

MODEL ENGINEER

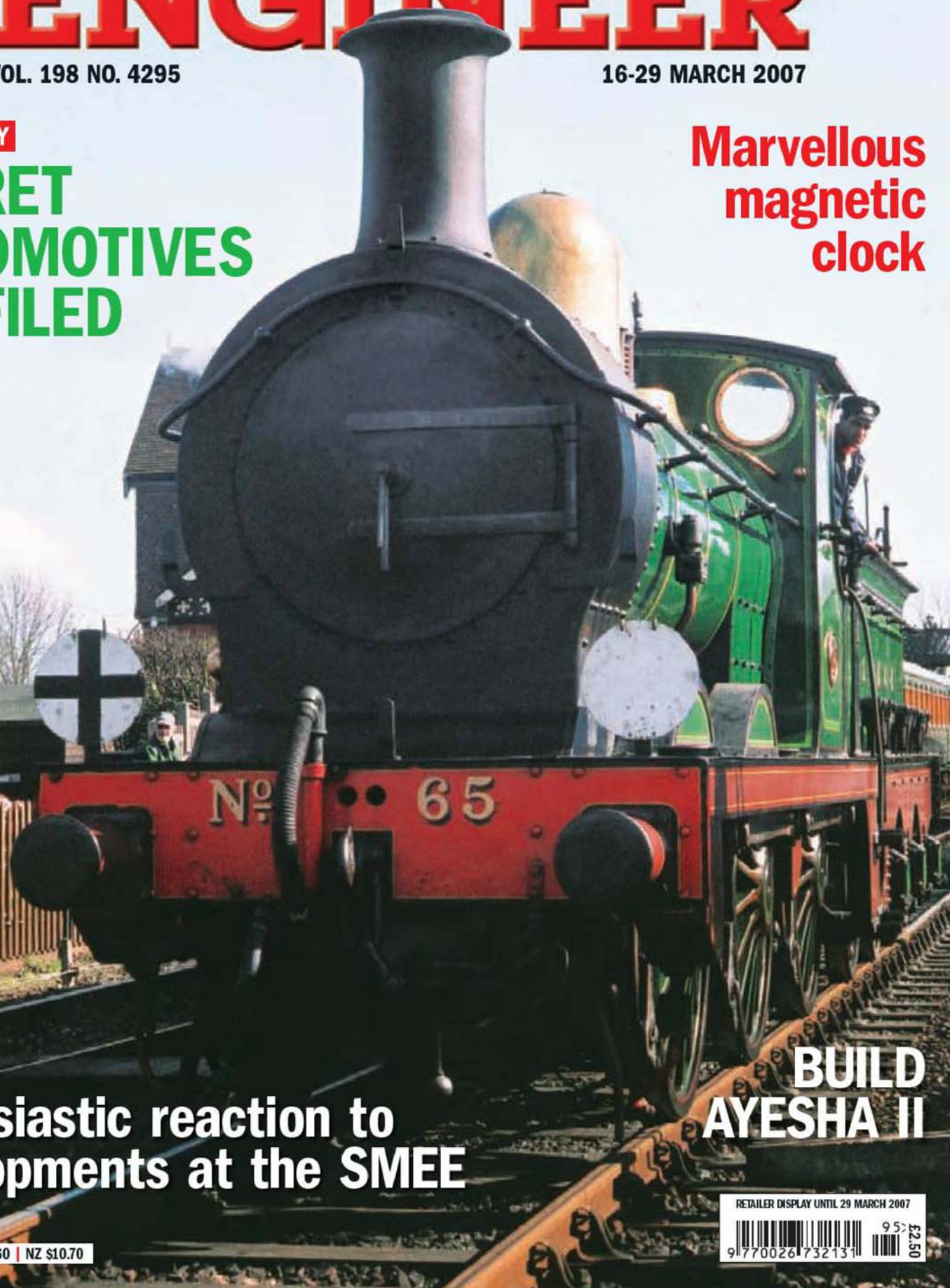
VOL. 198 NO. 4295

16-29 MARCH 2007

COVER STORY

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ON THE COVER...

Ron Isted turns his attention to the South Eastern and the London, Chatham and Dover Railways, vilified in their day, badly managed, unsuccessful and plagued by poor decisions. One decision resulted in the SECR 'Radial Tank class N', which today rates a place in the *Edwardian Elegance* series. The locomotive is described with a 3 $\frac{1}{2}$ in. gauge model very much in mind.

(Photograph by Ron Isted)

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182701 ML7 Lathe, Serial No. K 82137 Imperial	£1686.13
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179101 254V Plus Lathe, Serial No. ZS 1644701 Imperial	£7418.36
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194701 Super 7 Lathe, Serial No. SK 125566 Gearbox with Power Cross Feed, Imperial	£4112.50
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185601 Super 7B Lathe, Serial No. SKL 120972	£5522.50
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194401 Super 7B Lathe, Serial No. SK 168858	£4876.25
Gearbox with Hardened Bedways, Power Cross Feed, Imperial	
Mounted on a 20/038 Tray Top Cabinet Stand. As the lathe was re-assembled the headstock spindle was re-scraped into the front bearing and the alignments were set and checked and re-set where necessary.	
193301 Super 7B Lathe, Serial No. SK 145291 Power Cross Feed, Imperial	£4112.50
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194501 Super 7B Lathe, Serial No. SK 14855 Gearbox Power Cross Feed, Imperial	£4817.50
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194301 Super 7B Lathe, Serial No. SK 166205 Gearbox Power Cross Feed, Imperial	£4935.00
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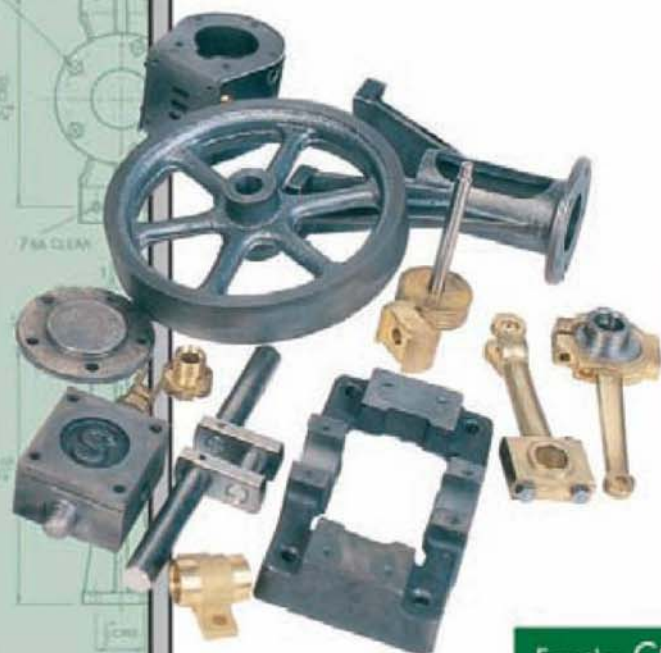
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H1	1/4 x 1/4 x 1/16	5/16 x 5/16 x 1/16	
	3/8 x 3/8 x 1/16	1/2 x 1/2 x 1/16	11.35
H2	5/16 x 5/16 x 1/16	3/8 x 3/8 x 1/16	
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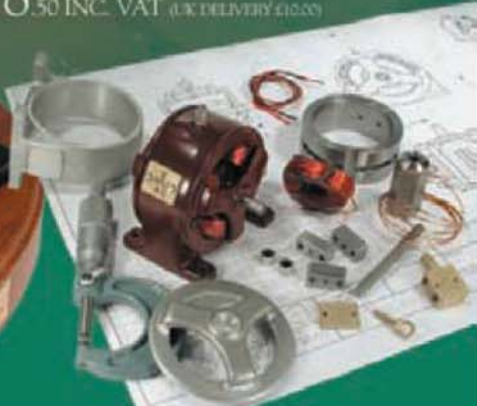
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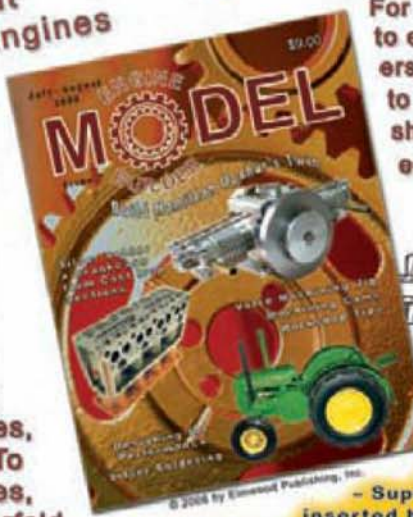
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Morton M5 Issue 2 Build Article



Section B-B

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NEW from Camden

The Shop Wisdom of Jesse Livingston
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This tremendous book contains full drawings and building instructions for three stationary engines, (one a Bernays Engine), plus two 7 1/2" gauge steam locomotives, both easily amended to 7 1/4" gauge. One is a vertical boilered, vertical (oscillating) engined loco, the other is a scale model of a Filer & Stowell 0-4-0 tender logging locomotive. These were the only successful full size steam locomotives to be fitted with oscillating cylinders, so this is a fascinating project - as are the other models. Plus there are some linked sections, one on foundry work, another on making a tube roller and yet another on scaling plans from photos. 172 pages culled from Live Steam magazine. Hardbound.

Fun with Engines and Other Things • £14.30
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Three books containing model designs by the late, great, Rudi Kouhoup. The first has full drawings for a Three-cylinder Radial Engine, a Piston Valve Steam Engine, a Model Vertical Steam Engine, Building a Small Steam Engine, a Compressed-Air V-4 Engine and a Revolutionary War Cannon. The second has the full drawings for a Walking Beam Engine, a Model Marine Engine, an Open Column Steam Engine, a Model Mill Engine, and Enclosed Crank Steam Engine, and a Model Horizontal Steam Engine, whilst the third contains three of Rudy's designs for three small hot air engines, all parallel cylinders types, one vertical and air-cooled, one horizontal and air-cooled, the third horizontal and water-cooled. NONE of these engines requires castings. Anything Rudy designed or wrote was good, but it must be stressed that you only get full drawings in these books, and a photograph of each model - NO building instructions, so you have to use the old grey matter a bit. 90, 104 & 84 spiral bound pages respectively. Card covers.

"Digital Machinist" • SAMPLE COPY • £ 6.35

Model engineering tends to be one of the last refuges of the old skills, but many model engineers are now enthusiastically embracing the modern era in the form of CAD design, and CNC for machinery. It is the latter which is the main subject of this quarterly magazine from the publishers of the Home Shop Machinist and Machinist's Workshop. If you are into, or considering installing CNC machines, you will find this very interesting!

By Precision into Power • Vessey • £22.40

'A Bicentennial Record of D. Napier & Son', a firm which started in general engineering, moved into printing presses and accurate measuring instruments. Steam power doesn't seem to have figured highly in their products, but it was the coming of the IC engine which brought them fame and fortune, starting with cars, but rapidly moving into aircraft engines, and diversifying from there into high power marine engines, and from one of those into powering Britain's most famous diesel railway locomotive - the 'Deltic'. Alan Vessey knows the Company and its products well, as is evident from this informative, and readable book. 256 well illustrated pages. Paperback.

Randolph's Shop • Bulgin • £30.30

This really is a cracking good book, with great ideas and projects well explained, a lot of humour, and a lifetime's experience in engineering. Six of the fifteen chapters of this book are expanded versions of articles which appeared in *The Home Shop Machinist* or *Machinist's Workshop*, and cover such things as building a Variable Speed Vertical Bandsaw, Removing Broken Taps and Studs by Welding (this alone worth the cost of the book!), Lifting Devices for the Small Shop, Repairing Worn or Damaged Shafts, Another Wife Pleaser (!) and Making Eggs. The author's experience is in small commercial workshops, rather than model engineering, and some of the projects are big - the bandsaw is floor-standing, but they can generally be scaled, and anyway there are so many useful hints, tips and suggestions here it hardly matters, plus you will chuckle much more reading this book than you will with any other engineering book we have come across; this is a pleasure just to read, even if you never Build a Better Powder Measure, or Organize Your Tool Box. 126 very well produced pages. Hardbound.

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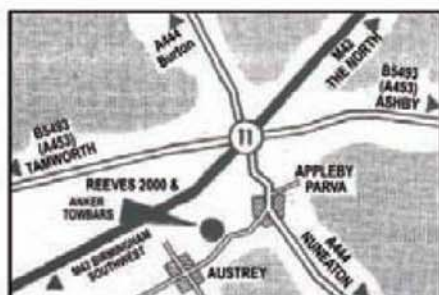
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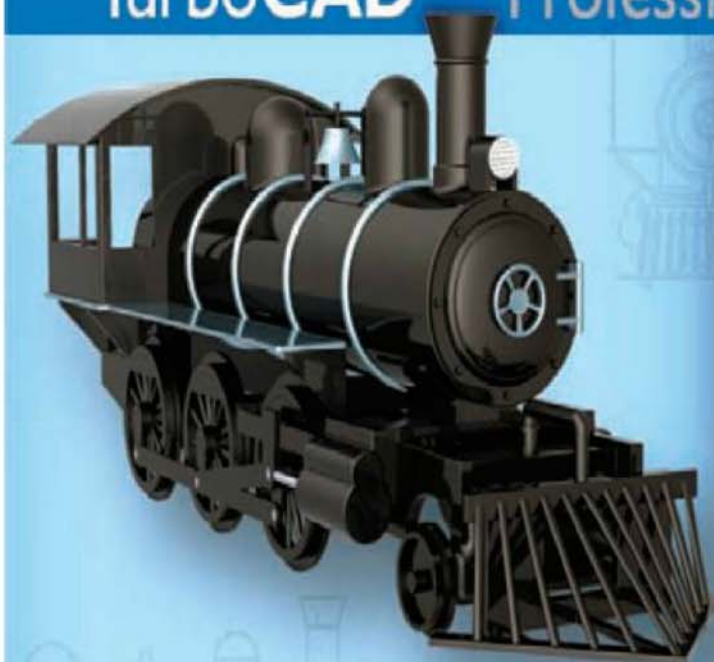
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How to service your Myford

This year, Myford Ltd. is introducing a new Spring Show. It will be at Myford's Works in Wilmot Lane, Beeston, Notts from April 26 to 28.

Entry, parking and light refreshments are all free. A prize draw worth £250 is open to all visitors. Many readers will have a Myford in their workshop in need of some T.L.C. Three fitters will be carrying out useful demonstrations on how to service your Myford and make the most of it.

Attending the Show will be Ivan Law and Harry Paviour, chief judges respectively at the model engineering exhibitions at Ascot and Harrogate, who between them have a wealth of experience in workshop practice to share with visitors.

In addition to model engineers, this show is aimed at Myford users who have interests in the reconditioning, maintaining and running of veteran, vintage and classic motorcycles. Myford will be running, both turning and milling demonstrations on a variety of motorcycle components.

To encourage those with motorcycle interests, anyone who arrives on a veteran, vintage or classic motorcycle will gain free entry to a second prize draw worth a further £250.

Clarification

Mr. Petrie, whose article on a fine feed system for a milling machine appeared in M.E. 4291, 19 January 2007 has written to clarify the procedure used to secure the 34 tooth gear to the output shaft of the motor. He writes:

"I had to figure out a way to secure the 34 tooth gear to the tapered, splined output shaft of the motor/gearbox unit. Fortunately there was still part of the drive linkage attached and this was cut and formed to make a drive flange. A mandrel was turned up to suit the bore of the gear and the drive flange. The two parts were clamped together using the mandrel for alignment and then brazed. Remember to check the taper on the drive flange before brazing as it could be fitted back to front. A simple extended securing nut was made from hexagon bar, the body diameter being a few thousandths of an inch under that of the bore and the body length slightly longer than the gear thickness. The gear could now be mounted and tightened on the tapered, splined drive shaft."

We are happy to pass this additional information on to readers.

Models at Milestones

Milestones, Hampshire's living history museum in Basingstoke will play host to a unique event on April 21 and 22. The unique setting of streets and factories will contain engineering models of all types.

Among entries are a large model tramway, passenger carrying miniature railways, locomotives in various gauges, a boating pool, traction engines and trade stands, while outside the main building, miniature road vehicles will be in steam. Model engineering clubs and societies from all over the South of England are also supporting this event with displays. One group is planning to bring along a large selection of miniature fighting robots.

Kew in Spring

The award-winning Kew Bridge Steam Museum will see steam in action every weekend, and London's only steam railway there will be in operation for most of the year. Forthcoming events include:

March 25, Stirling and Hot Air Engine Rally

More than 80 Stirling and hot air engines will be working, including model and full size engines, some coal fired and others solar powered, on show in the museum's Steam Hall, Mezzanine floor and around the Water for Life Gallery.

April 28 and 29, Kew Bridge Model Boat Show

A chance to see a fascinating array of model boats from clubs and individuals. There will be a special display about the *Medway Queen* and the Dunkirk Little Ships. There will be a demonstration pool where visitors can see models put through their paces and special childrens' activities, including making their own model boat masterpieces.

The 90in. Boulton & Watt and Maudslay beam engines will run on special weekends throughout 2007, including most of the Bank Holidays. The focus of these weekends (listed below) will be on the working life of the Victorian pumping station with specialised talks, behind the scenes tours of the original workshops, as well as standpipe tower tours.

**March 17 and 18,
April 7, 8 and 9,
May 26, 27 and 28,
June 23 and 24,
July 28 and 29,
August 25, 26 and 27,
September 22 and 23,
October 20 and 21,
November 24 and 25
December 29 and 30.**

You can find the museum in Green Dragon Lane, Brentford, Middlesex about 200 yards from the north side of Kew Bridge under the tall Victorian Tower.

You can guarantee that if we publish something about an item that does not exist, one will turn up. So when we said there were no 5in. gauge models of the *Great Bear* yet, it was no surprise to receive a photo of one. Wilf Baker from Scunthorpe e-mailed to say: "We had a 5in. *Great Bear* running on our track on New Year's Day for three hours. The engine is on display in the farming museum at Normanby Hall Country Park."

The full story is on the society website www.scunthorpesme.co.uk





1. Mr. Barrow's Burnett lathe has give sterling service for many years.

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Responses to published letters are forwarded as appropriate.

Metric threads

SIRS, - I have today received *M.E.* 4287, 24 November 2006 and seen that there is a new series by Anthony Mount on building a Bottle engine. In previous issues there has been also correspondence regarding the merits of the Imperial and Metric measurement systems.

Having lived in Switzerland now for almost 50 years I have had to deal with both systems, through my business life, as well as the hobby. There is room for both systems and although most of my machine tools have metric graduations, I work equally exactly with either system, the little bit of mental arithmetic does the brain a lot of good. Fortunately the Myford Super 7 has an Imperial lead screw as basically metric threads are a 'Brussels' compromise. You see that when I first came here there was no real standardisation of the metric thread system throughout the world. Swiss steam locomotives were made with Whitworth screw threads, what else.

The range of metric threads were M2, M2.3, M2.6, M3, M3.5, M4 and M5. This was then changed in the 1970s to M2, M2.2, M2.5, M3, M4, and M5 and today M2.2 does not really exist. This is not the only problem; you will find that the hexagon head sizes are often too large relative to the thread size. Typically a M5 hexagon head is 8mm but the bolt half that size or M2.5 has a head size of 5 millimetres.

A colleague here is building a 5in. gauge *Britannia* and insisted on using metric rather than BA size bolts. The obvious has happened; he spends hours machining the heads of the metric bolts so that he can get a spanner between the heads.

All this comes down to the fact that in model engineering the BA system, which is metric based and comes from Switzerland originally, of screw threads is superior to the standard metric system. In the list of threads given by Anthony Mount, the builder will have great difficulty in buying M2.2 and M3.5 machine bolts, apart

from probably having to machine down the hexagon head sizes.

Equally one must not forget that most plumbing around the world uses, in Brussels terminology, a thread called 'Gas'. For the more intellectual this is actually BSP, there being no known metric equivalent.

Unfortunately there is considerable Continental influence creeping into the model engineering world, as it will be seen that steam fittings are made with metric fine threads, however depending on the manufacturer the thread pitch will differ for the same diameter, and that is without the interference of the Brussels politicians. They have yet to realise that the English system of 60, 40, 32 and 26tpi was thought out by engineers probably before the others were born.

As a final thought on screw threads, could it be that in this throw-away world that Brussels will condemn the use of screw threads at all and insist that everything is made so that it can not be serviced, so all will be held together by adhesive or spot welded?

Philip T. Bellamy, Switzerland.

Silver solder for boilers

SIRS, - I refer to the letter under this title from P. H. Lewis on using silfos for boilers (*M.E.* 4287, 24 November 2006).

Any soldering rods containing phosphorous must not be used in any circumstances for high-pressure copper boilers fired with coal or oil. The rods in question are Sifcupron 17 and 172AG Sil-fos BS 1845 Type

CP1 and Silbralloys Type CP2 and any similar other manufacturers rods containing phosphorous. These alloys were designed for easy joining of copper refrigerator equipment and are delightfully easy to use but they are not suitable for high temperatures and are extremely sensitive to sulphur released from the combustion of fossil fuels.

A generation ago when these products were new on the market, many copper boiler failures occurred due to corrosion cracking. I have not heard of any boiler explosions being reported but failure took the form of so many small cracks and leaks that steam could not be raised. All this was explained in *M.E.* at the time.

These alloys may be acceptable for Mamod type pressure (max 20psi) meths fired boiler as used in Gauge 0.
Brian R. Harfield, Bolton.

Burnett lathe

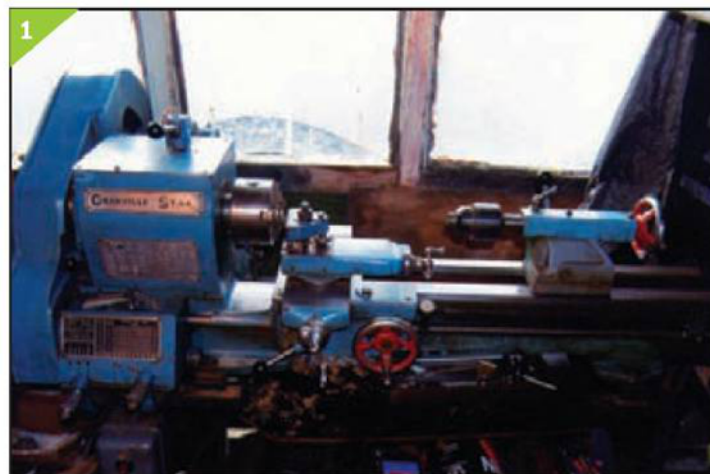
SIRS, - I thought you would be interested in a photograph of the lathe I purchased approximately 30 years ago.

Messrs. Burnett Ltd. only produced a few of them and then gave the idea up, why, I do not know.

The machine is a 4in. lathe with a gap bed of 3 1/2 inches. The length of the V-bed is 30 inches.

The head is a roller bearing type and has behaved perfectly for 30 years with a fair amount of work carried out on various machined items.

The spindle bore is 3/4in. with a No. 3 Morse taper and



the tailstock has a No. 2 taper.

The speed range is 40 – 2000rpm. And the lathe is fitted with a quick-change screw cutting gearbox providing a range of 54 thread pitches.

Edward G. Barrow, Birmingham.

Early electric motors

SIRS, - In view of the recent interest in Froment electric motors, I thought you might be interested in the illustration of an early motor from an old book (*Brighton College - The Elements of Natural Philosophy*, 1860) that I have. The type of motor shown was designed to propel a 28ft. long boat with 10 people aboard at a rate of 4mph and used a Groves platinum battery with 64 platinum elements as a power source. Each element had a surface area of 36 square inches.

I think platinum must have been a lot cheaper in those days to be able to use it in a battery of that size.

The book describes a wide variety of machines from hydraulic rams to generating electric sparks from a steam boiler. This latter interested me because one time I was standing close to *Blackmore Vale* locomotive on the Bluebell Railway and every time the safety valves lifted, the hairs on the back of my neck stood up. The steam passing through the valves was obviously generating static electricity but I would have thought that the locomotive would have been earthed by the track. Has anybody got any ideas on the subject?

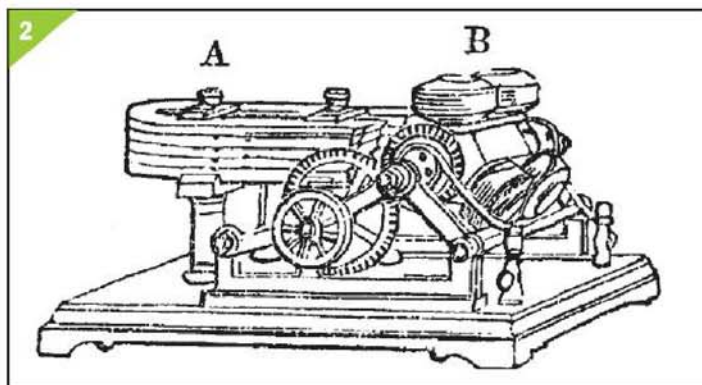
C. Wood, Sussex.

