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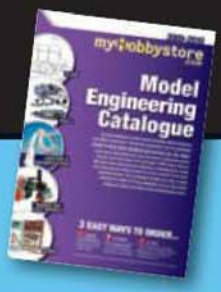

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Vol. 203 No. 4364 6 - 19 November 2009

ON THE COVER...

Martin Ranson's superb beam engine. See series starting on page 570.
(Photo by Martin Ranson)

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It's easy to see why our best selling turning tool is the SCLCR. It can turn and face a bar without altering the toolpost, and the 80° nose angle gives much more strength than a 60° (triangular) insert. The NJ17 insert cuts steel, stainless, cast iron, phosphor bronze, aluminium, copper, brass etc. Please state shank size required - 8, 10 or 12mm square. Spare inserts £5.36 each for 8-10mm tools, £6.20 for 12mm.

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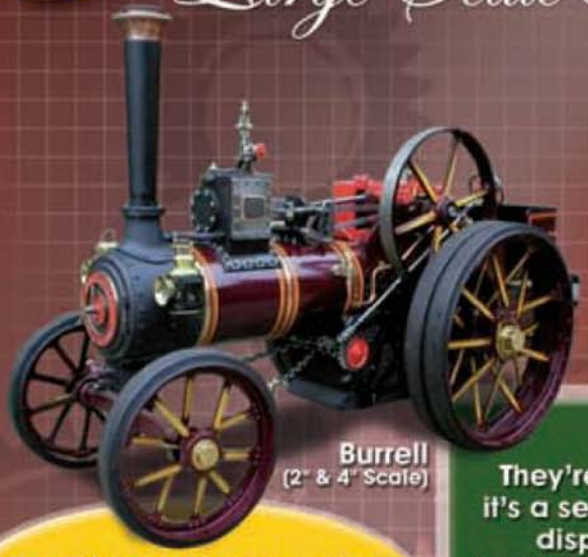

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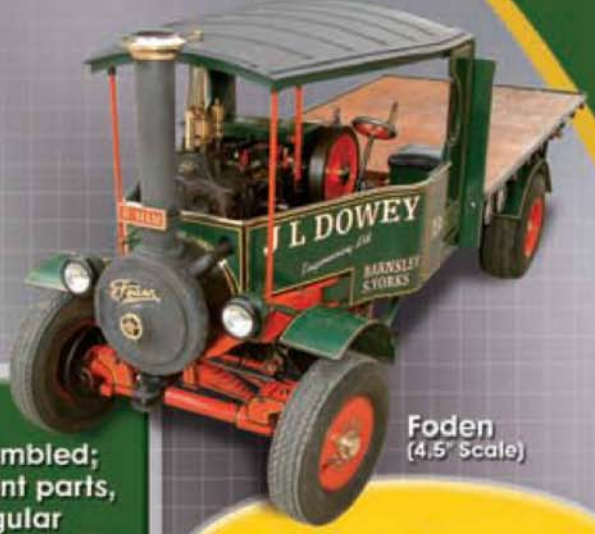

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JAW DEPTH - 30mm
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DAVID CLARK
Editor

Postal Strike

By the time you read this, the postal strike may be over but of course, there may be more. Please send your entries for the Model Engineer Exhibition competition as soon as you can. I can accept entries to the editorial email; print the form out, fill it in, scan it and email it to me. Don't miss out and get your entry form in as soon as possible.

Return of trophies

Could all of you who won trophies last year please return them ASAP. We need to get them cleaned, update the valuation and get the engraving sorted out so it is up-to-date. Please return to: Rosemary Martin, MyHobbyStore Ltd. PO Box 718, Orpington, Kent BR6 1AP. Please obtain a proof of posting.

Letters to *Post Bag*

When writing to *Post Bag* with a question please supply a phone number. It is far easier and cheaper for me to pick up the phone than to write a letter of reply. When emailing your letter, please supply a general location of where you are in the country, the nearest well-known town is fine. Readers like to know where you are.

Articles for *Model Engineer*

Since my appeal for articles when I took over the editorial chair, I have been inundated with your offerings. Some of you have actually seen your work in print for the first time. I hope you were pleased at the way the article turned out. I do still have articles that were supplied and will be using the majority of them in the near future. I would though ask you to write up that project or idea while it is still in your head for the benefit of other readers. Better still, take some photos, do drawings (simple sketches will be fine) and write it up as you go. We do pay well for contributions and with the increased page count your article is likely to get used sooner rather than later.

Remote wheelchair

Two readers have asked me to forward information to the designer of the remote control wheelchair mentioned in *Smoke Rings* in *M.E.* 4362, 9 October 2009. They have pointed out that 35 Mhz radio control equipment is only to be used for controlling model aircraft. I have informed REMAP and they are checking with the original designer to ensure that he has used the correct radio frequency.

3½in. gauge society

It has been mentioned on our website **www.model-engineer.co.uk** that there does not appear to be a 3½in. gauge society. If any readers are interested in starting one, there appears to be plenty of support. In the first instance, please visit the website and if anyone has any comments, I will be pleased to put them into *Post Bag*.

The Editor's workshop

Although my thumb is still swollen and sore, I have managed to get into the workshop to continue with the construction of the Stuart 10H. The bedplate and soleplate have been drilled and in the next issue, I hope to have milled the bearing seatings. I have done a drawing of how I would drill the holes without a digital readout. Dimensions are all taken from one position as requested by Steve Cooper. Even if the Stuart 10V or the editor's workshop does not interest you, the method of pitching out the holes might come in useful for other drilling jobs. While the casting is set for drilling the holes, it is relatively easy to mill the bearing seating in the correct position.

The Association of 16mm Scale Narrow Gauge Modellers

In a newsletter received recently, it said that this society is receiving three new members every day. This is good news for the association and could also be good news for your model engineering society. A lot of societies are introducing 32mm and 45mm narrow gauge tracks at their club grounds. I think that it might be a good idea to compile a register of what narrow gauge tracks are available at what club. (Should we do this for all gauges?) Please let me know what tracks your club has. I will put them into a PDF or similar document and post it on the web. Also let me know the address of your club website so we can attach that to the document as well.

Models in 16mm scale are fairly small (other than the odd Garratt) and are easy to carry, easier to build and also far, far cheaper as the majority are built from stock bar rather than expensive castings. They are the ideal introduction to model engineering and you can even buy or make real coal-fired versions. I feel we should be publicising which clubs have 16mm tracks in the magazine *16mm Today*. This may well attract new members to your club/society. If you have not seen a copy of *16mm Today*, see if one of your club members receives a copy. It puts many published magazines to shame both on content, quality and page count. As the 16mm Association has a layout at the Model Engineer Exhibition at Sandown, I expect there will be some copies of *16mm Today* on hand.

Fluorosint

Please note the correct spelling of Fluorosint as used in the article on making PTFE piston rings by Geoff King in *M.E.* 4362, 9 October 2009.

Free tool catalogue*

We are giving away a free 100-page tool catalogue from EXPO Drills with *M.E.* 4365, 20 November 2009.

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In the interests of security, correspondents' details are not published unless specific instructions to do so are given.

Responses to published letters are forwarded as appropriate.

Editor's comment on drawing quality

Steve Cooper's original letter was not intended for publication. The only reason it was published is because emails to Mr. Cooper bounced back so I could not answer him personally. Many replies have been received, some of which are printed below.

Drawing quality 1

SIRS, - I was rather amazed at the tirade of comments recently sent in to the *Model Engineer* by Steve Cooper with respect to the quality of the drawings that have been published in the past. Perhaps one should remind Mr. Cooper that most model engineers are, as far as I am aware, not professional engineers and are, therefore, not necessarily familiar with the finer points of technical drawing etc. As an amateur model engineer with some experience I would be highly offended if any of my articles and drawings that have been printed in *Model Engineer* and *Model Engineers' Workshop* fell under the umbrella of Mr. Cooper's complaints. I for one take the utmost care to avoid errors as I am sure others do likewise. Human nature being what it is mistakes can be made and can slip through - what is it that they say - the person that never made a mistake never made anything!

Over the years to date I have dealt with many of the editors both past and present and know about some of the difficulties in trying to produce a magazine of quality both to a deadline and to a budget not to mention trying to keep everyone happy.

I note that Mr. Cooper has been a subscriber to *Model Engineer* for some years. I have checked the indexes for the *Model Engineer* for the past 10 years and note that his only contribution to date was his letter of complaint. Perhaps he should get down off his pedestal and contribute something of constructional interest to us amateurs! After all, with 25 years experience in aerospace he might know something?

Ray McMahon, Stranraer.

Drawing quality 2

SIRS, - Mr. Cooper, I wish I could produce decent geometrical drawings. I have tried and tried over many decades but all I end up doing is either stabbing the pencil through the paper, or getting bored and screwing the paper up. I find it much easier to go and build something, even if it means a wasted prototype which should have been longer or shorter, or possibly I should have used brass and not steel. I have sometimes ended up realising that an item could have been built up from pieces rather than carving from the solid etc. We are all different and possess different perspectives on the world. Even if you offered me a million pounds for a good drawing I would lose out.

I have spent all my life designing and building things, at work; at home for myself; or at home for other people; or things I have designed and built for other modellers. With virtually everything that I have built over the years, I made a prototype first and worked from that. The ideas were in my head and very rarely put down on paper.

My work was a mix of electrical, electronic and lightweight mechanical engineering requiring various BA size spanners. Occasionally I needed a sledgehammer which was great fun. During all that time I read many, many drawings but I never actually drew any. I have apologized profusely on lots of occasions because my drawing skill is zero. However, people usually take notice when I have produced a working prototype.

I have been lucky enough to have a few articles in print but if it was not for the patience and skill of 'Mr. Editor' to translate my scribbles into something decent I would be doomed. With only one or two exceptions all my work has been done without drawings. The drawings have been produced afterwards to create a reference for me and any others. If something looks right then it usually means it fits properly. Whether something is in Imperial or Metric I have no real bias either way. The length of a particular piece is simply a mark on a stick or a dial reading to match another part. Again I apologize for my lack of engineering skill and workshop knowledge. The various people who try to produce articles in magazines are doing their best Mr. Cooper, but most model engineers are working with minimum resources and minimum capital. A well-equipped commercial style workshop would be heaven but it ain't gonna happen for most people.

You mention in your letter about getting a professional draughtsman to look over any drawings I might have made. Do you think he could come to my house? The pay would be zero but I could put the kettle on.

I suspect that we, as a collection of model engineers, are very different from each other, but we all have a love of engineering in its many forms. So please be tolerant of people like me who cannot draw for the proverbial toffee, it is not for want of trying.

P.S. on a good day I can sometimes file small items to within one thou, never mind 10 thou.

Martin Ranson, Bridlington.

Flying Scotsman Appeal

SIRS - With reference to the above, I thought your readers would be interested to know what actually happened to the contribution that I made some months ago towards the appeal for the restoration of the *Flying Scotsman* which was initiated by the National Railway Museum at York.

Ayesha

SIRS, - Further to my letter in *M.E.* 4356, 17 July 2009 I would like to thank Des of Tewkesbury's 2½in. Gauge Association for asking Chris Cruickshank of Louth to help me with my *Ayesha*. One is lucky indeed to have friends like these good people.

G. W. Judge, Grimsby.

At the beginning of the year friends of mine told me about the appeal, which was broadcast over the media looking for funds. It appeared that one could help restoration by purchasing a bolt for £25. I had seen the *Flying Scotsman* in steam on a number of occasions some years ago and more recently sadly in bits during restoration at the museum. I became interested in making a donation. As the result of enquiries I made it appeared to me that one could donate specific amounts of money towards the purchase of other items which they listed out to me over the phone; bolts, piston rings, fire bars, tins of paint and a fireman's seat etc. Upon enquiring about the cost of the fireman's seat I decided to make the appropriate donation. I might add that I am a pensioner and, as such, my funds are obviously limited. However, being an enthusiast for steam I thought this time I would go that little bit extra and purchase something more tangible that I could identify with, rather than one of the many bolts that were to be used on the engine. It would be an opportunity to help out with what has become an icon and a national treasure. In return I was informed that I would receive a certificate stating and confirming that my donation had been received in respect of the fireman's seat. I would also receive a newsletter in due course updating me on the restoration progress of the locomotive.

Imagine my surprise and consternation when I received the summer newsletter? The back page was made up of a form containing no less than 11 items required for the locomotive with specific amounts of money set against them - amongst them being a fireman's seat. It was in their own words a *"Wish List"*?

I contacted Katie Watkinson, Development Executive at the museum, and enquired that if one were to make a donation for a specific item which was listed and priced accordingly - was that item considered to be bought by the donator? The immediate answer was *"h'm, no not quite"*! I was told that the money was put into the general restoration fund for the *Flying Scotsman* and was therefore not used to purchase the item one purposely selected; it appeared this also applied to the other items listed. My question as to *"Why?"* then met with the incredible answer that was the way all charities operated! My immediate response was - *"why publish a list of specific items with their costs in the first place"*? Was this not misrepresentation or, to put it more bluntly, conning the public into thinking that they had purchased specific items to help restoration. The reply was "No" and that the list gave the public something to focus on! By this time I was furious and announced that as I had already donated money for the purchase of the seat I felt that I had been cheated, conned and, above all, let down by an institution which was obtaining funds using a method which, in my opinion, was questionable and quite unethical. Again the response was that was the way charities operated - but she could see where I was coming from but unfortunately there was nothing she could do about it. I immediately pointed out I was led to believe that I had purchased the seat but, as it turned out this was not, in fact, the case. I enquired - how many other donations were received from people around the country who thought they had purchased the fireman's seat? There was no answer forthcoming to that question! I then pointed out that if one sponsored someone to walk to London they would not expect the money to go to someone who had walked to Birmingham! As my donation did not go to the specific item which I thought I had purchased, I therefore demanded that it be returned forthwith, my request was met in due course.

I then advised the Development Executive that I would be contacting the press and various railway magazines to inform them about their questionable methods of fund-raising. This then met with a request - it would be appreciated if I would not go down this road as that could have an undesirable effect on their fund-raising. While I applaud the Railway Museum for their excellent work in the past in saving our railway heritage, and for the current preservation that is ongoing, I think that their method of raising funds in this instance is nothing short of scandalous.

Personally speaking I would not have expected an institution of this stature to behave in such a underhand manner. It is unbelievable that they did not think through the possible consequences of using such a method to raise money, which at the end of the day is going towards a worthy cause.

Later on that afternoon I received a phone call stating that a meeting had been called as a result of my telephone conversation. I was informed that with immediate effect any money donated to the appeal would be affectedly ring fenced against the items purchased from the list.

My immediate comment was that was the way it should have been handled in the first place and that I still expected the return of my donation.

The question now is - how many people are there out there who have been misled (perhaps conned is a better word) into believing they have purchased the fireman's seat complete with certificate when in effect like me they have just been sold a bum seat!

Ray McMahon, Stranraer.

Eccentric Engineering

SIRS, - For some months past an advert has been appearing in the *M.E.* for a Diamond tool holder. The only information given to contact the advertiser is *"Visit our website"*. This means absolutely nothing to me. Could you get your advertisers to provide an address or telephone number?

Gordon Hobson, Holmfirth.

We cannot force advertisers to supply a phone number or address. Eccentric Engineering is down under and because of the time difference they prefer not to have their phone number in the advert. I have written to Mr. Hobson giving him an address. Alternatively, Model Engineers' Workshop issue 156 has an article with drawings about making a tangential tool holder, Ed.

Cup washers

SIRS, - Every month I go through your magazine with great enthusiasm. I am looking for a supplier of cup washers; do readers know where these can be obtained?

Dennis Reece, Devon.

Bantam lathe

SIRS, - I wonder if readers have any spare parts for my Colchester Bantam Lathe AA 7549. I need the front 127 tooth gear Part No:3119 for the dual inch/metric cross slide dial and also need to know if this gear needs to be fixed, or does it rotate on its shaft?

Being a self taught dib-dob, I also am not quite sure of the correct operating procedures for the dials so any help would be gratefully accepted.

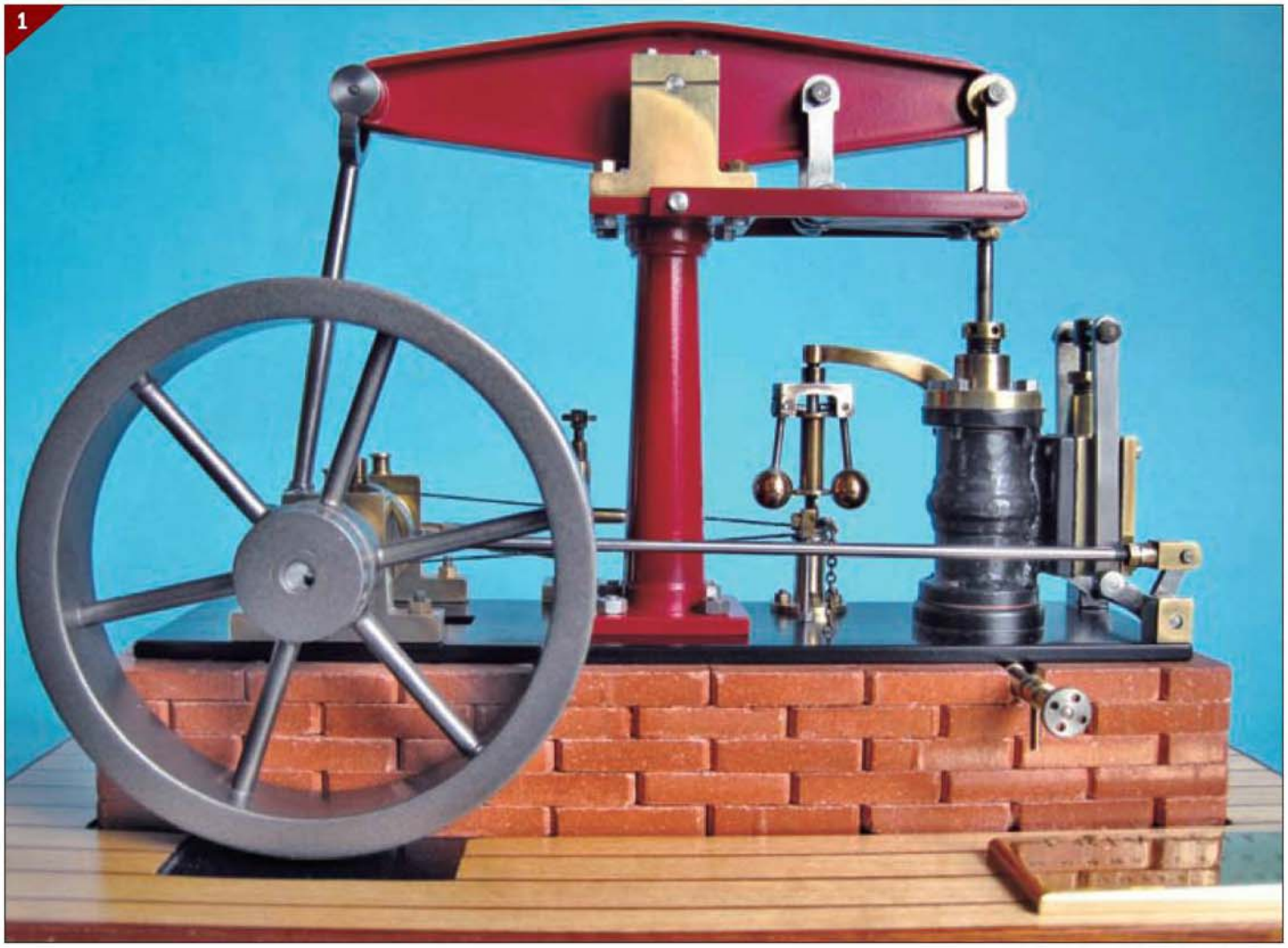
I also need some change wheels and if any of your readers have any spare, I would repay any costs involved. It goes without saying I very much enjoy the magazine, keep up the good work

Keith Russell, by Email.

Model engineering in Dublin

SIRS, - Every month I read *Post Bag* and look for contributors from Ireland, to no avail. Since taking up model engineering I have been hoping to make contact with any steam model enthusiasts in Dublin but it appears that there is little interest over here. We have a steam museum just outside Dublin with many models on display, but these have been made elsewhere. Do you know of any groups in Ireland who I could contact, it's a lonely hobby at the moment.

Gordon Sherrard, Dublin



A front view of the finished engine.

Freelance Beam Engine *Frivolity*

MARTIN RANSON

Martin Ranson turns an old cylinder casting into a superb model.

A general rear view of the engine.

This is definitely a beginners' project even though it was built over 40 years ago. Most of the sizes were determined by what was available in a local scrapyard. More than 40 years ago I acquired a steam engine cylinder from a school friend. Neither of us knew anything about where the cylinder had been made, but it was obviously a commercial item. I was told by various people it was from WEB or DRP, but to me it desperately needed to be made into something run by

steam. All that existed was the cylinder minus its piston but with a valve chest, the engine size looked to be ½in. bore and 1in. stroke. It ended up as the beam engine shown here (**photos 1** and **2**).

No plans were drawn in advance and no commercial items were bought to complete the engine. My workshop at the time comprised an 8 x 6ft. shed and a very ancient Myford ML4 lathe. It had no accessories except for two old chucks and two centres. It did not even have a motor. I found an old ¼ hp washing machine motor in the local scrapyard and rigged it up, via a Vee-belt taken from the same washing machine, to the headstock.

At the start of this project the lathe was only single speed, but I happened to see another lathe which used a 'layshaft' between the motor and the headstock. This slowed everything down and gave 3-speeds via a stepped pulley. I rapidly made a layshaft using bits of 1in. angle iron, Picador pulleys and bearing blocks. With a twin pulley on the motor driving the layshaft and a 3-step pulley on the headstock I now had a rough and ready clutch and six speeds. (Actually, there were only five because two ended up at the same overall ratio.) Picador made some very useful bearings, spindles and grinding wheels, so another motor and more angle iron were purchased from the same scrapyard. With these I was able to make a twin grindstone at minimum cost. Cutting metal got easier as this project continued.

The rest of my workshop comprised a few files and a hacksaw. Everything for the beam engine was made from available oddments of metal and included a visit to the back door of a local engineering firm. The flywheel started life in an old tape recorder. The engine as shown here has been altered a few times over the years, so not everything is the original construction. Some things have been changed to make adjustments and dismantling easier. There have also been three or four colour schemes over the years. At the last repaint I sprayed the engine with tins of spray from a car accessory shop instead of using a brush. Very tidy, why didn't I do that a long time before?

The sizes shown on the engine components have been measured from the parts as they now exist. The strips of mild steel used for the linkages were cut with a hacksaw and then filed until they fitted or looked right. For an engine nowadays I would be looking to purchase stock sizes of material, either 3/16 or ¼in. wide. Also at the time I must have had a large box of 8BA cheese-head steel bolts as these appear all over the place. Now I would use hexagon headed bolts to look neater, however the old ones will be kept as they are the originals. The original sizes have all been listed, but it may be useful to include alternatives in the text.

Brick base

The engine is stood on five rows of bricks which were donated by my girlfriend at the time, (**photo 3**). (She has put up with me for nearly 40 years of married life since then!) The bricks are very high quality with very smooth surfaces and made of very dense material. By now they are probably 50 years-old.


3

A close-up rear view showing the bricks.

As sold, they were apparently glued together with a non-waterproof glue to make a small building. when this was no longer required the glue was simply dissolved in hot water. Neither of us has any idea of the trade name, but it would be nice if there was a modern equivalent of equal high quality. I have seen some modern bricks but they had a very coarse surface and were somewhat random in size. Does anyone know if there are any on the market please? There were approximately 100 bricks available and this determined the size of any engine base that could be made. The baseplate was measured to fit on top of the bricks and using my usual method of 'guesstimation' the necessary height of the beam was measured. Regrettably there are no photos but most of the temporary supports were made from Meccano. This is extremely useful equipment for anyone who does scratchbuilding. I had no idea how all the parallel motion linkage should fit together, in fact at the time I did not even know the linkage was called parallel motion. I had no idea where all the bearings should be, but a mock-up was made to work it all out by using small Meccano strips.

