that if you give students practical interesting projects to work on they will be keen and motivated. Of course all model engineers know this but it seems that there are many in political circles who do not understand this.

A reader update

One of my regular contacts and NE15-S builder John Brown recently contacted me to say that while he was waiting for the twin to appear, he has completed his Howell designed V-twin and has made two of the smaller carburettors to the Simple Carburettor design published in this column a few issues ago (*M.E.* 4323, 11 April 2008 and *M.E.* 4325, 9 May 2008) to use on it.

John sent a couple of comments:

"Attached are a couple of photos of the finished V-Twin bench running on spark, probably at about 3,000rpm.

As you can see (**photo 2**) I have used two of the new carbys for your twin and it is running on straight methanol.

For the ignition the single rotating magnet passes two hall effect sensors each feeding into a single TM6 type board

(own make) and feeding both plugs via a 6-volt coil (Exciter).

It means a lot of sparks are wasted but as they don't fire at an unwanted point it does simplify the set up. I think Jerry Howell suggests two identical set ups.

Jerry Howell suggests that the mounting of the Hall Effect sensors be on a Delrin block or similar but I used aluminium. However, I did have to use brass screws etc to stop stray magnetism confusing the sensors."

John also sent his construction notes for the carburettors which others may find useful:

"15mm square extruded aluminium bar does not seem to be a popular size, well not here (Australia) anyway so I used 16mm, no one would know.

I cut the bar to provide two body blanks and four end plates whilst chucked in the 4-jaw chuck. The outlet spigots on the bodies were finished to size as were the external spigots to the end plates.

The bodies were then held in the collet chuck and finished to length and the inlet spigot finished. I added an O-ring groove, probably not needed.

The end plates were likewise chucked and the locating spigot finished to length and diameter.

The six parts were cleaned up of all burrs and assembled into two carbys. I then super-glued the parts together and then set them up in the mill and drilled the two holding screw holes 2mm right through, no tapping. Assembly means two bolts and not four screws. Unfortunately the drilling forced the lower cover away from the body before drilling was completed so this had to be completed separately. Dismantle the carbys, remove the glue, and reassemble with through bolts and return to mill for final drilling, bleed hole, adjusting screw and throttle stop. If making more than one, mark mating parts, I didn't. Bodies finished.

The throttle body is as drawn.

The carby body complete with throttle body was chucked on the inlet spigot and the throat drilled and the inlet flare bored.

I didn't have any brass hex for the needle valve body so turned it out of round and assembled it to the end cap and then drilled for the fuel inlet pipe. I used a short piece of 3mm brass tube Loctited in (609). Trying to align the hex flat for drilling didn't appeal. Perhaps the needle valve body could be made plain, no thread and again Loctited into correct position?

I thought I would use a sewing needle, again Loctited into the adjusting screw, as in the NE15-S design but the suitable needle had a 2mm diameter which made it tricky to get through a 3mm screw. In hindsight it may have been wise to check out this beforehand and use a 4mm adjusting screw.

Pull it all apart, clean up and assemble for the last time."

John has used the carburettor on glow ignition and spark ignition with no problems.

John's note also had a relevant comment on Alibre:

"Thanks for your encouragement on using this program. You have hit the nail on the head; you just have to put in the time to master it. Until I really need to use it I will probably struggle with it, though I do like the ability to assemble parts to make sure they all fit before cutting up material." **ME**

1. Students at IT Carlow busy machining the crankcase of an NE15-S.

2. John Brown's Howell designed V-twin running on two Nemett Simple Carburettors.

KEITH'S COLUMN

KEITH WILSON

Keith Wilson offers advice on the cleating (cleading) of boilers (*Lillian* included) and discusses some points arising from communications received.

At time of writing I am busy doing the firebox cleating on my *GWRILLIAN*, my version of *Lillian*. Not having my 'cleating gantry' (**photo 1**), to use here, it was too small for this boiler anyway, the task is proving rather less easy than hoped. When you think about it, clamping is rather tricky. Even though the shape of the *GWRILLIAN* kettle is quite simple, persuading springy brass that you know best is not one of the lighter matters. However, the proverbial penny dropped and I realized that pop-rivets might make life more tolerable. It seems to be working well enough and a) they do not look too bad, b) they will be largely hidden by the tanks, and c) after making things a bit more permanent with plumber's solder, the use of files, etc., can make the visible rivet heads well-nigh invisible (**photo 2**).

It is clearly necessary to locate each backhead side (backside for short) precisely, with easy removal and accurate replacement. This can be done using the four studs used for holding the firehole doors in place (**photo 3**). Now when I made the firehole door set I used a flat piece of brass $\frac{3}{32}$in. thick, it was scrap to start with, so no loss. This flat was used to locate the runners and lever pivots, so would be used later as a jig to locate the studs that will eventually hold the door assembly in place. These studs make good locating points for each backside location. Once I had drilled and tapped these holes (remember that there are four big stays in the backhead just for the door fixing) I realized that this plate with a bit of trimming would make a fine re-enforcing plate for backsides and doors.

There is also a problem in that much air can be drawn into the firebox through the gaps 'twixt backhead and cleating'. This can be lessened by putting a hole through the plate and fixing a ring into said hole (**photo 4**). This ring was turned from an odd stub of brass 3in. dia. and about 1¼in. long. Technically wasteful, but it was an odd offcut anyway. To get the location exact, so that it fitted into the firehole on assembly, the hole in the plate was deliberately enlarged by about ⅛ inch. The plate was fitted onto the studs and on top of the backsides, the liner was dropped through into the actual firehole; a gentle touch of the torch with a little drop of solder fixed the liner in place and that was that. The general appearance is not too bad.

GWR cleading

If you are aiming at super-detail (gong grabbing) then dummy washout plugs may be fitted. They have to be made in two bits: the outer round portion rather like a button and the inner square bit. A 4-jaw self-centring chuck is valuable here, only needs to be a 4in. dia. one.

I do not fit, nor recommend, 'working' washout plugs in our sizes, for a), they are not required and b), the fewer holes in an urn the better - as if you needed telling.

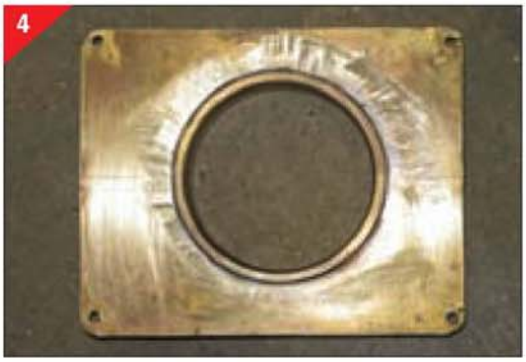
The trapezoidal piece for the top of the firebox is held on by a few 8BA roundhead brass screws. There is a piece of the cleading band material along each sloping side as well as the two bands (non-musical!) over the firebox cleating. I do not know which band is on top where they cross, but I find it easier to put the side-to-side bands on top. The 8BA screws go through the centre of the two longitudinal strips and into the sideplate edge. This looks tricky at first but it is easier than might be expected. A strip soldered onto the edge of each side along the top takes these screws and although they are not 'scale', it is hardly noticeable when finished - and very few people have seen the top full-size anyway. I have shown a photograph of the top of a big GWR miniature locomotive for easier visualization as to how it goes (**photo 5**).

The rivets on each side of the backhead cleading plates are real and dummies, about half each. They are there to boost the holding strength of the interlocking pieces seen on the back view. It will be

1. Gantry used to hold the various parts of the cleating in place on a GWR urn.

2. Side view of backhead cleating under construction, note the sides use pop rivets.

3. View of firehole plate installed on boiler backhead.



4. Firehole plate and firehole soldered together.
5. Top view of the trapezoidal plate over the firebox on a GWR locomotive.

seen that those on the right side 'underlap' the left plate, whereas those on the left 'underlap' the right plate. It follows that when assembled the plates must line up neatly. I don't know of any better way to ensure this, but of course this does not mean that there isn't one.

Handrails

Full-size handrail supports and the handrails themselves are painted the same colour as the cleating and/or smokebox. In our sizes I like to see them bright, 'tis but a matter of choice. Commercially made handrail supports - many are turned from German silver - are not strictly scale. In our sizes they are solid and screwed into the cleating - incidentally it is well to get them located on the cleating plates and soft-solder a pad behind them about 1in. square and anything up to ¼in. thick. Thus when a handrail gets a hefty knock (which can occur quite easily) it is less likely to distort the cleating. Any odd piece will do - the chances of it being seen are somewhat remote!

We usually thread the handrail through from front to back and leave it held in place by the parts across the smokebox front. It is advisable to make this handrail in three pieces at least, one for the smokebox front and one for each side. In the case of large GWR puffers, you will find that five are best. To assist in keeping bits in line, a 3/32in. dia. hole in the ends of each piece will take a short pin - it is not easy to ensure the joint is always inside a handrail support.

Although 'tis not too hard for us to thread the handrail through its supports, 'tis another thing to do this full-size with a 30ft. length weighing numerous kilograms, so the supports are in two parts. One is fixed to the boiler; the other is threaded onto the rail. When the needful number of supports is threaded on and approximately positioned then assembly onto the boiler is relatively simple, the supports being held together with taper pins. A bit tricky for us, for any sharp edges or small protrusions will catch in any cleaning cloths.

Cleaning 'our' boilers

For our copper teapots chemical means for descaling are best. Avoid sulphuric acid, for although it will dissolve scale (mostly calcium carbonate) it converts it to calcium sulphate which is much less soluble than the nitrate or the chloride. Nitric acid is tricky stuff, and under some circumstances will dissolve copper. Plumbers' suppliers usually stock descalents, and in powder or liquid form this does its stuff well and citric acid in powder form is stocked by many chemists. For those who are a bit shy of handling acids, then this is probably the best.

An interesting point here. With the injectors on my 5in. King, the one that I had purchased at first refused to work no matter what. Eventually I put a 0.015in. washer behind the steam cone, after which it never failed. I then dumped my twin water-pumps, and added a second injector on the other side, with a washer as per the first. It was a fairly hard-water area and of course the squirts tended to fur up a bit with scale. So I removed them after each day's steaming and put them into a cup containing some water c/w citric acid. It was a good idea and worked well.

The boiler was blown down at the end of running and whilst I was cleaning 'him' down, the injector overflow pipes were blocked and blowdown valves closed and tender water valves fully opened. Result, the last drops of steam condensed producing a boiler 'full of vacuum' (?) thus filling boiler with clean water ready for the next run.

As a matter of interest, your stomach contents include hydrochloric acid in quite high concentrations, which is why if you have the bad luck to vomit on a near-empty stomach your mouth and throat sting so badly, in fact it can rot through a carpet if not cleaned up soon. Hydrochloric acid is also known as muriatic acid - I don't how where the name originated, but it's still in use. Formic acid is another useful descalent; it is also used by red ants and stinging nettles as a good irritant. Taking things into account, kettle descalent is pretty certainly the best; one trade name is Kilroc.

Signalling

A friendly email received tells me that 'amber' does not apply to my recent notes on railway signalling. It was always 'yellow/double yellow'. I stand corrected. Thank you for this, friend. A point that is semi-relevant is that the glass in a semaphore signal was blue rather than green; this combined with the yellow of the oil-lamp flame made green.

This reminds me of a rather doubtful legal trial in which a driver was bullied into admitting that he had passed a red signal and he was therefore to blame for something or other. The fact that the red signal was on another track was carefully not admitted by the prosecution, in spite of the times the driver drew attention to it. "Did you or did you not pass a red signal?" "Yes, but not in the sense you mean." The old story of ignorance from every one involved (except railwaymen and the driver) should come as no surprise. In passing, let me mention that a degree in one subject does not necessarily mean omnipotence in any other subject. I have had some in my own experience in scientific research.

Hydrostatic lubrication

There has recently been some acrimonious correspondence of late re: hydrostatic lubricators. I am not interested in this matter (the correspondence), but I may be able to throw a little light on the observed size of oil droplets, or the factors causing this.

It seems to me that this must depend on relative specific gravities of the liquids concerned and the size of the nozzle. For when the upthrust due to oil being lighter (a lower specific gravity) than water reaches the strength of the surface tension of the oil globule, it must break away. The lower portion of the sphere becomes 'necked' and as the neck becomes deeper, obviously the tension on this neck increases. Like tensile strengths of metals, there comes a crucial point, (the yield point if memory is correct) at which the neck extends in length without any increase in the applied load. When the 'ultimate' is reached, the neck fractures and that's that.

I had an experience rather like this when I was required to find out the surface tension of titanium! Supplied with a few feet of 16swg titanium wire, it was done by using a self-adjusting welding machine to

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6. What scale is it? Amazingly this finely detailed locomotive is 'O' gauge.

7. Smokebox view showing the superheater headers, scale rivets and scale-size tubes.

8. The detailing of the cab area makes it hard to believe it's only 'O' gauge.

run a high-powered weld onto a slab of aluminium. The weld did not penetrate the slab, so the droplets were collected, counted, etc., and a few calculations gave the answer.

It was carrying out this bit of research that showed that titanium has a most beautiful violet flame coloration. Whoever now owns my very first engine - a 2½in. gauge 'Mary Ann' (an LNER 0-6-0 tender engine) - kindly note that the pushrod in the LBSC-designed whistle valve is a piece of pure titanium.

Perhaps the best all-round answer was invented by Larry Barker, of the **Wolverhampton SME** He used an oil pump in the oil tank working faster than usual against a little 'safety valve' set at a little above boiler pressure, returning oil to the tank. The system thus provided a constant supply of oil which was fed via a control valve to the hydrostatic sight feed set-up.

Whilst writing this I remembered an interesting fact. When you open the regulator, the pressure in the steam chest will rise and one of two things will happen. Either the train will move or the driving wheels will slip. The interesting fact is that this will happen at a much lower steam-chest pressure than one would expect. I put a steam chest pressure gauge on my first big engine, the 5in. gauge King, to see for myself what happened. Can't be sure now what the relative pressures were (boiler versus steam chest, it was about 46 years ago), but there was a big difference. I think that 100psi in the urn gave 40psi in the chest and off we went with quite a good load.

Size

As is fairly well known, on occasions I like to show a photograph of a model which is very hard to decide on the scale thereof (**photos 6 - 8**). The pictures herewith are of a Great Western Castle, but how big? I have only found one very tiny inaccuracy (and the maker says I am the only person to spot it) there is only one whistle chain in the cab. Apparently two were tried, but it made the footplate look a bit crowded. In full-size one chain went right across the cab for warning use by both driver and/or fireman, the other was on the right-hand for driver only; it was the larger whistle which of course sounded a lower note (for musician readers about a minor third lower). This one was the 'brake whistle' to call for brake application, presumably first provided before continuous brakes were used. Exactly how non-musical guards were expected to know which whistle was sounding I have yet to discover.

