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ON THE COVER...

David Humphry is concealed by a smoke screen (steam screen?) as he prepares his GWR 1400 for a run around the Illawarra track at the Hot Pot rally. (Photo: Les Phillips.)

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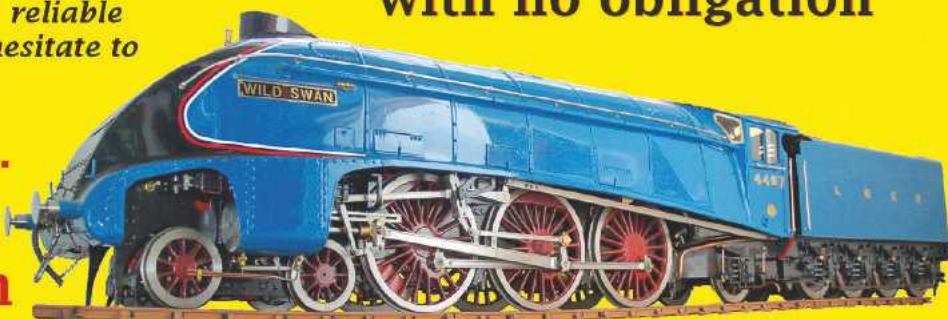
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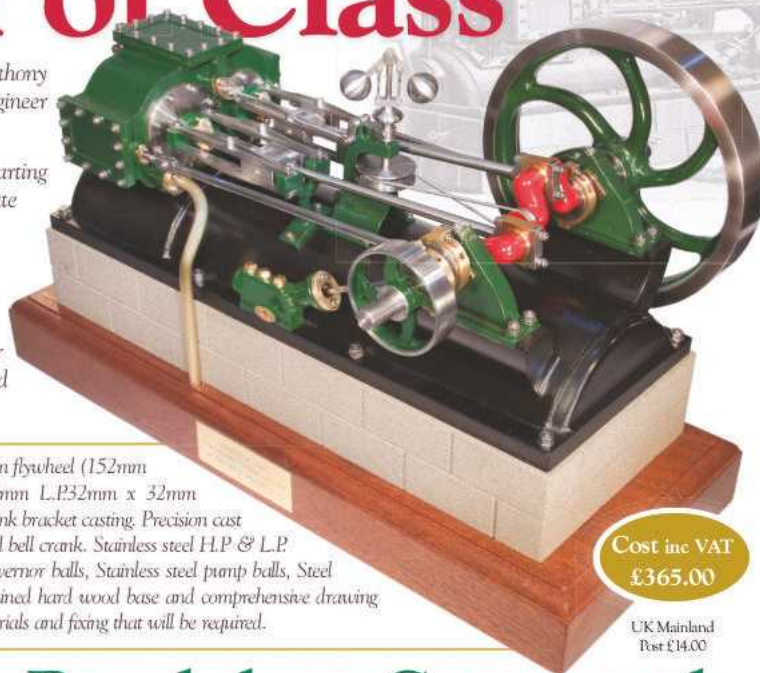


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**DIANE
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**MARTIN
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Acting Editor



The President of the Southern Federation partakes of a little light refreshment after the Midlands show. (Photo: Alex Chamberlain.)

Andy Clarke of Polly Models

You will no doubt have been as shocked as I was to read (M.E. 4570) of Andy's accident on the Isle of Man, in which he lost his right leg. Undeterred, he attended the Polly Rally just two weeks after the accident, having sweet-talked the ward Sister into letting him out, to award the prize for the best *Polly*. I'm glad to report that he continues to make excellent progress and has already been trying out his new leg, a mere seven weeks after the accident. He also helped to man the Polly



Andy Clarke is back on track behind a Polly V. (Photo: John Arrowsmith.)

stand at the recent Midlands Exhibition and was even seen outside driving a locomotive up and down the track – a *Polly*, of course. He told me that he 'got his head around' the loss of his leg within an hour of waking up without it and decided that he could

manage perfectly well on the other one. Andy Clarke – living proof that you cannot keep a good man down!

Our Editor

Diane has, at short notice, had to take a few weeks' sick leave, which is why you find me writing this editorial. Some of you may already know me if you are readers of a certain other magazine for model engineers! Diane, and I, hope that she will be back in the Editor's Chair as soon as possible after Christmas. I'm sure you'll want to join me in wishing her all the best for the coming weeks and for a speedy recovery.

*Martin R Evans
Acting Editor*

Christmas is on the way!

The clocks have gone back, the nights are drawing in, there's a chill in the air and, by the time you read this, Guy Fawkes will have put in an appearance and the bonfire potatoes been eaten (do we still have those or am I showing my age?). Time, then, to start thinking about Christmas!

More to the point, you are going to need some Christmas cards. Perhaps you would like a card with a railway theme, in which case those available from the *Welshpool and Llanfair Light Railway* should fit the bill. This year's card features the railway's Beyer-Peacock 0-6-0T *Earl* alongside a standard gauge pannier tank and includes the usual snow but no robin, as far as I can see. Cards are available in various quantities, from £4 for five, and may be ordered on www.wllr.org.uk. The 2015 and 2016 cards are also still available.



Martin Evans can be contacted on the email below and would be delighted to receive your contributions, in the form of items of correspondence, comment or articles.
mrevans@cantab.net

Stuart Steam Hammer

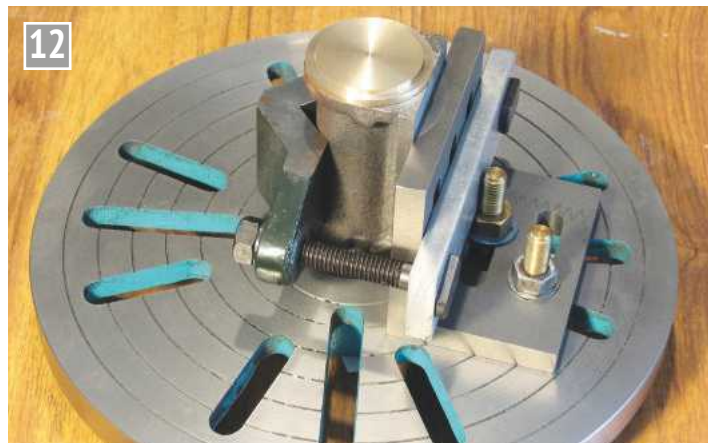
PART 2

Ray Griffin
now turns
his attention
to the
cylinder.



Continued from p.575
M.E. 4571, 13 October 2017

I opted to make the cylinder next. It is supplied in cast iron with a rough hole for the bore. Many methods can be used to bore a cylinder and there are numerous citations in Model Engineering magazines, where the process is described in meticulous detail. Readers looking for instructions on cylinder boring in book form will find useful information in volumes 1 and 2 of the books by Anthony Mount (refs 4 and 5) called 'Historic engines worth modelling'. Mr Mount shows in great detail how to undertake the work on a variety of engines. Internet users who enter 'boring model steam engine cylinders' into a search engine such as Google will find several useful pointers. There is a helpful YouTube film by Keith Appleton on www.mainstream.co.uk, where a mandrel held in a chuck in the tailstock is used as an aid to centring a cylinder in a four-jaw chuck. I have not used this method but it works well in the film. As I see it, the method relies on the cored hole of the cylinder being parallel with the exterior surface and also central in the casting. In my experience this is not always the case and misplaced holes would require a different approach, such as the Keats angle plate.



Cylinder, with brass location aid, held in a Keats angle plate attached to the lathe faceplate.



Milling the bolting face of the cylinder.

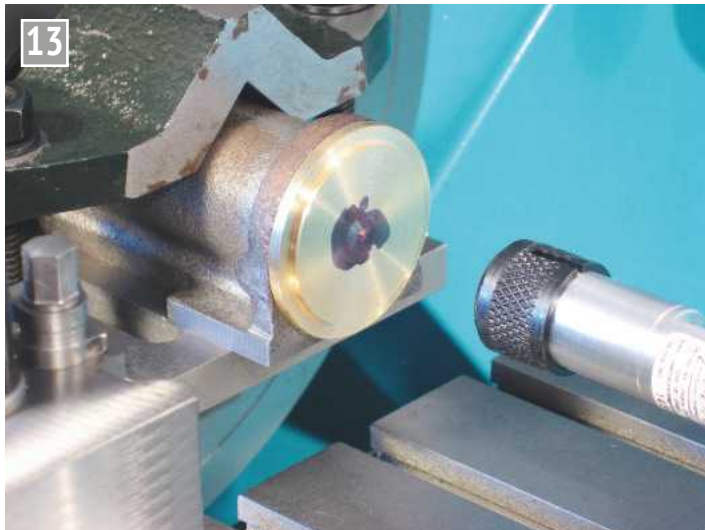
The first thing that I did was to machine the bolting face to ensure a flat surface. The bolting face should finish parallel with the axis i.e. the two thick ends of the cylinder. I was lucky in this respect as the cylinder rested with the ends on the base of my milling vice. Before the vice was clamped I rotated the work until the base was as parallel to the table as possible. I assessed squareness using a height gauge placed on the table. I have a height gauge with a long scribe that is useful for jobs such as this.

A flat surface was then created using the Arrand face mill mentioned earlier (photo 11). At this stage I removed a minimum of metal to achieve a flat surface. I did not attempt to relate its distance to the centre of the bore, as that position was not clear at this stage. Many methods for finding the centre of the bore of a cylinder are in the literature. For castings made with a hole for the bore, the usual method is to fill the hole with wood or filler to enable a centre to be found. I have seen the polyester filler used for car body work advocated for this purpose.

In my case, I turned a piece of brass rod to a diameter just

smaller than the end face of the cylinder. The end was faced to leave a small pip in the centre. A circular blank approximately $\frac{1}{8}$ inch thick was then parted from the stock. Four small drops of cyanoacrylate glue were placed around the end of the cylinder and my brass blank with the pip outermost put in place and made concentric with the outer rim of the casting.

For the benefit of newcomers, I should point out that in the interests of concentricity and smooth running it is very important that the end of the cylinder to which the piston rod attaches must be square with the bore of the cylinder. Just remember to have this end facing outwards when boring the cylinder so that the end can be faced at the same setting. To allow the blank to be moved into an optimal position, I used a form of glue that allows some movement before it sets. The cylinder was then held with a Keats angle plate and mounted on my large faceplate (photo 12). The bolts securing the setup to the angle plate were initially tightened sufficiently to hold all in place but allow movement for centre finding. The faceplate was attached



Centring the cylinder using a laser centre finder held in the tailstock.

to the lathe and a laser centre edge finder placed in the tailstock. It was easy to bring the centre of my brass blank in line with the laser spot, which ensured that the centre pip was at the centre of rotation (**photo 13**). The securing bolts were then fully tightened. It remained to detach the brass blank with a sharp tap from a small hammer and the boring process could be started.

It is worth pointing out that I protected the bed of the lathe from the falling blank with a small plastic kitchen chopping board. I used my largest insert tooling boring bar with a diameter of 12mm, obtained from Greenwood Tools. The suppliers state that these tools can be used with overhangs up to five times the diameter of the bar; more that this increases the risk of vibration. In theory my largest bar at 12mm can bore to a maximum depth of 60mm. The length of the cylinder on the steam hammer is 3 inches (76.2mm). I chose to use this tool and see what happened if I kept the speed low and took shallow cuts. All turned out well - perhaps due to the ease with which this tool cuts good quality cast iron.

Once the diameter of 1 inch was reached I changed the tool for a facing tool and made the end true. **Photo 14** shows the result at this stage. When facing ends of cylinders, it pays to work out how much metal should be removed so

that the flanges at each end are of equal thickness. Some years ago, in my first attempts at this, I was prone to remove too much from the first end and then had to leave more on the other end to get the cylinder to correct length. Hopefully, I have learnt that lesson. With the cylinder in this position, I drilled and tapped the five 7BA holes for studs to attach the mouthpiece. These are five holes on a PCD of $1\frac{1}{16}$ inches with a spacing of 60 degrees with the middle one of the set placed on the centre at the front. A hole is not required in the portion of the wall adjacent to the flat surface for bolting to the column as this space is used for a steam passage. I drilled 2.05mm (7BA tapping size) holes using my Quickstep milling attachment held in the tool post.

The first requirement was to find the centre of the cylinder bore. I took a short length of one inch diameter steel with a flat end, which was a close fit in the bore. The diameter of the steel was measured accurately and a cross made on the end using a surface plate and height gauge set at half the diameter. The plug was slipped into the bore and the spot from my laser centre edge finder held in a collet in the Quickstep centred on the cross, using the height adjustment and cross slide. The bolting flange was brought to the vertical position at the rear of the

lathe by rotating the work to bring the flat side of the cylinder in contact with a large set square placed on the bed of the lathe. The cross-slide screw was used to position the laser spot on the junction of the steel plug and edge of the cylinder, at the front of the lathe. I now subtracted one half of $\frac{7}{16}$ inch i.e. $\frac{7}{32}$ inch to give me the position of the centre screw hole at the front of the cylinder. My lathe has metric graduations so I used 5.5mm as a close workable equivalent to $\frac{7}{32}$ inch (5.5563mm). As usual when I use metric equivalents, I mark the plan accordingly; remembering especially to mark the data on the drawing for the mating part.

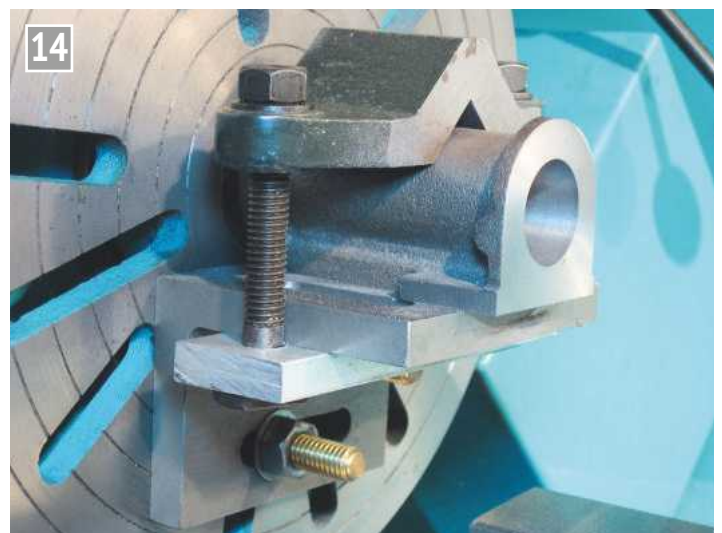
The Myford Super 7 Connoisseur has a handy indexing plunger that that is used in combination with the teeth on the bull wheel giving a step of 6 degrees for each tooth space. The plunger was locked to drill the first hole and then two holes drilled on either side at 60 degrees spacing.

The cylinder was then turned through 180 degrees on the Keats angle plate to face the top end. When the top cylinder cover is fitted, it is important for the sake of appearances that the end face is square with the axis of the cylinder. I achieved this by pushing the cylinder hard against a thin piece of parallel sided ground tool steel placed between the face plate and

the cylinder. In this position, the holding bolts were made tight and the parallel tool steel removed. The end was then faced to leave the cylinder 3 inches long. Six holes, tapped 7BA on a PCD of $1\frac{1}{16}$ inches with a spacing of 60 degrees to attach the end cover, were placed using the same procedure as described above for the mouthpiece.

It was now time to address the distance from the centre of the bore to the bolting flange. On the plan, this is given as $\frac{7}{8}$ inch. The radius of the bore is $\frac{1}{2}$ inch so the distance from the edge of the bore to the face of the flange needed to be $\frac{3}{8}$ inch. I placed the cylinder onto a surface plate, used a height gauge to find the edge of the bore, deducted $\frac{3}{8}$ inch, then marked a line on the ends and edges. The cylinder was returned to the vice on the milling machine with the flange uppermost. The flange was made parallel to the table surface using a DTI held in the milling chuck and excess metal removed using my large face mill.

The steam passages in this cylinder are fortunately parallel to the bore of the cylinder and can be drilled from each end with the setup shown in **photo 15**. The passage drilled from the lower end is $\frac{1}{8}$ inch diameter and $1\frac{29}{32}$ inches deep; the one from the other end $\frac{1}{8}$ inch diameter and $1\frac{17}{32}$ inches deep.



The cylinder, bored and faced.



Drilling the steam passages.

Attention now turned to the fixing holes and steam passages in the bolting flange. There are six holes tapped 7BA for attachment to the column, four holes 5BA clear for attachment of the mouthpiece and two $\frac{1}{8}$ inch diameter holes for steam passages. It seemed to me essential to place all holes relative to the centre line of the bore of the cylinder. I found a convenient way to do this. A length of 1 inch diameter ground steel bar was placed in the bore and the protruding ends of the bar supported with a V block at each end on my surface plate. I had in fact used this bar as a test piece when the cylinder was bored. The bolting flange was placed in the vertical position against a set square. I then set my height gauge so that the bottom of the scribe was just touching the top side of the steel bar. The height was noted and $\frac{1}{2}$ inch deducted, giving me the centre of the cylinder. A centre line was then scribed along the length of the flange and on the two end faces. At a later stage, the scribed lines on the end faces would be used to indicate the position of the steam passages.

Parallel sets of lines were scribed $\frac{7}{8}$ inch and $\frac{3}{4}$ inch

above and $\frac{7}{8}$ inch and $\frac{3}{4}$ inch below the centre line. The cylinder was then removed from this setup, stood on end on the surface plate and cross marks placed on the parallel lines to indicate the positions of all holes. I should point out that, before scribing, I coat the surface with black permanent ink from a broad felt tipped marker pen. The term 'permanent' indicates that the dried ink will remain in place with normal handling but it is easy to remove with acetone when the work is finished. The task required dexterity to ensure that the flange remained vertical against the set square but was successful.

The cylinder was relocated in the vice on the mill with the flange uppermost and a DTI held in the chuck used to ensure that it was horizontal in the X (longitudinal travel) and Y (cross travel) directions. **Photo 16** shows the cylinder held in this position. The two steam passages on the centre line are in place as well the four holes 5BA clear and three of the six 7BA threaded holes. I note two items here. First, the steam passages are drilled $\frac{1}{8}$ inch diameter x $\frac{5}{32}$ inch deep and the cylinder wall at this level is only $\frac{7}{16}$ inch thick. It is

critical that the drill does not break through into the bore so strict control of the depth of the hole is mandatory. My Emco mill/drill has an accurate depth indicator. If the vertical steam passages are in place you should feel the drill break into the track. Secondly, I drill and tap the 7BA threads in the casting at the same setting. I drilled a tapping sized hole for 7BA at 2.05mm and then placed a 7BA tap in the drill chuck (photo 16); the collet was loosened allowing the drill chuck to slide up and down and rotate. Some years ago I made an arbour with parallel sides and a screw thread for the drill chuck which is invaluable for drilling and tapping at the same setting.

On my plan, there was no provision for a drain cock at each end of the cylinder. Interestingly, there were two bosses in the casting in the correct position and I used these to add a pair of Stuart drain cocks that were in my spares box. The cylinder was gripped by the ends in a large milling vice and rotated until the bosses were in the vertical position. I then drilled a 1.5mm hole through the wall of the cylinder, changed for a 3.3mm

drill prior to tapping the $\frac{5}{32}$ inch x 40 threads for the drain cocks. A hole was drilled 6mm deep, then the drill changed to $\frac{5}{32}$ inch x 40 second cut and bottom taps in sequence. It would have been easier to drill right through the wall with the 3.3mm drill but I used this double diameter approach as one of the drain cocks was close to the position of a stud attaching the mouthpiece and I wanted to conserve as much of the surrounding metal as possible. I used a $\frac{1}{4}$ inch end mill at the same setting to form a flat seat for the drain cock then moved to the other end and repeated the process. This completed the work on the cylinder and attention turned to the piston rod and hammer, which we will discuss next time.

● To be continued.

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5. Mount A. (2008) *Historic engines worth modelling*. Volume 2. TEE Publishing Ltd. UK



Tapping the screw holes in the bolting face.

Storing Quick Change Toolholders

Roger Vane

presents a neat and simple storage rack for restoring order to his collection of Dickson quick-change toolholders.



Full house - the storage rack mounted on the wall above the lathe headstock.

Introduction

Around fifteen years ago I decided to change my tool holding system from a 4 way toolpost to a Dickson-style quick change (QC) system. However, I soon realised that a QC toolpost with 4 holders (one of which was a special parting tool holder) was little better than a 4-way toolpost in terms of flexibility. It was probably worse in respect of changing tools as those for the 4-way can at least be stored with a dedicated packing set, whereas the QC toolpost would have to be reset. I felt that only having three available holders for standard tools defeated the object of having a QC system.

So - I needed to buy more holders to really benefit from the QC system. I'm a firm believer in having dedicated holders for the most frequently used tools. Then, along with the acquisition of more holders came the problem of storage and selection - easy to handle with just a few holders but I soon came to realise that

I needed a better storage system.

Over the years there have been a couple of ideas for toolholder storage in the model engineering press - I seem to remember many years ago a rotary carousel was described and also a more recent example from welded steel. Neither of these particularly suited my situation - mainly down to size, limited capacity and cost.

What I needed was a storage system which would be:

- able to hold sufficient holders for my growing collection of insert tooling and special HSS tools and
- easily accessible from the lathe position in the workshop, for both viewing and selection.

My solution

As you will see from **photo 1**, I hit on the idea of a special storage rack where the toolholders are held on

'brackets' at an angle which makes viewing and selection easy.

The dimensions are suitable for the Myford size of QC holder (size 00) although the idea could easily be adapted for use with larger toolholder systems. In my particular case the overall dimensions are:

Height	360mm
Internal width	465mm

My own version can accommodate a maximum of 39 toolholders on three angled shelves which allow for visibility and easy selection. Anyone who wishes to make such a unit can modify the dimensions to suit their own collection of holders.

As you will see, the shelf unit is now full of toolholders, containing 38 of them of different styles. There is one small space on the top shelf where there is a transition from boring tools to those held in the 'external' position. In fact, I now have a total of

This was never intended to be an example of fine woodworking - it's simply a means of achieving organisation from chaos.

40 toolholders - you can see a couple of extras mounted on the wall to the right-hand side of the main unit in photo 1. One of these is for the dedicated holder for a DTI as described in *Model Engineer* (ref 1) and the other is permanently set to hold those tools made for the old 4-way toolpost, such as a Radford-style spherical turning tool and graduating tool, where the original centre height, based on the 4-way toolpost, needs to be maintained.