The bricks were originally glued with balsa cement and many years later the interior was laid over with fibreglass matting just to make sure nothing fell apart, (**photos 4** and **5**). There are five layers of bricks with 18 in each layer, the outside length is 7½in. and the width is 2½ inches. The height is 1 3/32 inches. Each brick is 1 x ½ x 7/32in. approximately. Various notches were filed on the inside edges of the top row to fit all the nuts and bolts used to clamp everything together. If this sort of construction were attempted today then the preferred adhesive would be epoxy resin, probably a slower setting type to >>


4

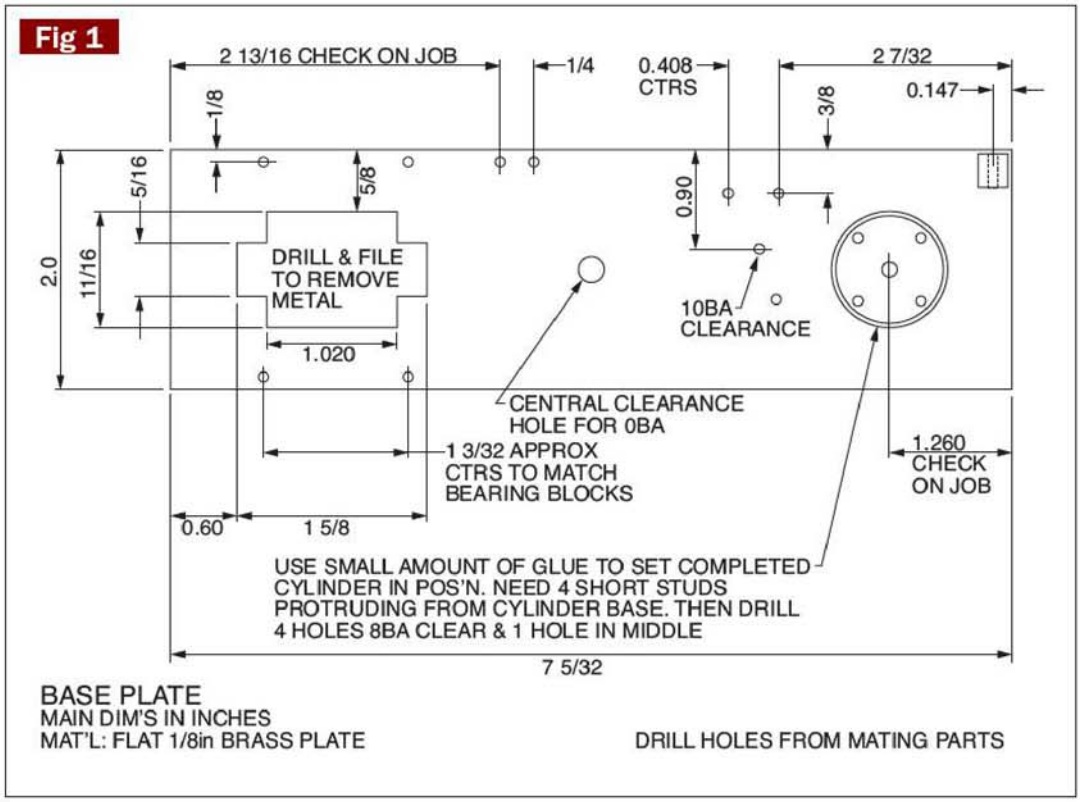
Brick base, front view.

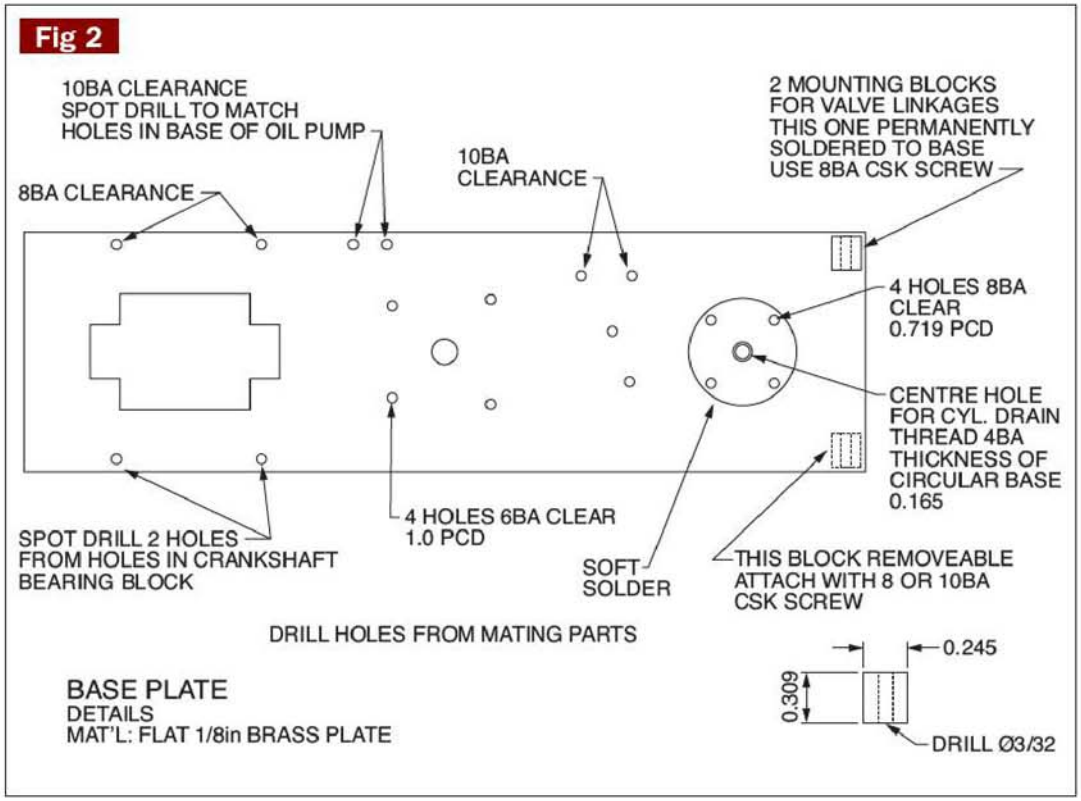

5

Brick base, top view.

Base plate seen from below.

Base plate seen from above.





give about 30-minutes working time. Possibly a thin layer of matt varnish could be applied to the top layer of bricks to keep the oil away.

Baseplate

The necessary cut-outs and holes to be drilled for this are shown in **photos 6** and **7** and **figs 1** and **2**. Note that on the underside there are two shaped brackets fitted to align the base within the bricks. One is a straight length of ¼in. square brass and the other is an 'L' shape. Possibly six bolts should have been used to clamp the baseplate to the bricks and would have given more of a scale appearance; nowadays the bolts would be used. The baseplate was gently clamped in position on the top of the bricks and the inside edge of the bricks marked on the underside of the brass baseplate.

The brackets were first soft-soldered in place to match the scribed lines and then three brass bolts drilled and tapped into each bracket though the baseplate; a 6BA thread is a suitable size. The top end of each bolt was filed off flat on the top surface. There are seven sets of holes to drill in the base. These are the crankshaft bearing brackets, the optional oil pump, the square base at the low end of the column (including the central clamp bolt), the optional governor assembly, the circular plinth for the cylinder and the valve linkage brackets. Finally, there is the slot to file for the con-rod big-end.

Beam construction

This is made up of 11 pieces of brass and several short lengths of 3⁄64in. brass rod to pin everything together, (**photos 8** and **9** and **figs 3** and **4**). A long time ago, runners for curtains used brass rollers. These were exactly the correct size to finish off each end of the beam. The two parts of the central boss for the bearing and the inner boss for the linkage are made to be a tight fit on each other so they can be tapped into place with a small hammer. The end of the beam sides may

need to be filed slightly where the con-rod swings as the engine rotates.

When finished, the entire assembly is carefully soft-soldered. This hides all the sharp edges and blends everything into one piece so it appears to be a casting. Do not apply too much solder, as otherwise the smooth fillet will disappear and the solder will run all over the place.

Support column

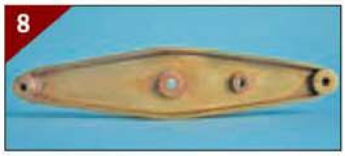
This is shown in **photo 10** and **fig 5** and is soft-soldered together from two pieces of ⅛in. thick brass plate and one piece of ⅝ dia. brass bar. As can be seen in fig 5, the top and bottom ends of the bar are turned to be a tight fit in the drilled holes in the plates. Note the central hole in the lower plate is larger than that in the top plate.

One of the square plates is soft-soldered to the column in any position and then the other end can be fitted to line up so the edges of the plates are parallel. This is easy to achieve by laying the column over sideways and pressing it down onto a flat surface. The two plates will be pushed down so they are flat and hence the edges end up parallel; this second end can then be soldered. There are various holes to be drilled in each end plate; the four in the lower plate can be drilled in advance and the holes eventually spot-marked through onto the baseplate, but not yet. Four of the holes in the top plate are to clamp the bearing blocks for the beam. Unless you have a means to drill these precisely it may be best to wait until the bearing blocks and the beam have been made.

When the beam and bearing blocks are made and assembled, the four clamping holes can then be spot-marked through onto the top edge of the column and drilled for 8BA clearance. Later in the construction a further hole on the outside edge of the top plate needs to be marked, drilled and tapped 10BA. (Nowadays drill and tap two on each side.) These are to clamp the arms which hold all the parallel motion steady and effectively stop it flapping in the breeze as the piston rod goes up and down. If correctly lined up the piston will travel in a straight line.

●*To be continued.*

The main support column.



Side view of beam.

Top view of beam, the circles indicate pins used for assembly.

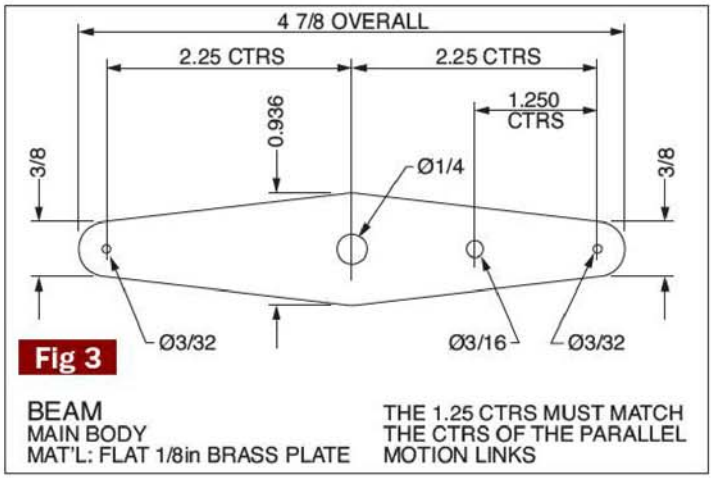


Fig 3

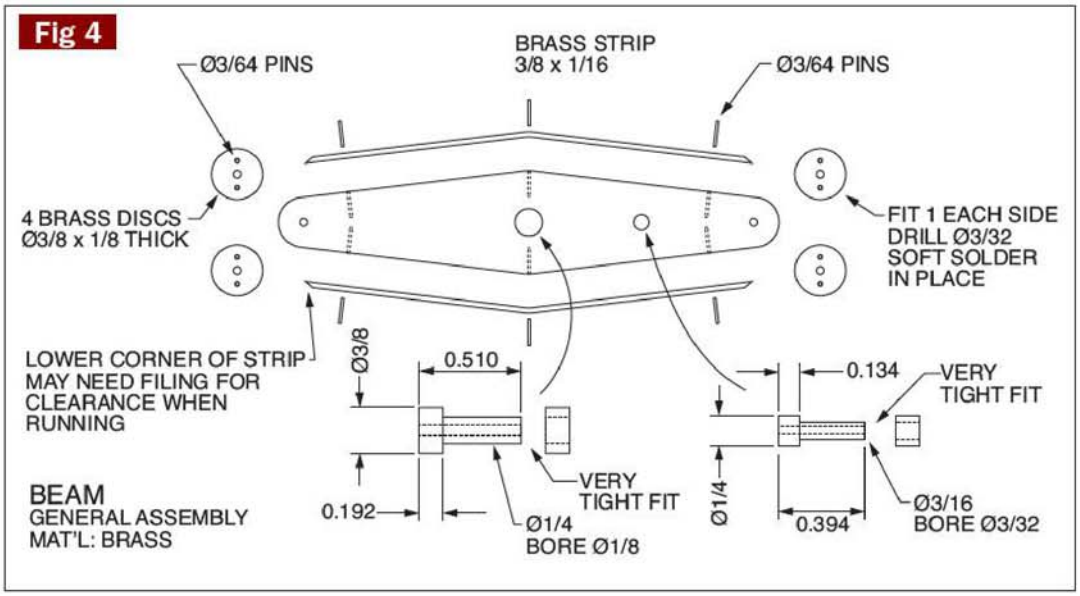


Fig 4

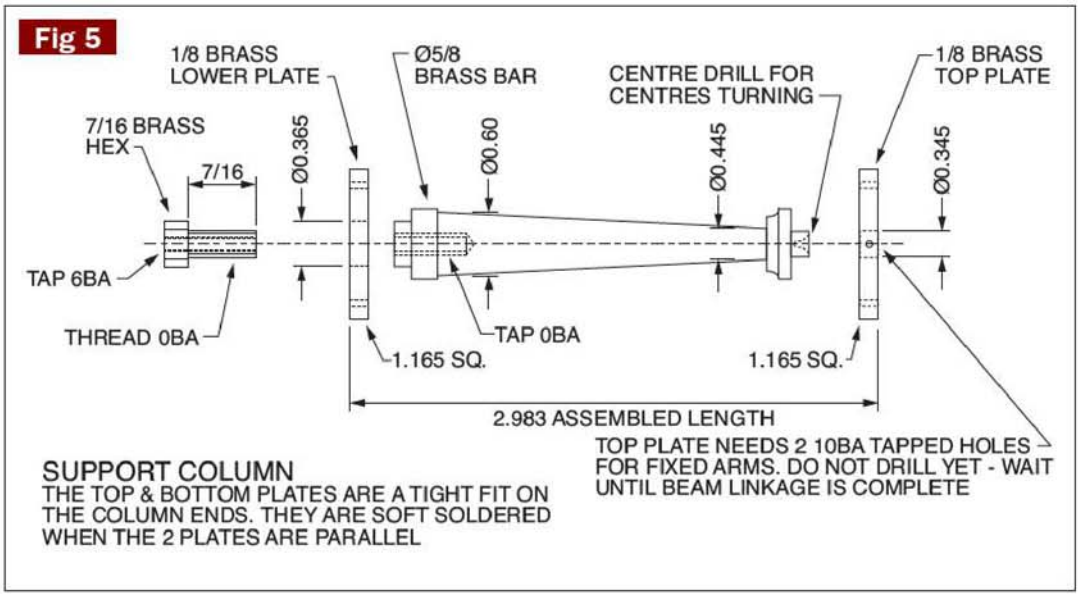


Fig 5

Matthew Murray's Rack Locomotive of 1812 for the Middleton Railway

ANTHONY MOUNT

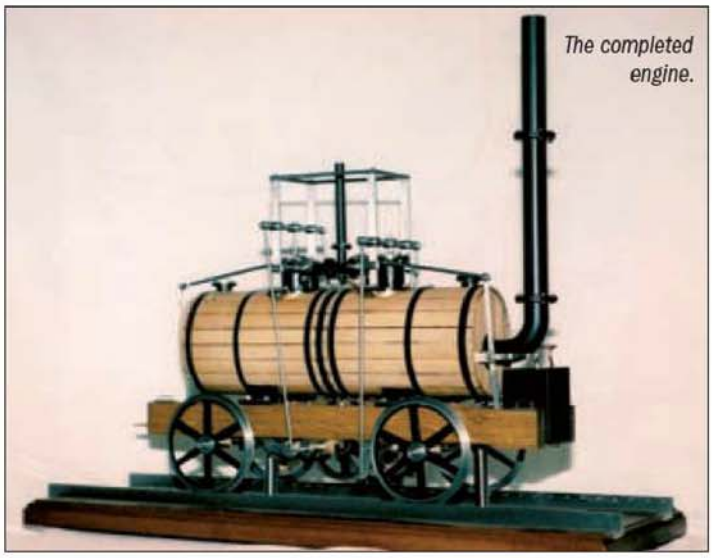
Anthony Mount begins construction of his new locomotive project with the mainframes and boiler.

PART 2

Continued from page 513 (M.E. 4363, 23 October 2009)

The main frame for the engine is a wooden framework and I am inclined to think that the material for the prototype would have been oak (Part 01). Extensively used in shipbuilding at the time, it was readily available. Interestingly, there was a timber supplier cartel during part of the Napoleonic period and Nelson had to go on a tour of the major timber suppliers to get material released for the repair and building of the navy including his flagship *Victory*.

We can use oak for the model but do try and get as close a grain material as possible to maintain scale. The frame is very simple consisting of two longitudinals and two cross beams. The cross beams are tennoned into the longitudinals and for the model can be glued together. I expect the prototype would have been wedged and doweled and may even have had wrought iron tie rods as well.



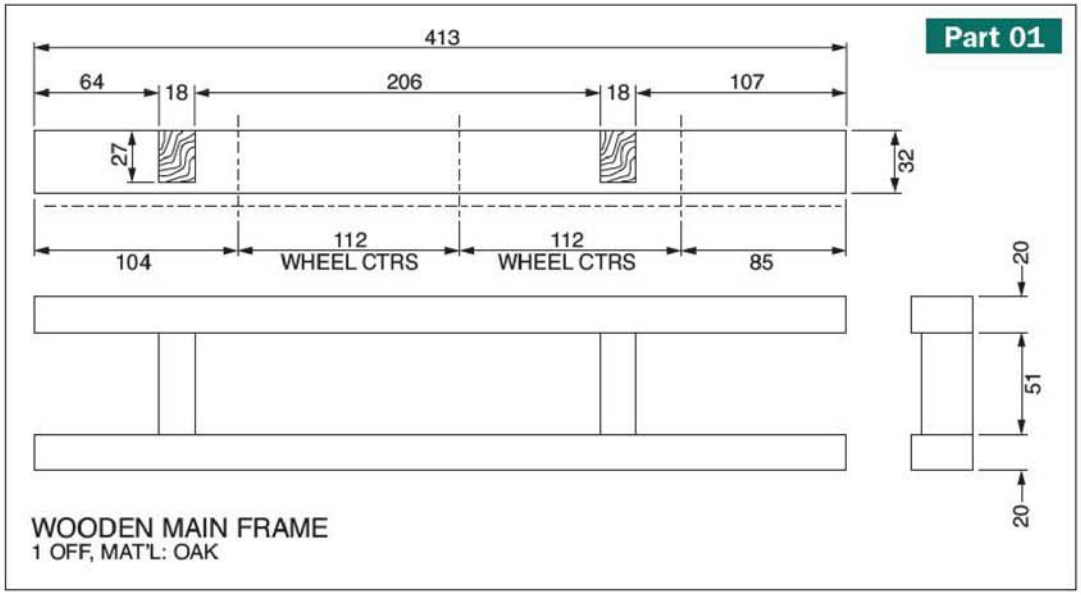
The completed engine.

At the front end there is a 3mm thick sheet fixed to the underside of the main frame to support the water tank, and at the rear end there is another area of boarding that serves as a footplate. The piece at the front end can be glued direct to the framework. The footplate is supported on a couple of 5mm square strips glued to the inside of the frame.

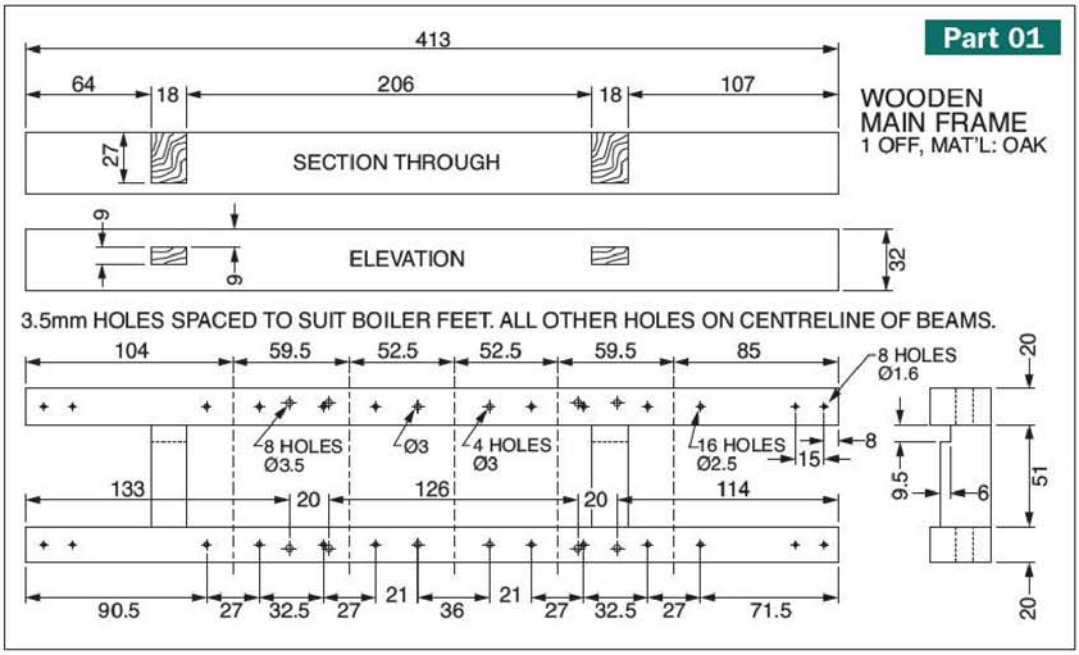
PVA adhesive is suitable for all the gluing work. Once assembled and cleaned up the woodwork should be clear polished to keep it clean. I used Sanding Sealer which I find one of the easiest polishes to apply and gives a nice semi matt sheen to the woodwork.

There are quite a few holes drilled in the frame for studs to bolt on the bearing blocks and boiler. A few of the holes are very close together where the boiler legs overlap studs. These can be drilled only halfway through and tapped to take shortened studs.

It is quite easy when drilling wood, especially from a hole started with a bradawl, to run off centre. I would recommend clamping the frame to the milling machine table and setting out and drilling all the holes using co-ordinates. Place a piece of plywood under the frame to protect the table from the drill.



WOODEN MAIN FRAME
1 OFF, MAT'L: OAK



Boiler (Part 04)

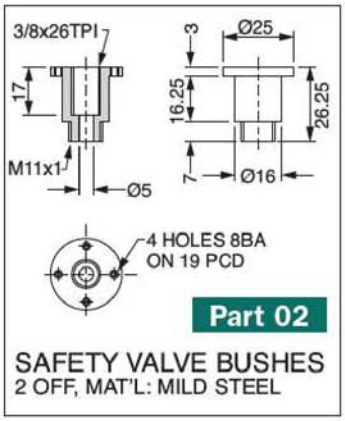
As previously mentioned the model has a non-working boiler, but it does need something of the right shape on which to hang all the other pieces. The full-size boiler of cast iron was elliptical in section and was virtually two Trevithick boilers bolted back to back.

I searched around and found a piece of aluminium tube 3¼in. dia. for the outer barrel and a flue tube of 1½in. dia. copper. The end plates were turned from mild steel and the whole lot was glued together with Araldite. The bushes were turned from mild steel and were screwed and glued into position. You could make the whole thing from steel if you can obtain suitable section tube.