As far as I know, the high-note was A flat; the lower was F. I have already mentioned in the past that a long high note followed by an equally long low note was recognized as a rude sound.

On this model, great attention has been made to detail; have a look at the front view showing the front tubeplate. Ideal for 'rivet counters', and admittedly the locomotive won't run any better for them, but rivets have to be used and they might as well be correctly sized and positioned. The same applies to many other fittings. The old proverb or adage "spoiling the ship for a ha'porth of tar" comes to mind. One trouble is that drawings are not usually dimensioned for rivet sizes or positions.

A typical case is that most impressive GWR 'King' bogie. There are at least three different sizes of bolts visible in each side. A certain amount of research was required to ascertain what these were. I found that they could best be done with three consecutive BA sizes of bolt. The trouble here with my last four Kings was that the modern sizes of bolt head in the BA series are smaller than in days of yore; this meant that I had to make some bolts myself out of the correct-size hexagon steel. I remember seeing a 3½in. gauge 'King', much fuss about being made to Swindon drawings. It had bolts at the front of the bogie side where there should have been rivets, and surprise surprise, rivets on the side-control fitting where there ought to have been bolts! Oh well! **ME**

WILSON'S WORDS OF WISDOM

There is honesty in disbelief, whereas there is none in the distortion of facts.

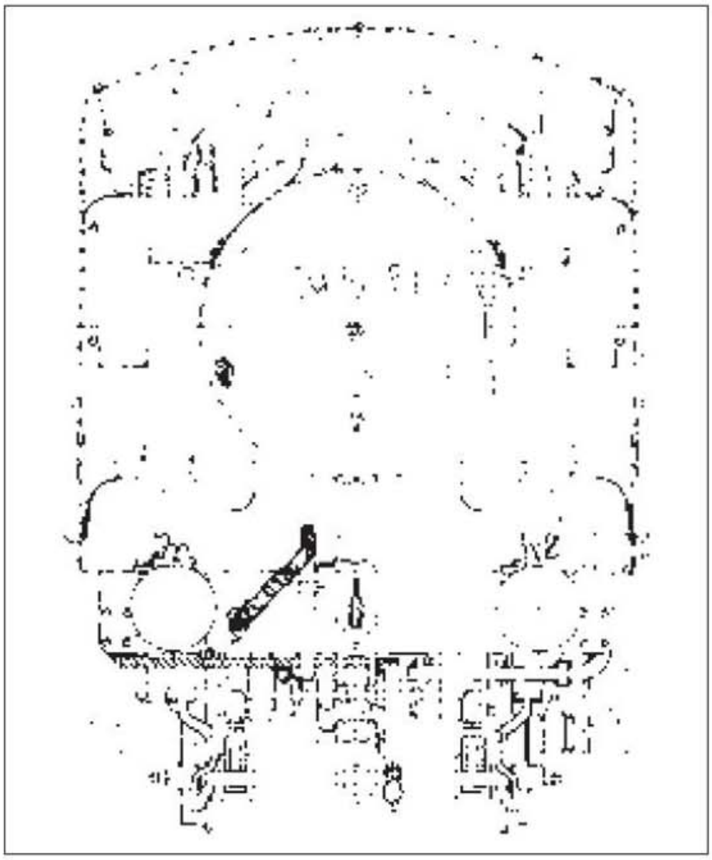
Elizabeth van Buren

The 94xx class pannier tanks

PETE RICH

Peter Rich explores details for modellers of the last large Great Western designed and built 0-6-0 pannier tank locomotives.

I was down at St. Brides Wentloog the other day having a quiet practice with the pipes when, once again, my mind drifted off into our model engineering world and I started thinking about my next model. For once, I thought I would build something modern and up-to-date, but it had to be of a Great Western nature and I almost immediately thought of one of the very last designs for the old company, namely the 9400 class of 0-6-0 pannier tanks. This group is all the more appropriate for me because I actually worked on them when I was at Ebbw Junction in the 1950s. At that time we had Nos. 8406, 8453, 9458 and 9492 allocated to us and were regularly visited by No. 8450 from Tondu.



Origins and relations

The 94xxs were the last large tank engine design for the Great Western, Nos. 9400 to 9409 appeared from Swindon in 1947. They were an updated version of the old 57xx class 0-6-0s of 1927, but fitted with a Standard No. 10 taper boiler. As such, they can be regarded as the tank engine version of the 22xx class of 0-6-0 tender locomotives, although 94xxs weren't built until 17 years after the 22s first appeared on the scene.

Recently, there has been quite a lot written about these engines in the railway enthusiast press, not a lot of which has been complimentary. The main concern has been their very short working lives and a lot of the focus has been centred on locomotive No. 9499 built in July 1955 but withdrawn for scrap in September 1959 after a working life of just over four years - more of that particular locomotive later.

In total, 210 units of the class were built. The first 10 were constructed at Swindon with superheated boilers. The other 200 were not superheated and were built by contractors such as Bagnall, the Yorkshire Engine Company and Robert Stephenson's. These were assigned the number ranges of 9400 to 9499, 8400 to 8499 and 3400 to 3409.

At this distance in time it is difficult to understand why these engines were built at all, because the Collett-designed 57xx class were very successfully doing everything that was required of them. Indeed, while the 94s were being built, Swindon was continuing to build more engines of the 57xx class.

Route codes

While the 94xx class may have been a modern equivalent of the 57xx design, they had the same tractive effort as the older engines, but they were actually a step backwards in usefulness because their axle loading was greater. This placed these newer locomotives in to the 'red' code for route availability restricting them principally to main lines. Thus, they could not cover all of the same routes as the 57xxs.

On the point of route availability you will note that I have shown the code disc for this just above the number plate. This was painted red indicating that the engine was restricted to red-coded routes and it carried a letter 'C' in black as shown, indicating the engine's power classification. This detail seems to have had some difficulty finding a set position on the cabs because some engines carried it fairly high up as shown, while on others it was lower down nearer the number plate.

For those of you who follow Great Western matters, I point out that the position above the number plate only came about after the introduction of the engines with side window cabs prior to which it was carried high up on the cab side in front of the cut-out. Indeed it remained there on quite a few locomotives with Churchward-style cabs even well into BR days.

Services

As far as I recall, Ebbw Junction used No. 8453 on the passenger trains up into the western valleys of Monmouthshire. This is about the only passenger service they were used on from Ebbw. The other duty I recall them

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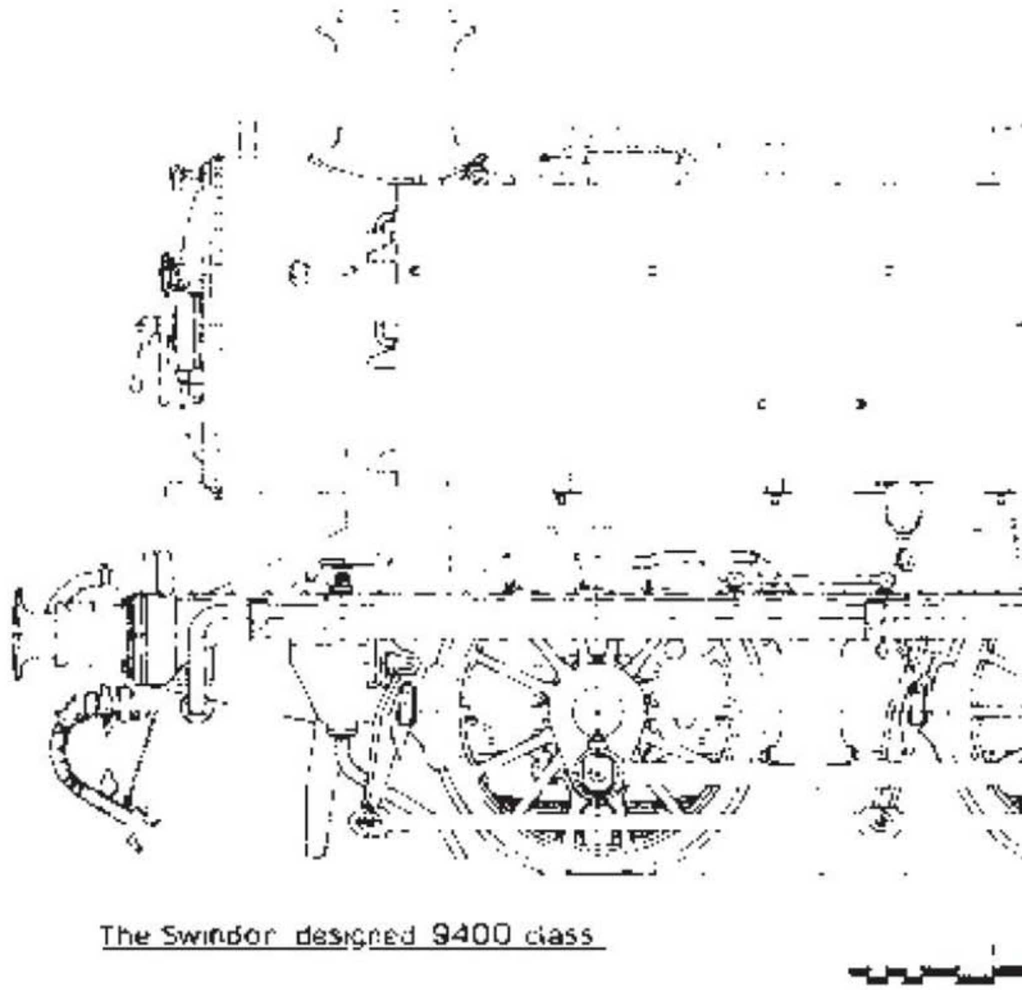
working was as pilot at Newport High Street Station where No. 9458 was a regular performer over a number of years. What duties the others did I am afraid I don't know, but they were probably goods yard pilots around the town.

Not another one-off

While researching and preparing the notes for this article, I did my usual examination of the top of the engine and low and behold I thought that I had found that No. 9400 qualified for one of my 'one-off' articles because photographs show its tank filler holes are further back along the tank, to just in front of the safety valve, whereas the works drawings show it as per my drawing. I was prepared to write the article from that point of view, but on further checking revealed that 9401 was the same. As far as I can see these were the only two with this arrangement, all others appear to be as shown in my drawing. So, it is interesting to note that the official preserved No. 9400 is not representative of the class and that the other survivor, No. 9466, fits that role more correctly for what was correct for the class overall.



The Swindon designed 9400 class

General modelling details

Now let's have a look at the class from an authenticity point of view. I will draw your attention to some of the details should you contemplate building a model of one of them.

The rear buffer beam side steps on both sides were mounted outside of the buffers facing rearwards on engines built at Swindon as well as a few others from the outside contractors, which also had them mounted that way. However, they were soon re-positioned per my drawing and faced to the side of the engine. These footsteps on most engines were as shown, but photographs show that there were variations. On some engines the right-hand step was omitted, but the side vertical handrail above it was retained. Others show that both were omitted. So, you really do need a good photo of your prototype if you want to be authentic when building a particular member of this class.

The bunker footsteps shown were only on the left-hand side of the engine. Close examination of photographs shows there was a difference between those first 10 engines built at Swindon and the rest from the outside suppliers. On Swindon-built engines, Nos. 9400-09, the aperture for the inset pocket for these steps was quite a lot higher than on the rest and the inside vertical wall was also much higher.

Examination of the official Swindon works drawings shows that the lower rear three lamp irons fitted level with the running plate and yet photographs show that they were actually bolted to rear of the bunker about 6in. above this position as shown on my drawing.

These locomotives were wider over their cab sides than all other GW engines except the 'County' 4-6-0 class. This caused a bit of concern that the driver could not reach the brake valve handle while leaning from the cab during shunting operations. The arrangement was modified by installing a fitting on the boiler backhead closer to the cab side and attaching it to the lever on the valve via a pull rod.

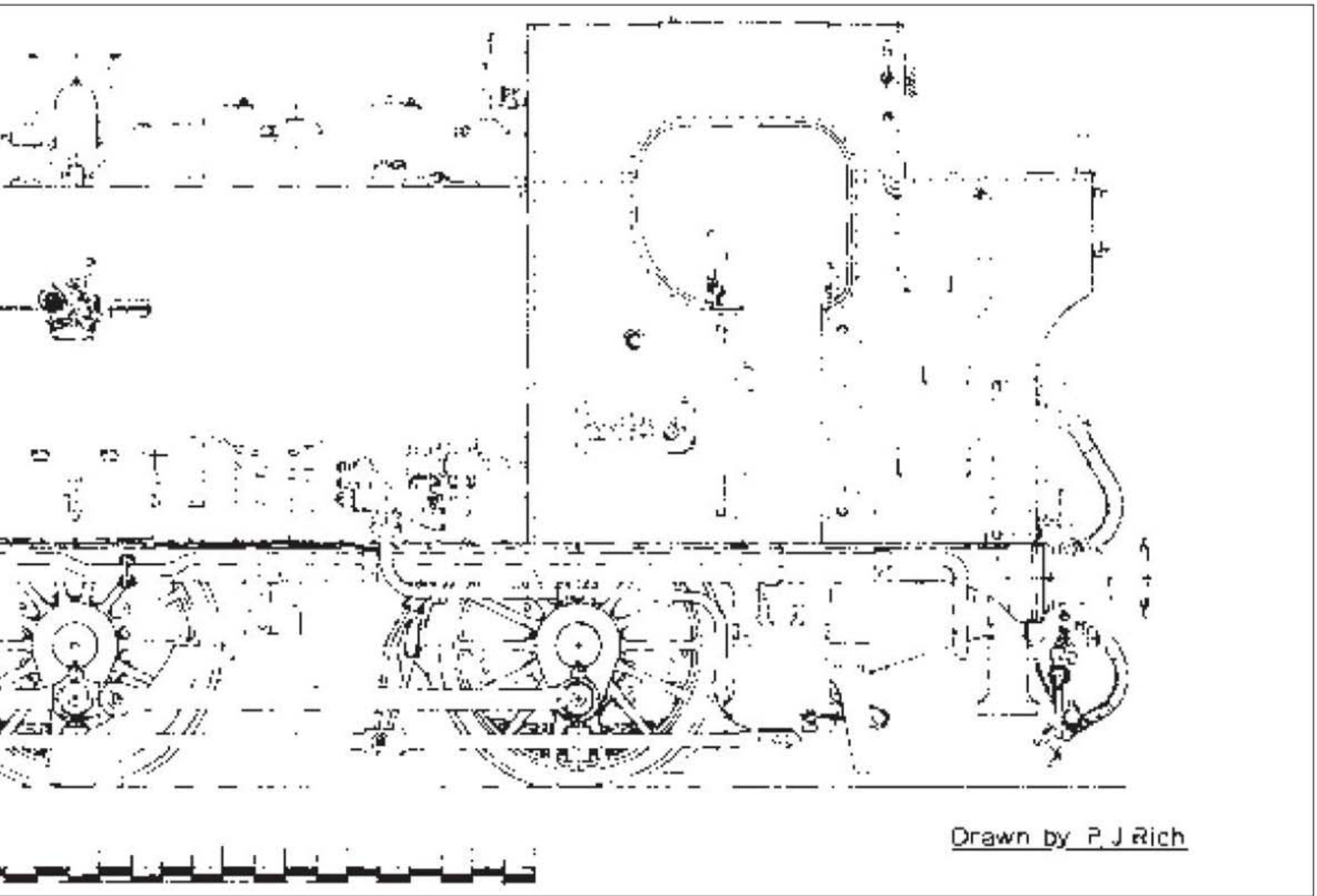
The 94xxs were also unusual because, in the past when GWR engines carried maker's plates, they had them on both sides of the engine. These 94s, however, had the builder's plate fitted only to the leading driving wheel splasher on the left side. However, it was sometimes removed at Swindon when the engines were delivered from the outside contractors, which appears to be borne out by photographs, some engines have them and others don't.

