MODEL ENGINEER

Vol. 191 No. 4207

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HIGHBURY
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IN THIS ISSUE

Vol. 191 No. 4207 31 OCTOBER 2003

On the cover ...

Samantha is a 4nhp Foden timber tractor originally built as a tipper wagon in 1929 (No. 13454, registration number KX 3340) During the 1930s she was converted to her current specification by Broughtons of Amersham and used by them until the 1950s for winching and hauling timber. The winch on the tractor is driven by a small marine engine. The current owners are D. & J. Hirst of Andover and this photograph was taken at the Lister Tynedale Rally, North Nibley, Gloucestershire 14 June 2003.*

(Photograph by Mick Bolton)

TURN TO PAGE 528 FOR GREAT OFFERS ON SUBSCRIPTIONS!

INDEX to ADVERTISERS

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2 CTC800	8 dr chest/cab set	£99.95	£117.44
PRO RANGE			
3 CTC103	3 dr step up chest	£44.95	£52.82
4 CTC106	6 dr drop front	£64.95	£76.32
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7 CTC107	7 dr trolley	£169.95	£199.69

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CAG115C*	PRO	720w	£35.19	£26.95	£31.67
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THE MODEL ENGINEER EXHIBITION

Please return completed form to:
Model Engineer Competition, The Leys,
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ENTRY NO.	OFFICE USE ONLY	
	CLASS	ENTRY NO.

ENTRY FORM - COMPETITION & LOAN MODELS

PERSONAL DETAILS (Please print)

Surname .... Forename(s) .... Age ....

Address ....

....

....

Post Code .... Home Tel: .... Daytime Tel: ....

Model Club or Association ....

Have you entered before? (Y/N) .... Do you purchase or subscribe to a Nexus 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 (Highbury Nexus will not insure the model unless a value is entered) £ ....

Name and address of local newspaper ....

....

NB Please make a copy of this form and any photographs enclosed for your own reference. Please note that Nexus 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 (01689-899232/3), 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!

COMPETITION CLASSES

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

- BI Working steam locomotives 1in scale and over.
- B2 Working steam locomotives under 1in scale.
- B3 Locomotives of any scale, experimental, freelance or based on any published design and not necessarily replicas of full size prototypes, intended for track duties.
- B4 Scratchbuilt model locomotives of any scale, not covered by classes BI, 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 1in scale.
- B10 Passenger or goods rolling stock, under 1in 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 medals

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 Nexus Special Interests.
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 Nexus Special Interests 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 Nexus Special Interests 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 that 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. Nexus Special Interests 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 Nexus Special Interests 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 Nexus Special Interests Ltd. are eligible to re-enter their model for the 'Duke of Edinburgh Challenge Trophy.'

Past winners at any of the exhibitions promoted by Nexus Special Interests Ltd. will not be eligible for re-entry into the competition unless it has been substantially altered in any way.

7. Nexus Special Interests 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 or 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 NEXUS WILL NOT ACCEPT LIABILITY FOR ANY LOSS.

CLOSING DATE 16TH DECEMBER 2003

SMOKE RINGS
With the Editors

What is a model engineer?

While browsing through a recent batch of club newsletters, we discovered the following bittersweet contribution by Gordon Gurney in the North Norfolk MEC journal. Too good to miss, with his permission we reproduce below a gently edited version for all to consider:

"What is a model engineer?

"Easy: an Engineer who makes models.

"So, how many of us qualify?

"The term 'Engineer' must be one of the most abused words in the English language. It seems that everyone, from the bloke who rods the drains (Sanitary Engineer) to the bloke (or bloke-ess) who keeps a 747 in the air, lays claim to the title with mixed success. To be difficult about it, you should only call yourself an Engineer if you are a member of an engineering Institution. As far as I can see, these august bodies relieve their members of loads of money for little other purpose than to make sure that 'the Club' remains exclusive. Hang on, that lets me in! Ahah, wrong sort of Engineer. Having a bit of paper that says I can fill potholes isn't a lot of use in the 'tin bashing' department.

"So the 'Engineer' bit is a bit doubtful. What about the 'model' bit? Hmm, do boats, planes, 'electric mice', bikes for very small wooden people, widgets various, and clocks qualify? Probably not. Oh well, it looks like NNMEC can cancel the hall and meet in a 'phone box! That is if BT don't take them all away.

"So, getting back to the original question "What is a model engineer?" I suppose an answer could be "Not many of us!"

"Perhaps it would help to think about what we have in common? A love of steam? Er, well, I am more interested in I.C. engines. "Blasphemy! Go wash your mouth out!" I hear the steam lot say!

"Actually, these steam people are quite friendly when you get to know them. Steam talk is a bit strange and primitive though. Apparently it takes years of immersion in oil, grease and muck to become fluent.

"Perhaps then it's an appreciation of things mechanical, good workmanship, and a sense of humour that keeps us together. I hope we can be tolerant of each other's views, interests and eccentricities, and above all enjoy ourselves, because that is really what NNMEC is all about.

"A final thought about the status of Engineers. When I was learning to be a Civil Engineer (funny term that, I have known a good few who were anything but civil), I paid a visit to the local builders' merchants. In front of me in the queue was a bloke in a pair of brand new overalls which had the word "Engineer" emblazoned across the back in large letters.

"It is my eternal regret that I didn't get a pair for myself. It would have been a damned site easier than five years of slog and exams! On second thoughts, perhaps I should get a pair of overalls with "Plumber" on them and make my fortune!"

For the record, among others, we have found the following dictionary definitions. An Engineer is "*... one who constructs or is in charge of engines, military works, or works of public utility.*" A model is "*... a miniature representation, a pattern, or a person or thing worthy of imitation.*" Now, there's food for thought! What is your view?

MEX 2003

We are very pleased to report excellent progress concerning arrangements for the forthcoming Model Engineer Exhibition which will take place at the well appointed and comfortable Sandown Park Exhibition Centre on Monday 29, Tuesday 30 and Wednesday 31 December 2003. The full price for a one-day adult ticket is only £7 at the door but advance booking discounts and concessionary rates are available — call the ticket hotline (01353-654422) or visit **www.meex.co.uk** for details.

For the convenience of readers, an official Competition Entry Form and full Class List are included in this issue (see facing page). We welcome entries in all categories of the competition — if you have any doubts concerning the eligibility of your model or a suitable class for it, we are happy to advise. We would be particularly pleased if you were to consider the Loan Model category so that we can all have the chance to enjoy seeing your work currently in progress, or previously successful competition models, or work which for whatever reason you do not wish to enter into competition. All the privileges associated with Competition Models apply equally to Loan Models.

We understand that most of the Trade Exhibitors' space has already been booked and allocated, and are happy to announce that 22 Clubs, Societies and Organisations will be supporting the event. In alphabetical order, these are $2^{1}/2$in. Gauge Association, Buckingham Garden Railway, Elmbridge Model Club, Gas Turbine Builders' Association, Guildford MES, GWR Preservation Group, Harrow & Wembley SME, I.C. Engine Builders Group, Ickenham DMES, Kew Bridge Steam Museum, KMYCA Steam Group (Antwerp), Malden DSME, Model Power Boat Association, Napier Power Heritage Trust, North London SME, REMAP, Society of Model & Experimental Engineers, Society of Ornamental Turners, Southern Federation of Model Engineering Societies, Staines SMEE, Stephenson Locomotive Society, and the Stirling Engine Society. We are grateful to members of all these organisations for their commitment to MEX 2003, and look forward to seeing them at Sandown Park.

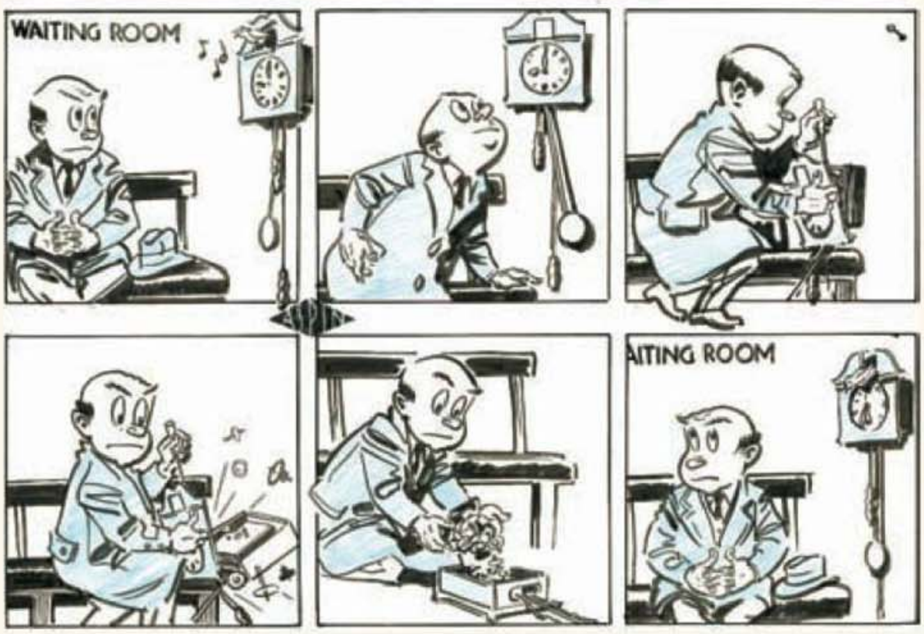
MEX 2003: another chance to study Mrs. Cherry Hill's exquisite workmanship.

We hear from the Society of Model & Experimental Engineers that in addition to the stand displaying examples of members' work, the Society will also be operating the workshop. manned by practical model engineers who will be pleased to try and answer your queries and help with problems. If you have a casting which you are not sure how to mark out or machine, please bring it along for a discussion. You may end up with several solutions to the problem, but two (or more) heads are always better than one.

Don't worry if you think that the question is too simple and that people will laugh, they won't; we have all had to start somewhere and we have all made the same basic mistakes, so take advantage and benefit from our experience.

Last year the free lectures organised by SM&EE and given by society members were well attended and greatly appreciated by visitors. Once again the lectures will be presented by society members, and details and times will be available from the Society stand. Be early or you may find it's standing room only!

CHUCK the MUDDLE ENGINEER **by B. TERRY ASPIN**



POST BAG

Gyroscopes

SIRS, - I was interested to read the article by David Wilcox on gyros (*M.E.* 4204, 19 September 2003). It reminded me of my own fascination when, as a child, my father made something similar for me to play with. Its curious behaviour puzzled me for many years until finally it was explained in school physics lessons. Knowing how I had been inspired, my own two sons were also introduced to gyroscopes from an early age. It was fun to watch their curiosity develop and then help to nurture this by looking, with them, at the action of rotating bicycle wheels, etc.

In his feature, the Author asks if anyone knows of useful model engineering applications of gyroscopes. Although I can't offer any first hand experiences, an article in an early edition of the *Model Engineer,* by an anonymous writer, reports on some experiments with a monorail system based on gyroscopic action (*M.E.* 317, 23 May 1907). The inventor of this particular system was Louis Brennan (famed for his torpedo, mechanically controlled by means of trailing wires). Photographs accompanying the report show a nicely made vehicle, perhaps some 4ft long by 1ft wide being driven along a single rail by a man described as about 10 stone in weight. The apparent centre of gravity of the system is clearly way above rail level. In another photo, a rather anxious looking young boy is seen sitting in the car, which is now traversing a length of cable suspended several feet above the ground.

The description informs us that the mechanism consists essentially of two contra-rotating flywheels driven at a very high velocity by electric motors. The flywheels were mounted on *"high class bearings and placed in exhausted cases so that both air and journal friction is reduced to a minimum."* We are also told that the stabilising mechanism occupies very little space and that it is placed in a small cab mounted at the front of the vehicle. After discussing alternative methods of powering the system, the report ends by extolling the virtues of this mode of transport.

In view of the claims made for it, together with the very clear and convincing photos, I can't help but wonder why the system never became commonplace. Was it just a question of economics or were there fundamental control problems that could perhaps now be overcome with today's technology? Maybe others have experimented with this idea and could provide some enlightenment.
Bill Steer, Middlesex.

Drawings required

SIRS, - I would like to get in touch with anyone who can help me with the drawings for an engine that I would like to build. It is Hunslet No. 206, *Beddgelert*, an 0-6-4 built in 1878 for working on the North Wales Narrow Gauge Railways.

I would be most grateful for any assistance.
P. Phelan, Gwynedd.

Evenly spaced

SIRS, - May I be permitted to comment on Peter Kings's letter concerning the spacing of letters by eye or by rule (*M.E.* 4203, 5 September 2003)?

I understand his point that a good artist or signwriter will do the job by eye. Nevertheless Eric Gill, who was one of the leading designers of the first half of the twentieth century, was employed by the LNER to design their house style and he produced his famous 'Gill sans' font originally to fulfil that contract, and in it he defined closely all the proportions of letters and spacings so that the company could reproduce them not only on the sides of A4 pacifics, but also in their posters and other publicity.

Using these data the modern computer methods do a good job of conveying the original design in all its detail. Admittedly some of the earlier computer systems had their shortcomings, presumably through lack of space within the programmes or compromise through using a printer that could not cope with the level of definition necessary for the purpose. This criticism cannot be levelled at the modern set-up.
D. A. G. Brown, Rutland.

Membership lists

SIRS, - I read with interest the information about the Data Protection Act scam in a recent copy of *Model Engineer* (*M.E.* 4203, 5 September 2003) and would like to add the following.

Up to the end of last year we at Urmston MES were registered for the Data Protection Act. On receipt of the demand for their periodic fee I rang the head office in Wilmslow over some of the detail.

On going through it with them it became clear that clubs such as ours with members' names, addresses, 'phone numbers, and the like, i.e. simple personal data, have absolutely no need to be registered and we de-registered saving the annual fee. Only businesses with financial details of banks, etc. need be registered.
Don Broadley, Cheshire.

Mr. Richard Beel of Bristol with his 'sophisticated toy' crane.

Sophisticated toy

SIRS, - In *Model Engineer* No. 3158, 18 January 1962, the late Martin Cleeve published an article entitled *Fun with a Crane* which he described as a *'sophisticated toy'*. He followed it with a five part constructional series April-June 1963.

Being fond of cranes and having a stock of Meccano gears, I built Martins 'gearbox' with a few modifications and then went on to produce the crane superstructure with full lattice type jib and backstays, as shown in the accompanying photograph.

In 1980 I sent a photograph to Martin Cleeve and received a charming reply in which he said that as far as he knew I was the only person to have built another. However, at an exhibition some years ago I did come across another under construction.

My crane is usually an attraction at exhibitions, especially with children if I let them have a go — under strict supervision, of course — and it was recently in action at our Bristol SMEE Exhibition.

Now to the point of this letter. A few years after Martin's death, I noticed from a classified advertisement in *Model Engineer* that his original model was for sale and am wondering if anyone knows where it is now?
Richard J. Beel, Bristol.

Convenient dispenser

SIRS, - I noted the suggestion in a recent issue (*M.E.* 4204, 19 September 2003) re using nail varnish bottles for marking blue.

In turn, I suggest using discarded liquid soap dispensers as oil cans. The pump feed bottle lends itself well to this, and the addition of a short plastic extension pipe creates a pump oil can for next to nothing.

Further, most of these dispensers are transparent, so you can see when they are running low. They can also dispense lubricant when using taps/dies, and readers will no doubt think of other uses.
Chris Finn by e-mail.

Oil, not grease!

SIRS, - In his letter published in *M.E.* 4204, 19 September 2003) J. Lake asks how *"... to modify the Myford oil gun so that it lubricates the lathe and not your sleeve."* The short answer is ... you can't!

In 1996. after much frustration and two equally leaky replacements from Myford, I contacted Lumatic, UK stockists for Wanner, but they were unable to offer an alternative.

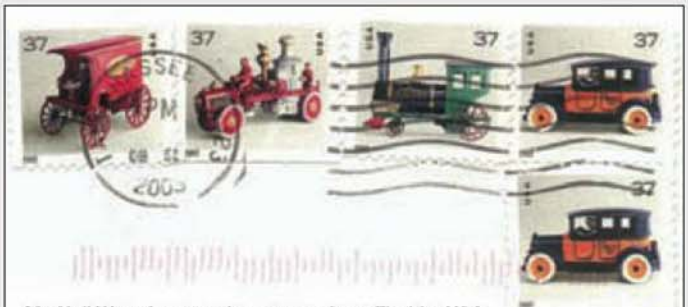
I then wrote to Abnox in Switzerland who are the manufacturers of Wanner equipment. Their Sales Manager, a Mr. Marti, telephoned me and expressed surprise that this gun was being supplied with the lathe since it was designed for grease and was totally unsuitable for oil. He arranged to send me the correct oil gun for the job, together with the extended nozzle required to reach the nipple on the headstock pulley. Happiness all round! A well oiled lathe — and a dry sleeve!

Lumatic (01424-436343) now stock this oil gun.
Shelley Curtis, Leicestershire.

Tool sharpening

SIRS, - I recently required the urgent sharpening of some large end mills and drills. I found Bromac Tool and Cutter Services in *Yellow Pages*, operating from premises near my home.

They sharpened the tools within a day, and I was much impressed by their friendly service. This is a father-and-son enterprise, equipped with a number of grinding machines.



Mr. Neil Wyatt's attractive stamps from Florida, USA.

They are able to sharpen existing tools and will modify these to any desired shape, or make special tools to order. They also stock a huge variety of milling cutters, taps and dies, both new and second-hand, for sale below standard prices. They deal by mail, throughout the UK and overseas.

Their address is: Unit 1A, Noke Lane Business Centre, St Albans, Hertfordshire AL2 3NY (tel: 01727-865408; fax: 01727-846008).

I hasten to say that I have no connection with this company, other than that of a satisfied customer. It is pleasing to find a thriving small enterprise, perfectly willing to cater for the small needs of a model engineer.

Hubert Elffers, Hertfordshire.

Copper wire

SIRS, - In reply to N. Dakers request for a source of enamelled copper wire, I have been using The Scientific Wire Company at 18 Raven Road, South Woodford, London E18 1HW (0208-505-0002) for a number of years and found them very helpful. They also may be found on the Internet at **www.wires.co.uk**

I hope this information is of some use.

Ian Gurton, Hertfordshire.

An engine called *Gladys*

SIRS, - After an absence of 40 years I am now returning to my interest in model engineering. Browsing through some old copies of *M.E.* which I have been fortunate to acquire, my interest has been taken by *Gladys*, a rotary positive displacement heat engine and I would like any information which may be available.

The article appears in *M.E.* 3598, 1 December 1978, (Vol. 144, from page 1433) and I believe that this engine may have been offered as a kit.

Does anyone have drawings or further information?

Stuart Gemmell, Glasgow.

Marking blue

SIRS, - Many years ago (45), when I was at Technical College, we used a marking blue which was a substance dissolved in methylated spirits. Does anyone know what this substance is or was? The fluid was kept in a small airtight plastic container and applied with a brush. Now all I can get is the stuff in aerosol cans which is expensive and I don't think is as good.

Frank Hasieber,
Durban, South Africa.

Toys on stamps

SIRS, - Readers may be interested to see the charming stamps we received on a letter from Tallahassee, Florida, USA and reproduced above.

They appear to show a number of tinplate toys of exceptional charm, including one of the well-known locomotive *Jupiter*. I am not sure that the details of the wheel arrangement and motion work are correct, but these are clearly toys of a very high standard. Can any of our American friends tell us more about these fine stamps?

Neil Wyatt by e-mail.

Only one lifetime!

SIRS, - I just wanted to say how much I enjoyed *M.E.* 4204 (19 September 2003) with the Broomy Hill Report by John Arrowsmith and the IMLEC notes by Neville Evans. I have just completed a report on the two Gilling Main Line events which were held this year. They went really well — we had 45 locos at the May event and 47 at the August one.

I also write to reply to a comment made by Lawrence Tatton in his thought-provoking letter in the same issue. Mr. Tatton is concerned about us producing laser cut parts, etc. thereby undermining the skills of others who prefer to do everything for themselves. However, I suspect that Neville Evans and Keith Wilson receive similar calls as me from people who have neither the time or the inclination to do everything for themselves. I get messages every day by e-mail, letter and, more to the point, by 'phone, asking me to produce anything which will save builders' time.

I know many of these customers personally and am well aware that they have the skills to do everything themselves, but don't want to spend twenty years building a loco. Once you have hacked out one set of frames there isn't much new in doing the same for another loco. The same can be said for milling out sets of coupling rods, a job which I hate. My main interest is in running the railway.

Many of my customers are ground level railway enthusiasts and GL5 members who don't just want to build a loco but, like me, a whole railway, and we want to do it in one lifetime. I'm sure Neville and Keith find as I do that I seem to spend a large proportion of my time trying to keep ahead of the game using any modern methods which come to hand, including CNC machining, laser cutting and lost wax casting to improve the hobby. The clock can't be turned back and we must look ahead.

Whatever we may think about the Winson debacle, the one thing which it has done is to bring in hundreds of new model engineers to the hobby. Most of them have the money but very little time, and desperately want to 'build' a steam loco. Many of them are railway modellers who do not have the skills to make all the parts and want to buy whatever they can to speed up the job. I speak to a large number of these 'new' model engineers, many of whom have since bought their own lathes and other tooling because they want to 'have a go' on their own. At least one new customer a day has to be put onto our computer and a lot are tackling something for the first time, even if it is 'only' a wagon.

Notwithstanding the above, I am well aware of the point which Mr. Tatton quite rightly makes about entering models into competitions, but I am sure there is a box on most competition entry forms which asks 'Anything to declare?'

Doug Hewson, Lincolnshire.

Pythagorean triangles

SIRS, - In *Letters to a Grandson* (*M.E.* 4205, 3 October 2003) Mr. Ellis wonders whether his discussion of right angled triangles is boring readers. I can only say that this reader was not bored and that I always find his column interesting.

He conjectures that his formula will deliver all possible proportions of Pythagorean triangles but I am sorry to say that I must disagree with that suggestion. If a few of these triangles are taken, working backwards to determine the generating numbers will show that some have 'y' values that are fractional. The generating formulae that can be found in mathematics text books are probably the most useful source for finding these triangles.

Since Pythagoras died in the 6th century BC, mathematicians down the centuries have discovered many unexpected properties of these triangles and a full length article would only cover a selection of these. Mr. Ellis therefore has much material available for his column. However, remembering his wise words about wearying people with what interests you, I will bring this letter to a close,

H. D. Turner, Wakefield.

Scale drawings and adhesive tape

SIRS, - In his letter to *M.E.* 4201, 8 August 2003, Mr. J. B. Sinclair in Manitoba, Canada requested information on constructing scale drawings from perspective photos. The following magazines all contain good articles on the subject. *Model Railway News* (January 1965), *Model Railway Constructor* (June 1969), and *Model Railroad Craftsman* (May 1996). The last is an American publication and from memory is probably the best of the three. Mr. Sinclair should have little bother getting hold of it in Canada; he may wish to try his local model railroad club.

If you ever find out his address I will be pleased to send him a copy if he cares to contact me.

In *M.E.* 4202, 22 August 2003, Roger Castle-Smith writes about using double sided adhesive tape to hold clock hands while sawing out, etc. He remarked on the difficulty of removing the finished part from the ply backing board. I use double sided tape for similar purposes when building my 4mm scale models and find the best release agent to be ordinary lighter fuel; a quick squirt soon breaks down the bond. With no lighter fuel to hand white spirit or turpentine substitute works equally well.