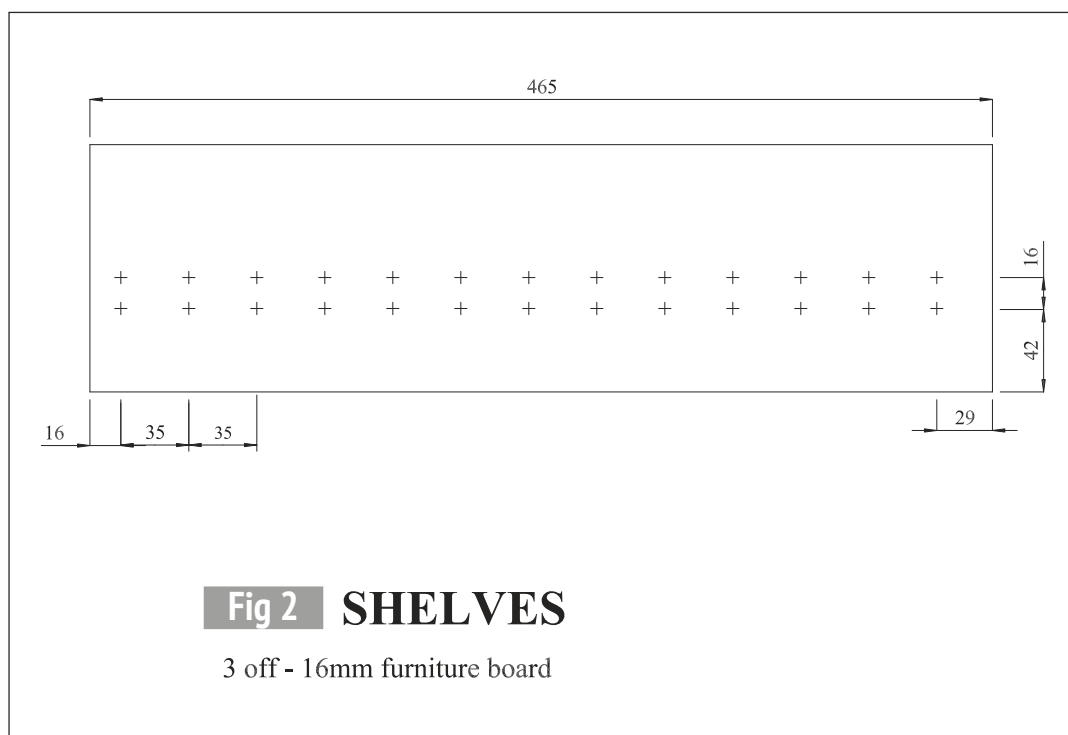
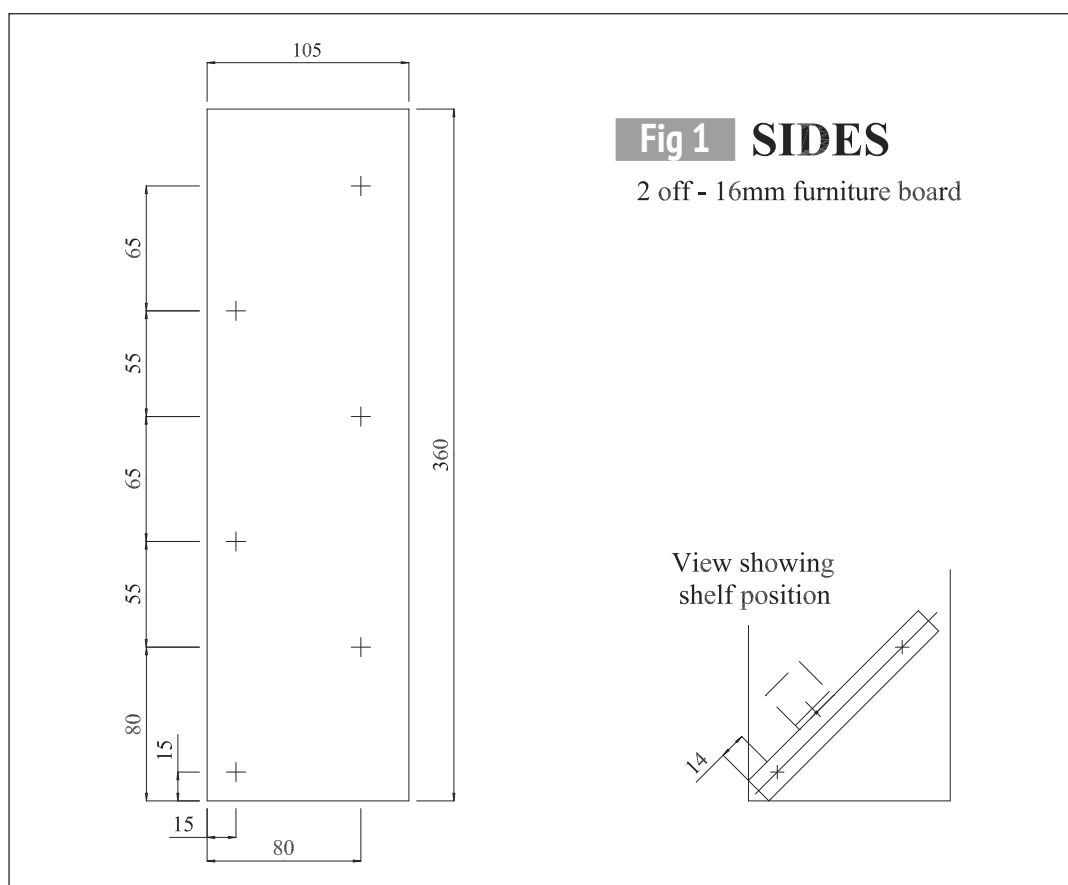
Making the storage unit

Let me stress from the outset that this was never intended to be an example of fine woodworking - it's simply a means of achieving organisation from chaos.

So it was down to the local DIY store to buy a couple of lengths of 150mm wide white furniture board (that nasty plastic covered chipboard stuff), some edging and a box of screws. I also rummaged through my material stocks and found some angle iron for the brackets.

For the purposes of this article I have provided some simple drawings. As mentioned above, my rack was designed to hold a maximum of 39 toolholders, and the parts are dimensioned to suit. The shelves are pitched at 45 degrees - an angle which in practice works very well. You will get sufficient visibility of the tool whilst having enough space behind the mounting brackets to accommodate the longer boring tools.

The sides are shown in **fig 1**. The board for the sides can be



reduced to 105mm wide and edging strip ironed on to the ends and the side which has been cut if you so wish. Drill holes for your chosen screws (I found that 4mm or No. 8 were suitable). Please remember that any countersinks will effectively 'hand' the sides. The drawing

also shows how the shelves are pitched at 45 degrees.

The shelves themselves are shown in **fig 2** and for these the board can be left at 150mm wide. The drawing shows the positions of the holes for attaching the brackets. Please note that the holes are pitched

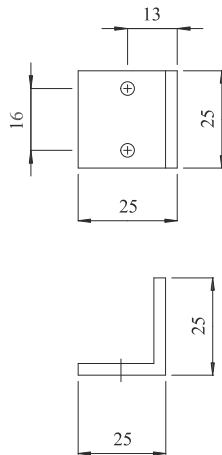
at 35mm between brackets, but are at different positions in relation to the ends. A simple small pilot hole at these positions will help in mounting the brackets in the correct positions.

The support brackets are made from pieces of 3mm

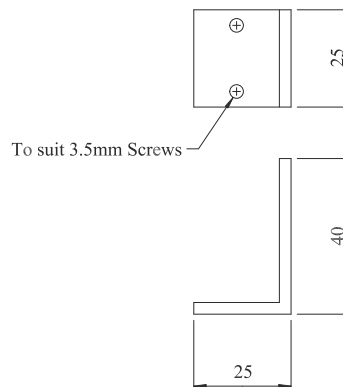
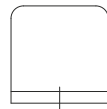
Fig 3

SUPPORT BRACKETS

39 off - 3mm steel angle



Standard toolholder bracket



Parting toolholder bracket



You will see that I've specified two different 'heights' for the brackets, the shorter brackets being for standard toolholders and the tall brackets for parting tools - just make up as many as you feel that you'll need.



Four tools removed to show the tool support brackets.

angle iron as shown in **fig 3**. You will see that I've specified two different 'heights' for the brackets, the shorter brackets being for standard toolholders and the tall brackets for parting tools - just make up as many as you feel that you'll need. **Photo 2** shows some brackets and how they are fitted to the shelves.

There's nothing too critical about the dimensions apart from the length (shown as 1

inch). My toolholders have come from various sources and they all fit the tool block and perform well but I have found that the width of the slot for the angle iron bracket does vary a little, so best to check. Rounding the upper corners on the bracket easier - nothing

special here, just round off using a belt or disc sander.

Holes for the screws are shown, and can be whatever suits the screws you have, but preferably countersunk to allow for maximum support of the toolholders.

All that now remains is to assemble the rack and hang it

on the wall, using brackets that suit your situation.

ME

REFERENCE

1. DTI holder for the toolpost - *Model Engineer* 4530 (18th March 2016)

The Barclay Well Tanks of the Great War PART 29

Terence Holland describes and constructs two appealing, century old locomotives.



Continued from p.594
M.E. 4571, 13 October 2017

This constructional series addresses Andrew Barclay 0-4-0 and 0-6-0 narrow gauge locomotives supplied for use in the First World War. Built without the use of castings, the 0-4-0 design is described as two versions; as-built for the British Admiralty in 1918 and as rebuilt and currently running on the Tallyllyn Railway as their locomotive No.6, *Douglas*. The 0-6-0 engines described were built in 1917 and operated on 60 centimetre gauge track at the Western Front in France. These were small, spartan machines of which only 25 were supplied and none have survived into preservation.



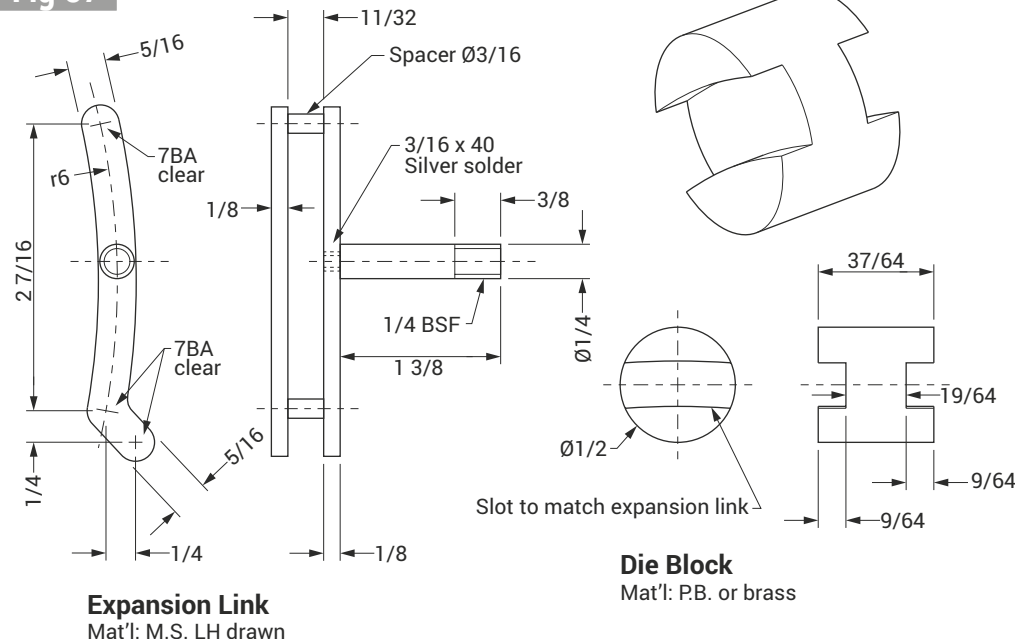
The author's painting of Douglas at Pendre in the 1980s.

Expansion link guide plates and die block

These two items are shown in **fig 87** and **photo 132** and are the only significant parts of the valve gear specific to the Barclay design, all other

parts being typical of basic Walschaerts gear. Note, however, that in photo 132 the connection to the eccentric rod from the base of the guide plates is different to the correct version shown in fig 87.

Fig 87



The die block

The die block is the only difficult part of the modified Walschaerts gear to make, mainly due to the two, parallel, curved slots and, of course, its small size. See sketch on fig 87. It took me a fair bit of 'thought ranging' to work out a method of manufacture and even then there were several pit-falls resulting in a fair few 'scrappers'. I eventually gave up the idea of making them in phosphor bronze, having seen my stock of half inch PB rapidly diminishing, and made them out of brass! I figured that they are easy components to replace if excessive wear occurs in service. And, bearing in mind (no pun intended) the satisfactory performance of a number of brass components etc. on my original locomotive,



Expansion link and die block on the rebuild.

I'm not so sure that the use of phosphor bronze, case hardened mild steel and silver steel is always essential.

The mention earlier of 'thought ranging' reminds me of my early days with the UKAEA. Someone in senior management must have had a 'bright' idea and thought it would be possible to introduce a 'time and motion' system of productivity bonuses into an industry conducting research and development into nuclear reactor design. At the time I was an Assistant Scientific Officer and had to fill in daily paperwork regarding the various jobs I had done – associated then with analytical chemistry. However, career grades above mine, i.e. Scientific Officer and above, were allocated a certain amount of what was officially termed 'thought ranging' time (skiving off we reckoned) but that luxury was not for us workhorses! Needless to say, the scheme died a natural and we never did get a bonus!

With internal curved surfaces, filing by hand is not an option. However, it is not too difficult to devise a jig so that the work can be set up for milling. The tricky bit is to get the two slots each side of the block in alignment. I overcame this problem by making a jig from a piece of $\frac{1}{4} \times 1$ inch brass stock about 3 inches long. Drill three holes in this on the centre line at $1\frac{1}{4}$ inch centres. Ream the centre hole $\frac{1}{2}$ inch diameter. A piece of $\frac{1}{2}$ inch diameter phosphor bronze of the correct thickness can now be soft soldered into the reamed hole (alternatively the

brass jig can be drilled and tapped to take two 2BA locking bolts – if slight bruising of the outside of the die block is deemed acceptable).

Set the jig and die block up on a radial milling attachment – that designed by Martin Evans for machining expansion link slots is ideal (Drawing WE 12). A photograph of Martin's radial milling accessory is shown in his booklet about locomotive valve gears. When mounting the blanks it is important that the holding down bolts are square to the milling attachment, as any error here will cause misalignment of the slots. Ensure that the centre of the jig lines up with the centre of the milling cutter.

Drop in a blank, $\frac{1}{2}$ inch diameter x 0.585 inch long, solder in place or lock up with the 2BA locking bolts. Mill across 0.140 inch deep then, with the first slot complete, turn the jig over lengthwise and mill the second slot. Release the die block, clean up and then face each end equally to provide a finished length of $\frac{39}{64}$ inch. Check that the centre section is less than 0.3125 inch across. The milling set up is shown in **photo 133**. Trial and error with various diameter cutters showed that the slot cut with a 7mm slot drill is a good compromise for a working fit on a $\frac{5}{16}$ inch wide expansion link.

The expansion link guide plates

For the Barclay/O&K design the expansion link consists of a pair of plain curved plates running in the oversized die



Milling the die blocks.

block (see fig 87). These are equivalent to the inner, slotted link on conventional Walschaerts gear. However, as they form the guide for the die block, they need to be more precise than conventional outer plates. The obvious way to make them is to bolt together four suitable pieces of mild steel, mark out the top plate and chain drill the outline. Mount it on a radial milling attachment and tidy up the two arcs, based on a 6 inch radius at the guide plate centre line. Remove the plate and cut out the link. Note that

each link has an extended base to connect to the eccentric rod. The back plate also has the $\frac{1}{4}$ inch diameter mounting shaft, which fits into the motion bracket. Screw the shaft into the backplate with a $\frac{3}{16}$ inch x 40 thread and silver solder in place.

However, having detailed the machinist's approach, I fancied having a go at an alternative method using hammer and anvil.

The smith's approach

The general idea was to find a piece of steel of the correct



Expansion link guide plate forging jig.



Forged blanks.

diameter, such as an old gas cylinder. Having failed on this one I decided to bend up a ring made from 4mm x 25mm steel strip. The ring was subsequently bent up, welded and hammered on the anvil until the diameter was uniform. The next stage was to weld another piece of steel strip across the ring approximately 3 inches down. The metal below this was cut off and discarded (see **photo 134**). I now possessed a former of the correct radius over which the guide plates could be forged.

To make the guide plates two pieces of $\frac{1}{8} \times \frac{1}{4}$ inch bright mild steel are required, about a foot long. Heat the end of the bar red hot and gently hammer them over the former held in a vice. Quench and repeat for the other three ends (see **photo 135**). Note, however, that each plate requires a tailpiece as shown in fig 87 for the eccentric rod connection. The guide plates shown in the photos are not the same, as the rebuilt engine has a slightly different arrangement.

Finish them off by beating them flat on the anvil and cleaning them up on the belt sander. Drill the bolting holes, round off the ends and reduce the plate width to fit the slots in the die blocks. Assemble them with 7BA bolts and spacers.

Radius rod

The Barclay radius rod (see **fig 88**), operated by the modified O&K expansion link, is slightly easier to make than the typical Walschaerts rod, as fitted to my locomotive before the rebuild.

The centre section, which runs in the expansion link, is quite large, making it a long-winded process to machine the rod in one piece. **Fig 89** shows a three-piece construction, screwed and silver soldered together. Threading the centre component to take the two threaded rods before soldering ensures alignment. **Photo 136** shows the two radius rods set up with distance pieces for silver soldering.

To make the die block housing prepare two pieces of $\frac{5}{16}$ inch thick mild steel,

Fig 88

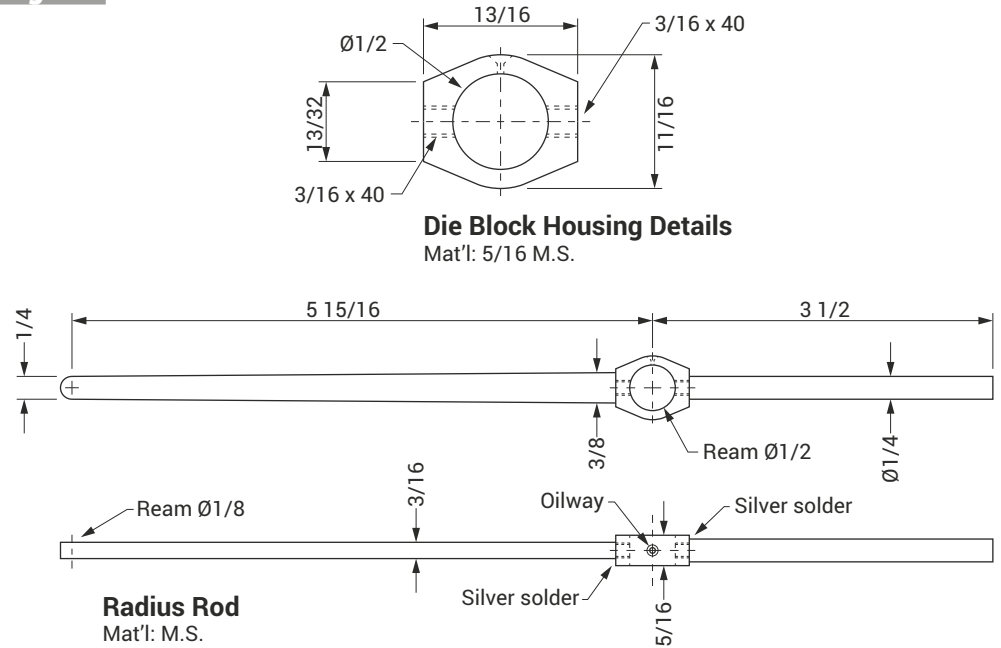
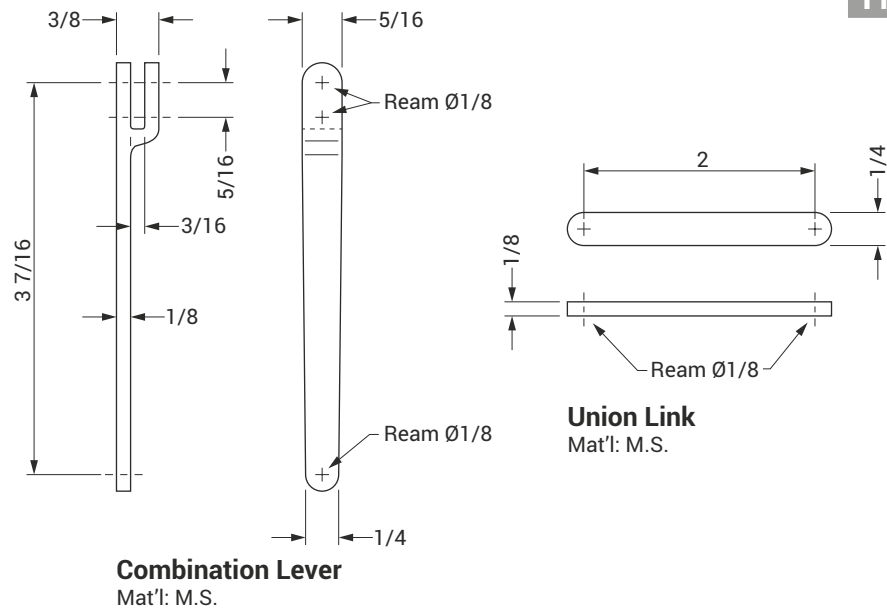


Fig 89



$\frac{11}{16} \times \frac{13}{16}$ inch. Mark the centre of each piece, chuck in the four-jaw and set to run true; drill a $\frac{1}{8}$ inch diameter pilot hole. Open this out to $\frac{3}{16}$ inch diameter and ream $\frac{1}{2}$ inch. Mark a centre on one of the smaller faces, $\frac{5}{16} \times \frac{11}{16}$ inch, and set to run true in the four-jaw. Centre drill and open out to 4.2mm right through, tap $\frac{3}{16}$ inch x 40 tpi. Drill the $\frac{1}{32}$ inch diameter oilway in the top and profile to shape. Set the rods

up for soldering as a pair as shown in photo 136. Note the use of distance pieces. After soldering set each rod up in the three-jaw chuck, holding it by the $\frac{1}{4}$ inch diameter

extension rod and true it up if it needs it by some gentle tapping until the end of the taper section runs true.

● To be continued.



Set-up for silver soldering the radius rods.