Ratchet drills

SIRS, - Reference the compact ratchet brace (*M.E.* 4288, 8 December 2006), in the article Bill Steer refers to the redundancy of this versatile tool and it falling into disuse after the Second World War.

I used this versatile tool during the 1970s, 80s and 90s and even within the last five years during my career in the Merchant Navy and NHS Estates.

Several examples come to mind, especially where either power was not available or was



not permitted in hazardous environments.

A recent example was to replace corroded fittings within an oil tank bund whilst the tank was still in use. The NHS site involved could not be closed for political and financial reasons. The ratchet drill being a slow moving, low heat generating and spark free tool came to the rescue, saving money for a cash strapped health service.

P. W. Collyer, Kent.

Stainless steel boiler fixings

SIRS, - I am the secretary and boiler tester for Barnsley SME. I am building a 6in. scale Ruston and Proctor tractor which has a Bell steel boiler. I have never seen anything in *M.E.* about using stainless steel fasteners, for example fastening fire-hole door, clack flanges etc., with stainless screws which penetrate the water space. Maybe you could print this in *M.E.* and see what the consensus of opinion is?

Graham Walker, Barnsley SME.

Kingette information

Good news for Tim Ostley, following his request under *Club Chat* (*M.E.* 4289, 22 December 2006) for information on the LBSC *Kingette*. I have the *Kingette* built by Dick Colbran over a seven-year period (1933–1940) and it is now in good running order again, thanks to assistance from Bob Andrew and Ken Coxey of the Stockport DSME. I shall certainly be pleased to provide any assistance I can and to e-mail any specific photos he needs - provided I don't have to

dismantle it too much! In working on it I have made one or two minor modifications of a practical nature which may be of interest. Also, if he contacts Peter Shaw at the National 2 1/2in. Gauge Association, there are reprints and printed details of the *Kingette* available for a small fee.

The *Kingette* is interesting in that it is a 4-cylinder locomotive, unusual in such a small gauge. It is based broadly on the GWR King Class and makes a fine 4-6-0 locomotive. This particular one is different in that it has a parallel boiler, giving it more of a Southern Region air.

I wonder how many *Kingettes* are in existence. It would be interesting for both Tim and me to hear of any others – there must be many ideas worth sharing.

Ian Gordon, Cheshire.

Tailstock adjustment

SIRS, - Re: Inchanga's piece on Tailstock Alignment (*M.E.* 4290, 5 January 2007), I have never understood why Myford fit the Series 7 tailstock with slotted head set-over adjustment screws, which are hard to turn and easy to slip out of, using a screwdriver.

The sideways setting-over of the tailstock (on my machine, anyway) has always been very stiff, and it was very difficult to move the slot headed screws controllably to make the necessary adjustment, and to get them tight enough to stop unplanned movement. Also I have always assumed that the set-over adjustment should be carried out with the tailstock very lightly clamped to eliminate any possible errors in the

2. The early electric motor referred to by Mr. Wood.

measurement due to rocking, and this adds to the stiffness of movement.

Years ago, therefore, I replaced the adjustment screws by 1/4in. BSW Allen grub screws of the same length, with similar dog points. With a 26tpi thread, this means that a 10deg. rotation of the screw causes about one thou. movement, and using an Allen key to turn the screw makes a small adjustment very positive and easy. I have never had any trouble making the adjustment since.

Having a DTI, I have found the simplest way of checking the alignment is to clean the tailstock bore, put the hard centre into it and clock around it using the DTI mounted on a bracket in the 3-jaw chuck.

Tony Finn, East Riding of Yorkshire.

Sifbronze and boilers

SIRS, - With reference to Mr. Lewis's letter in *M.E.* 4287, 24 November 2006 querying the use of Sifcupron for soldering copper boilers I offer the following comments. These alloys contain phosphorous which has an affinity for oxygen and which enables soldering to be carried out without flux. Unfortunately, it also has an affinity for sulphur so that joints made with such alloys when exposed to sulphurous gases suffer corrosion and early failure. Coal fires produce enough sulphurous gases to cause problems. The use of these alloys has been discussed in *M.E.* some years ago and the general consensus was that they should not be used particularly for firebox, flues and smoke box.

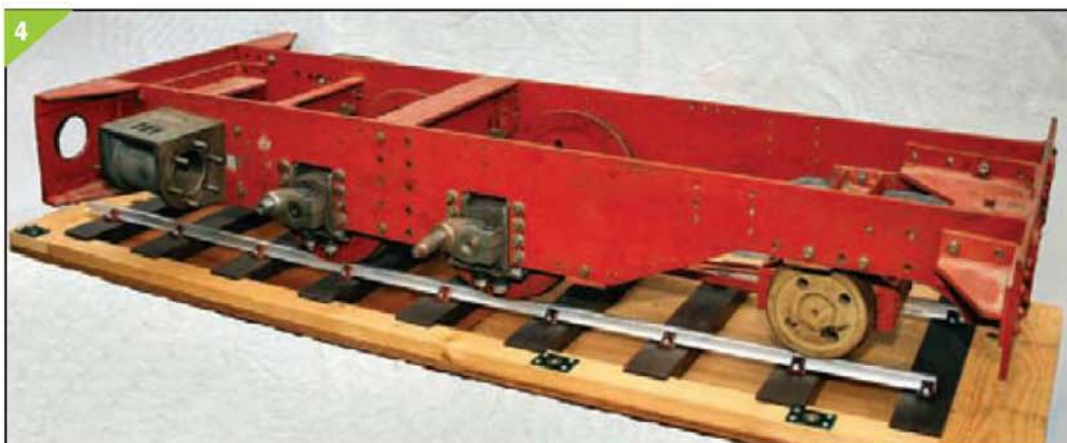
A handy tip; if you're not sure if the stick of solder you have is a phosphorous-copper alloy, Solder two pieces of mild steel together with it. If it contains phosphorous it will be quite easy to pull the joint apart.

F. A. J. Collin, by e-mail.





3. Malcolm Freestone's 2-8-0 locomotive chassis.



4. Malcolm Freestone's 0-4-2 locomotive chassis.

Mystery locomotives

SIRS, - I have recently acquired two-part-completed locomotive projects and these have presented me with a bit of a double mystery to try and solve. Both had been on show at the Conwy Valley Railway Museum and, at initial viewings, appeared to be a simple narrow gauge 0-4-2 on a purpose-built erecting stand and a 2-8-0, possibly a C19 but also narrow gauge.

Closer inspection of the 2-8-0 ruled it out as being a C19 as it had plate frames rather than bar and the wheel spacings were equal whereas those on the C19 were not. The wheel castings themselves were also of a different pattern, having the balance weights completely covering the relevant spoke areas. The frame assembly is of all-welded construction and the overall state of the chassis showed that it had had some previous use, thus suggesting it may have been a conversion or a re-build rather than an unfinished new build project. Another aspect of the construction was that Hackworth valve gear, or a form of it, was in process of being fitted.

On the other hand, the 0-4-2 does not show any evidence of former use, but intriguingly has two sets of mounting holes for cylinder retaining bolts - one set being horizontal and the other inclined, the latter actually having been used to mount the cylinders. The drag beam and supports had also been changed at some point, the whole tending perhaps to suggest a 'changing horses in mid-stream' approach. Research so far suggests a similarity with, but by no means identical to, a Kerr Stuart 'Stanhope' or possibly a similar Hunslet design.

No drawings or any other documentation were available on either project, thus any history or other known information would be welcomed and helpful in deciding the future of the two projects. It would not be an insuperable problem to make our own adaptation of either locomotive, but it would be interesting and useful to know their origins.

Malcolm Freestone, Gamlingay.

Combustion

SIRS, - R. L. Wright is to be complimented on his letter

(M.E. 4289, 22 December 2006) on *Combustion in I/C engines*. It is simple, clear and has the quality of making one say "Of course!" even about things that had escaped one's mind.

However, there is one thing that seems contradictory and that occurs right at the end. Here he states that adjustment of the fuel injected into a diesel engine so that all the inhaled oxygen is used up by an adequate amount of fuel (not an excess) results in enhanced power output. That seems to follow clearly from his previous dissertation on weak/correct/rich mixtures. But then he follows this with "...accompanied with voluminous quantities of thick black smoke..."

Does not this smoke, so obvious with many diesel trains, trucks and other engines when called on to work hard, signify unburnt fuel in the form of carbon molecules? From the previous arguments should not this mean that the mixture is too rich in spite of the increased power output?

Ted Wale, Canada.

All torque?

SIRS, - Surely, your contributor Inchanga (M.E. 4289, 22 December 2006, p.755) meant to say that "Torque is the (average) thrust multiplied by...", not divided by, the crank throw?

M. J. H. Ellis, Bristol.

Crewe has moved!

SIRS, - M.E. 4289, 22 December 2006 contained a well-written and researched article by Ron Isted on the LNWR 4-4-2 Tank Locomotives.

It did, however, contain one error, having re-located the famous Crewe works to Staffordshire, when it is of course still firmly in Cheshire.

I am a former pupil of Nantwich and Acton Grammar School and can recall vivid memories of straining my neck to see the locomotives of the day exiting the works, as my bus went over Mill Street Bridge adjacent to Crewe works, on my daily journey to and from school.

It is a silly error, but then there were several railway works in the UK, largely unknown to the contributors to *Model Engineer*, other than that obscure place at Swindon.

I am proud to say that I served my apprenticeship largely on steam locomotives at the Doncaster Plant Works which produced the current world speed record holder for steam traction.

J. D. C. Brown, Derbyshire.

Chiem tramway information

SIRS, - In Post Bag of M.E. 4288, 8 December 2006, Mr. Dowling refers to the tramway at Lake Chiem in Bavaria. Under the Internet address www.chiemsee-schiffahrt.de is a short article with three photographs, and under the section 'Technical Information' details of the locomotives, in English, can be viewed by clicking on the Union Jack.

P. Williams, Germany.

THE MODEL ENGINEER EXHIBITION

7th - 9th September 2007 Ascot

Please return completed form to:
Model Engineer Competition,
9 Tranmore Lane, Eggborough,
E. Yorkshire DN14 0PR

ENTRY NO.

OFFICE USE ONLY

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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 Magicalia Publishing 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 (Magicalia Publishing 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 Magicalia Publishing Ltd will not accept liability for any loss of documents or photographs submitted with this form.

To help you get the best from The Model Engineer exhibition

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

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

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

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

Club exhibits

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

Additional forms

If you do not wish to deface your copy of the magazine we are happy to receive photocopies of the entry form, one for each model. We will be pleased to send out extra forms if required, so if you know of a modeller who is not a reader of one of our magazines but who you think may wish to participate, please advise them to contact our Exhibitions Office, or simply photocopy the entry form for them.

The success of the show depends largely on the number of models on display. Your work could well be the stimulus which inspires someone else to start in the hobby. There can be no doubt that this event is our showcase on the world of modelling in all its aspects. Every modelling discipline needs more and more participants, and it is by displaying not only the crème-de-la-crème, but also examples of work of a more achievable standard, that people are encouraged to join into the wonderful world of modelling, in whatever aspect.

We look forward to seeing a sample of your work at the show!

Engineering Section

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

Railway Section

- B1 Working steam locomotives 1" scale and over.
- B2 Working steam locomotives under 1" scale.
- B3 Locomotives of any scale, experimental, necessarily 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 - non-working.
- 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 its 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 MAGICALIA PUBLISHING 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 MAGICALIA PUBLISHING 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 MAGICALIA PUBLISHING 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. MAGICALIA PUBLISHING 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 MAGICALIA PUBLISHING 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 MAGICALIA PUBLISHING LTD. are eligible to re-enter their model for the 'Duke of Edinburgh Challenge Trophy'. Past winners at any of the exhibitions promoted by MAGICALIA PUBLISHING LTD. will not be eligible for re-entry into the competition unless it has been substantially altered in any way.
7. MAGICALIA PUBLISHING 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 MAGICALIA PUBLISHING LTD WILL NOT ACCEPT LIABILITY FOR ANY LOSS.

CLOSING DATE 24TH AUGUST 2007



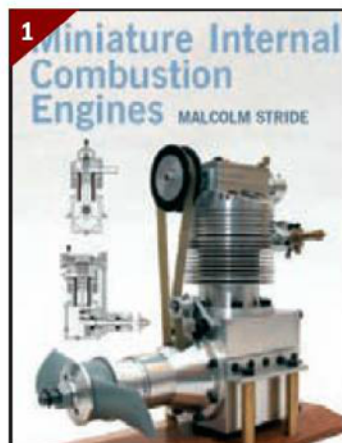
Nemett

presents another mixed-bag including details of a new competition for I/C engines at the Model Engineer Exhibition and details of some I/C engine websites.

1. The cover of the soon-to-be-published new book on miniature I/C engines.

2. John Whiteley from Bradford MES showing off his fine NE15S.

3. A closer view of John Whiteley's water-cooled NE15S showing the water pump drive.



It has been some time since a new book was published on building and running miniature engines. I am pleased to announce that the wait is (almost) over because a new book by Nemett's alter ego will be published in late April this year. *Miniature Internal Combustion Engines* (photo 1) will be published by Crowood Press

(www.crowood.com tel: 01672-520320) at £19.95. The book is not a detailed construction book for any particular engine but is intended to be a guide to designing, building and running miniature engines. It covers the general operating principles, basic design methods, and construction options for all the major engine parts. The main part of the book focuses on 4-stroke engines with separate chapters devoted to 2-stroke and other types of engines. It is a 175-page full colour hardback publication with approximately 150 photographs and drawings. I will provide a more precise publication date when I have one.

A new MEEX trophy and competition

Another thing which does not happen very often is the introduction of a new competition and trophy to the Model Engineer Exhibition. Because of the great interest shown in the NE15S I have been persuaded (conned?) into setting up a competition for Nemett engines (I know there is only one design at the moment, but I am working on that!) to be judged and awarded at this year's centenary show. The Nemett Cup will be awarded to the best example of any Nemett design entered in the competition classes at the show and, this year, in addition to the trophy I will also be including a copy of the new book. I hope to include a photograph of the trophy next time.

In common with the other awards at the exhibition, the winner will hold the trophy for a year. I will publish any other rules nearer the time, but I hope the competition will help to encourage more model engineers into the



field of I/C engines. Remember that you could make history by being the very first winner of the trophy at the centenary Model Engineer Exhibition.

This is probably an appropriate place to remind readers that drawings (15 A3 sheets) for the NE15S are available from Nemett, Box 001, Magicalia Media Ltd., Berwick House, 8-10 Knoll Rise, Orpington, Kent BR6 0EL. Cost is £45 and cheques should be made payable to M. L. Stride. There is plenty of time to build an engine before September!

Readers' engines

I have received information recently about some readers and their engines, including John Whiteley (photo 2), who won the Jack Ashworth Trophy for general engineering at the annual competition night at Bradford MES. The engine in

question (photo 3) is a water-cooled NE15S complete with a water pump driven off the timing drive. John has also incorporated a mechanical contact breaker on his engine instead of the electronic ignition.

John comments "I have pleasure in sending you a photo of my NE15S engine which was completed in August 2006. I have run it for several hours now and find starting easy. I made it with a cast iron and steel piston as per L. G. Mason (I have made three Mastiff engines from patterns I made) and use an 8mm wide belt. In order to improve water circulation a water pump was added driven by an O-ring off the back of the cam pulley. The spark plug is home made using PTFE as the insulator and a paper clip as the electrode as this is made of a good quality steel. The contact breaker is from a motor car although I did make an electronic version but had problems with it. The engine provides good torque and has a flexible speed range from 1000-6000 rpm".

I think John has made a small piece of history by being the first to gain a trophy with the NE15S. Well-done John.

I have also received a letter from Bill Linfield from Oxfordshire. Bill suggests that if readers are impatient to get going on a more complex engine "where it all hangs out" they look at the Vega V-twin or >>>





4. Bill Linfield's Vega V-twin to the design by the late David Parker.

5. Bill Linfield's Chenery designed Aero-Twin.

6. The top view of Dick Pretel's Wall Four showing the valve gear.

7. The pushrod side of Dick Pretel's engine.

the Chenery Aero-twin. Readers may remember I wrote a feature on the late David Parker, designer of the Vega (M.E. 4255, 2 September 2005). The Vega (photo 4) is constructed from the solid, while the Aero-twin (photo 5) uses some castings. The Aero-twin castings were part of the Working Precision range and will be

supplied by Hemingway once things get sorted out after the transfer. I thank Bill for the suggestions and photographs.

While on the subject of Les Chenery, I have just been told that Les is in hospital at the moment. I am sure all readers will join us in wishing him a speedy recovery.

Another award winner for an I/C engine is Dick Pretel from the Bay Area Engine Modellers who was awarded the Craftsman of the Year award for his superb Wall Four engine (photos 6 and 7). Not only is Dick's engine superbly constructed, it is also superbly presented on its operating base. The society web site (www.baemclub.com) contains a selection of further pictures



of this fine engine and others from members.

Miniature fuel injection

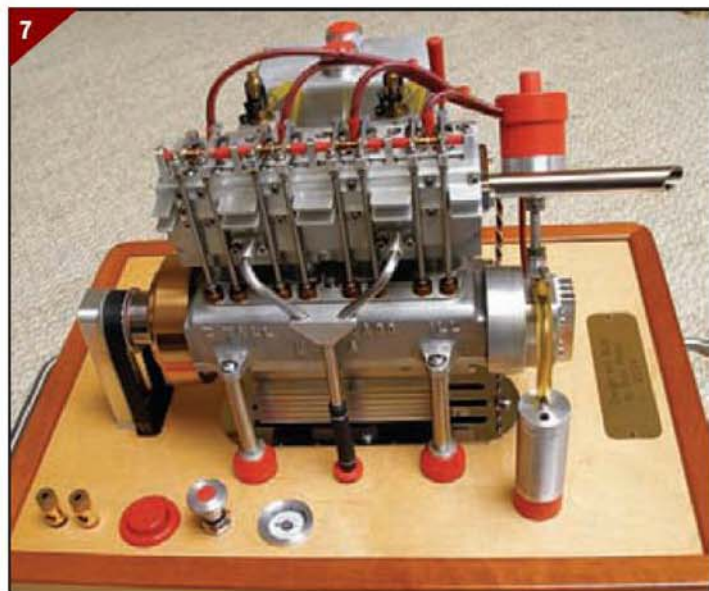
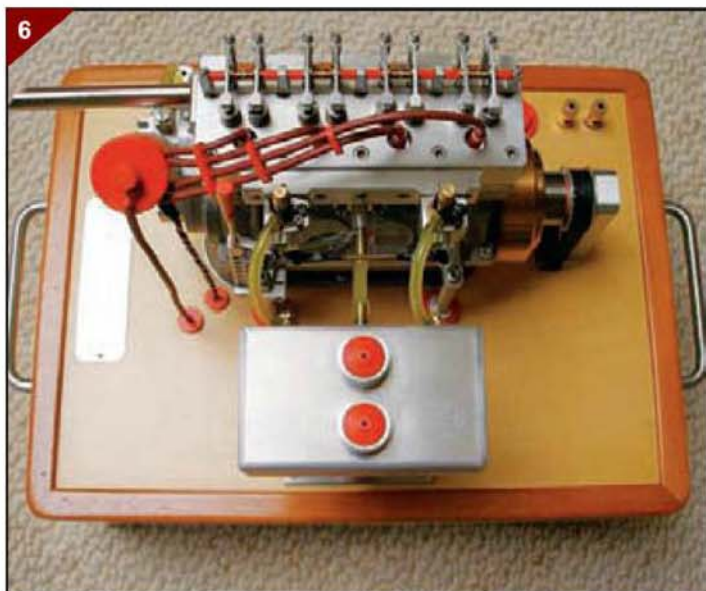
Reader Sean Craggs has found some details of a commercial miniature fuel-injection system. The system is supplied by O. S. Engines (www.osengines.com) and a basic diagram is on the website for those interested. The unit uses a solenoid-operated injector to inject fuel into the carburettor. The unit features an electronic control unit which has sensors for exhaust temperature and RPM and alters the amount of fuel-injected according to changing engine conditions.

From the description on the website, it appears that the fuel is pressurised using

crankcase pressure and the injector unit controls a valve allowing fuel to flow into the inlet. The injector is timed to suit the speed of the engine. The control unit also has inputs from the radio control system to allow changes to be made during flight.

The unit is fitted to the 26cc O. S. 160FX-FI. Unfortunately I have not had any response to my e-mail request to publish the diagram so cannot do that at the moment. Those with web access can find full details by clicking on the link to 'product manuals' at the top of the home page.

The general principle is interesting and would be worth investigating – but I am busy on the next design (among other



things) at the moment, so it is down to one of our readers!

Electronic ignition protection

Ian Maxwell-Hart has provided a suggestion for protecting electronic circuits such as the TIM-6 electronic ignition system from damage due to over voltage such as when the unit is operated without the earth connected.

Apparently the normal method of protecting circuits containing coils from such problems is to connect a diode across the coil so that when the coil is being energised, no current will flow through the diode. However, when the circuit is broken to fire the ignition, the reverse voltage (back EMF) generated in the coil is dissipated harmlessly through the diode, thus preventing damage to the circuit.

The diode Ian suggests is the 1N4148 and it should be connected across the supply to the coil (**fig 1**) with the cathode (denoted by the black band) connected to the positive (+ve) terminal.

I have not tried this yet, but intend to connect the diode across the circuit board coil output so that the diode is kept neat and tidy inside the ignition box, and will report back in due course.

Carburettors and springs for the NE15S

Readers may remember that Ian Maxwell-Hart had trouble finding small springs for the throttle adjustment screws on the NE15S. Mick Wilshire from World Engines has sent me a sample from the Supre Tigre range of engines which will do the job. The part number is SUPG4717 and 20p each and a stamped addressed envelope to Mick at 13 Smith Street, Watford, Herts WD1 8AA (tel: 01923-225233) will get you the springs.

Mick also has some Super Tigre carburettors which will be suitable for the NE15S. The most suitable is the MAG G34, part number 12163273 (12mm OD spigot). I have one of these carburettors to try but have not done so yet. Nemett builders will get a special price on these carburettors which have a

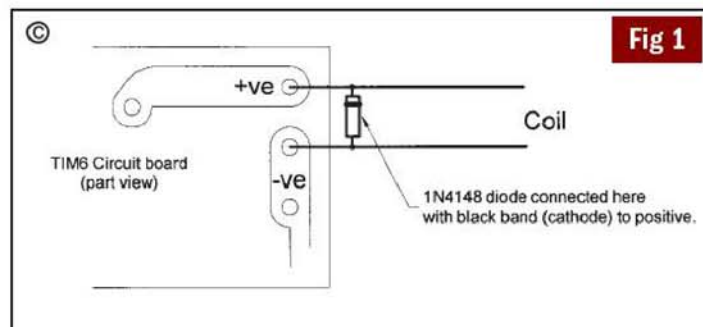


Fig 1. Connecting the protection diode to the coil output on the TIM6 Ignition system.

variable mixture facility and a separate slow running mixture adjustment. I have used the same carburettor on my previous push-rod 15cc design and it performed very well, so should be fine on the latest engine.

The next Nemett design

This has now been decided on; it will be a 15cc in-line twin with exposed push-rod operated overhead valves. I have made progress on the drawings and will hope to publish a first general arrangement shortly. The reason for the choice is to provide an easy progression from the NE15S onto a multi-

cylinder design with a multi-throw crankshaft and split big-end bearings. The shaft will be machined from the solid and I will probably produce both water and air-cooled cylinder jackets as with the first design. Watch this space!

I would like to thank all those who sent in suggestions for the next engine and to assure those who did not suggest a twin that all the suggestions have been filed for future use.

Miniature I/C engine websites

Many readers are regular users of the Internet and already

make good use of the wealth of I/C engine information from that source. I thought it would be useful to put a list of some of the sites I have used and found useful or interesting. Even if you do not have access to the Internet at home or via your club, don't forget that in the UK at least, local libraries usually have Internet terminals and the sites can be accessed using that route. I know at least one person who uses such facilities regularly for e-mail and Internet access. For those less experienced in such things, help is also normally at hand. If any readers have other relevant sites that they feel would be useful to others, please let me know and I will publish details. **ME**

<http://www.baemclub.com>

A good club site devoted to miniature I/C engines of all types but particularly larger multi-cylinder varieties.

<http://www.modelengineneeds.org>

An excellent site by Ron Chernich containing a large amount of technical detail, construction details and articles together with many links to other useful sites. The site also has the Camcalc program for calculating milling offsets for cutting cams.

<http://www.agelessengines.com>

A commercial site with details of drawings and instructions for building a range of radial and rotary engines.

<http://www.craftsmanshipmuseum.com/Tomlinson.htm>

This is a section from a much wider site, this part featuring Glen Tomlinson and his Deltic engine.

<http://rbowes1.11net.com/dbowes/index.htm>

This site is devoted to the range of electronic valve I/C engines by David Bowes.