Photograph 3 shows the boiler clamped down on the milling machine table for boring out the holes for the cylinder bushes. As can be seen, a mild steel bar passes right through the furnace tube with a clamp ≫

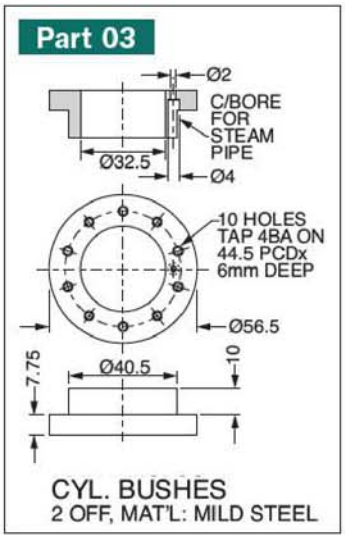
Safety valve bushes (Part 02)

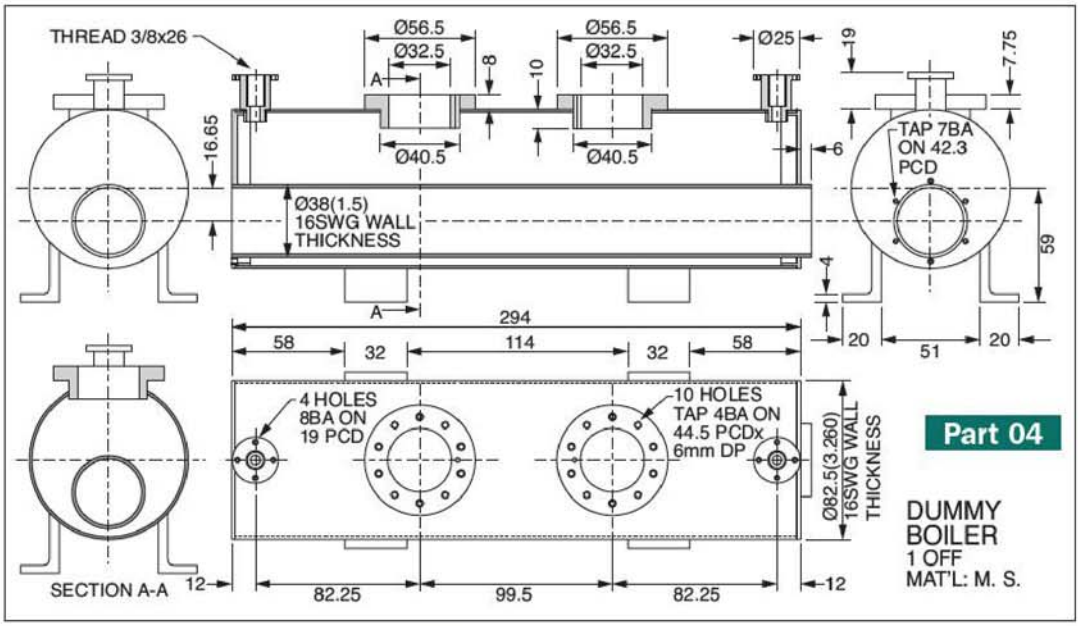
Two bushes at each end of the boiler contained the safety valves. As our boiler is a dummy the bushes can be made from mild steel. A simple turning job the bottom spigot can be threaded and screwed into the boiler shell.



Cylinder bushes (Part 03)

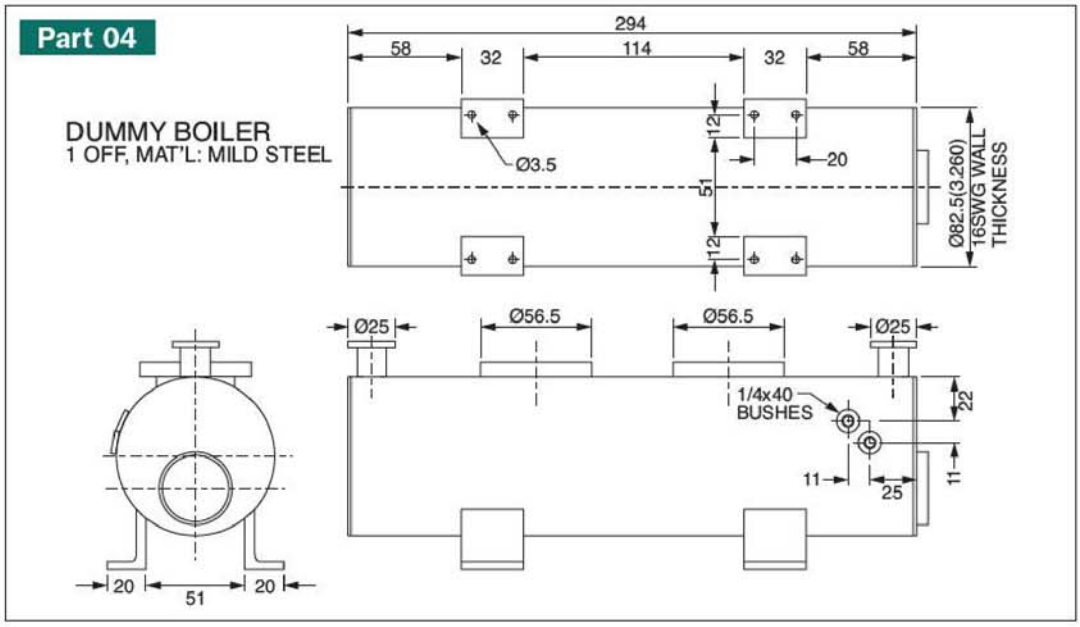
Two large bushes are fitted into the top of the boiler to receive the cylinders. Turned from mild steel, they are a simple job; the stud holes can be drilled and tapped using a dividing head (**photo 2**) before being fixed to the boiler. See also the steam entry hole and counterbore which will require pipe connections to the outside of the dummy boiler so that it does not become a pressure vessel.

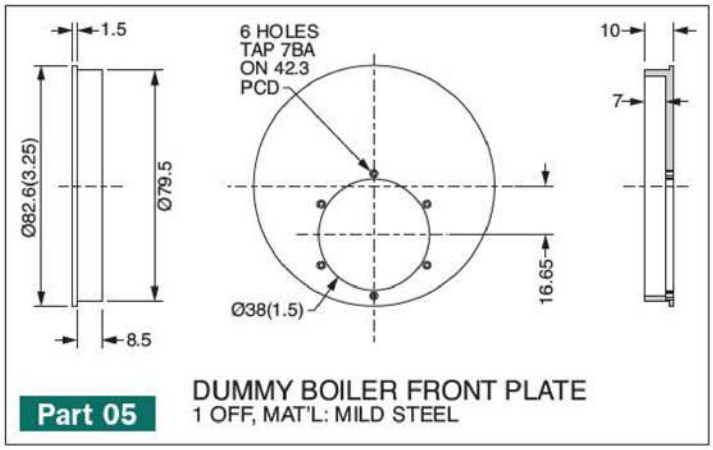


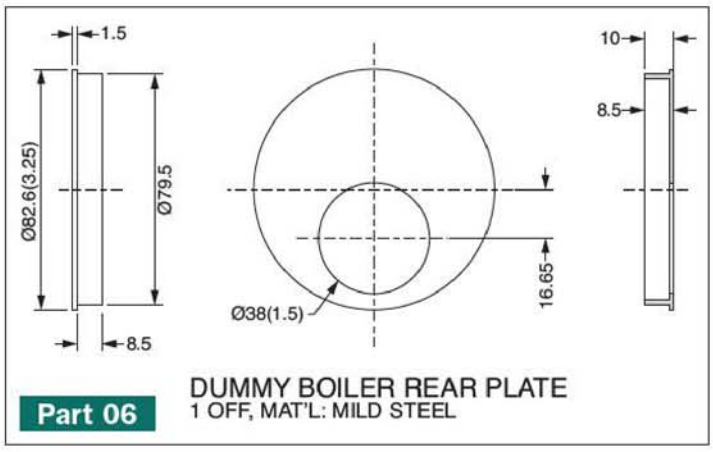


Drilling the cylinder mounting stud holes.

Boring the holes in the boiler.

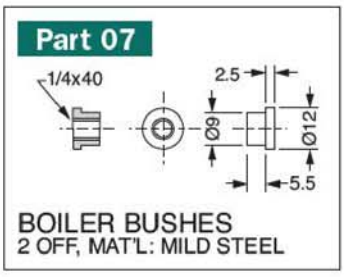






each end. The holes for the safety valve bush can be drilled at the same setup.

The legs of the boiler were cast in on the full-size engine but on ours are separate. Also, in view of using an aluminium shell, I made up the legs attached to a cradle that was screwed to the boiler shell, the whole of the cradle being hidden underneath the boiler lagging, (**photo 4**). The two leg assemblies can be seen in **photo 5**. The elliptical section was obtained by shaping the wooden lagging to the required section, and this was also glued into place using Araldite. Additionally there are steel bands as well to hold the lagging in place.



On the existing models the lagging appears to be varnished pine and, if you can obtain some close grained pine, this will do nicely. However, as pine is a softwood with a somewhat open grain and there are quite a few small pieces to be cut around the cylinders, you might consider a light coloured close-grained hardwood such as beech as a substitute. Though harder you may find it easier to work with in small pieces.

It would be perhaps advisable to place an engraved plate on the engine saying that the boiler is a dummy and under no circumstances should one try and raise steam in it. Who knows where your engine will go or who gets hold of it in the future?

Boiler end plates (Parts 05 and 06)

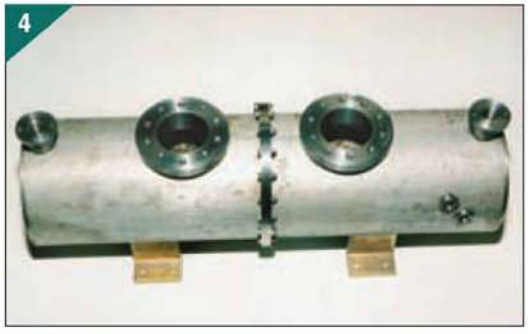
The two end plates for the boiler are turned from mild steel blanks and are fixed into the boiler barrel with Araldite or similar epoxy adhesive. They are turned down as spigoted flanged plates and are bored out to take the flue tube.

As the flue tube is offset the boring out was done on the milling machine and the setup can be seen in **photo 6**. Two necked clamps are used with a thin piece of mild steel under the end plates to protect the milling machine table.

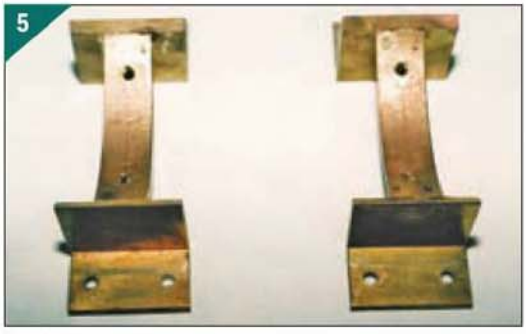
Try cock bushes (Part 07)

Two small bushes are fixed into the side of the boiler to take the try cocks. Again, they are simple turning jobs glued into the boiler.

To be continued.



The boiler showing the supports underneath.



The boiler supports.

Boring the boiler ends.

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ID90

Headlamps for the *Princess of Wales*

TONY MEEK

Tony Meek adds the lenses.

PART 2

Continued from page 464 (M.E. 4362, 9 October 2009)

The lens bezel is a turned piece of brass with a step on the spigot for accurate location in the front panel for a silver soldered assembly (**fig 4**). I left the stepped spigot long so I could turn the front and inside of the bezel, then after brazing, I loctited the assembly onto a mandrel and turned off the spare piece of spigot, flush with the inside of the front panel (**photos 8**, **9**, **10**, **11** and **12**). The front panel was then assembled onto the body (**photo 13**).

The finished lamps.

8

The lens bezel with extended spigot.

9

The bezel soldered to the front plate.

10

The bezel mounted on a mandrel.

Fig 4

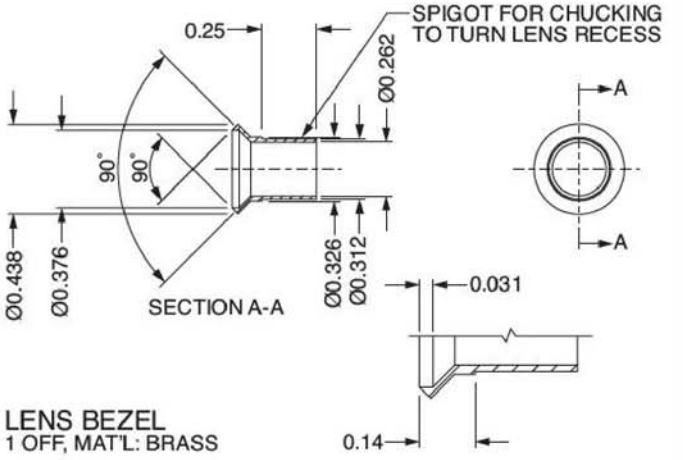


Fig 5

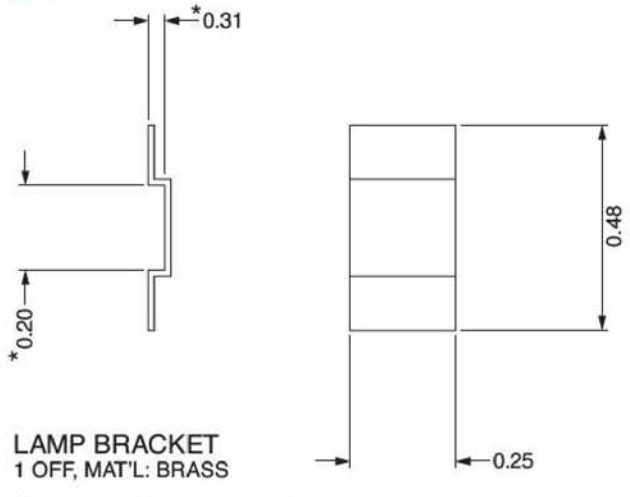
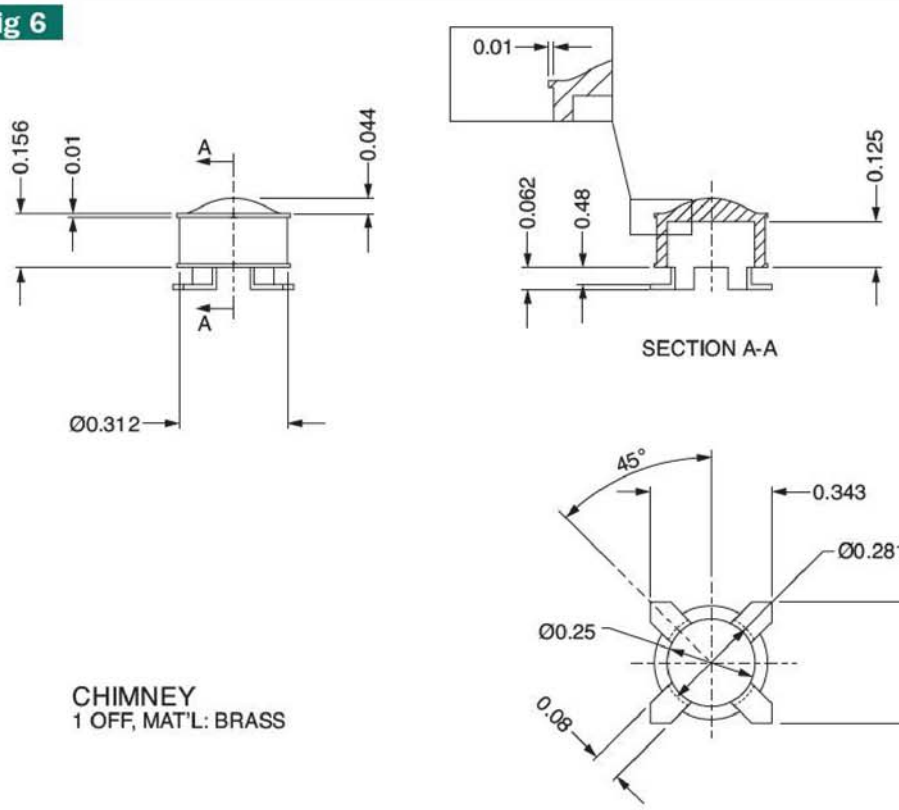
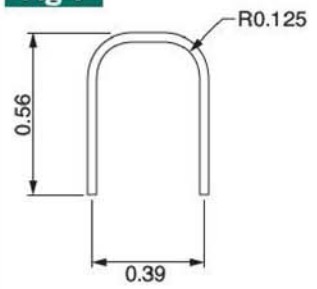


Fig 6



CHIMNEY
1 OFF, MAT'L: BRASS

Fig 7



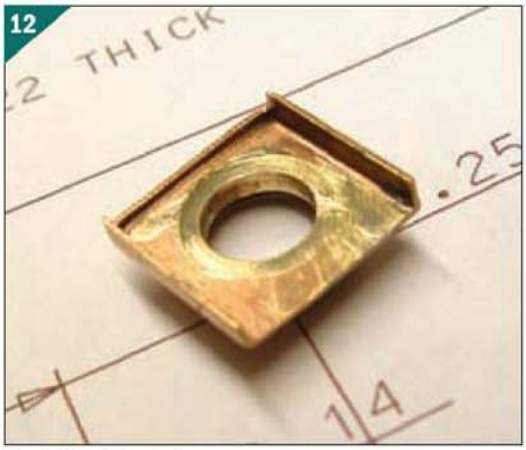
HANDLE
1 OFF, MAT'L: Ø0.04in
STEEL WIRE

The lamp bracket is a simple 'top-hat' section which is soft-soldered to the back of the lamp body with a couple of 1/32in. rivets popped in for appearance (**fig 5**).

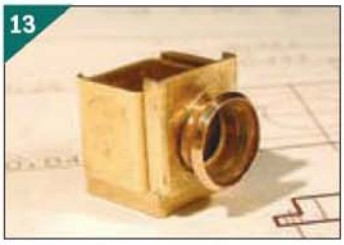
The chimney (**fig 6** and **photo 14**), handle (**fig 7**) and lamp body top (**fig 8**) sub-assemblies are straightforward examples of milling, drilling and turning and in the case of the chimney, a bit of jig filing to form the feet. The handle was silver-soldered into the lamp body top to which the chimney was soft-soldered using a simple positioning mandrel.

To be continued.

11 *Removal of excess spigot.*

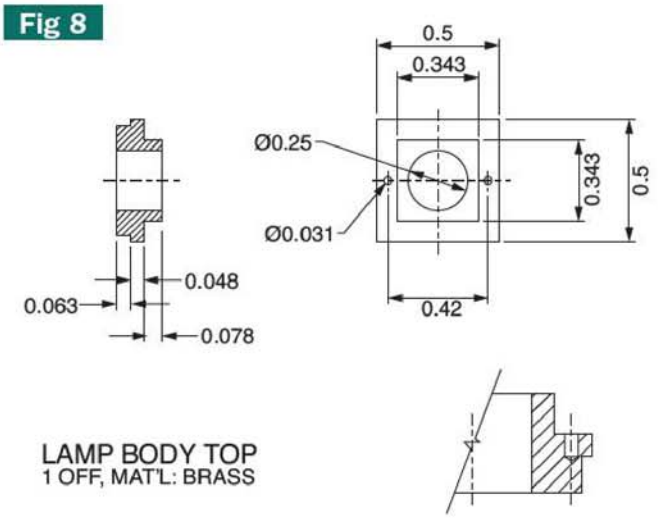


12 *The finished front plate.*

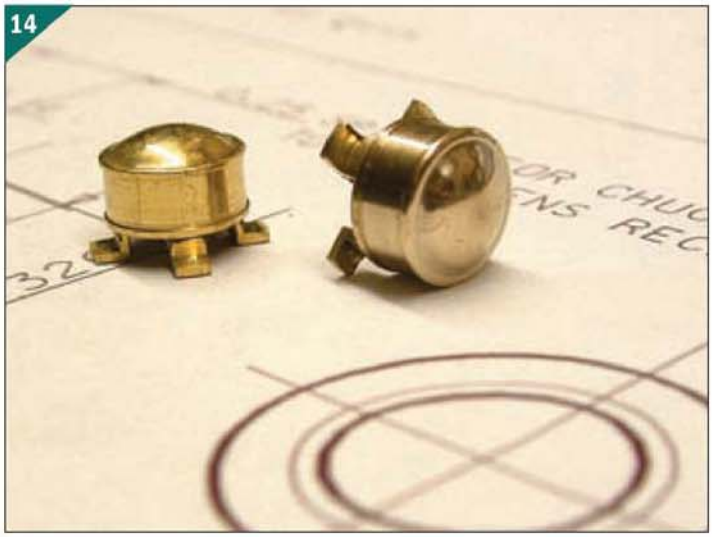


13 *Front panel and bezel assembly fitted to body.*

Fig 8



LAMP BODY TOP
1 OFF, MAT'L: BRASS



14 *Chimneys with jig filed feet.*

ALAN CROSSFIELD

Alan Crossfield continues with the tender.

PART 9

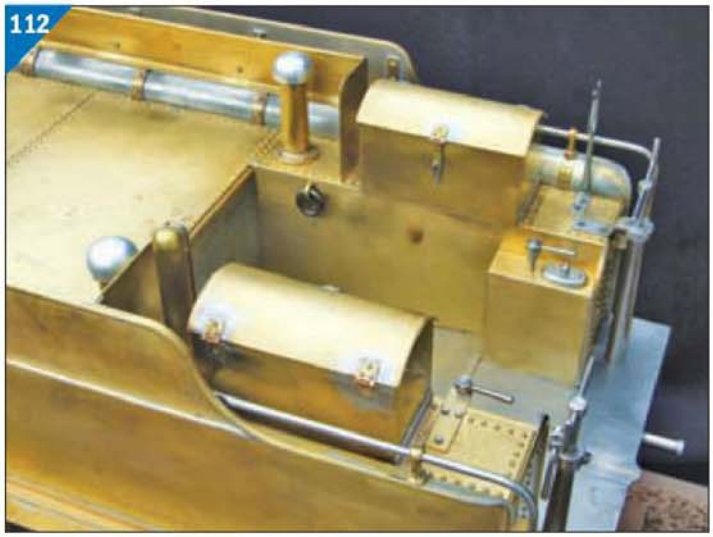
Continued from page 461 (M.E. 4362, 9 October 2009)

The finished model.

Empire Building

Unlike the concealed rivets on the water tank sides and rear, those positioned on the tank top present visible heads. In the Edwardian era of full-size construction, the riveter would take up position outside the tank whilst his mate, or apprentice, would be despatched to the cramped confines of the tank interior. Equipped with appropriate tools (I am not sure when pneumatics came in) the unfortunate soul within would have to deal with each red-hot rivet as it was hammered through its pre-drilled hole - not possible on a 5in. gauge model! Around 500 holes of 3/64in. dia. were drilled in the four panels that make up the tank top of the model. The rivets themselves were brass and are dummies in as much as they play no part in securing any of the panels in place. The rearmost panel was made detachable in order to access the filters etc. while the remaining panels were secured by several countersunk setscrews. Under normal conditions slot headed setscrews are not very welcome on a model of this scale; they look incorrect even when as small as 12BA. The dodge I've used is to hide the screws within the lines of rivets: 12 screws secure the centre portion of the tank top, and their heads are now extremely difficult to see under normal conditions - the eye views the lines of rivets and looks for a misalignment or an irregularity in the spacing. No adjustment was made to the spacing of the rivets, the countersunk head of each screw completely filling the space between two adjacent rivet heads.

Photograph 112 is a general view of the forward portion of the water tank. All riveting had been completed at this stage and most of the fittings are in place. Predominantly visible are the two toolboxes; these are simple fabrications, produced from 18swg brass plate. Silver solder has been used for the main joints whilst a combination of rivets and soft solder secures the hinges and latches. Directly ahead of both toolboxes are the injector water-valves. Other visible details are the left-hand side lifting ring and the sandbox lid. Both these fittings are duplicated on the right-hand side. To the rear of the right-hand side toolbox is



Fixtures and fittings on the tender top.

Making the water level indicator.

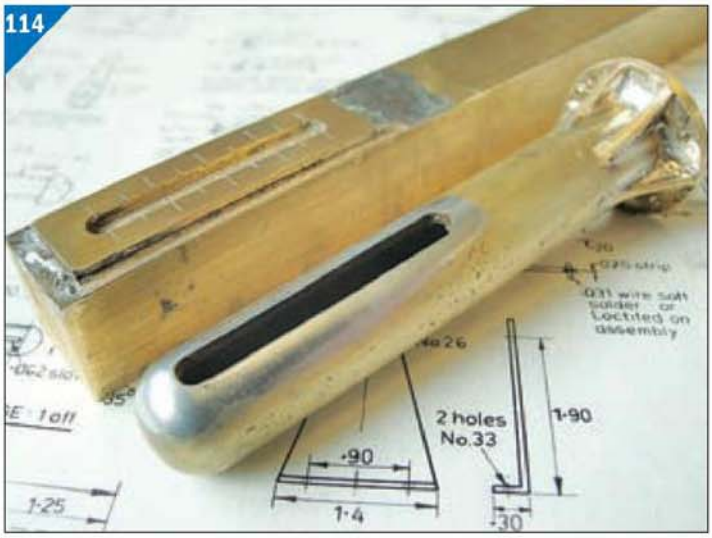
the water-level indicator. This is a fabricated item and can be seen in its part-built form in **photo 113**. The upper portion of the housing has been slotted in order to accommodate the movement of the indicator itself, whilst the base has been slotted to maintain the position of the two opposite gussets during silver-soldering. Other remaining gussets will be temporarily positioned by external means - anything that will keep them static for the duration of the silver-soldering process.