Mick Nicholson by e-mail.

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or to **neil.read@nexusmedia.com** or to **kelvin.barber@nexusadsl10.demon.co.uk**
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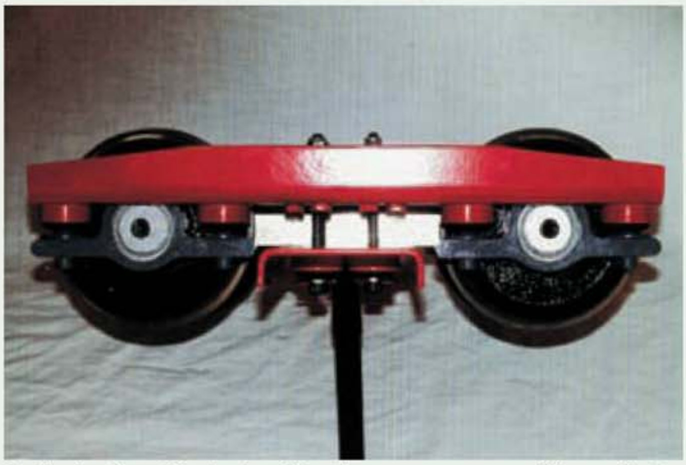
The Author's new passenger car featuring the pivot-less bogie design as displayed on the SMEE stand at the 2003 Harrogate show.



A side elevation of the bogie unit for the new passenger car. The excellent finish was achieved by powder coating.

SELF STEERING WHEEL SETS and SWING LINK SUSPENSION

David Hudson,
in a postscript to his original series, presents some further analysis, and previews a forthcoming feature on the construction of a passenger car.
●*Part VIII continued from page 153 (M.E. 4201, 8 August 2003)*

Four years after the original series of *Model Engineer* articles (*M.E.* 4189, 21 February, *et seq.*) was conceived, a number of issues have been raised by people interested enough to give me feedback. I have attempted to address these in the following discussion.

The development of four-wheel, long wheel base driving cars using self-steering wheel-sets has been a success story, right from the first driving car over twenty years ago. These driving cars embody self-steering wheel-sets having the 'Heumann' non-linear wheel tyre profile, and swing link non-linear rubber suspension units.

Since then four-wheel bogies for passenger cars have also been designed and have been in use for over nine years. These bogies also embodied swing link suspension units and self-steering wheel-sets. They were considered by some to be too complex, however the ride afforded has been exceptional and has been praised by all who have ridden on them.

A recent breakthrough in design has occurred, and a new much simplified pivot-less bogie, also having swing link suspension and self-steering wheel-sets, is now available. The first passenger car using these pivot-less bogies was displayed on the SMEE stand at the Model Engineering exhibition held at Harrogate this year, when the response was gratifying.

A constructional series is at present being prepared to cover this new passenger car, and should be ready some time in the new year. The use of this new design does offer an enormous improvement in passenger well-being, comfort and safety. However their success largely depends upon the use of the Heumann wheel tyre profile together with uniform rail head profiles. This last item requires addressing, and a discussion of the following items should help to make a compelling reason for doing something about it.

The expectations and aspirations of members of our model engineering societies are continually changing. The reluctance of members to get involved in maintenance, operating and safety duties has increased the necessity for passenger hauling revenue. Health and safety matters, liability and protection of club officials are becoming issues, and these together with rising insurance charges have to be addressed. That said, most if not all societies are already very active in resolving these problems.

Most insurance claims appear to arise from incidents involving passengers on our miniature rail tracks. The public seem to expect that a ride on our miniature railways should be 100% safe. This is just not possible. Nothing is safe, the best we can do is to take every reasonable precaution, and we are continually looking for ways to improve safety procedures. The trouble lies in the inherent characteristics of all passengers, which is that passengers possess what is known as 'delayed momentum' due to their flexible nature, and this when coupled with a relatively low passenger car mass is the very opposite to full size practice.

This delayed momentum can give rise to prolonged wheel flange/rail conflicts, and also prolong the de-stabilising effect of lurching by causing excessive passenger reaction forces of which we are all too familiar. It can be seen that we are operating at a serious disadvantage.

The use of swing link suspension alone is not a complete answer to all our problems. There are other areas that require addressing: the derailing and sudden stoppage of passengers for whatever reason, the lack of stability and falling off of passengers, the inconsistency of wheel/rail adhesion which prevents wheel-sets from steering a mean path, and effective braking controllable by both driver and guard in the event of an incident. In the event of an enquiry, it must be seen that all reasonable steps have been taken and this may even require written proof.

The use for over twenty years of swing links using non-linear rubber suspension units has adequately demonstrated that they are able to offer a large improvement in the buffering of passengers from excursions and sags in our miniature rail tracks. The derailing of passenger cars is also now a very rare event, and the use of stretcher bars close to the rails, acts as a very good stabiliser, as does the use of traction plates.

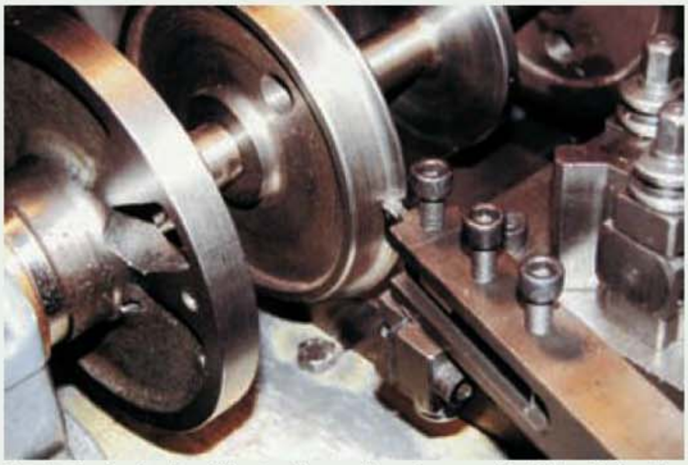
Self-steering wheel-sets have the ability to pursue a mean course along a track, provided sufficient yaw relaxation is available. However, the profile of the tyres must be maintained if they are to remain effective. It is a requirement that railhead profiles and wheel tyre profiles should conform in order to provide the largest contact patch area and minimum wear and maximum adhesion. Aluminium alloy rails conform fairly quickly, so there should not be much of a problem here.

It is perhaps worth mentioning at this stage that wheel-sets having straight conicity on wheel tyres will also possess self-steering properties; however, they do hunt from side to side, setting up large flange/rail conflicts and causing excessive tyre wear and having a propensity to flange climbing when wheels become temporarily lightly loaded. It is the Heumann non-linear tyre profile which allows a fast response and positional control that has been so beneficial in full size by reducing flange/rail conflicts and lurching.

Now, long wheel base four–wheel driving cars require sufficient yaw relaxation to enable axles to remain radial to the centre of curvature of the track. The shorter the wheel base, the less yaw relaxation is required; in fact, short wheel base bogies require very little, because the phenomenon of 'creep' (apparent slip without loss of adhesion) also plays a large part in allowing the relaxation of axle winding (this is what happens when one wheel of a wheel set wants to turn more or less than its opposite wheel).

It is not generally appreciated that axle winding sets up a turning couple (especially when axles are constrained in their axle boxes) and that this couple can materially affect the behaviour of the chassis it is supporting. The rotation of this turning couple will depend upon whether or not wheel tyre conicity is provided (coned or flat treads). Normal conicity tends to steer wheel sets away from derailing, whereas flat treads tend to do the opposite. Of course, if speeds are low enough and flanges are able to cope with side forces, as in the case of contractor's portable tracks and where the load does not possess delayed momentum, this may be acceptable as a commercial risk, but it is not

The configuration of the disc brake arrangement is clear from this view, as is the Heumann wheel profile discussed in the accompanying text.



The Author's wheel profiling tool is seen here in use on his Myford lathe; the 'button' style cutting tip is a circular 'throw-away' tungsten carbide item.

good practice. However, when rolling stock is used for carrying passengers, and passengers do possess delayed momentum, and then all risks have to be considered. It now becomes apparent that a means to alleviate this problem becomes necessary.

As previously stated, the combination of lurching and delayed momentum of passengers can have a de-stabilising effect on passenger well being. We are at present unable to alter the delayed momentum of passengers which increases with speed, and the effect of which is to prolong flange/rail conflicts, but we can do something about lurching. Suitable swing links suspension goes a long way towards alleviating this.

It is now well established that wheel treads and rail heads will wear to common profile, and that mixed wheel profiles will tend to continuously modify rail heads and *vice versa*. This phenomenon is well understood, especially by those societies having aluminium alloy rails.

Over the years, many discussions have taken place with model engineers all over the country to see if anything could be done about this apparent problem, especially with regard to steel railed tracks, and what follows are some of the findings.

In full size practice, rail head profiles are considered to be sacrosanct in as much as wheels can be easily re-profiled and are therefore usually made of a softer material in order to preserve the rail head profile as long as possible. The rail head profile can be re-ground using railhead grinding cars. These can only be used on accurately positioned rails and all rail excursions and sags must first be corrected. For obvious reasons, most of the above is not a practical proposition to us model engineers.

We cannot re-profile our railheads by grinding, there are too many difficulties, but we might re-profile them progressively over a period of time by making our wheel tyres equal in hardness or harder than the rails. It has been suggested that wheel tyres could be made of EN8, which is relatively inexpensive. An alternative, and perhaps a better proposal, is to use a work hardening steel on those passenger cars that are in most use with small diameter wheels. I think that this scheme requires looking into a lot further. It has also been suggested that wheel tyres could be turned from tube and then fitted to our existing wheels. Perhaps some enterprising person might look into this possibility.

We have to find a general solution that will be a realistic possibility, and obtain the willingness of all concerned. There is no short term solution which we can apply to all the variations of our miniature tracks, but we have to try.

The real culprits causing most of the wear and damage are heavily loaded, inadequately sprung, small diameter wheels on passenger cars, especially when coupled with high speeds and lack of super-elevation and transition curves. However, if we are able to modify the behaviour of our passenger and driving cars, this could go some way towards alleviating the problem.

First, adequate flexible suspension with suitable damping; secondly, the use of self-steering wheel sets; thirdly, increasing the mass of our passenger and driving cars; and fourthly, the coupling of all cars using traction plates instead of links or other non-stabilising couplings; and finally, providing adequate braking on all cars.

It must be remembered that most wear on wheel treads is apparent and not real because most metal tends to migrate from the high stress areas to the low stress areas. This is also true for cast iron as well as steel wheel treads. With the Heumann profile, most of the apparent wear occurs at the mean point of contact when the profile becomes hollow. Most of the metal tends to end up as a hump towards the edge of the tread, and very little on the root radius. This hump is easily removed by turning with a profiling tool. The root radius and flange require very little attention because in practice there are very few flange/rail conflicts. Because flange/rail conflicts are rare, rolling resistance on curves is very little different from that on the straights.

Positional control exhibited by Heumann profiled self-steering wheel-sets on rail heads is such that the root radius of a wheel tyre is rarely in contact with the rail at neutral speeds. However, if speeds are significantly above the designed neutral speeds while curving, then the contact patch area at the corner of the rail will be significantly reduced (don't forget that the root radius is larger than the railhead edge in order to prevent two point wheel/rail conflicts occurring).

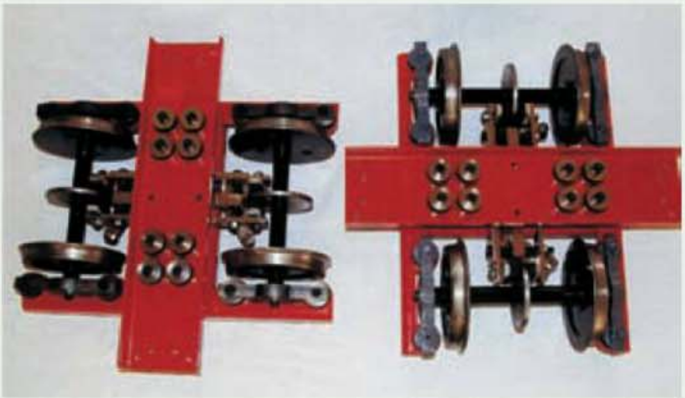
Under these circumstances the sub-surface stresses (on aluminium alloy rails) in that part of the rail head will be too great, and metal will be rolled away. If this persists, it will manifest itself as a very thin strip which will fall away from the rail, and yet examination will reveal that there has been no apparent flange/rail conflict. It is worth stating that over-gauge wheel-sets can also cause similar damage.

It now becomes obvious that sufficient flange/rail clearance is a must, to enable wheel-sets to self-steer. Right from the beginning, I have considered that a back-to-back wheel distance of $4^5/8$in. (117.5mm) is essential to allow sufficient flange/rail clearance, so that adequate instruction is available for wheel-sets to self steer. This distance was chosen when using the standard SMEE wheel profile as a starting point. Over the years I have found no reason for changing this figure. Recently I was persuaded to try an increase to $4^{11}/16$in. (119.0mm), which many designers seem to use. There is now sufficient evidence to indicate that the self-steering ability of wheel-sets using this latter figure is materially affected, so I do not advise departure from the original figure of $4^5/8$ –0/+0.01in. (117.5 –0/+0.25mm) back-to-back wheel flange distance. The above especially applies to heavily loaded passenger car and driving car wheels, whose loading can be up to 5 or 6 times that of most locomotives.

Now, a great many steel railed tracks are constructed from rectangular sectioned steel bar, and when flat or coned wheels are used, it is the root radius that always appears to suffer, especially with high speeds when curving, a combination of metal migration and scuffing soon can wear away the bottom of the flange, and in time the flanges become too steep for adequate safety. In order to restore the profile to its original shape, a lot of metal has to be removed from each wheel; this also happened in full size until the Heuman profile was adopted.

All the researches I have carried out have been in connection with $3^1/2$ and 5in. gauge scale railed tracks, both raised and ground level, especially those using aluminium alloy rails. However, there are a lot of what I consider to be non-scale heavy-duty steel railed tracks. These tracks generally have to carry both scale and narrow gauge locomotives and rolling stock, and the wheels may be over-scale or even nondescript, nevertheless such societies are very satisfied with their layout. Despite these differences, there is little doubt that they could benefit from the use on their rolling stock of the Heumann wheel profile and swing link suspension together with traction plates. The improvement in ride really is enormous, however suitable units will have to be developed and made available. I am aware that a number of people are very active in this field, and we shall just have to wait and see what happens with the pivot-less bogie.

I am frequently asked how often is re-profiling necessary, and how much metal has to be removed. My response is based on nine years of experience with four 6ft. long passenger cars, each weighing some 175lb. and fitted with cast iron wheels which run on aluminium alloy railed track. These cars each carry four adults or up to six children. Having only four cars means that they are used extensively for most of the year. Since only one car is presently



A pair of 4-wheel bogie sub-assemblies complete with rubber suspension and brake gear ready for mounting on the passenger car chassis.

equipped with a vacuum generator (plans are afoot to have separate add-on vacuum generator units for any car), it tends to do the lion's share of passenger hauling. This car is equipped with leading footboards so that all the driver's weight is carried on his feet for better control. This footboard overhang means that the leading wheel set can be grossly overloaded at times.

Notwithstanding all this, the leading wheel set requires re-profiling, say every two or three years. However, these wheel-sets are easily removed and can be re-profiled in about ten minutes using the profiling tool, and because only about 0.015-0.020in. has to be removed towards the tyre edge, and very little on the curved and root radius, it can be seen that five or six re-profilings can be accommodated with only 0.1in. change in wheel tread diameter. A further benefit accruing from the use of aluminium alloy rails is that alloy rail heads quickly conform to the Heumann tyre profile, and side cutting and rail head roll over is almost non-existent. Most certainly the overall condition of our track has been preserved when compared with that before the advent of our present rolling stock equipped with self-steering wheel sets.

I am unable to find any reason why locomotive builders should not apply the Heumann profile to all their wheels while under construction; after all the Heumann profile is only a small alteration to the standard SMEE profile. The argument that they were not prototypical will not hold, because they were used experimentally on the Continent during the mid 1920s, and when thoroughly proven, were officially proposed in 1932 by Professor Heumann. With all wheels of a locomotive being so close together, the degree of yaw relaxation required would be minimal, but it has to be allowed for, and if adequate axial end float is available for wheels to roll on their correct diameters then all coupled wheels should generate turning couples to steer the locomotive around the curve, and this plus the phenomenon of creep might just allow axle winding to be relaxed enough to prevent slip. It is certainly worth a try.

There is very little doubt that the larger the wheel diameter the larger the contact patch and the lower the stresses at the point of contact. Many years ago I was able to demonstrate that the contact patch area increased roughly as the square root of the wheel diameter and hence assume that the load bearing capacity of a wheel would also be proportional to the square root of its diameter, other things being equal.

Large wheel diameters have a lot to offer, especially when used with aluminium alloy rails; they produce less rail hammer at rail joints and last longer before re-profiling is required. The new design of passenger car allows much larger diameter wheels to be accommodated, and also provides a lower centre of gravity than up to now.

The lowest rolling resistance occurs when the elasticities of both wheel and rail are similar, because the hydrostatic distortion in both wheel tread and rail head are also similar. However, in our case it is the contact patch area that is the most important factor, and if sufficiently large diameters of wheels are available, then mixed elasticities could be acceptable. Thus, if wheel diameters are large enough to maintain adequate contact patch areas, then we could use steel wheels on our aluminium alloy rails, and this would reduce the problem of adhesion due to aluminium oxide pick up on cast iron wheels. This, however is an area which requires further investigation and is a topic upon which I am not in a position to speak authoritatively, but there is nothing to stop others better equipped to do so.

Of all the work I have carried out during the last twenty years or so, this project has given me a great deal of satisfaction, and in publishing my findings, I would not like to think that I was re-starting the old controversy of steel versus aluminium alloy rails, but rather creating a better understanding of what it takes to build better driving and passenger cars.

Finally, I would like to thank all those persons who have freely given of their time and knowledge during my investigations without whose help this series could not have been written.

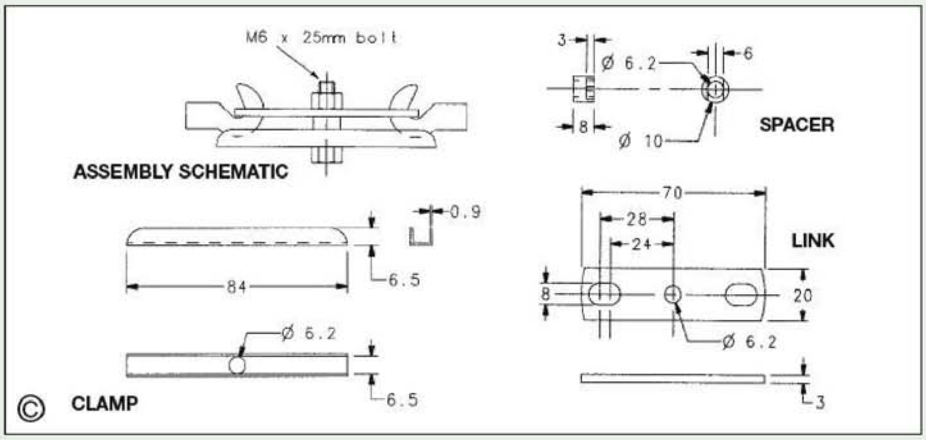
I have given Dave Noble the right to supply plans, components and the manufacture of my driving and passenger cars; he will doubtless find ways to simplify and improve the concept. Contact **Dave Noble at Woodbine Terrace, Stanton, Ashbourne, Derbyshire DE6 2DA; tel: 01335-324 530; www.davenoble.co. uk**

FAILSAFE COUPLINGS

D. Andrews

describes a device designed to improve safety on the club track.

After a number of years of running my locomotives using chain couplings, I have become convinced that this is not a good idea if you haul passengers frequently. All my rolling stock is fitted with reasonably scaled hooks and three links of chain as in full size practice. The chain is made up from 3mm dia. steel rod with the joints silver-soldered. Over the years I have had two of these chain links break at the joints, although to be fair the cause was probably due to the pull being twisted or offset to accommodate the larger gauge club passenger cars. The thought nevertheless remains that a failure could occur with any link at any time and should the train break the results could be serious.



This set me thinking about what could be done and, bearing in mind the recommendation that all couplings should be cut from solid with no joint to fail, I wondered how this could be achieved while retaining the proper hooks and chains.

A solid coupling placed over the two hooks is satisfactory until you start shunting whereupon it is promptly pushed out of one or the other hooks and the coupling is lost. It was to overcome this problem that I devised the method shown in the accompanying drawing, which I hope is self-explanatory. The solid coupling is held in place by a bolt, and the keep plate secured underneath the hooks. The system has been proved during several running seasons with complete success.

Even with this coupling in use, I have retained my failsafe system which consists of a strong steel cable firmly attached beneath the driver's car and secured with a shackle to any convenient and substantial part of the rear end of the locomotive.

Some may consider this approach to be rather excessive, but at least I can drive my engines with peace of mind.

The holes in the webs were drilled using a drilling spindle mounted on the lathe cross-slide.

Defining the positions of the last four webs with a parting tool.

Excess material was removed from the crankshaft webs using a slitting saw.

AN IN-LINE 3-CYLINDER OSCILLATING ENGINE

Colin Pape describes his method for building a fabricated crankshaft and makes a start on the cylinders.

●*Part XI continued from page 389 (M.E. 4205, 3 October 2003)*

The crankshaft is a piece of precision engineering which must be perfectly aligned. Alignment is more important than absolute positional precision. I think it would make very little difference if one crank was set to 119deg. instead of 120deg. away from another, but if the same difference is not applied in all positions along the crankshaft, the result could be a badly aligned crankshaft fit only for scrap.

So, to keep things working for us we need to take care to ensure that all the webs have holes with the same spacing and that any errors are all in the same direction. To do this I made the six webs together on the end of a piece of 30mm dia. free cutting mild steel round bar. **Photograph 23** shows the holes being drilled. The outer end of the bar was used to make the two inner webs, which are of fully circular form. I used a long length of material because I required the remainder for another job and did not want to cut off more than I actually needed.

The 7mm diameter centre hole goes through all six webs. Visible in this photographs are three outer holes which have the following purposes. The 5mm hole is for a crank end; this hole goes through all six webs. The two other holes are 3mm diameter; these are used only for crank alignment purposes and only extend through the two fully circular webs.

When the holes had been drilled, the end of the bar was re-faced and the first fully circular web was parted off. The bar was faced again and the second fully circular web was cut off.

It is important for future alignment that all the webs are used in the same sense as they are taken from the parent bar. In this way any positional errors in the crank holes will be the same all along the crankshaft. If a web is reversed, any positional error will be doubled.

I had decided that the outer webs would not be fully circular but simple shapes with the minimum material necessary. This would more nearly resemble actual practice, assist in balancing the engine, and aid assembly by providing a little more spanner clearance.

With the fully circular web pieces out of the way, work could now commence on the four outer webs. **Photograph 24** shows the defining of the webs in progress. Each web is partially cut off by a cut which is about 10mm deep. At this stage the excess material could be cut off; I transferred the work, in its chuck, to the milling machine and used a slitting saw to cut off the excess. **Photograph 25** shows the first piece of excess being sawn away. Of course Murphy was at work and the slitting saw was not quite big enough to cut right through the last web so it had to be finished in a separate cutting set up.