<http://www.jerry-howell.com>

Jerry's site contains details of his range of designs including his wide range of I/C engines and accessories.

<http://www.nvbackflow.com/engines>

This American site has a range of castings

and other parts for a selection of engines from V-twins to supercharged V8's.

<http://www.minimodelengines.com/index2.htm>

This site features the work of George Luhrs and has details of a wide range of engines built by George.

<http://www.ronsmodelengines.com>

This is Ron Colonna's site and includes details of his well-known 60cc Offenhauser 270 racing engine among many others.

<http://www.strictlyic.com/Index.html>

This site gives details of the back issues and how to order them of this excellent magazine, sadly no longer being published.

<http://fly.to/orkenrud>

This is Trygve Örkenrud's site and features some fine engines from this Swedish designer.

<http://hamiltonupshur.tripod.com>

This is the late Dick Upshur's site and according to the site the range of engine drawings is available via his daughter.

<http://home.swipnet.se/merc>

Ingvar Dahlberg is well-known for his superb Mercer Raceabout car and his range of engines. This is his site.

I have visited all the sites listed and used 'cut and paste' to copy the links, so they should all work.

MAGNETIC DRIVE CLOCK

PART 2

Continued from page 202
(M.E. 4293, 16 February 2007)

Richard Stephen continues with profiling the plates and moves on to the wheels and pinions.



The pegs are secured in the two holes in the board using super glue. The length of the 2mm centre peg should also be reduced to 4.5mm above the board. The back plate can now be profiled. **Photograph 4** illustrates the back plate ready for profiling the second half of the plate. The screws securing the plate to the 5mm pegs can be seen. It is essential that before you start profiling that

both the plate and all the waste material are very well secured to the board. I find that 20mm panel pins are the best way to secure the waste material. Make sure that the pins will not foul the slot drill.

Returning to the front plate, with the plate and all the waste well secured, check that the 2mm centre hole is still precisely at the origin of the co-ordinates ($x = 0$, $y = 0$). Now drill a 1.7mm hole at the

position of the two dial pillars $x = -42\text{mm}$, $y = 42\text{mm}$ and $x = 42\text{mm}$, $y = 42\text{mm}$. Secure the dial pillar arms to the board with 20mm panel pins. The front plate is now ready for profiling. For a good final finish the following points should be observed.

The finished plates are shown in **photo 5**. The profiling of both plates after setting up took a morning to complete. Here is some guidance on cutting them out:

- The plates are designed for profiling with a 3mm slot drill.
- Use a new slot drill.
- It is necessary to continuously remove the chips that are produced using a vacuum cleaner particularly as the cutting depth increases. If the chips are allowed to accumulate in the cut they will get stuck between the side of the slot drill and the work. This will certainly damage the surface finish and, in extreme circumstances, cause the breakage of the slot drill.
- Keep all parts of the work well secured to the baseboard.
- Do not use too high a feed rate 60mm/min is quite fast enough.
- A spindle speed of about 2500rpm is ideal if you are cutting dry. The combination of the recommended feed rate and spindle speed will reduce the chip size and make it a lot easier to vacuum chips out of the cut.

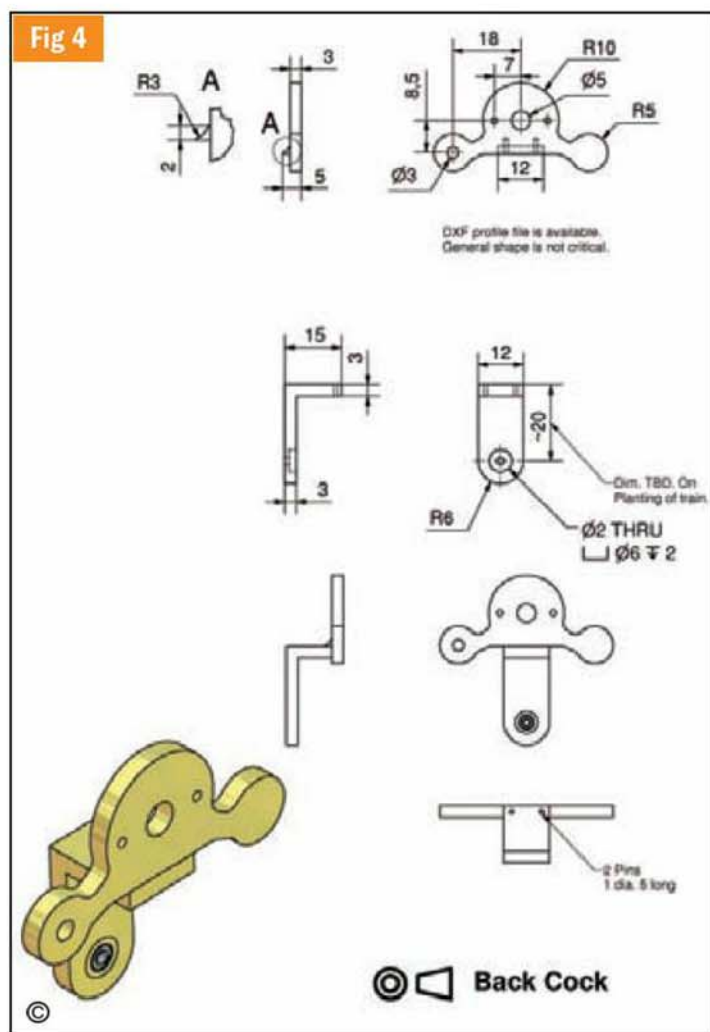
If these points are observed you should have almost no

4. Back plate ready for profiling.

5. The finished plates.

6. Drilling for the pins.





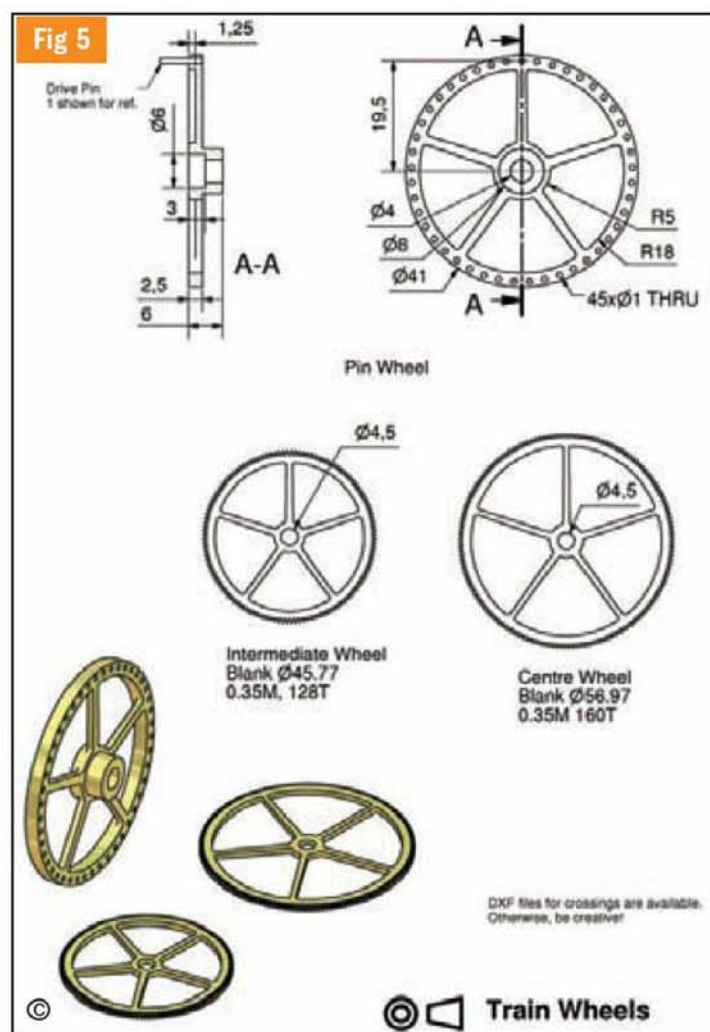
further work to do on the edges of the plates.

Back cock

The dimensions and details of the back cock are shown in **fig 4**. The cock is fabricated for ease of construction in two parts. The plate is profiled out of an off-cut of 5mm engraving brass and the L-shaped section cut out of a

suitable scrap of 12mm compo brass plate. The plate of the cock is quite small and as a consequence awkward to hold securely for profiling.

I soft-soldered the blank to an off-cut of 3mm brass sheet, which in turn I screwed to a piece of 18mm MDF board which was clamped to the table of the milling machine.



The origin of the drawing, and the start point for the profiling is the centre of the 5mm hole that fits on the upper pillar extension. Drill and ream a 5mm hole at the origin. The 3mm hole for attaching the pin wheel non-return ratchet should be drilled and reamed at the co-ordinates shown. Return the spindle to the origin

position and profile the back cock plate.

With the profiled plate still in position on the milling machine, reduce the thickness of the

7. Grinding down the pins.

8. Polishing the teeth.

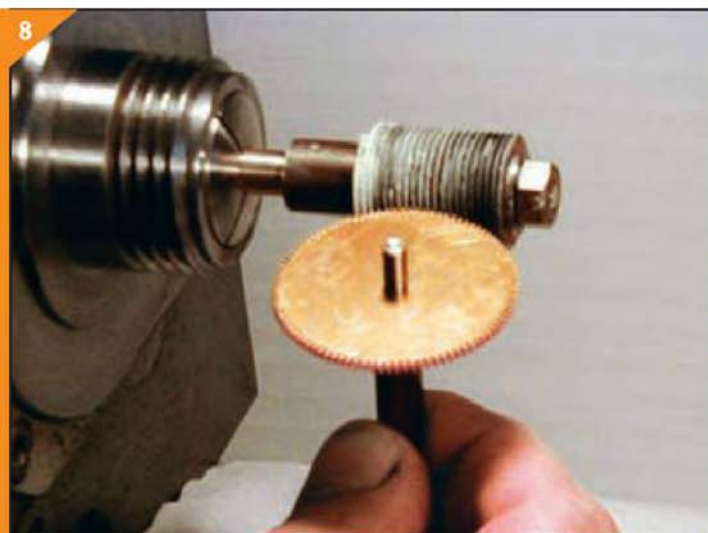


plate to 3mm leaving the section shown the full thickness. Replace the slot drill used for reducing the thickness with a 6mm ball nose cutter and fillet the raised section as shown in fig 4. Remove the plate from its mounting and clean up all the surfaces and edges with wet and dry paper. Now cut the L-shaped section out of a scrap of 12mm thick compo brass plate. Clean up all the edges and surfaces with wet and dry paper. I joined the two sections with Loctite 326 and 1mm brass pins for extra security.

Wheels and pinions

Details of the wheels and pinions are given in **fig 5** and **fig 6**. The pin wheel shown in fig 5 has 45, 1mm pins set on the circumferences of a circle 39mm in diameter. The pin wheel forms part of the drive mechanism of the clock.

The pendulum only drives the train as it swings in a clockwise direction. The gravity ratchet engages with the pins in the wheel to prevent the pendulum from driving the train as it swings in an anti-clockwise direction (see details of the pinion drive mechanism). The amplitude of swing of the pendulum is determined by the number of pins in the wheel. The pendulum for this clock is designed to have a total amplitude of swing of 8deg. ($\pm 4\text{deg.}$). With this amplitude the pendulum will have to make 45 complete oscillations (i.e. periods) for the pendulum arbor to make a 360deg. rotation. For a half second beating pendulum (period 1 second) this will take exactly 45 seconds. The centre arbor of the clock takes $60 \times 60 = 3600$ seconds to make a complete revolution. Dividing 3600 by 45 gives 80 (8×10) as the gear ratio required between the pin wheel and the centre arbor. The train uses 0.35 module 16 leaf pinions through out. Suitable wheel counts for the intermediate wheel and centre wheel, using the above factors, are 128 and 160 teeth respectively.

Pin wheel

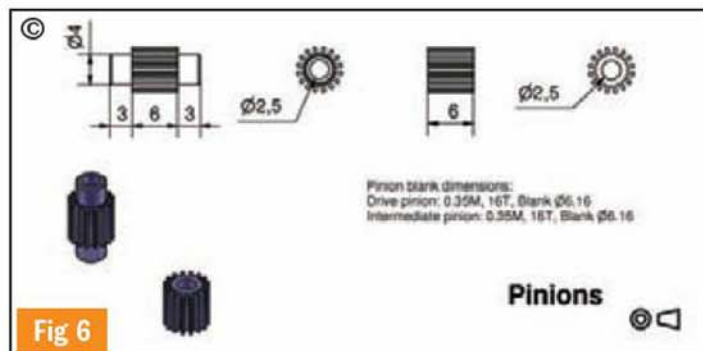
The pin wheel is made from a disc of free machining brass 6.0mm thick and 45mm in diameter. I cut my disc off a length of 50mm dia. brass bar. If you use brass bar, begin by facing off the end. Turn down the end to form a boss 3.5mm long and 8mm in diameter. Drill and ream a 4mm hole about 8mm deep in the centre. Now part off the blank, 8mm from the end of the boss. This will leave you plenty of material to true up the parted off end and reduce the thickness of the blank to 2.5mm (6.0mm including the boss). Turn the blank down to 45mm in diameter. The 45 holes for the pins should be drilled next. The holes are drilled on the circumference of a circle 39mm in diameter. The wheel will eventually be reduced to 41mm in diameter. This diameter leaves adequate clearance between the wheel and the arbor of the intermediate wheel.

Photograph 6 illustrates the set-up I used to drill the pin holes. The stepper drive dividing head was mounted vertically on the table of the milling machine using an angle plate. My gear cutting programme was configured to drill the 45 pin holes. I used a Sphinx 1mm micro drill.

Grip the 8mm wheel boss in a collet and reduce the diameter to 41 millimetres. The wheel is then recessed to a depth of 1.25mm leaving a rim of width 3mm and a boss 10mm in diameter. Bore the 4mm hole in the centre to 6mm diameter to a depth of 3mm. The wheel can now be crossed out, the dimensions of the crossings are shown in fig 5. Clean and polish the crossings before you insert the pins.

The 1mm pivot steel pins should be cut next. The blue pivot steel must first be polished with fine wet and dry paper to remove all traces of the blue. Unless this is done the Loctite used to secure the pins in the holes will not cure. Loctite requires both surfaces to be clean metal if the adhesive is to cure and grip.

Photograph 7 illustrates the set-up I use to cut the pins.



The Dremel, fitted with a 20mm diameter carborundum grinding disc, was clamped to the top slide of the lathe using a home made clamp. Grip a length of pivot steel in the lathe using a collet if you have one. Leave no more than 25mm sticking out. With the lathe turning fast and the Dremel set to maximum speed true off the end of the length of pivot steel. Using a slip stone remove the sharp corner of the end of the pivot steel. Advance the top-slide 9mm and with both the lathe and Dremel running cut off a length of pivot steel. Again remove the sharp corner and cut off a second length. Continue cutting until you have cut off 45 pins and a couple of spares.

The pins can now be inserted in the holes in the wheel rim and secured with Loctite 603. Press the ends of the pins flush with the back of the wheel rim. Carefully remove all excess Loctite from around the pins as you insert them. If any traces of Loctite remain after all the pins have been inserted this can be removed with a little Xylene solvent (if you can get some). To finish the wheel the pins all need to be ground to the same length (approximately 6.5mm proud of the surface) again using the Dremel grinder and the carborundum grinding discs.

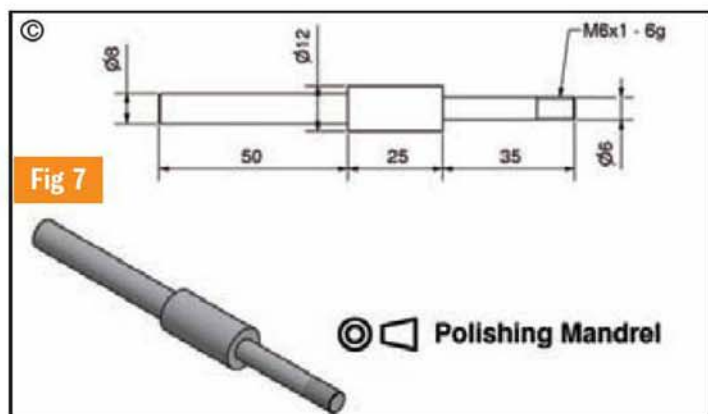
The set-up is illustrated in photo 7 is used to grind down the pins. Grip the wheel by the boss in a collet or chuck. With the lathe turning slowly and the Dremel at maximum speed slowly advance the grinding disc until the pins are all ground to the same length, about 6.5mm from the wheel surface. This completes the pin wheel.

The pinions and wheels are made next. The dimensions of

the wheels, pinions and the design of the wheel crossings are shown in fig 5 and fig 6. I make my pinions out of EN1A mild steel as this steel cuts very cleanly and preserves the edge of the very expensive Thornton cutters I use. The drive wheel pinion is made with a 4mm diameter by 3mm long boss at each end. The holes in the pinions are drilled 2.5 millimetres.

Case hardening the pinions

Before hardening the pinions true up and smooth the ends. The safest way to do this is to use the side of a carborundum dental cutting disc in a Dremel mini-drill. Hold the pinion in a collet in the lathe and grind the faces true. Now make a mandrel out of a 60mm long scrap of 3mm steel rod. Using a file taper the end so that it fits tightly into the hole in the pinion. Grip the mandrel in the chuck of a cordless or a hand drill (not mains powered). Check the pinion rotates truly. Heat the pinion with a blowtorch while at the same time rotating it. To minimise the formation of scale use the end of the flame not the base. When it is hot (not red) dip it in the case hardening powder and return to the flame. Repeat this process until you have built up a good covering on the pinion. Now heat the pinion up to red heat and maintain it at red for at least two minutes all the time rotating it in the flame. This continuous rotation ensures the pinion is evenly heated. Quench the rotating pinion in cold water. Quenching while rotating will prevent any distortion from occurring. With the wheels cut and the pinions hardened the



teeth on both the pinions and wheels should be polished. Polishing the teeth significantly reduces the engaging friction.

Polishing the teeth of the wheels and pinions

Readers may wonder why I go to the bother of polishing the wheel teeth. If one examines the teeth of a newly cut wheel under a microscope it is clear that the teeth are not smooth. Cutting the teeth even with the sharpest cutter will leave a slight surface roughness. This surface roughness generates a certain amount of friction as the wheel engages with the pinion. The presence of this friction is highlighted by the sound the wheel makes as it engages with the pinion before and after polishing the teeth. The sound generated reduces significantly after polishing indicating a reduction in friction. If polishing the teeth was a time consuming exercise it would possibly not be worth doing. Fortunately it is not.

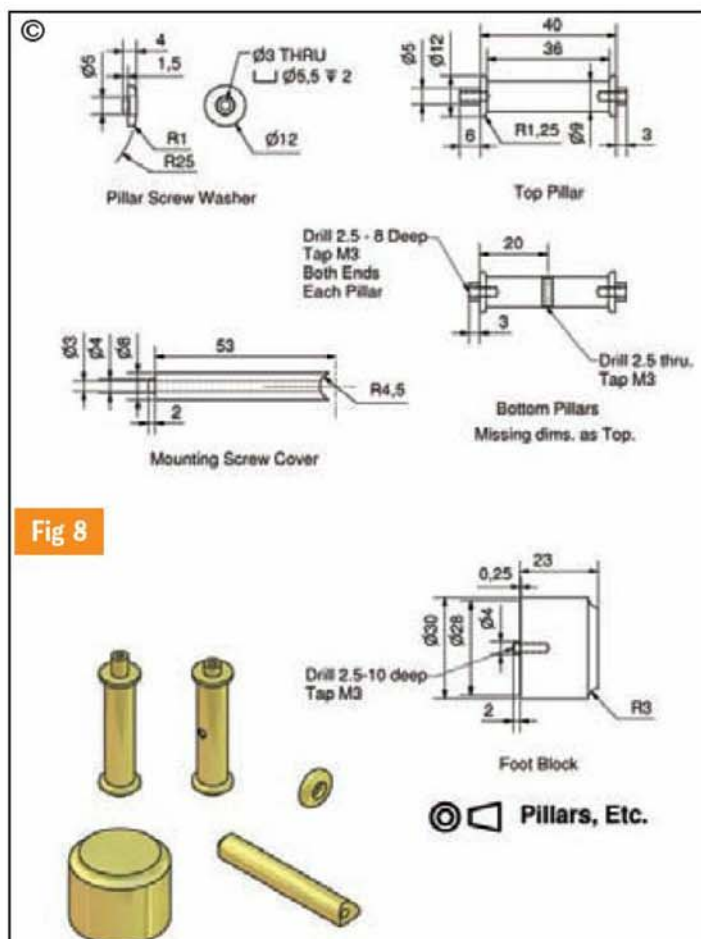
Making the polishing hobs

To make the hobs you will need a piece of box wood (the best) or any other hard close grained hardwood 70mm long and 30 x 30mm. Centre the block of wood in a 4-jaw chuck and turn a cylinder approximately 30mm in diameter. Drill a 6mm hole through the cylinder and cut it into two pieces about 30mm long. This gives enough to make two hobs one for brass wheels and one for hardened pinions. Make the mandrel shown in **fig 7** and attach one of the hob blanks. Screw-cutting wood is a problem using conventional screw-

cutting methods because the wood being rather brittle tends to break up. The easiest way to cut a clean thread in the hob is to use a milling spindle on a vertical slide fitted with the cutter used to cut the wheel you want to polish. Fix the vertical slide so that the axis of the milling spindle is parallel to the bed of the lathe. Running the cutter as fast as possible, cut the thread in the hob blank in the same way as you would any other thread. The pitch of the thread should be the same as that of the wheel you want to polish. For both versions of the clock you will need four hobs two for the 0.35 module wheels and pinions and two for the 0.40 module wheels and pinions. Suitable pitches for the hob threads are 1.10mm (0.35 mod) and 1.25mm (0.40 mod).

Polishing the teeth

Grip the mandrel in a collet or 3-jaw chuck. The hob first needs to be charged with a polishing compound. If the wheel being polished is made of brass, the polishing compound must be a non-embedding abrasive. The best non-embedding abrasive I have found is Autosol polishing paste for car paint work. This works equally well on hardened pinions. An advantage of non-embedding abrasives is that they will do little damage to the lathe if by chance some gets on the bed. Rather than taking any chances protect the lathe bed and compound slide with paper towel to ensure that the abrasive doesn't go where it shouldn't! To polish the teeth hold the wheel on a hand held



arbor. Engage the wheel in the thread of the hob, as shown in **photo 8** with the plane of the wheel inline with the axis of the hob. Run the lathe at about 500rpm. As the hob rotates the wheel is forced to rotate as well engaging with the abrasive loaded hob thread. As the wheel turns one flank of each tooth is polished. To polish the other flank, simply turn the wheel over on the arbor. The advantage of this method of polishing is that it does not damage the tooth form of the wheel. Polishing the teeth before you cross also avoids any possibility of distorting the

wheel. Polishing pinions with a hand held arbor is a bit awkward because of their small size. Instead I use a fixed arbor as illustrated in **photo 9**.

Pillars, feet blocks, screw covers and washers

The details of the pillars, feet blocks and the covers for the mounting screws and washers are illustrated in **fig 8**. The two lower pillars are cross drilled and tapped 3mm precisely in the centre of each pillar.

● To be continued.

9. Set-up for polishing pinions.



Marshall House, 28 Wanless Road,
London SE24 0HW.



Neil Read

a member of SMEE,
brings us up to date
with developments at
Marshall House.

The Society of Model and Experimental Engineers and *Model Engineer* were both founded in 1898 by Percival Marshall and so, although the organisation and running of the Society is now quite separate from that of the magazine, there has always been a close relationship between the two. For this reason we thought it only appropriate to feature our 'not so distant relative' in our occasional Club Profile series and make readers aware of the facilities and services available to members.

Now, let me start by quashing a few misconceptions. Membership of the Society is not just open to the elite in

SMEE UPDATE

model engineering. They did after all, accept me as a member and I have never won a Gold Medal at a Model Engineer Exhibition or been considered for the Duke of Edinburgh Challenge Trophy or any other major award for that matter. Anyone who is interested in model engineering in its many forms will be made very welcome.

The future

Nor is the society run by people with attitudes fixed in the late Victorian/early Edwardian era. All the elected officers I have met have their minds firmly on the present and the future, whilst perhaps appreciating that an awareness of the past is often the best guarantee of a future. True, there are many reminders of the past at Marshall House and I include a few photographs of some of the many treasures held within its walls or by its membership. However, these form only part of the facilities available to members.

For example, the building has a very well equipped lecture room where all the main

meetings are held. This is fitted out with modern electronic aids such as video screens, projection facilities for all types of images and audio amplification equipment. Upstairs is an extensive library with a wide range of books and periodicals all neatly arranged and catalogued. Needless to say there are several full sets of 'ours' available to members for reference. Downstairs is a very well equipped workshop area. This has recently been completely modernised with some very desirable machine tools and virtually any conventional machining operation can be carried out at Marshall House. Not least of the benefits of membership is that you can legitimately tell family and friends that you are visiting your 'London Club' when attending meetings.