I have no information as to the size and shape of the works plate for 8453, indeed it may well have been one of those removed on receipt from the makers. I have therefore omitted it from my drawing rather than include something which could be wrong.

The standard short safety valve cover was used on the class, but photographs show that two of the class (8403 and 9455) carried the old tall pattern for a while during their lifetimes and 8403 reverted to the standard short size before withdrawal.

Those engines built by the outside contractors had a thinner top to the upper works of their chimneys than those built at Swindon.

Another point to be noted with these engines is that their crankpin nuts were assembled with their flats arranged vertically through the wheel centre line. This was opposite to the normal practice of having the flats at 90deg. to the vertical centre line through the wheel although the locking bolt remained on the centre line. The coupling



rods were made with squared-off shoulders similar to those carried on some of the 2301 class 'Dean Goods' engines of 70 years earlier.

Piping

The vacuum brake train pipe was carried on the left-hand side under the running plate on the outside of the valance angle and turned down fairly close up to the front valance buffer beam angle at the front end. Photographs show that on some engines the pipe was turned down about 6in. to the rear of the angle. On some engines the pipe was dipped and a flange coupling was included in the pipeline as shown in my drawing. I don't know whether No. 8453 had this arrangement, but I have included it to ensure that the point is recorded. In all others it was carried straight through without the joint or dip.

A smaller pipe was carried in a similar position on the right-hand side. This was wrapped with asbestos cloth for insulation, as it was the steam heating pipe.

Injector positions

No authors have commented on the positions of the two injectors. There was one on either side, fitted above the running plate just ahead of the cab as shown. There is nothing unusual in this as far as GW engines were concerned, however the right-hand injector was mounted further inboard than the left-hand one which allowed its overflow pipe to bend and pass down through the running plate and through the bottom of the cab footstep. The overflow pipe from the left-hand side was carried out and over the edge of the running plate and then down to the step as shown in the drawing. Some locomotives had a flanged joint in this pipe, as shown, while others did the journey without a break. Both water control valves for these injectors were located on the left side of the engine and a long pipe lead around the front of the firebox to the right-hand injector.

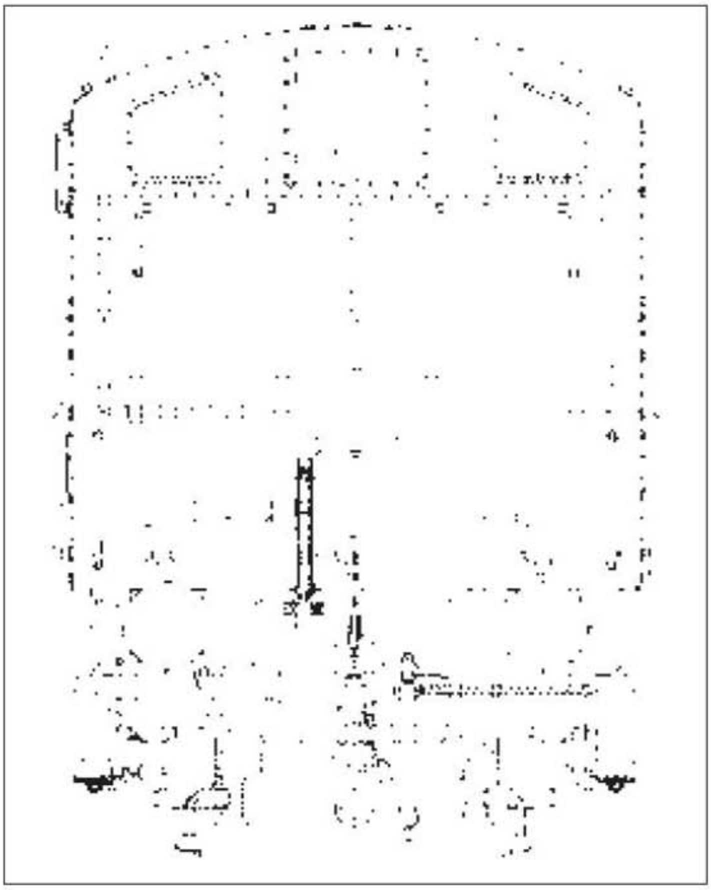
Table 1: Principle dimensions of the GWR 9400 class pannier tank locomotives

Front overhang	6ft. 6in.
Trailing overhang	7ft. 6in.
Wheelbase	7ft. 3in. + 8ft. 3in.
Wheel dia.	4ft. 7½in. dia.
Boiler	Standard No. 10
Barrel	10ft. 3in. x 4ft.
Firebox	6ft. - 0in. long.
Grate area	17.4 sq. ft.
Pressure	200psi
Total weight	55tons 7cwt
Tractive effort	22,515lbs
Tank capacity	1,300 gallons
Coal capacity	3-ton - 10cwt

Note: Overhang is the distance from the inside face of the buffer beam to the nearest wheel centre. It is not from the outside face of the buffer. The main drawing was scaled to the normal 5in. gauge of 1.0625in. to 1 foot. The scale on the drawing should assist those who want to use this as the basis for a model.

Buffer beams

When I started writing this article examination of a photo of the front of one engine showed that the front buffer beam was bolted to the frames with the >>



securing nuts on the outside face, a legacy left over from the 57xxs. I was happy to leave the matter as seen. However, I recently bought a paperback book about this class and its photographs show that, while most engines had buffer beams secured with nuts, this was not always the case and some had snap head rivets instead. Others had a combination of both whereby all were attached with nuts except for the lower horizontal row between the buffers where there were snap heads. On my front view I have shown the 'combination' type, but I hasten to add that the rear buffer beam was always snap head riveted.

Pannier tank painting

Before I leave the authenticity aspects of modelling these engines, I should point out to you that the pannier tanks finish (or start if you wish) short of the front of the smoke box and in connection with this I draw to your attention that some preservationists get matters wrong when painting the fronts of the tanks on the preserved engines. On GWR engines where the front of the pannier or saddle tank was level with the front of the smokebox, the whole of the front including the fronts of the tanks were painted black.

When panniers, saddles or side tanks finished short of the front of the smoke box the fronts of tanks were painted Middle Chrome Green and in pre-1914/18 war days they were fully lined out.

Smokebox hinge straps

Great Western smokeboxes had their hinge straps chamfered along their bars which stretched towards the centre of the smokebox, but photographs show that some of them had plain flat bars, so you really need to examine a good quality photograph if aiming to be authentic.

Lastly, photographs show that the first engines, built at Swindon, were fitted with plate between the frameplates matching the sloping part of the frame. There is some suspicion that other members of the class acquired this feature, but I have never found any photo to confirm this.

Shed visits

Back in the 1950s my old friend Gary Davies and I used to cycle down to Cardiff every Sunday and visit the three engine depots there, one of which was Cardiff East Dock Depot (coded '8B'). East Dock had quite a few of these engines allocated and during 1956 we saw all of the 34xx series arrive there brand new from the manufacturers. One of the points I remember about these engines was that they were not fitted with ATC equipment and later photographs show that the 34s did not have the battery box fitted to the rear of the right-hand cab footstep which is an indication that they probably were never so fitted.

During this time I recall that No. 9499 was always deep inside the shed right up against the stops and always seemed to be in brand new condition with shiny black paintwork.

Whenever we visited there it was, always in the same position, and I feel sure that it did not move from there for at least two years. It was still in the same position when the last two Rhymney Railway 0-6-2Ts were sent off from East Dock to Swindon for scrap in 1957. Number 9499 itself was withdrawn for scrap in September 1959 having existed for four years and two months and reputed to have done just over 50,000 miles in service, although I have my doubts about this figure. It was only eight years before this that No. 992 of the 850 class was withdrawn after a working life of 76 years. Makes you think, doesn't it?

Historical assessment

At Ebbw the 94xxs appeared not to be very popular with the enginemen and I recall comments that they were top heavy. That being accepted, it is fairly difficult to understand why they were unpopular with the crews because their footplate area was larger than on the 57s and probably more comfortable to work on. On the newer design, the rear axle box springs were mounted underneath. On the 57xxs these were coil springs mounted inside the cab above the axle boxes and were a nuisance. We were always bumping our backsides on them when firing.

I feel sure that their main problem as far as acceptability is concerned was that they were the last of a long line of similar engines and they had the unfortunate circumstance that British Railways was much committed to converting to diesel traction by the late 1950s. Any faults which might have been found in these engines would have been very much ironed out had steam continued and we might well have seen them emerge as much better engines than that which they became.

The 94s were unfortunate in that although they were more modern than the 57s which they were intend to replace, they were fighting their corner against an already excellent design and because of their restricted route availability they were not as useful as the 57s.

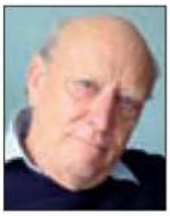
Preserved examples

Irrespective of any criticisms of them at the time, I thought they were attractive looking Great Western engines, both modern and up-to-date and I think they would make an excellent subject for a model if LBSC's 'Pansy' design were updated.

We are fortunate in that there are two full-size locomotives of this class which have been preserved, namely Nos. 9400 and 9466. Number 9400 is on static view and resides at the Steam Museum in Swindon, while 9466 has been privately preserved after being saved from the scrapyards at Barry. I have not yet been able to examine No. 9466 but I have consulted No. 9400 for this article. A number of detail dimensions for the drawings have been taken from that engine, official Swindon works drawings and careful examination of contemporary photographs.

The pipes have got to me again so I'm now going to go away and bide for a while until the urge for the drawing board takes me once more. Oh, those pipes have got a lot to answer for! **ME**

Rebuilding a Model Aeroplane Engine

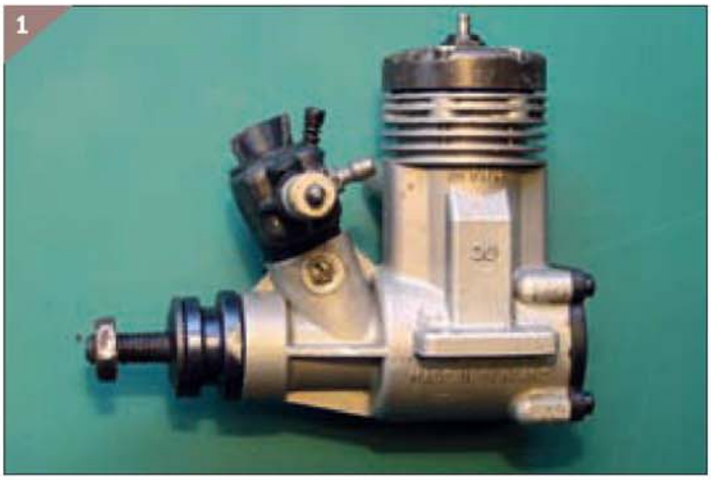


ALAN JOHNSON

Alan Johnson describes how he repaired an *Irvine 20* engine and converted it to diesel.

I came across the *Irvine 20* model aero engine at a modellers bring-and-buy sale a couple of years ago; it certainly looked in a bad way having had a lot of use and, from the damage, had been in at least one crash. Irvine engines are well made and powerful, and I thought I could restore this example to a working condition. "Be useful for spares", the vender said - and I got it for a song!

Back home, I removed years of solidified caster oil by soaking the engine in cellulose thinners (after first removing all plastic parts). Now I could see more clearly the task ahead (**photo 1**). Externally, some of the cylinder head fins were broken and the throttle-type carburettor was smashed. Internally, the piston/liner fit was badly worn and compression was non-existent, also the big end bearing had far too much play and would need attention.



1. Engine cleaned up prior to beginning work - the broken carburettor is clearly visible.

2. Piston and cylinder liner.

3. Drilling a con rod big end to fit a phosphor bronze bush (not Irvine con rod).

4. Big end bush - note the notches filed in the outer edges.

5. Using an electric heat gun to expand the con rod prior to pressing the bush in place (not Irvine con rod).

Compression

Firstly, I addressed the problem of compression, or rather lack of compression. As I explained in a previous article (see *MEW* 125, May 2007), I expanded the piston by heating it in a furnace then, after making an internal and external lap, I cleaned up the cylinder bore and lapped the piston to fit (**photo 2**).