Photograph 114 shows the water-level indicator at a later stage. The gussets have been secured, trimmed and shaped to create the impression of a casting. The area around the slot has been tinned with soft solder as a prelude to the fixing of the indicator plate. The indicator plate itself is shown temporarily soft-soldered onto a piece of ½ x ½in. section brass. This has enabled the plate to be held securely during the process to mark off the graduations. A tri-square and scriber were the tools used.

Water pick-up apparatus is represented on the model by several visible components. On the front right-hand side of the tank can be seen the water-scoop operating column (**photo 115**). A vertical slot has been machined into the operating spindle, its purpose being, to accommodate the latch of the water-scoop locking mechanism.

Photograph 116 shows the early GWR combined water-filler/water pick-up box. In full-size practice, this arrangement was later replaced by two separate structures - (see photo 102, *M.E.* 4362, 9 October 2009).

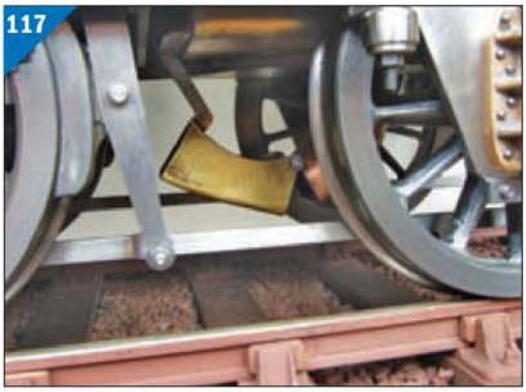
As water troughs no longer exist on any full-size railway, much of the pick-up apparatus has been removed from many of the surviving tenders. I was unsuccessful in my attempts to track down and photograph a preserved example of the scoop itself or any pictures of the original equipment. On the model, the water-scoop itself is represented by the hinged fabrication shown in **photo 117**. Also visible are some components of the brake rigging.



The graduation plate.


Water scoop operating column.


Combination water pick-up and filler.


Water scoop and brake rigging.

Final details

Prior to the advent of water troughs, tank ventilators were unnecessary; their function, on a tender so equipped, was to provide a quick exit for the air displaced by the fast inrush of water whilst passing over troughs. Two are to be found on the model, they are dummies and the method of producing them can be seen in **photo 118**. When completed, each ventilator was secured to the tank top by 4 x 10BA hexagon headed setscrews.

Tender brakes are operated in the normal manor by the rotation of the brake column handle. This action transmits movement to the right and left-hand side pull-rods. A brake adjuster is integrated into each of the pull-rods and is located inboard of its respective leading wheel. When correctly adjusted, all three axles may be locked by the clockwise rotation of the column handle - most useful during the preparation and disposal of the locomotive.

Photograph 119 shows the brake column and handle. Other visible details include the sandbox filling cap and operating handle (lower left). The tall elaborately shaped item is the fire-iron stowage bracket whilst directly behind can be seen one of the more tricky parts to manufacture. This is one of the two special handrail-stanchions mounted on the curvaceous upper portion of the side panel.

Details common to both locomotive and tender were those of their respective buffer-beams and in **photo 120**, components of the train brake connection pipe are laid out. Some parts are at an early stage of production whilst others are almost complete.

The 'Swan Neck'- **photo 121**, was made mainly from 3/16in. dia. copper tube. Solid bar was used at the point of the tight bend in order to avoid kinking. Other sharp bends or corners were created by firstly cutting a 'V' section out of the tube wall at >>


Making the tank ventilators.


Details of the tender front.

The train brake components.

Heat shrink sleeving (before).

Heat shrink sleeving (after).

the point of the proposed angle. This would allow the pipe to be bent sharply and close the gap. Any small gaps then remaining would be filled and the bend re-strengthened using silver solder.

For the flexible portion of the brake pipe, the coil spring was enshrouded for its full length, by heat-shrink sleeving. Very little heat was required to shrink the sleeve; a hairdryer may have been a more appropriate tool than my choice of a very soft propane flame. Heat was applied from a generous distance and the result turned out okay (**photo 122**).

Photograph 123 shows most of the parts (finished and unfinished) required for one pair of screw couplings. Of particular note is the method of creating the coupling shackles. After completing the 'U' bend, each shackle was silver-soldered onto one end of a length of ¼in. dia. bar. The component can then be easily gripped in either the lathe chuck or the vice. The former will be used to drill out the bosses whilst the latter will be used during further sawing and filing operations. Likewise, most of the work required to create the trunnion bosses will be carried out whilst the components remain connected to the parent bar stock.

Letter punches were used to stamp GWR onto the circular weight of the screw-arm. Initial attempts to use the punches freehand resulted in crooked and unevenly spaced letters. Eventually they were indexed using the cross-slide of the Myford. A simple guide was produced and held in the tool post whilst the circular weight was held in a fixture secured to the bed of the lathe. A spacing distance of 0.070in. between each letter, enabled GWR to be contained within the 5/16in. dia. disc (**photo 124**). Four split-pins complete the final assembly of the two connecting shackles onto their respective trunnion bosses. I must emphasise that these are scale couplings and that other than the hooks themselves, the components are not suitable for passenger haulage.

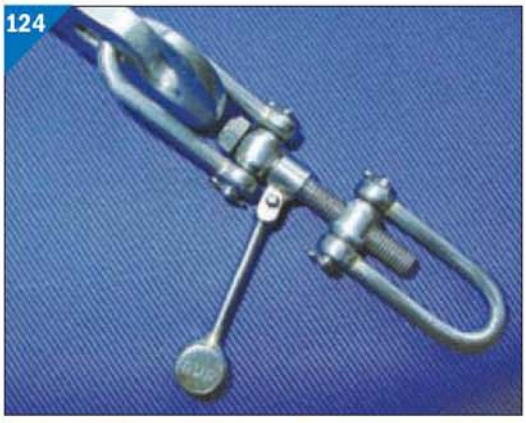
Photograph 125 shows a buffer-beam complete with finished coupling and train brake pipe. Each buffer stock is attached to the beam-plate by four scale nuts and studs.

Many years ago, I witnessed an accident in which a heavy locomotive (a 5in. gauge Britannia) hit the deck whilst being manhandled by two people. The person at the front had a firm grip on both buffers when suddenly the securing studs sheared. On 3405, the buffer-stocks of the locomotive have a ⅜in. dia. threaded portion that passes rearwards through the beam plate itself. Behind the beam plate, a matching nut engages the protruding thread and renders the buffer stocks usable for lifting purposes. The full weight of the completed locomotive may then be handled safely and conveniently by using the buffer stocks. Note that the buffer heads have been blackened. This was normal practice in full-size and would have been applied to most locomotives prior to their leaving the paint shop.

Painting

I always try to arrange for the painting to be carried out during the summer months. There are many sound reasons for this, one being the greater amount of daylight and another being the general increase in air temperature. Benefits of the latter are many but one of the most important is that of ventilation. This is particularly important during the de-greasing stage. For this I use 'gun wash' - a low-grade cellulose solvent available from most paint suppliers. I began by dismantling the locomotive and tender into manageable sections. The chassis, having been run on compressed air, was subjected to a thorough

Screw coupling components.



A completed screw coupling.

Buffer beam details.

Tools and finishing products.

de-greasing operation; this was due to the likelihood of it having retained some amount of lubricating oil. Smaller items, such as valve gear components, were completely submerged in solvent whilst larger parts, like frames, were subjected to a procedure best described as 'splash and brush'. Other parts having had no contact with oil such as the boiler, smokebox and tender water-tank were simply given a wipe over with a solvent dampened pad.

Paint type

Various types of paint were considered and used, the choice being based on the requirements of the location. For the wheels and frames the choice was cellulose. At the time, the latter was readily obtainable from a plentiful number of suppliers to the motorcar finishing trade. Today, thanks to E.U. regulations, the paint is much more difficult to obtain; a great pity in my view as the properties of the paint make it an obvious choice for many *M.E.* applications - quick drying, easy to apply, resistant to oils and resilient to the solvents of most other paints. One disadvantage of cellulose is that its colour stability can be unpredictable when subjected to high temperature. On a previously built locomotive, cellulose had been used on the boiler which, after several running sessions, had become darker in colour in areas subjected to the higher temperatures. Had the boiler been black, the darkening would have gone undetected; the boiler was green, however, as would be that of 3405 - for this reason a specialised paint was chosen for the boiler and smokebox. This paint, a product of H.M.G. of Manchester, has the advantage of colour stability over the relevant temperature range; it is known as TX modified synthetic enamel. A sample of GWR Loco Green (1906 - 1928) was submitted to H.M.G. and a 1-litre tin of colour-matched gloss acquired. For the smokebox, two ½-litre tins of black T.X. (one gloss, one satin) were obtained along with 2-litres of etch primer; this being composed of 1-litre basecoat and 1-litre activator. **Photograph 126** shows some of the paints, solvents and tools used in the painting process.

Having painted several model locomotives in the past I had by this time acquired some ideas concerning 'what to do' and 'what not to do' - the latter outnumbering the former in my case. High on my hypothetical list of 'what not to do' was that of painting piecemeal. This is when individual components are painted as they are produced. Readers may remember that in part one (*M.E.* 4349, 8 April 2009) I described how I'd taken the opportunity to paint the wheels prior to their inclusion in the assembly of the crankshaft. This was the first in a series of mistakes culminating in the finished colour of the chassis being somewhat inaccurate. Had the wheels been black events would have turned out more favourable, but the wheels, along with most of the chassis components, were to be finished in what the early GWR described as Indian Red (**photo 127**). Although the colour was available from the Precision Paints catalogue I had every confidence in my own ability at colour matching - another mistake! Equipped with a high quality coloured picture of *City of Truro*, I produced the paint for the wheels by mixing two standard colours from the Humbrol range; I then produced a sample plate from which a small quantity of cellulose gloss could be colour matched. The wheels were duly sprayed with said colour before being assembled within the fly-cranks. As it would be some time before the remainder of the chassis was ready for painting, I recorded the paint reference numbers along with the proportions of the mix. When the time came to resume painting three years later, the supplier of the colour-matched cellulose had gone as Humbrol's parent company Airfix was in receivership and my own supply of paint was nothing more than a dried-up tin! Thankfully Humbrol was later rescued and is readily available once again. However, during the period of Humbrol's non-availability, I was forced to re-match the paint from other colour sources. The result slowly became apparent as the new areas of applied colour became larger and I began to suspect that the colour mix contained a little too much red. By this time many of the components had been lined and lacquered.

A braver man than I may have bit the bullet and stripped the paint completely, implementing a fresh start. I decided against this mainly because of the time I had invested applying the lines. I consoled myself with the fact that a 100 years had passed since the colour was a regular sight on the GWR and that I was being over critical. Readers may by now have realised that besides being a model engineer, I am also a railway enthusiast. For those that don't know the difference, it's a case of priorities - for the model engineer, the paint finish is all-important - for the railway enthusiast - it's the colour!

Another item on the 'what not to do' list was the act of wearing a woollen pullover, or similar, during any preparation or application of paint. Woollen garments tend to moult and newly prepared or painted surfaces act like homing beacons to their hairs - another good reason for getting on with the painting when the need to keep warm is not so great.

The grand plan was to etch prime all parts irrespective of the type of metal. No further undercoat would be used, the coats of the chosen colour being laid directly over the etch primer. Spray application would be used wherever possible whilst brushing would be restricted to the application of etch primer and the painting of areas with poor accessibility. Other parts considered more suitable for brush application included components of the valve gear and motion.

●*To be continued.*

The Indian Red colour.

NEVILLE EVANS

Fair Rosamund

Neville Evans continues his GWR 0-4-2 tank locomotive *Fair Rosamund* with the cylinder drawings.

PART 4

Continued from page 468 (M.E. 4362, 9 October 2009)

The use of cylinders with valves between the bores was very common in the early years of steam engine development; in fact I would estimate that over 60% of all locomotives built for service in Great Britain used this configuration. The limitations of restricted cylinder diameter, long convoluted steam passages of small cross sectional area, lack of steam chest volume and the need for a crank axle, to mention but an obvious few, didn't really apply when these machines evolved in the middle of the 19th century. They filled the bill as small motive power which fitted neatly into restricted platform spaces, were very economical to run and to maintain and could show a remarkable turn of speed when required. Some of the 517 class lasted for over 50 years, and when Collett decided to replace them, he did so with a makeover which tidied up the basic locomotive and lasted until the end of steam on the GWR.

Our model cylinders are based on a well-proven design. Their general layout may be seen in the drawings of *Dunalastair* 3 by Mr. E. L. Pierce, which are available through *Model Engineer* and were first published on 1 February 1901. I have been able to slightly modernise the sealing arrangements using iron piston rings in iron cylinders, and O-rings or composite glass filled Nylon rings with O-ring backing in gunmetal cylinders.

Machining the cylinder blocks

I have machined quite a few of these blocks for myself and for other people, by the simple expedient of mounting them on the boring table of my trusty Myford and using a stout ⅞in. dia. boring bar, held between a 3-jaw chuck, and a revolving centre.

The dimension of 0.938in. from the port face to the bore centre is set to allow 1.125in. packing, thus bringing the centre line of the cylinder bore up to the centre height of the lathe. A piece of ⅛in. gauge plate and two 1in. spacer bars set side by side are all that is needed. The casting is held by two clamps pulling down on the bolting flange. This method ensures that the bores are not distorted by unequal pressures from above or the side. Machine the bolting face first then the port face. I always mill the port face, then linish it with a smooth belt, finally lapping against an aluminium lap.

The best way to finish off the rear end of the cylinders is by flycutting without moving the block after the boring operation. Make sure that you leave enough overhang on the boring table to use said cutter. It saves an awful lot of self-criticism. I always finish the other end on a mandrel, turned in situ from 1¾in. round aluminium bar. One problem for users of the Myford series of lathes, is that tightening the cylinder block down onto the boring table might warp the table, causing stiffness in the cross slide. Proceed with due caution and make certain that you identify the accurate rear end with a few pop marks or some such. Remember that indelible marker pen isn't indelible.

An alternative method is to hold the block in the 4-jaw chuck and to bore with the boring tool held in the tool post. Make certain that there is no lateral shake in the cross slide, and that the boring tool is as sharp as possible. I use a proprietary tool with disposable tip which I bought from one of our suppliers many years ago. I have never regretted this decision as it means that I, who is not the worst tool sharpener in the world, but must admit to being in the bottom half of the table, can always guarantee that I am using a tool tip that is sharp and of the correct form. I usually finish my cylinder bores by taking them off to my pal up the road and lapping them on his Delapena machine, which leaves a lovely oil retaining crosshatched finish.

Piston

This is made from Meehanite. I've never had much success with the push in and screw type of fitting, because I can never achieve the right fit. It means boring the piston to suit a rod of fixed diameter, not to mention the difficulty of making the rod the exact

length. We are using a ¼in. dia. piston rod so drill and ream the piston 3/16in. and counterbore as per drawing, it is then not too difficult to turn down the rod to a press fit, say 0.001in. oversize. Machine the rod to the correct length, tapping the piston end 3/16in. x 40tpi and the crosshead end ¼in. x 4tpi. Press into the piston and nut it up tight with added Loctite. Use a bronze or stainless steel nut for preference. The piston must be turned on its own rod while held in a collet, the free end being supported by a live centre. The Goodall method of holding the assembly in the 3-jaw chuck for finish turning of the roughed out piston is to chuck a piece of 7/16in. round brass, drill and ream ¼in., insert the piston rod assembly, and tighten up the chuck. It is cheap, cheerful, and just as accurate as a collet. If you turn a small shoulder on the brass bar before you start, it won't vanish into the depths of the chuck when you try to push the rod in. Take small cuts only. Turn the piston to bore size minus 0.002 inch. The sides of the ring grooves must be turned with a very small feed and a sharp parting off tool with a tiny radius on the corners. If you can rough out the ring grooves before mounting on the rod, so much the better.

Try to achieve a polished finish of ring width plus 0.001 inch. Make sure that there is about 0.006in. clearance under the ring, with a ring gap of 0.002in. - 0.003 inch. The ring itself may be lightly lapped on an aluminium lap using proper lapping compound. Brasso, Silvo, Blotto or some such is great for polishing the knocker of the old front door, but proper lapping paste will do a far better job in a tenth of the time. Ten members of our club bought a 500ml tin between them and had a large paste bottle each, which is practically a lifetime's supply.

If, like me, you decide to use gunmetal cylinders then make your piston from Heat Treated Aluminium, we used to call it Dural, and use a Fluorosint ring with an O-ring backing, or a plain O-ring.

Piston rings

If you are using proprietary rings, you have to bore to a diameter that bears an accurate relationship to ring size. Allow a gap of about 0.003 inches in the ring. If you are making your own rings (by far the favourite – use good quality cast iron and follow any of the prescribed methods,) you are not limited to spot-on accuracy in the bore because you can make the rings to suit your final dimension.

Over the last many years I have been rather dismayed by the piston rings supplied by some members of the trade. These rings are very wide in relation to their depth. I'm told that the theory is that steam leaks underneath the ring and forces it up against the cylinder wall, thus effecting a seal. Well, if this be true, Mr. Churchward wasted a lot of money in buying the patent for and then perfecting his semi plug valves, which in a rather complex manner actually do use steam to press the rings against the piston valve bores, releasing them when steam is cut off to allow freer running.

Consider the following...

The drag of the ring against the cylinder bore means that the ring is always seated on the back of the groove, which is where the seal takes place. Therefore, if the ring really fits against a highly polished groove wall, you don't get leakage past the ring. The use of a small clearance will also cut down fore and aft ring movement, known as 'ring flutter' in high-speed I/C engines.

The best thickness/width ratio of the rings seems to be about 1:1, so that a 1/16th wide ring should be 1/16th thick. This is in effect what a Clupet ring is, two 1/16th wide rings in line astern.

If you are making your own rings, you can adjust wall pressures when opening the rings and tempering them prior to finish turning. High wall pressures are undesirable for the obvious reasons that they are unnecessary for sealing and cause a lot of drag.

Contrary to what the pundits may say, ring gap is important. I would say that for a 1.125in. dia. piston, 0.002in. - 0.003in. is about right. Steam at high pressure can get through very small holes.

Rear cylinder covers

The problem here is to make the hole for the piston rod absolutely concentric with the cylinder bore. I am using a separate stuffing box cum slide bar support casting, which is a press fit in the rear cylinder cover, and is further constrained by four 8BA countersunk stainless steel screws as per the drawing. The casting has to be separate because of the need to mill right through for the slide bar mountings. Make sure that the slide bars are equidistant from the piston rod and absolutely square to it. The important thing is to turn the cylinder register, which should be a nice push fit in the cylinder bore, at the same setting as the hole for the piston rod, so make sure that the slide bar holder cum stuffing box has been permanently assembled into the rear cylinder cover. Make certain that you set the slide bar assembly parallel to the frames, both vertically and horizontally, otherwise you are in deep trouble. The lining up of the cylinder, slidebar and motion bracket group is one of the most important parts of the loco. Don't proceed any further until you are satisfied that it is correct.

Ports and passages

These may seem to be excessively large, with a corresponding waste of steam, due to the voluminous passages being filled and then emptied, at each end, and after each stroke, without doing any useful work. Not so! The passages form part of the clearance volume of the cylinder, and, as such have to be carefully proportioned to suit the valve gear and the valve setting. The object of the exercise is to compress the steam in the passage to just under valve chest pressure, so that on opening the port during the admission phase, there are minimal losses due to pressure drop in said passages, and the residual steam is warmed by compression which helps to minimise the dreaded condensation. A further advantage is that we can cut down frictional losses in the steam circuit at the same time, by allowing freer movement of the steam.

Take care, when drilling the first nervous exploratory hole between the end of the bore and the port, not to infringe too much on the bore itself for fear of snagging piston rings. Note the sectional drawing which shows the sort of minimal clearance that must be maintained at all cost.

Slide valve assembly

I first tried the idea of enlarging the slide valve sideways so as to fit the valve chest closely on the two Highland Railway engines and think that it has proved a success. The scheme was to simplify the buckle so as to make it a simple turning job, and to eliminate the need for a careful hand fit, buckle to valve. Thumbing through an old reference book the other day I came across a sectional drawing of a 'Bellis & Morcom' valve chest . There it all was, just a few thou. clearance between valve and chest wall, so simple, so obvious, and if it's good enough for Bellis & Morcom it's good enough for anyone. The next step was to do away with the front piece of the valve rod, a tricky thing to get right, and if it ain't there, it can't go wrong. Can it?

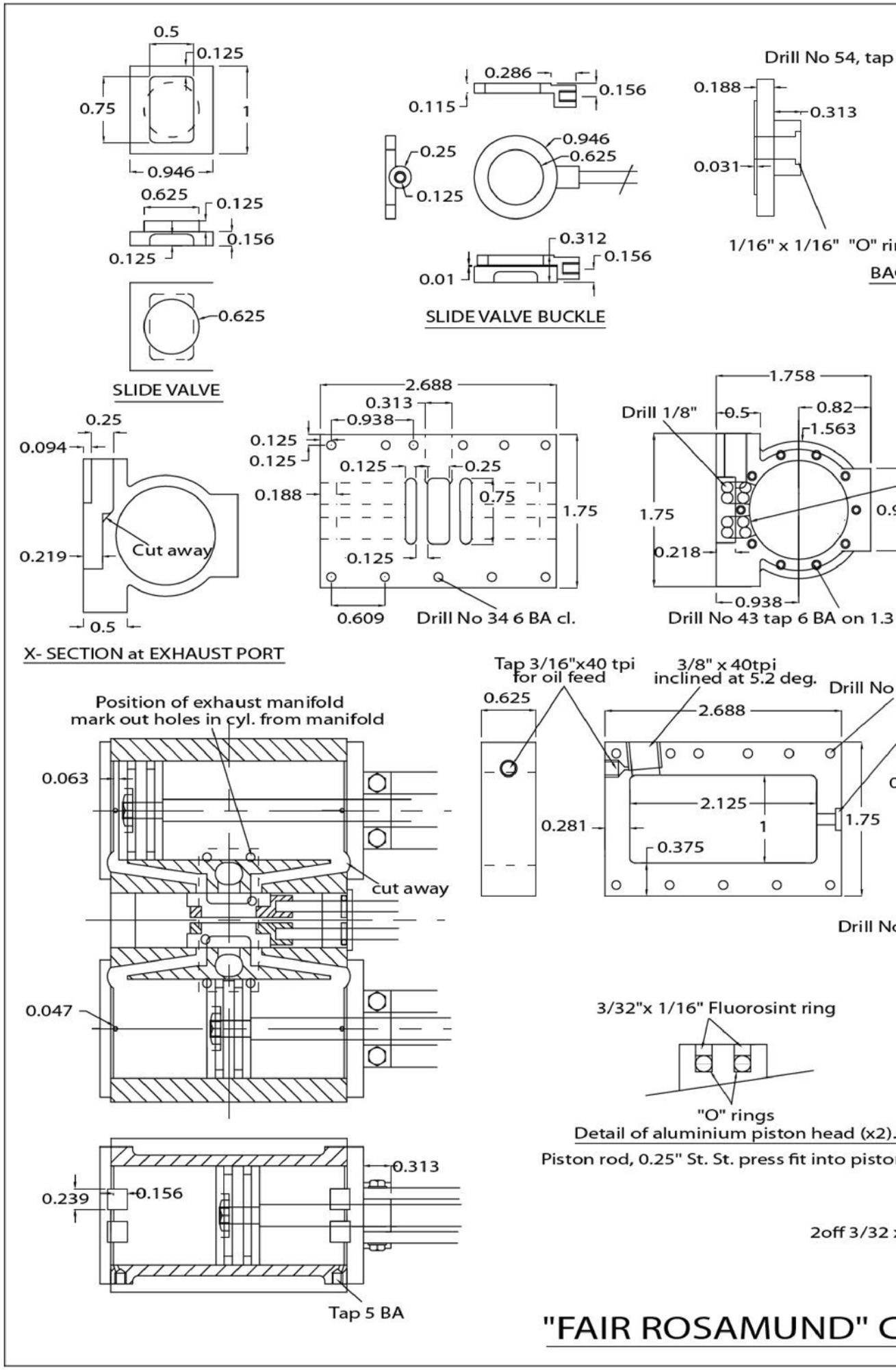
Valve chest cover and lubrication

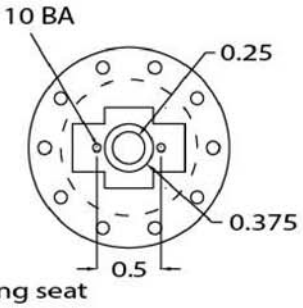
Oil is pumped into the steam line where it enters the valve chest thus ensuring equal distribution through said chest. The only point to watch is that the union nut does not extend so deep as to obstruct the flow of oil.