When I called at my 'London Club' to take these photographs the Society was holding one of its Training Seminars. A few years ago the Society's Council realised that the opportunities available to people who wanted to learn practical engineering skills were fast diminishing.

1. A file handle, once the property of LBSC (Curly Lawrence) now owned by member Mike Chrisp.

2. A steam engine constructed circa 1830 by Mr. Robert S. Charsley, a pioneer railway engineer.

3. A venerable I/C engine once used to power the workshop of Ian Bradley of 'Duplex' fame.

4. In part of the SMEE workshop can be found this Clarkson tool and cutter grinder.





5. A Midland Railway 3 1/4 in. gauge 4-4-0 locomotive built by Mr. T. W. Averill of Alcester in 1906.

6. Tucked away in the lecture room was this 6-cylinder radial swashplate Stirling engine built by David Urwick.

7. Part of the extensive library, which includes many rare volumes, available to members of the Society.

8. The superb Emco lathe in the Jack van Rijn room - part of the workshop housed in Marshall House.

9. The Polly Models steam engine and boiler being used as an aid to teaching model engineering.

10. Norman Billingham lecturing the students on safety valve manufacture.

aim of teaching students how to make a working model steam engine. The project chosen was one from the Polly Models range and a photo is included. I believe it was one of the designs originated by our one time contributor, the famous Tubal Cain. It was one of these sessions that was under way during my visit with talks and

demonstrations on how to make the base and the boiler safety valve for the model.

I was most impressed by the enthusiasm of the students attending the course and the pride taken in the work they were producing. I am sure they will all go on to make excellent models of which they and their families can be proud. I also believe that the SMEE are to be congratulated

on this initiative and it deserves wider recognition.

Marshall House is located at 28 Wanless Road, London SE24 0HW and is only 200 yards walk from Loughborough Junction Station, which is served by Thameslink services. Check out their website: www.sm-ee.co.uk or write to the Membership Secretary at Marshall House.

ME

Traditional apprenticeships are becoming a thing of the past and engineering classes at colleges and other seats of learning seem to be closing down. It was decided to introduce a training course to promote basic engineering skills with an emphasis on model engineering.

Success

The success of this programme prompted a follow up set of courses with the



LETTERS TO A GRANDSON

NO. 99

M. J. H. Ellis

finally gets around to making his own design micrometer-adjustable lathe tool-post.

It is odd that you should express an interest in the 'Grandpa' design of micrometer-adjustable lathe tool-post, which I envisaged some considerable time ago. (It was in No. 72, Ed.), But I have only just finished making one up, and it does what I expected of it. Well, it could hardly fail to, could it? I have made some alterations to the design, and the enclosed sketch (fig 1) gives dimensions suitable for the Myford Super 7, a type of lathe popular with model engineers in this country. Of course, you could alter them to suit practically any other kind of lathe. If you intend to make one for yourself you may as well profit from my experience, one of my mottoes is, "You learn a lot on the first job". So here are some detailed instructions.

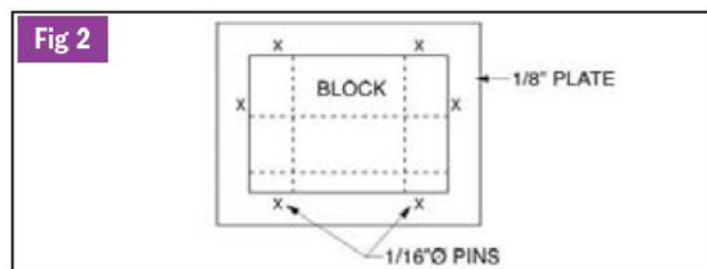
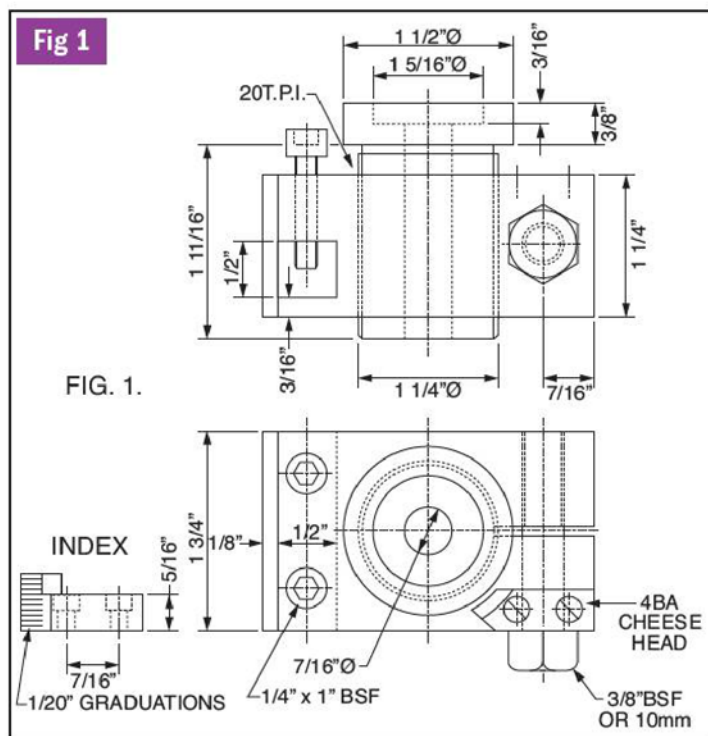
It is important for the threads in the block and on the pillar to be a good fit, and I deemed it wise to make the block first, and turn the thread on the pillar to fit it. I do not regret doing so. The block and pillar are both made from bright mild steel, so your first job is to hack off a lump for the block from $1\frac{3}{4} \times 1\frac{1}{4}$ in. stock. A coarse-toothed hacksaw blade makes the work easier, and if you still think it is hard work, remember that I trod

the road before you. Square off the two ends in the 4-jaw, but take easy cuts, as the work projects a fair way beyond the chuck jaws and you don't want to cause it to jump out. Leave it a bit ($\frac{3}{32}$ in. or so) oversize for the present, not that the precise length is really critical. Make a centre-pop on the centre-line of the bore, and mount the block in the 4-jaw with the pop running true. Drill through with a $\frac{3}{16}$ in. drill and open up the hole with successively larger drills to $\frac{1}{2}$ in. diameter. Bore the hole out to about $\frac{1}{8}$ in. below the finished size. Now you can use a bolt through the hole to hold the block down while you drill a row of $\frac{3}{8}$ in. holes along the centre-line of the slot which is to be milled in one end; the holes should be about $\frac{7}{16}$ in. deep, but no more. The reason for drilling these holes (which I forgot to say should be as close together as possible is to reduce the work to be done by the milling cutter. Most of us are unable to re-sharpen milling cutters for ourselves, but it is easy enough to sharpen a drill. Now you can mill out the slot big enough to give an easy fit for $\frac{1}{2}$ in. square.

The cap-piece which will be silver-soldered over the end of the block to close the slot can be cut from $\frac{1}{8}$ in. plate or strip, but it has to be $\frac{1}{2}$ in. bigger than the block both ways. Stand the block on the plate so that the plate projects by $\frac{1}{4}$ in. all round, and scribe a line on it round the edge of the block. Make six centre pops as shown (fig 2) a full $\frac{1}{32}$ in. outside the scribed line and use them to drill $\frac{1}{16}$ in. holes about $\frac{3}{32}$ in. deep, but not so far as to go right through. Cut off little pieces of $\frac{1}{16}$ in. welding rod $\frac{5}{16}$ in. or so long to make pegs

to fit in the holes. Their purpose is to locate the block on the end-plate for silver-soldering. I performed this operation in a pan which I keep for jobs like boiler making, laying the plate flat on a bed of coke with the block on top, and piling up coke around it. Before placing the work in position I snipped off three pieces of $\frac{1}{16}$ in. round silver solder as long as the milled slot and placed two lengthways under the wider face of the block adjacent to the slot and one under the narrow one I covered them with flux made into a paste with a little water. The reason for this rather elaborate procedure was that I wanted to do the job satisfactorily with the minimum of heat. I used oxy-acetylene, but no doubt an ordinary gas torch would do as well. As the solder melted; the block dropped onto the plate, and as soon as this happened I ran a pointed wire round the molten metal to dispel any bubbles of flux, and that was it. When the work had cooled off, but was still hot enough to produce steam I dropped it into cold water. This caused most of the flux to flake off, and the rest dissolved away by boiling it in water in a saucepan. I don't like to drop work into cold water too soon, because silver solder is said to go 'hot short' (i.e., go brittle with heat), and I was afraid of causing the solder to crack by differential contraction. The block now looked a sorry sight because of the heating, but after I had sawn away the surplus rim of the plate, and cleaned it up all over in the 4-jaw, the neat joint, solid metal all round, without the slightest flaw, was indeed heartening. I will continue my instruction in my next letter.

Your affectionate Grandpa.



PART 2

Continued from page 208
(M.E. 4293, 16 February 2007)

Tony Weale

moves on to the main chassis of this historic locomotive.

AYESHA II

Moving on to the locomotive chassis, this comprises the main side frames, trailing side frames, pump stay, cross-stay, buffer and drag beams, plus hornplates, trailing horns and joining angles. The main frames are available as water cut items, $\frac{1}{8}$ in. or 3mm thick, with horns of the same material. This thickness is over-scale but will only be visible at the edges of the frames ahead of the smoke-box. However, if this is a concern the frame width can be reduced by localised milling, or by tapering the edge with a file.

Should you wish to do so the chassis could be built in a slower and more conventional manner, with $\frac{3}{32}$ in. or 2.5mm frames, and cast hornblocks, as long as the width of $2\frac{1}{8}$ in. over the frames is maintained, and other dimensions adjusted accordingly.

If using water-cut frames and hornplates the first operation is to align the hornplates over the pre-cut slots in the frames, clamp together, then drill through from the pilot holes provided in the hornplates. Countersink the holes on the outside of the frames, and rivet the hornplates on with $\frac{3}{32}$ in. steel rivets. Remember that the frames are handed and the hornplates are on the inside. A piece of flat steel stock, which fits exactly into the axlebox slot can be used to gauge



alignment. Since water jet cutting leaves a small draft angle on the cut edges, this gauge will need to be slightly narrower than the $\frac{5}{8}$ in. finished width of the slots. It is worth machining a suitable piece to ensure that each axle-box will align with its opposite number.

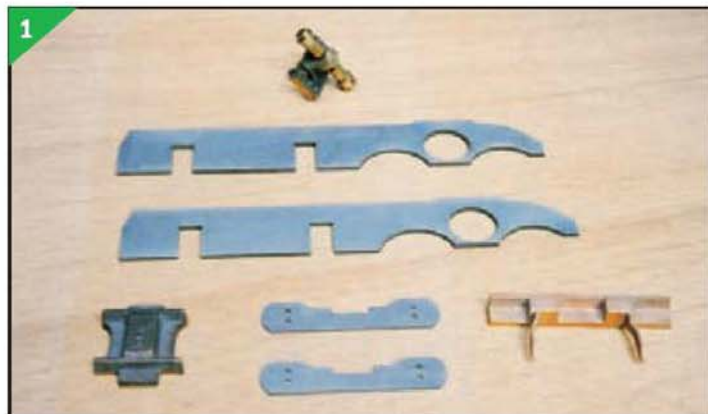
The next task will be to file the rivets flush with the outside of the frames. Then clamp the frames face-to-face with both the steam chest holes and the axlebox slots aligned, and file off the draft angles from the slots, leaving the edges perfectly square. Use a piece of $\frac{5}{8}$ in. flat stock as a gauge, and aim for a good finish on the inside of the slots. While the frames are clamped together, drill the holes for the

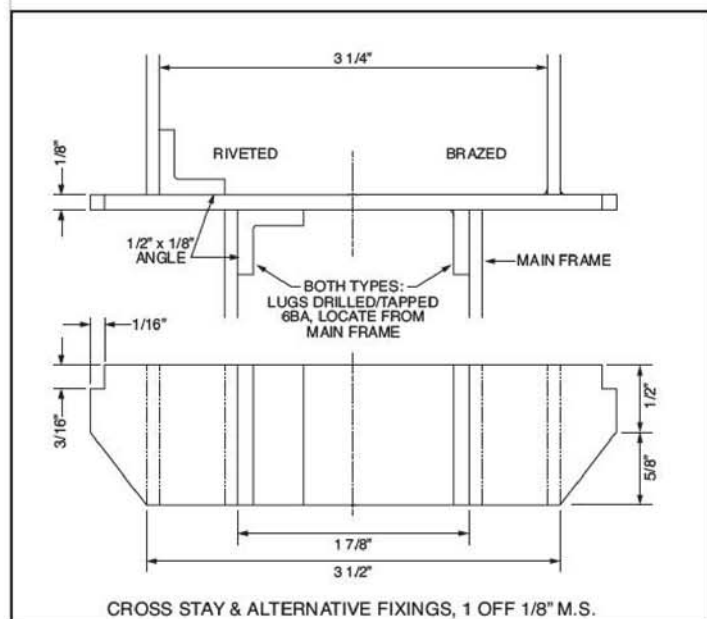
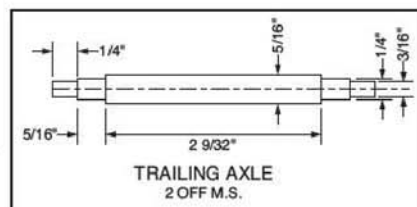
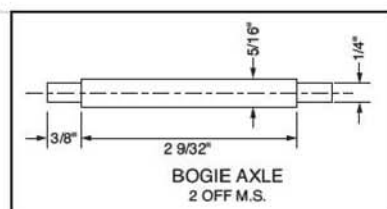
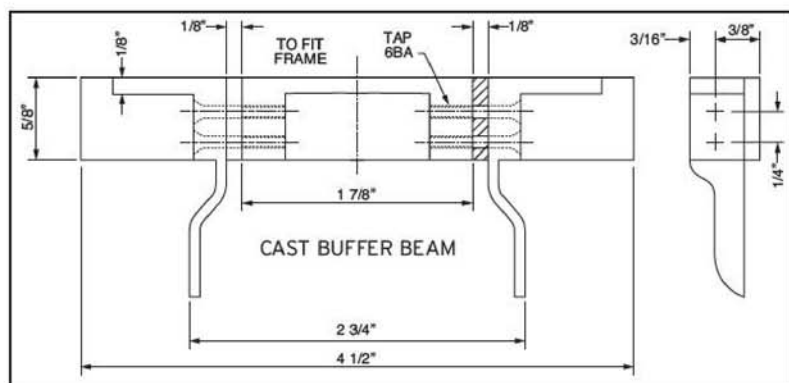
cross-stay joints, the smokebox saddle, and for the pump stay. If you intend to use steel angle for the buffer beam, drill the fixing holes for this. If a cast beam is to be used, the holes should be spotted through from the casting on assembly.

If making the frames from scratch, start with two pieces of mild steel plate, 2in. wide and about 13in. long. Mark out one frame and shape it by sawing and chain drilling, finishing off with files. Leave the horn slots slightly undersize, put in the pump, cross-stay and buffer beam holes, but not those for the hornplates or hornstays. Mark the centre of the steam chest hole, but do not cut it yet. Bolt or rivet the complete frame to the second piece of plate, >>

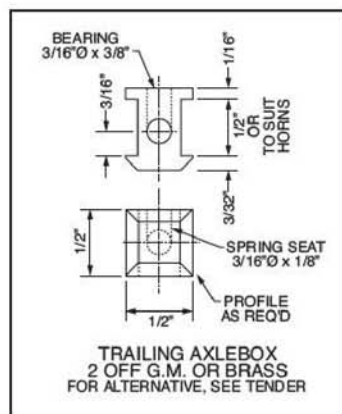
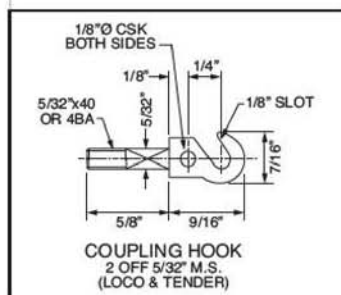
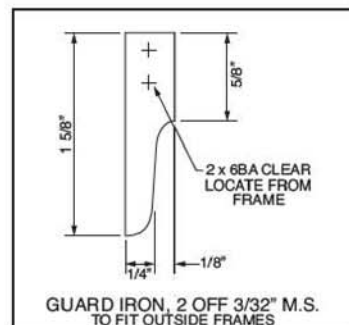
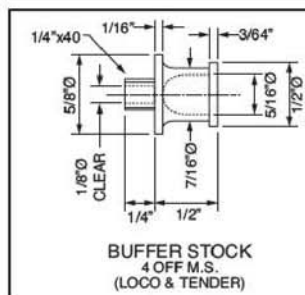
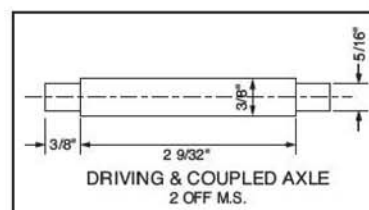
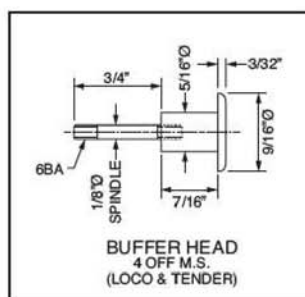
1. Pump and stay assembly, water-cut mainframes, and bogie frame parts.

2. Mainframe, with horns assembled, with trailing frame and front buffer beam temporarily held in place.





©



more experienced builder it is quick, neat and very strong.

Buffer and drag beams are next. The front beam is either steel angle, or a bronze casting which includes the distinctive guard irons of Curly's original locomotive. The casting will need minimal cleaning-up with a file, and the integral fixing lugs will need slotting to accept the frames. This is a job for a slitting saw in the lathe, with the beam clamped to the top-slide. Alternatively the slots can be

sawn and hand-filed, in which case drill a 1/8in. hole to locate the base of the slot, and use a fine-toothed hacksaw to make two parallel cuts down to it. The slots should fit over the frames tightly and must be at right angles to the face of the beam. Drill the fixing holes, 6BA tapping size through both lugs and frame, then enlarge the holes in the frame and the outer part of the lugs to clearance size, before tapping the inner part of the lug 6BA. Countersink

the holes in the outer face of the lug, so that the screws will clear the tail of the buffer. There should be no difficulty drilling 7/32in., lightly countersinking, and tapping 1/4in. x 40tpi for the buffer stocks, and the coupling socket is easily drilled 5/32in. dia. and finished with a small square file.

If using a steel angle buffer beam, this is prepared in a similar way. The nearest available commercial section is probably 20 x 20 x 3mm, so it will have to be reduced to 5/8 x 1/2in. by sawing and filing. It will also need a pair of joining angles cut from the same material, and screwed, riveted or silver soldered to the inside of the beam, flush with the inside of the frame slots. Ensure that they are correctly spaced.

If guard irons are required for the steel buffer beam, they are cut and filed from 3/32in. sheet steel or brass. They are retained, outside the main

frames, by the buffer beam fixing screws, the holes being located from those in the frames before final attachment of the beam.

The rear drag beam is a steel angle, similar to the front beam just described. It requires a small block of steel or brass, of any convenient dimensions, to support the drawbar pin. Attach this with countersunk screws as shown, or silver-solder it, then mark out and drill the 5/32in. pin hole through the top of the beam and right through the block.

Now we can assemble the chassis, with the aid of toolmaker's clamps. Clamp the front beam and the completed trailing cross-stay to the main frames, lay on a flat surface, and check alignment in all planes. Take your time and, especially, ensure that the main axlebox slots are in line across the chassis, that the side frames are vertical, and that there is no evidence of twist



when viewed from either end. Carefully drill, tap and countersink one screw hole at each corner fixing point, put the screw in, and check the whole thing again. If any adjustment is necessary, it may be useful to enlarge one or more of these first screw holes slightly to allow realignment after which add a second screw at each corner. The frame should now be fairly rigid.

If it is still 'all square' drill, tap and countersink the remaining holes, and add the rest of the screws. Any slight twist remaining in the assembly can often be corrected by twisting by hand, gently but firmly, in the appropriate direction. Note that since the steam chest is fitted into the frames, the front buffer beam cannot be permanently attached until the steam chest is fitted, so do not over-tighten it, or be tempted to silver-solder it!

The trailing frames and drag beam are added next, using a similar procedure. Stand the main frames on $\frac{5}{8}$ in. high packing pieces to match the height of the trailing end and again, check alignment in all planes before screwing or riveting. When satisfied with the job so far, make and fit the pump stay. Cut and file, or machine, this to fit exactly between the frames without distorting them, drill and tap the centre hole to suit your chosen feed pump, and rivet on the joining angles. To ensure alignment the pump thread is best tapped in the lathe. Hold the stay in the 4-jaw chuck, and rotate it by hand against the tap held in the tailstock. When the stay is complete clamp it in position, spot through the holes in each frame, then drill, tap and countersink for the fixing screws.

Now deal with the four main hornstays. These are cut from brass or steel angle, drilled 8BA clearance and countersunk at each end for the fixing screws, and drilled $\frac{1}{8}$ in. centrally to clear the spring guide pin. Clamp the stay to the outside of the frame with the lower flange facing inwards, centralise it on the appropriate horn slot, and drill the frame

for the fixing screws. These holes can be tapped, but since the fixing screws eventually have to be inserted between the spokes of the wheels, assembly is easier if 8BA clearance holes, with nuts inside the frame, are used.

Before we start on the running gear, we can add some details in the form of buffers and couplings, and we might as well make another identical set for the tender. Mark out the coupling hook on the end of a piece of mild steel flat which is rather longer than necessary, hold it in the vice by the excess while you work on it, then cut off when finished. Start by drilling the $\frac{1}{8}$ in. hole for the coupling link, and another to form the base of the slot, then saw and file to shape, rounding off all edges neatly. Make the square part of the shank a good fit in the buffer beam, but there is no need to turn the end of the shank circular for threading. Just file off the corners of the square to give the die a start, and a serviceable thread will result.

The coupling chains are made from $\frac{1}{8}$ in. steel wire. Welding rod is quite suitable. Each link needs to be about $\frac{1}{2}$ in. long. Make a former by rounding-off the corners of a piece of $\frac{1}{2} \times \frac{1}{4}$ in. flat bar a few inches long, hold it vertically in the vice, then wrap the wire around the bar as tightly as possible until you have enough coils for six complete links. Now snip the coil in the vice by its ends and saw through it to separate the links. Use two small pairs of pliers to assemble three links on to each coupling hook, bend them to butt the cut ends together as neatly as possible, then braze or silver-solder. After this the links will be fairly soft, but will probably have a rather rounded profile which can be corrected by light hammering, or squeezing in the vice. Finish by filing off any excess solder or braze, and clean up using a rotary wire brush.

The buffers are satisfying components to make, since they look good and actually work when they are finished. The stocks can be mild steel or brass. To produce four, chuck a

piece of round rod about 6in. long, with enough projecting from the chuck to make and part-off the first blank. Face the end, turn to $\frac{5}{8}$ in. dia. for just over $\frac{3}{4}$ in. length, then turn the first $\frac{1}{4}$ in. down to $\frac{1}{4}$ in. diameter for threading $\frac{1}{4}$ in. x 40tpi, preferably with the die held in the tailstock. Undercut the $\frac{1}{4}$ in. dia. section where it meets the shoulder, since the thread will not run right down. Then centre-drill, and put a $\frac{1}{8}$ in. pilot hole through just over $\frac{3}{4}$ in. deep. Part off at $\frac{3}{4}$ in. overall length, advance the material in the chuck, and repeat the process.

When you have made four threaded blanks, face off the piece remaining in the chuck, then drill it $\frac{7}{32}$ in. and tap $\frac{1}{4}$ in. x 40tpi, to hold the blanks for the next operation. Screw on the first blank, and use a narrow finishing tool, or a parting tool with the corners rounded-off, to machine the outside of the stock and form the shoulders. Note the dial readings as you finish each cut, and you can make the other parts identical. Finally, drill from the tailstock to open out the pilot hole to $\frac{5}{16}$ in. to about $\frac{7}{16}$ in. depth, and round off the outer corner of the part with a file. Unscrew the completed stock from the holder, wrapping it in emery cloth to protect the machined surface from the pliers, and repeat for the remaining three parts.

The buffer heads should be steel and are most readily made from solid. However, since most of the 'solid' will end up as swarf you may like to try LBSC's favourite buffer material, scrap $\frac{5}{16}$ or $\frac{3}{8}$ in. bolts, if you can find some with large enough heads.

Chuck the material by the head end, face the shaft to length, and turn it down to a sliding fit in the buffer stock. Centre-drill, drill, and tap 5BA, $\frac{1}{4}$ in. deep. Then part off, reverse in the chuck, and finish the head to diameter and thickness. Make all four parts to this stage, and then reset the tool to chamfer the corner of the head. Round this off with files and emery cloth to finish the profile. Each buffer now needs a suitable spring and a $1\frac{1}{2}$ in. length of $\frac{1}{8}$ in. dia. rod, threaded each end, with a retaining nut. Assemble the buffers, and see how they look on the chassis.