Bushing the big end

To reduce the big end play I decided to drill out the con rod and fit a phosphor bronze bush. There was plenty of metal in this region so the strength of the con rod would be unaffected. I enlarged the bearing bore with a letter B drill. I carefully measured the hole and turned a bearing two thousandths of an inch larger. Before parting off, I drilled the bearing using a No. 12 drill to allow a $^3/_{16}$in. hand reamer to be used after the bush was fitted (**photo 3**). In the past, I have had problems where bushes have moved, not when the engine was running but when reaming. To prevent this I now use a small triangular file to cut four small external notches on each end of the bush (**fig 1** and **photo 4**). After assembly, I use a centre punch to force a small amount of the surrounding metal into the notches. To assemble the bearing, the con rod is heated with an electric heat gun (**photo 5**). A small >>

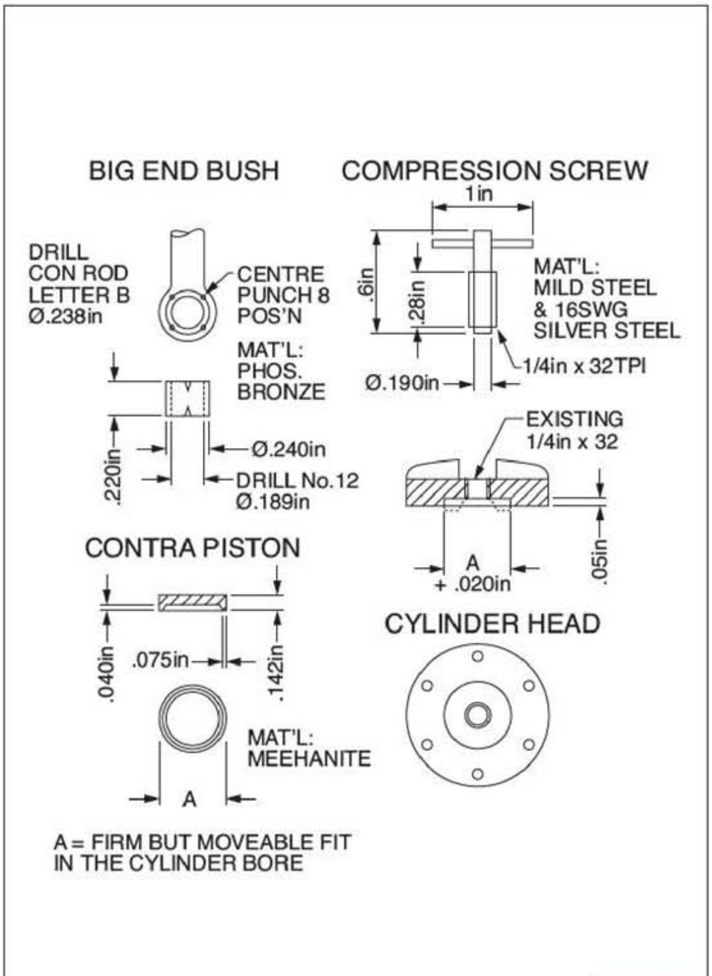


Fig 1

vice, fitted with soft jaw pads, was used to press the bearing home (**photo 6**), then the centre punching was done.

Once fitted the bush must be reamed parallel with the small end bearing. To do this a short length of silver steel was made a tight push fit in the small end; the other end of the silver steel held in the drill press, and the con rod held in the machine vice (**photo 7**). This ensured the bearing axis was perfectly vertical.

With the reamer held in the chuck and turning slowly, the bush was reamed (**photos 8** and **9**).

6. Pressing the bush into the heated connecting rod using a small vice.

7. Ensuring the axis of the small bore of the con rod is truly vertical (not Irvine con rod).

8. Reaming the big end bush.

9. Finished big end showing the centre pops to retain the bush (not Irvine con rod).

10. Polishing the contra piston in the lathe.

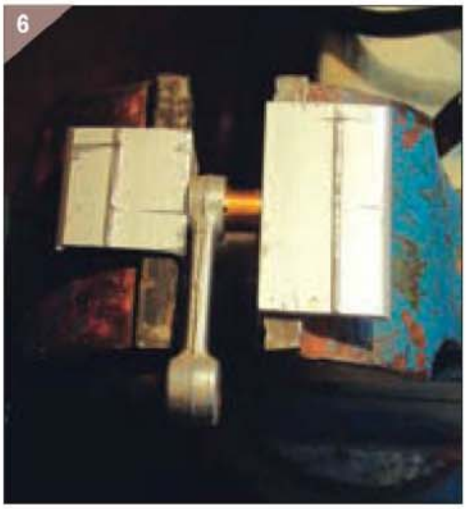
11. Fitting the contra piston 'squarely' into the cylinder liner.

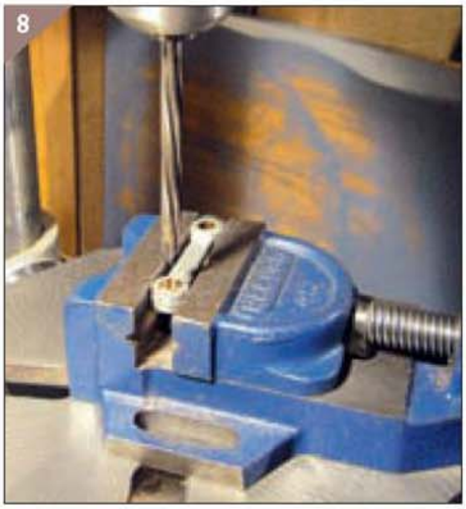
Converting to diesel

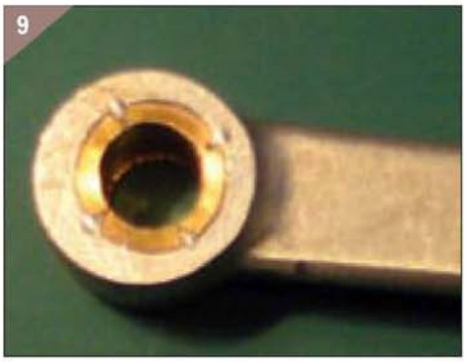
Because of the toxic content of fuel used in glowplug engines, I prefer to use diesel engines and I set about converting the *Irvine 20* to diesel operation:

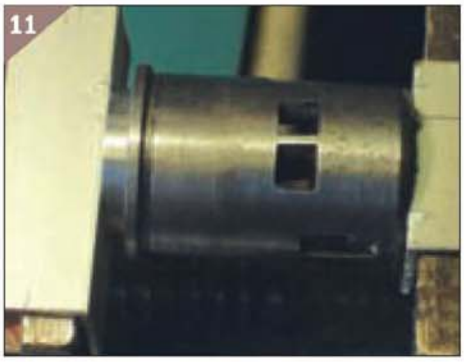
Firstly, I made the contra piston from meehanite. This is a simple turning operation, but the fit in the cylinder is critical. The contra piston must be moveable by turning the contra piston screw and must be capable of being moved back up by the combustion in the cylinder. However, the fit must be firm enough to keep the contra piston in position during starting operations, and be gas tight.

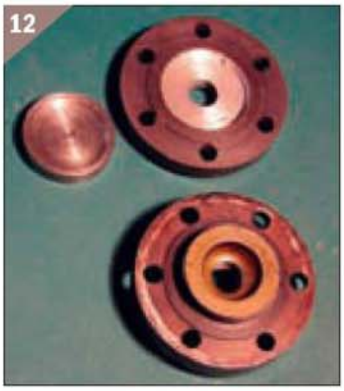
The contra piston was made slightly oversize and polished using fine wet-and-dry paper, held on a flat bar, with a little mineral oil for lubrication. The contra piston can be supported in the lathe between a short piece of aluminium bar held in the chuck and another piece, centre drilled for support by a running centre, clamped against the contra piston (**photo 10**). The contra piston must be fitted 'squarely' into the cylinder liner. This was again done using the small vice fitted with soft jaw pads - only a

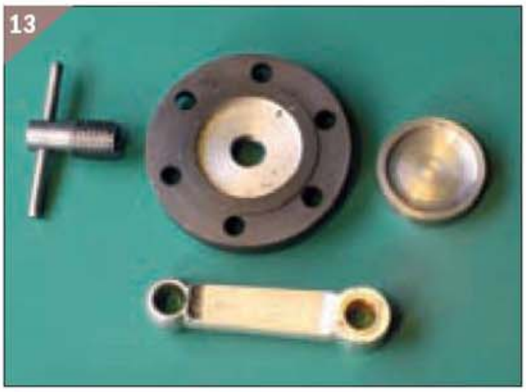












small amount of force should be necessary (**photo 11**).

The cylinder head was modified by removing the spigot and turning a cavity on the underside, to allow the contra piston to be backed off as necessary (**photo 12**). When fitting the cylinder head to the engine, the contra piston is left standing proud of the cylinder to centralise the head.

Making the contra piston screw was a straightforward turning and threading operation with the tommy bar a force fit in the screw.

Photograph 13 shows the modified cylinder head, contra piston, compression screw and connecting rod fitted with the phosphor bronze bush.

Carburettor

The damaged throttle carburettor was discarded and, since I wanted to use the *Irvine 20* in control line models, I made a simple one-speed carburettor (**fig 2**). The carburettor body was turned in the lathe and drilled. The venturi was formed using a triangular scraper.

It is easier to make the thimble for the needle first then, as the thread for the spray bar is cut, try the thimble until it screws into position with some resistance; this ensures the needle will retain its position when the engine is running. **Photograph 14** shows the carburettor parts ready for assembly; it is held in place on the engine with the two original clamping screws and is sealed with an O-ring.

Testing

All that was left was to bench run the engine before mounting in a model (**photo 15**). The engine has now been flown on several occasions. It is completely reliable and was well worth the time and effort I spent rescuing it from the junk box. **ME**

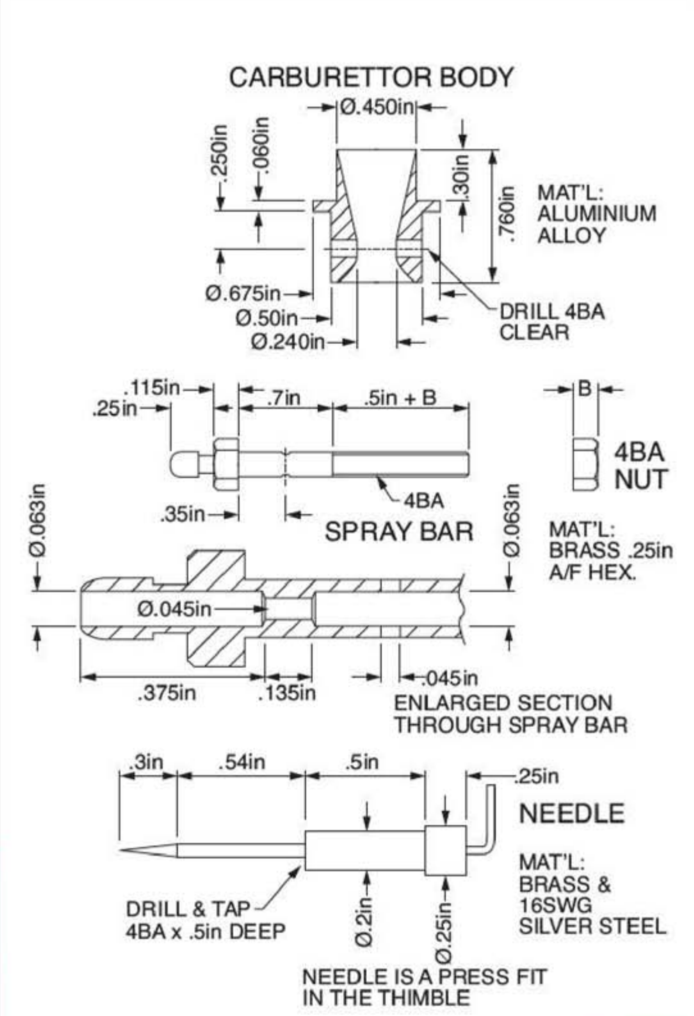
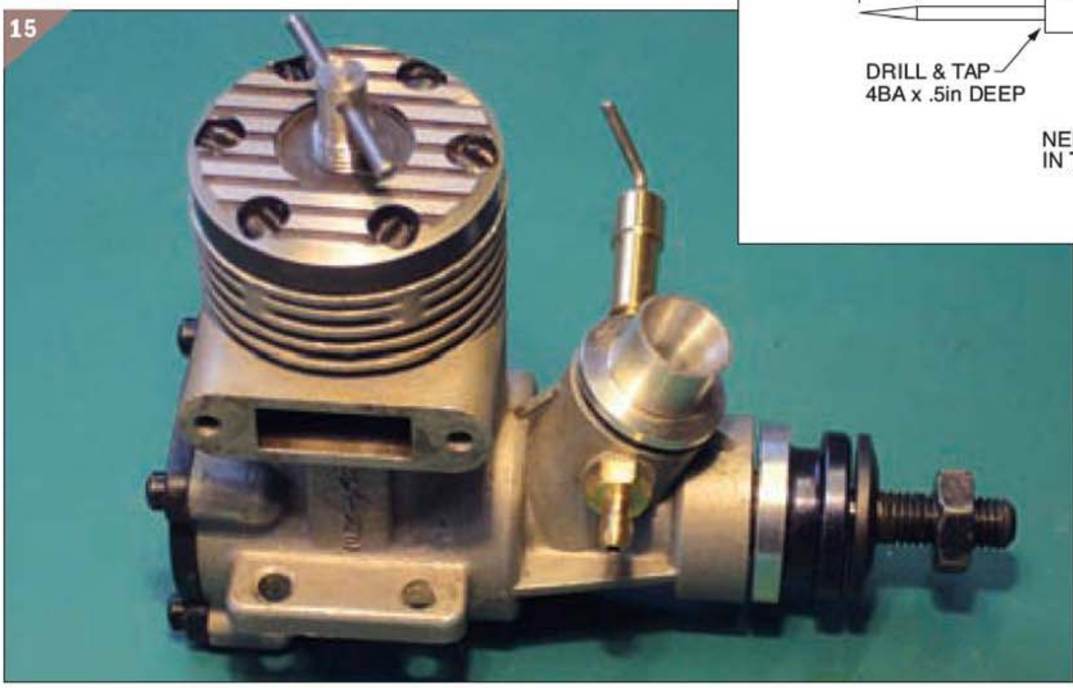


Fig 2



12. Modified cylinder head and contra piston (left) with original cylinder head (right).

13. Cylinder head parts and con rod.

14. Carburettor parts.

15. Engine ready for bench testing. Note the new carburettor arrangement and that the broken cylinder head fins have been turned down.

Superheating a dip into the past

BILL STEER

Bill Steer reviews the work of the 'experimentalists'.

Continued from page 621 (M.E. 4339, 21 November 2008)

A very active experimentalist in the early days was J. C. Crebbin (known affectionately by many as 'Uncle Jim') (**refs. 20** and **21**). Like LBSC, his interests had developed from a very young age, although initially in the area of boats. However, by the age of 15 he too was modifying and adapting one of the well-known, commercially made Ajax toy engines (as had LBSC in his early days), and had discovered for himself the benefits of proper blasting arrangements.