Improvements to a GWR 14XX PART 2

John Whale improves the keying of the wheels and the setting of the valves.



The following articles are intended to enable owners of the Winson 14XX to make their engines run more successfully. I assume your locomotive is complete and offer some suggestions for improvements.

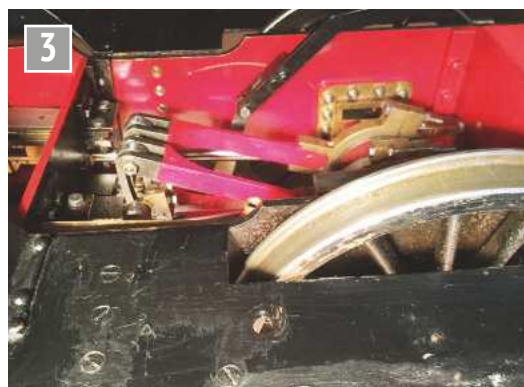


Now that all the alterations are complete I expect you are eager to put the cylinders back together but before doing this there are a number of things that need to be done, starting with the gaskets. If these are damaged you need to make new ones from thin gasket material or brown paper.

First cut the gasket to the outside shape then place on the steam chest and use a scriber to pierce two holes, insert screws in the holes to locate and then pierce more holes locating with screws until the holes are finished. Then cut the inside shape. The same technique can be used to make the cylinder cover and

any other gaskets. The piston seals can be either graphited string, Viton 'O'-rings or cast iron rings. Graphited string should be wound round the piston groove until it is proud of the outside diameter so that the piston is tight in the cylinder. The 'O'-rings should be 0.125 inch cross-section and 1.25 inch diameter. On my engine the rings are cast iron and instructions for making them are available separately.

The kit came with 3mm brass keys to locate the wheels on the axles but these should be discarded and 0.125 inch steel keys used instead. Try the square steel in the keyway and, if necessary, file carefully until it is a tight fit then cut to the length of the keyway and tap it in place. Try the wheel on the axle and, if required, file the sides and top of the key until the wheel



The ends of the expansion link are filed out square to extend the movement of the die block.



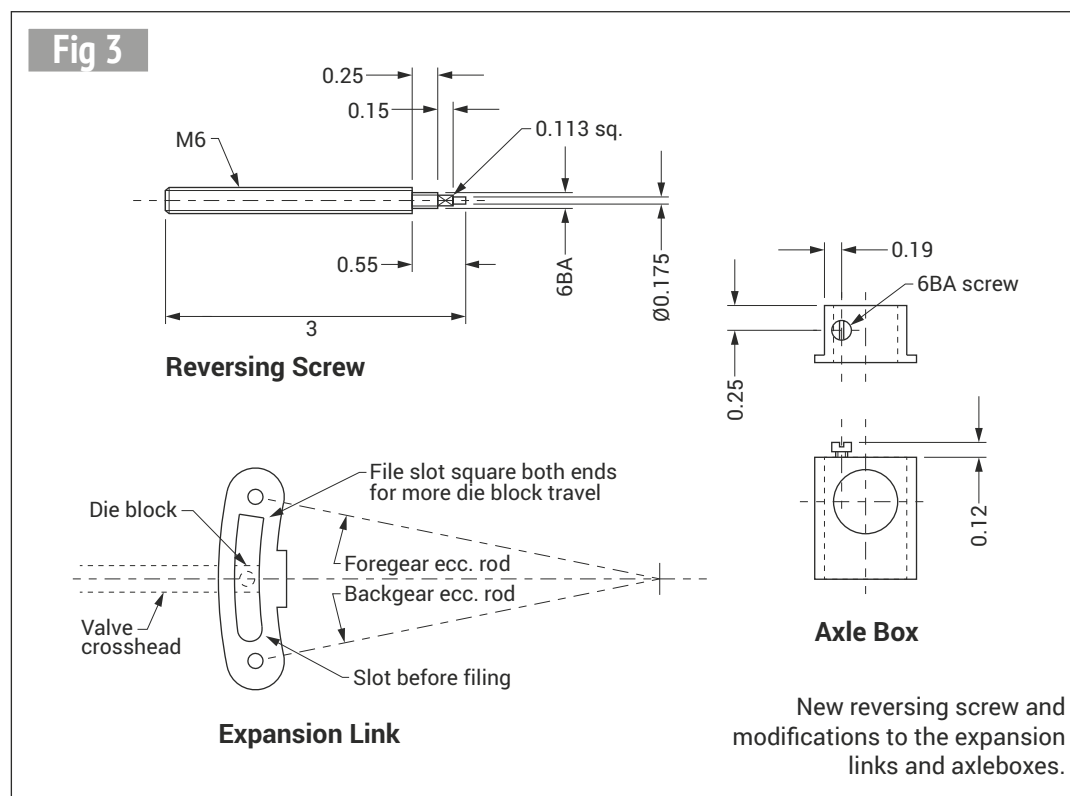
A new reversing screw is required to make use of the increased die block movement.

just goes on then apply the Loctite and press the wheel on using a vice. When doing this on the crank axle put packing between the crank webs to avoid bending the axle. The wheels should run true but if they don't it may be necessary to turn them between centres on a lathe.

When reassembling the crank axle the left hand crank should lead by 90 degrees going forward. On maximum spring depression the crosshead fouls the front axle. To prevent this drill and tap a 6BA hole in the top of the front axle boxes and screw in a brass screw until the top of the head is 0.125 inch above the top of the axle box (**fig 3**).

As supplied the valve travel was approximately 7.2mm which was not enough because the ports were only half open; LBSC's Juliet, for example, is a much smaller engine and has 9.5mm travel. To increase the travel the ends of the expansion link are carefully filed square so that the die block can travel to the ends of the slot. This will achieve 8.5mm travel (see **fig 3** and **photo 3**). Unfortunately this means that the reversing screw is not long enough so a new one has to be made (**fig 3** and **photo 4**). Cut off a 3 inch length of M6 studding or a long screw and hold in the lathe chuck. Turn 0.175 inch diameter and 0.55 inch long and then turn 0.110 inch diameter and 0.15 inch long and start the 6BA thread with the die and diestock held square using the lathe tailstock. Remove from the lathe and place vertically in a vice with soft jaws, with 0.3 inch protruding. File down one side of the square to give a dimension of 0.144 inch then file the opposite side to produce the 0.113 inch dimension. Turn it through 90 degrees and repeat the operation until the square is complete. Now finish cutting the 6BA thread.

Reassemble the valve gear expansion links and reversing screw and refit the crank axle. Attach the right-hand



cylinder to the frames and fit the steam chest then screw in the gland and fit the valve assembly, taking care not to bend the valve rods. Connect the valve rods and connecting rods then put the reverser in full forward gear and turn the wheels by hand.

Now we can go on to improve the setting of the valves.

I can do no better than to refer to L.B.S.C.'s words and music (*M.E. March 13th 1947* page 304). Adjust the valve on the rod so that the port openings at both ends of the movement are equal then put the crank on front dead centre. Check that the valve is just 'cracking', showing as a visible black line at the edge of the valve. Now put the crank on back dead centre and check the same. If a crack appears at both dead centres the setting is OK and the valve length is correct. If not, the valve is too long so remove the valve, taking care to keep the locknut position. File off equally at both ends and try again until the valve cracks the same at both ends (I had to take a total of 0.036 inch off the valves on my engine). Now do the same with the screw reverser in

reverse just to check. Remove the right-hand cylinder and steam chest assembly making sure you do not lose the valve setting, by securing the valve rod locknut.

Fit the rear cylinder cover and gasket to the left-hand cylinder. Then fit the steam chest and valve assembly with gasket in the frames and repeat the valve setting as for the right-hand cylinder. Now remove the left-hand cylinder, again taking care not to lose the valve setting.

The right-hand cylinder can be refitted to the left-hand cylinder and steam chest, not forgetting the steam chest gasket, thus making up a complete cylinder assembly. Fit the rear cover and gasket then insert the piston and fit the gland with graphited string packing and carefully slide the whole cylinder assembly in position. It will be necessary to jack the frames apart and loosen the motion bracket screws to do this. When the cylinders are lined up they can be bolted in position. Now fit the gland and packing to the left hand cylinder and fit the piston. The right-hand valve rod locking nuts can be tightened and the

graphited string packing put in both glands. The pistons can now be screwed into the crossheads and the front cylinder covers and gaskets can be fitted. Tighten the motion bracket screws and remove the small end pins and check that the crossheads move freely; if not shims may be fitted under the slidebars. Replace the small end pins and turn the wheels to make sure everything runs freely. This completes the cylinder assembly (**photo 5**).

●To be continued.



The complete cylinder assembly.

Reconditioning a 5 Inch Class 86 Locomotive

Ken Toone explains how the Birmingham SME revived their forty year old club locomotive.



This article refers to our 5 inch Class 86 locomotive, which was built by me around 1972 and featured in the *Model Engineer* Magazine Vol 138 No. 3454 dated 1-14 December 1972.

At that time, I suppose it's true to say it was one of the first battery powered models around which was able to perform serious work, in terms of regular passenger hauling. The model passed through a couple of owners before ending up as the club locomotive with the Birmingham SME.

The club upgraded the control system from the original multi-switched relay layout to a 150A 4QD unit and it has performed faultlessly for over forty years, travelling thousands of miles at club functions. However, it recently developed a fault, which has burnt out at least one of the motors. Furthermore, the drive gears were showing their age and had become quite noisy so the decision was taken by our committee to refurbish the model.

The first problem was to find suitable motors as the Lucas 9GM motors originally fitted were long since obsolete. Fortunately, we model engineers are hoarders



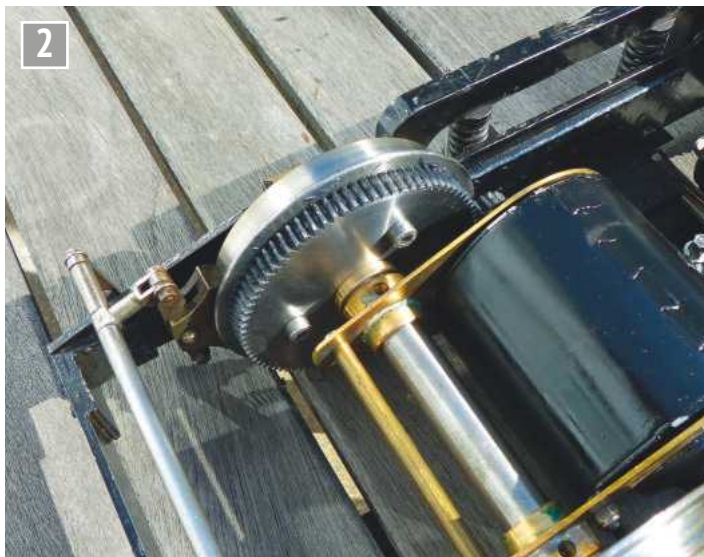
A motor modified ready for use.

by nature and an appeal to fellow members to search their stocks of 'items that might come in handy one day' produced a total of five motors, all with the same specification. I'm not sure of the exact make but suffice to say that, after testing, they were all considered suitable for use.

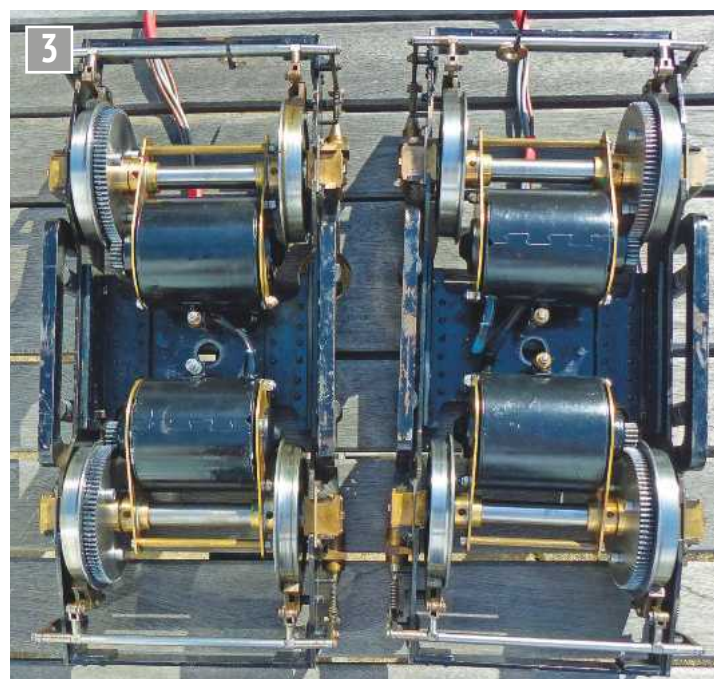
The only real modifications required were to remove the three mounting brackets from their casings, remove the moulded socket from the end

cover and shorten the spindle to suit. The casing needed to be drilled and tapped to mount the torque reaction brackets and flying leads were added, soldered directly to the brush contacts and out through a grommet in the side of the casing (**photo 1**).

The other problem was the drive gears. These had been made specially for me by the company that I worked for at the time and were 26DP pitch, which today appears



Motor installed showing the new drive gears.



The modified bogies ready to be installed.

to be a non-preferred size. Calculations showed that we could use 24DP pitch gears at a slightly different ratio and still maintain the same gear centre distance.

Our original material choice of steel, as opposed to 'plastic', for the gears has been vindicated by the forty odd years of service so we have repeated this choice and have purchased suitable 24DP gears, having a ratio of 15 teeth driving 84 teeth, from HPC Gears Ltd. (no connection).

The different overall shape of these motors has required new side mounting plates to be made, together with new suspension bushes, and has resulted in rather more space being available for assembly (**photos 2 and 3**). The original needle roller axle bearings are still perfect and only need repacking with grease.

The locomotive is now back in service (**photo 4**) although there was one rather heart-stopping moment, when on the first run it was found that its top speed was only around 50% of its previous



Back in service.

performance. Some head scratching ensued - had I messed up with the gear ratios? - before it was realised that we had wired up the motors backwards. On a 4QD controller the maximum reverse speed defaults to 50% of forward, in the interests of safety. A quick rewire and all

was well - pulse rate returned to normal!

Early indications suggest that these new motors might be somewhat more efficient than the old motors since the current drawn seems to be marginally less for a given speed/load. Certainly, with a fully loaded train at speed

on our back straight (1:1200 downhill), current drops to around 10-12 amps whereas previously it was around 15-17 amps.

Hopefully, we are now set for another forty odd years of service although most of our current membership will be long gone by then!

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- **The Bolton Tram**
Ashley Best makes some axleboxes for the tram
- **Wide-A-Wake**
Ramon Wilson continues with the reconstruction of the boiler
- **Ferrabee**
Anthony Mount makes a start on the valve gear for his stationary steam engine
- **CNC for Beginners**
Peter King plays 'snakes and ladders' with his computer system
- **The Jan Ridders Two-Stroke**
Robert Knox shares his experiences of building a simple two-stroke engine

Content may be subject to change.



ON SALE 24 NOVEMBER 2017

The I.L.S. 'HOT POT' Invitation Run

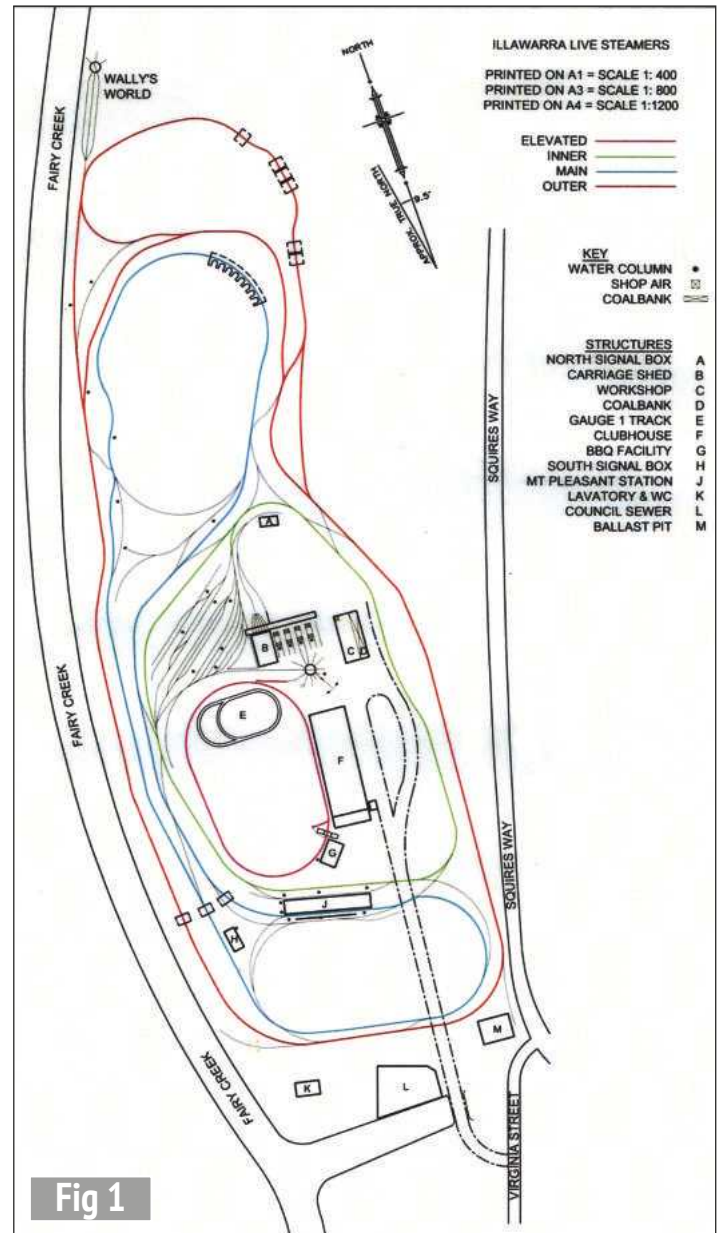
An Australian Icon

Les Phillips reports on the 'HOT POT' run held at the Illawarra Live Steamers track in New South Wales.

I think some sort of explanation is needed before I go too far. I.L.S. are the initials for the Illawarra Live Steamers in New South Wales. As to the term 'HOT POT', every year over our Australian Queen's birthday long weekend in early June, the Illawarra Live Steamers issue an invitation to members of all clubs affiliated with the Australian Association of Live Steamers to join them for a long weekend of 'trains and soup'. They have a very comprehensive and extensive track (see track plan – **fig 1**) comprising a five inch gauge only ground level track and an elevated oval track of combined 2½, 3½ and 5 inch gauge inside the ground level track. Inside that again, for those more inclined to the 'smaller' stuff, there is also a very nice gauge one layout.

For those readers unfamiliar with the I.L.S. - as it now shall be known - and I suspect there will be many - I hope the following will be of interest.

The I.L.S. grounds are located on the east coast of N.S.W. in Fairy Meadow, a northern suburb of the city of Wollongong, which has a population of 280,000,



Debra Gillam stands by ready to provide hot buns and a warm welcome.

approximately eighty kilometres south of Sydney. It is a steel 'city' in the sense that it was the home of Australian Iron and Steel who employed 25,000 people in its heyday. This then transitioned to B.H.P. and now Bluescope Steel, which currently has 15,000 employees.

I have been privileged to have attended this run over many years and to have experienced this club's wonderful hospitality and camaraderie. So, as well as reporting on this event for M.E. readers, it is also my tribute to our friends at I.L.S. and my

way of saying 'thanks for the memories' but I only hope from my point of view - it ain't over yet! To sum up it is an event on our Australian model railway calendar not to be missed.

Firstly, the term 'HOT POT' stems from the fact that the entry fee is - **three tins of soup!** Now don't knock it. Set up on the veranda of the club house at the kiosk end is a sort of 'Bain-Marie' with containers for the various soups. In a quiet moment (**photo 1**) Debra Gillam is waiting for her next customer and has a smile for the photographer. Gas burners provide the heat so that hot

soup and buttered rolls are available over the entire three-day weekend, the containers being topped up periodically. Any tins of soup left over at the end of the weekend - and there can be a fairly substantial number of them - are donated and taken to worthy local causes.

Secondly, the club was founded in 1964 with the original track located in West Wollongong and moved to its present site of 8½ acres in 1980. With a membership of approximately 85 they have a lot of grounds and track to look after. The site is a bit 'swampy' in places with Fairy Creek, which is tidal, on one side. Wollongong city is in a beautiful setting of coastal scenery and a magnificent escarpment of high cliffs, with the track a reasonable distance from the city centre.

There are plenty of trees and shrubbery through which the approximate total of two kilometres of track winds, giving an interesting run with a couple of long straights beside Fairy Creek and generally easy curves. Being fully signalled it is extensive enough to require two signal boxes. The main line is comprised of three main loops, an Inner of 350m, a Middle of 575m and an Outer of 650m. You can be switched from one to the other creating a 'figure eight' and even a 'double figure eight', the latter being one and a half kilometres long! The inner loop incorporates the station and very extensive yards

while to finish it off there are numerous 'lay-bys' in which to seek refuge. Finally, the *pièce de résistance* to me is that you pass trains going in the opposite direction!

The Illawarra members are not a group that rests on its laurels. Since this event was first held in 1993 each year has seen some sort of improvement or extension to its facilities and this year was no exception! An area that was more or less swamp has seen three new bridges (**photo 2**) and a track extension go in, which add a new dimension to the circuit (the photograph only shows a small section). This has been called the five bridges loop as there were already two bridges to negotiate.

Unloading to the steaming bays is relatively easy with a large turning area which enables you to back up to one of about five positions giving access to parallel steaming bays. A converted fork lift (**photo 3**) provides the lifting/lowering facility. This photograph also shows Ian Bussell's *Nigel Gresley* about to start down the gentle incline to the yards or main line. In addition, there is an unloader to a turntable at the rear giving access to radiating bays. All in all, it provides storage for a lot of locomotives and I can assure you on this weekend every one is needed! The majority are under cover - a big advantage in inclement weather.

Provision is made for those who wish to camp or place a caravan on site



Several bridges carry the Illawarra line safely over the swamp.

and this year the 'full house' sign was up! No club worthy of its name does not have a ladies' auxiliary and the ladies of I.L.S. surpassed themselves on this weekend with morning and afternoon teas. Moreover, led by member Dennis Hamilton, for a nominal cost the ladies put on a substantial cooked breakfast which really set you up for the day! Camaraderie over the breakfast tables was something to behold and for some reason was fairly quiet!