The next item required is the feed pump, which has to be mounted between the frames before the wheels and axles are fitted. The pump to be described can be made from solid material by simple turning. It will draw its supply from the tender hand pump outlet, so that only two pipes - one pressure connection and one bypass - will be required to the tender. Alternatively, a conventional LBSC pump of similar dimensions, such as the 'Tich' type, can be used.

● *To be continued*

● **Drawings for Ayesha II will be available from the Magicalia Plans Service. For those in a hurry to get on with Ayesha II, copies of the original drawings are available from:**
Tony Weale
Woodlands
Ginhall Lane
Leominster
Herefordshire HR6 8RD
Tel: 01568-611201

● **For details of castings and water-cut frames please send an SAE to:**
Box 2500
Model Engineer
Berwick House

8-10 Knoll Rise
Orpington
Kent BR6 0EL

● **For details of membership of the National 2½" Gauge Association contact:**
Peter De Salis Johnston
7 Tudor Court
Fulford
Stoke-on-Trent ST11 9RX

● **A number of Ayeshas are underway, and can be seen in a special display at the Centenary Model Engineer Exhibition, Ascot Racecourse, September 7-9, 2007.**

James Beggs and Co.

BOTTLE FRAME ENGINE

PART 5

Continued from page 220
(M.E. 4293, 16 February 2007)

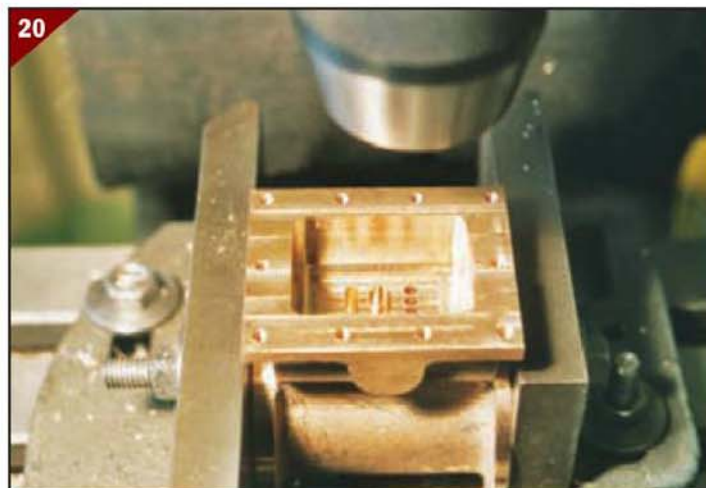
Anthony Mount completes the cylinder and then describes the covers and other fittings.

The end mill can now be dropped down inside the steam chest to machine it to depth, then use the side of the cutter to clean up the inside edges of the steam chest. As you will probably do the sides in a number of steps due to the depth, it is sensible to set the milling machine length and width stops which will save keeping note of the number of turns of the feed screws, especially if you do not have digital readout. Also machine a little under size for the majority of the work then re-set the stops to take a final cut all round to clean up all the inner surfaces of the steam chest.

Try the slide valve in place and check that it seats down completely. If your cutter has a slightly chamfered or rounded corner to the cutting edge the slide valve will sit on this and not the valve face. A few strokes with a flat file on the short edges of the slide valve will allow it to sit down properly.

This is a case where a solid carbide end mill is so useful in keeping its edge while cutting through sand coated castings and doing a lot of work under trying conditions.

While I was machining away from stop to stop I wondered



20. The cylinder shown with the steam ports partially machined. Note the third port has been drilled ready for milling.

21. Here a Woodruff cutter is being used to form the slot that connects the cylinder bore to the steam passages.

22. Turning the top cylinder cover in a 3-jaw chuck fitted with soft jaws.



about slot drills and end mills, why do we have three types, a slot drill with two flutes, an end mill with three flutes and an end mill with four flutes? I know a slot drill is for machining a slot close to size, as a four-flute end mill will cut a slot oversize. But the three flute will do all the jobs, so why have two flute and four flute cutters? Also, so why call the two flute cutter a drill and not a mill?

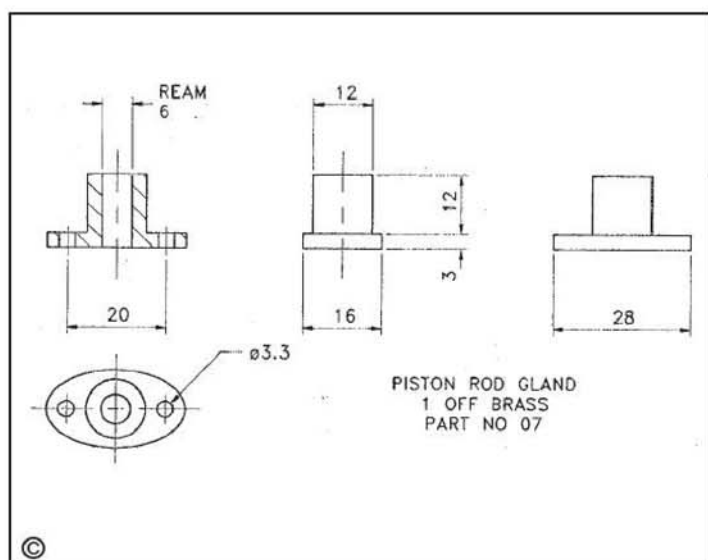
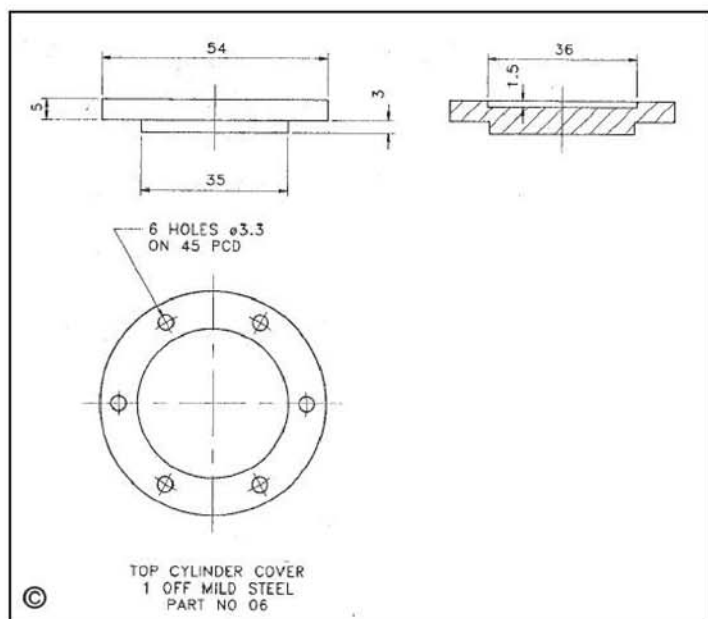
It is important that the head of the milling machine is truly vertical and that the cutter is really sharp. If the head is leaning over the cutter will produce a series of angled slots across the bottom and we want a flat finish, as the slide

valve has to work on this surface. A sharp cutter will give a good finish that will hardly need any work done to it to prepare it for the slide valve.

It is a good plan to make a sketch of the valve face and steam chest face and work out the co-ordinates for drilling the stud holes and ports. The stud holes go right through the steam chest flange and are tapped M3 (5BA).

For the exhaust port drill a hole each end and one in the middle 5mm diameter. Join the holes together with a slot drill to a depth of 9mm. For the steam ports drill five holes at 3mm dia. and join them together with a 3mm slot drill. >>





In **photo 20** the exhaust port and one steam port are complete and the last steam port has been drilled only. Mark out and drill the 3mm diameter holes for the steam passages. Then clamp the cylinder to the milling machine table by the

23. The finished top cylinder after turning and drilling operations.

24. Drilling the piston rod gland. The work is mounted in a dividing head fitted to the lathe cross-slide.



flanges, end upwards (as can be seen in **photo 21**) leaving the bore clear, and use a 25mm diameter x 3mm thick Woodruff cutter to form the slot that connects the cylinder bore to the steam passages you have just drilled.

Bring the cutter down until it just touches the top of the cylinder. Zero the dial and then lower the cutter 6mm, which will leave the top edge of the cutter 3mm below the top of the cylinder. Now feed in the cutter sideways until it reaches the drilled passages. Do the same to the bottom end of the cylinder and, while in this set-up, the top of the valve rod boss can be faced off with the Woodruff cutter.

The steam passage holes are tapped 4BA for a depth of 3mm and then plugged with threaded rods. The rods only need to be threaded for a length of 3mm, then screwed in with thread sealant and cut off and filed flush. As such they should hardly be noticeable.

For a really professional looking job leave the cylinder 0.25mm long each end before drilling the passages then the cylinder can be remounted on the expanding arbor after the holes have been plugged and the ends skimmed off instead of filing the plugs level.

Locate the centre of the cylinder. It would be handy at this stage if you have made up the piston and rod, then they can then be used as a gauge held in the drill chuck to position the cylinder under them. This will locate the cylinder accurately enough for co-ordinates to be used to

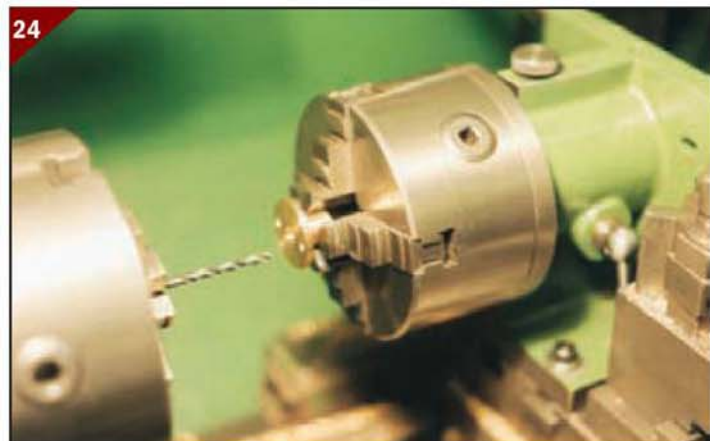
position the valve rod hole in its boss. This can be drilled and reamed 3mm and counter bored 6mm diameter for the gland stem.

Practical method

Hopefully, with a sharp cutter your valve face will be nice and flat. However if you feel it needs a little more work on it the official procedure would be to scrape it flat to a small surface plate, however for most of us this will be impractical. I machined off flat, the end of a short length of 10mm round bar, and glued a piece of fine abrasive paper to it. It was then possible to carefully rub down the surface of the valve face with the end of the bar to remove any imperfections.

The cylinder cover can be used as a drilling template for the stud holes. Take care to line up the holes as the studs are long and pass right through the cylinder flanges to reach the main frame. The two stud holes adjacent to the steam passages pass right through the body of the cylinder through solid metal. So, you see how important it is that the stud holes are accurately positioned each end so the holes meet up when drilled from the ends.

I used a square off the face of the steam chest to line up the cylinder cover across two holes and clamped it in position with a pair of small engineer's clamps. The cylinder casting can be clamped on its ends between two angle plates on the milling machine for the drilling and tapping of the steam inlet and exhaust holes.





Top cylinder cover (part 06)

After all the work on the cylinder it is a piece of light relief to machine up the cylinder cover. This is supplied as a disc of continuous cast iron, a lovely material as it is more homogeneous than ordinary cast iron without any blow holes.

Start by holding the disc in the 4-jaw independent chuck. Face off and turn down to 54mm diameter for a length of 6mm. Recess the centre to a depth of 1.5mm at 36mm diameter.

I have seen some inverted vertical engines where the top cover is drilled and tapped in the middle to receive a lubricator. If you do this, do not form the recess right across but leave a boss in the middle say 12mm dia. to receive the tapped hole for the lubricator.

Using soft jaws

Change to a self-centring chuck and fit soft jaws see **photo 22**. These can be bored out to a depth of 3mm to take the top of the cover. Machine the disc to finished thickness and form the spigot to fit the counter bore in the cylinder. Do not forget to lightly chamfer all the edges.

Set up the dividing head on the lathe cross-slide facing the lathe chuck and zero in on the edge of the cover. Position the centre drill 4.5mm from the edge and index round 6 times for the stud holes which are drilled 3.3mm for M3 (5BA) studs. The cover is now complete as seen in **photo 23**.

I have not shown it on the drawing, and it is hardly ever done on model cylinder covers, but an extra two holes could be drilled in the cover equally spaced between two adjacent holes and opposite each other. They would be tapped say M2.5 (7BA) and are used for jacking screws when it is desired to remove the cover. They break the seal between cover and cylinder and make it easy to remove the cover. It avoids damage to the paint work and edge of the cover/cylinder from a blade or drift being tapped between the joint to break the seal.

Piston rod gland (part 07)

Another simple job is the machining of the piston rod

gland. This is merely a short length of 30mm diameter brass turned down to fit in the counter bored hole in the bottom cylinder cover. It needs to be a good sliding fit without any shake to avoid the studs pulling it over and jamming against the piston rod.

Drill and ream 6mm for the piston rod. Change to a dividing head on the lathe cross-slide and drill the two stud holes, shown in **photo 24**. It may seem over careful to use a dividing head for just two holes. However, its use does ensure their accurate positioning especially if your dividing head, when on the cross-slide, automatically comes to the lathe centre height.

The elliptical shape can be done with hand filing by eye. As it is upside down under the cylinder it will be hard to examine it for truth to an ellipse. Of course, you could cut out the ellipse on the drawing and glue it to the gland and use it as a template.

However, in **photo 25** you can see the gland bolted to a stub of rod with an Allen screw, the stub is set up off-centre in the 4-jaw independent chuck and one side of the gland is turned to a largish curve. The gland is reversed through 180

degrees and the other side turned. Then the two curves are merged with a file at the ends to form an ellipse.

Valve rod gland (part 08)

The valve rod gland is a repeat of the piston rod gland except that it is a bit smaller.

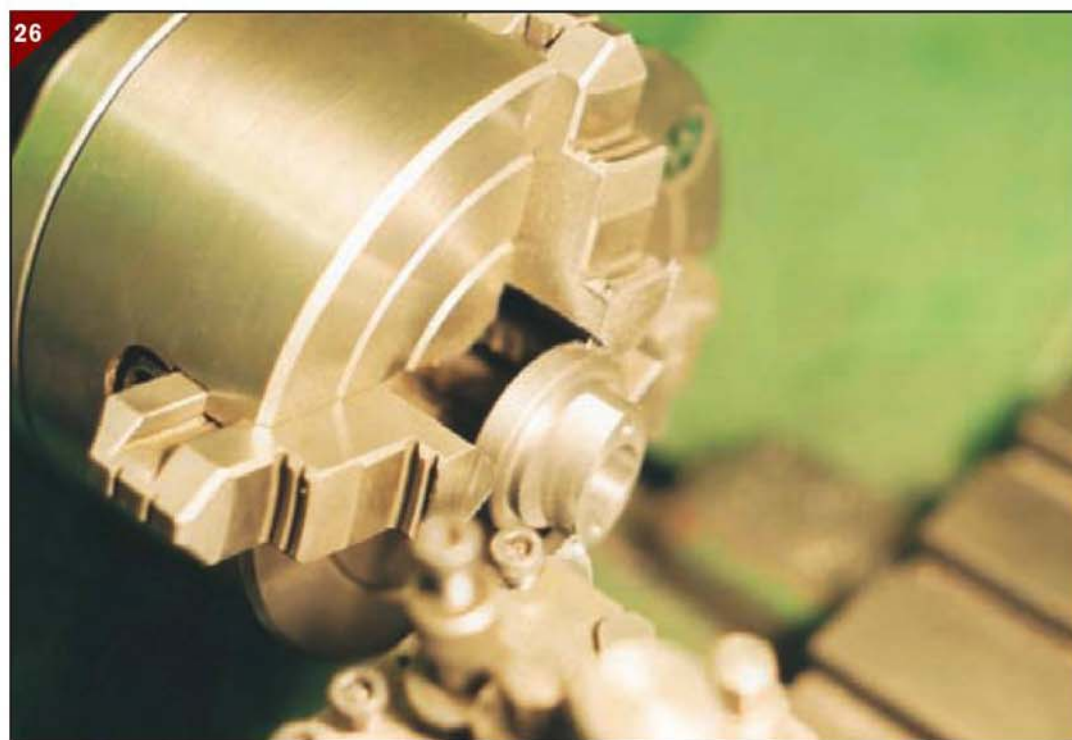
Cylinder bottom cover (part 09)

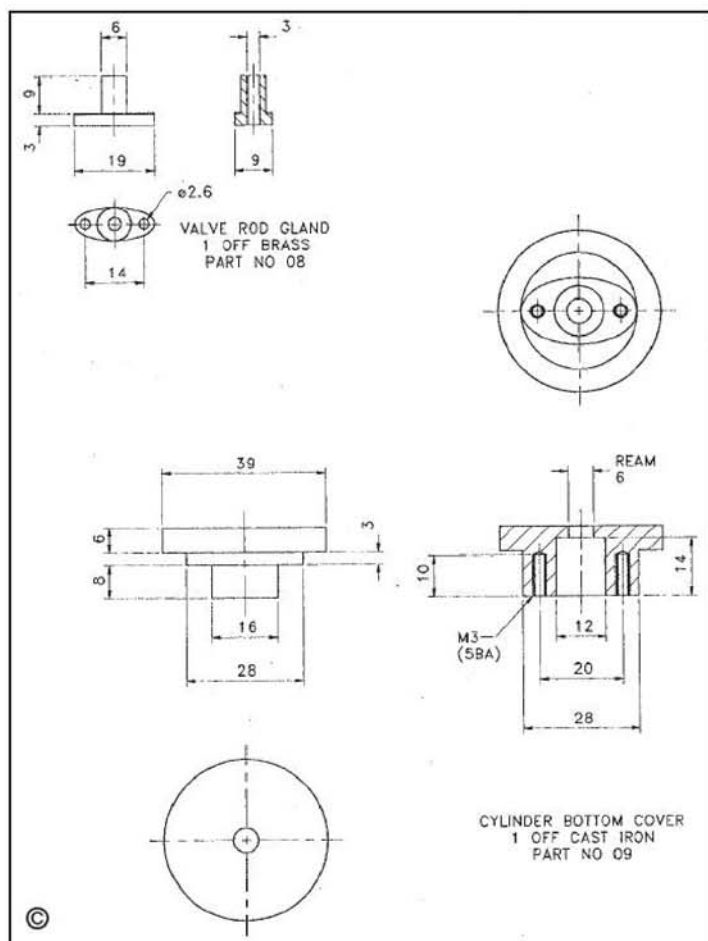
The cylinder bottom cover is a little unusual in that it has no stud holes as it is sandwiched between the cylinder and the mainframe. This allows greater access to the main frame for machining it and to be able to form the ellipse on the underside of the bottom cover. When the bottom cover is complete it can be fixed permanently into the mainframe with high temperature Loctite, and when the cylinder is bolted in position the cover will be tightly gripped between cylinder and mainframe.

It is supplied as a length of continuous cast iron. Hold in >>

25. The piston rod gland bolted to an offset stub of steel for turning one of the large radii of the elliptical flange.

26. Turning the ellipse on the cast cylinder bottom cover.



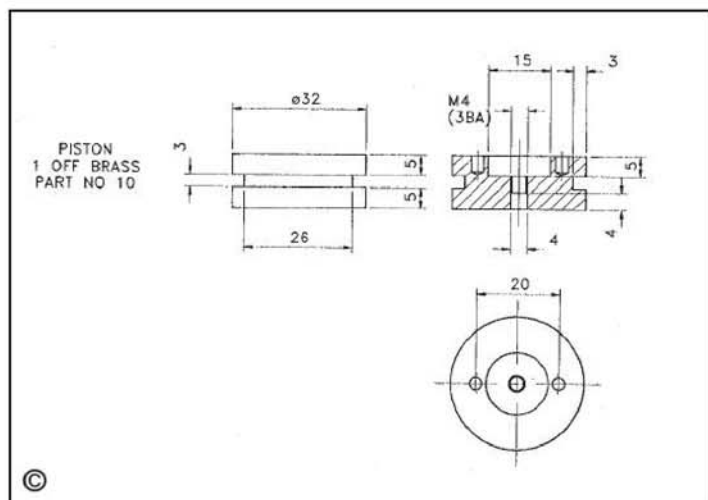


the 4-jaw independent chuck and turn down to 35mm diameter. Turn the 28mm step, then drill and ream for the piston rod and counter bore for the gland stem. The counter bore can be finished to size and furnished with a flat bottom using a small boring tool.

Use the gland as a template to drill and tap for the stud holes or set up the dividing head on the cross-slide as for the gland itself. With a scriber draw around the ellipse of the

gland to transfer the shape to the bottom cover. Hold the stub in the machine vice on the vertical milling machine and with an end mill remove as much of the waste material as possible. Finish by hand filing.

There is another way to form the ellipse and the method I used on my engine. Later in this series when we get to the wooden base, which is also an ellipse, I will show how to set out the ellipse using compasses and only two arcs. It is of course



not a true ellipse but for all practical purposes it is, indeed the junction of the two curves comes on the line of a true ellipse. This process set me thinking and the following evolved.

Creating the ellipse

If you offset the cover in the 4-jaw chuck, in this case by about 10mm, you can turn one side of the ellipse. How can an ellipse have a side? I mean the long arc. Turn the cover through 180deg. and you can turn the other long arc. All that needs to be done is the merge the two curves together by a little filing and you have a nice neat ellipse.

The set-up is shown in **photo 26**. I posed this photograph as I had parted the cover off before I thought of taking the photograph. You can sight through with a small rule held across the stud holes to orientate the cover with the jaws. Re-chuck and part off. Hold the cover in bored out soft jaws to face off the parted surface.

The gland flange can also be done by this method though in this case, as you can see in photo 25, I have bolted the gland to a stub of steel. If there were a number of glands to do, by putting in a couple of pins in the steel mandrel to locate in the stud holes it would be a simple bit of repetition turning to do all the flanges without having to think or adjust the set-up. **Photograph 27** shows the completed bottom cover and gland.

Piston (part 10)

The piston is a fairly straightforward machining operation, but you need to make a decision on what sort of packing ring you are going to use. The traditional material for

27. The completed bottom cover in cast iron and its brass gland.

models was graphited yarn and this is still a useful material and quite forgiving to, what one might term, amateur use and is kind to a bronze cylinder.

A more modern form of packing would be to use an O-ring. But this does require you to work to accurate dimensions both for the bore of the cylinder and the depth and width of the piston groove. The groove is wider than the ring to allow it to roll slightly, and the depth is critical to achieve the correct seal. O-ring manufacturers supply a chart with all the tolerances, and there have been a number of articles in these pages in the past on O-rings.

Another material that could be used for packing is PTFE, usually available in tape form for use in plumbing. However, it is available from Bruce Engineering (now part of Polly Models, tel: 0115-973-6700) as a 3mm dia. coil that can be used in a similar manner to graphited yarn. Hold the length of brass rod in the chuck and turn down to fit the cylinder bore. It need not be tight, a 0.025mm (0.001in.) clearance all round will do.

Put in the packing groove with a short parting tool, drill through and counter bore for the piston rod, tap M4 with a tailstock tap holder.

Part off, reverse, and hold in bored out soft jaws for facing off to length and for boring out the recess for the nut, use a bronze or stainless steel nut as you do not want it to rust.

● To be continued.

PART 3

Continued from page 213
(M.E. 4293, 16 February 2007)

Michael Duggan continues with the description of his outstanding design for a river boat steam plant.

A MARINE STEAM PLANT

The boiler is supplied through the main or auxiliary non-return valves and distributed through either of the water drums by an internal copper pipe suitably drilled but each can be removed externally for cleaning, (see fig 3 M.E. 4291, 19 January 2007) and **photos 28 and 29**. At first sight it seems an unnecessarily complicated system also shown diagrammatically in fig 1 (also M.E. 4291). Each pump draws from the hot-well and the hand pump is fitted with a screw down valve on the discharge side. All the pumps discharge to a common brass block, and the main feed then passes through the feed heater to the boiler water drum, but the auxiliary feed by-passes the feed heater and passes to the other water drum of the boiler. The feed discharge pressure is measured at the block (**photo 30**).

The two engine driven pumps require no explanation but, if the main engine is not running another source, has to be available for the auxiliaries which may be running and using steam. For this I have made the small Stuart horizontal pump; also for the skill that is required in its construction (**photo 31**). Then after some deliberation I wondered if this would be sufficient, so I then made the



28. Feed internal pipe.

29. Feed internal pipe and clack valve.

30. Feed suction and discharge blocks.



vertical shuttle valve Southwater feed pump which is very much like the vertical Weir feed pump of which I have several years experience and its idiosyncrasies (**photo 32**). My thinking was really it is better to overdo the system than have trouble later.