Although never becoming a professional engineer (for many years he worked in the clerical side of the Bank of England), his experiments continued and, in 1900, his well-known 4½in. gauge Atlantic locomotive, *Cosmo Bonsor*, was conceived. This engine was entirely experimental and, in her early days, was used to test compounding ideas.

Originally oil-fired, she was converted, between the years 1907 and 1909, to burn coal. At some stage superheaters were fitted, but the very hot steam was found to cause scoring of the cylinders. Since Jim Crebbin was known to be a personal friend of Churchward, one can't help but wonder whether Churchward's cautious approach to superheating, on the GWR, was influenced by Crebbin's experience. Crebbin's cylinders were, in fact, made of bronze but recognising that this could be a problem, he later fitted them with steel liners and the pistons with piston rings.

One of his most significant contributions, as far as we are concerned, was his pioneering introduction of the radiant superheater - this in 1937!

Writing in *The Model Engineer* at this time (**ref. 22**), he describes some of his recent experiments and said, "My 4-6-0 *James Milne* was originally fitted with a spearhead superheater, but I was not satisfied with the temperature of the steam..." He continues, "I therefore decided to fit my standard firebox superheater." This was apparently a very successful move, as a little further on he says, "The result of the alteration was remarkable."

The same treatment was then given to his locomotive, *Aldington*. This was originally a 4-cylindered compound but, at this time, was converted to run as a simple high-pressure version. He says, "The model as first converted was very sluggish, but now is very lively and popular with its drivers."

A photograph accompanying the article clearly shows what we would instantly recognise as a radiant superheater fitted well within the firebox. However, rather than pass a complete superheater element (flow and return tubes) through a single flue, he passes each individual superheater tube through its own flue-tube. This of course necessitates the use of a removable U-section in the firebox. His superheater tubes were made of rustless steel and the U-sections attached by means of ferrules made of mild steel. It is interesting to note that LBSC never adopted radiant superheaters. In fact, in response to a beginners query in 1953, he dismisses them rather lightly (**ref. 23**).

As well as his experimental work, Jim Crebbin was particularly noted for the friendship and encouragement he gave to all who knew him. He was one of the founder members of the then Society of Model Engineers (now the SMEE), and served as vice president, committee member and chairman, at various times.

Incidentally, the cup named in his memory and presented annually at the Model Engineer Exhibition, is awarded for the best entry in the Locomotive, General Engineering and Mechanically-propelled Road Vehicle, classes.

Who fitted the first superheater?

At this point we may begin to wonder: who was the first to fit a fire-tube superheater to a miniature locomotive? Certainly, in much of LBSC's writing, he likes to give the impression that it was he.

Some insight can be gleaned as a result of a claim, made in 1952, by a reader of *The Model Engineer* that his brother, Harold Lee, had made the first coal-fired, passenger-hauling, 2½in. gauge model steam locomotive in 1911 (**ref. 24**).

This, to LBSC, was rather like waving a red flag to a bull and, as might be expected, he responded to it in no uncertain terms (**ref. 25**). However, in summing up, he tantalizingly mentions in passing, some

Fig. 7. Superheater for Jubilee, *Martin Evans scale model of the Stanier 2-cylinder, 2-6-4 tank in 3½in. gauge.*

Fig. 8. Return bend for Martin Evans' Rob Roy *(3½in. gauge), 1961.*

Fig. 9. Return bend for Martin Evans' Firefly *(3½in. gauge version), 1962.*

Fig 7

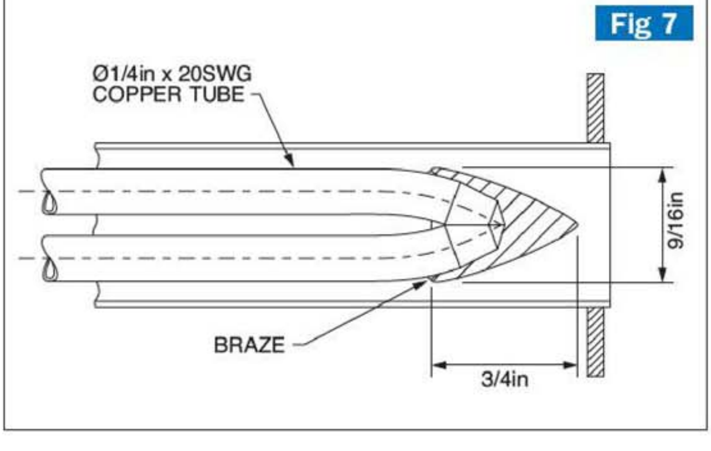
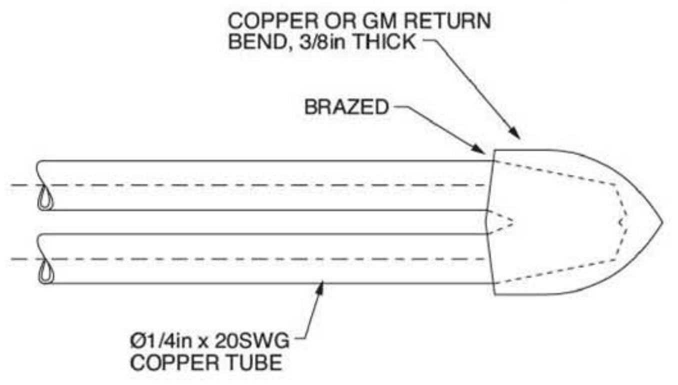


Fig 8



of his early experiments with superheating, but without giving specific dates other than that they were pre-*Ayesha*.

Correspondence is then drawn from C. M. Keiller, another respected writer and one time pupil of Churchward (**ref. 26**). He felt that he was the first to employ fire-tube elements, in any size model locomotive. In support of this he mentions an article describing a 2½in. gauge 4-4-0 locomotive, written by him and published in *The Model Engineer* in June 1920 (**ref. 27**).

This time, LBSC's reply is a full and very enlightening *Lobby Chat* entitled: *Another Look Backwards* (**ref. 28**). In this he makes the counterclaim that he had known of the advantages of superheated steam, as he put it, "over the wash-day variety", ever since childhood days. He then continues to justify this by describing some of his early experiments, including those based on spirit firing and the use of a single flue boiler. The article concludes with a short treatise on the importance of valve events and port sizes etc.

A further letter from C. M. Keiller (**ref. 29**), courteously acknowledges LBSC's article, but leaves one feeling that he was not over impressed with the arguments. Conceding his own earlier claim, he mentions that he had since discovered that a flue-tube element for a 3½in. gauge locomotive had been shown in an article by E. W. Twining (another well-known contributor of his day), in 1915. This particular debate rumbles on for a few more issues (**refs. 30** and **31**) but produces no more relevant facts.

Looking at the aforementioned Twining article (**ref. 32**), we find that it is for a large, coal-fired, Pacific type locomotive.

Talking about the superheaters in his introduction, Twining says, "In this engine a flue-tube type of superheater is introduced which, I believe, is new in models. The superheater pipes (four in number) are arranged in four flue tubes of larger diameter than the rest, in much the same way as in the Schmidt, Swindon, and Robinson superheaters; though, perhaps, it is most like the last, since no dampers are fitted in the smokebox."

The drawings for this locomotive show the superheater pipes fitted to block type return bends, which are later described as being gunmetal castings. So was Twining the first?

Unlike the later LBSC designs, with their full constructional notes, much detailed knowledge and skill would be required by anyone contemplating building the Twining engine. The design is beautifully drafted, but careful reading of the accompanying description reveals the phrase: "it has not yet been built"!

We are unlikely to ever know who really was responsible for installing the first fire-tube superheater into a miniature locomotive, but certainly, many people were quietly experimenting with the idea in those early days. However, one thing that is quite apparent is the very significant role that LBSC played in promoting the use of superheated steam. His early writings would often include snippets to this end, but by the 1950s it was being positively championed by him. I wonder just how many of us have, over the years, directly or indirectly, followed the Maestro's "words and music" without question?

Martin Evans

From the time that he first started writing for *The Model Engineer* in the early 1920s through to the late 1950s, LBSC's reputation was such that he had little competition from other designers of small locomotives. J. I. Austen-Walton was perhaps the only exception, with his constructional series on Twin Sisters appearing in 1949 (**ref. 33**). It's quite obvious though, that LBSC was able to keep 'Bro. Hyphen' confidently at arms length!

However, in 1957 things were about to change. At that time a new general assistant was taken on at the *Model Engineer* office in Noel Street, London - his name was Martin Evans (**ref. 34**). Before long the 'new boy' was producing his first very own locomotive design, under the watchful eye of J. N. Maskelyne (Technical Editor at the time). This was for *Jubilee*, a scale model of the Stanier 2-cylinder, 2-6-4 tank in 3½in. gauge.

The superheater for this engine has three elements, each with a block type return bend made from gunmetal (**ref. 35**). It is very similar to those prescribed by LBSC, but note the way it was drawn (**fig 7**), suggesting that it should be carefully shaped to a point so as to reduce the drag on the passing flue gases.

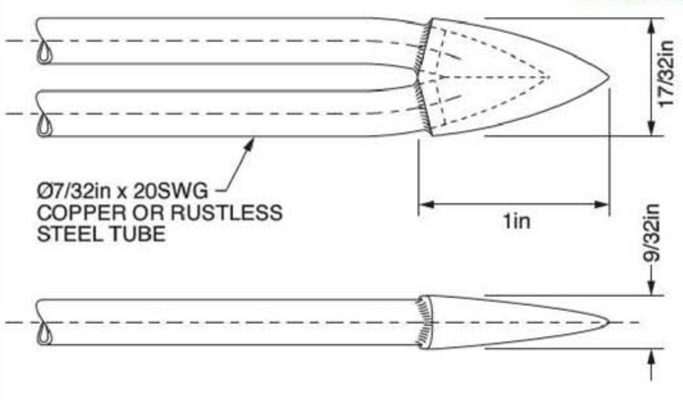
In many ways, these return bends can be quite tricky to manufacture, their shape making work-holding particularly difficult. Some advice is given, but only concerning the drilling of the holes. The instructions continue by saying that the assembly can be brazed using Sil-fos or B6 alloy (in fact it is now known that Sil-fos can be attacked by the products of combustion and is also weakened through flexing. Hence, it should never be used for boiler or similar work).

Martin's next design was *Springbok*, the LNER B1 Class 4-6-0, in 5 in. gauge; this appeared at the close of 1959. The return block for the superheater of this locomotive (**ref. 36**), was also shown drawn to a point, like that of *Jubilee*; again, emphasising a need to streamline the flow in order to overcome 'birdsnesting', an ever-present problem with block ends.

Although the instructions for Springbok's superheater call for copper tubes with gunmetal return bends, a suggestion is made that stainless steel might be a better material to use. The reason given, is simply that the elements could be made a little longer as stainless steel is more resistant to both heat and wear than copper - a look towards things to come?

Rob Roy (**ref. 37**), is shown with stubbier return bends, a little more like those of LBSC, >>

Fig 9



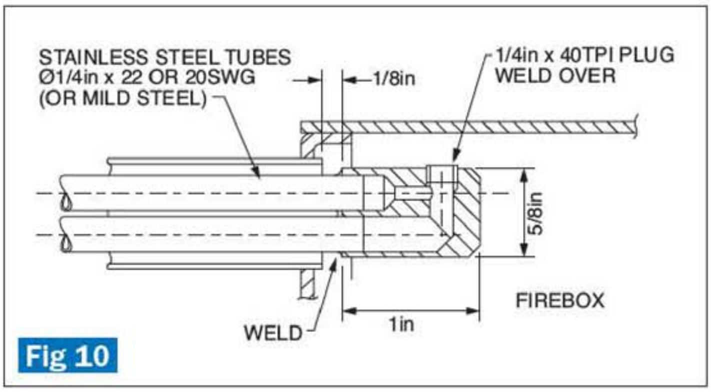


Fig. 10. Superheater for Martin Evans' Boxhill *(5in. gauge), 1964. Note the close proximity of the return bend to the firebox tubeplate.*

Fig. 11. Fully radiant superheater for Martin Evans' Highlander *(7¼in. gauge), 1966.*

which are possibly easier for a beginner to make (**fig 8**).

In contrast, *Firefly* (**ref. 38**), is drawn with return bends even more pointed than those of *Jubilee* and *Springbok* (**fig 9**). Gunmetal is specified for the return bends and copper or rustless steel for the tubes, the latter simply to help resist abrasion. In all cases the return bends remain well within the surrounding smoke-tubes.

This general theme continues until we come to *Boxhill* in 1964. In his introduction to the boiler for this locomotive (**ref. 39**), Martin comments, "Most engineers continue to debate whether the fitting of superheaters in model boilers is really worthwhile. The real difficulty is that no one so far has carried out accurate tests to establish either the exact temperatures reached in model superheaters and steam chests, or the economies made in coal and water consumption. In the meantime designers must rely on experience and observation."

Martin continues, "My own view is that superheating in model locomotives justifies the small extra trouble involved. It is sometimes forgotten that even if the superheater temperature actually attained in the steam chest is low, it will at least prevent any possibility of condensation - that archenemy of good cylinder performance. Admittedly, the elements tend to block the superheater flues, making them difficult to keep clean. But this is not an insoluble problem."

A few weeks later, drawings were given for a new style of superheater, to be made in stainless steel (**ref. 40**). This employs long return bends which, as drawn, would extend just beyond the flue-tubes and lie within the upper part of the firebox (**fig 10**). It was claimed that: 'Not only will the steam be given a higher temperature; the flues will be easier to clean as the return bend lies clear of the brush.' At this point, no mention is made of the term 'radiant superheaters'. We have to wait a further two years for this, until his next design the 7¼in. gauge *Highlander*.

Writing in October 1966 (**ref. 41**), Martin says, "A firebox radiant-heat superheater is specified, similar to that I recommended for *Boxhill*, and to that used by Jim Ewins in his 5in. gauge 0-6-2 tank engine." He comments, "the solid return bends are arranged hard up against the underside of the inner firebox wrapper, and just short of the firehole." This is shown in **fig 11**.

Martin's many other designs following *Highlander* all specified radiant superheaters based on this idea and, in 1992, we find a short piece written by him, now positively extolling their virtues (**ref. 42**).

Jim Ewins

Born in 1915, Jim Ewins had a long standing interest in model engineering (**ref. 43**), but he was first and foremost an experimentalist. Referring to this he is quoted as saying: "that's why I don't build many engines" - in fact he built eight!