The work was then returned to the lathe and each web was faced before being cut off. All the pieces were prepared exactly to size prior to assembly. **Photograph 26** shows all the finished crankshaft components plus the three guide rods.

When all the parts were finished, the crankshaft was assembled without adhesive but using the three guiding rods. At this stage any errors in the parts could be detected and corrected. There should be no sloppy fits, and it should be possible to insert and remove the guide rods without a struggle. When everything was correct, the parts were taken apart and thoroughly cleaned to remove all dirt and oil; they were then re-assembled without adhesive.

Final assembly with adhesive took place starting from the outside ends of the assembly. The two small fixtures used to assist in the correct setting of the parts are shown in **photo 27**. Note the small recess at the base of the guide rod; this is provided to ensure that the adhesive will not cause the parts to stick to the fixture.

An outer journal part and its web were withdrawn from the assembly. The web was placed on the larger jig, the adhesive was applied to the journal end that fits in the web and the part was then slid down the guide and inserted in the web. When the adhesive had set, one or two minutes was sufficient, the sub-assembly of web and shaft was removed from the fixture and put aside. **Photograph 28** shows these operations in progress. ▶

A full set of components for the crankshaft and the guide rods shown prior to assembly.

The two small fixtures used to align the crankshaft during assembly.

One of the fixtures in use to assemble the last journal/web assembly.

The other fixture being used to assemble cranks to webs.

A similar sequence was used to insert the other journals into their webs but the central journals were only attached to their outer webs.

The next operation was to attach the cranks to the webs.This was done using the smaller fixture, **photo 29** shows these operations in progress.

It was important to always position the webs so that in the finished crankshaft they were positioned in the same sense, i.e., all facing the same way as when they were on the parent bar.

I now had a set of webs with journals and cranks attached but in no case were two webs attached to the same crank or journal. The guide rods were used for the remaining operations. **Photographs 30** and **31** show the final joining up of the crankshaft parts.

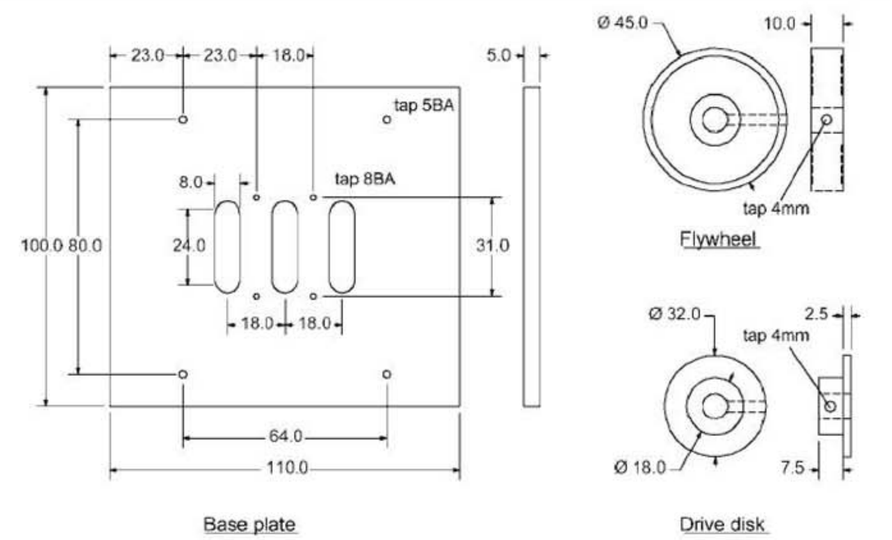
Assembling the bottom half of the engine

The base plate and the sole plates for the end frames are required for the next step, so if they have not yet been made, now is the time. The base, flywheel and drive disc are shown in **fig 4**. The sole plates were shown in fig 1.

Since this is a four bearing crankshaft engine, perfect alignment of the bearings is required. The end frames were made as a pair but now have their sole plates fitted. The intermediate bearing supports have been made but not with reference to the actual end frames, so the next operation was to ensure that they would all line up properly.

The four sub-assemblies were mounted on a length of 8mm rod. A piece of 14mm bar was passed through the A-frame pivot holes and the assembly clamped, base up, to an angle plate on the milling machine table; some packing was necessary. The bases were then all milled to the same level. **Photograph 32** shows this operation.

The four pieces were then fixed loosely to the base plate. A length of 8mm rod was passed through all four bearings and a length of 14mm rod passed through the two pivot holes. The frames and supports were then aligned, so the attachment screws were tightened. An 8mm reamer was run through the four bearings to remove some minor tight spots. **Photograph 33** shows the aligned bottom half frames and bearings waiting for the crankshaft. **Photograph 34** shows the completed bottom half. The guide rods for the crankshaft have been removed. No cleaning up or finishing was required and the crankshaft is in place.

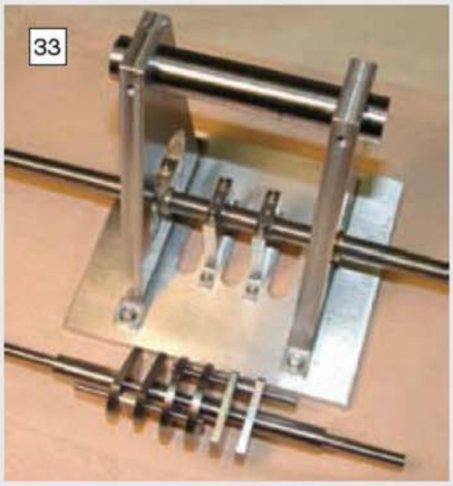


© **Figure 4: Base plate, Flywheel and Drive disk**

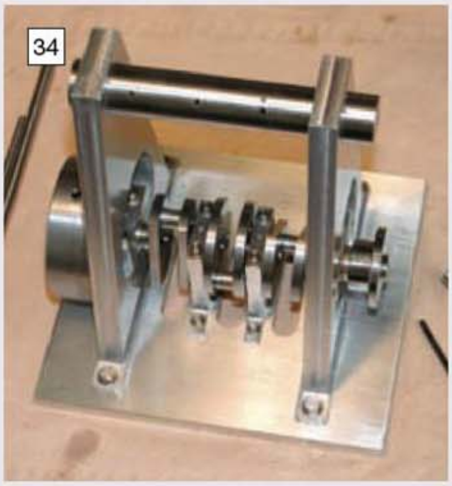
The penultimate stage in the crankshaft assembly process; note the rods which ensure correct alignment.

Completing the final joint in the crankshaft assembly; note the adhesive on the mating surfaces.

Cleaning off the bases of the supports to ensure that they are all true and aligned.



The perfectly aligned bottom half awaits the addition of the crankshaft.



The finished bottom half with a smoothly turning crankshaft.

Pivot hole liners

I used the same method previously employed when making *Pip*, the single cylinder engine described in a previous article. The only difference was that this time I made all three together as a 'stick'. The parts are shown in **fig 5**.

The first operation was to take a length of 16mm brass rod and skim off the minimum on the outside diameter to ensure a perfectly round surface. It was then marked off into 18mm sections with a shallow parting off cut.

The next operation was to bore out the inside to 12mm diameter which left sufficient wall thickness for adequate strength during the drilling and slotting operations. The job was then transferred in its chuck to an indexing device on the milling machine.

The first operation in the milling machine was to establish the centre of each future slot with a 1/16in. dia. hole drilled right through the wall. The slots at each station are separated by 80 degrees. When all the holes had been drilled each was extended into a slot with an overall width of 5mm using a 1/16in. dia. FC3 cutter. **Photograph 35** shows the stick when most of the slots had been made.

After this, the stick was returned to the lathe and the I/D finished to 14mm, section by section, using a length of 14mm round stock as a gauge. As each section was brought to a good running fit, it was cut off and the boring then continued into the next section.

Cylinders

The cylinders were made from lengths of hard brass, about 55mm long, cut from a 3/4 x 3/4in. square bar. They could have been made in two parts: a cubic shape for the pivot end with a separate round barrel, the two parts being joined using adhesive. I used this system to produce the cylinder for the inside-out engine described in a previous article.

I made the cylinders in two stages. Stage 1 was to bore the cylinder in each length of brass and to turn the external cylindrical section. This was done before making the pistons. Stage 2 was to complete all the other operations, which requires the pivot hole liners to have been finished.

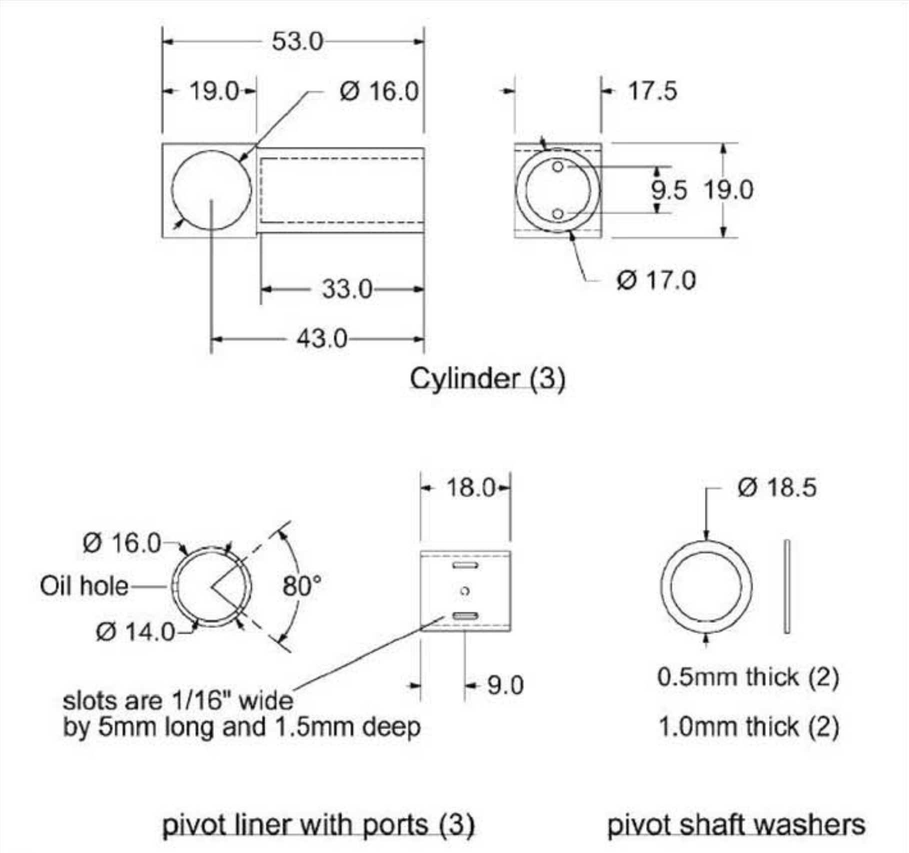
The parts are shown in **fig 5**. The first operation was to cut off three lengths of brass each about 55mm long. The finished length is 53mm, the extra 2mm is for peace of mind just in case the cylinder is bored a little bit too deep.

Next, and one by one, the cylinders were bored out to 13mm diameter to a depth of 27mm with a flat bottom. Had this depth been inadvertently exceeded the excess can be trimmed off at the open end. It is important to have at least 1mm of metal between the cylinder bottom and the pivot hole.

All the cylinders I have made for the various oscillating cylinder engines I have produced have 13mm bores for which I have made myself a little Go/Not Go gauge to facilitate the boring process. Since three cylinders are required for this engine, it may well be a good idea to have such a gauge available. The barrel section of the cylinder was also turned at this setting.

The cylinders can now be honed which completes stage 1 and makes the cylinders available for use as gauges to check the pistons.

●*To be continued.*



© **Figure 5: Cylinder and its Pivot hole liner**

A 1/16in. dia. FC3 cutter was used to finish the slots in the pivot hole liners.

Forming the inlet elbows on the finish turned rear cover using the rotary table mounted on the milling machine.

This set up was used to form the radius under the square flanges of the elbows as a guide for hand finishing.

BRISTOL *HYDRA*
THE FIRST EIGHTEEN MONTHS

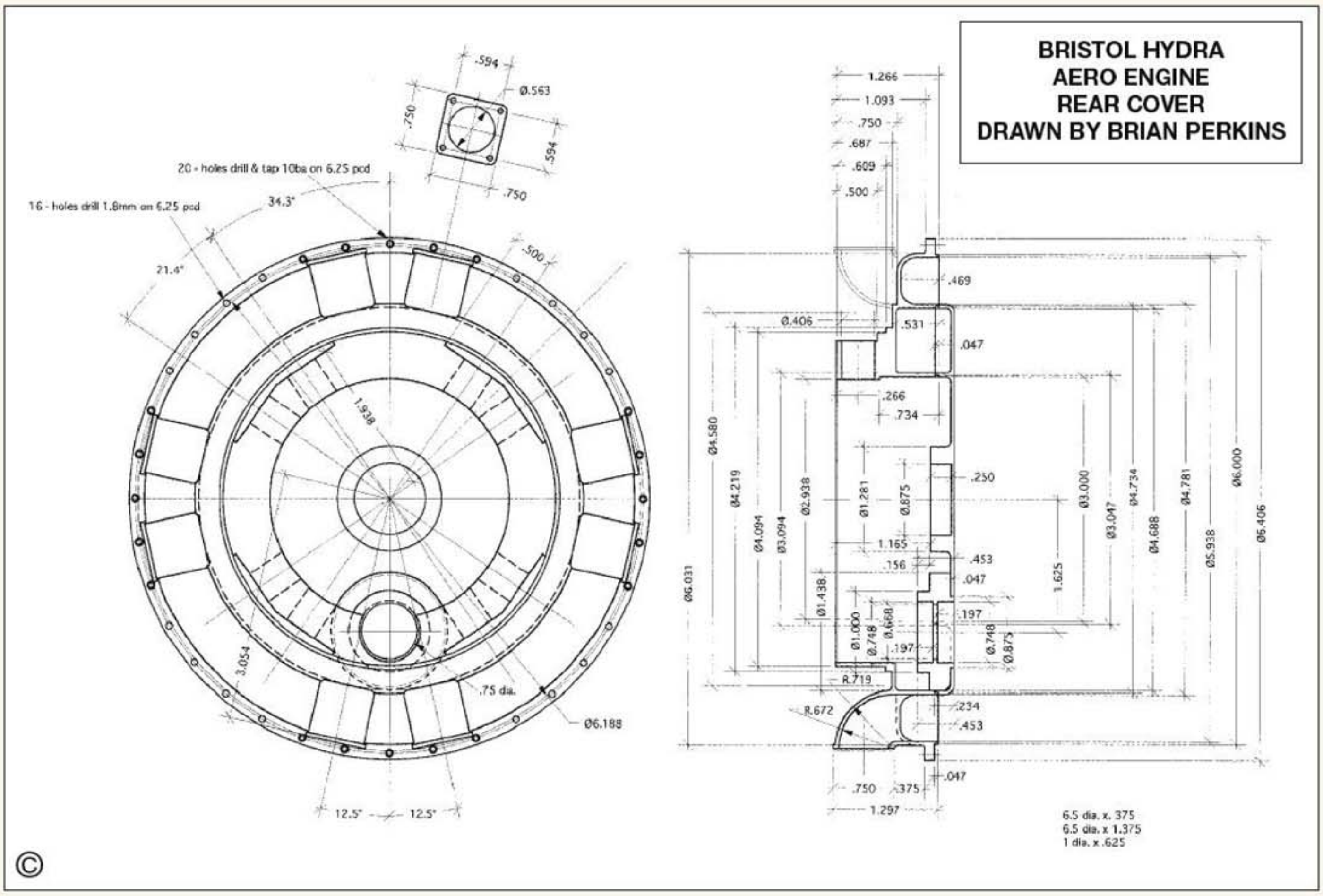
Brian Perkins describes how he made the rear and supercharger covers for this complex and fascinating engine.

●*Part III continued from page 380 (M.E. 4205, 3 October 2003)*

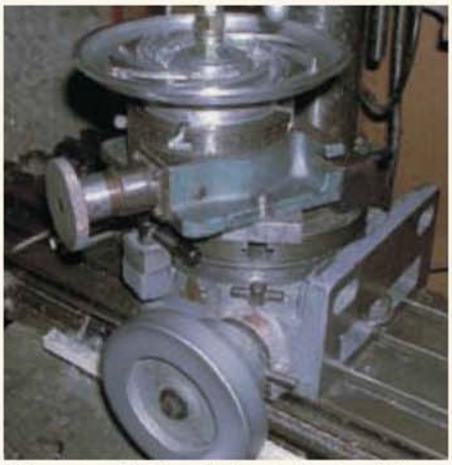
In view of its construction the rear cover is made in two parts, the front being the complicated piece and the rear being a simple cover which also forms the bearing housing for the rear timing gear bearing and for the bearings for the drive shaft to the auxiliary gearbox and supercharger.

The majority of the initial machining was carried out on the lathe — back to the Super 7 now — and then the blank was set up on the rotary table to remove the bulk of the metal between the elbows in a series of cuts to produce the large radius. The square flanges were milled and drilled and the component was then mounted between centres to produce the radius under the square flange which gave a guide for hand finishing and blending in the outside form of the elbows. The bores of the elbows were finished in the same way, drilling with a series of drills as far as possible in both directions and then blending in with the Dremel.

Moving backwards along the engine we now come to the supercharger casing which, due to its internal form, is again made in two parts to be bonded together. In the full size engine all of these components are castings. I am constantly amazed at the skill of the pattern makers of the time and the fact that the company were willing to



Profiling the rear side of the supercharger cover on the rotary table.



Using a combination of rotary tables to mill the diffuser vanes in the supercharger cover.

The set up for boring the angled inlet holes in the supercharger cover.

invest the time and money in producing these complicated components for what was essentially a development project.

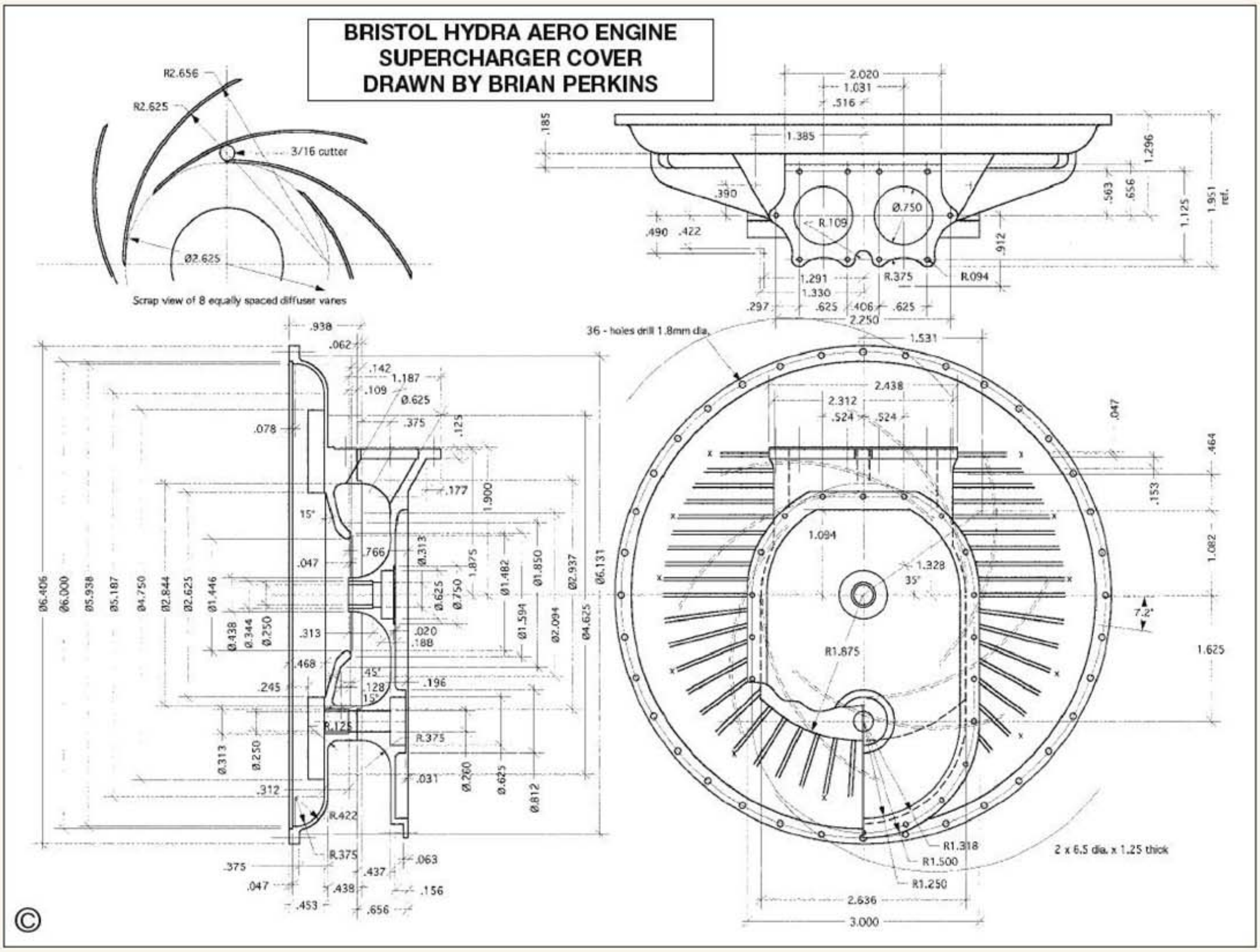
Back to the model, and the front half is again mainly a turning exercise with the additional complication of the diffuser vanes. These were produced using the same technique as for the *Aquila* with one rotary table mounted off centre on another.