Motion stay

I have had to modify the motion stay, to close the slidebars up a little for clearance reasons that weren't apparent in the first drawings (i.e. I goofed). Take great pains over this large stay. The accurate positioning of the two complex holes that hold the slide bars is vital to ensure that you finish up with a smooth running engine.

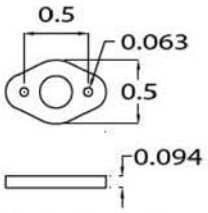
To be continued. >>


0.5
0.125
0.75
1
0.946
0.625
0.125
0.156
0.125
0.625
SLIDE VALVE
0.286
0.156
0.115
0.946
0.25
0.625
0.125
0.312
0.156
0.01
SLIDE VALVE BUCKLE
Drill No 54, tap
0.188
0.313
0.031
1/16" x 1/16" "O" ri
BA
0.25
0.094
Cut away
0.219
0.5
X- SECTION at EXHAUST PORT
2.688
0.313
0.938
0.125
0.125
0.125
0.25
0.188
0.75
1.75
0.125
0.609
Drill No 34 6 BA cl.
1.758
Drill 1/8"
0.5
0.82
1.563
1.75
0.218
0.938
Drill No 43 tap 6 BA on 1.3
Position of exhaust manifold
mark out holes in cyl. from manifold
0.063
cut away
0.047
0.313
0.239
0.156
Tap 5 BA
Tap 3/16"x40 tpi
for oil feed
3/8" x 40tpi
inclined at 5.2 deg.
Drill No
0.625
2.688
2.125
1
1.75
0.281
0.375
Drill No
3/32"x 1/16" Fluorosint ring
"O" rings
Detail of aluminium piston head (x2).
Piston rod, 0.25" St. St. press fit into pisto
2off 3/32
"FAIR ROSAMUND" C

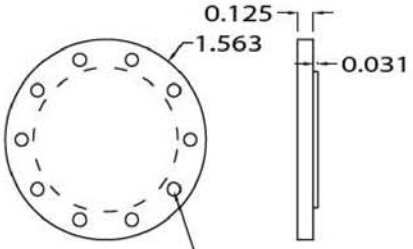


ng seat

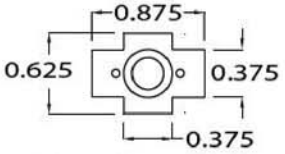
CK CYLINDER COVER



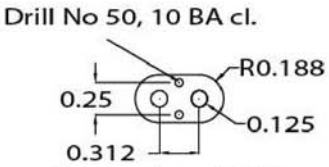
"O"ring retainer



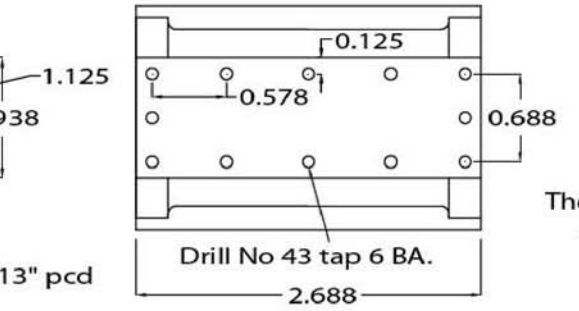
Drill No 34 6 BA cl.
FRONT CYLINDER COVER



Detail of slide bar fastening



Steam chest "O" ring retainer 3/32" brass.

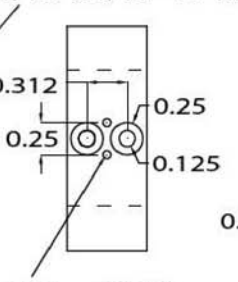


13" pcd

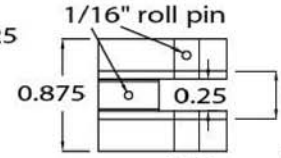
The cylinder steam passages may be left as two 1/8" holes, or blended into one hole using an end mill or a "D" bit, cut away end covers to suit

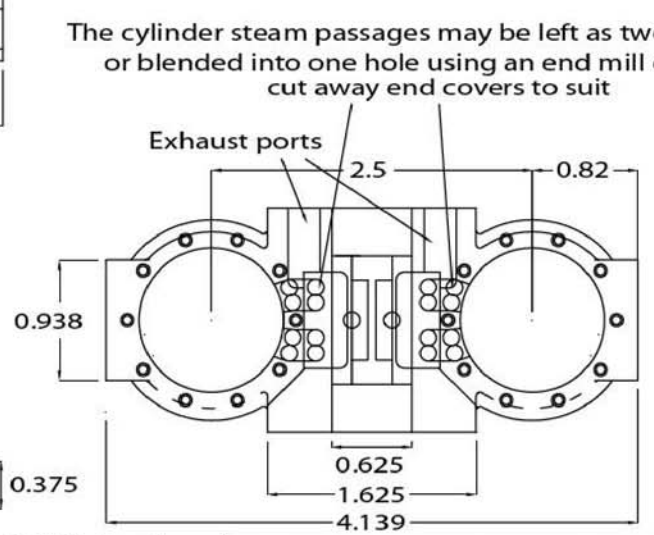
34 6 BA cl.

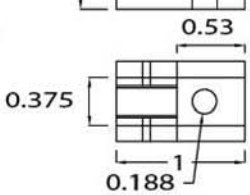
1/16" x 1/16" "O" ring seat



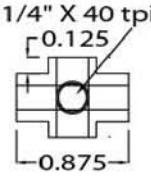
o 54 tap 10 BA.



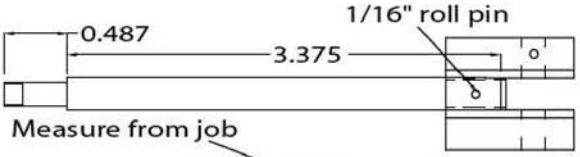




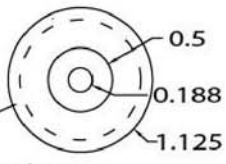
CROSSHEAD 2off
Gun metal



N.B. Cylinders may be supplied in cast iron, use cast iron piston with cast iron rings, or in gunmetal, use dural piston with PTFE (i.e. fluorosint) rings with an "O" ring underneath. as per detail drawing..

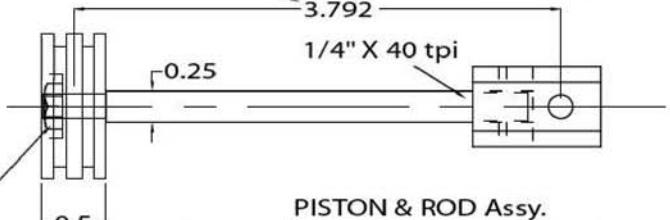


n.



x 3/32 C.I. piston rings

PISTON Cast iron



Nut 3/16" x 40 tpi. St. St

PISTON & ROD Assy.
Piston rod, 0.25" St. St. press fit into piston.

CYLINDERS

Shand Mason Steam Fire Engine in 1:6 scale

GÜNTER KALLIES

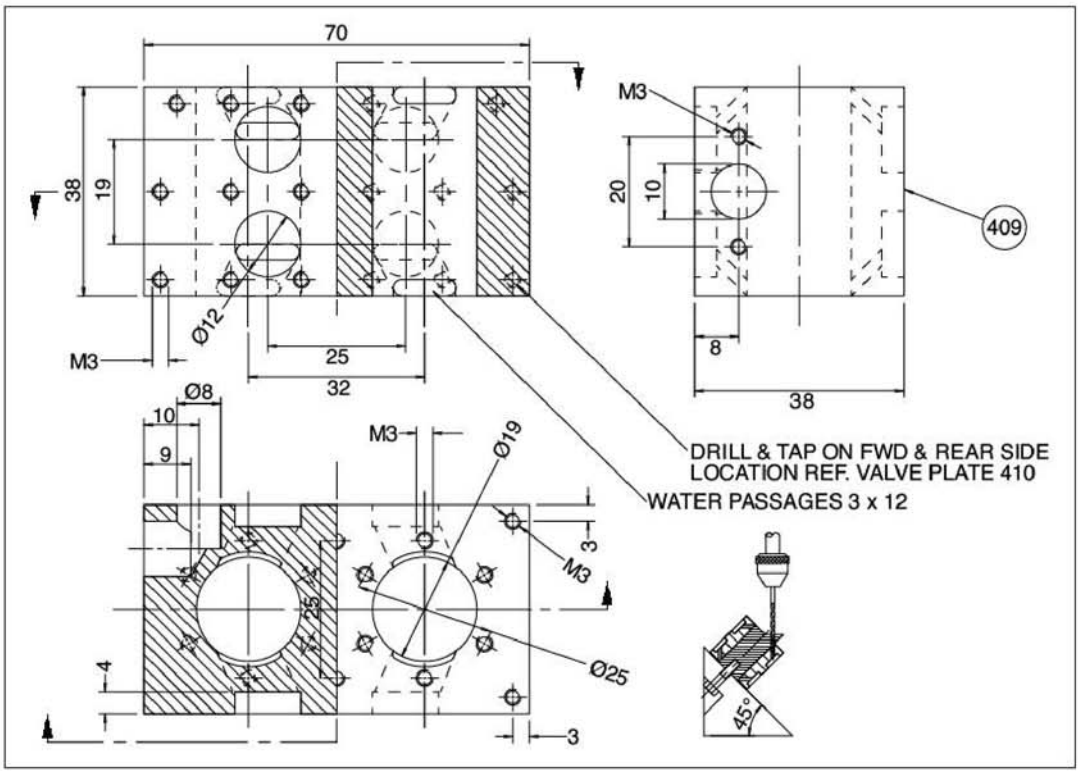
Günter Kallies continues the description of the pump and engine of his horse-drawn fire engine of 1890.

PART 7

Continued from page 481 (M.E. 4362, 9 October 2009)

All the individual parts for the piston rods and yokes should, without exception, be made out of stainless steel. The profile for the **yoke beams** (**431**) or (**434**) and (**435**), should be machined out of suitable 5mm sheet metal. Then 7mm wide strips can be separated, which must be drilled, tapped and rounded at the ends. Care should be taken to mark out and drill the holes as accurately as possible, also to tap them squarely so that they will fit truly on the rods. The accompanying piston or **valve rods** (**430**), (**432**) and (**433**) are screwed to the yokes and sweated in addition to produce a permanent assembly.

A Shand Mason single pump engine.



Spacer bushes (436 and 437)

These are also best made out of stainless steel. Maintain the same length of the corresponding parts. This is most important to ensure parallel assembly of the yokes, otherwise the alignment of the pistons and plungers will be affected when the complete rod system is assembled.

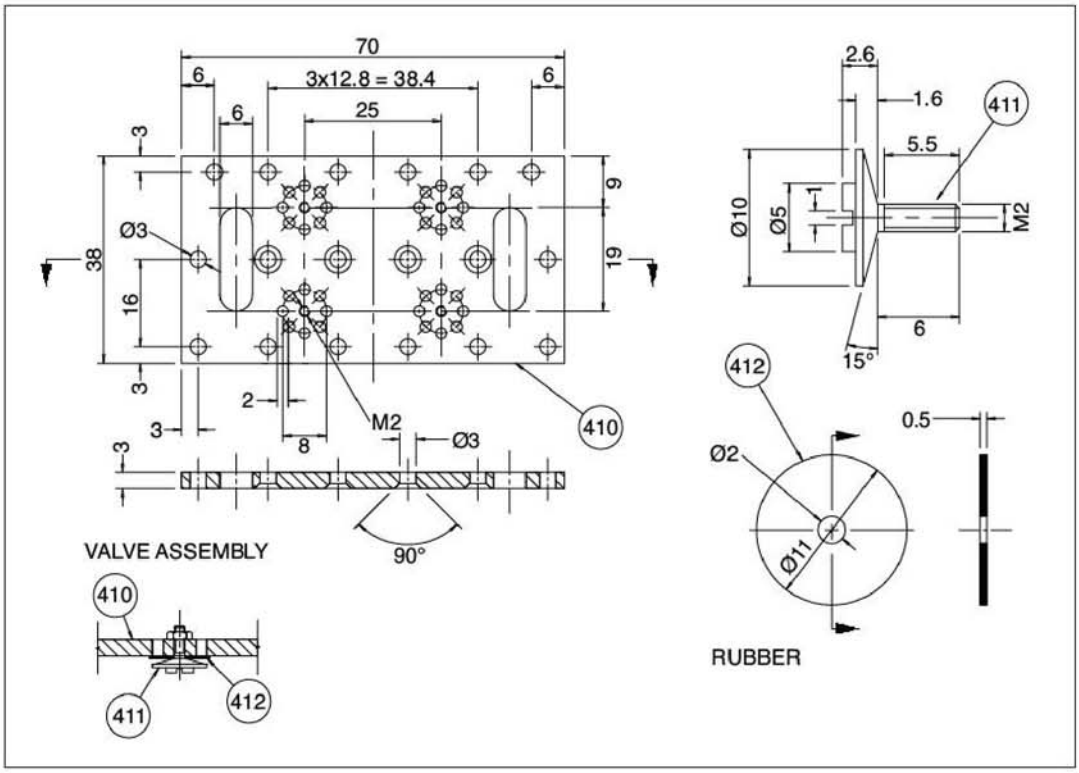
Brackets (438 and 439)

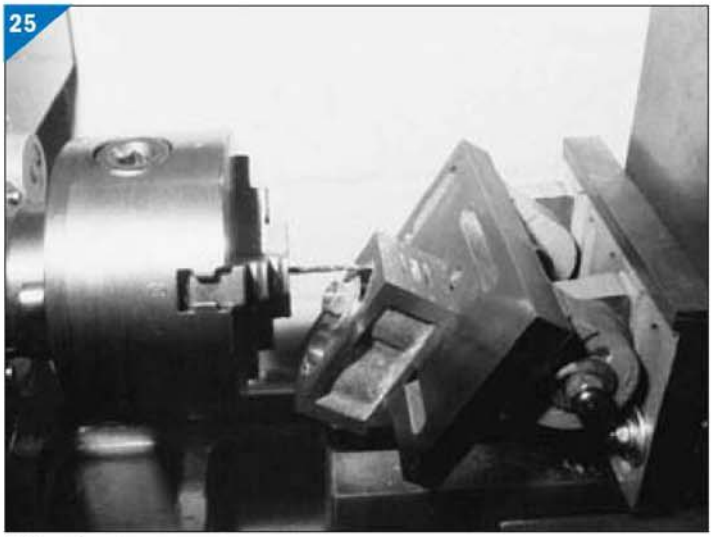
The last parts of this assembly are the attachment with which the complete steam pump is attached to the boiler. These parts can be best made by sawing out from a piece of square pipe 40 x 40 x 2mm, which is commercially available on the market and can be found, sometimes, in a scrapbox. Once again, stainless steel is recommended for these components, but mild steel will do the job just as well. Alternatively, the brackets can be cut out and formed from sheet metal and bent to shape, but in this case care should be taken with the sharp bend to avoid cracks. The position of attachment holes should be carefully checked with its counterpart, the steam pump or the support ring on the boiler respectively.

The components should be assembled using model hexagon bolts. These screws should have a smaller hex width, but an increased head height. That looks much more realistic on a model. Rustproof screws made from brass or stainless steel is the better choice. The backside **pump lid** (**416**) is fastened with M3 countersunk screws.

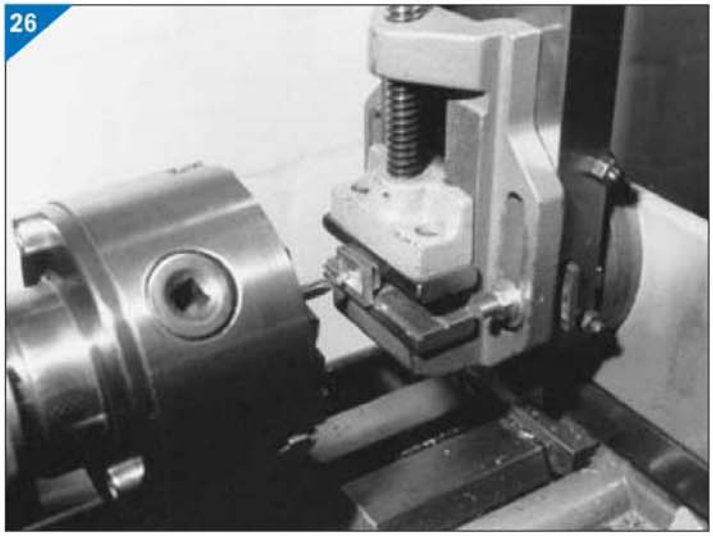
For the cylinder front and rear cover plate 0.7mm sheet metal is recommended, the cover plates are fastened to the cylinder block using some short M1.4 screws.

Care must be taken on assembly of the components. All joints of the cylinder block or pump block must be steam or water tight. Make sure that the joint surfaces are flat and even; they may be finished by lapping. To seal the joints, thin

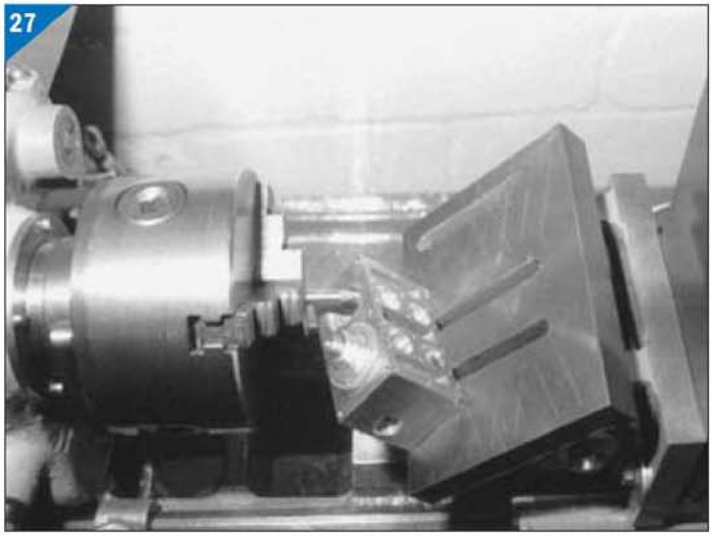



25

Drilling the steam passages.


26

Machining the slide valve.


27

Pre-drilling the water passages.

>>

Honing the cylinder.

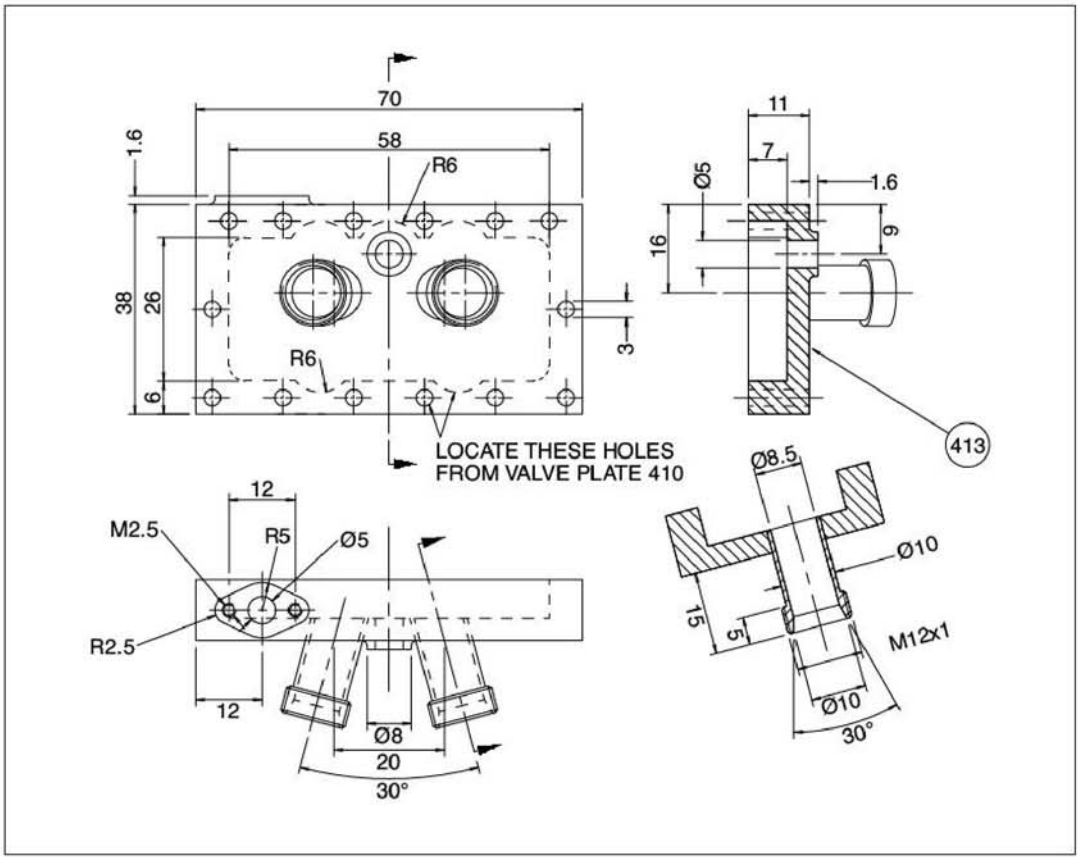
gaskets made from oiled paper can be used or alternatively you can use sealing compound. A steam proof paste, which is available from specialised trade suppliers, will be a good choice. The classic way to seal the piston and valve rod glands is to use soft packing, graphite yarn for the steam glands and tallow-cotton for the water glands. It is best to form it into rings or 'grommets' before insertion. However, O-rings are very popular today and available on the market in various sizes, therefore, one can decide to install them as an alternative.