His field of work involved wide-ranging aspects of scientific research and for some time he was a lecturer in physics at the City University, London. Early retirement from this post gave him the opportunity to turn his attention to ways of improving the performance of steam engines. This took him into the fields of injectors, valve gears, safety valves, lubricators etc.

However, his best-known contribution was the work he did on testing a locomotive boiler in 1966 (**ref. 44**). He had for some time been wondering about the efficiency of boilers and wanted to find out whether it would be better to make them with shorter tubes and longer fireboxes. At the same time, he was concerned that the question of superheaters in models was still a matter of conjecture, and that blasting arrangements were subject to widely varying opinion.

To enable him to get a better understanding of all these aspects, he took his 5in. gauge 0-6-2T locomotive and set it up as a fully instrumented, stationary test bed on which he could conduct a number of carefully controlled scientific investigations. This engine was based on LBSC's *Minx*, but varied from it in a number of ways. These differences included the use of stainless steel superheaters, which projected about 7in. into the firebox, larger passages and ports to the cylinders, greatly enlarged exhaust ways, increased blast pipe nozzle diameter, and a shorter boiler barrel.

The locomotive was equipped with numerous thermocouples; some for measuring steam temperature at various points along its travels, and others, the temperature of the fire bed and flue gases. Manometers were used to determine smokebox, firebox and exhaust pressures and a Bourdon gauge for the steam chest pressure. A simple braking arrangement was used to load the engine and the rotation speed of the wheels determined by means of a tachometer. The rate of flow of the flue gas could be measured and its composition determined.

With all these parameters being monitored, he was able to establish: the proportion of heat transferred by the flue-tubes to the water in the boiler; the energy absorbed in drawing air and the products of combustion through the firebed and tubes; the degree of superheat; back pressure at the exhaust nozzle in relation to power output; and finally, the overall thermal efficiency (**ref. 45**).

His results, taken from several test runs, enabled him to answer a number of pertinent questions. In particular, he was able to demonstrate that radiant superheaters are

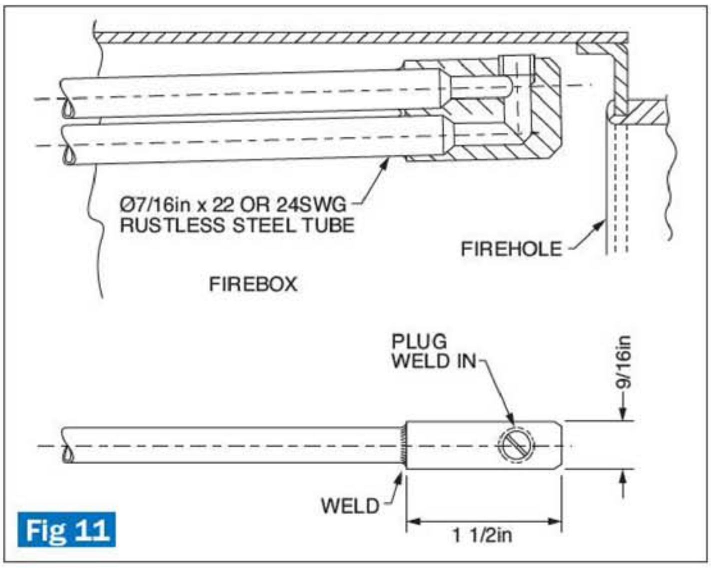
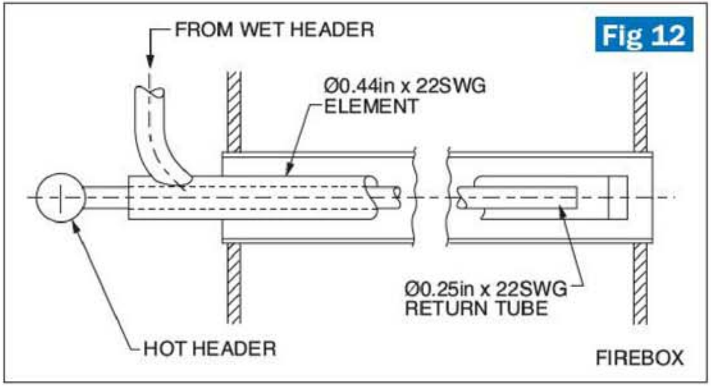


Fig 12



capable of minimising cylinder condensation. He also showed that with good lubrication, even cylinders made of gunmetal would not suffer from scoring as a result of the high temperatures involved.

Unfortunately, he never set out to determine the actual differences in performance between non-radiant and radiant superheaters, nor did he apparently run a control experiment using wet steam. However, referring to his measurements of the flue gas temperature gradient, he did suggest that the non-radiant form of superheater may not be very effective - interesting in the light of LBSC's assertions!

Overall his wide-ranging, interdependent, investigations represented a considerable piece of work; it was well received at the time and is still often referred to today.

The mid-1960s on

There is no doubt that Jim Ewins' work, coupled with the endorsement given by Martin Evans, had wide-ranging influence on other designers of miniature locomotives. However, the trend towards radiant superheaters still took some time to permeate.

Don Young's *Jersey Lily* was drawn in 1972, with LBSC's original style of non-radiant spearheads (**ref. 46**). Following some criticism of this by Martin Evans, *Mountaineer*, in 1974, is shown with a concentric form of non-radiant superheater (**ref. 47**), for which acknowledgements are made to Alec Farmer (a well-known maker and supplier of small boilers). This superheater is shown in **fig 12**.

In 1975, Derby 4F, is shown, again, with concentric superheaters, but with the option of extending them to the back of the firebox (**ref. 48**). It is interesting that Don's stated reason for this was simply to overcome the loss in surface area (and hence potential for heat transfer) that occurs with concentric superheaters.

David Piddington, also acknowledging Alec Farmer, adopted concentric, radiant, superheaters for *Washington* in 1992 (**ref. 49**).

Keith Wilson, described the use of a concentric tube superheater as early as 1966 in *Mogul*, his GWR 2-6-0 locomotive (**ref. 50**), and again talks about their construction in an article on superheaters in 1995 (**ref. 51**). Generally, however, he seems to prefer the more conventional form of two tubes, side by side.

In 1980, he gives some interesting tips for making the copper block type return bends, for the non-radiant superheaters, specified in his *Bulldog/Dukedog* series (**ref. 52**). *Ariel*, in 1986, was similarly drawn with the non-radiant type (**ref. 53**), but with brief instructions for a radiant variation - "if required". By 1998, fully radiant superheaters are specified for *Dean Goods*, with no less than two complete elements passing through each of the four flue-tubes (**ref. 54**).

Most contemporary locomotive designs appearing over the last decade have specified radiant superheaters. These are usually based on the Martin Evans style, although some, looking more like LBSC's original spearheads, but with a double return bend (**fig 13**), have recently appeared in the drawings of Neville Evans (**refs. 55** and **56**). Owing to the difficulty of manufacturing such items (made from stainless steel) in the home workshop, these are now available commercially.

To be continued.

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Fig. 12. Concentric, non-radiant, superheater for Don Young's Mountaineer *(3½in. gauge), 1974.*

Fig. 13. Radiant superheater for Neville Evans' Stowe *(5in. gauge), 2007.*

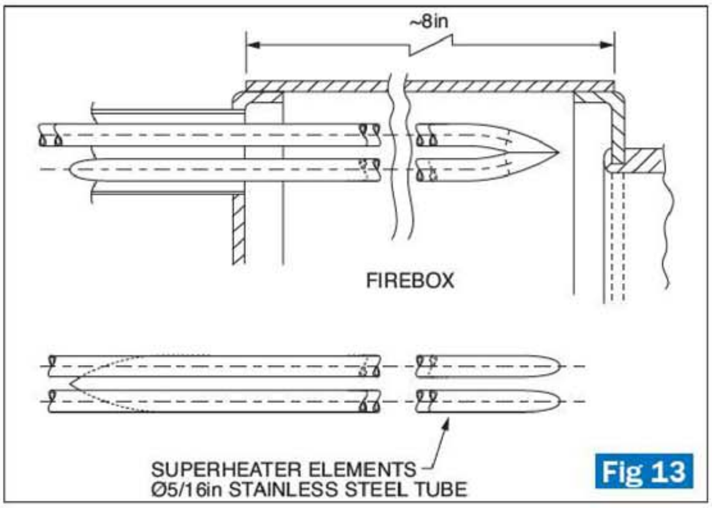


Fig 13

Novelty - a Gothic style beam engine

KARL KONRAD

Karl Konrad continues his description of the engine that combines engineering and architecture.

Continued from page 624 (M.E. 4339, 21 November 2008)

10. Setting the flywheel to run true in the lathe.

11. Machining the outside diameter.

12. Machining the bore.

13. Checking the bore for size.

14. Cutting the keyway slot.

15. Marking out the segment holes.

16. Drilling the segment holes.

17. Marking the dummy segments using a scriber.

18. Marking the circumferential segment lines.

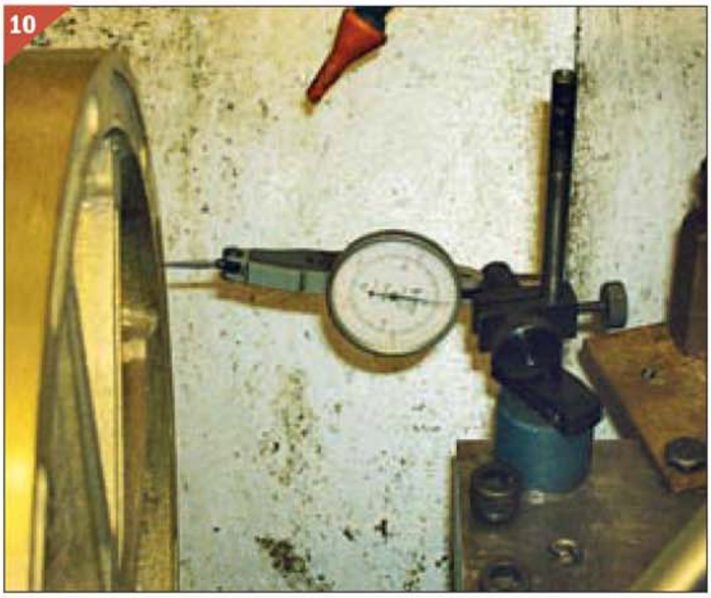
19. Bolts 'pretending' to hold the spokes in place.

On the original machine, the flywheel consists of eight rim segments and eight spokes, which are mounted on the hub. For the model, this assembly method would have been too complicated. For this reason, the flywheel was made as a single casting and parting lines and screws added to suggest segmentation.

The flywheel measures 276mm (10.87in.) dia. and was too big to be machined on my Myford Super 7 Lathe. Then I thought about my model engineering friend, Arthur, in England; he has a bigger lathe on which the flywheel could be machined. This solution also meant that I had an experienced model engineer at hand - a very good move because the machining was not as easy as I expected.

The flywheel casting was aligned as true as possible in the 4-jaw chuck. The outside diameter, side faces and crankshaft bore were machined (**photos 10 - 13**). After that the slot for the keyway was cut (**photo 14**).

10

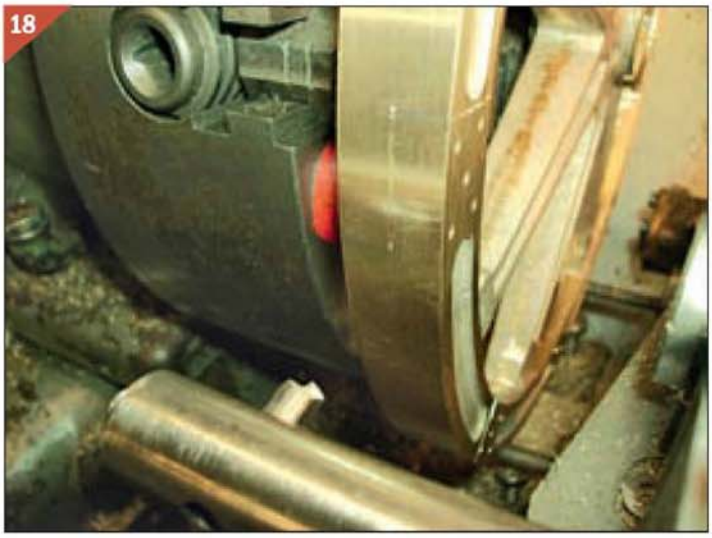


In order to mount the dummy screws, a jig was used to mark the position of the holes in the centre of the rim segments. After fixing the jig, using a toolmaker's clamp, the holes were marked using a small hand drill (**photo 15**). When all the holes had been marked, the holes were drilled using the drilling machine (**photo 16**). I used 1in. long 7BA screws and nuts.

The individual segments are represented by marking 'parting lines' with a scriber and, importantly, these must be radial (**photo 17**). This should be taken into consideration when making and setting the jig. The circumferential parting lines on the outside diameter were then marked (**photo 18**). Next, the parting lines of the individual segments were marked halfway across the width of the rim. This work is rather nerve-racking because of the fear of marking the lines a bit too far!

11

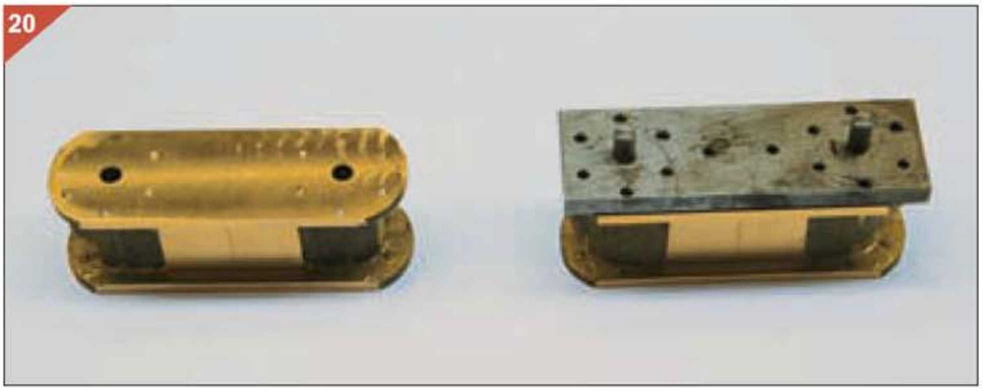
12



The spokes are made to look as though they are separate, and held in place by bolts. These are simply hammered into drilled holes, which were a couple of tenths of a mm smaller (**photo 19**). Alternatively, the bolts could be glued into position.