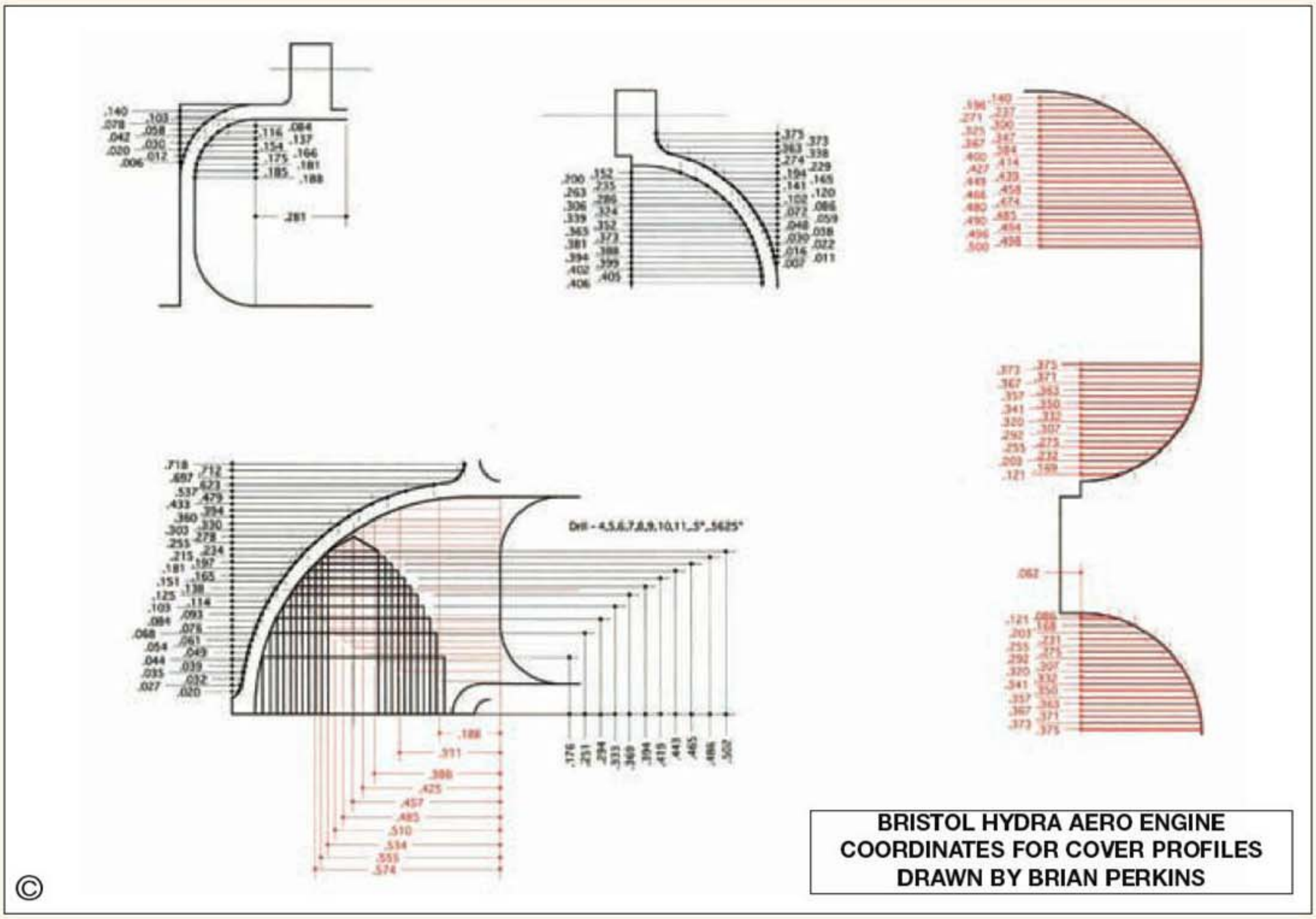
Completed rear cover with the cam drive bevel gears in position.

The rear half involved rather more milling after the preliminary turning and was rather more wasteful of material as it was also produced from a 6½in. dia. blank, quite a lot of which ended up in the scrap bin. It could have been produced from a rectangular blank but the initial setting up is so much easier if you start from the round.

The two components were then temporarily screwed together with a locating pin through the accessory drive bore and the carburettor flange and angled bores machined.

●*To be continued.*





The Author's wobbler. Simple to make, this tool provides an accurate method of positioning features on a work piece with respect to its edges.

The hollow body of the wobbler houses the ball seating of the probe. A light spring keeps the probe on its seat.

MAKING AND USING A WOBBLER

Tutor
describes a simple but invaluable aid when setting up work for machining.

You are not sure what a wobbler is? Well, I have some interesting news for you. You have been missing out on one of the most useful tools and one which is so easy to make and use. The wobbler is a device that is used to accurately position a hole centre from the edge of a work piece.

It is very much quicker to use than toolmaker's buttons, and accuracy is more certain than with other methods. You can expect to place a hole centre within 0.001 inch. How does it work? Well, I am coming to that.

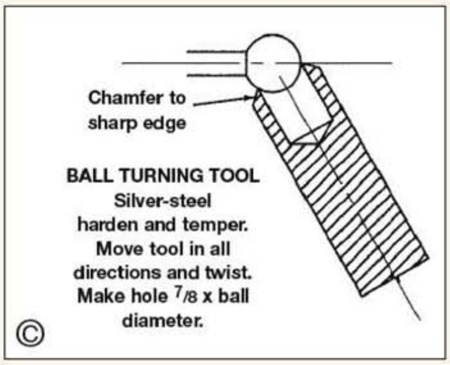
The wobbler is used on a machine such as a milling machine or a jig borer although I see no reason why it could not be used on a lathe or a drilling machine fitted with a cross-vice.

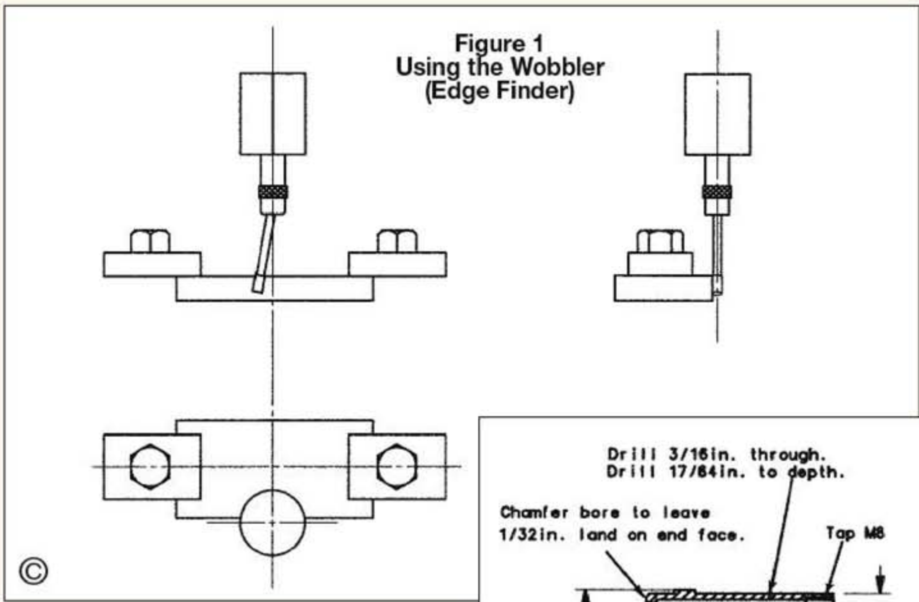
The way it is used is as follows:

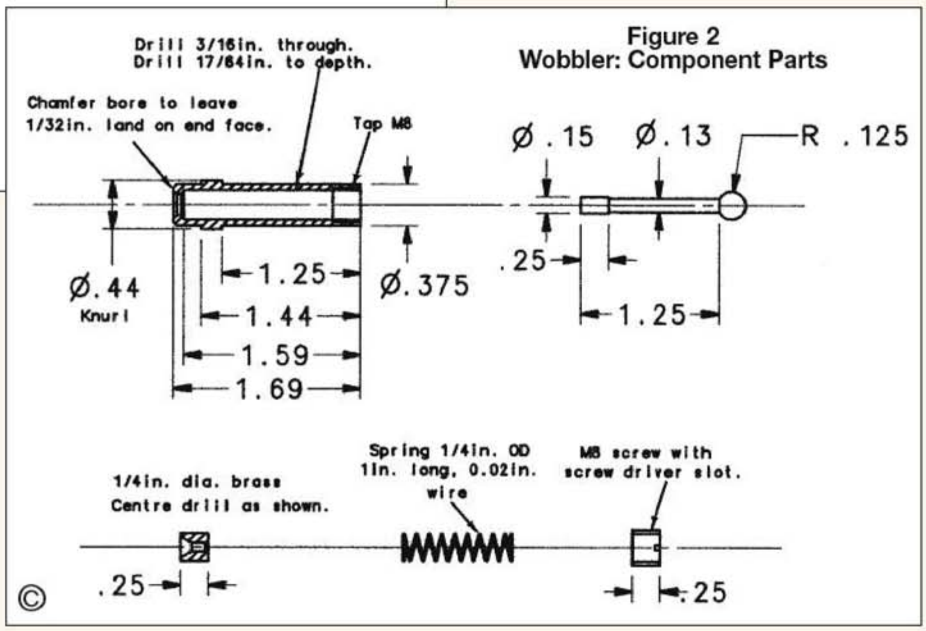
1: Take a look at **fig 1**.
2: With the wobbler held in a chuck and the spindle running at more than, say, 500 revs per minute, wind the machine table across until the spinning tip of the wobbler touches the job. Continue winding until, the tip runs nearly true. Now for the interesting bit. Very gently continue winding until the tip just skids sideways. This is the point at which the edge of the tip of the wobbler is exactly in line with the edge of the job, even if the chuck is not running quite true. In fact, in order for the tip to skid sideways you have taken it slightly beyond the edge of the workpiece, but this amount can usually be disregarded.
3: Set your index dial to zero.
4: Remove the wobbler from the chuck.
5: Move the machine table a further amount equal to half the wobbler tip diameter. By now I hope it is clear that the machine spindle is precisely centred at the edge of the work piece.
6: Repeat for the other work piece edge as necessary.

Side elevation of the simple ball turning tool for hand finishing the probe ball seat.

The ball turning tool cutting edge is provided by chamfering the edge to a central hole.







7: Set both index dials to zero.

8: You can now accurately position a hole at any place on the job by reading the index dials. I often just use a centre or spot drill on a milling machine to find the centres and then do the drilling on a drilling machine.

After a little practice you will find this a very easy way to be sure of accuracy, especially if, like mine, your eyes are not quite as sharp as they were for marking out hole centres.

Read the useful tips at the end of this article before rushing out to the workshop to make and try out your latest toy.

Making the wobbler

Okay, let's get started. Study **fig 2** and have a rummage in your materials collection for a few inches of 7/16in. and 1/4in. dia. silver-steel. Chuck the 7/16in. dia. rod so as to leave 2in. projecting and turn all the diameters but do not do the knurling yet.

Now drill the hole diameters, taking care with the depth of the 17/64in. dia. hole.

Hold the M8 tap in the tailstock chuck to start the thread truly, turning the lathe spindle slowly by hand or carefully under power. Finish the tapping by hand using a tap wrench. If you do not have an M8 tap, a 5/16in. thread will do but drill the hole to a suitable tapping size.

If you want the knurled finish, now is the time to do it as the job is likely to run out of true after knurling and you have no further work to do on this setting.

Reverse the job in the chuck and finish the nose end to drawing.

We are going to turn a ball end soon, so I am going to show you how to make a simple tool that will help you to turn one with great accuracy.

Drill a 3/16in. dia. hole in the end of a piece of 1/4in. dia. silver-steel and chamfer the O/D to leave a sharp edge around the hole. This is a cutting edge, so ensure it has a good finish. That was simple, wasn't it?

Now harden the tool by getting it bright red hot and quenching it in oil or water. Temper to straw. See that a file will not scratch the tool to check for successful hardening

Now we are ready to turn the probe. This is 1/4in. dia. (finished size) silver-steel, so if your chuck does not run true use a larger size of material and turn it down.

Turn the probe with the ball end nearest to the chuck. To turn the ball part first rough out the shape as near as you can with a form tool, or by eye, then hold the special tool that you have made against the rotating work piece, twisting and moving it all the time. Soon an excellent spherical shape will be seen. It is finished when it is the same size all over when measured with a micrometer.

After parting off, it can be finished on the end using a file (please use a handle when filing on the lathe) and the special tool. A polished finish must be obtained on the ball and on the tip

Perhaps this is a good time to take a tea break.

I hope that you are now refreshed and ready to do the other bits. These are shown in fig 2 and I am expecting you to sort them out for yourself. When you have finished the small bits read on for the hardening instructions.

The body only has to be hard on the ball seat but can be hard all over. Mine is. So get it red hot and quench in oil. Do the same with the probe but temper to blue in the middle leaving the ball and the tip hard. Polish the ball and the tip with emery cloth in the lathe. Now you can assemble your wobbler.

Hints and tips

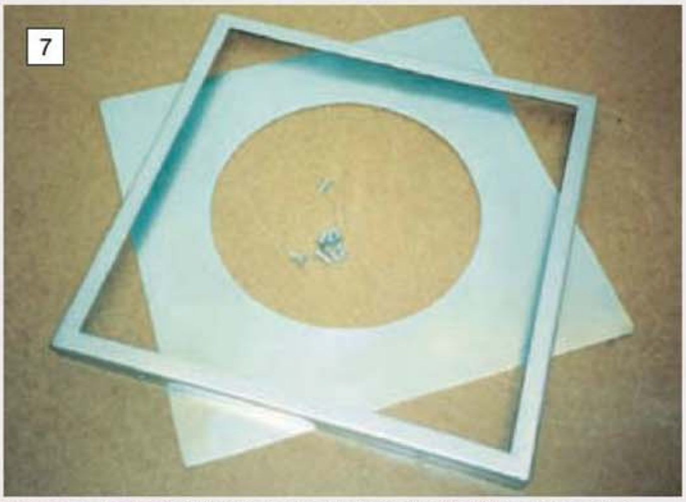
1: It is always worthwhile making tools such as the ball turning one for future use so, although it would be satisfactory, do not be tempted to use a softened ball bearing.

2: Small diameter turning is often easier if the end furthest from the chuck is finished to size before starting to work on parts nearer to the chuck.

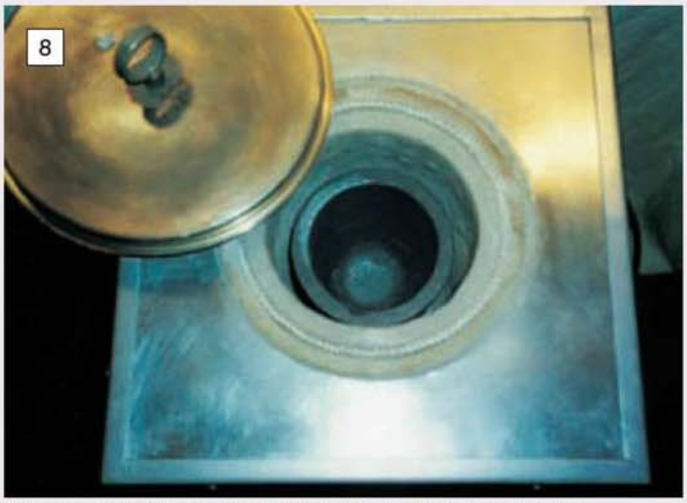
2: When hardening long, thin items, quench them end-first to avoid distortion.

3: When using your wobbler, it is best to measure from a machined edge.

4: The wobbler will work best with the spring adjusted to the minimum pressure that will stop the probe moving under its own weight.



Furnace top cover and light steel angle frame for fixing to outer casing.



Furnace top showing cover with lifting ring and 6mm hole for the thermocouple probe. Note the glass cord seating for the cover

A SMALL MUFFLE FURNACE

Ian Cook completes the construction of his furnace, fits the electrical control gear and tests its operation.

●*Part II continued from page 400 (M.E. 4205, 3 October 2003)*

There are really two casings to this furnace, a light inner steel box to contain the high temperature insulation and a stronger outer box to hold everything together (see fig 1, *M.E.* 4205, 3 October 2003). The inner box was made from thin steel sheet salvaged from a couple of empty cooking oil drums from the local carry-out. Washed out with hot soapy water and then cut up they yielded more than enough material.

The box was made a close fit around the fire bricks on which the muffle sits and 8mm lower than the height of the muffle to allowed for the thickness of the fireclay cover. The four sides were fixed together with light steel angle and blind rivets. The two 10mm holes required for the cable entries were drilled close to where the connections on the muffle would be so that the minimum amount of wire was subjected to high temperature; this is where the ceramic beads should have been. The holes were insulated by fixing a 30mm square of mica on either side of the plate with a 3.5mm hole for the wire (**fig 3**).

The base (fig 1) was made from two 360mm lengths of 50 x 20mm steel box section on which two lengths of angle were mounted to hold the bricks and inner casing. Four short legs were attached to this frame to keep the unit clear of the floor. The base plate was made from a 350mm square of 0.5mm steel sheet with 20mm trimmed off the corners at 45 degrees. This plate was clamped centrally between the box section and the angle. The outer casing was also made from 0.5mm steel sheet. Four pieces 360 x 266mm were used, a 12mm wide right angled lip was formed along the bottom edges to improve rigidity and to fix to the underside of the box section frame.

The sides were fixed together with light angle and blind rivets as before. A 20mm dia. hole was drilled in the rear plate for cable entry and a couple of handles were fitted to the sides. The top cover was made from a 360mm square of 0.5mm sheet with a 200mm hole cut in the centre. It was held in place by means of a light angle frame fixed to the outer casing with self tapping screws (**photo 7**).

Cover

The cover was made from a shallow steel dish of around 200mm diameter. It was actually an old baking tray from the kitchen — well, it looked old to me! An 8mm dia. hole was drilled in the centre and the dish filled with clay. The previously moulded disc with the 8mm stud was then attached to the surface of the clay and held by means of a nut and the lifting ring (**photo 8**) Once dry, a 6mm dia. hole was drilled through the cover offset by about 50mm from the centre to allow the insertion of a thermocouple to monitor furnace temperature.

Electrics

All the wiring inside the furnace was done in glass sleeved high temperature wire as used in cookers, ovens, and the like. Additional glass sleeve was slipped over the wires which were inside the inner casing where they are exposed to the full heat of the element. In all, five wires are used: a live and neutral for the element, an earth which is connected to the inner casing, base and outer casing; and two for a thermal trip mounted on the inside of the outer casing. This trip is a standard unit found in many heating appliances, the contacts open on reaching 100deg. C and close again on cooling to 85 degrees. My reason for fitting a trip was that if the outside of the furnace has reached a temperature as high as that, then something is really going wrong inside!

The wires were taken to a row of connectors mounted in a box on the outside of the furnace

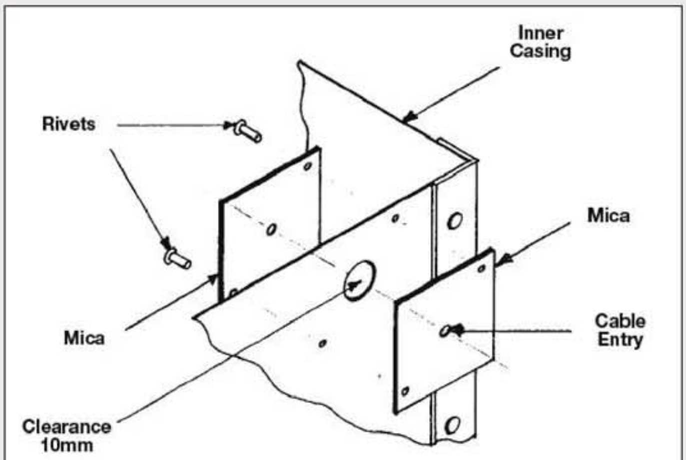


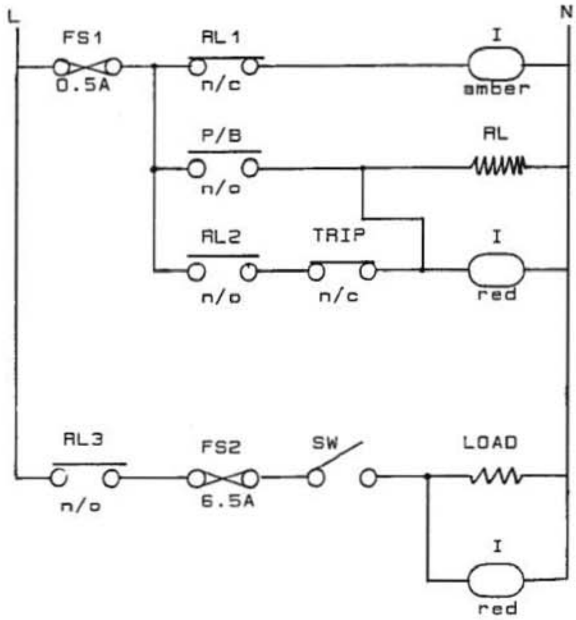
Figure 3
Cable Entry Insulation

The connection box is fitted to the rear of the furnace. Note the multi-pin plug and the protective cable sheath.

A multi-pin socket is fitted to the rear of the control box.

A view of the front of the control box showing switch, indicators, fuses, etc.

Figure 4: Muffle Furnace Control/Power Circuit



RL Relay: DPCO 240V coil
P/B Push Button: instantaneous, normally open
TRIP Remote thermal trip opens at 100deg. C
SW Switch: DP 16A with indicator
I Indicator: 24V neon

©

(**photo 9**). A 3-core cable was used for the power and earth and a light 2-core cable for the trip. For protection they were both enclosed in a flexible metal sheath — I used an old shower hose with the inner rubber tube removed. This sheath was also connected to the earth terminal of the furnace.

As I had other plans for it, I had already decided that the control box was to be detachable from the furnace, so a multi-pin plug and socket was required. This was made from a 10 amp 8-pin plug-in relay and panel mounting socket. Once the defunct relay had been removed it was a simple matter to solder the five wires to the pins and fit a suitable gland to the cover (**photo 10**). The socket was fitted inside the control box with the plug-in base through a hole in the rear of the box.

The control circuit (schematic) is very basic and operates as a no-volt release and over-temperature trip. Neon indicators show tripped/normal and the element status. There are separate fuses for the control circuit and for the element (**photo 11**).

The entire unit is protected by a 10 amp fused plug. When the unit is first switched on at the mains the indicator shows tripped; pressing the reset button energises the relay which brings on the normal indicator and allows power to the element switch. If the thermal trip in the furnace is normal and the furnace is plugged into the controller, the relay will remain energised and allow operation of the system. If there is a loss of mains power, an over-temperature trip, or the controller is unplugged, the relay will de-energise and the unit will revert to the tripped state. It then requires to be manually reset as before.

That seems to cover the electrics and the electrical safety aspect of the furnace other than if it is used outside (highly recommended). It should then be connected to a socket with RCD protection. Of course we all do that when we operate 240 volt equipment outdoors, don't we?

All the components required for the controller are stock items available from Maplin (0870-264-6000), RS Components (01536-201234), etc.

Electrical parts list

Description	Quantity	Maplin	RS Components
Enclosure (Control box)	1	LH68Y	207 - 1521
Relay (DBDT 10A 230V)	1	QC81C	329 - 828
Relay socket	1	QC86T	329 - 884
Switch (16A DP with neon)	1	GU55K	287 - 7335
Fuseholders	2	GU77J	414 - 106
Push button	1	FF98G	331 - 758
Indicator (Red) 240V neon	1	RX83E	577 - 083
Indicator (Amber) 240V neon	1	RX82D	577 - 061
Halogen tube holder (muffle connect)	1	GC47B	171 - 001
8 pin 10A relay (for plug)	1	JG6OQ	348 - 762
8 pin relay base (for socket)	1	JG54J	403 - 853

Assembly and insulation

The base was assembled first, the feet attached with blind rivets and the two pieces of angle positioned to hold the fire bricks firmly in the centre. Clearance holes were drilled in the base plate and the angles fixed to the box section base through the plate. This provided a solid base on which to build the rest of the furnace and was given a couple of coats of zinc primer. The two fire bricks were positioned and the 140mm diameter clay disc was fixed in the centre with clay paste. This disc would centralise the bottom end of the muffle once it was fitted.

The inner casing was then slid into place over the bricks and an earth wire connected from it to the base using screws and nuts on clean areas of metal. Another piece of wire was attached for connecting to the outer casing.

A piece of the Durablanket S material was wrapped around the muffle and held firmly in place with glass cord. The glass sleeved wire was attached to the connectors with screws and nuts (see photo 1, *M.E.* 4205, 3 October 2003). The muffle was then fitted in place and the inner casing filled with more Durablanket S, taking care that the wires ran straight from the muffle through the mica insulators thereby minimising the length inside the casing.

The entire assembly was then lowered into the outer casing and attached to the base by means of screws through the bottom lip into the hollow section frame. The wiring from the muffle and the thermal trip was fed through the 20mm hole in the rear of the casing now protected by a rubber grommet, and into the connection box.