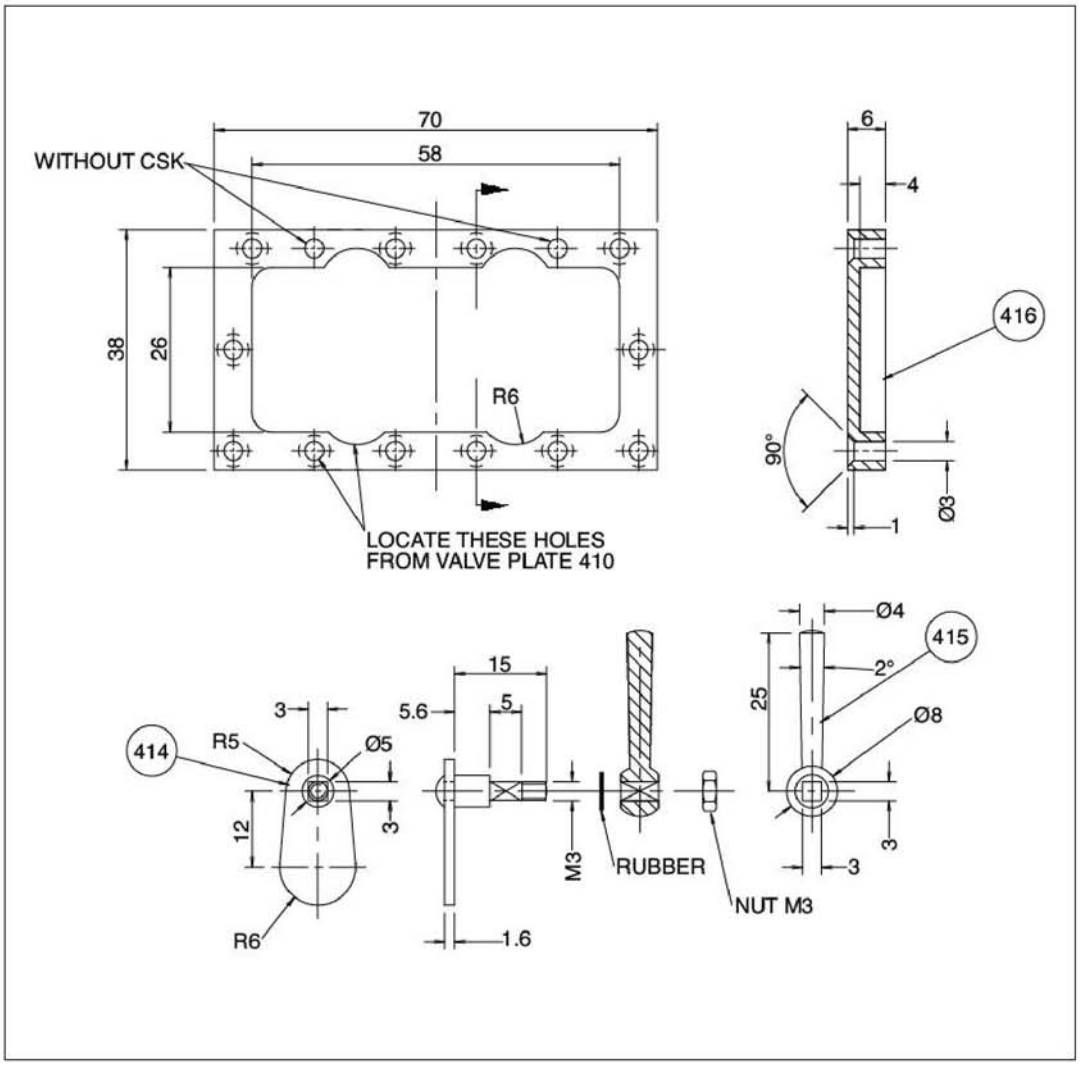
●*To be continued.*

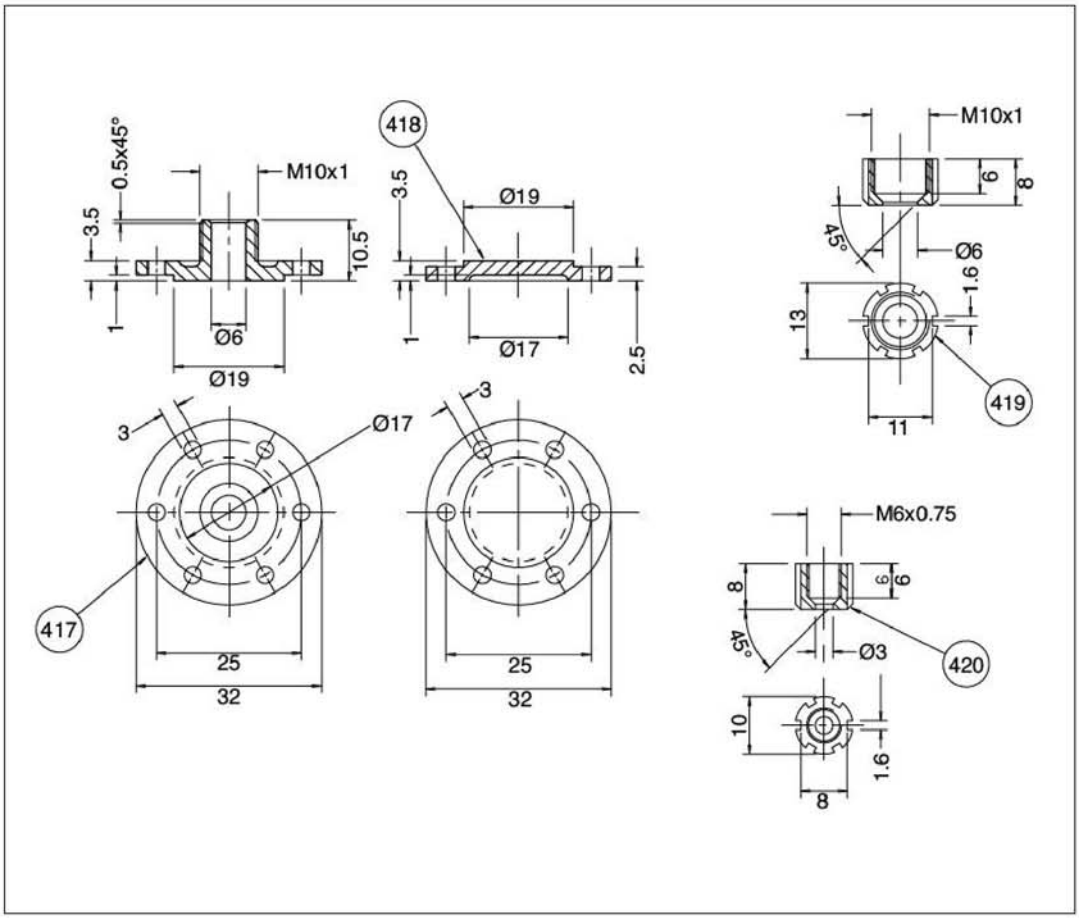
Model Engineer Exhibition Entries

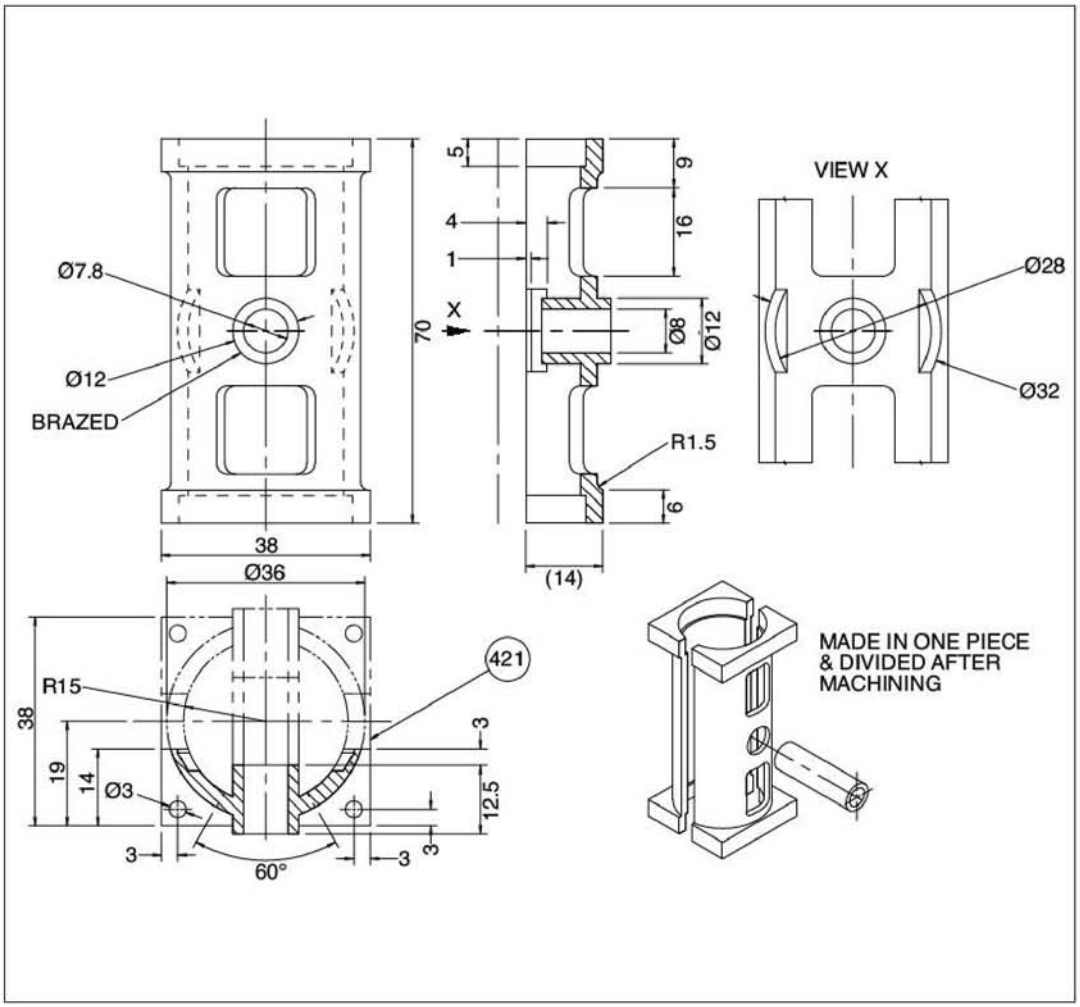
If you are supplying a model to your local club to bring to the Model Engineer Exhibition because you can't deliver it yourself, you can still enter the competitions.

Fill in the entry form as normal but state that you would like to display the entry on your club stand. The judges will visit the club stand to judge your entry. The same applies to loan models. Just fill in the entry form, state that you want the item displayed on your club stand and tick the loan box.









Model Engineer Website

We have put plenty of articles onto the *Model Engineer* website. Most of the *Model Mechanics* from the 1980s are now up, the webmaster has all 10 issues of the *Model Engineer Centennial Special* and I have seven issues of *The World of Model Engineering* to forward to him.

We also wish to put some beginner's articles on the web and have put some up already. Does anyone know the real identity of Geometer? He wrote from about 1955 to 1964. Some people suggest it was Ian Bradley but I wonder if it could have been George Gentry? The reason for this is that in *Model Engineer* 3244 it said Geometer is ill. In *Model Engineer* 3245 it said George Gentry had passed on. There were no more Geometer columns after this but Ian Bradley continued writing for many years. Can anyone tell me for sure who Geometer was?

I know several other pen names for *Model Engineer* writers over the years but would like to compile a full list. If anyone can help, please contact the editor.

The names that I believe correct are:

- Kenneth C. Hart was Martin Cleeve.
- Edgar T. Westbury was Artificer, Exactus, Kinemette and Ned.
- Ian Bradley and Dr. Norman Hallows are Duplex.
- Tom Walshaw was Tubal Cain.
- Alfred W. Marshall was Inchometer and Phantom Pen.

I expect there were many more pen names besides the ones listed above. The compilation of a list is the first stage of getting permission to put their articles onto the web.

Please visit the website **www.model-engineer.co.uk**

Photographed and built by Paul Dewstowe

Northumbrian
A second look at *Rainhill*

Tony Weale finishes the pump, fits the wheels, and adds footplate handrails.

PART 5

Continued from page 457 (M.E. 4362, 9 October 2009)

To mark out the slots to accept a C spanner, bring each jaw in turn to the horizontal position, facing towards the operator, and mark the job at this position, either with a scriber against a straight edge held in the toolpost, or simply with the point of a lathe tool. Repeat with each jaw set horizontally facing the rear of the lathe, and six equally spaced guide lines should result. Transfer the job to the bench vice and complete the slots by sawing and filing.

Whilst not particularly accurate, this is a useful technique for indexing small components.

It is worth making a height gauge, in the form of a simple rectangular or cylindrical spacer, to fit between the lathe bed and the chuck jaw to locate it in the horizontal position.

Fitting the wheels

There should be no difficulty in assembling the trailing and tender wheels to their axles with high-strength Loctite, or a similar product. Do not rely on any oil tolerant properties, but degrease the mating surfaces with acetone or industrial spirit, and allow to dry. Use a small paintbrush to spread a few drops of Loctite on the wheel seating, fit the wheel and press in place until the adhesive starts to grip - a matter of a few minutes - then wipe off any surplus, and leave to set, preferably overnight. Remember to fit the axleboxes to the trailing axle before adding the wheels, and keep the Loctite away from the bearing surfaces if you want the wheels to rotate afterwards!

The driving wheels need a little more attention, since the crankpins have to be set at 90deg. to each other. At this stage it is a good idea to assemble the eccentrics, stop collars, eccentric straps and axleboxes on the leading axle, and put the wheels on temporarily, for a trial fit in the frames. Check that the wheels will rotate when fully home on the axle. It may be necessary to skim the faces of the axleboxes to achieve this. Ensure that the axleboxes slide in the horn slots but without appreciable play, that the eccentric straps can rotate on the eccentrics freely, and that the valve gear eccentrics can rotate on the axle, again without play. Also check that the axle is square to the frame, and that the pump eccentric strap will line up with the location of the pump itself.

One of the advantages of building a single-driver locomotive is that there are no coupling rods to worry about, so the quartering of the driving wheels does not have to be exact. It can, in fact, be done entirely by eye, but a few precautions are sensible. First fit one wheel to its axle with high-strength Loctite, as before. Then put on the axleboxes and eccentrics in the correct order. Move the axleboxes as far inboard as possible to keep them clear of any excess Loctite. Fit the other wheel dry, and stand the assembly on a level surface, with the crankpin of the first wheel vertical. Check this by sighting against a set square, and then apply a couple of small toolmakers clamps to the wheel rim to hold it in position. Move to the second wheel, and locate the axle centre using a height gauge - or just make a fine pencil mark on the blade of the set square. Rotate the wheel until the crank is horizontal - it does not matter which way it points - and align the crankpin centre with the height gauge. Scribe a fine line across the wheel boss and crank, then apply Loctite to the wheel seating and refit the wheel as indicated by the

A copy of the original drawings are available from the author, price £39.50. Write to Tony Weale, PO Box 87, Leominster HR6 8AJ.

scribed line. There will be time to make small adjustments before the adhesive begins to work. Then wipe off any surplus adhesive, and leave to set.

Inlet and outlet fittings

The threaded water inlet and outlet fittings, and the feed pipe connection to the tender, are all similar parts. It is convenient to make all three together. The material is ¼in. dia. brass or bronze rod. Chuck a length of rod in the 3-jaw with about 1in. projecting, face the end, centre-drill, and open out to ⅛in. dia., say 5/16in. deep. Thread the outside of the job ¼ x 40, ¼in. long using the tailstock, and part off to finish 9/16in. long. Advance the material in the chuck and repeat for the other two parts.

Now chuck a larger piece of brass rod - around ⅜in. dia. and ½in. long will do, face off, drill and tap ¼ x 40 to make a truly-running socket. Screw each of the fittings into this in turn for finishing. The two fittings for the pump need 1/16in. of the end reducing to 5/32in., so that they will push tightly into their locations in the pump body and inlet elbow in preparation for silver-soldering. The third fitting is simply counterbored; say ¼in. deep, so that it will fit over the 3/16in. water feed pipe.

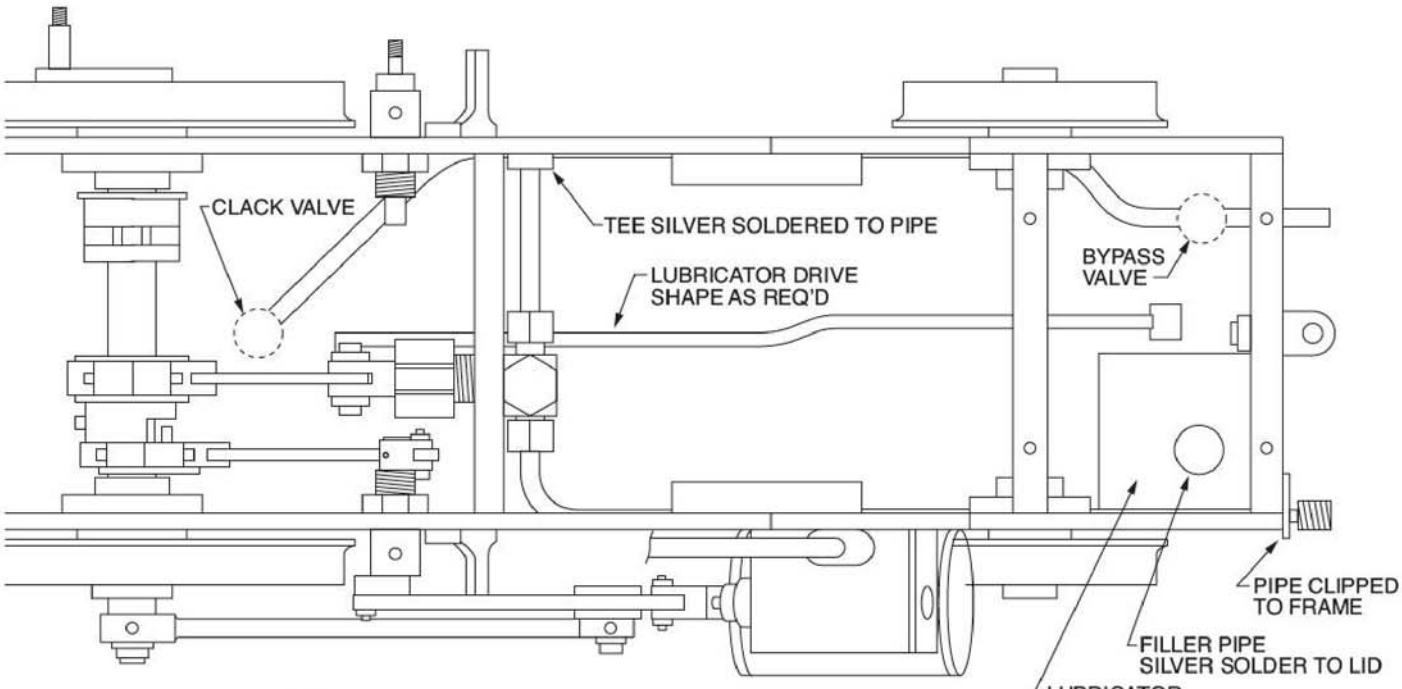
Silver-soldering

We now come to the first silver-soldering job. In principle this is exactly the same as the larger silver-soldering jobs on the boiler. Those of you who know everything can go ahead, but for the benefit of newcomers we will look at the process in detail. You will need silver solder wire, flux, a supply of acid or alkaline 'pickle' for cleaning, tongs or pliers for holding the hot workpiece, and a fireproof, well-ventilated working area, away from machinery and precision tools. Silver-soldering requires dull red heat, and the most convenient source of this is usually a propane gas torch with a range of interchangeable nozzles. I use an inexpensive outfit from a well-known chain of tool suppliers and have found it quite satisfactory. Building *Northumbrian*'s boiler will require a nozzle of about 1¼in. dia., while smaller sizes are more suitable for more delicate jobs such as the feed pump we are working on. In order to work safely with heat and chemicals, you will also require what used to be called common sense.

The silver-solder is an alloy of mainly silver and brass, and melts at around 600-700deg. centigrade. Note that many other solders nowadays contain silver, as a substitute for lead. Some of these are sold as 'silver solder' though they melt at much lower temperatures. Whilst these solders may have applications in model engineering, they are not generally suitable for boiler work and to avoid confusion they are best left alone. Examples of suitable brands for our purposes are Easyflo No. 2 and Silverflo, the latter having the advantage of being free of poisonous cadmium. The flux is usually in powder form, and is mixed with water before use to form a stiff paste. Like the solder, it contains some fairly unpleasant chemicals, so avoid breathing the hot fumes - hence the need for a ventilated working area. In good weather, silver-soldering can be done out of doors.

Pickle, for cleaning the work before silver-soldering, and removing the flux residue afterwards, can take several forms. Dilute sulphuric acid is traditionally used. One part of acid to about 30 parts water will give a suitable strength. The acid must be added gradually to the water, never the other way around, since the heat generated could well cause an explosion. Citric acid is easier to obtain nowadays and is safer, though slower-acting. Alkaline solution in the form of toilet cleaner is readily available and works quite well. You will need a strong plastic or rubber bucket, preferably with a lid, for the pickle, and you will need enough pickle to immerse the workpiece completely. Keep the pickle away from your skin, clothes and workbench, and wash off any splashes immediately with cold water.

The work is best performed on a proper brazing hearth, but a metal workbench covered with firebricks will do for jobs of the size we are considering. Proper firebricks are quite expensive. The bricks from an old electric storage heater are a good substitute, but do not use ≫



(98) CHASSIS LAYOUT

ordinary builders' bricks. It is useful to have some spare firebricks to support irregularly shaped jobs, and to contain the heat around a large workpiece. A final and very simple safety precaution whenever using heat is a bucket of clean, cold water for first aid in the event of burns. All this perhaps makes silver-soldering appear dangerous, but it is perfectly safe if carried out intelligently, and in some ways is easier than soft-soldering.

Returning now to our feed pump, immerse both the inlet elbow and its threaded fitting in the pickle for, say, 20-minutes to clean them. Meanwhile, get everything ready. Mix up some flux powder with water to make a fairly thick paste, and put a small nozzle on your propane torch. Fish the parts out of the pickle with pliers or tweezers, and wash in clean water. Push-fit the two parts together, and coat the joint area with flux paste. Stand the job on a flat firebrick, and apply the torch flame. The flux will solidify as it dries, then turn black and become liquid again. The metal will now be approaching dull red heat.

At this stage move the torch clear, touch the end of a length of silver solder wire on the joint, and if the temperature is correct it will melt and run instantly around the joint. Then turn the torch off, allow the job to cool until black, pick it up with pliers - it will still be pretty hot - and quench in cold water, then return it to the pickle bath for another 20-minutes to dissolve the residue of the flux. Finally, wash again in water and inspect to make sure that the silver solder has penetrated all around the joint with no visible gaps. Repeat the job with the pump body. We can now clean up the parts of the pump and assemble it.

Assembling the pump

To complete the top valve chamber, which is the outlet, place a 3/16in. steel ball in the hole, and use a hammer and drift to form a seating at the base of the hole. A single light tap is all that is required. While doing this, the pump casting must be well supported. It will be convenient to fit it to the mandrel made previously, and hold this in the bench vice. Next put the outlet ball into the valve box, then screw in the top plug until it contacts the ball. Since the threaded part has been made overlength, there will now be a gap between the shoulder and the face of the valve box. Return the elbow to the lathe and skim enough material from the threaded end to close this gap. Then remove a little more metal, not more than 1/32in., so that the ball can just lift from its seating.

Moving to the bottom valve chamber, form a ball seating on the top of the inlet elbow, as just described, and use the same procedure to adjust the ball lift to a maximum of 1/32in. It is worth remembering that these fittings are threaded 40 to the inch, so removal of 'one thread' of metal will be about right.

Discard the balls which have been hammered, and use new ones, ether rustless steel or bronze, for the actual assembly. Plumbers' jointing, silicone, or non-setting gasket cement can be used on the threads, and the inlet elbow at the bottom should face to the nearside of the locomotive. Check by blowing through that the valves will open and close.

Screw the pump barrel through the frame stay and align it so that the valve boxes are vertical, with the outlet at the top. A drop of thread locking compound can be used, but it is barely necessary since the pump will not be able to move much once connected. Alternatively a thin lock nut can be made to fit the barrel.

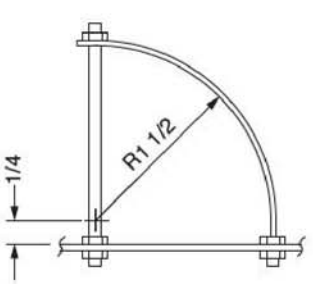
Next, put the ram in, wind a few turns of packing around it, and screw on the gland nut finger-tight. The ram should slide in and out with only slight resistance. When it is fully in, the slot and flat at the outer end of the ram must be clear of the gland nut. Either PTFE yarn or traditional graphited yarn can be used for the gland packing. The latter is usually sold in rather small packets, but can easily be made from scratch, since the ingredients are fairly obvious. These little pumps can be rather irritating things to make, but it is very pleasing when you eventually dip the suction pipe into water and discover that the device really will squirt when you operate the ram. The pump and stay can then be fitted to the chassis.