Valve gear

The original machine is equipped with double seat valves. This is impossible to copy in 1:20 scale so conical valves were used. In order to ensure alignment of the upper and lower valve manifold fixing holes, two identical drill jigs were made (**photos 20** and »



21). These were also used to align the valve manifold columns, while soldering the connecting bridge in position (**photo 22**). **Photograph 23** shows the complete valve assembly. The valves are worked via two eccentric cams, which are mounted on a shaft that extends across the centre of the two columns (**photo 24**).

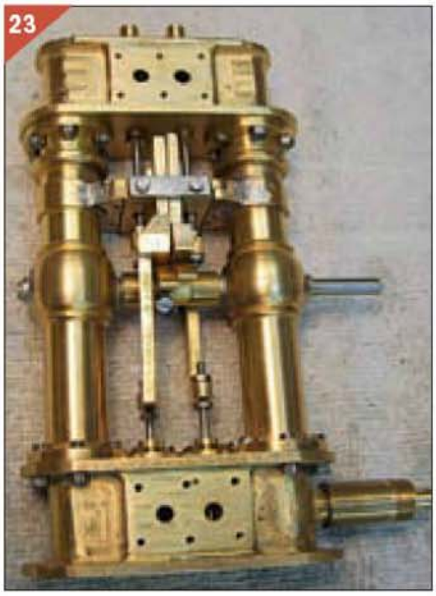
Cylinder

This is a brass casting and is easy to machine. It has a bore of 28mm and is 114mm long. The casting has lugs on the upper flange for fixing the cylinder and valve manifold assembly to the 'gothic' side frames. The flange also includes fixings for the crosshead guide bars. **Photograph 25** shows the completed cylinder and valve manifold assembly prior to soldering. The complete valve assembly was soldered to the cylinder and the lower valve manifold screwed to the base plate (**photo 26**).

Air pump

The air pump and the exhaust chimney are located on the base plate. The condenser on the model is non-functional (**photo 27**).

●*To be continued.*



20. Valve manifolds and drilling jig.

21. Drilling jig in place on base plate.

22. Valve columns ready for soldering the connecting bridge in place.

23. Complete valve assembly.

24. Eccentric valve cams.

25. Cylinder and valve assembly prior to soldering.

26. Complete cylinder and valve assembly mounted on base plate.

27. Air pump, condenser and chimney mounted on base plate.

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DIARY

DECEMBER

19 **North London SME.** *Ian Johnston: By tall ship from Liverpool to the Canaries.* Contact Rachael Chapman: 01442 275968.

19 **Rochdale SMEE.** *Work in Progress.* Contact Bob Denyer: 0161 959 1818.

19 **Romford MEC.** *Bring & Buy Sale.* Contact Colin Hunt: 01708 709302.

20 **Chesterfield & District MES.** *Public Running.* Contact Mike Rhodes: 01623 648676.

20/21 **Nottingham SMEE.** *Santa Specials.* Contact Pete Towle: 0115 987 9865.

21 **Birmingham SME.** *Children's Christmas Party.* Contact John Walker: 01789 266065.

21 **St. Albans DMES.** *Club Sailing Morning.* Contact Roy Verden: 01923 220590.

21 **Tyneside SMEE.** *Christmas Party.* Contact Malcolm Halliday: 0191 2624141.

21 **York City & DSME.** *Running Day.* Contact Pat Martindale: 01262 676291.

22 **Bedford MES.** *Draughting & Dribbling.* Contact Ted Jolliffe: 01234 327791.

23 **Northampton SME.** *Christmas Drinks.* Contact Pete Jarman: 01234 708501 (eve).

26 **Cardiff MES.** *Steam-Up & Family Day.* Contact Don Norman: 01656 784530.

26 **High Wycombe MEC.** *Boxing Day Steam-Up.* Contact Eric Stevens: 01494 438761.

26 **Leeds SMEE.** *Boxing Day Steam-Up.* Contact Geoff Shackleton: 01977 798138.

26 **Leyland SME.** *Mince Pie & Steam-Up.* Contact A. P. Bibby: 01254 812049.

26 **Maidstone MES (UK).** *Public Running.* Contact Martin Parham: 01622 630298.

26 **Malden DSME.** *Boxing Day Run.* Contact John Mottram: 01483 473786.

26 **Newton Abbot & District MES.** *Boxing Day Steam-Up.* Contact Graham Day: 01626 772739.

26 **Sutton MEC.** *Boxing Day Run.* Contact Bob Wood: 020 8641 6258.

27 **Bradford MES.** *Mince Pie Steam-Up.* Contact John Mills: 01943 467844.

28 **Edinburgh SME.** *Xmas Steam-Up.* Contact Robert McLucke: 01506 655270.

28 **MELSA.** *Sunday in the Park.* Contact Graham Chadbone: 07 4121 4341.

31 **New Jersey Live Steamers, Inc.** *New Year's Eve Midnight Run.* Contact Karl Pickles: 718 494 7263.

JANUARY 2009

1 **Birmingham SME.** *New Year Steam-Up.* Contact John Walker: 01789 266065.

1 **Chesterfield & District MES.** *Arctic Running.* Contact Mike Rhodes: 01623 648676.

1 **Frimley & Ascot LC.** *New Year's Day Run.* Contact Bob Dowman: 01252 835042.

1 **Leyland SME.** *Chairman's Run.* Contact A. P. Bibby: 01254 812049.

1 **Melton Mowbray DMES.** *New Year's Day Steam-Up.* Contact Phil Tansley: 0116 2673646.

1 **Newton Abbot & District MES.** *Dinner Dance.* Contact Graham Day: 01626 772739.

1 **Nottingham SMEE.** New Year's Day Run. Contact Pete Towle: 0115 987 9865.

1 **Peterborough SME.** *New Year's Day Run.* Contact Lee Nicholls: 01406 540263.

1 **Romney Marsh MES.** *New Year's Day Track Meeting.* Contact John Wimble: 01797 362295.

1 **Sutton MEC.** *Club Talk Night.* Contact Bob Wood: 020 8641 6258.

1 **Tyneside SMEE.** *New Year's Day Steam-Up.* Contact Malcolm Halliday: 0191 2624141.

3/4 **Northern Mill Engine Society.** *New Year Steam-Up.* Contact John Phillip: 01257 265003.

5 **Peterborough SME.** *John Hennessy: Mechanical Calculating.* Contact Lee Nicholls: 01406 540263.

5 **Lancaster & Morecambe MES.** *Meeting.* Contact Mike Glegg: 01995 606767.

6 **Oxford (City of) SME.** *David Price: Old tools and their uses.* Contact Chris Kelland: 01235 770836.

6 **Romney Marsh MES.** *Roy Clench: John & Sheila Percival's Slides.* Contact John Wimble: 01797 362295.

6 **Taunton ME.** *Tom Dominey presents.* Contact Nick Nicholls: 01404 891238.

6 **Bradford MES.** *Bits & Pieces.* Contact John Mills: 01943 467844.

6 **Stamford MES.** *AGM.* Contact Derek Brown: 01780 753162.

7 **Birmingham SME.** *Library & Chit Chat Evening.* Contact John Walker: 01789 266065.

8 **Bournemouth DSME.** *Tech-Chat.* Contact Dave Finn: 01202 474599.

8 **Leyland SME.** *AGM.* Contact A. P. Bibby: 01254 812049.

8 **Sutton MEC.** *Video Evening.* Contact Bob Wood: 020 8641 6258.

10 **Glasgow & S.W. Rly Ass'n.** *George Davidson: Life & Career of OVS Bulleid.* Contact Bruce Steven: 0141 810 3871.

11 **Sutton MEC.** *Track Day.* Contact Bob Wood: 020 8641 6258.

12 **Melton Mowbray DMES.** *Auction.* Contact Phil Tansley: 0116 2673646.

13 **Crawley ME.** *AGM.* Goffs Park Light Rly. Contact Allan Sinclair: 01293 888203.

13 **Romney Marsh MES.** *Social Get-Together.* Contact John Wimble: 01797 362295.

14 **Harrow & Wembley SME.** *Gerry Divine: Trams.* Contact Roy Goddard: RSGwatford@aol.com

14 **High Wycombe MEC.** *Derek Wright: The Severn Valley Railway.* Contact Eric Stevens: 01494 438761.

14 **St. Albans DMES.** *Frank Benfield: Old Films.* Contact Roy Verden: 01923 220590.

15 **Sutton MEC.** *Bring along your model.* Contact Bob Wood: 020 8641 6258.

16 **North London SME.** *Members' DVDs & Videos.* Contact Rachael Chapman: 01442 275968.

19 **Lancaster & Morecambe MES.** *Sale Night.* Contact Mike Glegg: 01995 606767.

19 **Model Steam Road Vehicle Soc.** *Ray Sturdy: 100 years of Triumph.* Contact John Bagwell: 01452 304876.

19 **Peterborough SME.** *Bits & Pieces.* Contact Lee Nicholls: 01406 540263.

20 **Romney Marsh MES.** *Geoff Dunster: Misc. European Railways.* Contact John Wimble: 01797 362295.

20 **Taunton ME.** *Nigel Gettings: Building Gauge 1 Locos.* Contact Nick Nicholls: 01404 891238.

21 **Bournemouth DSME.** *Meeting.* Contact Dave Finn: 01202 474599.

21 **Bristol SMEE.** *David Kent: Welsh Highland Railway.* Contact Trevor Chambers: 0145 441 5085.

22 **Plymouth MSLS.** *AGM.* Contact Malcom Preen: 01752 778083.

22 **Sutton MEC.** *Curry Night.* Contact Bob Wood: 020 8641 6258.

23 **Hereford SME.** *Annual Dinner.* Contact Nigel Linwood: 01432 880649.

27 **Romney Marsh MES.** *Social Get-Together.* Contact John Wimble: 01797 362295.

27 **Stafford DMES.** *David Keay HM Principal Inspector of Railways.* Contact Chris Dobbs: 01889 270533.

28 **Bournemouth DSME.** *Annual Dinner.* Contact Dave Finn: 01202 474599.

29 **Canterbury & District MES (UK).** *Meeting.* Contact Gina Pearson: 01227 830081.

29 **Sutton MEC.** *Chris Mc Donald: The Life and time of LBSC.* Contact Bob Wood: 020 8641 6258.

30 **Newton Abbot & District MES.** *Models Night.* Contact Graham Day: 01626 772739.

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NEWS NEWS NEWS

MALCOLM STRIDE

Malcolm Stride reports

1. Robert McLuckie's winning entry in the Edinburgh SME photo competition.

2. Colin Poole leading the rush back from the pub at Nottingham SMEE.

Before we start the proper business this time, I would like to take this opportunity to wish all readers and contributors to this column a very happy Christmas and a prosperous and peaceful New Year. It does not seem like a year since I was last doing this and this issue marks the end of my 11th volume of *Club Chat* or 5½ years which seems to have slipped by at great speed. I would like to express my thanks to all those who send in material for the column, without you, there would be no column - keep it coming!

Notices

May 2008 Gilling Mainline Rally DVD

Stephen Greener and Paul Marsden from the **Ryedale SME** have produced an excellent DVD of the 2008 Mainline rally. The DVD is very well produced and is for sale to raise funds for the new clubhouse. Those wishing to purchase a copy can do so for £12.50 plus £1 p&p. The person to contact is W. A. Rinaldi-Butcher, 7 Hambleton Way, Easingwold, York YO61 3EE (T. 01347 822733). Contact may also be made via the website at www.rsme.org.uk

In Memoriam

It is with the deepest regret that we record the passing of the following members of model engineering societies. The sympathy of staff at *Model Engineer* is extended to the family and friends they leave behind.

John De Banks	*Isle of Wight MES*
George Hammond	*Society of Model & Experimental Engineers*
Doug Weathers	*York City DSME*

Edinburgh SME new website

A website has been set up by new member Jonathon Bolton. The site is at www.esme-club.co.uk and is excellent with detailed information about the society, plenty of pictures of club activities and also a forum which is open to non-members to join.

South Downs Light Railway Santa Specials

Based at Wyevale Garden Centre, Stopham Road, Pulborough RH20 1DS, the society has sent details of its Santa Specials for 2008. There will be a few dates left at the time of publication and special trains will run between 11am and 3.30pm on the following days:-

- Saturday, 20 December
- Sunday, 21 December
- Tuesday, 23 December

Fares for children aged 2 to 16 (to include a train ride to Santa's Ice Palace and a quality present) are £8 (£7 if pre-booked). Fares for adults are £3 (£2 if pre-booked) and include a train ride and a glass of mulled wine.

For further information and bookings please contact Chris English on 07518 753784.

UK club news

In spite of being rained off twice, **Bedford MES** have ended up having a good season with several record days, a new club locomotive, a boat pool and an Awards for All Grant to enable the building of a new workshop and footbridge. Progress has already been made on the two projects with steel and a container ordered and foundations prepared. It is hoped that the new bridge will be in place by the start of the new season. Special triple-headed trains were run at the exhibition to celebrate the 60th Anniversary and these are reported as "making an impressive site as they blasted up the hill with nine loaded coaches on a train".

The Friday night meeting of the **Colchester model engineering society** was entertained by a talk from Chris MacDonald from the **Tonbridge Society of Model Engineers**. His subject was the life and times of the celebrated model locomotive designer known as 'LBSC', real name Lillian Lawrence, who died in 1967.

After a number of years service for **Edinburgh SME** the secretary, Robert McLuckie, has stood down due to work commitments. Phil Ogden has been elected as the new secretary and can be contacted at 0131 476 5323. Inspired by the photographic competition in *Model Engineer*, the society held its own competition. On 10 November the competition was judged by Bob Thomson of the **Livingston Camera Club** with constructive criticism being given for each photograph. The winning photograph (**photo 1**) had been taken by Robert McLuckie and featured his excellent Standard Class 7 being driven by Colin Smith. Those readers who saw this locomotive on the Edinburgh SME stand at the Harrogate exhibition can see here some proof that this locomotive is indeed run regularly and doesn't live in a glass case.

Members of **High Wycombe MEC** will benefit from the generosity of Derek Harrowell who has donated a portable overhead projector and a screen to the society in the last year. The talk in January on the 'Severn Valley Railway' by Derek Wright may well benefit from these items. Since the completion of the steel track re-laying last year, the rails have been "polished" by running and the sleepers have bedded nicely into the concrete beams. The new track has quietened considerably and is in good condition for Public Running. There is still some sleeper replacement to do, but this is not urgent and will be done on an "as and when" basis. In spite of setting the rail joints to a reasonable gap, after one Sunday running day in May, when the temperature was quite high, the traverser jammed on the running track nearest the steaming bays. The gaps were observed on other days after running and the same closure was seen when it was hot, so it was decided to fix the traverser rails to the steaming bay end


2

aluminium sleeper by pinning through the rail foot into the sleeper - the pins are retained by the screwed on clamp plates. This appears to have stopped the movement.