So - to the run itself. The weather at this time of the year can be a bit 'iffy'. As an aside from this weekend, a few years ago a sandbar backed up Fairy Creek and the track was flooded (**photo 4**). We had no option but to sit or stand around, having a 'cup of the enginemen's best friend' and talk 'steam' until the local council cleared the sandbar which had blocked Fairy Creek

at the ocean. After a two or three-hour delay, and not to be deterred, away we went again! And what's more the signal boys had them working again!

The official days were Friday, Saturday and Sunday but it seems to have evolved to include Monday morning. Those of us there on Friday were able to run around the set double figure eight, which is no hardship considering the length of run it provides.

FRIDAY dawned and we were lucky as the heavy overnight rain had cleared, the day was overcast but fine and, as it turned out, there were some periods of sunshine. The early birds were making the most of it with the free running on the track. As the day wore on new arrivals made their presence felt and the steaming bays filled up as did the yards. Consequently, track activity was building up and there were some interesting trains.



Nigel Gresley prepares to head to the main line.



Fairy Creek makes its presence felt.



Mount Pleasant yard.



Roger Kershaw passes sedately by the yard.



Barry Potter chaperones The Princess as she passes the yard on the main line.



David Humphry is this week's 'mystery driver' as he steams up his GWR 1400.



NSW 32 Class – with paint.



NSW 32 Class – without paint.

It is approximately mid morning with a view of the Mount Pleasant yards (**photo 5**) with some rolling stock still covered against the overnight rain. The steaming bays and storage sheds are to the right and North signal box is in the far distance.

A little earlier than that and taking advantage of a quieter track is Roger Kershaw (**photo 6**). A regular at this event and always an early starter, he looks very relaxed on his N.S.W. 27 Class and usual long goods train proceeding through the yards. In the background are some of the

tents of the campers.

Meanwhile, adjacent to the yards, Barry Potter passes on the main with his goods train and N.S.W. 59 Class (**photo 7**) looking just a little superior in front of the camera! Members of his home club at Orange (west of Sydney) have nicknamed this engine *The Princess* as it is not allowed to get dirty, run in the rain or go out unchaperoned!

SATURDAY again dawned overcast but fine after overnight rain. After a hearty cooked breakfast your 'intrepid reporter' went hunting for 'game' to photograph. First

stop was the steaming bay. It was becoming crowded (**photo 8**) with David Humphry's delightful G.W.R. 1400 Class in the foreground ready for 'the off' (David likes to be *incognito* but he is in **photo 9**!). Craig Parkinson's N.S.W. 32 Class (**photo 9**) waits patiently for its driver whilst Ray Lee's lovely unpainted N.S.W. 32 Class (**photo 10** - courtesy Arthur Hurst) is on display.

Out on the track Craig Hill on his N.S.W. 30 Class (**photo 11**) enters the yards seeking refuge to go and have some soup. Wandering further I was in time to catch Greg Bird on

his N.S.W. 30 Class (**photo 12**) and highly detailed goods (the cattle trucks do have scale sheep and cattle in them) passing by and, soon after, followed by Arthur Hurst on his 4-6-2 with a rake of beautifully finished goods rolling stock (**photo 13**).

I was having a chat to Arthur, congratulating him on the lovely even beat his engine had. He informed me it was not his engine but belonged to his club, the Sydney Live Steam Locomotive Society, and was eighty years old! It was built in 1937 with a steel boiler, which was replaced by a

copper one in the 1990's. It was bequeathed to the club on the passing of the owner Mr. Neil Campbell around 2006, along with the rolling stock, and has served the club faithfully over many years. Arthur took on some refurbishment work some years ago and looks after it.

SUNDAY is always a little less busy as some visitors leave the previous afternoon and evening. For a change the day dawned with a bright blue sky as the forecast predicted. On the strength of the forecast your reporter and travelling companion Marin Rowe (with 3807 and 3808) arrived for our planned early start and found others had the same idea! We raised steam and did a few laps before indulging in a late cooked breakfast. Crikey - life can be tough at times!

After 'brekky' some more running before putting on my reporter's hat again and checking on what others were doing.

Three visitors from Queensland had come a long way to join in the fun but then so had many of us Victorians! They ran triple headed all weekend with their Queensland Railways locomotives and **photo 14** shows them leaving the yard via the access road. Phil Hadley is leading on his C17, Cliff Turner on his BB18½ is in the middle and Kevin Cooper on his BB18½ is trailing. Despite some visitors having left the yards were still busy, as **photo 15** shows, with Barry Olney's N.S.W 3807 and short goods in the foreground, Martin Rowe's 3808 behind, then the top of Roger Kershaw's 27 and goods train. Behind that again a couple of diesels (which were radio controlled and with very realistic sounds) and numerous rolling stock.

MONDAY was again fine with a blue sky but it was packing up time for many of us. However, a few were having a last quick fling, not the least of whom was Les Bird having relieved his brother Greg on his 30 class and goods. Les is seen in a refuge preparing for a final couple of laps before

packing up (**photo 16**) with two trains passing one another on the mains. Jim Auld (**photo 17**) on his Q.R. PB15, heads past the yard signal to drop his train and then to the steaming bay.

Another fantastic weekend has come to an end, apart from farewells.

I was advised that, this year, 85 locomotives were in attendance as against last year's almost staggering figure of 120! But they did beat last year's people in attendance figure of 600 with a whopping 750! These statistics will give you some idea of the popularity of this event 'down under'.

The only personal blight for me over this wonderful weekend was that I did not win



Craig Hill heading off to sample some of the 93 varieties of soup.

a prize in the raffle - and with about twenty plus prizes to be won! I'll have to think about not going next year. I've thought about it - yes, I will!

To conclude if you are ever in Aussie try and work in a visit

to I.L.S. for this event - you will not be disappointed.

As the immortal L.B.S.C. used to say, 'huff sed! Happy steaming all.

ME



A nicely made scale goods train complete with scale livestock.



Another nicely made goods train driven by Arthur Hurst.



A triple header - all the way from Queensland.



There was plenty of activity in the yard.



Les Bird weighs up the conflicting benefits of more soup or another run around the track.



After a long day, Jim Auld heads off to the steaming bay.

Technologie sans Frontières

PART8

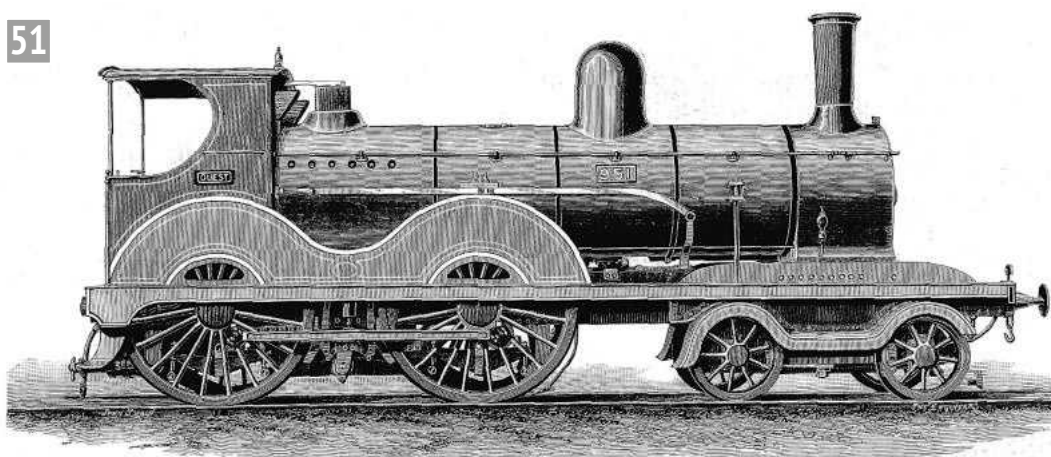
Dr. Ron Fitzgerald looks at English and French locomotive design in the second half of the nineteenth century.

Continued from p.591
M.E. 4571, 13 October 2017

'All steam locomotives in France are scheduled to be withdrawn by 1971. Thus will end the story of the finest locomotive work the world has ever seen; a story of highly efficient but often highly complicated machines, worked by the best trained and most competent locomotive men there have ever been.

A lot of superlatives perhaps but nobody who has studied steam locomotive work in many countries will deny their truth.' Dr. P. Ransome-Wallis.

51



Ouest no. 951. Source: *The Engineer*, October 11th, 1889, p. 396.

Clerault and the Ouest's Anglophile phase

One of the strengths of French locomotive technology was the absence of insularity amongst the main railway companies. Not only did they borrow freely from each other but they remained receptive to the ideas of the private locomotive builders and to wider international influences. This characteristic has already been evident in the events that led up to 701 leaving the Mulhouse works and just as the Nord had sustained contacts with the Great Northern Railway in England, so the Ouest was to draw upon British practice from the mid eighteen-eighties. The Ouest's English

connection has already been referred to in the Webb compound, Ouest 501. In 1888 a pair of 4-4-0 locomotives appeared from the company's Batignolles workshops that were effectively a French translation of Samuel Johnson's four-coupled, inside cylindered, bogie, express locomotives (ref 1).

Johnson's design had its origins in a pair of locomotives designed in 1873, during his time with the Great Eastern Railway. They introduced the Adams style of bogie 4-4-0 into English standard gauge express locomotive practice. By the time the Great Eastern locomotives entered service, Johnson had moved to the

Midland where the format was refined into the graceful Midland Railway 4-4-0s, the first 22 of which were built in 1876. A further 65 machines emerged from Derby throughout the eighteen-eighties.

Clerault, the engineer of the Ouest, had been appointed in 1885. The Ouest's passenger locomotive stock up to that point had been predominantly 2-4-0s with inside cylinders and outside valve gear. The design went back to 1857 (ref 2) and whilst it had served the Ouest well, by the standards of the last decades of the century it was under-powered. Clerault evidently found Johnson's work sufficiently appealing to make it a major

influence on the first express locomotives that he designed to replace the traditional Ouest traction mainstay (**photo 51**). His Ouest numbers 951 and 952 of 1888 brought France into the bogie locomotive era but their technological significance was considerably wider and the debt to the Midland Railway was more subtle.

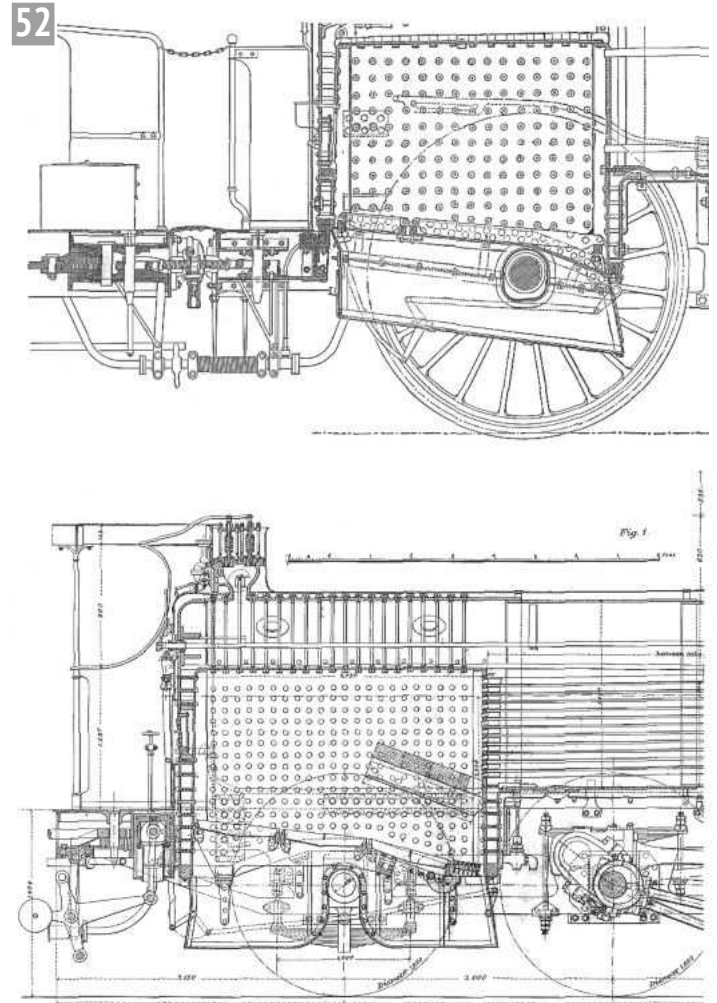
Under Matthew Kirtley, Johnson's predecessor on the Midland, Charles Markham (**ref 3**) had developed the first simple and effective means of burning coal in a locomotive firebox where previously coke had been the universal fuel. Markham's use of the brick arch extended the flame path within the firebox promoting more complete combustion in the area where the heat transfer process was most effective. The provision of a deflector plate above the firehole directed the air entering the firebox into the combustion zone and the blast pipe was modified to give more appropriate draughting.

Coal burning had two major consequences for the design of the firebox. A longer firebox was needed to ensure an adequate gas combustion path and the grate needed a steeper slope compared to the often level or near-level coke grate that had hitherto prevailed. In four coupled locomotives these requirements had implications for the vexed question of coupling rods. Retaining the traditional Crampton rear axle location, under the footplate and behind the backhead, risked elongating the coupling rods beyond the accepted wisdom. To avoid this situation the less than satisfactory arrangement of enclosing the rear axle within the ashpan, under the grate bars was frequently resorted to (**photo 52**). This left the axle prone to heating, the air flow to the grate was interfered with and the ashpan capacity was reduced.

The coupling rod problem was ultimately solved by

the substitution of steel for wrought iron in coupling and connecting rods. Up until the eighteen-fifties it was not practical to make steel in other than small quantities as the traditional process used single, small capacity crucibles. Krupp in the Rhine valley pioneered production of crucible steel on a large scale, organising production to coordinate the melting of multiple crucibles which were cast into a single ingot. This could then be rolled or processed into finished products. Tyres were the first locomotive components to be successfully made of cast crucible steel and this was Krupp's primary market. Vickers in Sheffield and Kitson's Monkbridge Ironworks in Leeds adopted Krupp's techniques and after 1860 the crucible steel locomotive tyre rapidly replaced the older wrought iron tyre. Krupp steel was tried for axles, connecting rods and motion parts in the early eighteen-sixties by Borsig and several British engineers but the high cost and quality control issues deterred potential users.

Homogenous bulk steel production came with the Bessemer process but by a quirk of fate Bessemer steels were acid steels, a type of steel that had high wear resistance, eminently suited to use in rails but less well adapted to meet bending stresses. Some attempts were made to use Bessemer steel for motion parts (**ref 4**) but the true steel age had to await a series of innovations in the eighteen-sixties and eighteen-seventies by Siemens and Thomas in England and Martin and the Terrenoire Steelworks in France. This Anglo-French effort eventually produced steel that was chemically basic and it was this 'mild steel' that combined cheapness with high strength, ductility and predictable quality. A bar of basic steel was 50% stronger than a comparable best Yorkshire iron bar but only 10% heavier

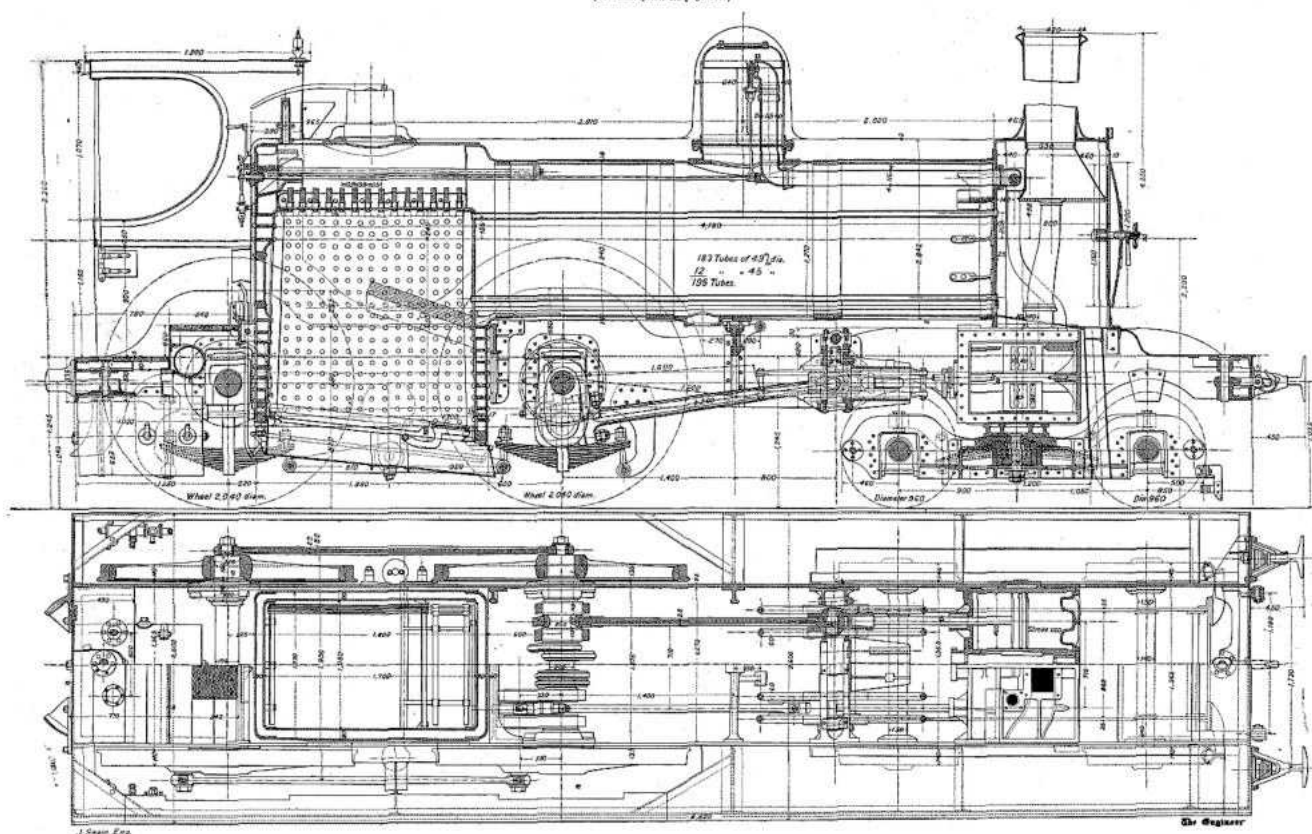


Two attempts to accommodate the trailing axle within the ash pan. Above, Ouest Railway 2-4-0 of 1878. Lower, Sauvage's 2-6-0, three cylinder compound for the Nord 1889.

for a unit equivalent (**ref 5**). Perhaps most importantly, the sinister flaws that plagued wrought iron were almost entirely absent in well-made steel.

Outside the L.N.W.R., steel coupling and connecting rods became common in the second half of the eighteen-seventies. The higher strength of steel permitted more widespread use of fluting which reduced the inertial mass of the rods and produced a better sectional modulus. Fluting was first used in Europe by Dr. Carl Linde, the head of design at Krauss in Munich. The firm showed a locomotive at the 1869 Paris Exposition with fluted steel rods. Thomas Worsdell, the first British exponent of the fluted rod, made use of them on his Great Eastern Railway 562 class in 1882 (**ref 6**).

Clerault's four-coupled bogie locomotives absorbed all of these technological developments (**photo 53**). The Batignolles drawing office adopted the lineaments of Johnson's 4-4-0 series of 1882-3, introducing into France Charles Markham's coal burning firebox. Clerault used inside cylinders of identical size to the Midland 4-4-0s, 18 x 26 inch, the valve chests being placed between the bores, driven by Gooch link motion. The same driving wheel diameter of 6 feet 8½ inches was used with coupling rods slightly longer at 8 feet 10¼ inches compared to Johnson's 8 feet 6 inches. The axles were placed in front of and behind the firebox. Johnson's rods lacked flutes although steel was probably used. The French locomotives had fluted rods that were almost certainly made of steel.



Quest 951. Source: The Engineer, October 4 1889, p. 286.

The front end of the Ouest locomotive's chassis was somewhat more attenuated than the Midland engine with a bogie centre pin located 11 feet 8 inches in advance of the leading coupled axle, 1 foot 8 inches more than the Johnson spacing. The bogie wheelbase was 4¾ inches longer compared to Johnson's 6 feet but the bogie wheels were smaller in diameter at 3 feet 1¾ inches against the Midland's 3 feet 6 inches (photo 54).

Quest 951 and 952 appear to have been the first locomotives in France to use a firebox with a brick arch (**ref 7**), the first to use fluted steel rods and the first to use the sliding pivot bogie. Without further research it pays to be cautious but they appear to represent a substantial advance in French locomotive building practice.

●To be continued.



Quest 4-4-0 no. 983. ser. 960-999. Source: Roelof Brettschneider collection.

REFERENCES

1. It is also worth noting that the London, Chatham and Dover Railway had recently introduced William Kirtley's M Class 4-4-0s (the first of which, the M Class was authorised in November 1876). These were very similar to the Johnson machines. William Kirtley was a nephew of Matthew Kirtley, Johnson's predecessor as head of locomotive affairs on the Midland. William had been appointed to the L.C. & D.R. in 1874 having previously served under his uncle and Johnson at Derby where he worked with Markham on the coal firing experiments. Clerault is likely to have been aware of these developments immediately across the Channel.
2. *Tales of the Old Owest: The 2-4-0 Family*. Andy Hart, Journal of the S.N.C.F. Society Number 143, September 2011, p. 23.
3. Markham had been manager of the Marquise Ironworks and Rolling Mills near Boulogne until 1848 when the political situation destroyed the enterprise. Marshall, *Biographical Dictionary* op. cit. p. 152.
4. Crewe with its own Bessemer plant had been the first to make Bessemer crank axles and it is likely that Ramsbottom introduced steel connecting rods. Ahrons op. cit. p. 165.
5. These figures are taken from 19th century sources but see particularly *The Works Manager's Handbook* Walter S. Hutton. Pub Crosby Lockwood and Sons 1895.
6. *The Development of British Locomotive Design*. E.L. Ahrons. Pub. Locomotive Publishing Co., Ltd., 1914. p. 67.
7. Notably, Emile With in his *Le Mechanicien de Chemins de Fer* published in 1885 (pub E. Bernard & Cie, Paris) makes no mention of brick arches in his discussion of coal burning and smoke control, p. 14. None of his firebox drawings show the brick arch.

Technical drawing of a frame assembly, showing top, underside, and cross-sectional views with dimensions and labels.

Top View: Shows the overall dimensions of the frame. The total width is $8\frac{5}{8}$. The total length is $2\frac{3}{4}$. The frame has a central section with a width of $1\frac{1}{2}$ and a depth of $2\frac{3}{4}$. The frame is labeled "FRAME".