The earth wire from the base was fixed to a brass screw passing through the casing into the box to be used as the main earth connection of the furnace.

The space between the inner and outer casings was packed with normal glass wool loft insulation with the wiring against the outer casing to be as far away from the heat as possible.

The fire clay cover was then placed in position centrally around the muffle and the steel top cover fixed in place and held down by the angle iron frame and self-tapping screws into the outer casing (photo 7).

Glass cord was packed into the gap between the muffle and the clay cover both to support the top end of the muffle and to act as a seat for the furnace cover (photo 8).

A view of the furnace on test showing the control box, digital thermometer, and thermocouple probe in place through the hole in the cover.

Finished and tested, the Author's small muffle furnace awaits its first melt. Note the tongs, ring shank and moulding boxes all made for the job.

The complete furnace was given a couple of coats of heat resistant paint (the type used for car exhausts) and, after an insulation test, connected up to the mains and run up to working temperature. It was held at around 700deg. for about an hour after which I decided that it was going to work after all.

There's always a little voice whispering *"Any minute now it'll go bang!"* Well, it didn't, and it hasn't up to now, so I'm content (**photo 12**).

Conclusion

All in all, this has been an interesting project, it's not often that metalwork, woodwork, electrical work and even a bit of pottery are combined to make one item. Has it satisfied the original criteria? I would like to think it has.

1: No one will be burned by touching the outer casing which never gets more than warm. Perhaps more importantly, no one (especially me!) will get an electric shock from it. It does what it's supposed to do every time without having to fiddle around to get it working.

2: A full crucible is ready for pouring in less than an hour from cold; further melts take much less time as the furnace is already hot. It stows away under a bench when not in use and is easily carried outside when required.

3: All the materials used in its construction are readily available from various sources as specified in the foregoing notes.

Operation is clean and silent with the temperature being controlled by simply switching the element off and on. I thought of fitting a temperature control unit but the cost of one didn't seem justified. I do use a digital thermometer to keep a check on how things are going, but it's not really essential. Its advantage is that the cover stays on the furnace and no heat is lost by removing it to have a look inside. The thermocouple is inserted through a small hole in the cover just stopping short of the top of the crucible and gives a reasonable indication of furnace temperature.

When it becomes necessary to replace the element, which won't last forever, the furnace can be stripped down quite easily, the muffle removed and re-wound, and the furnace put back together again, probably in no more than a couple of hours.

That about covers everything concerning the building and operation of the furnace. I hope the information may be of use to anyone else considering making their own. It really is better than 'setting a tin can on a brazier' (**photo 13**).

Calculations

Current (A)
= Power (W) ÷ Voltage (V)
=1500 / 230 = 6.5A

Resistance (Ω)
= Voltage (V) ÷ Current (A)
= 230 / 6.5 = 35.4Ω

Length of resistance wire required
(assume 22swg wire at 2.75 Ω/m approx.)
= Total resistance (Ω) ÷ Ohms/metre (Ω/m)
= 35.4 / 2.75
= 12.9m = 12900mm

Circumference of 100mm plastic pipe
= π x Diameter (mm)
= π x 100 = 314.2mm

No. of turns required on pipe
= Total length (mm) ÷ Length/turn (mm)
= 12900 / 314.2
= 41 turns (N.B. Check resistance!)

Circumference of 152mm dia. muffle
= π x Diameter (mm)
= π x 152
= 477.5mm

No. of turns required on muffle
= Total length (mm) ÷ Length/turn (mm)
= 12900 /477.5
= 27 turns

Spacing of turns
= Length available (mm) ÷ No. of turns
= 150 / 27 = 5.5mm

TRADE TOPICS

Model & Craft Tools Catalogue from Squires of Bognor Regis

We have recently received a copy of this company's catalogue which we feel sure will be of interest to many of our readers.

Approximately 9 x 6in. in size and 1in. thick. the catalogue lists a wide variety of tooling and sundry supplies for the model engineer, hobbyist, jeweller, woodworker, electronics enthusiast, artist and sculptor. For those who require them, the company also offers specialised catalogues for artists and needlecraft workers. Some of the equipment offered is quite specialised, for example the list of pliers, cutters, wire strippers and pop riveters extends over eighteen pages, and a further three pages is required to list all the different types of tweezers available. However, it is also possible to source such 'mundane' items as insulation tape (available in seven colours) and self tapping screws.

Squires Model & Craft Tools is located at 100 London Road, Bognor Regis, West Sussex PO21 1DD; tel: 01243-842424; fax: 01243-842525; email: sales@squirestools.com website: www.squirestools.com

A SOUTHERN RAILWAY MERCHANT NAVY CLASS LOCOMOTIVE IN GAUGE 1

Roger Thornber

continues with the motion brackets, slide bars and connecting rods.

●*Part VIII continued from page 387 (M.E. 4205, 3 October 2003)*

The motion brackets are a very much simplified version of the original, but since most of them is covered by the bodywork this hardly matters. The attachment plate and the plate onto which the slide bars are attached should be made from 1/16in. material, the rest can be from 1/32in. material.

These two thicker plates are silver-soldered together and left slightly oversize until the other parts have been attached. Assembly is made easier if the plates are slotted together. The cut-outs in the vertical plates are not necessary except the one that allows access to the front fixing bolt. My preference is to use silver-solder throughout, but some items could be attached with soft-solder. The cut-out at the rear may need to be adjusted to clear the wheel rim.

The slide bars are built up from 9/32 x 1/16in. and 3/32 x 3/32in. steel which are best case hardened. I silver-soldered one end and used two 10BA bolts on the other end. This allows the crosshead to be inserted. The attachment bolts should be countersunk from underneath the top bar. Silver-solder was again used.

Construction of the crossheads begins with a piece of 9/32in. steel. Two 3/32 x 3/32in. slots are cut to accommodate the bottom slide bars, and a 1/8in. slot to take the little end. The outline can then be filed to shape. A boss is turned and filed to fit in this slot. Both items should be case hardened. A simple fixture should be made to hold the two items in alignment for silver-soldering.

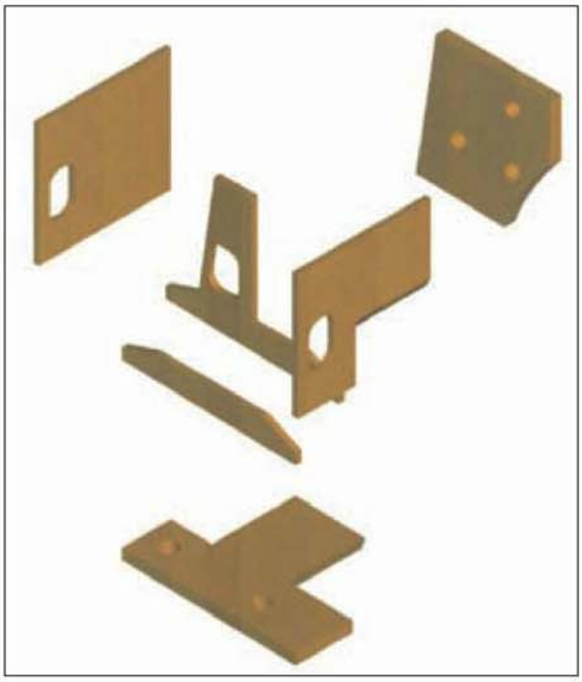
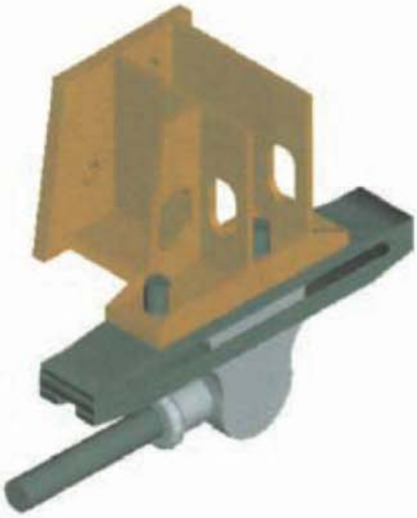
The connecting rods are made in the same way as the coupling rods. The tapered sides and fluting however makes them a little more complicated.

The lubricator is a simple box with four bushes. I have shown it attached to the main frames with bolts into blind bushes. One of the tapped bushes takes a simple filler plug, the other is for the banjo type connection, which also has the feed hole at its top. I suggest that the centre is drilled about 1/16in. and a plug with a smaller hole (1/32in. perhaps) in the top. This may be adjusted to suit. If the hole is too large, great dollops of oil will be thrown out, if it is too small no oil will get through!

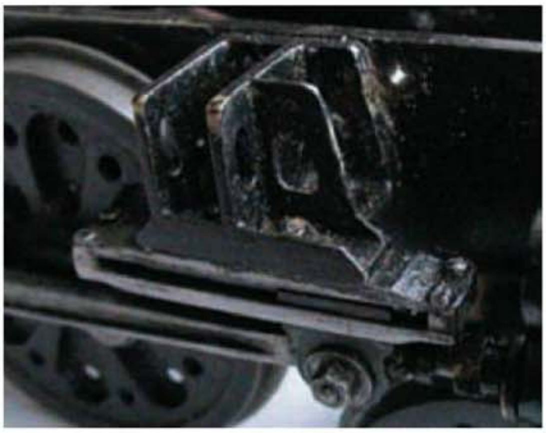
Don't forget that the lubricator tank carries full steam pressure so there should be no leaks, hence the blind fixing bolts.

Eagle-eyed readers may have noticed slight differences between the photographs and the drawings. This is due to the fact that minor changes have been made as a result of experience.

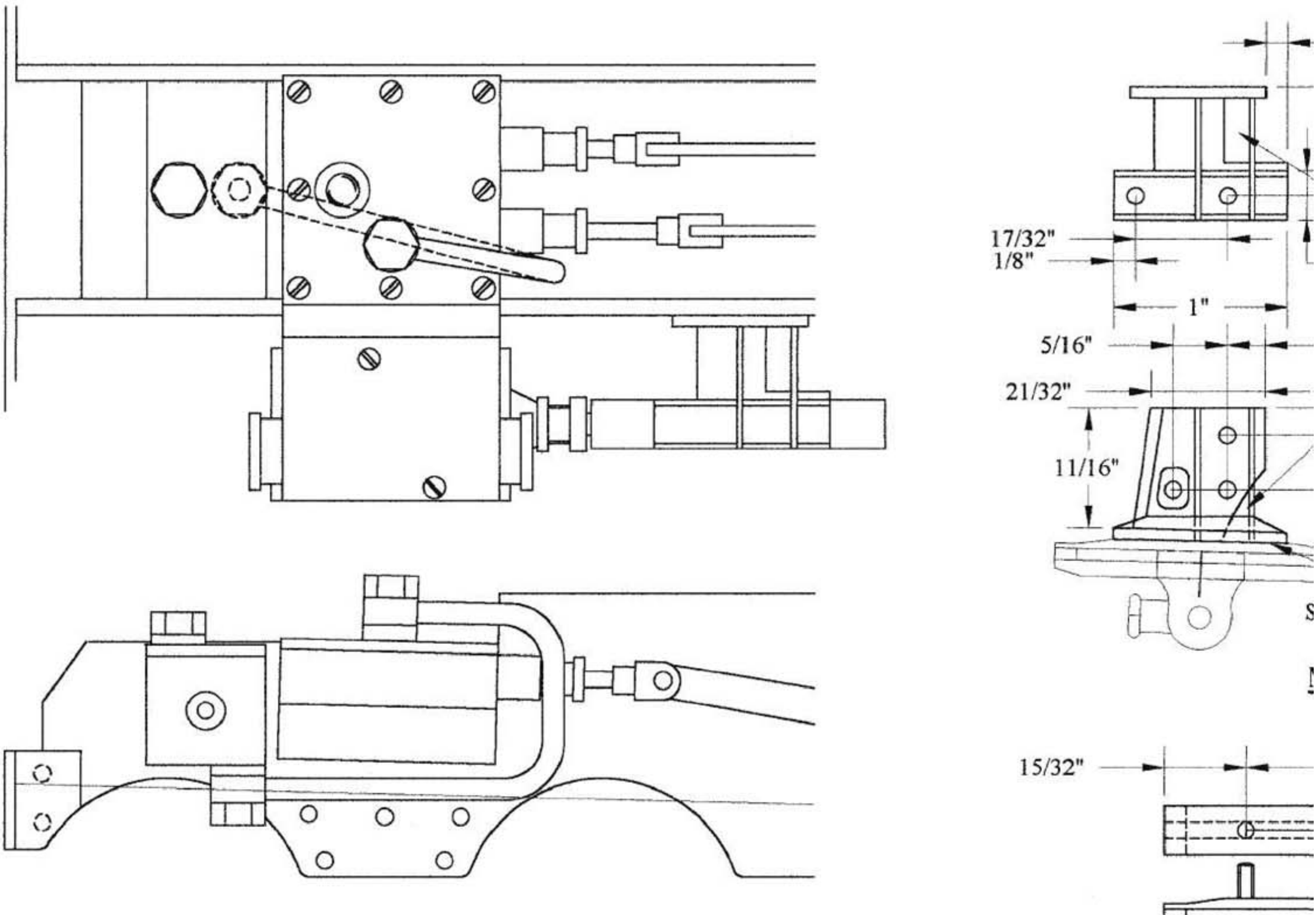
●*To be continued.*

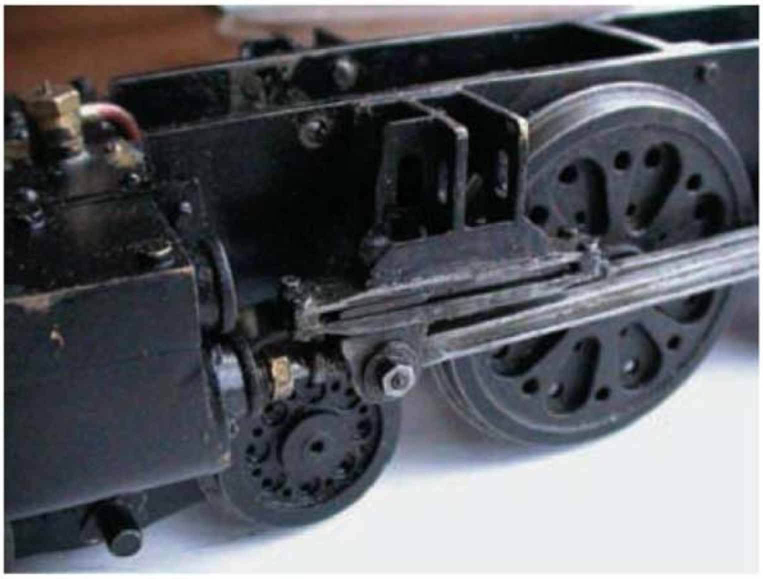


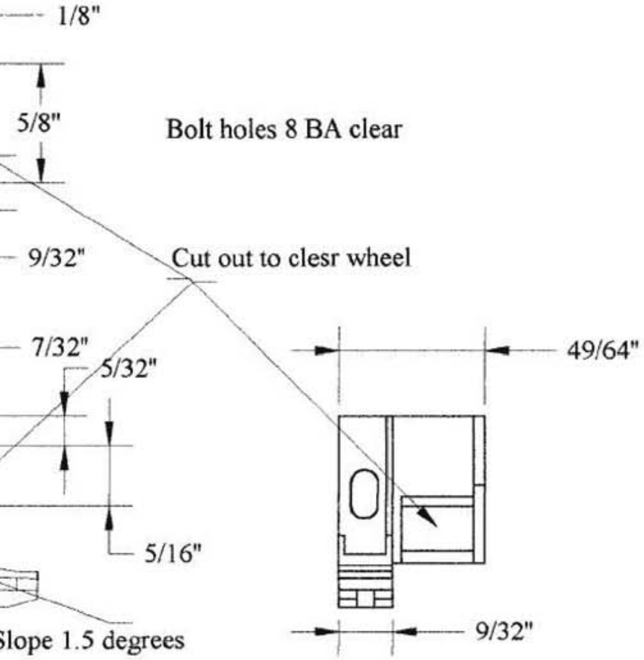


These three-dimensional exploded views and photograph showing the motion bracket and crosshead of the Author's locomotive will clarify the design and construction of these intricate parts.

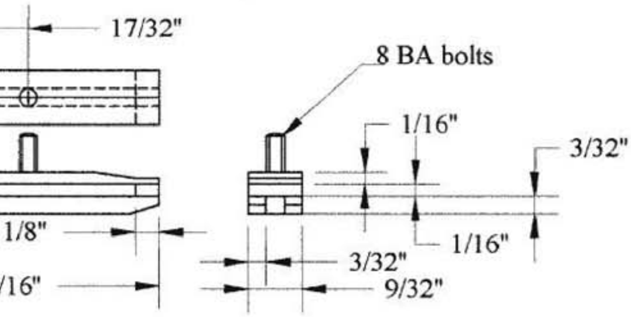

17/32"
1/8"
1"
5/16"
21/32"
11/16"
15/32"
11/16"
Tap 3/16"x 40 thread
5/16"
1 1/4"
1/4"
1/2"
13/16"
Blind bushes
Tap 8 BA from frames
11/16"
3/16"x 40 thread

Lubricator

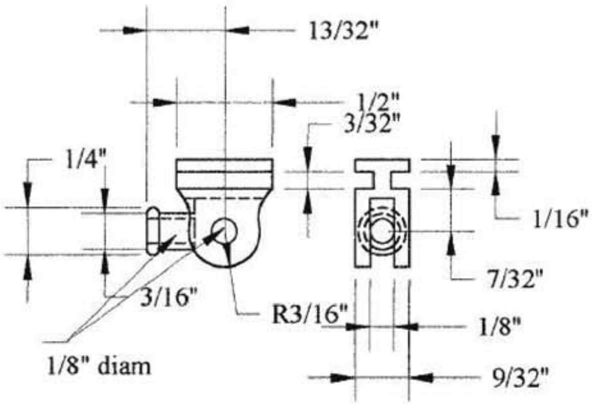




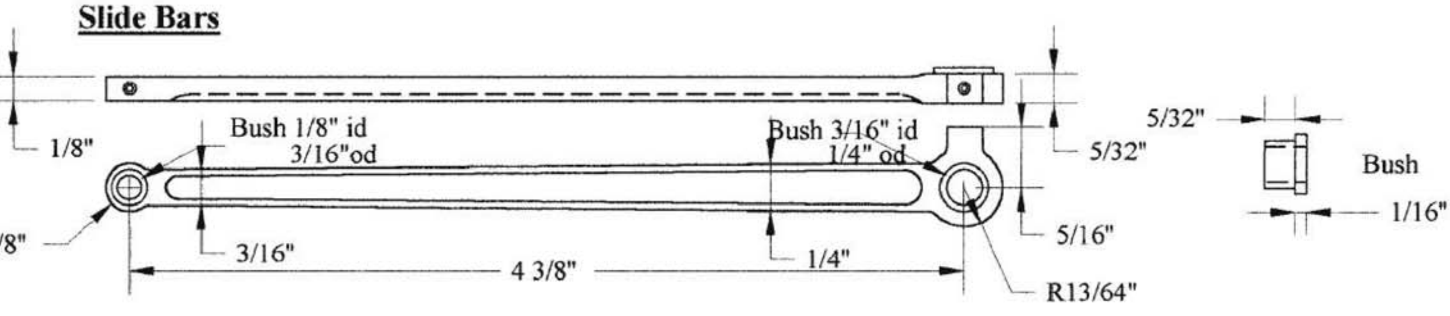
Motion bracket



Slide Bars



Crossheads



Connecting rod

A SOUTHERN RAILWAY MERCHANT NAVY CLASS LOCOMOTIVE FOR GAUGE 1 BY ROGER THORNBER

The Author's Warco BH600G lathe complete with the rack feed tailstock described in the accompanying text.

A view of the modified tailstock showing the neat and businesslike appearance of the rack feed mechanism.

FINE TUNING A WARCO BH600G LATHE

Anthony Mount
discusses the design of a tailstock capstan unit for his lathe and makes a start on its construction.

●*Part IX continued from page 384 (M.E. 4205, 3 October 2003)*

The tailstock feed on the Warco BH600G lathe is of the traditional screw type. I have had a rack feed tailstock by Cowells of Watford fitted to my Myford for many years, and find it a great boon. Ideal for a pecking motion when rapid withdrawal is required when using small drills, I find it much more comfortable to use than the more usual screw feed. Cowells had nothing to suit the 32mm diameter rack feed spindle for the BH600G and no longer seem to be trading, so I decided I would have to make my own.

For those not conversant with the mechanism, the Cowell unit is an iron casting that replaces the feed wheel on the tailstock. Passing through the tailstock and the casting is a barrel, bored with a morse taper for the chuck and with a rack cut in the side. On top of the casting is a capstan and below, inside the casting, is a gear which meshes with the rack. When the capstan is rotated, the barrel feeds back and forth.

My first job was to decide the length of feed. On the Myford it is almost 5in. and the dial is graduated for 3in. to one revolution. I thought 150mm would suit the new machine. As there is a dial on the capstan, round figures would be nice again and what better than 100 millimetres.

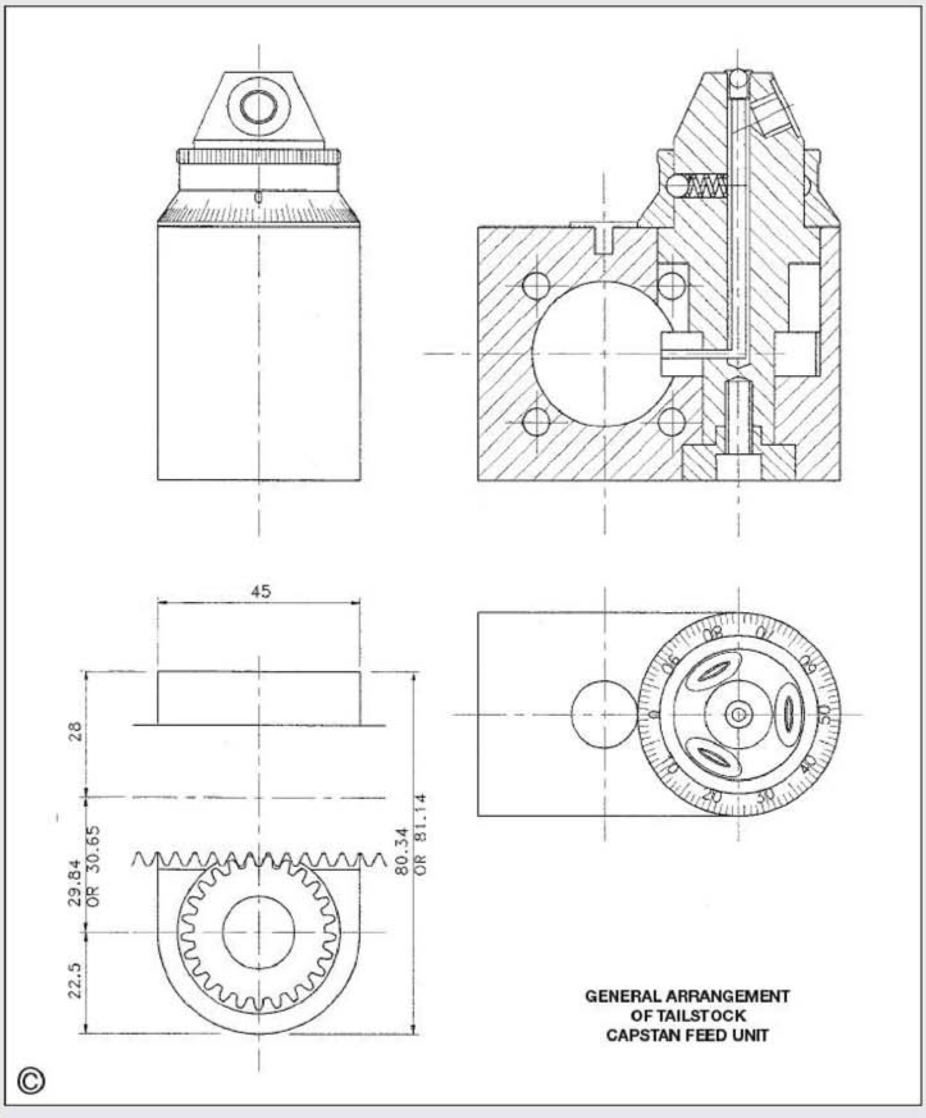
The circumference of the gear on the pitch circle would therefore also have to be 100 millimetres. From this the pitch diameter of the gear is obtained from $(100 \div \pi) = 31.83$mm which is not a metric Module standard. However, having both metric and imperial systems running side by side can have its uses. If 31.83mm is divided by 25.4 to convert from metric to imperial dimensions, we get $(31.83 \div 25.4) = 1.253$in. which is just 0.003 greater than $1^1/4$ inch.