The June Miniature traction engine rally at **Nottingham SMEE** was successful with a good selection of engines in steam. The day featured a road run to a local pub (**photo 2**). The photograph shows Colin Poole leading the exodus from the White Horse back to the heritage centre.

The September meeting at **Stamford MES** saw an interesting talk on sourcing and refurbishing second-hand machines and equipment by Bill Bostock and John Orton. Bill started with an apt quotation "Good judgement comes from experience and experience is the result of bad judgement".

At **York City DSME** after some very rapid progress, the Signal box work continues at a slower pace at the moment due to the workshop clearance which is taking place on Wednesdays. Construction should recommence shortly. Other work on site has included weed suppression and grass seeding. The society had a very successful visit from the Ryedale Society on Saturday 2 August - even the weather was good. Ryedale members brought several 5in. and 7¼in. gauge locomotives and some of the rolling stock from Gilling.

Humour time

I could not resist these two examples this time.

A lesson in management!

A company, feeling it is time for a shake-up, hires a new Managing Director. This new boss is determined to rid the company of all slackers. On a tour of the facilities, the MD notices a guy leaning on a wall. The room is full of workers and he wants to let them know he means business! The MD walks up to the guy and asks, "And how much money do you make a week?" Undaunted, the young fellow looks at him and replies, "I make £200 a week." The MD hands the guy £200 in cash and screams, "Here's a week's pay, now get out and don't come back!" Feeling pretty good about his first firing, the MD looks around the room and asks, "Does anyone want to tell me what that slacker did here?" With a sheepish grin, one of the other workers mutters, "Pizza delivery guy from Domino's!"

With thanks to **North London SME**.

Estate planning

Dan was a single guy living at home with his father and working in the family business. When he found out that he was going to inherit a fortune when his sickly father died, he decided he needed a wife with which to share his fortune.

One evening at an investment meeting he spotted the most beautiful woman he had ever seen. Her natural beauty took his breath away.

"I may look like just an ordinary man," he said to this beautiful woman, "but in just a few years my father will die, and I'll inherit 20 million dollars."

Impressed, the woman obtained his business card and three days later, she became his stepmother. Women are so much better at estate planning than men.

That one from Stamford MES.

NEXT ISSUE

- **John Wilding clock**
- **McOnie's engine**
- **I/C engine cam design**
- **Digital readout for a mill**
- **Dutch steam museum visit**
- **Club stands at the MEX**
- **A path to gold**

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POSTBAG

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David Clark,
The Editor,
Model Engineer,
MyHobbyStore Ltd.
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8-10 Knoll Rise,
Orpington, Kent, BR6 0EL;
fax: 01689-899266 or email
david.clark@myhobbystore.com

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Responses to published letters are forwarded as appropriate.

Will I ever learn?

SIRS, - Some years ago I bought a guided tailstock tap wrench from one of the regular trade suppliers at an exhibition. It appeared to be okay and was marked "made in India". When I tried it I found the guide hole was so inaccurate that the body of the tap wrench described a circle of about 8mm diameter when rotated about the guide pin held in the tailstock chuck. Obviously the thing was of no use as purchased so I Loctited a close-fitting rod in the end of the wrench to make the guide hole solid, centred it up and carefully drilled and then reamed the hole to a larger size making a new guide pin to suit. This cured the problem. I made a mental note not to buy cheap Far Eastern items ever again. I let the supplier off the hook.

At the recent Midlands Model Engineering Exhibition I decided to buy a travelling steady for my Myford Super 7. One trader was selling genuine Myford ones at £45 which is a good discount and represented a very good deal.

Did I buy one? No, like an idiot I bought a 'pattern' one for £21, knowing it would originate from the Far East, from one of the principle suppliers who regularly advertise in all the model engineering magazines.

My reasoning was that there could be little risk buying such a simple item. Wrong! When I got it home and took it out of its packet I noticed the single fixing hole was very large considering the fixing bolt is only ¼in. diameter. Closer examination showed the hole to be 10.2mm diameter and that it was drilled on the skew by about 5deg. but even worse, when offered up to the lathe the hole was so out of place that the top finger was about 2.5mm back from the horizontal centre line. Then I looked at the side finger and found that to be 2mm below centre height. Again it was a totally useless item. I told you I never learn!

I could have returned the item for exchange (would a replacement be any better?) or I should have got my money back. Instead I made the large inaccurate hole solid and re-drilled one the correct size in the right place and made a suitable spacer to go below the steady. It is now usable.

So again I let the supplier off the hook. I should have made them do something about it but, to be honest, I was so ashamed and disappointed with my own stupidity and meanness that I felt obliged to put matters right myself.

Can someone please tell my why the factories that make these parts produce items that cannot possibly fulfil their basic function when it is just as easy to make them correctly.

Is it the fault of the suppliers who obviously do not carry out sufficient quality control checks?

No, it is my fault and the fault of other model engineers for always wanting a bargain regardless of origin. The suppliers are only fulfilling our demand. If they were to offer higher priced quality items no one would buy them - look what happened to the excellent Hobbymat lathe that is still made in Germany but no longer sold in this country because it is too expensive.

I have now learned my lesson and resolve to buy only top quality items in the future. The problem is that it is now almost impossible to buy anything that is not made in the Far East. This is our fault for not supporting quality British and European manufacturers when we had the chance.

The importers must be our guardians and ensure that any faulty goods are returned to these wayward manufacturers. They should routinely carry out proper quality control procedures by checking

Railway collision at Hull

SIRS, - The head-on collision at Hull Paragon, to which Keith Wilson referred to in *Keith's Column* (*M.E.* 4337, 24 October 2008) occurred on 14 February 1927. Keith's remark "Somehow a crossover suddenly reversed" is not quite true, as was proven beyond doubt at the subsequent enquiry. The signalman in his haste to keep traffic moving disobeyed the then Rule 61(b) and replaced No. 171 signal to danger before the complete train had passed it and the junction points ahead. This action freed the signal box interlocking and allowed him (The Signalman) to pull in error No. 95 points, the crossover mentioned instead of No. 96 points. At most and also proven at the inquiry, the signalman had two seconds to make his fatal mistake. At the time of the accident all the points and signals at Paragon were worked by compressed air and both signal boxes concerned had miniature frames with the levers spaced about 2½in. apart.

Keith's comment on page 519, "It was of course possible to have the Distant showing clear with the Home signal at danger etc.", NOT SO. In any signal box, the locking, be it mechanical or electric is laid out in such away that all relevant Stop signals must first be worked to 'free' the Distant. The latter once cleared by means of the aforementioned interlocking then 'Back Locks' all stop signals in advance.

Regarding 'Gresley's double-amber system' (page 520). Four aspect colour light signals were brought into use by the Southern Railway on 21 March 1926, the first in the world. Railway signals have yellow lights, it is the road traffic lights that have 'amber'.

While on the subject of mechanical locking, 65 or more years ago the late O. S. Nock wrote in this magazine a series of articles describing the various makes of mechanical frames. At the time he suggested one would make an interesting and unusual modelling project. Did anyone take him up on the suggestion?

Mick Nicholson, Hull.

(Coincidentally signalman at the present Hull Paragon box!)

samples against drawings etc. I am sure they will say they do, but my limited experience indicates otherwise.

My advice to my fellow model engineers is to buy the best quality that you can and if you receive poor quality items make a big fuss with the supplier and do not 'bottle it' as I did.

Have I really learned my lesson? - only time will tell.

Eric Clark, Buckinghamshire.

In good faith

SIRS, - On the question of *Offset Turning (2)* (*M.E.* 4336, 10 October 2008), your correspondent Michael Wheelwright seems to be oblivious to the fact that *Post Bag* is meant to be a means of expressing opinions and also to provide a forum for discussion between readers. He fails to understand that everything which appears in *M.E.* is published 'in good faith' and to suggest that the editorial staff should arbitrate on the many and various shades of opinion expressed is at least impractical.

Your editorial comment which follows his letter confirms what most of us already know, that reason in great measure still exists in the pages of *M.E.*

Norma F. Smith, Oxon.

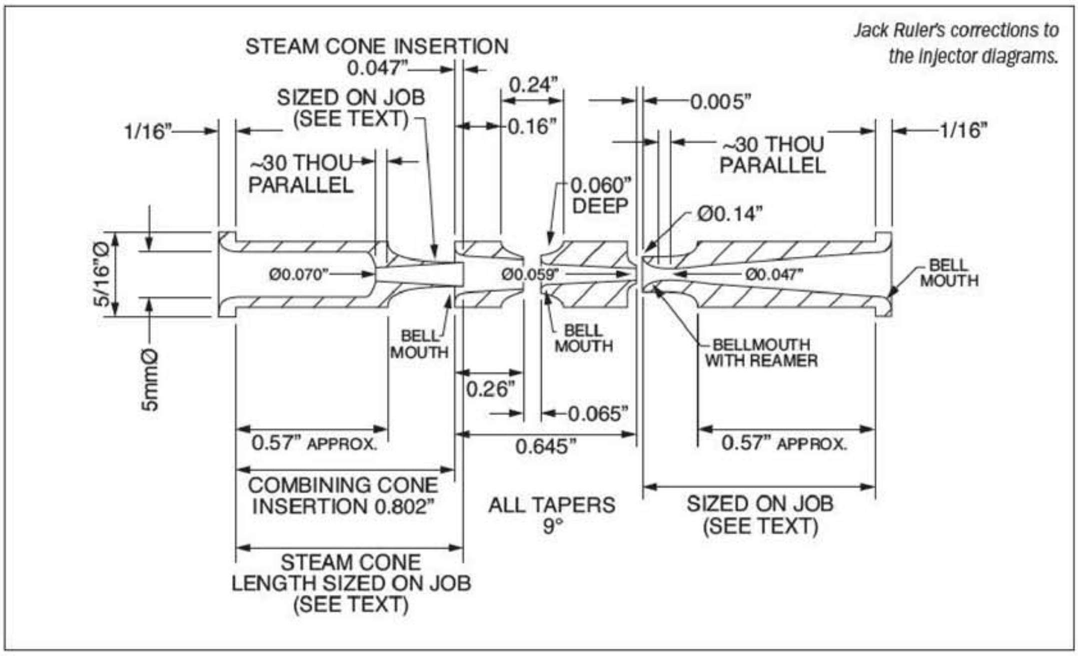
Brown Junior details

SIRS, - Reference the article covering the Brown Junior model engine (*I/C Topics*, *M.E.* 26 September 2008), I would point out that the transfer duct was brazed, not soldered. The gudgeon pin carrier was also brazed into the top of the piston. This is as in my engine which I have had since 1947.

Unfortunately, I do not have the contact breaker assembly and I would therefore be grateful either to obtain one, or to have the details to enable one to be made.

Incidentally, this engine also had a choke (a rotating brass collar on the end of the induction tube). This blanked off two holes in the side of the induction tube, something I have not seen on other examples of the Brown Junior.

R. E. Sidwell, Berkshire.



Jack Ruler's corrections to the injector diagrams.

Thanks from Teddy Myford

SIRS, - At the recent Model Engineer Exhibition at Ascot, the RNLI box that sat next to Teddy Myford on the Myford stand collected a total of £15.61. Also, at the recent Myford Open House, a total of £39.06 in donations was collected for a slice of one of my cakes.

This money will be passed on to the Cotswold branch of the RNLI. With many thanks.

Doreen Paviour, Gloucestershire.

Igniter cable

SIRS, - Dave Fenner (*Foolin' Around With Pulse Jets*, *M.E.* 4334, 12 September 2008) describes his solution to the problem of creating an extended spark plug. During my time working at the BICC Pyrotenax mineral insulated cable works, I saw some heavy-duty single core cable in stock. I was informed this was 'igniter cable', used in the oil refining industry to light the flare-offs which are a dramatic part of these plants. In use the single core is bent over toward the outer sheath, rather like the business end of a spark plug; this 'spark plug' could be many hundreds of feet long. I was told that before this cable was available, the engineer would have to climb the flare-off tower and hurl a lighted brand into the 'exhaust', but I rather think that story is akin to the apprentice being sent for a long stand!

Single core mineral insulated cable might be rather difficult to come by, but a length of standard 2-core would work just as well and should be a lot easier to obtain. The redundant core can simply be ignored, a bell test indicating which core is the active one.

John Chamberlain, Lancashire.

Injector corrections

SIRS, - I have been interested and enthused by Terence Holland's excellent series on the practical approach to making injectors and can't wait for some workshop time to try it!

Unfortunately the printer gremlins have struck in the last instalment (*M.E.* 4338, 7 November 2008, page 577). When working through the article I noticed that there are a number of discrepancies between Figure 7 and the text in the area of the combining cones. The attached mark-up highlights the areas and the drawing above is my attempt at resolving the differences, plus small suggestions in the steam and delivery cone areas.

Jack Ruler, by email.

Quorn, can anyone advise?

SIRS, - I am about to embark on the building of a Quorn Cutter Grinder. Reading through the instructions it appears there could be a potential limitation to machining long cutters. The two horizontal base bars are 12in. long which seems to limit the distance between the wheel and the work head. Has anyone found this to be a limitation? Would there be any advantage in increasing the length of these base bars to say 18 inches?

Tony Ashgrove, by email.

Gauge glass connections

SIRS, - I note with interest, and general admiration the articles *My First Boiler* by Julia Old and one particular comment made in (*M.E.* 4335, 26 September 2008).

This commented that the practice of connecting the water gauge to the manifold was no longer recommended because it can lead to inaccuracies.

I would be interested to understand why this is the case, if only to throw some light on a similar problem that I have experienced with water gauge accuracy. The application that I have had trouble with is with a 1910 Stanley Model 60 that I have rebuilt and, based upon my model engineering background, I arranged for the feed to the top of the water gauge to come from a manifold.

The problem is manifested by the water in the gauge not reflecting the situation in the boiler so I can confirm that such arrangements do present problems but can somebody explain why?

Colin C. May, North Yorkshire.

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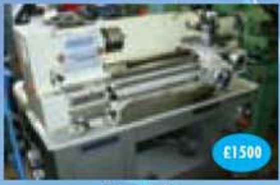

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