Underside View: Shows the bottom of the frame. The total width is $8\frac{5}{8}$. The total length is $2\frac{3}{4}$. The frame has a central section with a width of $1\frac{1}{2}$ and a depth of $2\frac{3}{4}$. The frame is labeled "FRAME".

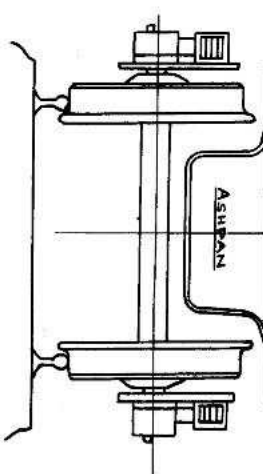
Cast Dummy Springs: Shows the top view of the cast dummy springs. The total width is $1\frac{1}{2}$. The total length is $2\frac{3}{4}$. The frame is labeled "FRAME".

Between Frames: Shows the cross-section of the frame. The total width is $8\frac{5}{8}$. The total length is $2\frac{3}{4}$. The frame has a central section with a width of $1\frac{1}{2}$ and a depth of $2\frac{3}{4}$. The frame is labeled "FRAME".

Labels and Dimensions:

- Top View:**
 - Overall width: $8\frac{5}{8}$
 - Overall length: $2\frac{3}{4}$
 - Central section width: $1\frac{1}{2}$
 - Central section depth: $2\frac{3}{4}$
 - Frame label: "FRAME"
- Underside View:**
 - Overall width: $8\frac{5}{8}$
 - Overall length: $2\frac{3}{4}$
 - Central section width: $1\frac{1}{2}$
 - Central section depth: $2\frac{3}{4}$
 - Frame label: "FRAME"
- Cast Dummy Springs:**
 - Overall width: $1\frac{1}{2}$
 - Overall length: $2\frac{3}{4}$
 - Frame label: "FRAME"
- Between Frames:**
 - Overall width: $8\frac{5}{8}$
 - Overall length: $2\frac{3}{4}$
 - Central section width: $1\frac{1}{2}$
 - Central section depth: $2\frac{3}{4}$
 - Frame label: "FRAME"

WHEELS & AXLES



PART CROSS SECTION

BOILER DETAILS.

DIANA

G.I. 4-6-2

By L.B.S.C

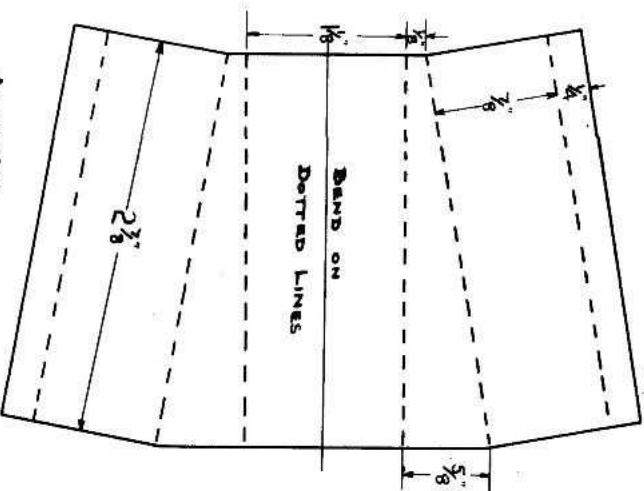
13-35 Bridge St.

Hemel Hempstead

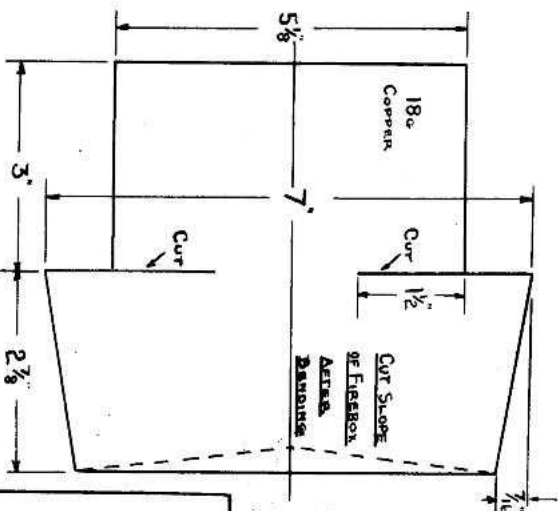
Hertfordshire

LO 56

sh 3



ASHPAN



Boiler "IN FLAT"

LO 56

5"

18g.

FUEL REGULATOR.

ONE 5/8 x 20g FUEL

5 3/4"

8 1/4"

2 1/4 DIA HERE

3"

1 1/2"

3/8"

1"

5 1/2"

3"

1 3/4"

3"

7/8" DIA. COPPER STRAPS.

NE 41 DRILL

TAP 9/32 x 40

3/8"

18g.

16 Gauge Union Bolt

1 1/2"

7/16"

3/8"

16 GAUGES

1 1/2"

Average 1 1/2"

16 Gauge Union Bolt

The diagram shows a cross-section of a shell with several internal features and dimensions:

- Top Section:** A semi-circular top with a radius dimensioned as $\frac{7}{8}$ RAD.
- Internal Features:** Five circular or oval shapes are arranged within the main body. One central feature is labeled $\frac{5}{8}$. Four surrounding features are labeled $\frac{1}{8}$, $\frac{1}{8}$, $\frac{1}{8}$, and $\frac{1}{8}$.
- Right Side:** A vertical dimension on the right side is labeled $1\frac{3}{8}$ DIA.
- Bottom Section:** The bottom part of the shell has a width dimensioned as $1\frac{1}{2}$ APERTURE.
- Left Side:** A vertical dimension on the left side is labeled $1\frac{3}{8}$ APERTURE.
- Text Labels:** "FIT TO CONTOUR" is written vertically along the left edge.

Technical drawing of a grate assembly, showing side and end views with dimensions and labels.

Side View Dimensions:

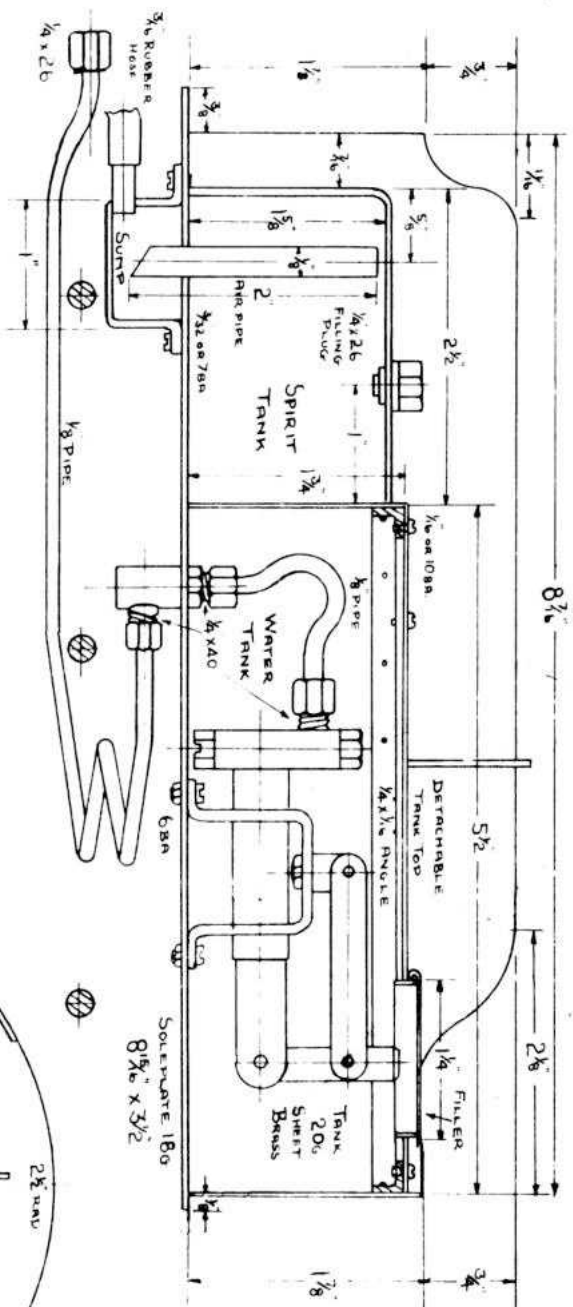
- Overall width: $2\frac{3}{8}$
- Bar thickness: $\frac{3}{8}$
- Bar spacing: $2\frac{3}{4}$
- Bar length: $3\frac{1}{2}$ in / 7 in

End View Dimensions:

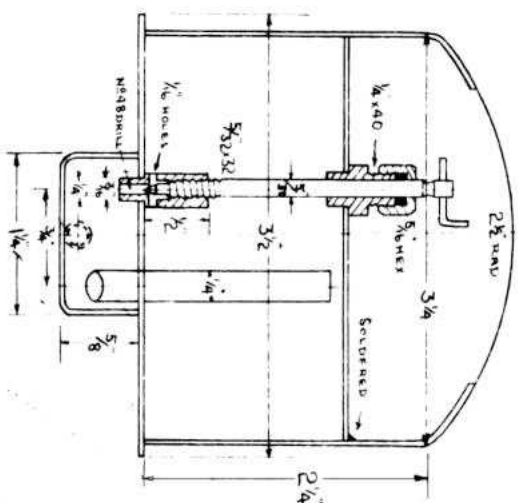
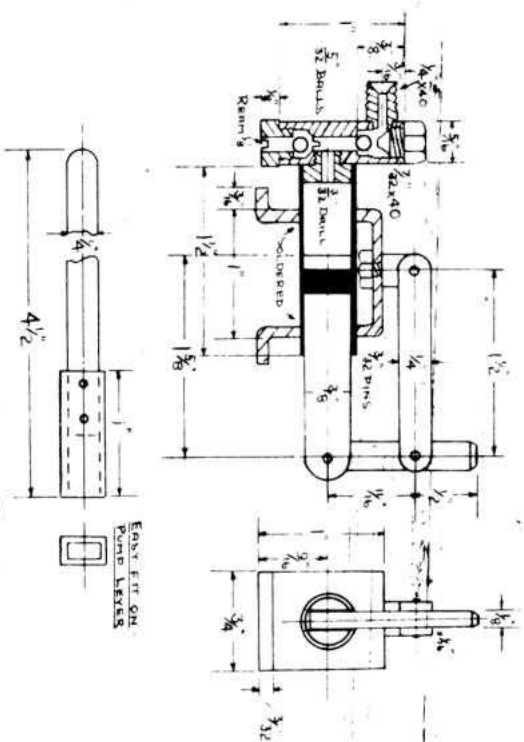
- Overall height: $2\frac{3}{8}$
- Bar thickness: $\frac{3}{8}$
- Bar spacing: $2\frac{3}{4}$
- Bar length: $3\frac{1}{2}$ in / 7 in

Labels:

- END VIEW
- PONY SPRING
- GRATE DETAILS
- SPACERS:-
- $\frac{1}{8}$ THICK
- EXCEPT WHERE
- GRATE NARROWS



LONGITUDINAL & CROSS SECTION OF TENDER:



DOT
L.M.S. CLASS 5 G/I
By L.B.S.C.

L.M.S. CLASS 5 G.I

By L.B.S.C.

C MODEL ENGINEER 1967

13-35 BRIDGE ST. HEMEL HEMPSTEAD HERTS

Pete Targett describes the Mk2 version of his DynoBox.



DynoBox PART 2

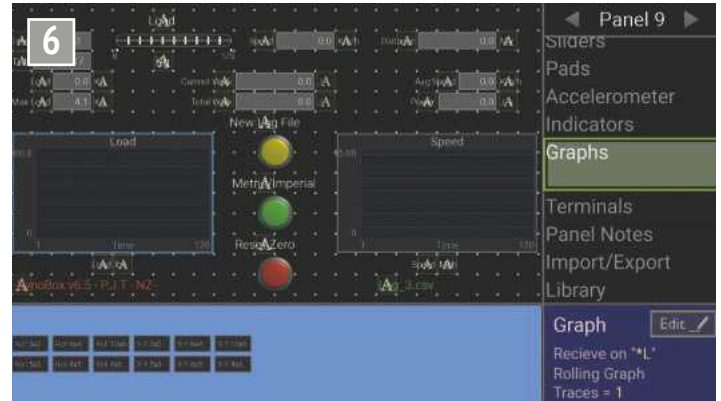
Continued from p.566
M.E. 4571, 13 October 2017

DynoBox Mk2

The Mk1 DynoBox was really a proof of concept working from the principles established by Duncan's article. As with anything we do there is always room for improvement and tweaks that can be made. The evolutionary process continued initially to try to create a better user interface on the mobile phone.

The terminal display was a bit basic - it was now 2016 not 1980! I started to look at writing my own phone app so the Android SDK was downloaded and attempts made to do some basic displays. I may have spent nearly 40 years in IT but I am in my 60's not 16 and it can be hard to grasp some of these new concepts without a lot of effort. However, the internet is there and somebody somewhere has invariably already done something pretty close to what you are looking for. I did not need to look far - the Android app store has an application 'Bluetooth Electronics' (ref 2) intended for Arduino and Raspberry Pi developers. It has an interface that is simple and has plenty of features that make it suitable for any development platform.

Bluetooth Electronics has a large selection of 'widget' controls available including buttons, switches,



Bluetooth electronics mobile app configuration screen.

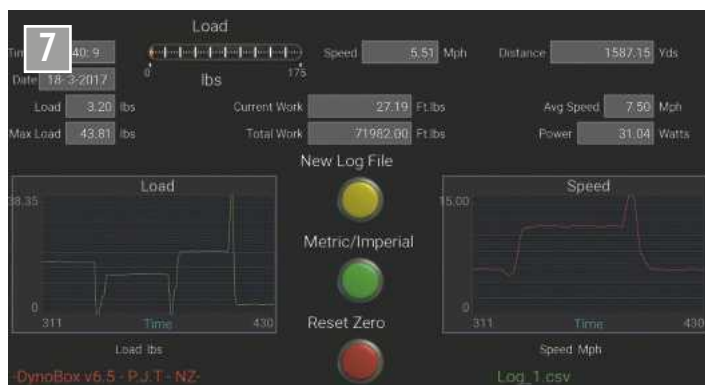
sliders, pads, lights, gauges, terminals, accelerometers and graphs (photo 6). These can be 'dragged and dropped' onto the panel grid. Then their properties are edited to receive data sent from your application by simply adding a '*' and a character to the beginning of the data element (see bottom right of photo 6) and terminating with another '*' (table 2). Likewise, buttons, switchers, sliders and controls can be configured to send control data back to your application. I am using buttons to change the units from imperial to metric and reset the drawbar load to zero. No programming on the phone is required at all and the screen can be laid out as you wish (photo 7).

As with anything, there is a limitation to Bluetooth Electronics - it cannot log data. I tried to get into contact with the developers to see if logging could be included. I did not receive a response so an alternative was required. Secure Digital (SD) cards prove to be pretty simple to wire into projects as they use the Serial Peripheral Interface (SPI) generally available on microcontrollers. Writing control software could be a nightmare but life is too short so Google came up with FATFS, a full library of routines

Table 2: Data string tags	
"*A"	Avg Speed
"*a"	Average Speed Units
"*D"	Total Distance
"*d"	Distance Units
"*G"	Current Work
"*L"	Load Total
"*l"	Load Units
"*M"	Max Load
"*P"	Current Power)
"*p"	Power Units
"*S"	Speed
"*s"	Speed Units
"*W"	Total Work
"*w"	Work Units

for microcontrollers interfaced to SD cards providing a file format compatible with most computers in general use (ref 3). As with the Bluetooth module an SD card module is available from eBay. It provides a holder for the card and a voltage regulator for the 3.3V required by the SD cards. Information on an initial implementation of FATFS is given in (ref 4). Logging was sorted.

In order to accommodate the interfaces and the software required to support these modules a bigger microcontroller was required so a PC18F26K80 was pressed ➤



Final display for Mk2.

into service. This is available in a 28pin PDIP pinout which is ideal for hobbyists.

The SD card worked fine but it soon became clear that some form of date and time reference would be required to be able to establish which log file related to which run. After all, a 1GB SD card would be capable of holding one year's worth of continuous data! There are two real time clock (RTC) modules that appear to be in common use, the DS1307 and DS3231. The DS1307 is cheaper but less accurate than the newer DS3231. I started with a DS1307 as one was readily available from my local electronics store. Eventually I obtained a DS3231 card from eBay and the DS1307 was dropped from the design. The RTC module has battery backup so once it is set up the date and time are retained for over 5 years with a time accuracy of about 1 minute/year (ref 5). As with anything in life it is not always simple. The interface to the RTC uses the Inter-Integrated Circuit (I²C) protocol and I'd used the pins on the microcontroller for the connection to the Bluetooth module. So back

to Google where I found that the PIC micro manufacturers, Microchip, had this sorted with the code modules for a 'bitbang' I²C interface. Rather than have dedicated hardware provide the functions 'bitbang' interfaces just use the standard hardware input/output lines and software to provide the logic and timing (ref 6). I now had Bluetooth on RS232 serial, disk on SPI and RTC on I²C (fig 3).

The new log file now contained more useful data, either in Imperial or metric units; if the units are changed during the run this is reflected in the log file. Each line contains all the data required to do the calculation of distance, speed, work and power etc. This means that snippets of the data can be used without any reference to other data in the file. If the units are changed mid-run that is reflected in the file as well.

Having a readily accessible storage media also allowed for the introduction of system configuration parameters such as wheel size, initial unit (imperial or metric) and calibration tables for the strain gauges (table 4).

Table 3: Sample log file data from MK2 DynoBox				
*V-DynoBox v6.5.5 - P.J.T - NZ-Start- 15/8/17 - 10:40:08				
Time	Wheel Dia (in/cm)	Wheel Revs	DBP	Units
.....				
10:41:18	11.23	436	25.03	Kg
10:41:19	11.23	446	34.39	Kg
10:41:20	11.23	457	42.79	Kg
10:41:21	11.23	467	45.67	Kg
10:41:22	11.23	478	46.66	Kg
10:41:23	11.23	489	41.95	Kg
10:41:24	11.23	499	33.10	Kg
10:41:25	11.23	510	24.09	Kg
10:41:26	11.23	520	15.01	Kg
10:41:27	4.42	531	23.42	Lbs
10:41:28	4.42	541	21.20	Lbs
10:41:29	4.42	552	21.08	Lbs
10:41:30	4.42	563	21.48	Lbs
10:41:31	4.42	573	21.89	Lbs
10:41:32	4.42	584	22.78	Lbs
10:41:33	4.42	595	23.59	Lbs
10:41:34	4.42	605	24.07	Lbs

All these modules (Bluetooth, SD card reader and the RTC) are available on a carrier designed for use with the Arduino but they can also be used for other projects. They make life a lot simpler than having to design

a circuit with the basic chips. They are all cheap and available from the usual internet suppliers (through eBay etc.). As they have all been designed for the Arduino they each have a common pinout regardless of who supplies them.

With the addition of the SD card and RTC more data tags were added to be able to present the data on the Android screen (table 5). The codes for the control buttons are also given in table 6.

The evolutionary process continued and I now had a fully functional version running but it was still on stripboard and if I was going to write it up for ME the story had to come to a more satisfactorily engineered conclusion. The time came to update the circuit diagrams and board layouts, get out the UV lightbox and double-sided photo sensitive circuit board and produce a more permanent solution. Although I am capable of doing my own PCB's I have never been that happy with the results. I now had an updated board layout and the Eagle design software could produce the files required for professional board

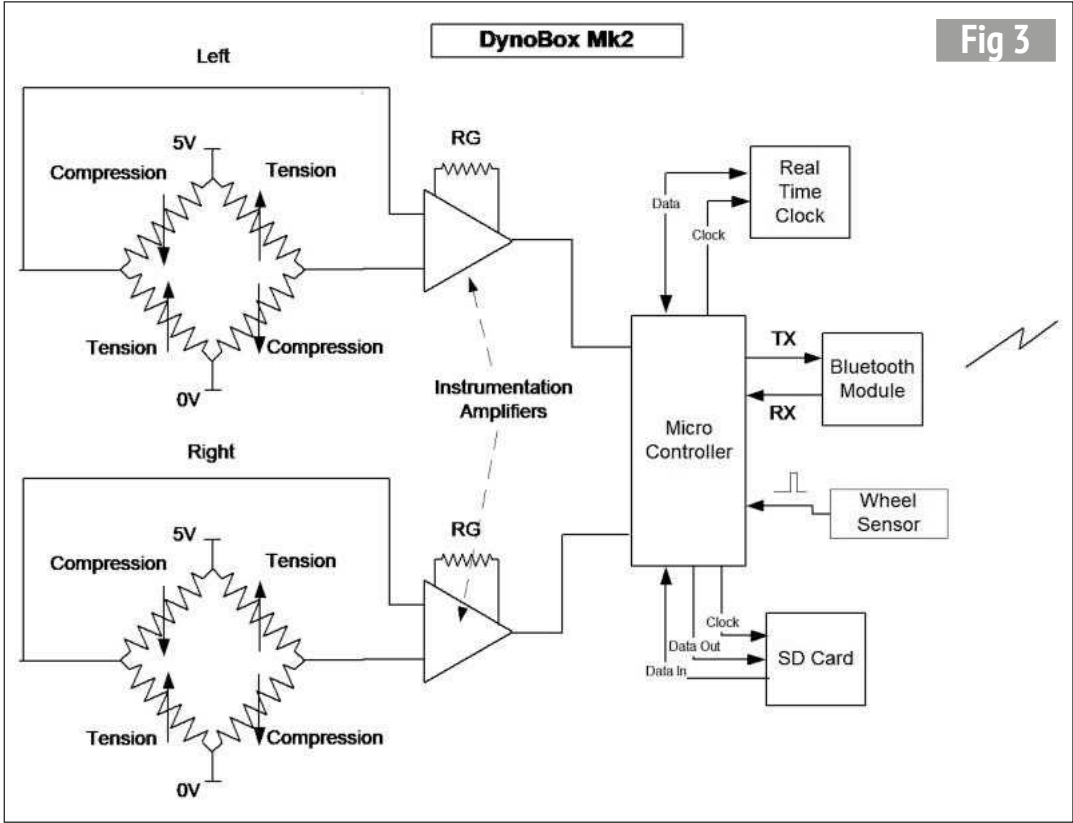


Fig 3

Table 4: Configuration file

```
// *****
// * Configuration file for Dynobox
// * Order and number of parameters has to be maintained *
// * Commented lines such as this can be added
// * null lines are also acceptable
// *****

// Starting Units (these can be changed while running using
mobile control)

// Imperial = 1, Metric = 2

2

// *****
// Wheel Diameter ins or mm, defined by units (4.625")

112.3

// *****
// Load Calibration Table, 10 items long

0.01835
0.01835
0.01835
0.01835
0.01835
0.01835
0.01835
0.01835
0.01835
0.01835

// End of file
// *****
```

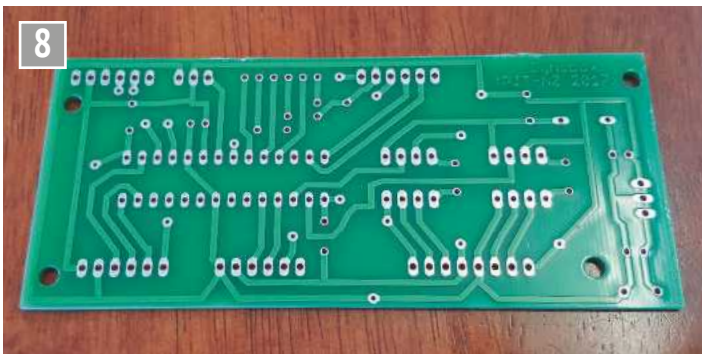
production. Google came up with some suppliers and I was pleasantly surprised at the prices and turnaround times so thought I would give them a go (**photo 8**).