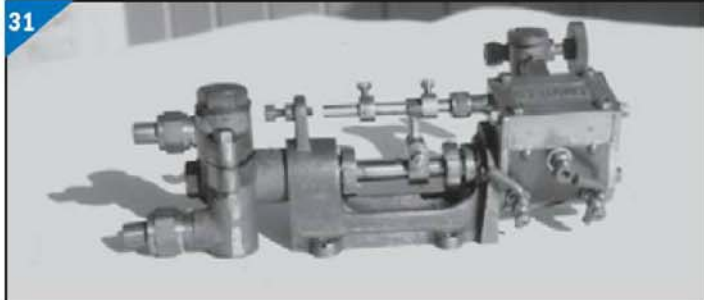
The hand pump (**photo 33**) is to either fill up the boiler, or top it up when insufficient, or no steam, is available. Initially the water will be rainwater but after passing through the boiler, de-aerated and hopefully most of the lube oil taken out of it, it should be semi-distilled.

Hot well and make up tank

The hot well is an important part of the open feed system,

also see fig 1. In this case I have made it of stainless steel 12 gauge sheet 12 x 12 x 12in., and half of the top has a hinged lid whilst the other half is bolted with two welded studs with wing nuts. Within it are four baffles to minimise sloshing, but to also hold the towelling to absorb the lube oil in the water, and prevent it from contaminating the boiler. In full-scale practice, canvas is often used. The capacity I have aimed at, being two thirds full under working conditions and a cascade system but in hindsight I think the tank is on the heavy side. The feed pumps draw from this and of course the condensate and drains pass into it (**photo 34**).





31. Feed pump-horizontal.

32. Feed pump-Weir.

33. Feed pump-hand.

Fig 8. Forced draught fan.

There are bound to be various losses so there will be a make-up tank which will pass cold water into the hot well. I aim to make its capacity about three gallons but its shape will conform to the punt and also its trim, as it will be built in.

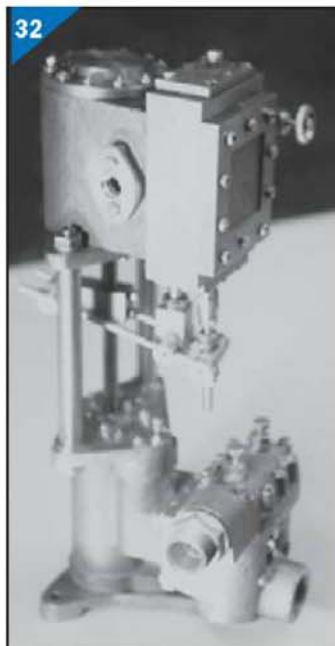
Although the water should be clean and uncontaminated I will arrange for it to be drained, cleaned and filled easily.

Forced draught fan

The normal practice of Naval engineering with this type of boiler was to use a pressurised boiler-room, but with Merchant ships the fan blew air into the boiler and sometimes an induced draught fan was also fitted. I opted to fit a single forced fan to supply air to the boiler.

The first problem was that I could find no information on a model fan for this size of boiler. I found that there was much information of full-scale practice in a paper read to the Institution of Mechanical Engineers in 1942, and from this I designed my forced draught fan.

The fan is driven by a 2-cylinder steam engine (D.10) and supplies air to all three



burners, as necessary. The discharge is through a 1in. square tube, and square flanges of course, to the double casing on the front of the boiler, and thereby the air is warmed before combustion. The 20 blades were cut from a copper tube of 0.1in. thickness, 1 1/2in. radius and a chord length of 1 1/2in. were silver-soldered to the

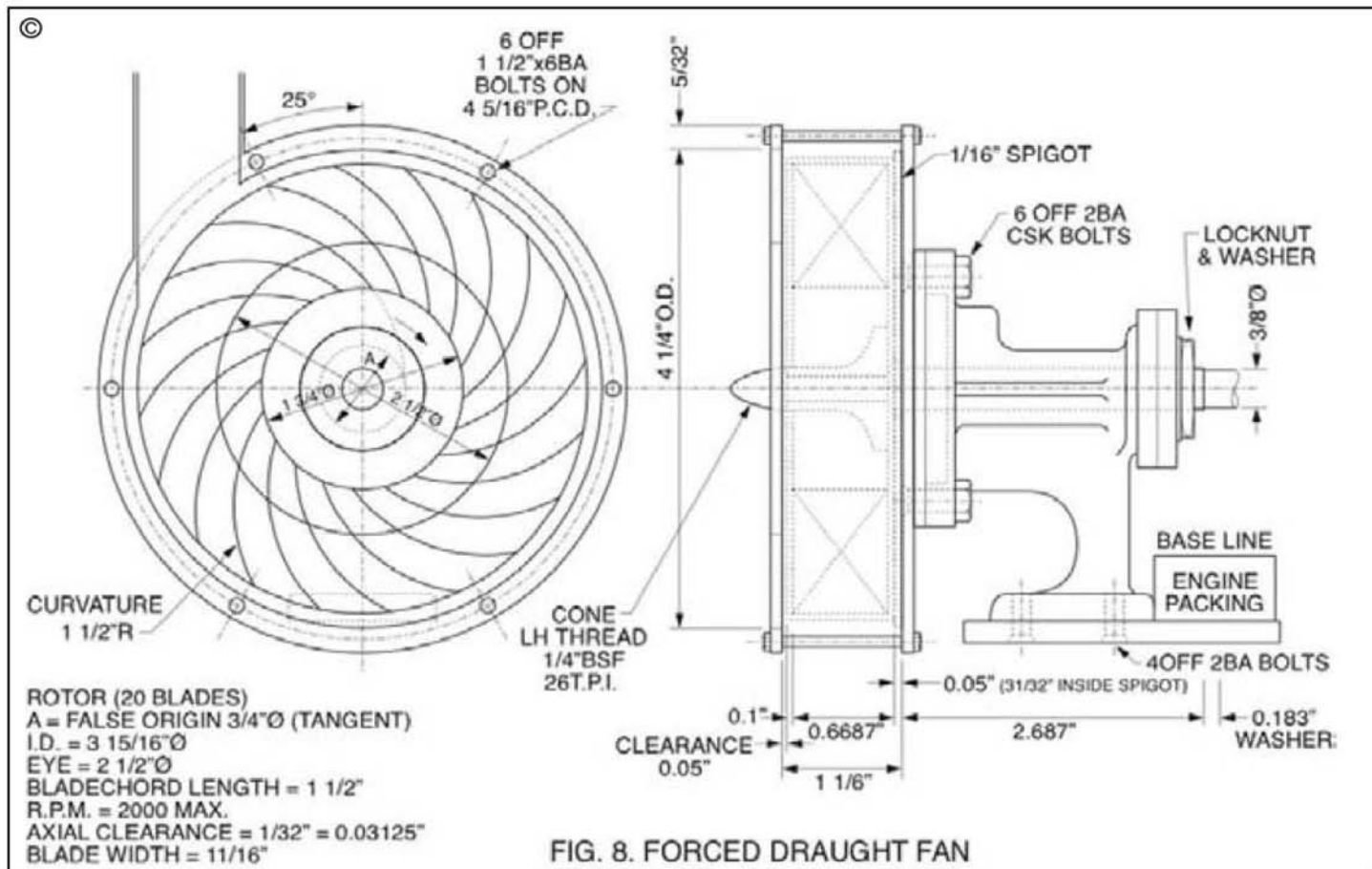


copper plate which rotates.

Details are shown in **figs 8** and **9**, and looking from the inlet end the fan rotates clockwise. The cone is therefore fitted with a left-hand thread and the lock nut is a right-hand thread.

The clearances at present are set at 1/16in., but can be much finer if required in practice and the complete unit is aligned on an aluminium base plate and two 1 1/4 x 3/4in. 'I' section girders. To date I have only run it at 1000rpm but it is designed to operate at 2000rpm.

The fan and engine are shown in **photo 35** with the air intake plate removed to show the blades on the runner and the partly constructed impeller in **photo 36**. The completed unit is shown in **photo 37**.





I hope to get $1\frac{1}{4}$ in. (water) of positive air pressure at the burners in practice, but this will depend on several factors but the system is capable of alteration with trials.

Electricity generation

This is strictly not necessary on a punt, however I have partly made the system in case I want to install three navigation lights and was also a good excuse to make the Sun 2-cylinder piston valve engine (photo 38). It is very similar in design to the Sirius engine but smaller and now completed and tested on air.

I have standardised on 6-volts and acquired an unused Sturmey Archer cycle hub

dynamo, (photo 39). It is a GH6 for a 28in. wheel, and is a 20 pole AC unit rated at 2 watts and 0.34 amps. On a bicycle it operates between 3 and 12mph and if the bicycle goes faster the design is such that the output generated is stabilised for 12mph. This is no longer legal for its designed use but may prove ideal for my purposes. A graph of the rpm against the generated voltage which I have measured is shown in fig 10.

There are, however, one or two problems. The hub dynamo is designed to have a fixed shaft and a rotating hub, whereas I require a rotating shaft. The ratio of engine speed to dynamo speed is approximately 1:15, so



this will require a compound belt drive I suspect, with the engine faster than the dynamo. The diameter of the generator is $3\frac{11}{16}$ in., a bit bigger diameter than I require, but considerably better than the smaller Stuart dynamo of 4-volts, 1amp at 8000rpm. The latter is not weatherproof either, but in this case the dynamo is faster than the engine. This is illustrated in photo 40.

Propeller and shafting

The propeller shown in photo 41 is a three-bladed manganese bronze unit of 13in. dia. and exactly right for my purpose. After some difficulty in acquiring one it was given to

34. Hotwell.

35. Forced draught fan and engine with fan intake plate removed.

Fig 9. Forced draught fan, detail of shaft.

me by a friend in Canada, also a marine engineer, whose boat was vandalised some years ago. It is mounted on a 1in. stainless steel shaft by a 1 in 40 taper, a 2 x $\frac{1}{4}$ in. key, and a Nyloc nut. The thread is $\frac{3}{4}$ in. UNC, and right hand.

The shaft will run in a bearing that has a gland on the inboard side to stop the ingress of water. Between the driven end of the shaft and the engine will be the thrust block to relieve

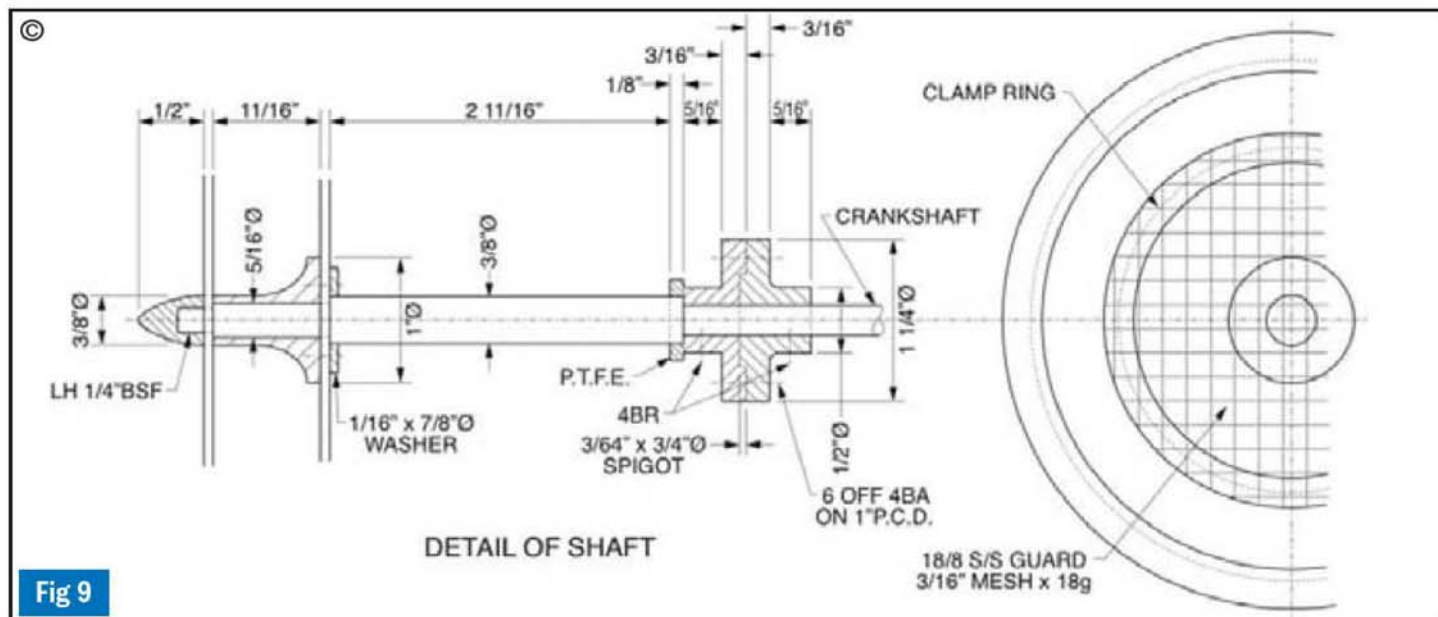


Fig 9

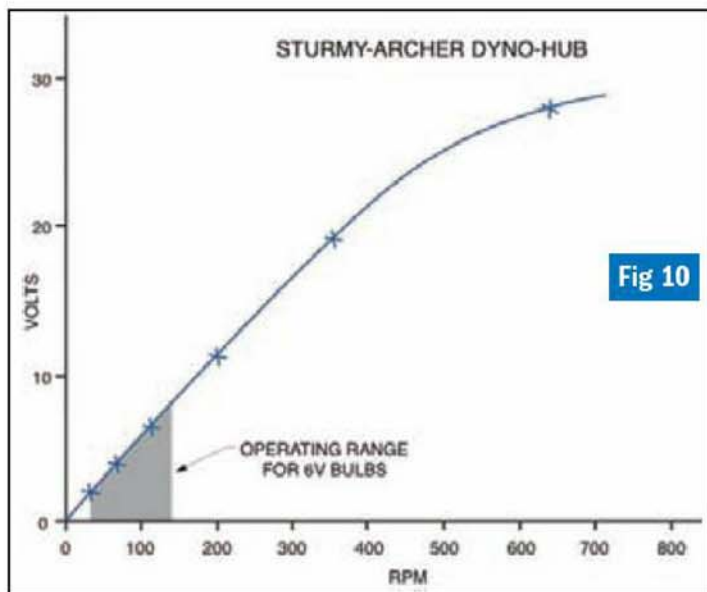


Fig 10. Graph of Sturmy Archer Dyno-hub voltage and rpm.

Intake plate removed.

36. Forced draught fan partly constructed Impeller.

37. Forced draught fan and engine.

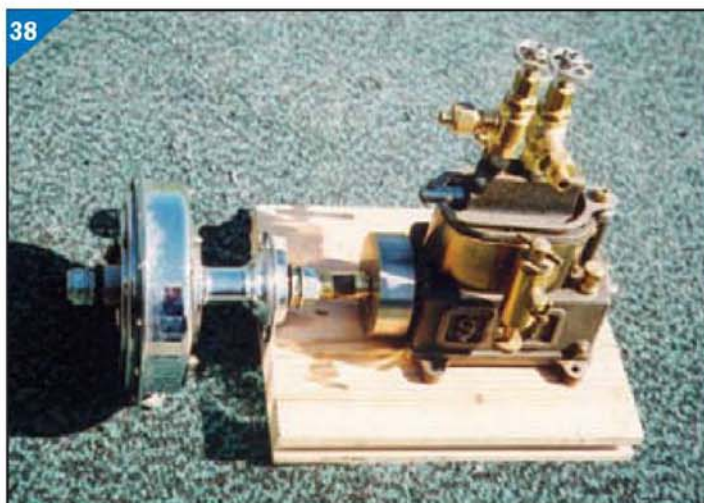
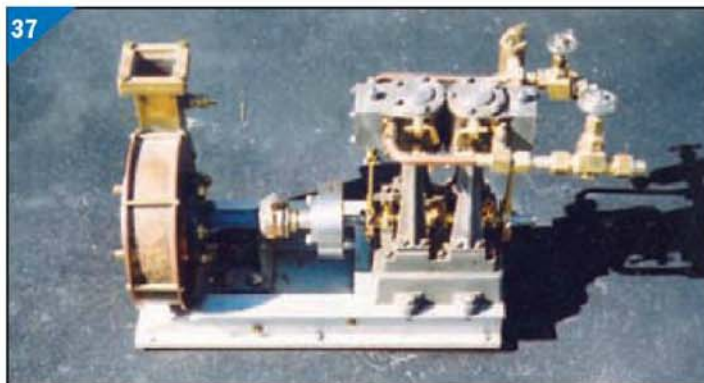
38. Sun engine with Sturmy Archer generator.

39. Sturmy Archer Hub Dyno.

40. Stuart Dynamo.

41. Propeller and shaft.

the engine crankshaft of any axial thrust imposed by the propeller. I have not made the pattern for this yet but I now know where the castings can be made in England. Outwardly the thrust block will be similar to a conventional Michell block with a bolted cover, but instead of white metal pads it will have a single roller race with collars and externally shaft flanges with fitted bolts. The block will contain some lubricating oil as normal. The casing and cover will be made of gunmetal but the conventional design with a



number of horseshoe collars for a reciprocating engine has not been entertained.

The shallow draft poses a problem as the blade tips should not be below the keel for fear of damage. Also if the propeller is not totally immersed it will cavitate. Uffa Fox was faced with the same problem when he designed and tested the Mk. 2 airborne lifeboat in the war. This was a highly successful achievement and he read a paper in 1948 on its design and operation. The draft was similar to my

punt but his boat had to fit into a bomb bay of a Warwick bomber and was propelled by a Morris Vidette petrol engine. He found that if the propeller was installed in a cone, even though half of the propeller was above the water line, then the cone was always filled with water when operating and the blades did not cavitate. I intend using a similar technique on my punt and the cone will fit under the after deck, which is slightly raised compared to normal.

● To be continued.



Wainwright's SECR might-have-beens

PART 1

Ron Isted

revisits his favourite period with a look at what was happening in the South Eastern part of the railway network of Britain at the time.

I doubt whether any other commercial organisation in this country was held in quite such low public esteem towards the end of the nineteenth century as the pair of railway companies that professed to serve the southeast corner of England - the South Eastern and the London, Chatham and Dover. Many years of cutthroat competition and a personal feud between their respective chairmen had reduced both concerns to near bankruptcy, so that expenditure on crucial items like new rolling stock, or even maintenance of their existing stock, was well below an acceptable level. Third class passengers were rigorously excluded from virtually any train that remotely resembled an express, while first and second class fares were "enormous", to quote one contemporary writer. Another claimed that the cost of any journey of more than 20 miles exceeded the total monetary value of any vehicle owned by either company. The permanent way was also suspect, and it is remarkable that there were so few serious accidents - although this was partly due to the funereal pace of all but a small number of continental and seaside services. Because of the competition between the two companies, these few exceptions were in fact very tightly scheduled, as mentioned in an earlier article in this series, and generally kept good time, but the vast majority of trains were abysmally slow. On the Reading to Redhill line, for example, *"the fastest train appeared to average about four miles an hour, with occasional spurts to five"*, according to one

of the authors mentioned above, and he publicly expressed his intention of going on foot the next time he needed to visit that neck of the woods. In spite of the low speeds, punctuality, or rather the lack of it, was another characteristic that distinguished these two companies from most of those north of the Thames, with both the South Eastern and the 'Undone, Smash 'em and Over' desperately competing for the title of PML (Perpetrator of Maximum Lateness) - although both the neighbouring Brighton Line and the Lancashire & Yorkshire Railway, a couple of hundred miles to the north, ran them pretty close at times.

Forgiveness

And then, suddenly, in the very last year of the 19th century and to the utter amazement of everybody, especially the long-suffering passengers, the two feuding companies fell lovingly into each other's arms in a moving example of mutual forgiveness and reconciliation to create the South Eastern and Chatham Management Committee, with the avowed intention of transforming the whole system into a sort of railway Nirvana. Now, my dictionary defines this as *"an ultimate experience of some pleasurable emotion"* and it has to be said that the SECR did not quite manage to achieve that blissful state. After so long a period of under-investment, and, at least in the case of the Chatham, even the initial construction of the line carried out on a shoestring budget, the permanent way, for example, took many years to sort out: the Southern Railway's disastrous

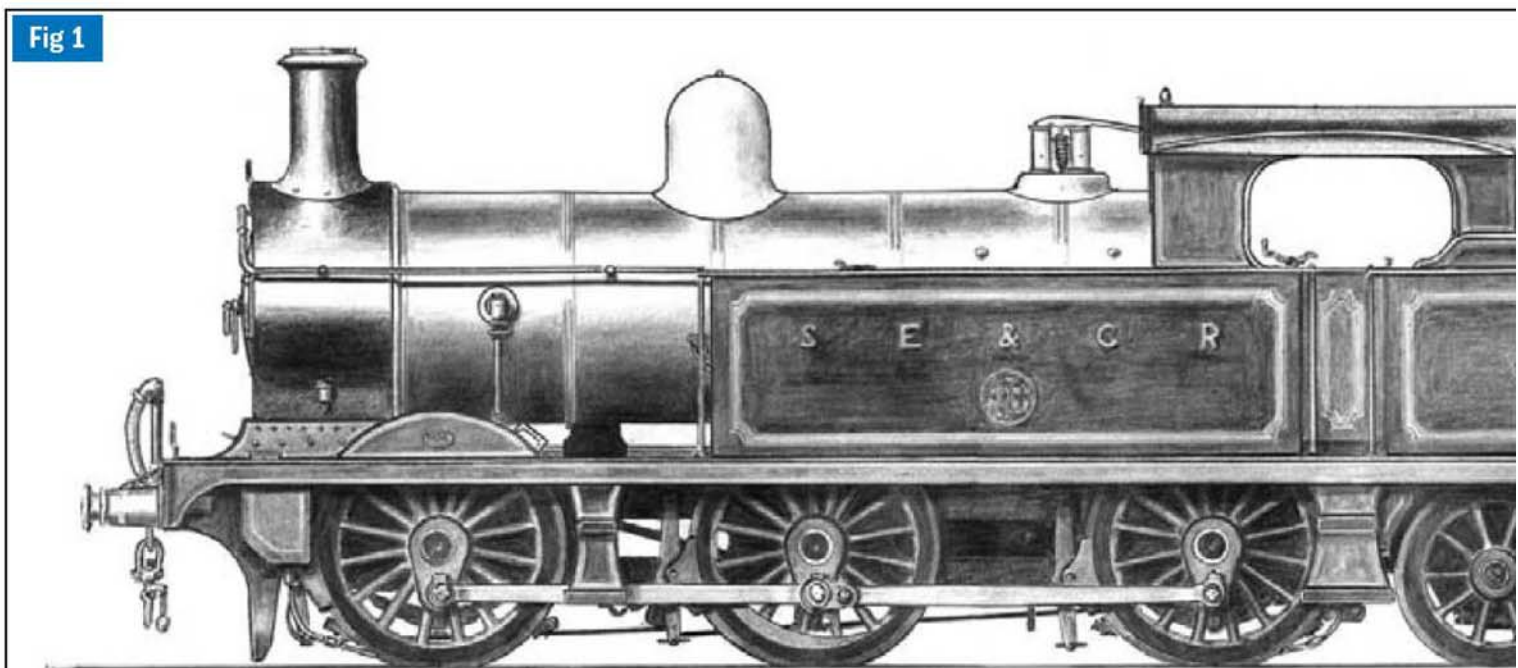
Sevenoaks crash in 1927, involving the tank locomotive *River Cray*, was almost certainly due to track defects. Does this have a familiar ring? But given the financial and other constraints it inherited, the South Eastern and Chatham Railway achieved truly spectacular improvements in the years before the First World War and completely transformed its image in several ways, including the use of one of the most attractive colour schemes ever applied to railway locomotives. Although the two railways retained their separate financial identities until the 1923 Grouping, they were worked as one system from 1899 and various connecting lines were built in the early years of the 20th century to ease congestion. But a lethal legacy of heavy gradients, sharp curves, severely restricted loading gauge and very low permissible axle loadings, particularly on the Chatham section, created serious operating difficulties that have not been completely eradicated even now.

Happy bunny

The first Locomotive, Carriage and Wagon Superintendent of the combined South Eastern and Chatham was Harry Wainwright, former Carriage and Wagon Superintendent of the South Eastern, who must have been a very happy bunny when his annual salary jumped overnight from £700 to £1,250. It has been claimed that Wainwright had absolutely no knowledge or experience of locomotive work, but this is another of those false statements that has become generally accepted simply because of constant



Fig 1



©

regurgitation by writers who cannot be bothered to do a little original research. He had in fact served as locomotive draughtsman in the drawing office of the London, Tilbury and Southend Railway, and his father, William, had been Locomotive and Carriage Superintendent of the 'Old Worse and Worse', otherwise known as the Oxford, Worcester & Wolverhampton Railway, in succession to the redoubtable David Joy. I think we may assume, therefore, that young Harry was not altogether ignorant of locomotive practice and it is pretty unlikely that the board of SER and LCDR directors would have appointed him anyway if he had been. He succeeded to the SECR top job at the early age of 34 and was responsible for a highly successful series of locomotives, many of which gave excellent service almost to the end of steam traction, one or two of them running more than 2,000,000 miles during careers lasting well over half a century. Considering the rapid spread of electrification under the Southern Railway and after Nationalisation, their survival for so many years is a great tribute to the Ashford design team.