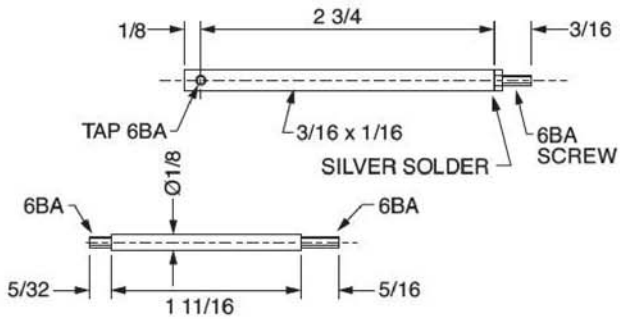
Fitting the wheels and axles

It is convenient to give the chassis a coat of paint at this stage, before fitting the wheels and starting on the motion work. Degrease the assembled parts thoroughly before painting, and do not put the paint on too thickly. Aerosol cans of car paint are very suitable, and one coat of primer followed by one or two top coats will suffice. The working surfaces of the horn slots can either be masked with tape, or just scraped clean when the paint is dry.

Springs for 3½in. gauge locomotives are commercially available, but will probably be rather too stiff for such a light locomotive, so the springs for *Northumbrian* are best made from scratch. Some 22 gauge piano wire will be about right for the driving axle springs. The trailing ones can be thinner. Winding the springs is not difficult, although it takes a bit of practice. Find a bit of steel rod about 6in. long, and slightly smaller than the required internal diameter of the spring, in this case about 3/32 inch. Put the rod in the 3-jaw chuck, trap one end of the piano wire under a jaw, then rotate the chuck with your left hand, guiding the wire onto the rod with your right, keeping each coil of wire in contact with the last. When you have wound about 4in. release the tension on the wire and the coils will spring evenly apart.

Cut up the coil with snips or side cutters to make the individual springs. The driving springs will need to be about 1¼in. free length, and the trailing springs about 5/8in. but some adjustment will probably be necessary when the locomotive is complete. Flatten the ends of each spring by holding lightly against the side of a grinding wheel. Now fit the axles to the chassis, and put on the horn stays. Compress the trailing springs with tweezers, and slip them into their seating in the axleboxes. If the ends of the springs are flat, they will stay





(13) HANDRAILS
2 OFF, MAT'L: M.S. OR BRASS

put in a vertical position. Put the leading springs over their pins and fit the retainers, followed by 5BA nuts. Adjust these temporarily so that the chassis sits reasonably level. My prototype chassis weighs about 6lbs without cylinders, and the driving axle needs a load of about 4lbs to compress the springs to working height.

Feed pump drive

Complete the pump installation by fitting the eccentric strap and rod. Rotate the wheels so that the pump eccentric is in its rearmost position. Push the pump ram into the barrel as far as it will go, withdraw it 1/32in., and mark the position of the pin hole in the rod to coincide with the hole in the ram. Remove the strap for drilling, then reassemble and add the drive pin. This is just a bit of rod - preferably silver steel, but mild will do - threaded at both ends for retaining nuts. It is long enough to pass through both the pump ram and the lubricator drive link. We will fit this later, since it would get in the way at this stage. Meanwhile, check that the pump and drive work freely - a good excuse to push the chassis along and play trains!

Returning to the plumbing department, make up and fit the suction, bypass and delivery pipes. These are shown on the drawings as 3/16in. dia., but 5/32in. would be adequate. The water pipe layout is shown in the plan view of the chassis. The supply to the axle pump is drawn through the tender hand pump, which makes a neat arrangement requiring only two connections between the locomotive and tender. The only disadvantage is that the driver must remember to close the bypass valve before using the hand pump. Route the suction and bypass pipes below the main frames so that they will be clear of the firebox and ashpan, and make up clips from sheet steel or brass to attach them to the rear end of the frames, or to the drag beam.

Quite a lot of bending is involved, so use a length of soft copper or steel wire of similar diameter to mock-up the pipe runs and to determine the finished length of each pipe. These copper pipes can easily be bent to shape by hand, but go gently and keep the radius as large as possible to avoid kinks. If the pipe seems hard to bend, or hardens during the process, anneal it by heating to dull red and quenching in cold water, repeating if necessary. Allow a little extra length on the delivery pipe, to simplify lining-up with the clack valve when fitting the boiler.

The threaded connector for the suction pipe has already been mentioned. A tee piece is required in the delivery pipe to accept the bypass pipe and this is just a block of brass or bronze, drilled on three sides, into which the pipes are silver-soldered. Screwed unions are required for connection to the pump and clack valve. Union nuts, complete with cones, can be bought ready-made, but a neater job can be done by using the next size smaller union without its cone, and silver-soldering a copper or brass ring directly to the pipe.

The technique here is to make the ring oversize on diameter, silver-solder it to the pipe, then put the pipe in the lathe and turn the ring down to size. Clearly the pipe must be straight at this stage, and since the copper will be very soft, it needs a sharp tool and a light touch on the feed. The nuts themselves are easily made from hexagonal stock, and the procedure is exactly the same, dimensions apart, as that described for making the axle pump gland nut.

Footplate handrails

As a change from heavy engineering, we can make the footplate handrails at this stage. The dimensions given are a little on the robust side, but the handrails are in a vulnerable location, and may sometimes be useful for lifting a hot locomotive. The vertical columns are just lengths of 1/8in. rod, turned down at each

The footplate handrails.

end to accept a 6BA thread. Make these first. The curved handrail is best formed on the end of a strip at least 6in. long to provide some leverage for bending. Mark out, square off one end, then drill and tap the 6BA hole. Grip this end in the vice together with a suitable former of about 3in. dia. - preferably a little less - and pull the strip around it to produce the curve. The former can be a piece of thick-walled tube, or a block of metal or hardwood turned to size. Drill and bend the second handrail at this stage, and when you have two identical curved strips, cut them off slightly over the marked length to allow for adjustments.

Now screw the two parts of the handrail together, place a 6BA screw in the rearmost mounting hole on the footplate, and trial-fit the handrail assembly with the foot of the curved strip resting on the 6BA screw. Adjust matters by filing the end of the strip, or easing the radius of the bend, until the correct profile is achieved, with the column vertical. Secure the column with a 6BA nut under the footplate, and silver-solder the curved strip to the head of the screw on which it rests. The silver-soldering is very easy, especially if you have just completed the feed pump. The footplate itself can act as an assembly jig, but if you prefer, a piece of scrap steel, suitably drilled, can be used.

When cool the completed handrail can be unshipped from the assembly fixture and cleaned up. There is no real need to pickle a small item like this to remove the flux. Any residue left after quenching can be chipped off, or dissolved in boiling water. Follow this with as much fettling and polishing as you wish to do. A rotary wire brush is very useful here. The design of the handrails can, of course, be varied to individual taste. One obvious possibility is to use four columns with flat railings on top. They could also be made from brass or nickel silver, in which case they could be assembled with soft-solder. A further variation would be to enlarge the footplate to the full width of the locomotive, but this does not seem to have been a feature of the prototype.

To be continued.

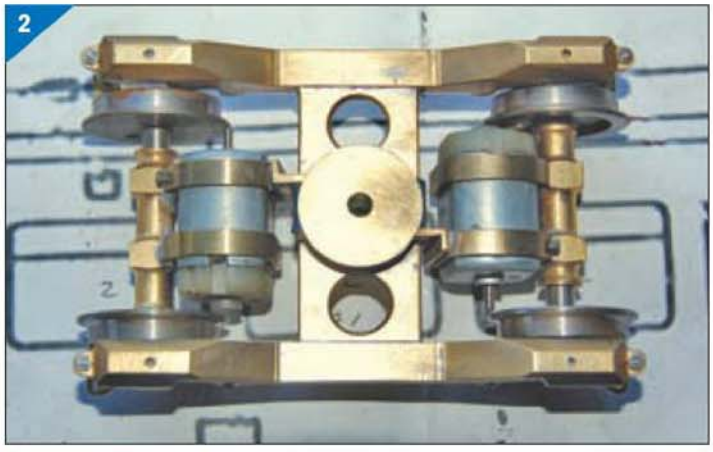
The finished 3-car set.

British Rail Class 323 EMU 3-car set

KEN TOONE

Ken Toone scratchbuilds a gauge 1 model.

In the early 1990s the Regional Railways sector of British Rail placed an order for new electric multiple units, to work the newly electrified Birmingham Cross-City Line. The order was placed with Hunslet TPL in Leeds and, in fact, these units were the last trains to be built by this once famous company. A total of 43 EMU 3-car units were built, numbered in the range 323201-323243. Each unit is formed of two outer driving cars and a central intermediate trailer fitted with a Brecknell-Willis high-speed pantograph for collecting current at 25kv ac.

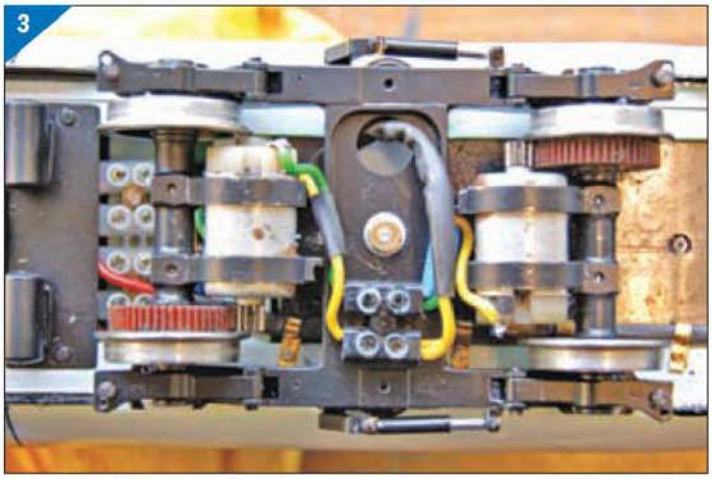


The bogie with the motors fitted.

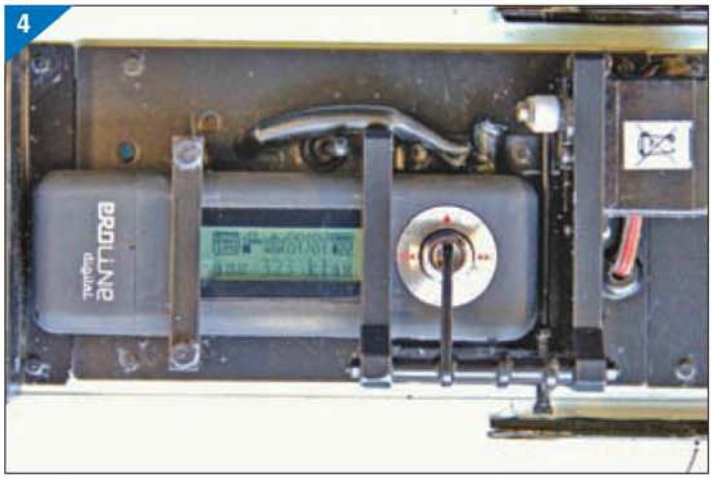
The former Central Trains inherited the fleet of 26 units from British Rail and, in November 2007, these were passed on to London Midland. They were originally delivered in 1993/4 painted in the Centro green and grey livery with a blue stripe. They were originally allocated to Bletchley Depot, but have since been moved to Soho in Birmingham, where a new Depot has been built for maintenance and repairs.

The model, in 10mm scale (**photo 1**) has been finished in the Centro livery and depicts unit number 323211. As with all one off projects of this nature, it is important to research the proposed model as much as possible and grateful thanks must go to Matt Thompson at the Soho Depot, who was instrumental in arranging a visit, whereby I was able to spend two or three hours, armed with my trusty Nikon D50, tape measure etc. collecting all the details that are not normally seen from the lineside.

I was particularly fortunate that at the time of my visit, a unit was on shed split into three, with one of the driving cars on jacks, having a bogie removed for a motor change. This enabled me to get many



Gears and wiring up completed.



The MP3 player and operating servo.

close-up detail shots of the power train, the suspension and also details on the inner ends of the cars, again something not normally seen.

Chassis construction

Armed with all this information, a start was made with the model bogie design (**photo 2**) and it soon became apparent that suitable motors might be a problem. When I built my Class 86 locomotive (*M.E.* 4342, 2 January 2009) I was able to use four standard type 360 12v motors without any significant modification. This time, however, there was much less space available due to the smaller 27.5mm wheel diameter. Obviously with a spur gear drive, the outside diameter of the driven gear must be smaller than the tread diameter of the wheel. Also it was important to get the largest gear reduction possible within the available space. I did not want to resort to a right-angle worm drive as the model would not be able to coast when the power was shut off.

Eventually I decided that a ratio of 6:1 would be suitable, using 0.4 Module spur gears with a 10-tooth steel pinion driving a 60-tooth Tufnol gear, from HPC Gears of Chesterfield, working to a centre distance of 14.4 millimetres. This meant that the motors could not be larger than about 19mm dia. after allowing for axle diameter and motor mounting details. Much time was spent on web searches and, whilst companies like RS Components stocked a very nice Swiss made motor, the cost was somewhat prohibitive. Finally, a web search located Anaheim Automation, a company in California USA who marketed a range of motors, of Chinese origin. Their BDT-24-31 Series motor has proved to be ideal for our purpose. It also just happened that a friend was taking a holiday in the area and was able to pick up half a dozen for me. These 12v motors although 24mm dia., have two flats on the body at 18.3mm A/F so it was just possible to fit them within the available space (**photo 3**).

The bogie side frame is machined from 10 x 25mm brass bar and the main bolster bar is 6 x 25mm brass. The parts are soft-soldered together to form a rigid assembly. The rubber metalastic suspension details are modelled as close as possible to full-size, using rubber 'springs' cast in dental silicon moulding rubber. ENA needle roller bearings 3mm dia. are used throughout in order to minimise rolling resistance and thereby power consumption.

I decided very early on that all the power components i.e., drive motors, speed controller, radio receiver and batteries etc., would be located in the centre car as distinct from the full-size version where the two end cars contain the drive motors and the centre car has the power transformer and the pantograph. This layout has the advantage that no power connections are required between the cars other than lights and horn wiring and makes for a self-contained drive unit.

Power and sound

This is supplied from two 12v 3.3ah Yuasa rechargeable gel batteries connected in parallel, to an Electronize FR15HVR speed controller, and controlled by a Futaba TR-6EX 2.4Ghz radio control. These latest UHF digital radios really are a godsend, since interference and glitching is now a thing of the past.

An additional channel is used to control the two-tone horn. This makes use of a miniature MP3 player (**photo 4**) loaded with an actual recording of the real horn. The player is located under the coach frame, so that its AAA battery can easily be changed when required. A small servo simply trips the play button when the sound is required. The output from the player is fed to a Maplin 12 watt sealed amplifier module and thence to a speaker located in the front coach.

Working LED lights are fitted and arranged in reverse/parallel connection so that a white light shows at the front and red at the rear, changing with direction of travel.

Coach body construction

This follows my now proven method, similar to model aircraft assembly (**photo 5**) whereby a soft-soldered framework of brass angle and bulkheads is covered in 0.5mm nickel silver sheet. 12mm brass angle is used for the main chassis and 3mm square brass for the longitudinals. All the bulkheads are 16swg sheet. It is important to attach the sides and roof panels before any door or window apertures are cut, as otherwise, the metal will take the line of least resistance and many of the curves might end up in the wrong place.

A particular feature of these coaches is the fact that the ends are tapered both in plan view and side view. This meant that the roof had to be made in three parts i.e. a centre section plus the two tapered >>

The aircraft type construction.

Milling the windows.

Milling the roof to take the pantograph.

ends. A 1.5mm dia. brass rod is soldered along the joint between the sides and the roof panel to represent the cant rail and hide any errors.

The complete coach assembly was then placed on the milling machine (**photo 6**) and all the window apertures were cut out working to previously calculated co-ordinates. The centre coach also had a large aperture machined out of the roof to allow for the pantograph assembly to be mounted (**photo 7**). All the windows are made from 3mm tinted Perspex and are bolted into position.

Whilst talking about the pantograph I must thank the lads at Brecknell-Willis Ltd. of Chard, Somerset (the makers of the full-size pantograph) who were invaluable in helping with the model pantograph design. They were kind enough to send me an outline drawing and several photos which enabled me to get the assembly looking right (**photo 8**).

The Class 323 front/rear ends have a quite distinctive shape (**photo 9**) and it was important to try to capture this shape in the model (**photo 10**). Now, when I built the 6 x Mk. 2F coaches (*M.E.* 4349/50 April/May 2009) all the coach ends were the same, so I made a pattern and had a number cast in resin, which proved to be very successful. This time round however, the front/rear ends and the intermediate ends are different shapes (**photo 11**) so I decided that they would have to be hacked out of the solid. My first attempt with the cab ends was from 25 x 100mm Perspex bar in the hope that I would be able to machine the windscreens in situ. However, I found that it was not easy to polish the actual windscreens to the required standard, so they were consigned to the scrap bin.

A second attempt was made using aluminium bar and has proved to be more successful (**photo 12**) this time with tinted Perspex windscreen panels let in. A particular problem for me was the radius down each front corner of the cab, which worked out at a little over 8 millimetres. I purchased a 8mm HSS rounding tool but, on delivery, it was found to have a 25mm screwed shank. The maximum size acceptable to my Clarkson toolholder was 16 millimetres. I thought *"No problem, I will just turn it down and rethread it"*. I had assumed that the shank hardness would be similar to that of a Morse taper drill and could be turned with a carbide cutter. Not so, it was glass hard. So, I simply got it red hot and slow cooled it, which softened it sufficiently

The finished pantograph.

The front of a full-size train.

The front of the model train.

Different ends from solid aluminium.

A side view of an end.

An intermediate end.

Almost ready for painting.

A carriage painted except for the lines around the doors.

to successfully machine it. The cutting edges were still hard enough to easily cut aluminium.

The intermediate ends were then carved from aluminium bar in a similar manner and include the corridor connection framework (**photo 13**).

Since these coaches are over 30in. long there is significant relative sideways movement when negotiating crossovers and similar reverse curves, so much so that I have had to allow for +/- 16mm side movement in the couplings. Again I have used a simplified version of the Hornby-Triang style coupling. **Photograph 14** shows a 3-coach set almost ready for painting.

Painting

The Centro livery consists of a total of six colours, whereas the London Midland livery features eight colours including some complex curves. I therefore decided to stick with Centro, which of course was the original livery for this Class. I was indeed fortunate that Precision Paints still had stocks of the Centro green and grey paints.

Following the usual etch primer and undercoats, I applied the grey finish to the sides and then masked the upper and lower portions to apply the green. Further masking of the green allowed the doors to be finished in yellow. The sides were then masked out totally in order to apply the roof grey (**photo 15**). This left just the lining out to be finished.

Lining out

Not having a steady hand nowadays, I decided to approach Pinstriping UK in Leicester who market a range of masking tapes specifically for lining out. Essentially these consist (in the case of the blue line) a backing tape roughly ⅝in. wide to which are stuck two additional tapes ¼in. apart. The whole tape is applied to the sides of the coach and then the backing tape is peeled off, leaving the two tapes at the specified distance apart and parallel to each other. The blue paint was then applied with a brush, filling the space between the lines. Then the tapes were removed, whilst the paint was still wet and the job allowed to dry. The same procedure was used for the black lines around the door apertures, using the appropriate width tapes.

All the end panels were painted separately and then bolted on. **Photograph 16** shows a finished front end of the 3-car set.

Transfers

Finally, the Centro logo and the numbering were produced on my computer using an inkjet water-slide decal paper. This paper, which is identical to that found in normal water slide transfers, is marketed by Craftycomputerpaper, a company based in Hexham, Northumberland. It is available as a transparent paper for items such as the coach numbers and also as a white paper for items like the logo, which need an opaque background. Full instructions are provided to ensure success. If you are printing your designs with an inkjet printer, then they will need to be sprayed over afterwards with three coats of acrylic spray, as deskjet ink is not waterproof. After application to the model a further coat to seal the transfer is recommended (**photo 17**).

Conclusion

Suitable carrying cases have been made from 6mm ply to provide adequate protection. A single case is used for the centre car which weighs just over 20lb and a double case for the driving cars which have a similar combined weight.

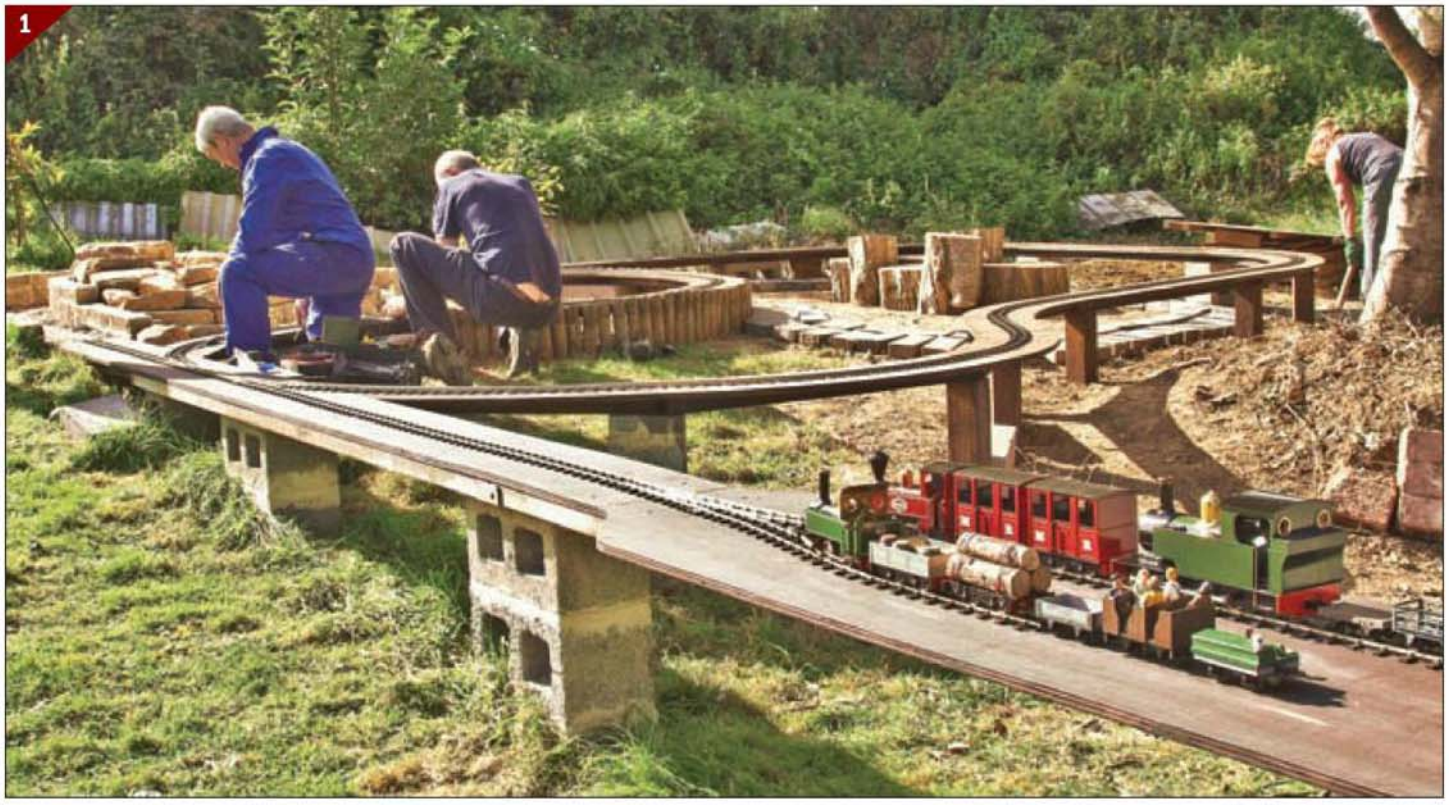
Looking back, I note that this project has taken a little over 2-years to complete, from my initial research. The model performs very well and the batteries last for several hours of intensive use. All in all, it was I think perhaps a worthwhile project and I can recommend it to anyone looking for something different. **ME**

Website details

Brecknell-Willis
www.brecknell-willis.co.uk
HPC Gears
www.hpcgears.com
Electronize Design
www.electronize.co.uk
Futaba
www.futaba-rc.com
Maplin
www.maplin.co.uk
Pinstriping UK
www.pinstripinguk.f9.co.uk
Craftycomputerpaper.
www.craftycomputerpaper.co.uk

A finished driving carriage in its colurful scheme.