Using the Arduino modules hasn't resulted in the single board, single box solution I had originally intended but the electronics is in a box 125mm x 75mm x 50mm and the

drawbar in a similar sized box. Getting it all in one box would require all the components mounted on a single PCB; not impossible but not really necessary at this time.

Building it

For those contemplating a similar project, there are some points to consider that may be of use to you.



PCB from supplier.

Table 5: Extended data tags

"*F"	FileName
"*T"	Time
"*Y"	Year
"*V"	Software version

The overall success is primarily dependent upon the combination of the strain gauges used and the gain setting of the instrumentation amplifiers (via resistor RG). My experience was similar to that of WDMES which was not surprising as we were using similar devices. I found that an RG of 180ohm was best. I had a range of the standard values available from 150ohm to 270ohm and empirical testing determined the best value for my system. I had considered a trim-pot potentiometer but was concerned about the long-term stability of the setting of the value so I did not try it (**ref 6**).

Duncan reported an apparent negative transition of the output of the strain gauges from the zero point. I had some discussion with others whether a Dynamometer should record 'push' or negative values of load. The decision was it should not so if the train is pushing you downhill the drawbar load will be shown/recorded as zero. My circuit has a diode/resistance combination setting the bias level on the instrumentation amplifiers which resolves the problem experienced by WDMES with negative values at zero load and the software filters any negative load values.

Connecting the strain gauges the wrong way will

Table 6: Input control codes

L	New Log File
R	Reset Zero
F	Close File
U	Units Selection

result in negative voltage output with an increase in load. My gauges had four leads: red, black, green and white. With red and black going to the positive and negative supply respectively, the other two leads need to be tested for correct orientation. You cannot really do this with a meter so they have to be tested in circuit using the instrumentation amplifiers. The orientation of the strain gauges as they are installed in the draw-bar also affects this as the direction in which they are stretched defines the direction of the voltage shift. Basically, if you are not getting a reading in the software then try the strain gauge installed the other way around or switch the leads. As the results are summed one strain gauge going positive can be countered by the other going negative. This caused me some pain until I realised what was happening.

The calibration tables can help with getting a better set of results over the range. I made a simple test rig with a weighing scale in series with the drawbar and a bottle screw to apply load. This allowed me to test the full range of values (**photo 9**).

The design includes three LED's so you can see that things are working while you are driving without having to refer to your phone. One is



Calibration test rig.



Setting the real time clock.

the clock tick which flashes on/off each second which indicates that your system is running. Another is the wheel sensor pulse, which indicates the wheel revolutions are being detected and the third shows that data are being written to the SD card. If it is off then there is a problem – perhaps the disk is missing or the configuration file has not been found.

There are five connectors on the circuit board: one for the drawbar, one for the wheel sensor and three for the modules. Additionally, there is a connector for in-circuit serial programming (ICSP). This pinout is compatible with the Microchip PICKit 3 In-Circuit Debugger which enables the software to be updated. The connections for the LED's could allow the LED's to be located remotely, say on the driving trolley.

Table 7: Real time clock setup codes	
'0'	Reset secs to 00
'1'	Decrement mins
'2'	Increment mins
'3'	Decrement hrs
'4'	Increment hrs
'5'	Decrement date
'6'	Increment date
'7'	Decrement Month
'8'	Increment Month
'-'	Decrement Year
'+'	Increment Year

To enable the real time clock (RTC) module time to be set initially an extension to the software was required. This is controlled by a separate Bluetooth Electronics module (photo 10). This controls the application which in turn sets up the RTC. Once set the RTC



MK2 completed and in the original Mk1 box for testing.

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3. FATFS - http://elm-chan.org/fsw/ff/00index_e.html
4. How to use SD Card Interface - http://elm-chan.org/docs/mmc/mmc_e.html
5. DS3231 Real Time Clock Module - <https://datasheets.maximintegrated.com/en/ds/DS3231.pdf>
6. I2C Bitbang - <http://www.microchip.com/wwwAppNotes/AppNotes.aspx?appnote=en560799>
7. PIC 16F1827 - <http://ww1.microchip.com/downloads/en/DeviceDoc/41391D.pdf>
8. PIC 18F26K80 - <http://ww1.microchip.com/downloads/en/DeviceDoc/39977c.pdf>

should run for years. The control codes are given in table 7.

As I said I did not meet my original objective of getting it all in one box on the drawbar (photo 11). Using surface mount devices and moving the real-time clock and SD

card holder onto the main circuit board would reduce the size considerably. I am in the process of drawing up the circuits for MK3 but moving to surface mount devices does move into a new area for me in hobby electronics.

ME

No.261

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■ LBSC 3.5" gauge 0-6-0 Molly, close to prototype version of the LMS Jinty. Running bottom half. Copper boiler with paperwork, drawing. £875.
T. 0116 278 3549. Leicester.

■ Bentley 9-cylinder rotary engine, 1/4v scale with plans and book, 90% complete. Offers invited. Vertex rotary table, new, still in box, £70. Warco bench drill, 5 speed, 2MT quill, 5/8" chuck with vice, never used. £80.
T. 01425 616636. New Milton, Hants.

■ 7 1/2" gauge electric engine, working needs work! Two 25 amp 12 volt motors plus two bogie passenger truck with electrical brake. Can be tested on site at Salcombe. £300, ONO. 7 1/2" gauge Scaleaway point signal 14 inches high with 12 volt lamp bulb. Virtually unused, £170 ONO.
T. 01548 844 186. Salcombe.

■ Minnie traction engine, part finished, £50. Arc welding and brazing equipment, £40 – offers. Odd loco parts.
T. 01952 242867. Wellington.

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■ Stuart Turner 'Sirius' unmachined full set of castings, £200 + P&P.

T. 0161 320 7754. Stockport.

■ Profiled steel rail, 2lbs per yard. 120 feet unused with fish plates and special bolts. Comes with steel tube for sleepers and old arc welder, £140.

T. 01548 844 186. Salcombe

Magazines, Books and Plans

■ MEW 219 (Sept 14) - 257 (Aug 17), Model Engineer 4448 (7 Feb 13) - 4505 (16 April 16). Free to collect or carriage (est. £14) each.

T. 01757 702 437. Selby, N. Yorks.

■ Model Engineer magazines from late 190s to present day, many in binders. Nine volumes Engineering in Miniature, 2002/2010. Many loose issues. World of Model Engineering by Stan Bray, 7 issues. Offers.

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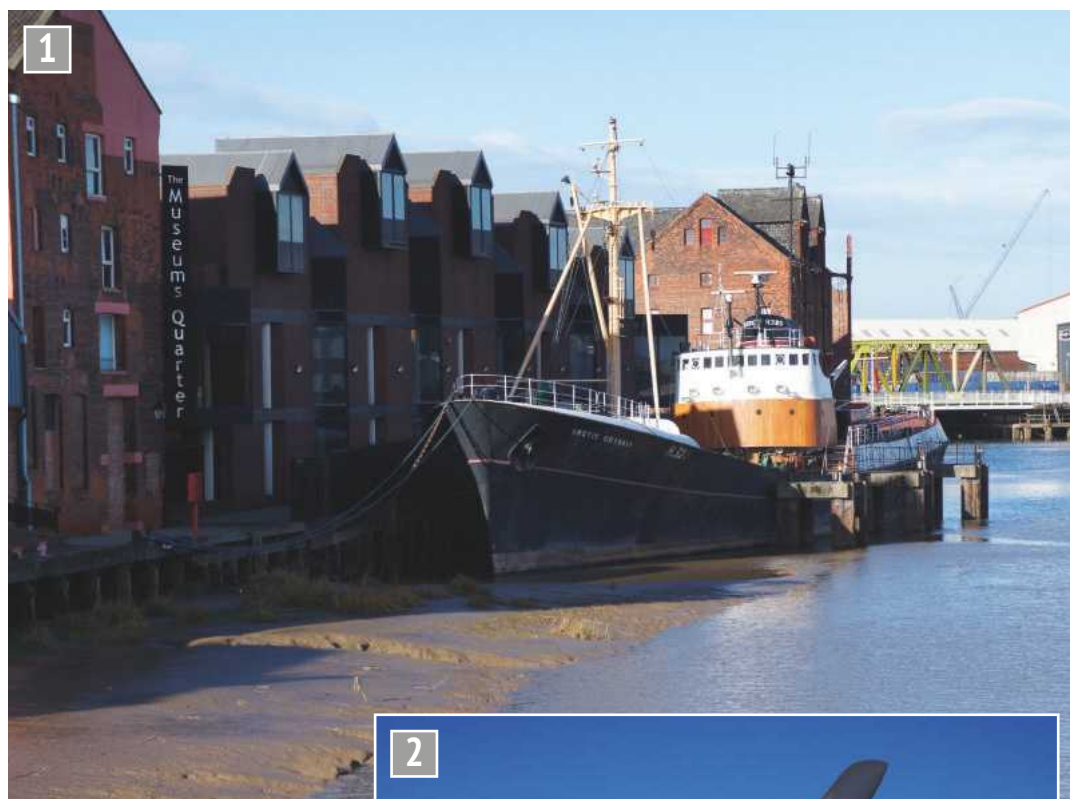
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An Engineer's Day Out

Roger Backhouse pays a visit to Hull's **Streetlife** Museum of Transport (photo 1).



Hull's Streetlife Transport Museum is fittingly on the River Hull banks. The Arctic Corsair, the last Hull sidewinder trawler, is moored outside. A former flour mill towers behind.



Stop sniggering at the back. Kingston upon Hull really is the 2017 UK City of Culture with a busy programme mixing fine art, idiosyncrasy and the inevitable pretence. Away from many cultural attractions Hull has engineering interest and some excellent museums - well worth a visit.

At the time of writing Queen Victoria Square's centrepiece is an elegant 250 foot (75m) long wind turbine blade made at the nearby Siemens factory, showing that engineering is often great art. This was to be removed in March 2017 (photo 2).

Despite wartime destruction Hull has a historic Old Town and fine Victorian and Edwardian buildings. Hull Transport Museum opened in 1925, one of Europe's earliest and a fine example of municipal enterprise. Renamed *Streetlife* it reopened in expensively refurbished premises in 1989.



Blade, a sculpture by Nayan Kularni was in Queen's Square until March 2017 but engineers who designed the elegant wind turbine blade made at the nearby Siemens factory deserve credit. At 75m long this is claimed as the world's largest handmade fibreglass component cast as a single element. Hull's domed Maritime Museum, formerly Dock Offices, stands behind.

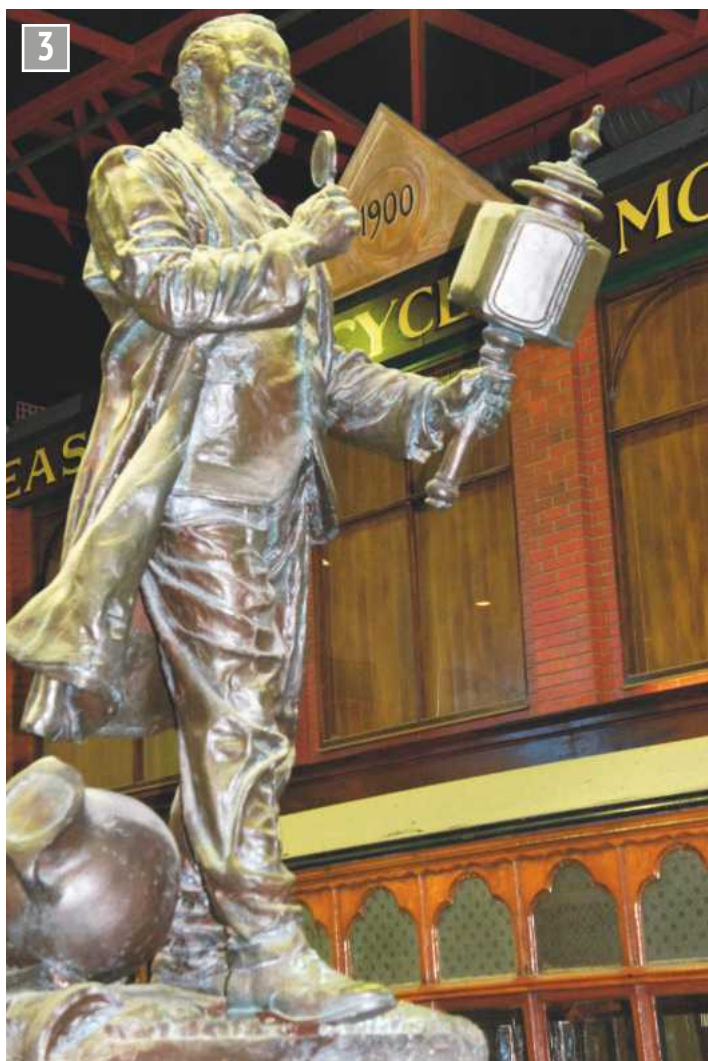
The collection was started by Thomas Sheppard, Hull's Director of Museums, from 1900 to 1941. He's honoured by a statue in the museum (photo 3). Though collecting objects irrelevant to Hull, he saved unique items when they were unfashionable. Others have since added much material.

The museum generally displays objects in recreated settings with sounds and figures but they are often tricky to photograph. Fortunately, Hull's curators ensured mostly correct captions - something that eludes even prestigious national collections.

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Streetlife – Hull Transport Museum

Open free of charge Monday to Saturday 10-5 and Sunday 11-4.30. Last admission 30 minutes before closing. Website www.hullcc.gov.uk Tel 01482 300300



Thomas Sheppard was curator and then Director of Hull's Museums from 1901 to 1941. Something of a magpie, he accumulated items of no relevance to Hull but built remarkable collections.

Tramways and Buses

Hull's electric tramways began in 1899 with four-wheel Milnes open top cars (photo 4). The museum has a classic four-wheel Hull electric car, used until 1945, when many were sold to Leeds on closure (photos 5, 6 and 7). Hull's tramway engineers designed an experimental car and built

a model, which was displayed at the British Empire Exhibition in 1924 but was never built full-size.

Thomas Sheppard acquired an 1867 Ryde Pier tramcar from the Isle of Wight. It is the oldest surviving British tramcar, first bought by a Romford man who offered it to museums. Thankfully Hull



Model of an 1899 open top Milnes tramcar.



Later four-wheel tramcar of a type made in 1910 that operated until system closure in 1945. Some were then sold to Leeds.



Hull coat of arms on tramcar side. Municipal enterprise and city pride.



Tramcar interior.



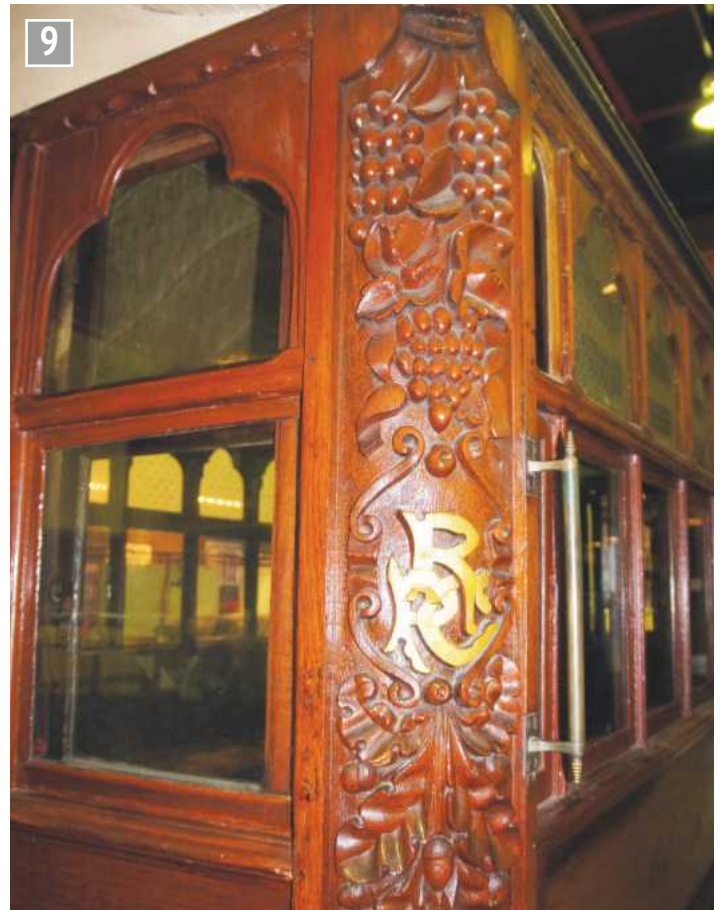
Ryde Pier horse drawn tramcar. Believed to be the oldest surviving tramcar.

saved this horse drawn car for posterity (photos 8 and 9).

At least the Kitson steam tram built in Leeds had a Yorkshire connection. It saw service on the 3 foot gauge Portstewart Tramway in Northern Ireland from 1882 to 1926, when the line closed. A governor restricted speed to 10mph and a rooftop

condenser helped avoid steam emissions (photos 10 and 11).

Hull's trams were replaced by trolley busses (though none survive here) and diesel busses. One of these was an AEC Regal Mark III single decker introduced in 1949 and converted to one-man operation in 1954 (photo 12).



Detail of Ryde Pier tramcar, designed and built for the 'carriage trade'.



Kitson steam tram, Leeds, built in 1882 for the 3 foot gauge Portstewart Tramway in Northern Ireland. Later controlled by the Northern Counties Committee of the Midland Railway.



Firebox and backhead of Kitson steam tram.

Railways

In Hull the established North Eastern Railway was opposed by the upstart Hull and Barnsley Railway, built in the late 19th century to bring South Yorkshire coal for export. Construction costs overran, the NER replied with a rates war and the Hull and Barnsley went into receivership. It never prospered and was almost all closed in the 1950's.

The museum has Cottingham Signal Box with films of steam age signal working (**photos 13 and 14**). A 1957 Sentinel steam shunter built in 1957 worked at a Teesside steel works. There's a recreated goods yard and an NER guards van (**photo 15**).

Several good models include a fine 3½ inch gauge model of an NER Atlantic made by H. Clarkson of York (**photo 16**).

●To be continued.



AEC Regal Mark III bus introduced in Hull 1949, converted to one-man operation in 1954.



Cottingham Signal box overlooks a Sentinel steam locomotive built in 1957, shortly before the Shrewsbury works switched to diesel production. It was quick to steam and could be operated by one man.



Cottingham signal box interior.



North Eastern Railway guards van.



Fine 3½ inch gauge model of a Great Northern Atlantic made by H. Clarkson of York in 1981.

The 40th Anniversary Midlands Model Engineering Exhibition

Robert Vine enjoys a day out at The Fosse, near Leamington Spa.



This is Challenger, the Bassett-Lowke spirit-fired locomotive that lost the 'Battle of the Boilers' to LBSC's Ayesha in 1924.

The Midlands Model Engineering exhibition at The Fosse is one of a few that I make sure I never miss. You shouldn't miss it either but, in case you did, here are a few notes on what I found there. My own interest is in locomotives, specifically 5 inch gauge, but I found plenty to

interest me outside that rather limited range of interests and, in this brief report, I'll highlight some of these.

One of the first things you see when you enter the hall is a stand celebrating famous model makers Bassett-Lowke. The centre piece of the stand (**photo 1**) is the spirit-fired, water tube boilered, Greenly designed locomotive *Challenger*, would-be nemesis of LBSC's coal-fired, fire tube boilered *Ayesha*. LBSC's locomotive, of course, won convincingly and established usual model engineering practice from then onwards.

Moving on to the Oxford SME stand the first thing that drew my eye was a Southern Railway Q1 class (**photo 2**). I understand that these locomotives were quite successful and many people like them but I have to say that I think they are a bit of an acquired taste! They are certainly an interesting

'chapter' in the development of the steam locomotive. Sitting behind the Q1 was *Russell*, a locomotive from the West Highland Railway (formerly the North Wales Narrow Gauge Railway). 'Ah! More my thing' I thought (**photo 3**). This model, in 3½ inch gauge, was originally built in 1961 by Ross Harrison and has recently been totally rebuilt by Simon Mulford with only the paintwork left to complete. It was one of quite a few fairly ancient locomotives in the show.

Anyway, that's enough locomotives for the time being.

Moving on to the Melton Mowbray stand I had another chance to admire Norman Smedley's very nice cab for a 3 inch Foden *Speed Six* Steam Wagon (**photo 4**). It has a traditionally constructed Ash framework with fully working doors and windows. The next step is to clad it in Aluminium sheet, with water-proofed



A Southern Railway Q1 class locomotive on the Oxford SME stand. I have to say I think these are a bit of an acquired taste!

calico for the roof. I shall look forward to seeing it again once that has been done.

In the *Olde Clock Shop*, John Mobbs was carefully oiling and reassembling a 1950's Smith's mantle clock (**photo 5**). Outside the Clock Shop on the competition table was a lovely looking scroll clock, which was a worthy first prize winner in competition class 9 (**photo 6**).