Influence

To what extent Wainwright was directly involved in the detail design is debatable, and there is no doubt that the Chief Draughtsman, Robert Surtees, who had held the same position on the London, Chatham & Dover before the two companies joined forces, had a great deal of influence. One of the first designs for the South Eastern & Chatham from this partnership was an improved and enlarged version of the LCDR B2 class 0-6-0 goods engine, to be known as the C class, of which no fewer than 109 were built at the company's works at Ashford and Longhedge, as well as by outside contractors, between 1900 and 1908. They were immediately popular with footplate crews mainly due to the free-steaming boiler which, incidentally, is said to have been Wainwright's main contribution to the design. However, they also possessed a good turn of speed and frequently appeared on relatively long-distance passenger workings, especially seaside excursions and hop-pickers' trains as described in an earlier article in this series, *M.E.* 4198, 27 June 2003.

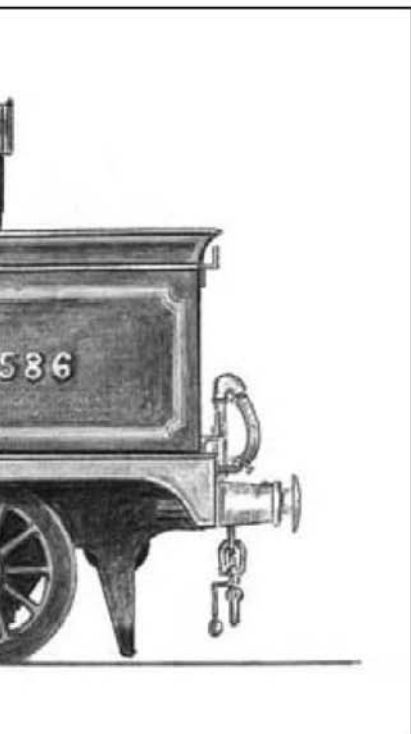
In addition to his Chief Draftsman, an even more

potent influence on any Locomotive Superintendent, or Chief Mechanical Engineer as he was usually known in later years, was the railway company's Locomotive Committee, usually composed of a number of directors, whose practical knowledge of the basics of running a railway, let alone things mechanical, was not always everything it might be. This small difficulty did not, however, prevent the said committee members from periodically having a go at the unfortunate CME and attempting to dictate his future policy, and since they held the purse-strings, he needed to be a strong personality to hold his own in the various arguments. Many are the tales of altercations between practical engineers and the men in dark suits, the most famous probably being Churchward's reply to a GWR Director who demanded to know why Swindon-built locomotives cost twice as much as the products of Crewe? *"Because one of my engines can pull two of their xxxxx things backwards"* was the short and succinct reply. This story may or may not have been true, but Churchward, besides being a very great and highly respected engineer, was also a very strong character

and more than capable of fighting his corner, as was that irascible Scot, Dugald Drummond. It would appear that Harry Wainwright was not made of quite such stern stuff and his premature retirement at the age of 48, *"for health reasons"*, was a blatant example of one man carrying the can for the misdemeanours of his nominal superiors, as will be recounted later.

Locomotive Committee

The Locomotive Committee of the South Eastern & Chatham Railway was already throwing its weight around in the early years of the company and in October 1905, demanded to know why the Locomotive Superintendent was building locomotives with expensive separate tenders in the form of the C class, when the neighbouring LBSCR, for example, made great use of tank locomotives. As usual in these circumstances, the driving force was almost certainly financial: the SECR 0-6-0 tender engines built at Ashford works between 1900 and 1908 were costed at £2,800 each, about £300 more than the LBSCR E4 0-6-2Ts built at Brighton in 1901-2. Even worse, at least from Wainwright's point of view,



a mile or two up the road from the Chatham's Longhedge works, the LSWR was apparently churning out Dugald Drummond's M7 0-4-4Ts from their Nine Elms establishment for the proverbial peanuts - the official figure was quoted as £1,440 each. Several years later, Eastleigh (which by then had replaced Nine Elms) admitted that various essential costs had been discreetly omitted from these figures to the tune of not far off £1,000 per engine, if outside manufacturers' costs are anything to go by. But of course, the SECR Locomotive Committee was unaware of that at the time and continued to use these figments of the accountants' imagination to try and badger their Locomotive Superintendent into producing a tank engine version of the C class goods. I have visions of Harry W. vainly trying to explain that the extra coal and water capacity of a tender was necessary for the lengthy journeys worked by many of the C class and that the time spent coaling and watering tank locomotives would lead to the need for more engines, so negating any extra first cost, etc., etc. Perhaps unhappily for H. W., but interestingly for us, the Locomotive Committee won

the argument and the Ashford Drawing Office was ordered to produce a diagram of a 0-6-2T version of the C class.

Point taken

Now, I find myself wondering whether, on reflection, Wainwright came to the conclusion that perhaps the dreaded Locomotive Committee did have a point after all, because the result, Ashford drawing No. 31170 entitled "S. E. & C. R. Radial Tank Class N", is nothing less than a fully detailed general arrangement, showing both side elevation and plan, and far removed from the rudimentary outline sketches normally produced for such projects. In addition, Don Bradley (see references), published a drawing, credited to British Railways, of a side elevation of the design carrying the running number 586, and stated that the Ashford Locomotive Register shows running numbers 586-591 already allocated to these engines, which implies the serious intention of placing an official order on Ashford Works for construction of an initial batch of six. However, as is normal practice, no running number appears on the copy of the general arrangement diagram, kindly supplied by the National Railway Museum, that I have used as the primary source for my drawings, **figs 1 and 2**. By the way, I have also referred to several secondary sources, including GAs of the H class 0-4-4Ts, and a large number of contemporary photographs of these and other SECR classes, so I hope my drawings are a fairly accurate representation of what a Wainwright 0-6-2T would have looked like.

The engine has the unpretentious elegance of all the Wainwright/Surtees designs, but lacks certain sophisticated touches like the small splashers over the trailing wheels of the London, Tilbury & Southend 0-6-2Ts described in an earlier article, *M.E.* 4269, 17 March 2006. On the other hand, many basic dimensions of these two designs are surprisingly similar,

the diameter of the coupled wheels being 5ft. 2in. on the SECR engine, an inch smaller than the LTSR machine, while the diameter of the boiler over cladding on the Tilbury tank was just $\frac{3}{8}$ in. more than that of its Kentish cousin, whose boiler pressure was 160psi compared to 170 pounds per square inch. Both had inclined inside cylinders, $18\frac{1}{2}$ in. dia. x 26in. stroke, with valves between, and both had a 12in. crankpin throw. Length over buffers differed by less than 3in., and although the calculated weight of the Wainwright engine was about a ton and a half less, the actual weight, had it been built, would probably have come out at about a ton or so more than the estimated figure. As is normal in these circumstances railway drawing offices always seemed to contain more than their fair share of optimists! The main frames of the Chatham engine were a substantial $11\frac{1}{16}$ in. thick, compared to 1in. on the Tilbury, although the grate area on the latter was about 15% bigger, mainly because the same boiler was used on the contemporary 4-4-2Ts. However, as mentioned earlier, the Chatham C class boilers were renowned for their free steaming capabilities, so their smaller grate would

probably not have put them at a disadvantage. Another less common piece of equipment incorporated in both designs was a steam reverser, mounted in the cab of the Tilbury tank and on the right-hand side of the footplate, just forward of the dome, on the Ashford engine. Several other companies also produced almost identical locomotives, including less well known ones like the Furness Railway for example, whose 0-6-2Ts had coupled wheels an inch smaller, and overall length over buffers an inch more, than the Ashford design.

Contemporaneous designs

Comparison of these contemporaneous designs is an interesting little exercise and just shows how, beneath the cosmetic details like the radial wheel splashers mentioned above, which were a sort of visual trademark for the LTSR, there was a quite astonishing similarity in the basic proportions of locomotives of many railway companies at any given period. While obviously not denying that practical considerations came into the equation, I'm going to stick my neck out and suggest that the major contributory factor to

Fig 2

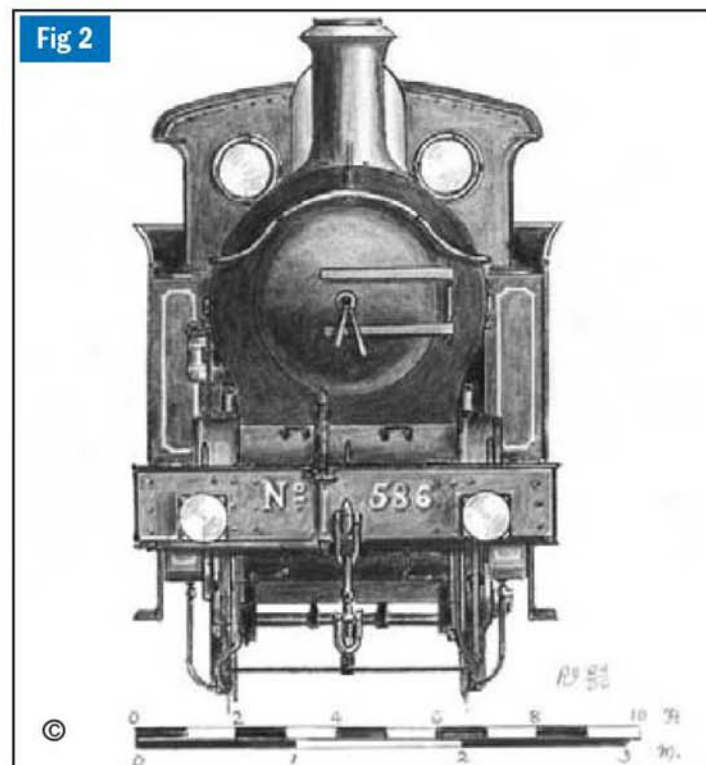
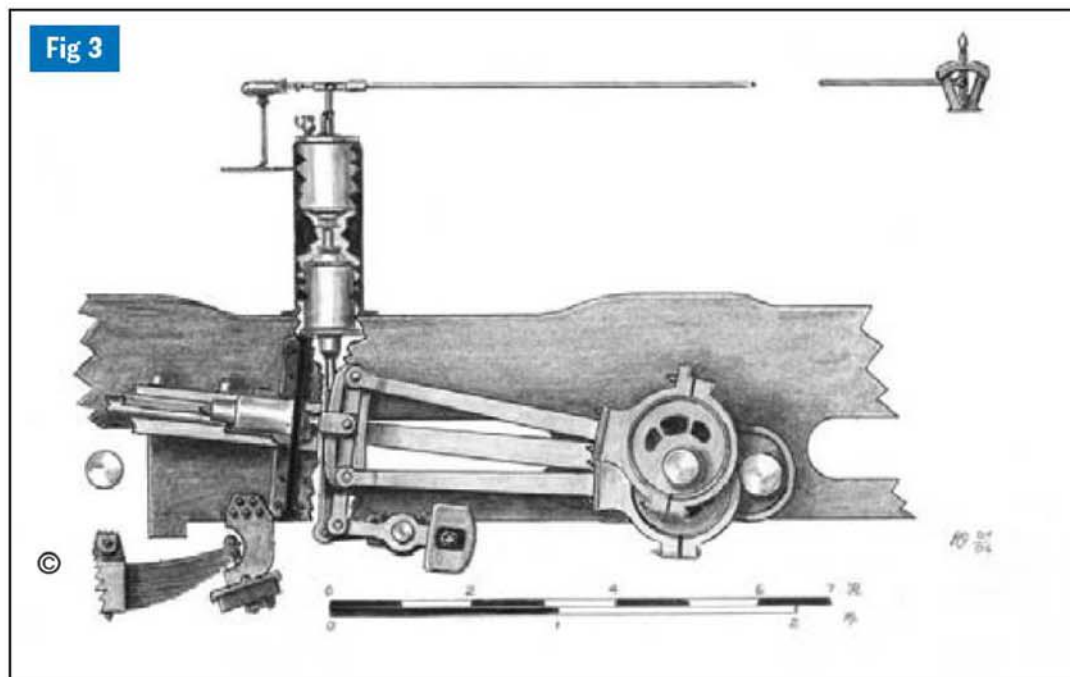


Fig 3



1. Tender axlebox of SECR 'C' Class No.592 show the 'Hodge and Spencer Auxiliary Bearing Springs'. Seen at the Bluebell Railway in April 2006 (photo: Ron Isted).

this phenomenon, at least in Britain, was a species of 'sheep instinct' peculiar to railway design offices. I would further suggest that, to a lesser degree, there also existed a kind of inverted version of this instinct, in that certain companies refused to countenance certain types of locomotive, simply because a rival concern did make use of them! Like nearly every human activity, engineering in general, and the art of locomotive design in particular, had its 'flavour of the month' fads and fashions, and these could spread like wildfire in one country, but fail abysmally to catch on in another. In Britain, the O-6-2T was very popular with several companies in Wales (where it originated), the London, Brighton & South Coast (a quarter of whose stock consisted of this wheel arrangement at the 1923 Grouping), the Great Northern, the Great Eastern, the Great Central, the North British and many others, but was never very common abroad, although I have fond personal memories

of some exotic Austrian narrow gauge machines. The radial tank's cousin, the O-4-4T, was also very 'in' with several British railways, such as the Caledonian, North Eastern, London and South Western and the Midland, and these comparatively small-wheeled, front-coupled engines were sometimes expected to run at express speeds, in spite of occasional thunderbolts from the Railway Inspectorate after a few fairly hairy derailments. Other British companies, the London and North Western for example, wouldn't touch the O-4-4T at any price (possibly because it was popular with the Midland) and favoured the 2-4-2T. But none of these wheel arrangements made much headway outside these shores, at any rate as tank engines. On the other hand, the 2-6-0T, almost unknown in this country, was very popular abroad, and I even came across a couple of interesting specimens during a recent visit to Greece.

Smart return

I seem to have wandered somehow from the hop fields of Kent to the olive groves of the Peloponnese, so I will apologise for these irrelevant musings and return to the South Eastern and Chatham main line forthwith! Like the Tilbury O-6-2T, or indeed

the Furness engine, the projected Wainwright design would make a fine subject for a working model and one that would not take too long to build, but - and it is a big but - the SECR colour scheme was in some ways even more complex than that of the LTSR, although as the Chatham engines weren't named, at least you will be spared the Tilbury's extraordinary curved lettering. When discussing models of the Tilbury engine, I suggested possible commercial castings for a 5in. gauge version, so this time I will confine my remarks to 3 1/2in. gauge.

Wheels

The driving and coupled wheels on the Chatham tank are 5ft. 2in., equivalent to 37 7/8in. in this gauge and the nearest would seem to be Don Youngs' O-6-0 Derby 4F. They have the correct 16 spokes, as specified on the Ashford GA diagram, but are intended for a crankpin throw of 7/8in. instead of the 3/4in. we need. The radial wheels would have been 4ft. diameter with ten spokes, and LBSC's *Jeannie Deans* leading wheels should do nicely, although purists may question the cross section. The driving wheels of our radial tank engine were supported on what the Ashford drawing calls "Timmis Spiral Springs" - which



look exactly like the standard type specified by LBSC, Martin Evans and other designers for 'our' sizes in spite of the proprietorial, and probably patented, name. The radial and other coupled wheels were fitted with laminated springs, supported on "Hodge & Spencer's Auxiliary Bearing Springs", also presumably patented, and visible in the photograph of the C class tender axleboxes, (photo 1). I have also drawn one at the bottom left of fig. 3, which shows that those on the coupled wheels were set at an angle to the vertical, and may cause some would-be constructors furiously to think about methods of producing eight identical spring hangers. As already mentioned, the frames were 1 1/16in. thick, and were in two sections, the main front portion extending to 2ft. 9in. behind the rear coupled axle, where a very substantial stretcher was fitted, incorporating the drawbar anchorage. This stretcher was stepped in the vertical plane, so that the front section frames were 4ft. 1 1/2in. apart and the rear frames were spaced at 3ft 8in., to increase the sideplay of the radial wheels, quoted on the GA as 3 1/4 inch. This idea of a stepped stretcher seems to me rather a good idea for use in a miniature version, and possibly a simpler alternative to incorporating matching mini z-bends into 1/8in. thick steel plate.

● To be continued.

LILLIAN

A narrow gauge locomotive for 7 $\frac{1}{4}$ in. gauge

PART 31

Continued from page 228
(M.E. 4293, 16 February 2007)

Keith Wilson discusses the fine adjustments of cylinder valves (as distinct from backhead and tender valves), piston valve manufacture and draincocks.

Some assorted drain cocks.



This is a subject of interest to builders, for there are many ways to adjust cylinder valves, ranging from coarse to exact.

The coarsest way is a substantial thread on the valve rod. This under normal use will give a nearest average adjustment of half the thread pitch, for it is seldom impossible to rotate one of the screwed components half a turn. A substantial thread is recommended for reasons of strength. Not that there is a tremendous need for strength, but remember it is a rapidly oscillating load, from which it follows that there is every likelihood of the thread wearing itself badly unless it is very tight - and of course being very tight it would not be so easy to adjust; the easier it is to adjust then the more likely is it to be set dead right.

Of course, piston valves are much easier to set, for the rod pivots easily in the valve (if it doesn't then it ain't my fault) and the other or driving end is usually threaded into its knuckle joint so 'tis easier to set. A locknut at this screwed

joint is an absolute must, especially to keep the setting and also for strength as mentioned above. It is an extremely useful practice to have the outer end of the valve rod machined square or hexagonal; setting of the valve is made very much easier using a box spanner (sometimes called a nut spinner). The beauty of this system (amongst other things!) is that fine-tuning *under steam* is possible - and if anyone knows of a better system, 'ye are to confess it'.

Some years ago, running my big *Prairie* at the late lamented track in Walsall Arboretum, it was a damp day and no passengers arrived, so I tried the above 'setting under steam' method. The track was quite high quality, boasting of a 200 yard uphill stretch of exactly 1 in 50 (I checked it myself, dead straight and perfectly even) so it was ideal for testing at high power output.

After adjusting the valve rods by $\frac{1}{6}$ th of a turn at a time and giving 'her' flat-out bursts in between, I arrived at a point where she would run in mid-gear still pulling well. Alas, the same did not apply in reverse; hence the reversing pole and reach rod must have been a bit out. Could have cured it, but since at least 95% of running is forwards 'twasn't worth the trouble. One other fascinating manifestation of the uphill climb was to look above one's head, leaves on the trees were tossed around merrily in the not over-quiet exhaust, especially with a loaded train.

Running late at night on that lovely old Echills Wood railway, nice were the firework displays if the old girl slipped going up the gradient through the Wood station!

To set slide valves under steam is less easy, for there are generally threads on both ends of the valve rods. In locomotives of the inside cylinder type, it is hardly possible to set valves under steam for they are almost without exception blessed by inside valves as well. However, with a little ingenuity great accuracy is not impossible. Possibly the theoretically ideal way is to employ left and right-hand threads, remembering to use right and left-hand locknuts at the ends.

It may not be generally known, but left-hand taps and dies when available cost no more than standards ones, at least my two sets did. (For brake adjustments only, $\frac{1}{4}$ in. BSF for 7 $\frac{1}{4}$ in. and $\frac{3}{8}$ in. BSF for 10 $\frac{1}{4}$ in.). Contrary to some semi-popular beliefs couplings at front and back of locomotives were *not* right and left-hand; (the left-hand bit was a swivel); only those on rolling stock were. I have tried to find out the reason(s) for this but in 40 years or so I have learnt nowt. N. B. This applies at least to the railway, for the others I cannot vouch.

Aside for a moment, I enjoyed Ron Isted's recent remarks about my reaction to friendly 'digs' at the GWR. As Curly used to say, items like this, *"the sugar round the pill"* is/are what makes *Model Engineer* so enjoyable to read. I remember a splendid article several years ago, about giving the Editor (at that time) written permission to travel Westwards to Bristol (I can't remember why) signed by Brunel, myself and somebody else (can't remember who at present but I was a teeny bit miffed at it not being



Churchward). No author details appeared, but in later chats with Ted Jolliffe I understood that it was written in crayon on some brown paper by the late Dave Lammars and sent in as a joke - a delightful one too! I hope he got paid for it as well. Regretfully, he passed away before I found out so I was unable to thank him.

To avoid the need for left and right-hand threads, try different thread pitches. Some years ago this system was aired in 'ours' but due possibly to an elementary error in the write-up the idea seems to have fallen by the wayside. The adjustment 'output figures' were multiplied instead of subtracted. Thus as far as my memory goes, the possible adjustment was claimed as the product of the two threads rather than the difference between them.

For example, if we look at 26tpi and 32tpi, a full turn of the rod would move one end by $\frac{1}{26}$ th or 0.0384in., but the other end would move in the opposite direction a distance of $\frac{1}{32}$ nd or 0.0313 inch. The distance overall is therefore the difference between these two figures, a matter of 0.0071 inch. Not really enough to adjust. However, if we recall that the rotation of one of the end parts (as distinct from the rod itself) almost unavoidably a full turn but sometimes a half-turn, the valve can be moved a distance of 0.0313in. or 0.0384in. thus giving a rough setting within approximately 0.015in. (or 0.019in.) and then by turning the rod itself (which of course can be rotated a fraction of a turn) an exact setting can be found, for is it not clear that (say) $\frac{1}{4}$ of a turn clearly moves the valve by 0.007/4, which comes out as 0.00175 inch? And I very much doubt that the valve gear can overall be made to this sort of accuracy and to hold it under working conditions. In our sizes, that is.

On the Swindon King drawings (and on photographs) a neat set-up appears on the adjustments for the valves. It appears to be substantially a micrometer device! In which

case Swindon could very well have set the valves to the nearest 0.001 inch. It wouldn't surprise me, for 'pre-set' coupling rods on all Swindon locomotives were within 0.006in. of nominal. It follows that crankpin throw; quartering, axleboxes, frames, horns, and a few other bits were machined within about 0.001in. of nominal. How's that for accuracy? As another point, knuckle and similar pivoting joints were all bronze bushed, on hardened and ground steel pins, tapered for good measure. It follows that backlash could be as near zero 'as makes no odds'. It was a very great pity that diesels took over when they did, for six sets of Timken roller bearings for six Kings were delivered to Swindon. It makes me think of a rather silly note that was shown on some pieces of artwork: "*Perfection at its best!*" Any questions?

Slide Valves (which are usually outside admission) can usually be set by looking into the steam chest, cover removed! Piston valves (usually inside admission) can be set from holes drilled through the cylinder block into the valve liners and plugged afterwards but better by flexible plastic pipes from each draincock into a jar of water, or (possibly easiest) by stethoscope (can be purchased at Shakewells, your local chemist).

I also recall reading somewhere that the Britannias were originally supplied pre-set with no allowance for thermal expansion of valve rods etc. When an engineer on the Eastern Region noticed this, he made some quite tricky calculations and had them applied to one of the class. Performance was nicely improved, so the others were also treated, and I believe that the Brits then proved to be one of the finest locomotive classes to run on the Region. They did not seem so good on the GWR, I suspect prejudice had something to do with it.

Oddly enough, this prejudice seemed a bit different when Swindon produced the last locomotive to be built there

(named *Evening Star*); the lads gave it a copper cap to the chimmock - just about the finest compliment they could pay. However, the designer (so I heard) made them remove it as it didn't suit. Phooey!

So it follows that great accuracy in setting all sorts of valves is practical. There is an important corollary, make sure there are locknuts used at both ends of the rods!

Piston valve manufacture

Although not perhaps pertinent to *Lillian*, the matter has recently been raised via email; so it seems logical to kill two grooves with one ring at this time.

The main matter causing concern is the location of the grooves relative to the end of the valve heads. There are (apparently) good reasons for the various ideas. Hence it seems that some 'lobby chat' would not be entirely inappropriate.

We have the matter to decide as to the actual position of the rings. It looks at first as though the rings must be at the extreme ends of the heads; however this raises the problem of strength of the heads. In any size, this is a problem. One possibility is that of T-shaped rings, or possibly L-shaped. I do not see any reason why this should not work; however the problem arises of making the rings. Whilst ring making is within the scope of the amateur, it is not the easiest of tasks, and unless I am very much mistaken, the heat treatment required is another matter. It is one thing to make something when you have the experience plus the specialised machinery that is often required — but!

I remember many years ago someone writing to *Post Bag* was 'bellyaching' about rings snapping automatically when trying to install them. Admittedly they must be treated with respect, but I got the impression the he was trying to put them on radially as distinct from the correct method of axially. I mean here that he might have been trying to put them on from the side instead of the ends; at any rate it was clear that something was wrong.