Home-made transfers ready to apply.



The 16mm narrow gauge circuit nearing competition.

CLUB PROFILE

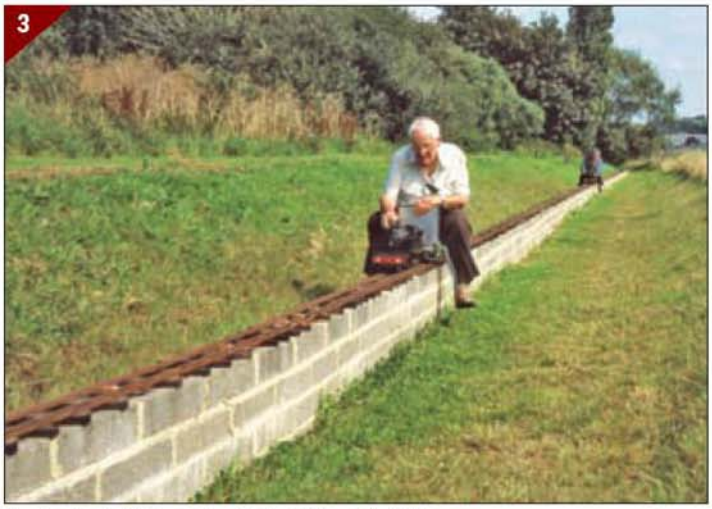
Westland & Yeovil District Model Engineering Society

The bends before the steaming bays; those winter days are always best for showing lots of steam.

This small society with a very big name was formed by amalgamation of the Westland Model Engineering Society and the Yeovil District Model Engineering Society when the latter lost their track site at Yeovil College some years ago. The society is a section of the Westland Leisure Complex (previously the Westland Sports and Social Club) which, although putting no restriction on society membership, members must also join (for a modest sum). In reality this is probably the best sports and social club in Somerset, with a theatre/ ballroom, function rooms, two bars, and many sporting facilities, so is worth joining in its own right.

The Westland & Yeovil DMES has been assigned an area of securely fenced land on the edge of Yeovil airfield as a location for their track and other facilities. The only drawback is that this is at the far side of the allotment section's site so it is necessary to pass through two secure rabbit-proof gates before you can unload your car and run your engine! On the positive side, and touch wood for the future, vandalism is not a problem.

The society's 30-40 members have interests covering stationary engines, railway locomotives and rolling stock, and traction engines. On land beyond the rabbit-free zone they have a 1,240ft. track circuit



The back straight; gradient 1 in 100 uphill all the way.

The steaming bays.

with 2½, 3½ and 5in. gauges on a raised wall together with the usual steaming bays, a Portakabin clubhouse, two 40ft. containers for workshop and storage, and a brand new Portaloo! Overall, the site is a mixture of mown grass, shrubs and trees, undergrowth and blackberries, with rabbits, badgers and foxes. The society rarely does passenger hauling on the main track circuit so events are, for the most part, for member's own enjoyment and the rules and regulations are kept to a minimum at these times. There is, of course, a club locomotive so members without a locomotive or whose locomotive is 'being shopped' can still have some fun. There is also a small workshop with a Myford 7 and a pillar drill.

The latest project is to build a 16mm narrow gauge layout (now well advanced) and this is expected to be ready for use fairly soon. It is hoped that this will encourage younger people and those with less well-equipped workshops to join. **Photograph 1** shows the final screws being inserted to complete the circuit on the new 16mm narrow gauge scale layout. The layout is built of plywood on block or timber pillars, except through the cutting where ballast stabilised with cement has been used, and has a nominal minimum radius of 4ft. 6 inches. Just over 30 yards of Peco SM32 track have been used, plus points, to give two loops. The gradient is nominally level. The track gives smooth running and trains may be pulled or pushed around the entire circuit without any problems with derailment or buffer lock.

A busy visitors day.

The club engine in full steam!

Inspecting the new Portaloo facility, July 2009.

The Myford ML7 in the workshop container.

>>

The Society track during a Steam day at the South West Main Line Steam Co. at Yeovil Junction.

Part of the society stand at Taunton Model Engineering Exhibition, April 2009. The TV screen is showing moving pictures.

Communal steam-ups and track running days are held throughout the year, normally around twice per month, though members may use the clubhouse and main track facility at any time they please. The Thursday gang carry out building, maintenance and gardening tasks every week during the summer months. Evening meetings are held in the Westland Leisure Complex on the first Thursday of each month and, during the winter season, these will include talks, demonstrations or other entertainment likely to be of interest to members. The society has a modest website where details of up and coming events may be found: W. **www.communigate.co.uk/twc/yeovilmodelengineers**

Visitors are always welcome at society events but if you have a locomotive to run then a valid Southern or Northern Federation boiler certificate must be shown first.

The society also has a length of track at the South West Main Line Steam Co. site at Yeovil Junction Station and provides out-and-back passenger hauling during their event days each summer. They also occasionally support local school and charity events using a portable track. In recent years they have also exhibited at the Taunton Model Engineering Society annual exhibition, and also put on some less formal displays at Yeovil Junction.

Prospective members should contact Gerald Martyn on 01935 434126. **ME**

- Sheet two of Hatfield by Martin Evans
- Mathew Murray Locomotive
- *Charlie* - A Southern Railway Q1
- Stockport Vacuum Engine
- Keith's Column
- A visit to a drill making factory
- *Shand Mason* Fire Engine
- An Engineer's Day Out
- Will Hay - Model Engineer

The 17th Annual Sweet Pea Rally held on Saturday, 6th June 2009 at the Sheffield & District Society of Model and Experimental Engineers' Abbeydale Miniature Railway at Dore, near Sheffield. Full report inside.

ON SALE 20 NOVEMBER 2009

Contents subject to alteration

Beginners start here

DAVID CLARK
Editor

In the workshop with the editor.

PART 5

Continued from page 405 (M.E. 4361, 25 September 2009)

Last time we looked at setting up the bedplate and soleplate castings on the mill and centering the spindle in the exact centre of the casting. From there, with a digital readout, it is a simple matter of pitching all the holes out. But what if you don't have a readout? The drawing, **fig 1** shows all the required dimensions for the hole positions as well as the centre of the casting where the bearing slot is cut.

The datum for the machining is the top left intersection of the two datum lines where all the dimensions are taken from. You will also see the hole centres all have letters on them. This is to show the drilling sequence.

First you have to wobble of the back face and then the left-hand end of the casting in turn. Wobble of the back face first, move the table very slowly until the wobbler rolls off or along the edge of the casting. Raise the quill and move the table half the diameter of the wobbler. Zero the dial (or make a note of the reading if the dial is non-zeroable). The centre of the wobbler should be over the edge of the job.

Move the table another turn so that the wobbler is over the job, the amount of movement is not important. Now you need to wobble off the left-hand edge then move the table half the wobbler diameter. Zero the dial for the axis you have just wobbled from. Wind back in the first axis you set so the wobbler is a turn or two away from the job. Wind back to zero so the centre of the spindle is over the datum point which is the theoretical intersection of the top left corner of the job.

Now we can start to pitch out the holes. Move the table in the longitudinal axis to 0.225 inch. Now we are in line with the row of four holes at the left of the job. Centre drill the first hole. This hole may wander slightly as it has already got a dimple from the casting process. You should not be too far away from the centre though. Move in the cross axis to 0.5in. and centre drill the next hole. Move to the 1.0in. position and again centre drill the hole. Move to the 1.3in. position and centre the last of this row of holes. Move to the 1.375in. position and then move to the 1.037 axis in the longitudinal direction and centre drill the hole. Finally, move to the 1.633in. position and drill this hole. We now have holes A, B, C, D, E and F centre drilled (**photo 20**). Now we go back to the start point at the top left of the component.

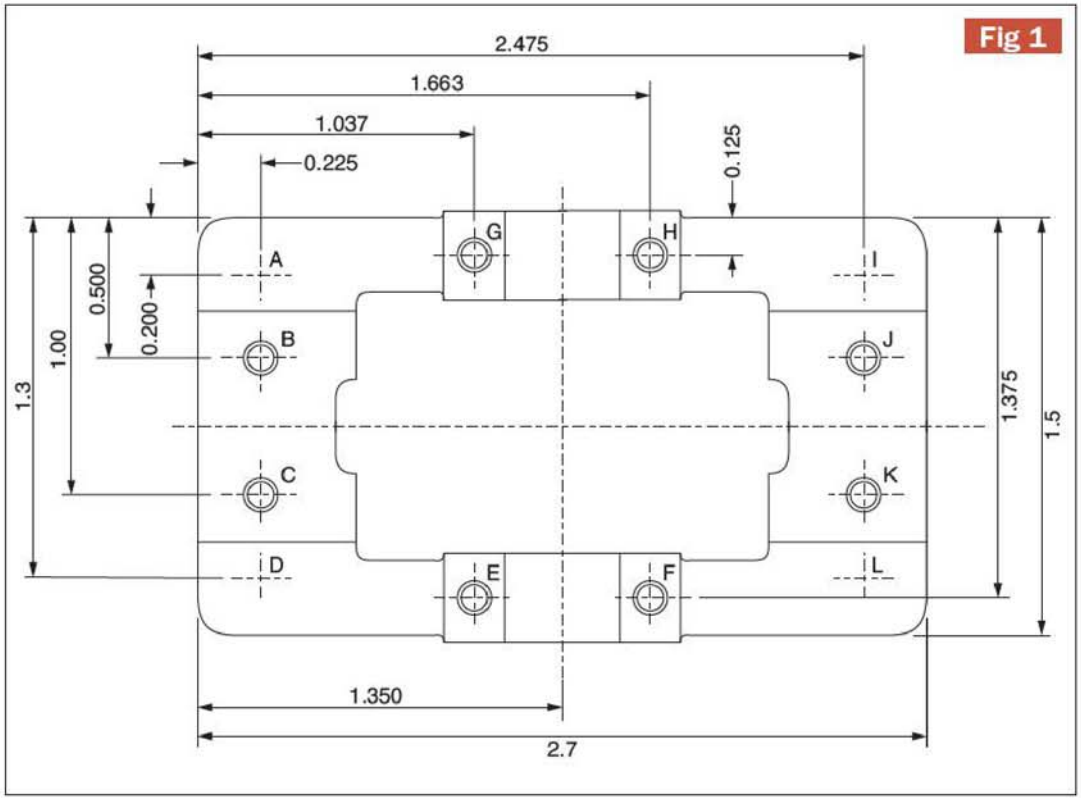
Move over to the 0.125in. position and move along to the 1.037 position. Centre drill the hole then move along to the 1.633in. hole and centre drill again. Now you can move over to 0.2in. on the cross axis and to 2.475 on the longitudinal axis. Centre drill the I hole and move over in the cross axis to centre drill holes J, K and L. You have now drilled all 12 holes in the correct position without any errors from backlash in the feed screws.

If you did accidentally wind past the required hole position, just wind back a turn or two and then move up to the hole again. By going back a couple of turns, and then moving forward again, you are taking the backlash out of the equation.

I hope this is clear, if not read it through again doing the moves in your mind using the drawing. The principle will work for any component you care to machine. Yes, you might have to sketch it out differently or re-dimension it, but it will save you time and save you scrapping work. Do double-check your dimensions carefully if re-drawing though. This method is not only relevant to machines without a readout. I have used the same principle on a worn out CNC machine to reduce errors to within drawing limits.

To be continued.

Fig 1



To help you get the best from The Model Engineer exhibition

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

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

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

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

Club exhibits

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

Additional forms

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

Engineering Section

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

Railway Section

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

Marine Models

C1 Working scale models of powered vessels (from any period). Scale 1:1 to 1:48
C2 Working scale models of powered vessels (from any period). Scale 1:49 to 1:384
C3 Non-working scale models (from any period). Scale 1:1 to 1:48
C4 Non-working scale models (from any period). Scale 1:49 to 1:384
C5 Sailing ships and oared vessels of any period – working.
C6 Sailing ships and oared vessels of any period – nonworking.
C7 Non-scale powered functional models including hydroplanes.
C8 Miniatures. Length of hull not to exceed 15in for 1:32 scale, 12in for 1:25 scale, 10in for 1:16 scale; 9in for 1:8 scale. No limit for smaller scales.
C9 For any model boat built from a commercial kit. Before acceptance in this class the kit must have been readily available for at least 3 months prior to the opening date of the exhibition and at least 20 kits must have been sold either by mail order or through the retail trade.

Scale Aircraft Section

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

Model Horse Drawn Vehicle Section

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

Junior Section

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

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

Model Vehicle Section

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

DUKE OF EDINBURGH CHALLENGE TROPHY

Rules and Particulars

1. The Duke of Edinburgh Challenge Trophy is awarded to the winner of the Championship Award at the Model Engineer Exhibition.
2. The trophy remains at all times the property of MyHobbyStore Ltd.
3. The name of the winner and the date of the year in which the award is made will be engraved on the trophy, which may remain, at the discretion of MyHobbyStore Ltd., in his/her possession until required for renovation and display at the following Model Engineer Exhibition.
4. Any piece of model engineering work will be eligible for this Championship Award after it has been awarded, at The Model Engineer Exhibition, a Gold or Silver medal by MyHobbyStore Ltd
5. No model may be entered more than once.
6. Entry shall be free. Competitors must state on the entry form:
   (a) That exhibits are their own bona-fide work.
   (b) Any parts or kits which were purchased or were not the outcome of their own work.
   (c) That the model has not been structurally altered since winning the qualifying award.
7. MyHobbyStore Ltd. may at their sole discretion vary the conditions of entry without notice.

COMPETITION RULES

1. Each entry shall be made separately on the official form and every question must be answered.
2. Competition Application Forms must be received by the stated closing date. LATE ENTRIES WILL ONLY BE ACCEPTED AT THE DISCRETION OF THE ORGANISERS.
3. Competitors must state on their form the following:
   (a) Insured value of their model.
   (b) The exhibit is their own work and property.
   (c) Parts or kits purchased.
   (d) Parts not the outcome of their own work.
   (e) The origin of the design, in the case of a model that has been made by more than one person.

NOTE: Entry in the competition can only be made by one of the parties and only their work will be eligible for judging.

4. Models will be insured for the period during which they are in the custody of MyHobbyStore Ltd.
5. A junior shall mean a person under 18 years of age on December 31st in the year of entry.
6. Past Gold and Silver medal award winners at any of the exhibitions promoted by MyHobbyStore Ltd. are eligible to re-enter their model for the 'Duke of Edinburgh Challenge Trophy'. Past winners at any of the exhibitions promoted by MyHobbyStore Ltd. will not be eligible for re-entry into the competition unless it has been substantially altered in any way.
7. MyHobbyStore Ltd reserve the right to:
   (a) Transfer an entry to a more appropriate class.
   (b) Describe and photograph any models entered for competition or display and to make use of any such photographs and descriptions in any way they may think fit.
   (c) Refuse any entry or model on arrival at the exhibition and shall not be required to furnish a reason for doing so.
8. Entry into the competition sections is not permitted by:
   (a) Professional model makers.
   (b) Anyone who has a financial interest in the direct supply of materials and designs to the public.

NOTE: If unsure, please contact the Competition organisers prior to the show.

9. The judges' decision is final. All awards are at the discretion of the judges and no correspondence regarding the awards will be entered into.
10. Exhibitors must present their model receipt for all models collected at the end of the exhibition and sign as retrieved.
11. The signed release for each model must be presented to security staff when leaving the exhibition complex with display model(s) after the close of the exhibition.

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

CLOSING DATE 20th NOVEMBER 2009

THE MODEL ENGINEER EXHIBITION
11th – 13th December 2009

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

ENTRY NO.

OFFICE USE ONLY

CLASS	ENTRY NO.

ENTRY FORM - COMPETITION & LOAN MODELS

PERSONAL DETAILS (Please print)

Surname _____ Forename(s) _____ Age _____

Address _____

_____

_____ Post Code _____

Home Tel No _____ Daytime Tel No _____

Model Club or Association _____

Have you entered before? Y ❑ N ❑

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

How many years have you been a modeller? _____

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

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

Entry Class (competition entries only) _____

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

Model Description _____

_____

_____

Model Scale _____ Length _____ Width _____ Height _____ Weight _____

Type of construction _____

_____

Parts not made by you and commercial items _____

_____

Have you supplied a photograph? Y ❑ N ❑

Are you supplying Judges Notes? Y ❑ N ❑

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

Name and address of your local newspaper _____

_____

N.B. Please make a copy of this form and any photographs enclosed for your own reference.
Please note that MyHobbyStore Ltd will not accept liability for any loss of documents or photographs submitted with this form.

NOVEMBER

6 **North London SME.** Colin Gent: CA Class WW2 Destroyers. Contact Rachael Chapman: 01442 275968.

6 **Romford MEC.** Competition Night. Contact Colin Hunt: 01708 709302.

7 **Canterbury & District MES (UK).** Fish & Chips Run. Contact Gina Pearson: 01227 830081.

7 **Ickenham DSME.** Public Running. Contact Phil Wimbush: 07759 275353.

7 **Peterborough SME.** Guy Fawkes Run. Contact R. A. Meek: 01778 345142.

7 **Romney Marsh MES.** Bonfire Night Track Meeting. Contact John Wimble: 01797 362295.

7 **SM&EE.** Mike Kapp & Alan Wragg: Building a spark erosion machine. Contact Maurice Fagg: 020 8669 1480.

7 **Westland & Yeovil DMES.** Steam-up Day. Contact Gerald Martyn: 01935 434126.

7 **York City & DSME.** Firework Steaming. Contact Pat Martindale: 01262 676291.

9 **Bedford MES.** D. Billington: Duchess in 7¼in. gauge. Contact Ted Jolliffe: 01234 327791.

9 **Erewash Valley MES.** AGM. Contact Peter Siddall: 0115 9255397.

10 **Frimley & Ascot LC.** AGM. Contact Bob Dowman: 01252 835042.

10 **King's Lynn DSME.** Video & DVD Evening. Contact Ben Cannell: 07963 093270.

10 **Northampton SME.** Brian Groves: A35 Rebuild. Contact Pete Jarman: 01234 708501 (eve).

10 **Romney Marsh MES.** Members' Social Get-Together. Contact John Wimble: 01797 362295.

10 **Stockport South MES.** Meeting. Contact Mark C Pybus: 0161 973 2086.

11 **Birmingham SME.** Peter Flavell: Garden Railways.Contact Mike Page: 01564 784006.

11 **Bradford MES.** Meeting. Contact John Mills: 01943 467844.

11 **High Wycombe MEC.** Video Evening. Contact Eric Stevens: 01494 438761.

11 **Norwich DSME.** Meeting. Contact Shirley Berry: 01379 740578.

11 **St. Albans DMES.** EGM and Members' Evening. Contact Roy Verden: 01923 220590.

12 **Cardiff MES.** Cyril's Film Night. Contact Don Norman: 01656 784530.

12 **Leyland SME.** Mothballs Night. Contact A. P. Bibby: 01254 812049.

12 **Northampton SME.** AGM. Contact Pete Jarman: 01234 708501 (eve).

12 **NW Leicestershire SME.** Andrew Goodman: I moved it my way! Contact Jamie Wilde: 01530 273270.

12 **Worthing & District SME.** Annual Club Auction. Contact Brian Trickey: 01903 235102.

13 **Hereford SME.** D. Payne: The Great North Railway (USA). Contact Nigel Linwood: 01432 880649.

13 **Polegate & District MEC.** AGM. Contact D. F. Pratt: 01323 645872.

14 **Glasgow & S.W. Rly Ass'n.** Jim Summers: How we used to do it. Contact Bruce Steven: 0141 810 3871.

14/15 **Hutt Valley MES.** Tauranga Open Weekend. Contact Gavin McCabe: 567 4487.

14 **SM&EE.** Basic Training part 1, day 3. Contact Maurice Fagg: 020 8669 1480.

15 **Frimley & Ascot LC.** Club Running. Contact Bob Dowman: 01252 835042.

15 **NW Leicestershire SME.** Public Running. Contact Jamie Wilde: 01530 273270.

15 **Otago MES.** Club Running Day. Contact James Woods: 476 1369.

15 **St. Albans DMES.** Puffing Field Morning. Contact Roy Verden: 01923 220590.

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

16 **Lancaster & Morecambe MES.** Auction. Contact Mike Glegg: 01995 606767.

16 **Leicester SME.** Malcolm High: Laser CNC Pt. 2. Contact John Lowe: 01455 272047.

16 **Model Steam Road Vehicle Soc.** Doug Newton: Concorde. Contact John Bagwell: 01452 304876.

16 **Peterborough SME.** Neil Davis: Reminiscences of a Bomb Disposal Officer. Contact R. A. Meek: 01778 345142.

17 **Chesterfield & District MES.** David Newton: Locomotive Nameplates. Contact Mike Rhodes: 01623 648676.

17 **Nottingham SMEE.** DAG Brown: Anna Narrow Gauge Engine. Contact Graham Davenport: 0115 8496703.

17 **Romney Marsh MES.** Malcolm Parker: Kentish Royal Trains. Contact John Wimble: 01797 362295.

17 **Taunton ME.** Work in Progress. Contact Nick Nicholls: 01404 891238.

17 **West Wiltshire SME.** Members' Evening. Contact R. Nev. Boulton: 01380 828101.

18 **Birmingham SME.** Peter Flavell: Internal Combustion Engines. Contact Mike Page: 01564 784006.

18 **Bournemouth DSME.** Richard Knott: Members' Video Evening. Contact Dave Finn: 01202 474599.

18 **Bristol SMEE.** On the Table Evening. Contact Trevor Chambers: 0145 441 5085.

18 **Guildford MES.** Bits & Pieces. Contact Brian Jones: 01483 531485.

18 **Leeds SMEE.** Jumble Sale. Contact Geoff Shackleton: 01977 798138.

18 **MELSA.** Meeting. Contact Graham Chadbone: 07 4121 4341.

19 **Cardiff MES.** AGM. Bits & Pieces. Contact Don Norman: 01656 784530.

19 **Isle of Wight MES.** Contact Malcolm Hollyman: 01983 564568.

19 **Melton Mowbray DMES.** Work in Progress. Contact Norman Smedley: 01664 434349.

19 **Warrington DMES.** Natter Night. Contact Duncan Webster: 01925 262525.

20 **North London SME.** Ian Johnston: How to make a Teranaki Gate and learn about Hudson's Point. Contact Rachael Chapman: 01442 275968.

20 **Romford MEC.** Photo Talk. Contact Colin Hunt: 01708 709302.

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

21 **SM&EE.** Rummage Sale. Contact Maurice Fagg: 020 8669 1480.

22 **MELSA.** Bracken Ridge. Contact Graham Chadbone: 07 4121 4341.

22 **St. Albans DMES.** Club Sailing Morning in Verulamium Park. Contact Roy Verden: 01923 220590.

23 **Bedford MES.** Ted Jolliffe: Possible research sources. Contact Ted Jolliffe: 01234 327791.

24 **Romney Marsh MES.** Members' Social Get-together. Contact John Wimble: 01797 362295.

24 **Stafford DMES.** Meeting. Contact Chris Dobbs: 01889 270533.

24 **Wigan DMES.** Bits & Pieces. Contact John Chamberlain: 01744 882255.

25 **Birmingham SME.** Fish & Chips Evening. Contact Mike Page: 01564 784006.

25 **Hull DSME.** Chairman's Evening. Contact Tony Finn: 01482 898434.

26 **Ascot Locomotive Society.** AGM. Contact Derek Alford: 01344 482485.

26 **Leyland SME.** Photo Competition Night. Contact A. P. Bibby: 01254 812049.

26 **Worthing & District SME.** Bits & Pieces. Contact Brian Trickey: 01903 235102.

27 **North London SME.** Workshop Evening. Contact Rachael Chapman: 01442 275968.

28 **SM&EE.** Workshop Topics. Contact Maurice Fagg: 020 8669 1480.

29 **Hereford SME.** Ladies Night. Contact Nigel Linwood: 01432 880649.

29 **Otago MES.** Club Running Day. Contact James Woods: 476 1369.

30 **Canterbury & District MES (UK).** Bits & Pieces. Contact Gina Pearson: 01227 830081.

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