To convert back $(1.25\text{in.} \times \pi) = 3.9270$in. which we can multiply by 25.4 to get back to metric, i.e. $(3.9270 \times 25.4) = 99.75$ millimetres. Therefore, $1^1/2$ revolutions of the capstan (150mm of feed) would give an error of 0.375mm (0.015in.)

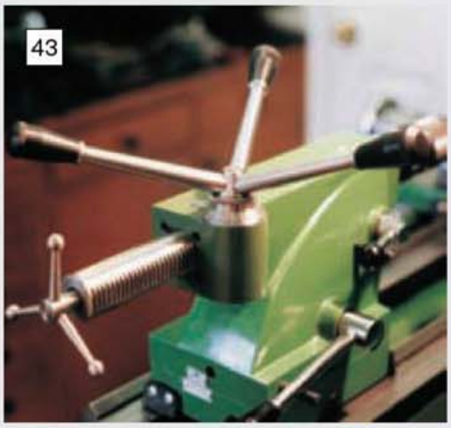
If a 20 diametral pitch (DP) gear of $1^1/4$in. pitch circle diameter is used, we have 25 teeth on the gear. 20DP gears are readily available from HPC Gears (01246-268080), Davall (01707-265432) and Muffett (01892-542111); they are also Myford Series 7 lathe change gears. I mention the above as some readers might not want to cut their own gears.

However, to get back to a pitch diameter of 31.83mm, it might not be a standard DP or Module gear but it can be a circular pitch (CP) gear. While seldom mentioned in model engineering, circular pitch gears are designated by the distance between two teeth on the pitch circle. To give a movement of 100mm by the rack therefore requires a gear with a pitch circle circumference of 100mm. Divide this, say by 4mm gives $(100 \div 4) = 25$. The gear will therefore have 25 teeth spaced 4mm apart and the pitch diameter is 31.83 millimetres.

HPC gears were able to supply a ground, 32mm dia. steel bar with a rack cut in and the CP gear. However, as it was a one off it did turn out to be rather expensive. All I would need to do would be to bore through the bar, machine the



GENERAL ARRANGEMENT OF TAILSTOCK CAPSTAN FEED UNIT



Viewed from the rear of the lathe, the tailstock barrel rack is clearly evident.

Radiusing the gear housing on the rotary table. Note the brass packing and method of securing.

The finished gear housing after cleaning up and deburring but prior to painting.

No. 3 Morse taper and the 6mm wide slot. Tempting though it was to save some work, regrettably I could not justify the expense.

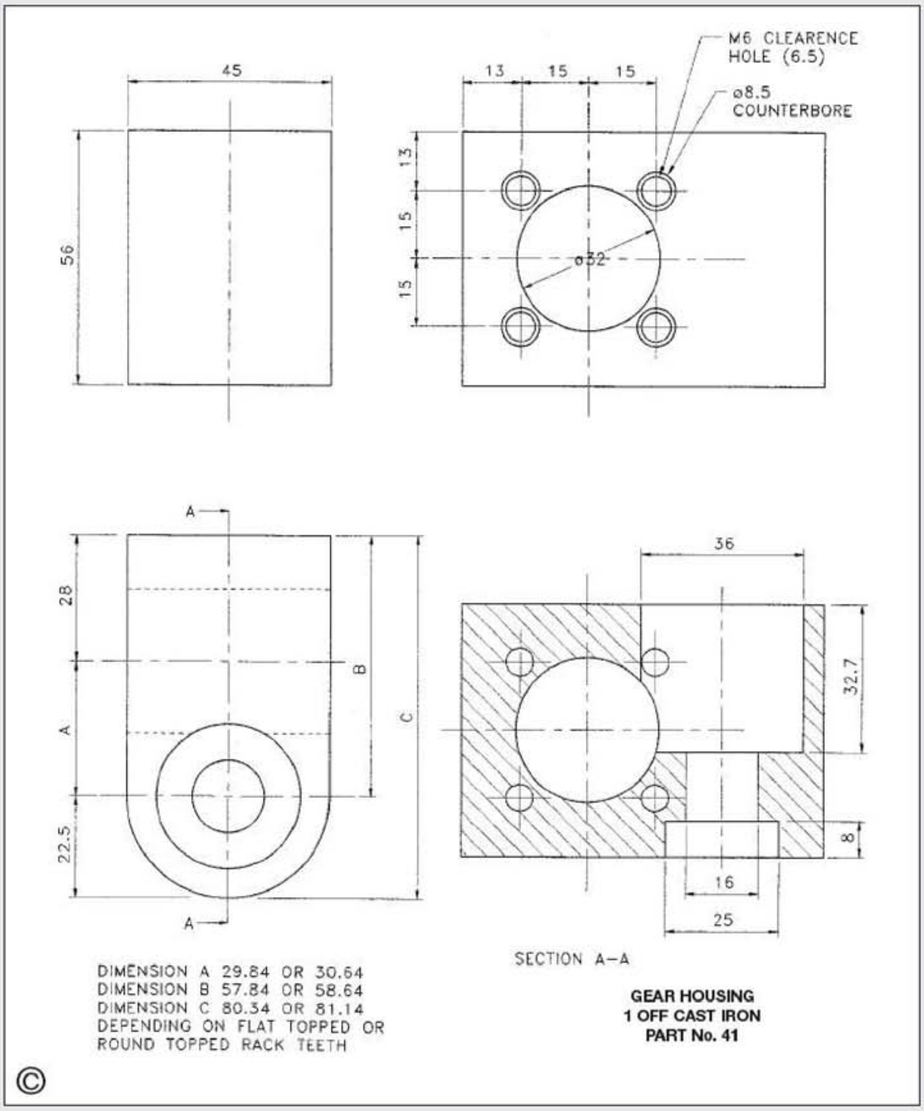
I have shown a flat 10mm wide on the face of the rack on the spindle. This will give the maximum area for tooth contact. However, some round racks do not have a flat, the tops of the teeth being left round. You could do this for the tailstock spindle if you prefer; this will reduce the amount of metal to be machined when cutting the rack. However, you will need to increase the centre distance on the gear housing by 0.8 millimetres. So, now is the time to make that decision.

Since the centre to centre distance is so important, it may be prudent to make the rack and the pinion first. Then, with the two pieces in mesh the distance overall can be measured. By subtracting half the diameter of the barrel and half the diameter of the pinion the centre to centre distance is obtained.

Photograph 41, shows a general view of the lathe with the tailstock fitted with the rack feed. **Photographs 42** and **43** show close-up views of the tailstock.

Gear housing (Part No. 41)

I used mild steel for the gear housing but cast iron could be used instead. A start was made by machining the block to the overall dimensions shown. This can be done with a face cutter or large end mill.



The centre to centre distances are important and the bolt holes need to be drilled before any boring is done since one hole breaks into a bore and cannot be drilled afterwards. Hence co-ordinates are used for positioning the holes.

The bolt holes are close to the spindle bore, but I wanted to utilise the tapped holes already in the tailstock. Hence I reduced the diameter of the heads of the cap head Allen screws I used from 10 to 8 millimetres.

The block was clamped to the milling machine table and an edge finder used to set up the 0,0 datum in one corner of the block. The four bolt holes were spaced out, drilled and counterbored. I made them a little oversize at 6.5 and 8.5mm respectively, to allow for alignment on assembly. The centre of the spindle was located and drilled right through 6mm diameter.

The block was turned through 90deg., the 0,0 datum reset and the hole for the pivot shaft centred and drilled right through. I drilled mine 12mm as I had a Morse taper with a 12mm pin tapped M8 which I used in the rotary table to centre the block for rounding the end. At the same setup, a 4mm hole was drilled for the index button.

The rotary table was transferred to the vertical mill with packing under the block to protect the working face of the rotary table and stops bolted to it via the tee slots to prevent the block from twisting under the action of the cutter. A single bolt through the block alone cannot be relied upon to hold the workpiece firm. **Photograph 44** shows the setup.

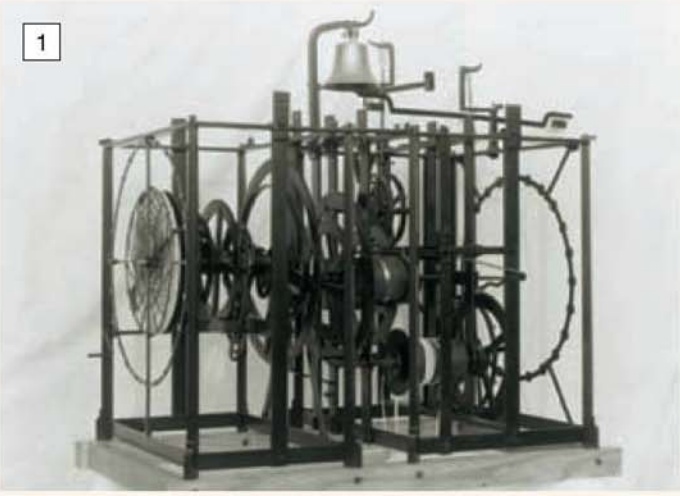
A long reach end mill is needed and a ripper cutter can be used to shift the waste quickly. The cutter can be helped by sawing away some of the waste material beforehand. The cut should not be taken in one long bite but in a series of relatively shallow steps.

After rounding it off, the block was transferred to the 4-jaw independent chuck for boring out the pivot shaft cavity; it could have been clamped to the faceplate in the lathe. Following this it was reversed and counterbored for the washer. It was then repositioned, the shaft hole re-set to run true and bored through to 32mm diameter.

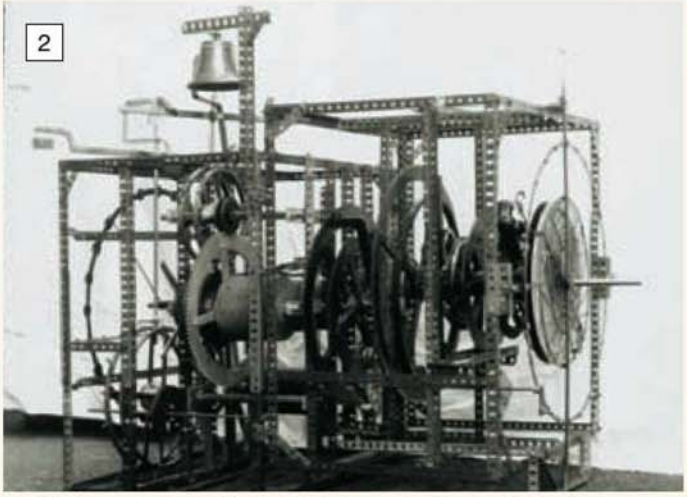
Heavy cuts were avoided to prevent the occurrence of problems caused by intermittent cutting where the two bores break into one another, and one of the fixing bolt holes.

All the machine marks were filed off to provide a nice finish, all sharp edges removed and, after de-greasing, the block was painted to match the lathe. **Photograph 45** shows the block ready for painting.

●*To be continued.*



A view of the completed clock. The building of this timepiece must have represented a significant challenge in the fourteenth century.



The movement installed in a temporary Meccano frame convenient for testing and proving purposes.

A REPLICA WALLINGFORD CLOCK

Don Unwin introduces his re-creation of a fourteenth century clock to the design of Richard of Wallingford, one time Abbot of St. Albans.
●*Part I*

In *Model Engineers* Nos. 3794, 3796 and 3798, 6 February, 6 March and 3 April 1987, I described some of the interesting operations used when constructing my replica of the Planetarium made by Giovanni de Dondi in 1342 and destroyed nearly 200 years ago. At present my replica is on public display in the Manor House Clock Museum, Bury St. Edmunds.

I have also built a replica of another lost clock (**photo 1**) that was made by Richard of Wallingford, Abbot of St. Albans 1327 to 1336. This large clock was lost after the dissolution of the monasteries in 1536 and the only details we have are those in manuscripts written in Latin by Richard, fortunately translated for us in the 1970s by Dr. J. D. North. Unlike the Dondi manuscript, which was very fully detailed if somewhat difficult to follow, Richard's is incomplete and leaves a great deal to conjecture and it is uncertain what the clock was actually like.

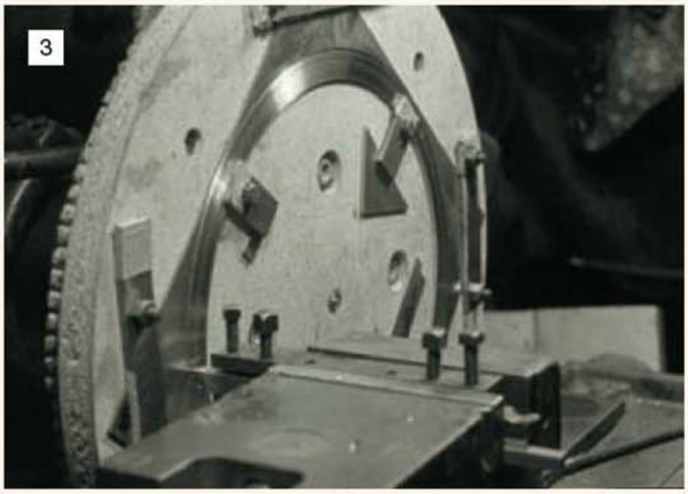
Dr. North has done a great deal of detective work and has been able to deduce much of the detail, particularly that of the ingenious epicyclic gear trains of the astronomical section. Richard describes a clock with single stroke strike at each hour then goes on to give brief details of means to make it strike the hours 1 to 24, but he does not say which was used on his clock. In a later section of the manuscript he describes an 'astronomical instrument' which shows true solar time or sundial time, which can differ from mean solar or clock time by much as 15 minutes fast or slow at different times of the year. It also showed the phases of the Moon, the incidence of lunar eclipses and had an astrolabe from which the positions of the stars and other astronomical information could be obtained.

While it appears that the 'astronomical instrument' device was to be driven by hand he also says that it could be connected to a common clock. He does not say how it would be connected or if the dial is horizontal or vertical. Some think that it was horizontal and viewed from above although Dr. North and others felt it was vertical, a view with which I agree. This opinion is supported by the near contemporary manuscript illustration depicting Richard with his leprosy pock marked face pointing up to a vertical clock dial.

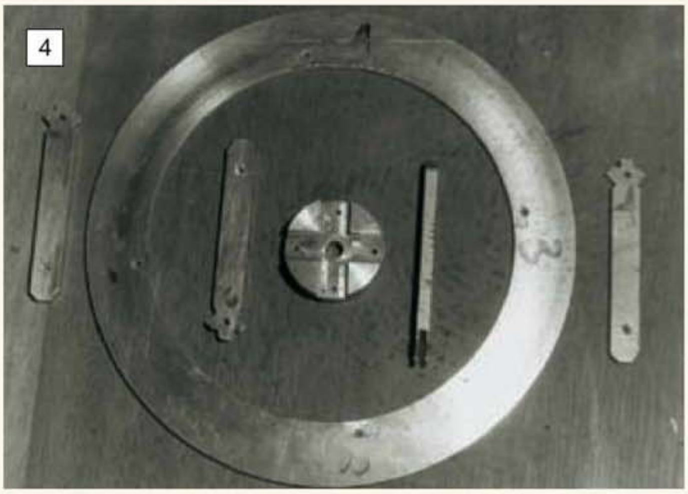
Dimensions

One problem was that of size. Richard gives all dimensions in terms of the circular pitch or tooth-to-tooth distance of the teeth on the great wheel, a dimension which Dr. North calls 't'. Strangely, as decimal fractions were unknown, fractions of a tooth distance are given as minutes and seconds. For example Richard says that the framework is 43 't' wide but no absolute value for 't' is given. Dr. North feels that it might be between 2.5in. and 3in. but I think this estimate may be too large, as it would involve the medieval blacksmith/clockmaker forging frame members 10ft. long and weighing some 2cwt. (101kg).

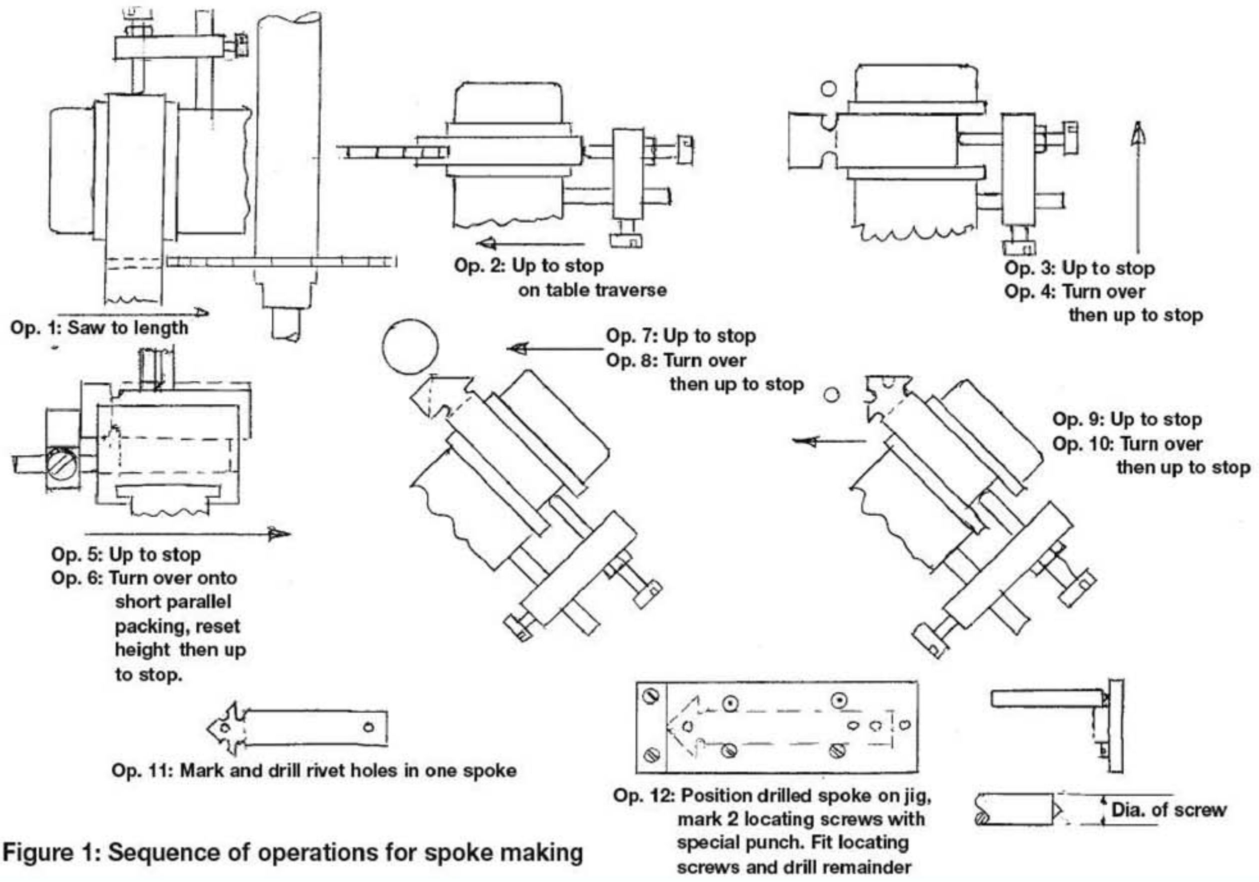
If we look at the slightly later clocks of Wells and Salisbury 't' is about 1in. giving the Wallingford clock a width of about 5ft. 5in., very similar to the width of these two clocks. My workshop facilities could not possibly deal with a clock of this size, nor could the Bury Museum accommodate it, so I decided to make a reduced size replica, using 10mm as my value for 't', about a quarter full size. This give me a framework about 470 wide, 500 high and 300mm deep for the clock and 470 x 500 x 280mm for the astronomical unit, a quite manageable size.



Trepanning out an annular gear ring. This operation was too large for the lathe and was carried out on the milling machine.



A set of large gear parts shown finish machined and ready for assembly. This was accomplished by riveting and hot-set epoxy resin.



© **Figure 1: Sequence of operations for spoke making**

Design

Details of the framework in the manuscript were almost non-existent, so I decided to make all the mechanisms for the astronomical unit and the clock first and fit them into separate but adjacent temporary frameworks constructed of Meccano (**photo 2**). This ensured that any changes required during construction would be relatively painless and the fixing of framework details an easy task. As both were built as separate units, it put off until later the difficult decisions of having the astronomical dial vertical or horizontal and how to connect them together!

The clock itself was of fairly simple design but I chose to make the 1 to 24 hours striking system, as it was the most complicated. However details are very vague although Richard gives an excellent table for setting out the pegs on the strike count barrel and Dr. North has worked out a possible scheme which I developed into an arrangement which works very well indeed. The clock dial has a narrow chapter ring with the mean hours on small discs engraved 1 to 24. The astronomical unit dial has much more information with sidereal and solar time, signs of the Zodiac, an astrolabe and the Moon and its phases.

The astronomical unit is much more complicated than the clock but both sections involved some interesting workshop processes. Unlike the planetarium of Dondi, which was made almost entirely of brass and scientific instrument maker built, Richard's device was made by blacksmith/clockmakers mostly of iron. We do not know how it was finished, probably as left from the hammer, corrosion not being a problem with these early irons, so I decided to paint mine semi-matt black or, where possible, oil-blacked steel.