The Midlands Meccano Guild stand was my next port of call. This was rather different than in past years, in particular its new location in the main hall. One end of the stand was dedicated to a very large model of a Lancaster WWII bomber (**photo 7**), props spinning and ready for take-off, which had attracted a large crowd of admirers. The other end of the stand was taken up by a model of *Brooklands Garage* (**photo 8**), complete with old fashioned gasoline pumps and several very convincing looking motor cars. The interior of the garage was quite detailed and I even managed to spot a naughty girlie calendar on the wall. The length these Meccano guys will go to achieve authenticity is quite commendable!

Moving swiftly back to the competition table I found a couple of rather unusual models, both of mobile shepherd's huts. The first (**photo 9**) is of an American sheep herder's wagon by Brian Simpson which (unsurprisingly) looks like something out of *Wagon Train* (that takes me back...). Close examination of the interior confirmed my suspicion, first prompted by watching *Blazing Saddles*, that the trek to the Wild West was fuelled almost entirely by baked beans. This wagon won first prize in competition class 12. Next to it was a French shepherd's cabin by Brian Young which won second prize (**photo 10**). No doubt *le berger Français*, in contrast to his American colleague, was fuelled by *du vin, du pain, du Boursin* washed down, perhaps, by the odd bottle of *Beaujolais*. 'Unusual' didn't stop there as I found a couple of wind instruments, a



The Oxford SME stand was also home to this West Highland Railway locomotive, Russell, in 3 1/2 inch gauge.



John Mobbs, from the Olde Clock Shop, ponders the reassembly of a 1950's Smith's mantle clock.



This large Meccano model of a Lancaster bomber attracted quite a crowd of admirers.



This American sheep herder's wagon won first prize in competition class 12 for Brian Simpson.



Norman Smedley's very nicely made cab for a 3 inch Foden Speed Six Steam Wagon was to be found on the Melton Mowbray stand.



This scroll clock, by Kevin Woods, won first prize in the competition class 9.



At the other end of the Meccano stand was this representation of Brooklands Garage with some very convincing looking motor cars on show.



Here is another shepherd's cabin by Brian Young which won second prize in class 12.



A French horn, made from Beech and Lime, which can actually be played!



A rather pretty GWR 0-4-2 1400 class was to be found on the Northampton SME stand and, in front, a fairly early stage chassis for a Maid of Kent.



The Northampton stand was also graced by this rather handsome B1.



One of Giancarlo Mastrini's exquisite little locomotive models, which won first prize in competition class 1.

French horn (**photo 11**) and a trumpet, both made entirely of wood by wood turner George King. Even more surprising is the information that both are playable. *Sacré bleu!*

At this point I was suffering a mild locomotive deficiency so I headed over to the Northampton SME stand where I found plenty to see, including Howard Wakefield's GWR 1400 (**photo 12**), a *Maid of Kent* and very handsome

B1 (**photo 13**). The *Maid of Kent*, being built by David Calvert to the Smart design, will be a genuine compound locomotive. The cylinders are machined from a bar of cast iron and the wheel patterns were made by fellow NSME member Norman Johnston. On the way there I came across this superb model (**photo 14**), another first prize winner by Giancarlo Mastrini who, you may remember, won

both first and second prize at last year's Midlands show.

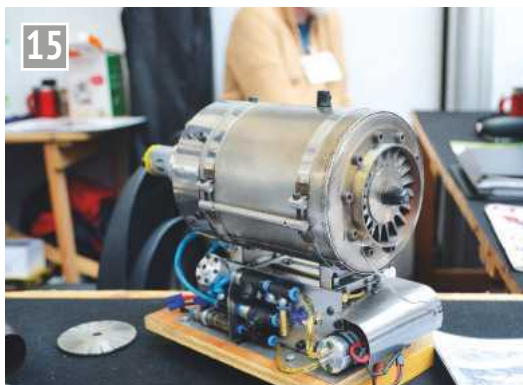
I couldn't resist a visit to the Gas Turbine Builders Association's stand where there was an array of gas turbines of various sizes on display. Jon Burrell showed me his prototype gas turbine (**photo 15**) and explained that the plan is to use it to propel a bicycle at high speed. Mrs Burrell has been designated chief test pilot. I asked him

why he didn't do that himself but he pointed out to me, quite reasonably, that it would be far too dangerous.

Finally, I ventured deep into the darkest corner of the hall and discovered the SMEE workshop where DAG Brown was busy sharpening drills on his Quorn tool and cutter grinder (**photo 16**).

Apart from the models and the club stands all the usual traders, of course, were there and I hope the show was as rewarding for them as it was for me. In particular, I was greatly impressed to see Andy Clarke in charge at Polly Model Engineering, determined not to let a minor inconvenience like losing a leg get in the way.

If you didn't get to the show this year, and even if you did, make sure it is inscribed in your diary for next year. I certainly have.



Jon Burrell's prototype gas turbine. I have seen it running. It's loud.



DAG Brown demonstrates precision drill sharpening on his Quorn tool grinder.



ABOVE LEFT: Tom Perkins presented this model of a four-stroke engine, winning second prize in competition class 8. ABOVE RIGHT: Ashley Stone's GWR 4-6-0 County of Devon.



The Birmingham SME presented this coffee table steam plant, built by Ashley Stone. It does virtually everything except toast crumpets.



Ralph Thompson presides over the SMEE Stationary Engine Group stand.



A cluster of five vertical boilers and steam engines built by Halliford School students Misha Edwards, Aiden Saunders, Seb Maud, James Woodgate and Cameron Collie, under the guidance of their teacher Phil Abbott, and all very highly commended.



The Hereford club presented a comprehensive stand with a very broad variety of models.

The Middleton Inverted Vee Engine

PART 2

Rodney Oldfield completes another small stationary steam engine by designer, Bob Middleton.



Once again, Bob Middleton has come up with a new concept for a small stationary engine and it has been my privilege to be one of the first to build this Inverted Vee Engine. This article describes its construction which, as with all Bob's engines, is invariably from stock size material.

Continued from p.560
M.E. 4571, 10 October 2017

Slide bars (fig 12)

Fortunately, I had some $\frac{3}{8}$ x $\frac{1}{2}$ inch material, so I machined some of this down to $\frac{1}{4}$ inch thick x $\frac{3}{8}$ x 2 inches long (8 off). After machining to size, clamp it into place, as shown

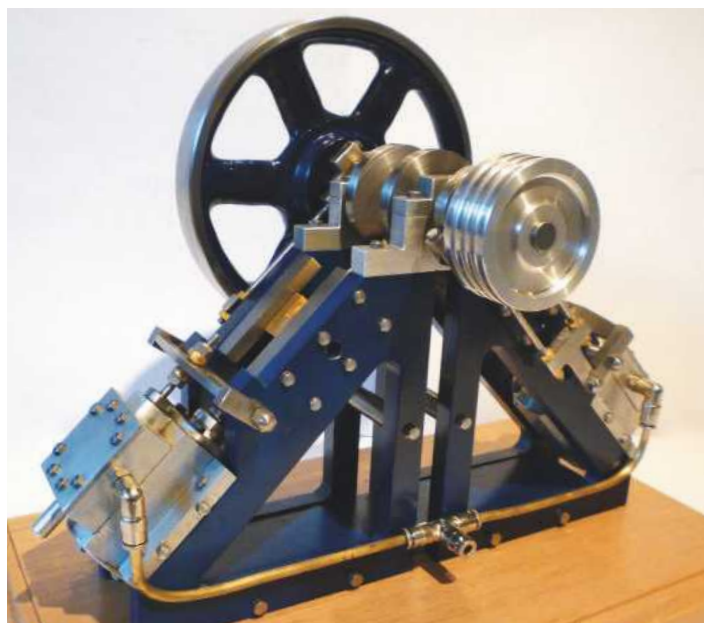
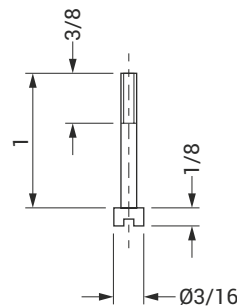
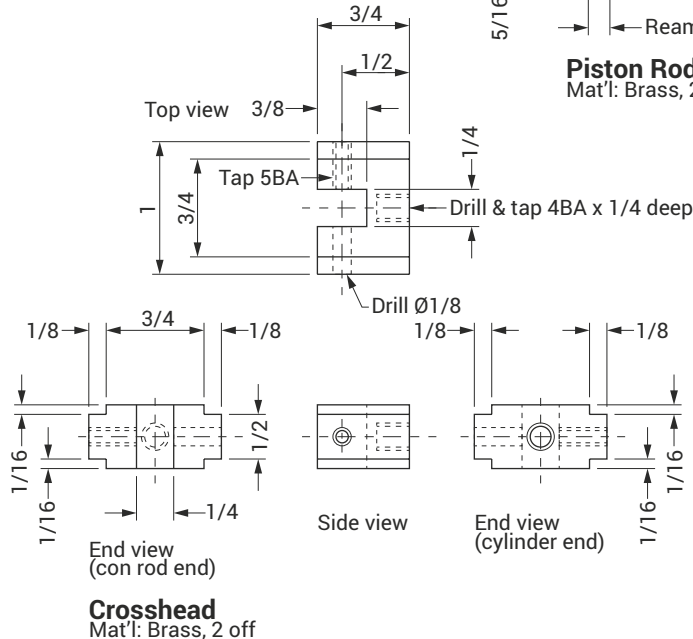
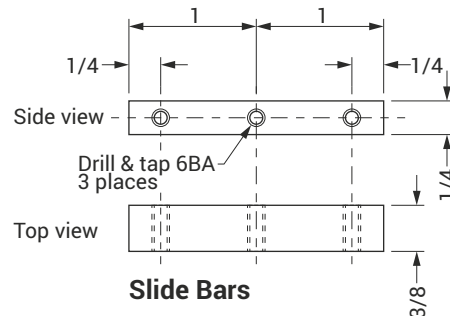
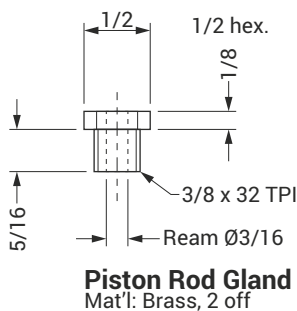
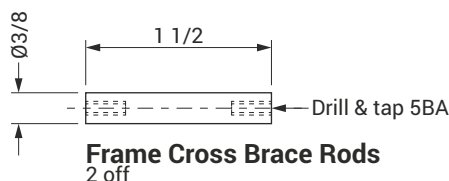


Fig 12





Clamping the upper slide bar into place for spotting through the holes.

in **photo 29**, making sure it is level with the top edge of the frame.

Back mark through the centre hole 6BA clearance, then drill and tap 6BA then bolt it together making sure everything is level, then repeat for the other two holes. Repeat this on all four frames. Next, take a $\frac{3}{8}$ inch thick parallel piece of material and clamp it between the top slide bar and the bottom slide bar. Spot through all holes, drill and tap 6BA.

At this point it is a good confidence booster to build all the frames up complete with cylinders to see the model emerging.

Crosshead

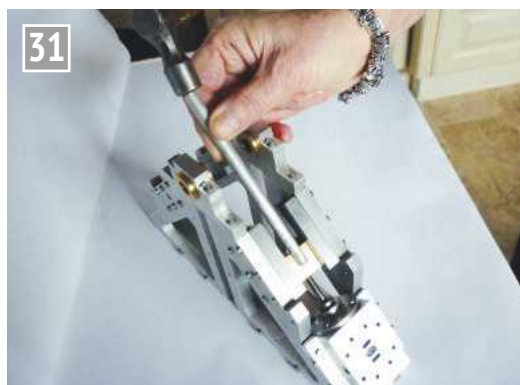
I was given a 6 foot length of $\frac{7}{8}$ inch A/F hexagon brass bar so I parted off a 1 inch piece and machined it down to drawing dimensions (**photo 30**). Do not drill the $\frac{3}{16}$ inch diameter hole through yet.

Make sure that you get a good sliding fit in the sliding bars (you will probably have to do quite a bit of filing here and there if you are anything like me). Once you have achieved this build it all up, with the cylinder and pistons fastened onto the frame, then lightly tap the crosshead with something soft as illustrated in **photo 31**. If there is a slight point on top of the piston shaft you then have a centre point exactly where you want it. If it is not in the centre of the crosshead, do not worry - mine was 45 thou out but it still works.

Take out the crosshead and centre pop the mark. To centre the work I mark a circle as big



Stages in forming the crosshead.



Transferring the centre of the piston rod to the crosshead.

as possible with dividers and lightly centre punch north, south, east and west round it. This makes it a lot easier to set up in the four-jaw chuck. Sometimes I take my small four-jaw chuck and clamp it into my three-jaw chuck as illustrated in **photo 32**.

Drill and tap 2BA for the piston rod. Finish off the

crosshead by milling out a $\frac{1}{4}$ inch slot $\frac{3}{8}$ inch deep.

Next, place the crosshead into the slide bars, screw the piston rod into the crosshead, and with your finger push the piston up from the bottom. To get it all to work smoothly I had to open my clearance holes out to $\frac{1}{8}$ inch - not my proudest moment.



Crosshead held in a 'piggyback' chuck.

Pulley (fig 13)

This is made out of 2 inch diameter bar (doesn't matter what material you use). Take a light cut over the top, turn down a boss $\frac{3}{4}$ inch diameter x $\frac{1}{4}$ inch long, then put a recess in the flange approximately $1\frac{1}{2}$ inches diameter x $\frac{1}{16}$ inch deep. With a small, round nosed tool form three grooves

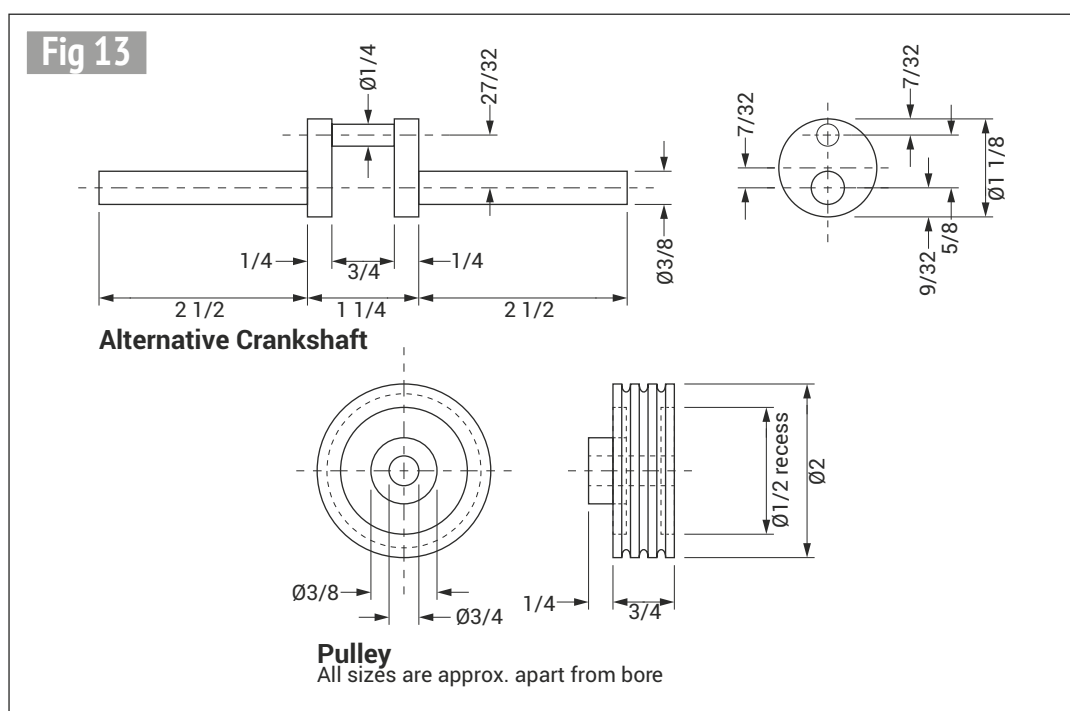
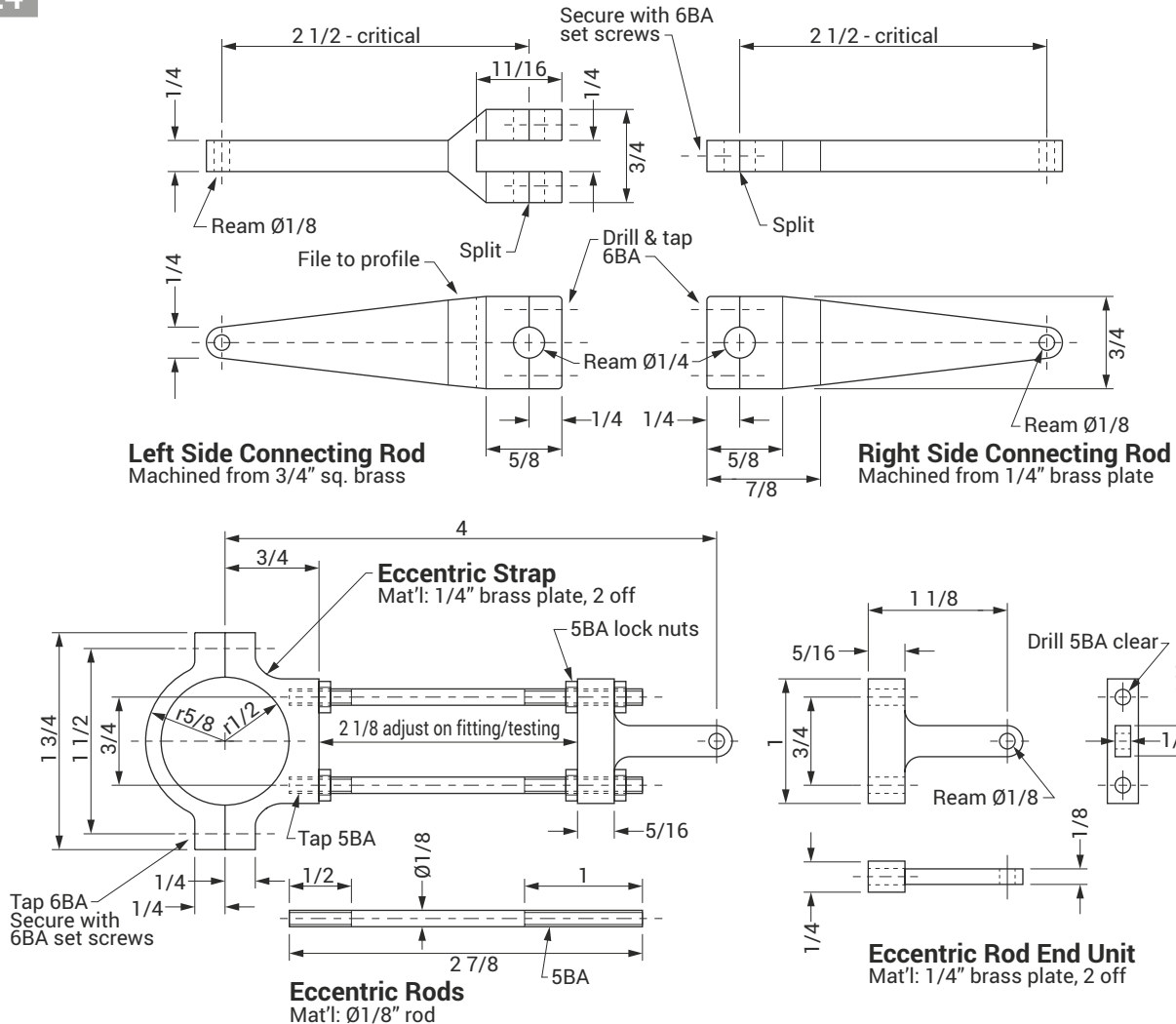


Fig 14

in the top diameter, centre, drill and ream $\frac{3}{8}$ inch. Part off at $\frac{3}{4}$ inch, turn around in the chuck nipping on the boss, face off and put a recess in just for appearance sake. Drill and tap through the boss for a grub screw (**photo 33**).

Place the crankshaft in the bearings and with the pulley fastened on making sure it is

a good running fit between the bearings and runs freely.

Eccentric straps (fig 14)

Using a bit of $\frac{1}{4}$ inch thick stainless steel plate machine up two pieces $1\frac{3}{4} \times \frac{5}{8}$ inch and two at $1\frac{3}{4} \times \frac{3}{4}$ inch. Using a 6BA clearance drill through the top strap then spot through to the bottom strap,

drill and tap 6BA taking great care to line everything up. Mark out the centre and then draw a 1 inch diameter circle, centre pop, north, south, east and west. Next, place in a four-jaw chuck and get it running true (**photo 34**).

Centre, drill through and bore out to 1 inch diameter to gauge size. Put a good radius

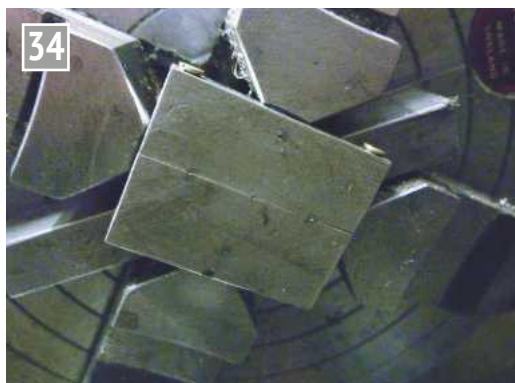
on the bore before you take it out of the chuck and put a very strong radius on the other side before splitting. On splitting the bearing, please, give a good filing to the edges of the bore. This is where all the split bearings have a grip so you must file or scrape it out. You may just see it marked in black. Fasten together making sure the 1 inch gauge goes through. Mark out the shape of the eccentric, cut out and file to shape (**photo 35**).

Eccentric rod end

Machine down two pieces of $\frac{1}{4} \times 1$ inch bar stock $1\frac{1}{2}$ inches long, as illustrated in **photo 36**, to $\frac{1}{8}$ inch thick in the middle. Cut out to shape and drill two 5BA holes through the bottom. Place the eccentric rod end onto the eccentric rod strap,



The finished pulley.



Centring an eccentric strap blank in the four-jaw chuck.

spot through and then drill and tap the eccentric strap 5BA (photo 37).

Eccentric rods

Cut off four $\frac{1}{8}$ inch diameter rods (stainless steel or silver steel), thread down 5BA for $\frac{1}{4}$ inch at one end and 1 inch at the other. Screw the $\frac{1}{4}$ inch end into the eccentric rod strap using Loctite. After you have cleaned and polished everything up, unless you have a very accurate taper you will have to place the eccentric strap end in a vice and square the rods up so that the eccentric rod ends slip onto the two parallel bars easily. Because I used stainless steel I put a brass bush into the rod end (photo 38).