One rather tricky operation is when it is necessary to move a ring over the 'first' groove in order to get it to its place in the 'second' groove; filling the 'first' groove first is a good help but then you need to work the second ring over the first. Tricky, but it may help.

There was much discussion several years ago as to which point should be taken for the 'business' end of the head as far as valve setting was concerned. This at first seems perfectly logical, but let us look a bit closer. If the locomotive is moving extremely slowly then, in theory, steam has a chance to leak past the edge of the head as far as the edge of the ring and so this would be the admission point for setting purposes. Bethink you however, if moving at a reasonable running speed; it is hard to imagine how any reasonable quantity of steam could leak in this way. Of course, I am assuming that the diameter of the valve heads is only up to about two 'thou' smaller than the inside diameter of the sleeve. Curly reckoned that a 'cold' clearance of 0.001in. was OK for pistons; I don't remember him giving any suggestions for piston valves, but I see little cause for concern for using the same clearance, although of course with rings in use another 'thou' or so would not make much odds. The only obvious cause for concern is that the first part of the cylinder system to get hot and therefore expand is the valve set, followed by the pistons. The expansion does not seem to matter too much, depending on the initial fit.

One of my biggest locomotives had just a bit too much tightness in the valves, in any case the owner didn't have any 10¹/₄in. track anyway, so he carefully jacked up the engine, packed up the driving wheels to running position, filled the boiler to running level, put his compressor onto the boiler and set the engine to tick-over speed, in full gear of course, lit the fire and just sat waiting. As things got hot, 'orrible skreeetches issued forth, but after two or three

occurrences the thing quietened down and before long 'she' was the perfect GWR locomotive miniature. Once the complete cylinder system has reached operating temperature all is well, in fact with the superheating system I use after initial warming up there is no need to use draincocks for a normal station stop.

A point to bear in mind is that whilst running under power, the pressure on the valves is all one way (inside to out for normal use - there are exceptions) but the pressure on the pistons is alternate/ reciprocating. It may or may not be an important matter, but might well be worthy of consideration. For those fans who would like to see these big 'uns try:

www.cattlecountryrailway.com

Draincocks

I was intrigued by the recent article (page 553, M.E. 4286, 10 November 2006) on automatic cylinder draincocks. It was one of those things that are so obvious - once pointed out - that no-one else seems to have thought of it.

Draincocks are always tricky, for they are:

- a) Fairly weak structurally and
- b) Often need an operating system that is seldom over-simple; in fact often fiendishly tricky to arrange.

In those far-from ideal 'scale' tracks that we have to use, derailments are by no means as rare as we would like.

I believe that a vertical 'bump' in the track of $1/\text{sin}$. is heavily frowned upon (full size) which means that for us, ideal tracks should be within $1/64$ inch. Jolly joke; ha ha! Again, once out of Paddington there is no curvature that I am aware of (main line) sharper than about 3 miles radius; which would make ours about 2,030 feet radius - some hopes!

It follows that derailments for us are somewhat more likely (how's that for an understatement?) and draincocks being as mentioned above it is quite on the cards that they get damaged far more often than we would like. To replace them often calls for a lot of faffing about underneath, meanwhile precious running time is lost.

It also follows that the stronger they are (as well as height above rails) the better, and to this end I have made my own fresh set much smaller than the type I originally showed for *Lillian*.

Although on the drawing the original ones looked okay, when I fixed them on my own chassis, they looked as if they were almost below rail level - any questions? So the automatic type shown by friend Bob Thomas looked far more attractive; and made as I show are somewhat stronger than my original. Let me make it clear that I do not claim any originality for the things, credit must lie elsewhere. However, I hope that friend Bob will forgive a little leg-pull, for one

dimension was missing! Diameter of ball is there but diameter of bore was missing; and although I do not ascribe great importance to these figures, a little nudge in the right direction would have helped. For, perforce, drawings as printed in 'ours' are seldom full-size; therefore a few measurements and calculations had to take place.

All right, I know that I too have missed out on such matters, but feedback is almost incredibly unknown even when requested. It is clear that there must be an ideal relationship between ball size and chamber bore, but fluid dynamics are mighty queer cattle and only empirical evidence could throw light on the matter.

I might mention the reason my original design was longer than needful was in order to clear the nuts holding the things onto the cylinders; otherwise they could only be fixed by dismantling the actual valve - hardly ideal. For I do not like the 'screw-in' variety of draincocks as unless bonded in they are certain to work loose, and as well, are tricky to align. And if they are bonded, occasionally very difficult (even impossible) to remove.

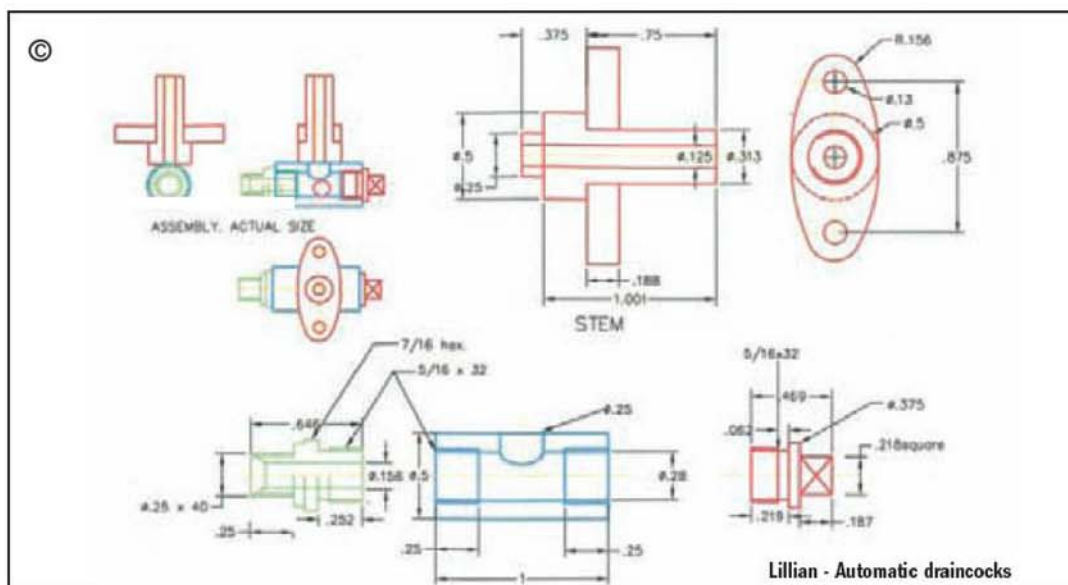
I have yet to try these under steam, but under breath pressure they work well. Incidentally, with good superheaters, it is seldom that there is condensation (after initial steaming up) except after a long stop. I have shown them with

a screw-cap in each end, for it is good policy to lead the hot mixture of steam, water, and oil forwards in pipes so the squirt-out is forwards, excellent for shooing livestock out of the way, and doesn't blow quantities of ballast up into the works. Sideways away from the engine is of use in persuading some people to give a bit more clearance - works well on elevated tracks - but hardly encouraging to the HSE. So rather than unscrewing pipe fittings, if internal examination is required, the rear cap will unscrew without disturbing any pipework.

In the picture of assorted draincocks, the one on the left is the one I originally fitted to *Lillian*, on its right is the easier one to fit but is dangerously low, to the right is the assembled 'automatic' one. At the bottom are the two end caps plus a main body.

This recalls a little incident which occurred whilst I was working on the Tallylyn rather a long while ago (1955 to be precise). We were operating a train containing a working group when a sheep was sighted on the track. For some reason best known to itself it fled along the track instead of getting the h*ll off it. Draincocks opening only accelerated said sheep, until suddenly it vanished under the locomotive. The train was stopped, and there was no sign of the peripatetic mutton. I baled out and ran forwards looking for sheep, not a sign! It had been a rainy night, and in places the water was up to ground level, so culverts were well-nigh invisible. Then I looked down, there was the ewe, comfortably submerged in a narrow culvert bridged by rails alone. Hauled out, it only had a minor cut on one leg, after bandaging it found its way off the track area.

● *To be continued.*



**Wilson's Words
of Wisdom**
If we all thought the
same way there
would be no progress.
Henry Timken

UK CLUB NEWS

Rex Hanman has sent in an update on the situation at **Andover DMES**. Readers may remember that the society lost its track site some two years ago. The search for a new permanent home is continuing. In the mean time, due to the generosity of the Vice Chairman, meetings are currently held in a Portacabin surrounded by full size traction engines and a considerable number of relics from a bygone age. The older members are reported to fit in well!

A pair of old shipping containers provide storage and one has been turned into a well-equipped workshop. It is hoped to make use of this as a training facility and for the production of club projects. One such project is a new set of trolleys for raised track use. The site is not suitable for a track of any sort to be built but a small raised 3½/2in. and 5in. gauge track has been constructed in a neighbour's garden! Of very light construction on wooden trestles it is really little more than a test track but it has seen some use from time to time.

The post of Chairman has been filled by Ann Turner and Stan Scott (tel: 01980-846663) has taken on the role of Secretary. The society was recently asked to put on an exhibition at a transport enthusiasts' day. The result was a very large display that stretched the length of the school sports hall, the biggest and best that the club has put on for a long time. Prompted by this success it is hoped to put on several more displays in the future. The annual dinner, held in November, was well attended and the atmosphere was enhanced when a power failure caused the meal to be held in candlelight. We are delighted that the society is still active and wish it success in its search for new premises.

Some good news to report, **Plymouth Miniature Steam** has obtained access to new workshop facilities at Plymouth College of Further Education following the loss of the original

facilities last year. The college has been very supportive and Ralph, the laboratory technician who supports the group is described as *"the most helpful person we could wish for"*. This positive approach is to be welcomed and is a change from the closures recently reported in other areas of the country. The group is deemed to be *"a course with no end qualification"* which seems to differ somewhat from the approach recently reported at Newbury College (*Post Bag*, M.E. 4292, 2 February 2007).

Reading SME report that more progress has been made on the renewal of the concrete beams on the raised track and the job is now almost complete. A group of members visited the British Library to look at early copies of this journal in an attempt to establish the date the society was founded. The earliest mention was in February 1910 with regular mentions until 1913. The first society visit was in March 1910 to the 'Reading Electric Light Company'. Sounds like a centenary in 2009 or 2010. Alan Davidson set a puzzle in the newsletter. He asks what is so unusual about the following: *"It looks so ordinary that you would think nothing was wrong with it at all, and in fact, nothing is. But it is unusual — why? If you study it and think about it you may find out, but I am not going to assist you in any way. You must do it without coaching. No doubt, if you work on it for long, it will dawn on you. Who knows? Go to work and try your skill."*

A group from the **Saffron Walden SME** made the *"annual pilgrimage to the Great Steam up at Sinshiem"* and report that those who used the ferries rather than the more expensive channel tunnel suffered some considerable delays due to the gales at the time. Once installed at Sinshiem however, everyone had a very good time and even fitted in a visit to the railway museum at Heilbron.

Roger Stephen of **St. Albans DMES** has been doing some serious repair work on the boiler of his *Princess Marina*. Following the discovery that

most of the firebox crown was no longer attached to the girder stays, attempts are being made to repair the boiler by soldering in 14 new rod stays and a new regulator bush. This is after consultation with the boiler inspectors and as the report says, the hydraulic test will prove rather nail-biting. We will report further progress in the future. Most boilers would be condemned after discovering such damage, so we shall be interested in the outcome.

Members of **Stamford MES** were treated to a talk on laser cutting by Malcolm High at the December meeting. Malcolm described his experiences and the principles involved in laser cutting. One fact Malcolm mentioned is that the power required is not great; a 3KW laser can cut through 15mm plate.

Thanks to the efforts of Peter Russell, the **City of Sunderland MES** has a new website. The site can be found at www.csmes.co.uk The local council has been removing several dead trees at the track site and the gang were under strict orders from their bosses *"not to damage the track"*. Sounds like another supportive council.

Brian Mundy from the **Sutton MEC** found the following nice story on the Internet;

A lady was travelling to Dent, a station on the famous Settle to Carlisle Railway in the UK. On arrival at Dent, she alighted and seeing nothing but countryside around her asked the guard *"Where is the village of Dent?"* the guard replied that it was about 3 miles away, down the hill. The lady then asked *"Wouldn't it have been better to build the station near the village?"* to which the guard replied, *"Yes madam, but we thought it better to build it near the railway"*.

After the final run of last year, the *"Sutton MEC Wreckers"* (their words) removed some 60ft. of the raised track in order to prise out eight corroded track uprights complete with the concrete feet. These are to be replaced and hopefully the track will be in action again early in the New Year.

A note in the **Tyneside SMEE** news announces that the

IN MEMORIAM

It is with the deepest regret that we record the passing of the following member of a model engineering society. The sympathy of staff at *Model Engineer* is extended to the family and friends left behind.

Jim Proud
Hull DSMEE

remaining members of the **Newcastle Model Yacht Club** have decided to wind the club up after 124 years. The members sail on the lake in the same park as the engineering society and have given the reasons as "dwindling membership and the poor condition of the lake" among others. We are sad that such a long established club is to close. Work on the ground level track at Tyneside continues with approximately half the circuit trenching and the trenching for the double line by the club house completed.

We seem to be starting off the New Year with news of track sites being lost. **West Wilts SME** reports that it intends to make the most of the facilities this year because it may be losing its site "in the not too distant future". No doubt news from readers of potential new sites would be welcome. The society is holding an Easter

Monday Steam-Up on 9 April at the Bulkington Railway and a Summer Gala Event on 23 June at the Queens Road, Westbury site. Details can be obtained from the website at www.wwsme.org.uk

WORLD CLUB NEWS

Australia

Model Engineers and Live Steamers of Maryborough celebrated its 30th anniversary in August last year. The weekend was described as a resounding success. During the celebrations

Graham and Robyn Chadbone were awarded life membership for their service to the society. This was a particular surprise to Robyn who edits the newsletter and she described herself as "rendered almost speechless". Congratulations to both on their achievement.

Canada

The Whistle, the newsletter of the **British Columbia SME** contains several photographs showing the track under several inches of snow in November. I have picked

the cover picture (**photo 1**) entitled "Winter at Rainbow Creek Station" as a nice example.

South Africa

The **Centurion SME** reports that there are some considerable goals to achieve regarding new and expanded facilities: the finishing of the rail work for the new tunnel, extended tracks and points for the station, the raised track, a workshop/storage room next to the steaming bays, the extension of the library facilities, etc. We wish the members luck with these aims and we look forward to reporting progress in due course.

TRADE NEWS

We intend to put news of new products and other news items from our traders here, so if you want to publicise a new product or other relevant items from your company, please pass such information to the Editor.

1. Rainbow Creek station in the snow at British Columbia SME.



DIARY

- | | | | | | |
|--------------|---|----|--|-------|--|
| MARCH | | | | | |
| 16 | Ickenham DSME. Colin Gent: Rolls-Royce Merlin Engines. Contact David Sexton: 01895-630125. | 20 | Chesterfield MES. AGM. Contact Mike Rhodes: 01623-648676. | 22 | Cardiff MES. Brian Hawker: Severn Crossings. Contact Don Norman: 01656-784530. |
| 16 | Romney Marsh MES. DVD/Video Evening. Contact John Wimble: 01797-362295. | 20 | Nottingham SMEE. AGM. Contact Graham Davenport: 0115-8496703. | 22 | Harlington LS. AGM. Peter Lugg: Brunel. Contact Peter Tarrant: 01895-851168. |
| 17 | SM&EE. Disposal Sale. Contact Maurice Fagg: 020-8669-1480. | 20 | Romney Marsh MES. AGM. Contact John Wimble: 01797-362295. | 22 | Worthing DSME. Bits & Pieces. Contact Bob Phillips: 01903-243018. |
| 17-18 | The 3rd Model Engineering & Hobbies Exhibition at Michael Herbert Hall, South Street, Wilton, Salisbury. 10am-5 pm. Adults £3, Accompanied Children £1.50. Contact Peter Parrish: 01980-610-346. | 20 | South Durham SME. Afternoon Steam-Up. Contact B. Owens: 01325-721503. | 23 | Ickenham DSME. Martin Humphrey & Peter Pardington: Manufacture of ferrous & non-ferrous metals. Contact David Sexton: 01895-630125. |
| 17 | York City & DSME. Richard Gibbon: New engines for the SS Great Britain. Contact Pat Martindale: 01262-676291. | 20 | West Wiltshire SME. Stefan Owen: Rods and Motion. Contact R. Nev. Boulton: 01380-828101. | 24 | Chesterfield MES. Public Running. Contact Mike Rhodes: 01623-648676. |
| 18 | Bedford MES. Boiler testing - Traction Engines - by appointment only. Contact Ted Jolliffe: 01234-327791. | 21 | Bournemouth DSME. John Hoyle: Model I/C Engines. Contact Dave Fynn: 01202-474599. | 24-25 | Hutt Valley MES. Wanganui Heritage Weekend. Contact Gavin McCabe: 567-4487. |
| 18 | Bristol SMEE. Steam-Up and Boiler Testing. Contact Trevor Chambers: 0145-441-5085. | 21 | Bristol SMEE. On the Table Evening. Contact Trevor Chambers: 0145-441-5085. | 24-25 | London Festival of Railway Modelling Exhibition at Alexandra Palace. Advance booking (to 15 March 2007): Adults: £8, Children: £3.50, OAP: £6.50, Family (2+3): £23. Information and Ticket Hotline: 01778-392089. www.brmodelling.com |
| 18 | Frimley & Ascot LC. Club Running. Contact Bob Dowman: 01252-835042. | 21 | Chingford DMEC. Martin Masterson: Live steam in "OO" gauge. Contact Ron Manning: 020-8360-6144. | 25 | Adelaide Miniature SRS. Public Running. Contact Bob Yule: 8387-5032. |
| 18 | Leyland SME. Boiler Testing Day. Contact A. P. Bibby: 01254-812049. | 21 | Guildford MES. Bits & Pieces. Contact Dave Longhurst: 01428-605424. | 25 | Bedford MES. Boiler testing - Locomotives - by appointment only. Contact Ted Jolliffe: 01234-327791. |
| 18 | Northampton SME. Boiler Testing Day. Contact Pete Jarman: 01234-708501 (eve). | 21 | Hull DSME. Contact Tony Finn: 01482-898434. | 25 | Bristol SMEE. Public Running. Contact Trevor Chambers: 0145-441-5085. |
| 18 | St. Albans DMES. Puffing Field Morning. Contact Roy Verden: 01923-220590. | 21 | Leeds SMEE. Meeting. Contact Colin Abrey: 01132-649630. | 25 | Cardiff MES. Open Day. Contact Don Norman: 01656-784530. |
| | | 21 | MELSA. Meeting. Contact Graham Chadbone: 07-4121-4341. | | |
| | | 21 | Staines SME. Cheese & Wine Evening. Contact Stan Bishop: 01784-241891. | | |
| | | | | 25 | MELSA. Sunday in the Park. Contact Graham Chadbone: 07-4121-4341. |
| | | | | 26 | Bedford MES. Close season progress - what we achieved over the winter. Contact Ted Jolliffe: 01234-327791. |
| | | | | 26 | Canterbury DMES (UK). AGM. Contact Mrs P. Barker: 01227-273357. |
| | | | | 27 | Basingstoke DMES. Meeting. Contact Guy Harding: 01256-844861. |
| | | | | 27 | Chelmsford SME. Bob Goss of Henkel Loctite Adhesives: Talk. Contact D. Blake: 01376-324205. |
| | | | | 27 | Romney Marsh MES. Last Winter Members' Social Get-Together. Contact John Wimble: 01797-362295. |
| | | | | 27 | Wigan DMES. Bits & Pieces. Contact John Chamberlain: 01744-882255. |
| | | | | 28 | Chingford DMEC. Roy Berg: Vintage RAF Films. Contact Ron Manning: 020-8360-6144. |
| | | | | 28 | Guildford MES. AGM. Contact Dave Longhurst: 01428-605424. |
| | | | | 29 | Cardiff MES. Bits & Pieces. Contact Don Norman: 01656-784530. |
| | | | | 29 | Leyland SME. Internet Night. Contact A. P. Bibby: 01254-812049. |
| | | | | 30 | Hereford SME. Transport Challenge. Contact Nigel Linwood: 01432-270867. |
| | | | | 30 | Ickenham DSME. Gauging Your Interest. Contact David Sexton: 01895-630125. |
| | | | | 31 | Cardiff MES. Steam-Up & Family Day. Contact Don Norman: 01656-784530. |

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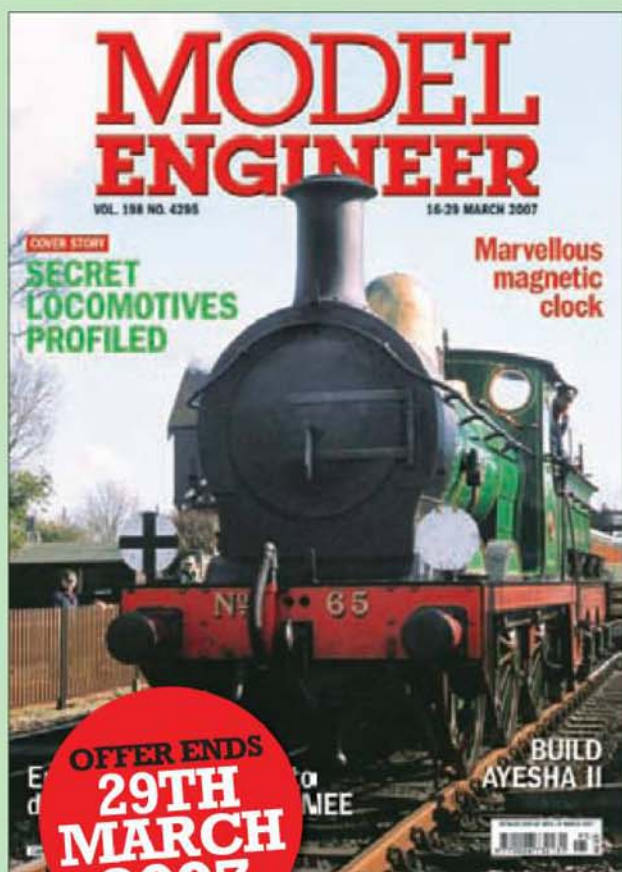


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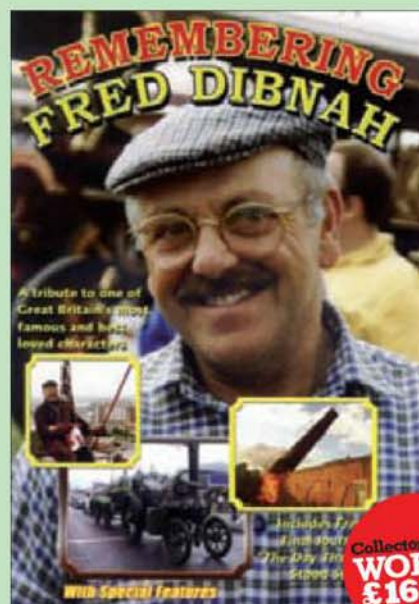
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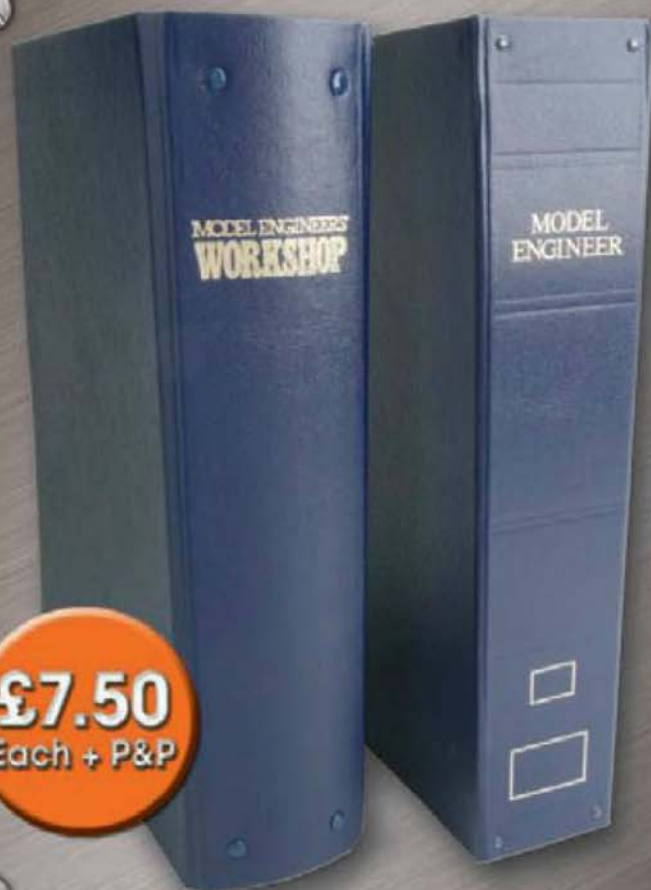
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MOTOR 1.5HP
DIMENSIONS (LxWxD) 1370x740x680MM

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