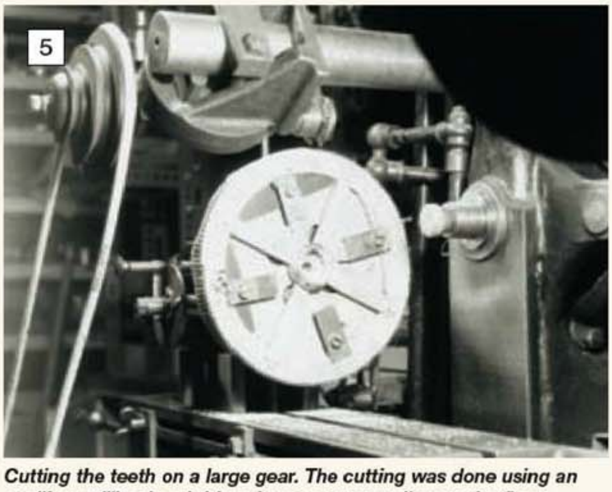
Construction

To avoid the heavy work of hacking the large gears from steel I made them of a hard grade of light aluminium alloy painted when completed. These have proved still to be perfectly satisfactory after running since 1992.

These wheels were built up of an annular ring, 4-spokes with forked ends riveted to it and fire welded to a hub. I used the same construction except that I let the spokes into the hubs and bonded the assembly with epoxy resin. The rings were trepanned from a sheet of aluminium alloy. Much too large for my lathe, these were held on a chipboard faceplate mounted on my milling machine, (**photo 3**). By careful selection I was able to get several rings from one piece of sheet, starting with the smallest first and parting the outside of the largest last.

Making the spokes was a 'mass production' job, 28 being required varying only in length. It was an interesting job which, given a little thought before starting, proved very successful. The series of operations in the sketch (**fig 1**) explains things better than a lot of words!

Four equi-spaced lines were marked on the ring, the forked spoke ends carefully positioned over the lines and the other end fitted into slots milled in the hub to which they were secured by a 6BA screw. The rivet holes in the rim were then drilled and the spokes riveted with a piece of 3.2mm dia. aluminium alloy rod, the ends not being neatly finished with a snap but left from the hammer as was medieval practice. The whole was then bonded with hot-set epoxy resin. **Photograph 4** shows a set of parts before assembly.



Cutting the teeth on a large gear. The cutting was done using an auxiliary milling head driven by a motor standing on the floor.

To cut the teeth and finish the bores, which in most cases were square, the wheel was mounted on a faceplate secured by clamps across the spokes. The outside was turned, the hole bored to the A/F size, those over 250mm diameter turned on the milling machine, then mounted on the dividing head for tooth cutting. Some of the largest needed quite a rig-up with the head packed up and the cutter on an auxiliary spindle driven by a motor standing on the floor (**photo 5**).

As the medieval tooth was not of involute form I had to make special cutters using the methods I described in *M.E.* Nos. 3399, 3426 and 3427, 21 August 1970, 1 and 14 October 1971, and more recently in *Model Engineer's Workshop* Nos. 6 and 7, August/September and October/ November 1991.

●*To be continued.*

MODEL HACKSAW

Ted Hansen

in Canada, makes good use of available hardware to complete this neat little project before describing its assembly and adjustment.

●*Part III continued from page 392 (M.E. 4205, 3 October 2003)*

Detail of the geared drive to the reciprocating saw frame of the Author's machine which was originally designed to give his Depenbusch 'hit and miss' engine some work to when on display at exhibitions.

Make the vice jaws from $1^{1}/_{4}$ x $1^{1}/_{4}$ x $^{1}/_{4}$in. angle cut to length with bottom and face sides surfaced square. The reduction in height to 1in. is strictly for appearance and can be omitted if desired.

To locate the mounting screws for the fixed jaw, clamp the jaw in proper location square with the frame and drill tapping size through both pieces at once.

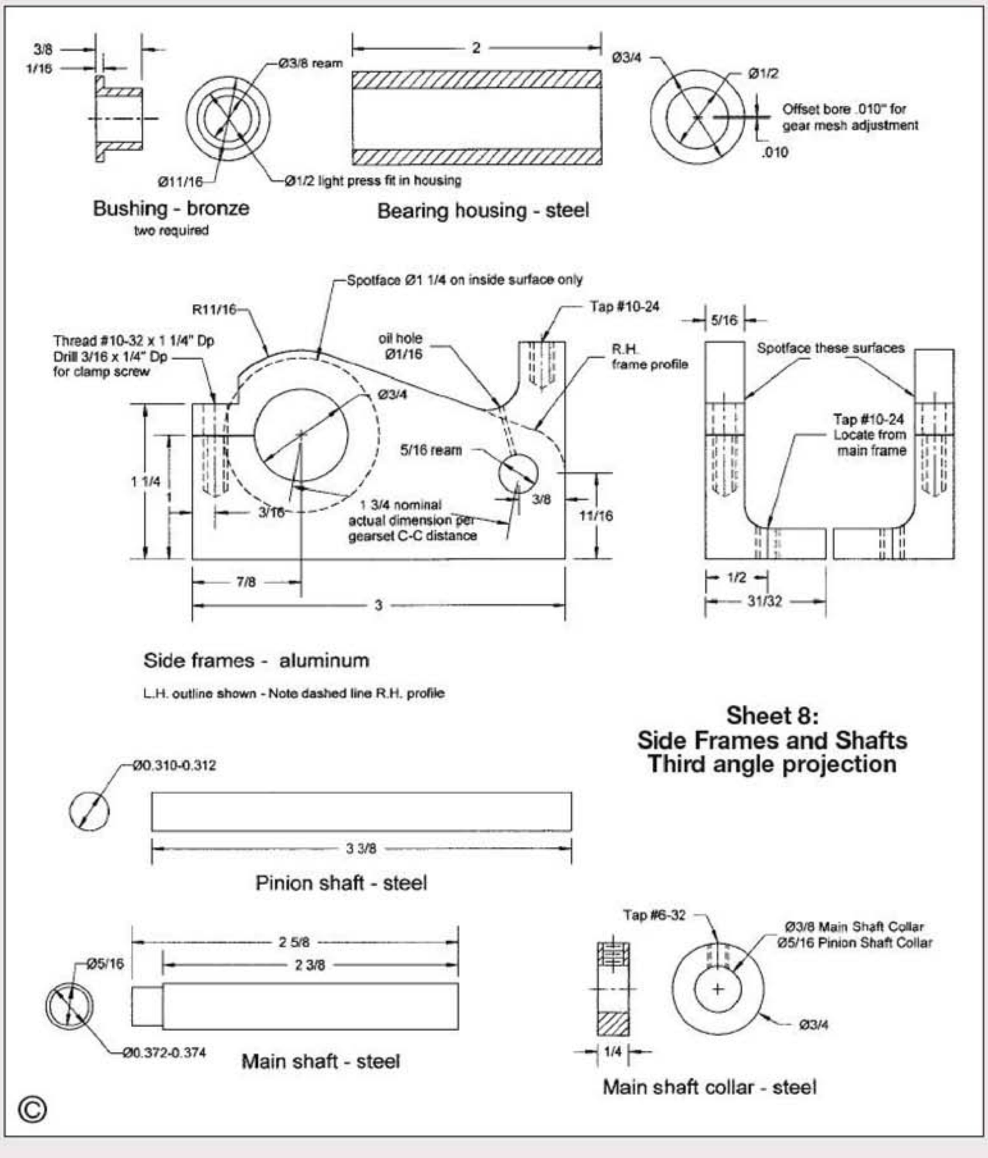
The vice screw should be left-hand thread to obtain 'normal' rotation of the handle (clockwise to tighten). This initially seemed to pose a problem. It is a simple matter to turn the screw thread on the lathe but cutting the $^{3}/_{8}$in. 16tpi left-hand thread in the nut is more difficult and I wanted an easy to build design. After some contemplation, however, the brain light went on. A suitable left-hand thread screw is as near as the nearest hardware store in the form of a commonly available turnbuckle.

Cut the unthreaded hook end off the screw part and reduce the end of the thread to $^{5}/_{16}$in. (or to the root diameter of the threads) for a distance of $^{1}/_{2}$ inch. Cut the nut part of the turnbuckle in two leaving stubs approximately 1in. long attached to the nut. Grip the newly turned down part of the screw in the tailstock drill chuck and screw the nut onto the thread with the stubs facing the headstock. This will position the piece sufficiently accurately for the initial machining operation. Without disturbing the alignment, carefully clamp the nut in the 4-jaw chuck, holding by the stubs.

Remove the screw, face off the end of the nut, then turn the end to approximately $^{1}/_{2}$in. dia. for a short distance ($^{1}/_{2}$in. or so) to form an accurate surface to grip when facing the reverse end. Machine only the amount required to give an adequate holding surface; enough of the original diameter must be left to form a flange to attach the nut to the nut block. Finally, reverse the piece in the lathe, hold by the turned diameter, cut off the stubs and face the end leaving a small register diameter to align the piece with the nut block.

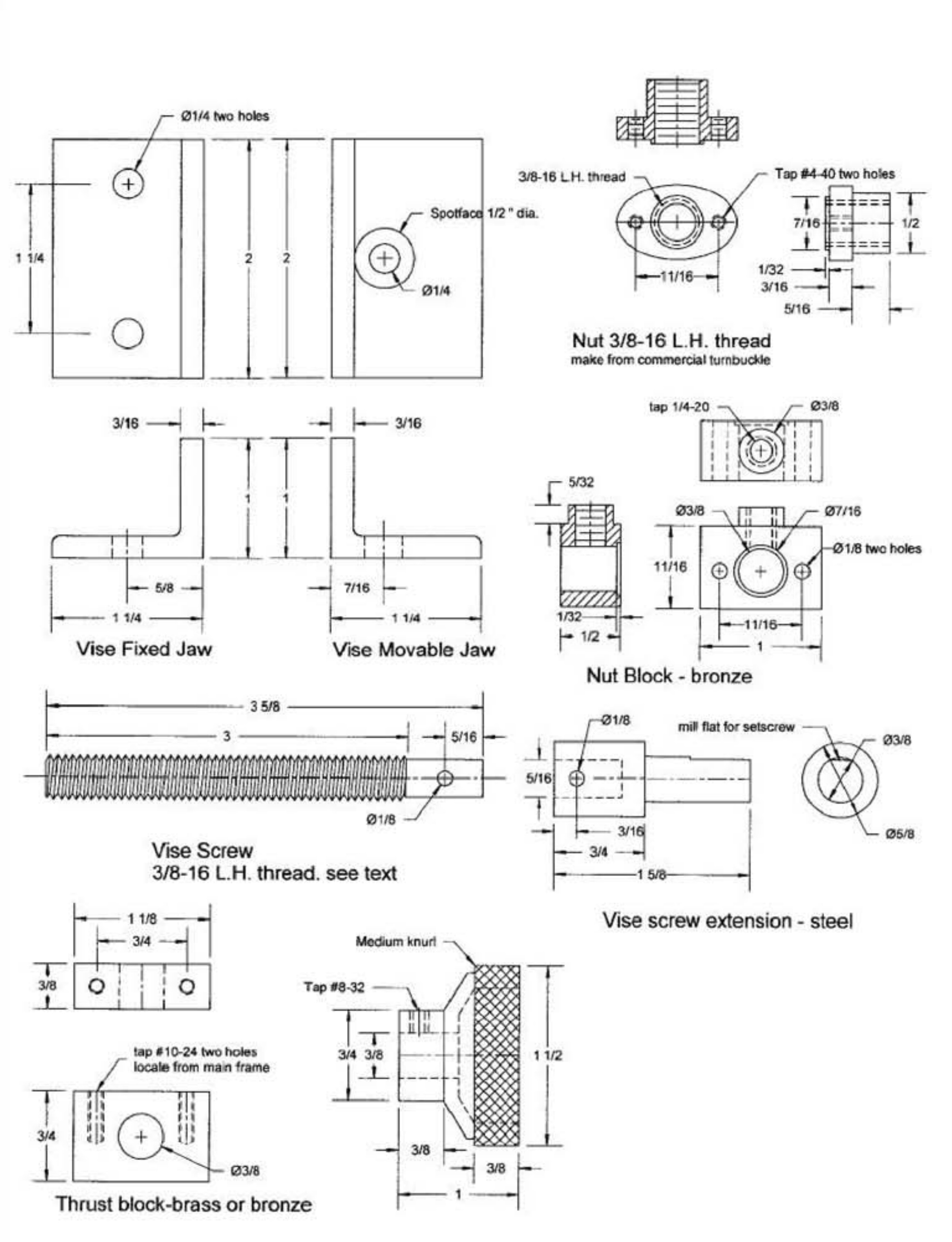
The nut block is of brass or bronze, as is the thrust block. Both pieces are squared up and machined to the dimensions shown. The mounting screws for each are best located *in situ* with the pieces clamped together.

For the screw extension, start with a $1^{5}/_{8}$in. length of $^{5}/_{8}$in. dia. stock. Turn one end to $^{3}/_{8}$in. dia. by $^{7}/_{8}$in. length. Reverse in the chuck, face the end then drill $^{5}/_{16}$in. dia. by $^{1}/_{2}$in. deep. Mill a small flat on the $^{3}/_{8}$in. dia. for the handwheel set screw. Assemble to the screw by pinning the two pieces together using a $^{1}/_{8}$in. spring pin. Ensure that the screw is fully seated in the hole when cross drilling for the pin so that the seating and not the spring pin takes the thrust loading when the vice is tightened. The knob should really be a stylish handwheel, however I used a suitable left-over from the scrap box.



Drive gear guard

Although not necessary in order for the saw to function, the guard really adds to the finished appearance as well as providing an added measure of safety since it is intended to be operated on public display. Feel free to substitute materials; I used whatever happened to be on hand. The galvanised sheet metal was left over from household furnace ducting and the perforated stock came from an old electric motor cover. Assemble with 50/50 solder using liquid flux. For sheet metal work, I still get best results with an old-fashioned copper bar soldering iron preheated with a propane



Sheet 9: Vise Components
Third angle projection

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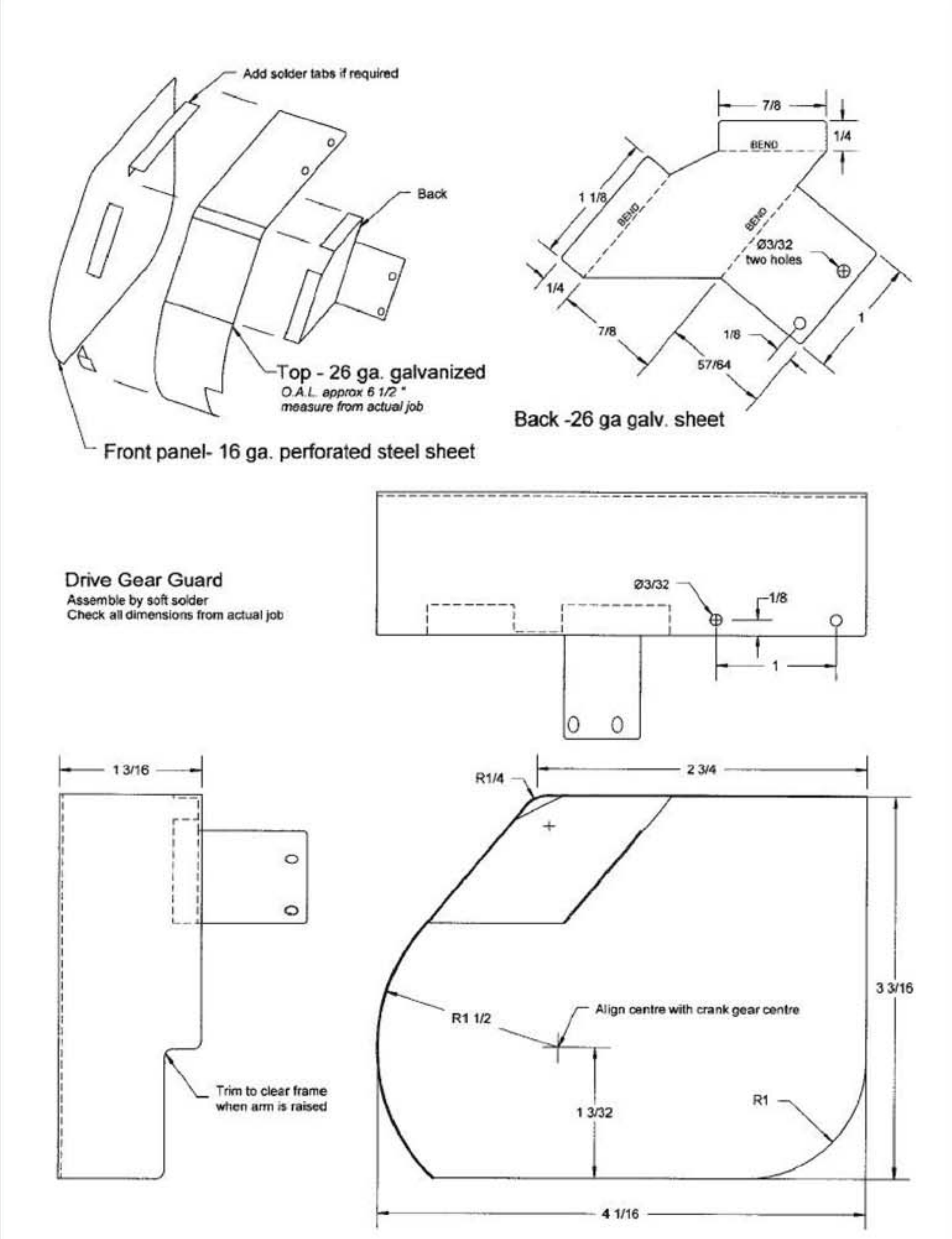


Sheet 10: Guard
Third angle projection

©

torch. Electric irons generally do not have sufficient heat while direct heating with the torch is difficult to control. Hold the pieces together with a simple jig (e.g. nails and scrap wood) during the initial tack soldering.

Assembly notes

The bearing housing design render it impossible to provide oil holes for the crank gear shaft bushings, so lubricate these well before assembly. Since they are lightly loaded bushings operating at low speed, a good initial lubrication should last a long time. To adjust the gear mesh clearance tighten the set-screw that locks the spacer washer to the bushing housing, but not the set-screws on the slide bar mounting bracket. Using the spacer as a grip, rotate the bushing housing to adjust the backlash. When properly adjusted, lock the bushing housing in position by tightening the mounting bracket set screws.

Adjust the clamp screws on the side frames to allow free rotation of the slide bar assembly with no slack or side play at the saw head. Adjust the travel stop screw to limit the depth of cut to just below the bottom of the frame. Check that the saw travel is parallel to the frame and square with the vice. Adjust if necessary by shimming the slide bar at its mounting screws. Check that the saw frame clears the workpiece support angle bracket and trim the bracket if necessary to provide clearance.

Close detail of the lifting link with the saw in the lowered position. The travel stop screw (centre) is adjusted to arrest downward motion when the cut is completed.

The lift latch should automatically fall into place resting on the frame just behind its travel slot as the slide bar is lifted. Trim the latch rod to length so that it holds the saw well clear of the workpiece when raised. The lift latch pivot stop prevents the lift latch from rotating too far forward when the latch is depressed to lower the saw head. Mark the location for the stop pin so that the latch rod is within the slot in the frame when the latch is pressed all the way down, remove the slide bar spacer piece, drill 1/16in. and press in a spring pin to serve as the pivot stop. File off any excess length and re-assemble.

A final note

Most of the drawings were prepared using TurboCAD 2D, which was available as a free download from **www\imsisoft.com.** The version I used has since been replaced by an improved version (TurboCAD LE), but it is still available free. I found it to be a good starter program, the commands were straightforward and intuitive, everything worked as it should, the help files were actually helpful and there was even a user forum on the website for extra assistance.

A big plus is that, unlike many other 'demo' programs, it doesn't expire after 30 days or crudely print *DEMO* across your printout, and you can't beat the price. It worked as a product promotion too since I later bought one of their 3D CAD packages!

LETTERS TO A GRANDSON

M. J. H. Ellis

demonstrates how the majority of the energy in steam is used in its conversion from water, before embarking on a fascinating review of injector construction.

●*Part LVI continued from page 377 (M.E. 4205, 3 October 2003)*

Dear Adrian, before continuing the theme of my last letter, I will deal with your query: where did I set the figure for the total heat energy of a pound of saturated steam at a pressure of 100lb./in. absolute which I quoted in an earlier letter? Actually, the figure was 1182BTU (BTU: British Thermal Unit), and it was five letters back). I'm sorry, it was a slip on my part. I fully intended to tell you at the time, but somehow overlooked it.

It came from the 'Steam Tables' which are reproduced in every serious work about Thermodynamics and steam engines. This invaluable information was originally compiled, and I wonder with what labour, by the French savant Henri Victor Regnault as long ago as 1847 and, subject to revision by later workers, is still in use. Incidentally, the figures vary slightly between different text books, but I don't think we need concern ourselves about that.

These tables are informative, and remember that they relate to saturated steam, which means that if it were to be cooled ever so slightly it would start to condense back to water. All the figures are with respect to a base of water at its freezing point 32deg. F. We can apportion the 1182 BTU as follows:

Heating the water by 180deg. F. to its boiling point under atmospheric pressure (212deg. F.):	180BTU
Converting it to steam at the same temperature:	967BTU
Heating the steam from 212deg. F at atmospheric pressure to 328deg. F and 100lb./in.^{2} absolute:	35BTU
Total:	1182BTU

You will see that 967 out of the total of 1182BTU, or 82% was expended on converting the water into steam. The trouble with the steam engine is that so little of this can be recovered as useful work. The tables tell us, that even if the steam could be expanded in an engine down to 2lb./in.^{2} absolute, its total heat would still be 1121BTU so that the most that could be converted by the engine into mechanical work is (1182 - 1121) = 61BTU, and this is only a little over 5% of what we started with.

The Author's poppet valve injector.

In a condensing engine, a little of the heat would remain in the condensate, soon to become feed water, but most of it would have to be discarded in the condenser cooling water. If we were talking about a locomotive, it would go straight up the chimney. Of course, matters could be improved by superheating the steam in the first place, or raising the boiler pressure, but I have digressed enough.

Compounding

Now, picking up the thread of my last discourse, I think that the economical performance of the French engine can be attributed to the benefit of compounding, and perhaps also to well-designed valve-gear. You must not get the idea that in some magical way the compound engine gets work out of the steam twice over. It simply uses it more efficiently.

As steam expands in an engine cylinder, it cools, with the result that if it expands all the way in a single cylinder, the cylinder walls are left considerably colder than the steam which will be admitted on the next stroke. Some of this steam is thereby condensed, but evaporates again before the piston ends its stroke. This reduces the mean effective pressure. By dividing the expansion process between two or more successive cylinders, the range of temperature in the individual cylinders is lessened, and this undesirable effect reduced. At the same time, the stress on the working parts is diminished, so that they can be made lighter, and the multiple cylinders enable the engine to run more smoothly.

However, in spite of these undoubted benefits, the Great Western did not persist with compounding. I believe that one reason was that

The poppet valve unit of the Author's injector.

the improved efficiency was outweighed by the increased maintenance costs, and I also have an idea that it found that it could achieve the same end better by improvements in the valve gear of simple (i.e., non-compound) locomotives.

It may perhaps interest you to know that around this time there was an upsurge of interest in compounding, and at least seven of the main line companies experimented with it. I don't pretend to be an expert on the subject, but so far as I know, the only company which continued to use compounds was the Midland, and I can recall travelling behind three-cylinder compounds of their design after British Rail took over. They may even have kept going until the end of steam.

Injectors

I feel sure that *La France* would have made an elegant, even dainty model, but to be honest, what caught my notice at the time was not so much the locomotive as the author's observations about injectors. Like me, he thought that the Achilles' Heel was the relief valve. He went on to say that he had substituted a flap-valve for the ball-valve, and that this had made his injector, much more reliable. However, so far as I know, no drawing was given of his injector, and so, in adopting his suggestion, I have had to evolve a design of my own.