Eccentric sheave

I used brass for this component as my eccentric strap was stainless steel and it is better to use two dissimilar metals to run together. Place the brass bar into a four-jaw chuck and put a $\frac{1}{8}$ inch distance piece under jaw no.1 to define the throw. Get it running true then machine down the brass bar to $1\frac{1}{4}$ inch diameter. Moving over the plunging tool by $\frac{3}{8}$ inch, plunge in to 1 inch diameter. Repeat this until you have a slot $\frac{1}{4}$ inch wide, the width of the eccentric strap. At this stage split the eccentric strap making sure it is a nice easy fit in the groove. Slacken the three jaws off, take out the packing piece and tighten the



The eccentric strap is cut out and filed to shape.



Forming the eccentric rod end.



Spotting through onto the strap.



Eccentric strap assembly.

three jaws up again (this gives you the throw). Turn down to $\frac{3}{4}$ inch diameter, $\frac{1}{4}$ inch deep which will leave you with a $\frac{1}{8}$ inch collar. Centre, drill and ream $\frac{3}{8}$ inch then part-off at $\frac{7}{8}$ inch. Drill and tap for a grub screw on the small diameter (photo 39).

Connecting rods

The only brass I had was my faithful $\frac{7}{8}$ inch A/F hexagon bar so I used that again for the left side rod; an ideal starting point though would be $\frac{3}{4}$ inch square brass. Part off a piece $3\frac{1}{16}$ inches long

and machine it down to $\frac{3}{4} \times 0.650$ inch, which was just sufficient. Mark it out on the end with centres at the corners of a $\frac{1}{2}$ inch square, drill 6BA clearance holes down to $\frac{1}{4}$ inch deep then 6BA tapping size down to $\frac{7}{8}$ inch. Next tap 6BA, doing all this while still in the bar length. Saw it off at $\frac{1}{4}$ inch plus, clean up both faces and fasten together with screws. Taking great care to get everything square drill and ream the $\frac{1}{4}$ inch diameter hole. Move the work by $2\frac{1}{2}$ inch then drill and ream a $\frac{1}{8}$ inch diameter

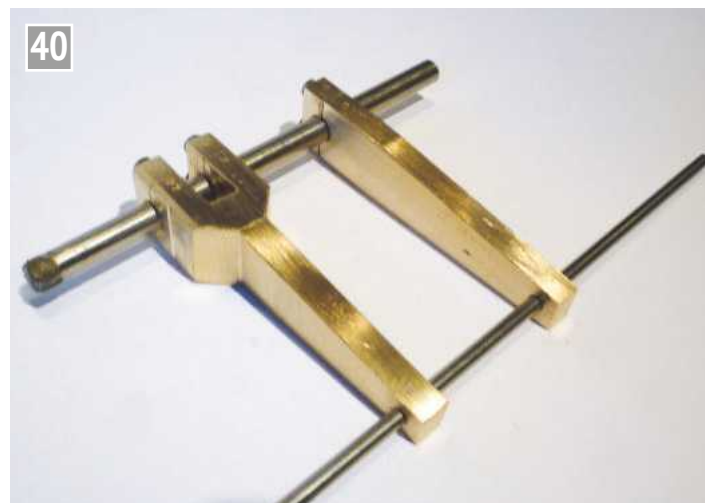
hole. The part may then be machined to shape.

Cut out the right side rod from $\frac{1}{4}$ inch brass plate and do a similar job of drilling, tapping and splitting the 6BA clamping screw hole. Drill and ream a $\frac{1}{4}$ inch diameter hole. Insert a $\frac{1}{4}$ inch pin through both connecting rods and, using the left side rod as a guide, drill and ream a $\frac{1}{8}$ inch hole in the right side rod (photo 40). Finally, machine the rod to shape as in the drawing.

● To be continued.



Finished eccentric sheave.



Left side and right side connecting rods.

CLUB NEWS

Geoff Theasby reports on the latest news from the Clubs.



I got a new radio, from the Far East, which operates on two bands, has 100+ memories, hi and lo power, and can be programmed by computer. The last time I bought such a radio I paid over £200 for it. This one, £20, brand new and boxed! Looking inside it, there is precious little to see. Almost all the electronics has been concentrated into a couple of tiny 'chips'. It would be difficult to repair but at that price, regrettably for the environment, you can afford to bin it and buy another.

Things are hotting up *Chez Theasby* or, as I have begun telling scam callers, *Wentworth Woodhouse*. I claim to have a private income, I am 92, with several wives, and I practise Zoroastrianism. Did I have a car, he asked. "Which one?" I replied and, when he asked how many bathrooms my house had, I said I thought it was 23. This morning I was told I sounded much younger than 92. I thanked him for the compliment; he was suitably grateful and wished me many more years of good health. Anyway, back at the ranch, or the Northern stable block at any rate, in the next week I had booked to attend Northern Manufacturing in Manchester, a large amateur radio rally, the Barrow Hill reopening, a talk on the Enigma coding system, another on radio communications in WWII convoys and an 'Aerajumble' at an aviation museum. The manufacturing exhibition and Barrow Hill will have to go and if I can attend all the others I will be doing well.

An old episode of 'The Avengers' featured John Steed being attacked by a Fowler bulldozer bearing a TWW logo. I didn't know they made such machines nor what the T W Ward connection was. It seems that Fowler took over Marshall and made some dozers for export to Australia based on the tracked Field Marshall tractor. TWW took over the company in 1938.



Sam Foregrave's steam wagon at Cultra, MESNI (photograph courtesy of Editor, Terence Aston).

In this issue: Steam, Camera, Action! More steam, *Leader*, workshop views, flooding, a silencer, titanium again, locomotive help, oil cans, a solder test and WOOPS!

The Lobby, Summer, from **Brighton & Hove Society of Miniature Locomotive Engineers**, boasts one of the youngest editors in publishing, Mikey, who is not quite 16. He has just acquired his first locomotive, paid for with birthday and Christmas money and by taking a weekend job washing dishes. He offers his thanks to those who helped him with tools, bits and advice. The last page bears a picture of a 2 foot 6 inch gauge 'ZB' locomotive from India's Western Railway, all now gone! **W. www.hoveparkrailway.co.uk**

The Link, September, from **Model Engineers' Society (NI)** held a SMALLS day in September at which oscillating, Stirling, Mamod etc. models were all welcome. A review of the 2017 Irish steam scene filled one page with photographs and another displayed a number of steam wagons at the Cultra track including this 'action' picture (photo 1).

W. www.mesni.co.uk

The Autumn *Newsletter* of the **Worthing & District Society of Model Engineers** has a picture of Neil Furze, made indistinguishable by steam, which has collected under an umbrella supposedly sheltering him from the rain. I don't think it was doing him any good! A meeting of the Worthing Childminders' Association at the track saw an immense number of prams and buggies collected by the station whilst the welkin was riven by shrieks of joy from the recently-released inhabitants. Editor Dereckspeltoddy would welcome contributions from female members, partners or pressed women to contribute to the *Newsletter*. 'Difficulties in cleaning his workshop' or 'Getting the stains from his overalls' might be thought sexist these days, but whatever... (My Deborah, Peace Be Upon Her, has so far kept her promise, made 12 years ago when I moved in, not to disturb my workshop/computer/radio station. This promise is wearing thin due, I suspect, to the unhappy coincidence of her needing some technical help whilst catching me in mid-project.

The basement is wont to look a little 'lived in' at such times.) Reading the IMLEC report in *M.E.* 4569, I was pleased to see a model of Bulleid's *Leader* being run by Worthing's Kevan Ayling. I've just bought a book on this locomotive - it is not well documented and I didn't even know such a model existed, despite it being built 20-odd years ago.

W. www.worthingmodelengineers.co.uk

Kingpin, Autumn, from **Nottingham Society of Model & Experimental Engineers**, has Bob Bramson making the driving wheels for '4457'. Attempting to decide on the correct grade of steel, allied with practicality, he settled on EN8 but found it difficult to machine on his Harrison M250 so borrowed the use of a Colchester Triumph. The blanks were first annealed by heating to bright red for an hour and then allowing to cool overnight.

The Gauge 1 MRA is 70 this year and a two-week period in June saw them visit several locations, starting with The Fosse, and Ruddington being one of course. This photograph of a *Royal Scot* is rather good, I feel (photo 2). Nigel Mundy visited Switzerland and three miniature railways, spotting *Aigle*, to name but one, at the *Swiss Vapeur Parc* (photo 3). Note: this is NOT the Blavier & Larpent of 1855 or the Stephenson's 'No 6', also named *Aigle*. 'My Workshop', this time by Andy Lowe,

reminisces about an old friend whose workshop window was only a few inches from a brick wall. Later, said friend moved to Minehead, where his workshop had a magnificent view over the Bristol Channel. Andy, by contrast, has a view of the preserved GCR from his workshop. Now then, who had the better view?

W. www.nsmee.org.uk

The *Link*, August/September, from **Ottawa Valley Live Steamers & Model Engineers**, opens with a picture of two of the five visitors to Frontenac Society of Model Engineers at Battersea. This club has a four-rail raised track, 3½, 4¾ and 5 inch gauge, as well as the ground level 7¼ inch gauge track. A stub switch has been replaced by a sprung switch, avoiding the possibility of derailments at the convergence. The landslip realignment made two switches redundant, for the moment. They are currently in store. The locomotive noise reduction exercise involved making up a silencer to replace the existing device, using flexible piping and black iron. This has achieved a reduction of 10dB or more at the driving position, as measured by a Radio Shack sound level meter. The silencer is a ¾ inch pipe drilled with 44 ¼ inch holes, wrapped with stainless scrubbing pad material and fastened inside a 2½ inch diameter pipe, 16 inches long.

W. www.trainweb.org/ovlsme



Royal Scot G1 at NSMEE (photo courtesy of Steve Andrews).

I am invited to a 'bit of a do' at **Sydney Live Steam Locomotive Society** on 4/5th November but I'm afraid that the editorial budget doesn't stretch as far as the Antipodes. Nevertheless, I wish them a great time. It will be 50 years to the day since LBSC's death. Accordingly, only 'Curly' Lawrence's locomotive designs will be allowed in.

W. www.slsas.asn.au

Reader, John Bauer, writes with reference to titanium bolts, mentioned in *M.E.* 4566. He warns us against allowing cadmium-plated items to be used with them due to delayed (weeks or months) embrittlement causing catastrophic failure. This was first noted on the SR-71 Blackbird, in which there was much titanium.

PEEMS Newsletter, August, from **Pickering Experimental Engineering & Model Society**, reports that they were able to help Cedar Barn, a pick-your-own fruit & veg farm shop near Pickering. They have a miniature railway for visitors, powered by a replica *Warship* locomotive, which had failed. PEEMS lent them a locomotive until the repairs had been carried out. Community service, see? Strawberry Fields Forever! Near Malton, across the valley floor, is Wolds Way lavender farm, also with a 7¼ inch gauge miniature railway. Everything is painted a tasteful shade of lavender, natch!

(<http://woldswaylightrailway.co.uk>). The first Clock Focus Group meeting was well attended, and a visit to the British Horological Institute in Newark is being planned. The Wolds Vintage Rally was attended by the Oil Can Man, who has a collection of 16,500 oil cans - the biggest in the UK, possibly the world! The Ryedale Show display for PEEMS was provided by Brian Stephenson, showing some of his unusual models. A short video is available (<https://www.youtube.com/watch?v=E1b7p9eBu5U>). The portable train and track was almost continuously busy. One exhibit at the Driffield Show was a Rolls-Royce Griffon engine with contra-rotating props on a trailer. (Is this the one owned by Guy Martin?) Further information on the Deeley valve gear is given, with illustrations (dated 1907) taken from the NRM archive, and photographs of the gear on a locomotive, showing the 'scissors' action.

Steam Lines, September/October, from **Northern Districts Model Engineers' Society** (Perth) reports a remarkable turnout for the August public running day, when forty members turned out to operate the railway. That's half the membership! When most clubs struggle to get help and the same few do most of the work this is very gratifying. Ken Austin has almost completed his 7¼



7¼ gauge 0-6-0 Aigle at the Swiss Vapeur Parc, from Kingpin, NSMEE (photograph courtesy of Nigel Mundy).



Murray Vince's half scale model M60 GPMG, Otago MES (photograph courtesy of John Anderson).

inch gauge 2-6-6-2 Baldwin *Mallet* logging locomotive. It is pictured on a curved track, built specially before it took to the club tracks, which makes it look as if the boiler is off-centre, like a Shay. However, this is an optical illusion. The purpose was to ensure the locomotive would not produce any last-minute running problems. A profile of former President, Paul James, reveals that, having a keen practical interest, teaching for 37 years until retirement, he also found time to build furniture, a long case clock, dune buggies and a 3½ inch gauge *Heilan Lassie* before taking on his father's incomplete, freelance traction engine, begun in 1950. Editor, Jim Clark and Ron Collins are both building models of mid-19th century locomotives; Ron, a 7¼ inch gauge *Crampton* and Jim, a 5 inch gauge *Cornwall*. A practical test of various solders by Keith de Graauw shows that the silver or copper-added types are stronger than the soft, tin/lead solders, and do not mix well with the softer types. This is to be expected, but it is good to have some numbers and types to identify.

W. www.ndmes.net

Conrod, August, from Otago Model Engineering Society, reports that the weather has been so cold and wet (100mm of rain in 24 hours) that the boating pond wharves were underwater and overflowing and Kevin Gamble was able to

sail his model paddle steamer in his flooded back yard! The aero-modellers also found their flying ground inundated but, undeterred, fitted floats to their models and carried on. Look on YouTube for 'Speedfreak NZ'. The Editor's Challenge produced a 100% non-entry situation. That is not good! A Lego exhibition in Perth produced 48 exhibits, including an Arc de Triomphe, a sinking Titanic and a sectioned Concorde. Murray Vince has produced a half-scale M60 machine gun (photo 4).

W. www.omes.org.nz

Modelling Ways, September, from Fareham & District Society of Model Engineers, begins with details of the unknown (to me) William Kelly Wallace, primarily a Civil Engineer, who worked in Ireland from 1906 and, from 1934, the LMS. The Open Weekend was very busy, and made a net profit of over £1,000. 1900 rides were sold and the new signal box sold lots of candy floss but what



My guards van.

a shame there wasn't a mill instead... (Mill? Floss? Oh well...)

Blast Pipe, September, from Hutt Valley & Maidstone Model Engineering Societies, announces that the next meeting of the Hutt Valley will be a 'WOOPS' evening, or Workshop Misadventures. Don't be shy! As it used to say in *Flypast Magazine*, (I paraphrase of course) 'I learned about engineering from that'. A talk on astronomy was illustrated by some pictures, the earliest being 1420, which was surprisingly accurate. Just before reporter, Claude Poulsen, was born (about 13.5 billion years before...) the Big Bang occurred, with the results we now see, if we look up. Peter Targett has finished his GWR *Dart* 1466, and acquired a part-built matching brake van - a 'Toad', which is now almost finished. It looks good too. (I acquired a G1 brake van for my YEC diesel, now close to being finished. It contains

the batteries powering the locomotive, keeping them out of sight. As far as I can tell, it is a LMS 10 Ton model, to a Diagram 390, Drawing 753, Derby specification, held by the Midland Railway Study Centre. Most brake vans were 20 Ton. A solitary brake van looks quite normal behind a light engine, where a single truck would not (photo 5)).

W. www.hvmes.com

I was not able to include Mel Martin's Christening spoon, which he made for his granddaughter, at the time of reviewing the *SMEE Journal*, but here it is now. It is made in Sterling silver and engraved by CNC (photo 6).

And finally, another one from Richard Dedman, of Welling MES: 'Of course I talk to myself, sometimes I need expert advice'.

Contact:
geofftheasby@gmail.com



Christening spoon by Mel Martin of SMEE (photo courtesy of Richard Dedman).

OCTOBER

- 23-29 North Norfolk MEC.**
Public running for October school holidays. Contact Gordon Ford: 01263 512350.
- 26 Sutton MEC.** Rod Dean: 'The Meteor and Its Development' Contact Jo Milan: 01737 352686.
- 27-29 Vale of Rheidol Railway.** Hallowe'en events. Contact: 01970 625819.
- 28 Cardiff MES.** Hallowe'en steam up and open day (no public running). Contact Rob Matthews: 02920 255000.
- 28 Frimley & Ascot LC.** Public running for Hallowe'en 6.30pm - 8.30pm. Contact John Evans: 01276 34970.
- 29 Grimsby & Cleethorpes MES.** Public running noon - 4pm. Waltham Windmill site. Contact Dave Smith: 01507 605901.
- 29 Motor Neurone Disease Association, East Surrey Branch.** Model railway and model engineering show, Bookham United Reformed Church. Contact Roger Wakeford: 01372 374675.
- 31 Lancaster & Morecambe MES.** Hallowe'en public running. Contact Mike Glegg: 01995 606767.
- 31 Wigan DMES.** Glen Atkinson: 'Well, I Never Knew That!' (Inventions in Salford). Contact Kevin Grundy: 01942 522303.

NOVEMBER

- 1 Bradford MES.**
Club Auction (members only can bid). Contact: Russ Coppin, 07815 048999.
- 1 Bristol SMEE.**
Members' night. Contact Dave Gray: 01275 857746.
- 1 Leeds SMEE.** Bonfire Night steam-up. Running from 3pm with Pie & Peas. Contact Geoff Shackleton: 01977 798138.
- 2 Cardiff MES.** Robin Williams: Ebbw Vale, 1813 - 2013. Contact Rob Matthews: 02920 255000.
- 2 Sutton MEC.** Bits and Pieces night. Contact Jo Milan: 01737 352686.
- 3 Rochdale SMEE.** Bits and Pieces night. Castleton Community Centre, 7pm. Contact Len Uff: 0161 928 5012.
- 3 North London SME.** Club meeting. Contact Ian Johnston: 0208 449 0693.
- 3 Stockport DSME.** Bits and Pieces night. Contact Dave Waggett: 0161 430 8963.
- 4 Grimsby & Cleethorpes MES.** Public running and fireworks display 5 - 9pm. Waltham Windmill site. Weather permitting. Contact Dave Smith: 01507 605901.
- 4-5 Vale of Rheidol Railway.** 'Autumn Colours' event. Contact: 01970 625819.
- 5 Ellenroad Engine House,** 'Engines in Steam' 11am-4pm. Enquiries: 01706 881952.

- 5 Frimley & Ascot LC.**
Public running 11am-4pm. Contact John Evans: 01276 34970.
- 5 NW Leicestershire SME.**
Members' and visitors' steam up. Contact Den Swain: 01530 412048.
- 6 Lancaster & Morecambe MES.** Informal meeting. Contact Mike Glegg: 01995 606767.
- 6 Peterborough SME.**
Bits and Pieces night. Contact Terry Midgley: 01733 348385.
- 11 Otago MES.** General meeting 7.30pm. Contact James Woods: 476 1369.
- 11 Westland & Yeovil DMES.** Track running day 11am - 4.30pm. Contact Bob Perkins: 07984 931 993.
- 11-12 Vale of Rheidol Railway.**
'Autumn Colours' event. Contact: 01970 625819.
- 12 Sutton MEC.** Afternoon running from noon. Bonfire and Soup! Contact Jo Milan: 01737 352686.
- 14 Erewash Valley MES.**
Club AGM. Contact Alan Brittan: 01773 710133.

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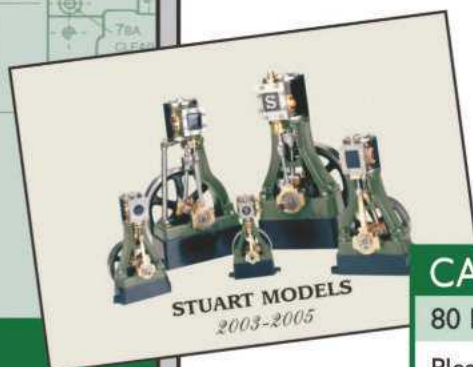


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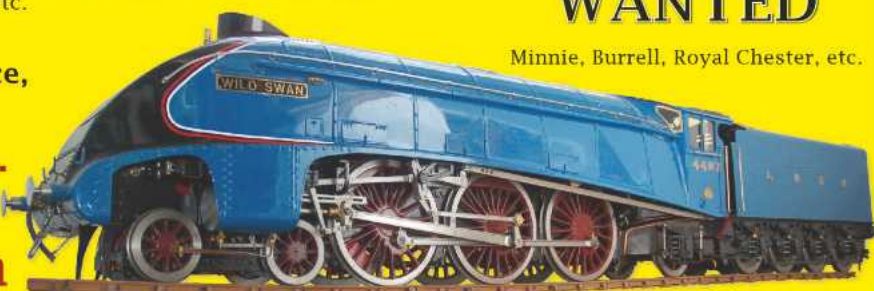


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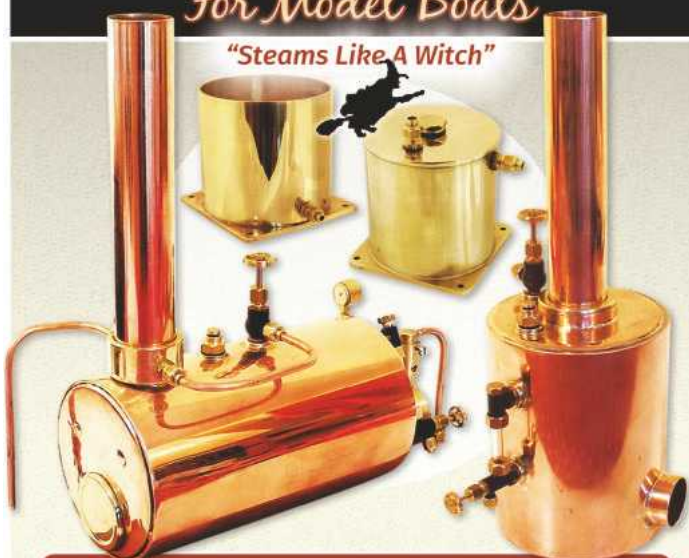
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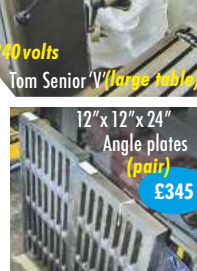
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