The important thing about the flap-valve is that the flap is made from a resilient material which can adapt its shape to the seating. This led me to try another design, in which there was a little poppet valve. But in this application, the valve was upside-down compared with the usual valve of this sort, and seated on the top of its head (which for the benefit of any bemused reader, I had better make clear was now its bottom). Well, I admit, it is rather confusing. Just look at my diagram (**fig 1**) and you will see what I am trying to say. To make confusion worse confounded, it isn't the valve proper which seats at all, but a tiny O-ring which fits over a pip on the top (or, if you prefer, bottom) of its head. This injector worked quite well, but it was bulkier than the flap-valve type, and it was also more fiddly to make, particularly the poppet valve, which was made from stainless steel.

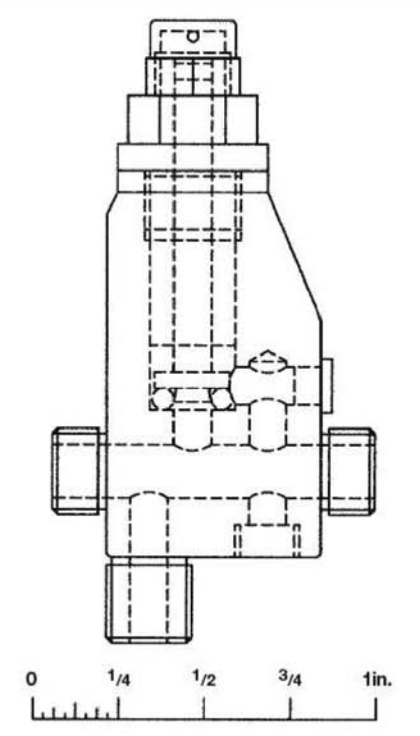


Figure 1: Poppet valve injector

So now for what LBSC used to call *"the words and music"* about the flap valve, shown in **fig 2**. I suggest that if you have not already made one, you should start by making a 'double-ended adapter' for 1/4in. x 40tpi You will need this for holding the injector during manufacture. Cut off about 2in. of 3/8in. dia. round brass rod, and catch it up in the 3-jaw chuck, which you should tighten using that socket which causes the work to run the most true. Make a centre-pop against No. 1 jaw as a guide to replacing it.

Face off the end, centre it with a 1/4in. centre drill, and drill in for about 1/2in. with a smallish drill; 7/64in. would do nicely. Now open up by degrees to 7/32in. and put a shallow countersink in the end, for which the same 1/4in. centre drill will again serve. Tap the hole 1/4in. x 40tpi, starting with a 'second' tap held in your tailstock chuck. Carefully clear off any little burr, leaving the end of the work nice and smooth, so that anything screwed into the adapter will be sure to run true.

The Author's flap valve injector.

Now reverse the work in the chuck, making a centre-pop as before, face off the end, and turn a 1/4in. dia. spigot 1/4in. long. You should undercut this cylinder by 0.015in. at the end nearest to the chuck, and make sure that the cheek is nicely finished, since work held on this end later depends on accuracy here in order to run true. If I were doing it, I would now cut a 40tpi thread on the spigot by screw-cutting in the lathe; in brass, it doesn't take long, and if your lathe, like mine, has an 8tpi leadscrew, you can pick up the thread anywhere, as 40 is an exact multiple of 8. I would not disagree with anyone who finished the thread with a 1/4 in. x 40 die, but if you want a good fit, you really need something like a union nut with the same thread to try it with, starting with the die opened to its full extent in your tailstock die-holder, and closing it by degrees.

With this adapter ready for action you can now proceed with the body of the injector, by cutting off (in my case, from a bar of cast gunmetal which I got the foundry to run for me) a piece which you can machine, using the 4-jaw chuck, to a full 1 x 1 1/4 x 7/16 inch. I shall continue with this work in my next letter.

Your affectionate Grandpa.

●*To be continued.*

Inside the Author's flap valve injector.

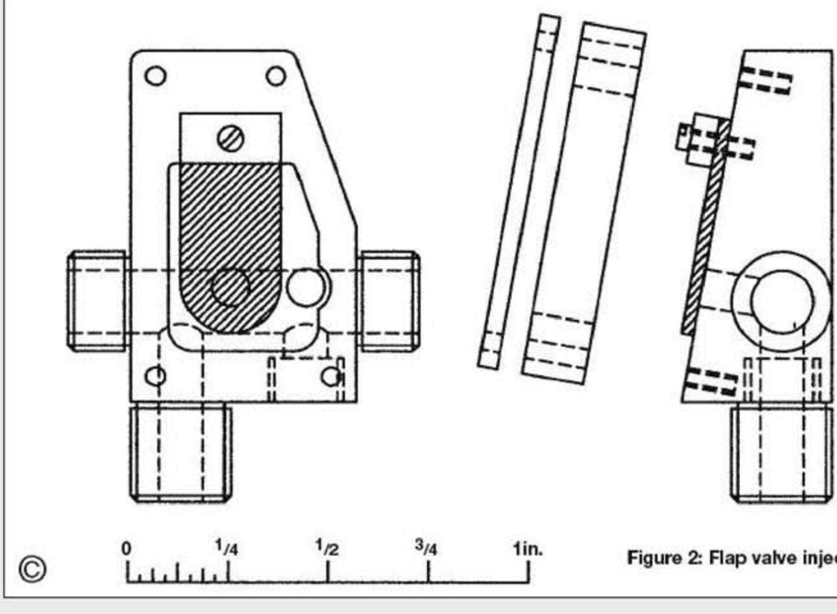


Figure 2: Flap valve injector

KEITH'S COLUMN

Wilson's Words of Wisdom:
To admit ignorance is the first step towards gaining knowledge.

LOGGER & SLOGGER
AMERICAN TYPE 2-8-2 LOCOMOTIVES
for 5in. and 7 1/4in. gauges

Keith Wilson
makes a start on the boiler fittings with notes on water gauges and steam stop valves.

●*Part XXIII continued from page 395 (M.E. 4205, 3 October 2003)*

Now, while I can safely claim to have at least a nodding acquaintanceship with Great Western locomotive practice (how's that for a modest understatement?) I can make no such claim concerning American locomotive practice. Therefore, I can only offer boiler fittings which have stood the test of time.

A slight modification to the water gauge as described for the Saint and 47 would seem to meet the case. In fact, the gauge could be used exactly as Saint-shewn, but in case anyone would rather use screw-in rather than bolt-on fittings, this alternative is shown. (My use of different spellings for shewn/shown depends on the locomotive with which I am dealing at the time.).

As mentioned recently, threads may be varied to suite country standards, however I do not recommend the use of threads any finer in pitch than those I have specified. Diverting slightly for a moment, I wonder why standard pipe threads are so seldom employed or shown in model engineering; locomotives in particular? There are only six within our range, anything over 3/4in. BSP would seem to be little use for us.

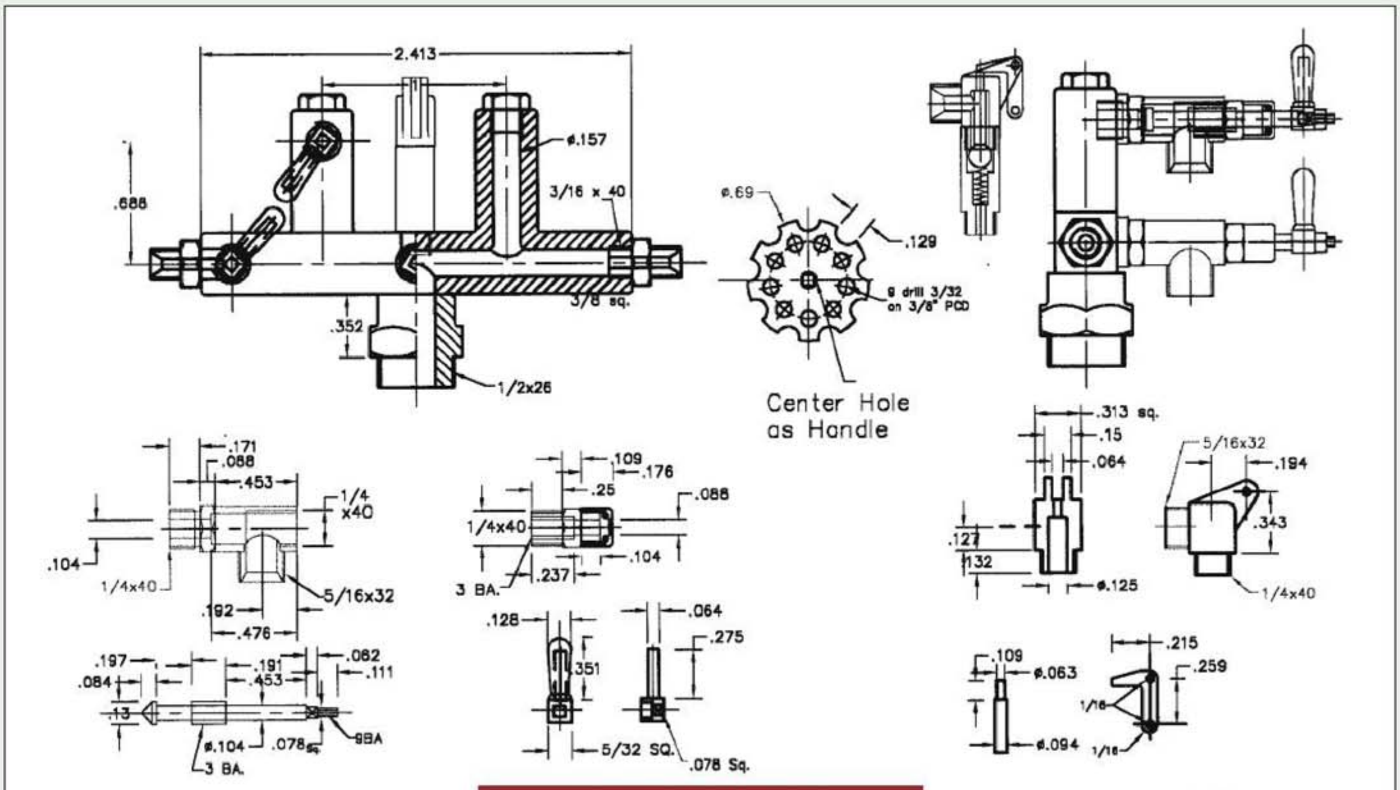
BSP thread (in.)	Threads per inch	Outside diameter (in.)	Comment
1/8	28	0.383	So close to 3/8in. x 32tpi that it hardly offers any advantage
1/4	19	0.518	Close to 1/2in. BSF
3/8	19	0.656	
1/2	14	0.825	
5/8	14	0.902	
3/4	14	1.04	

The above list shows that a useful range of diameters is opened up to us, and especially if occasional unscrewing of the joint is necessary, the coarser pitch has great advantages. Faffling around in a smokebox is not one of the lighter matters and cross-threading a fine thread is easier than might be thought. Added to which, commercial BSP fittings such as union nuts can be obtained. A further advantage is in thread strength: although 'scale' threads are theoretically possible, to get equivalent/relative strength would mean 'scale' tolerances! Work that one out.

Back to work: regrettably, gauge glass is not a precision product. Nominal 1/4in. diameter gauge glass is usually a bit oversize; however 'O'-rings are fairly flexible and since the seal is static rather than rotational or sliding, there should be little trouble. A reasonable dealer might be persuaded to select one or two pieces of gauge glass close to the nominal size, alternatively get your glass first and make the fitting to fit.

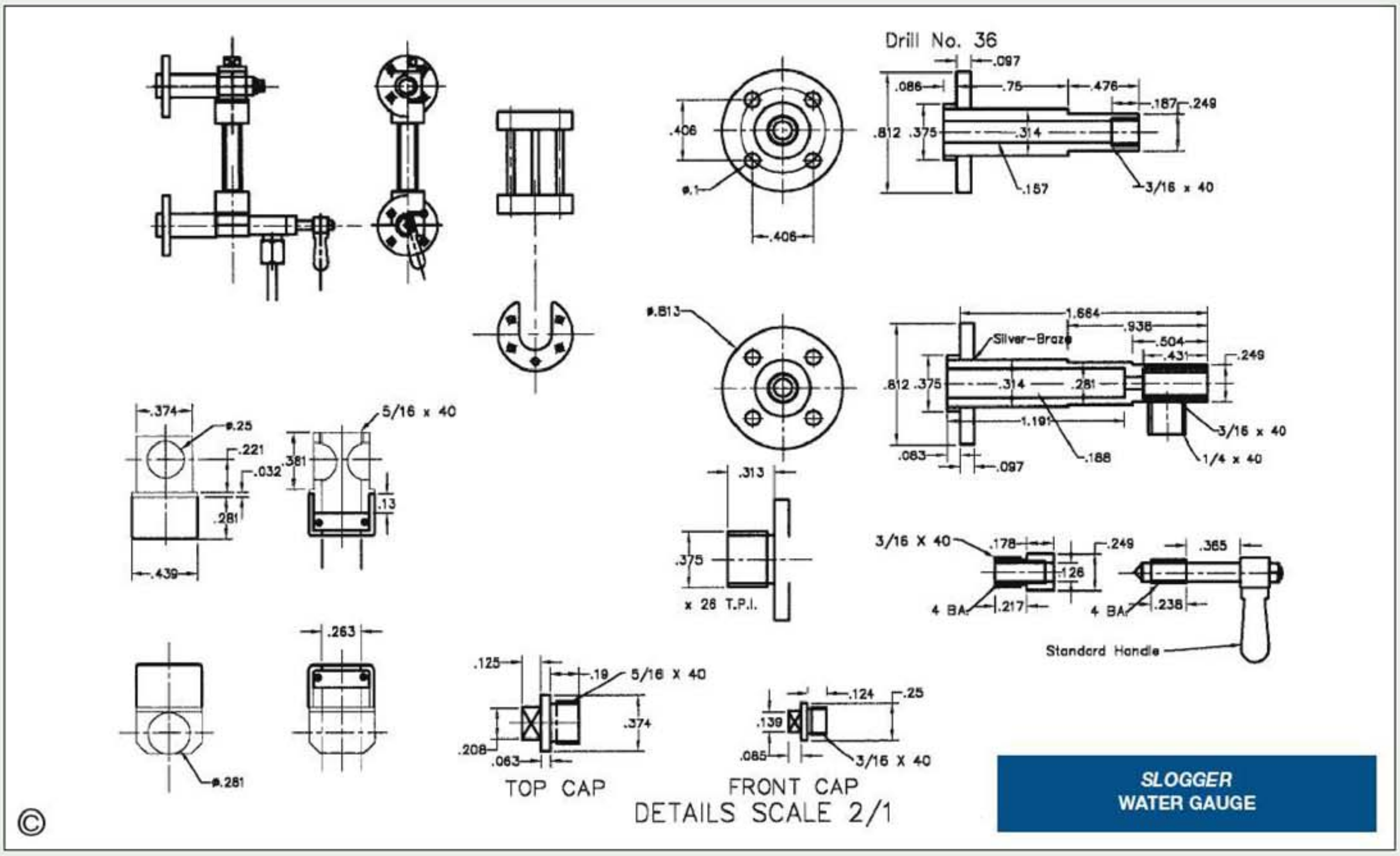
Plain 'O'-rings will suffice, there's no need in this case to go for Viton ones. This type of seal is such that even when in steam, the glass itself can be rotated by finger-pressure alone without breaking the seal, but the practise is not recommended as a regular procedure.

Inserting the glass into the final set-up may presents some minor problems. It probably won't go in at first, but if the end is bevelled off with medium emery paper and the glass is lubricated by some saliva (very effective lubricant here) you should have no problem. To cut the glass to length,



LOGGER FOUNTAIN UNIT

WHISTLE CONTROL VALVE



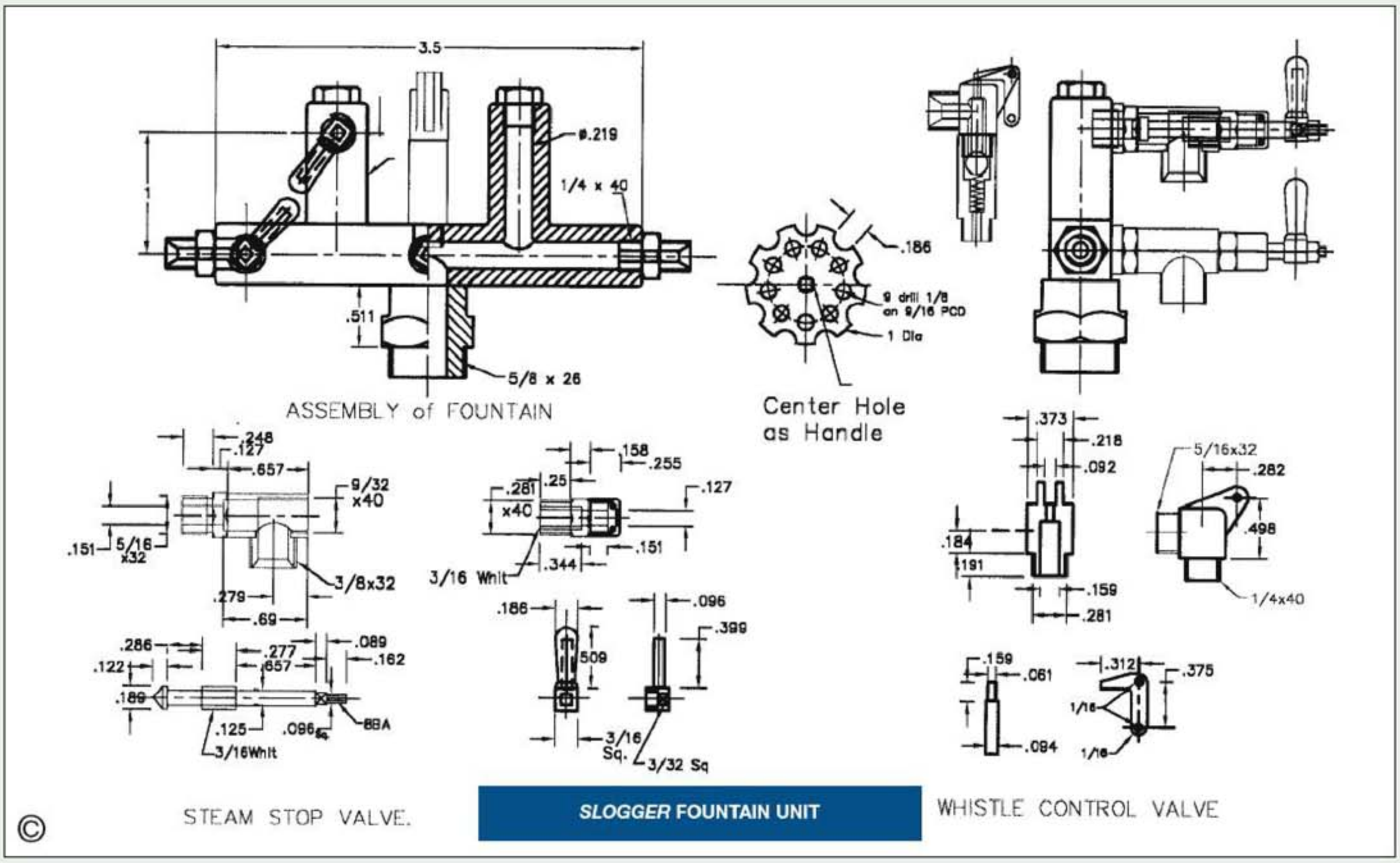
SLOGGER WATER GAUGE

merely use a small triangular (for preference) file to make a nick at the correct length. Hold the glass with this nick pointing upwards, 'bend' the glass away from this nick with fingers and the glass will snap in two, usually dead square for good measure.

My drawing also shows a gauge-glass guard, should you require one. The gauge can be screwed into the boiler bushes, or bolted thereto with 7BA bronze studs and brass nuts.

If you decide to screw the gauges into the bushes, you will discover for yourself an intriguing fact. Either the fitting will become tight long before the right position is attained, or it will tighten just after lining up — malicious asterisk little things. The easiest way out is to anoint the thread with Loctite 532 (Thread Sealant) before screwing in. This is roughly the thickness of treacle and if left to itself in the joint will set hard, but not too hard to be un-screwable should the need arise. Leave the fittings lined up, as if it was not obvious, and all will be well.

Due to further technical problems with my computer, I regret that I have not had enough time to fully prepare drawings for the 5in. water gauge. To modify an old adage: time, tide and editorial deadlines wait for no man. In any case, a water gauge is something that cannot be scaled (from



SLOGGER FOUNTAIN UNIT

View of the backhead of the locomotive parked up on a remote siding at Ladysmith, east of Vancouver Island, British Columbia.

full size) because the laws of Nature are rather difficult to avoid. Capillary attraction means that for water in glass (as well as in many other combinations of substances) the level will be higher than the true level due to the wetting action of the water. In a small tube, this will actually lift the water in the tube slightly; the amount depending on the internal diameter of the tube.

It follows, just as dust carts follow Lord Mayors' shows, that for very small tubes this lifting is quite high. I would not, for example consider using less than $^1/4$in. O/D tube for any $7^1/4$in. gauge locomotives, $^3/16$in. being the lower limit for 5in. gauge engines. Go below this for any gauge, and you've got to look out. I am probably over-cautious here and if corrected will accept the amendment, but I always prefer *working* locomotives and the easier they are to control the better. Water height in a large steel boiler is of supreme importance; in small copper silver-brazed boilers it is far less so. Even running such a boiler completely dry is unlikely to actually do much damage, if any, for as the blower goes off the fire will rapidly die. However I do *not* recommend this practice as a regular one.

Scrutiny of the photographs accompanying this article show quite respectable numbers of small valves, all fitted with nice red handle wheels. Exactly what they all do (or don't), as the case may be, is beyond my current knowledge. Also, if scaled, they would be confoundedly small and therefore somewhat flimsy. Whatever they are for, I would be very surprised if we needed them all. I can see a requirement for:

Whistle valve.
Steam to donkey pump (air for brakes).
Two steam valves for injectors.
Steam supply for oil-fired system.
Blower.
Fitting for steam pressure gauge.

A manifold of some sort is indicated, with at least five valve outlets, one lever outlet, and one for the pressure gauge. A manifold with a spare outlet appears herewith; the spare would be blanked off with an appropriately sized stainless or bronze ball trapped beneath a union nut. A spare access route to or from the boiler can be useful.

To discuss the location of valves, it seems to me that some valves are more (or less) often used than others. Thus blower and injector valves would be most often used but a donkey pump valve rarely (to be fitted with an auxiliary shut-off valve operated by air pressure, if I can design one). The whistle is operated by a chain, so the location of this is less exacting. In full-size, some valves could be supported by their associated pipework, rather like injectors in our sizes, but whereas injector stresses are much less for us, non-scale drivers are not; old square-cube can work both ways depending on circumstances. It follows that our control valves are best mounted on a strong manifold where room is needed for fingers to operate them, plus room for pipework.

The manifold is a fairly solid affair and can either be made from solid or built up.

From manyfolds to manyvalves

I see little reason for having valves of different sizes for minor differences in applications, so herewith a simple screw-in valve that will pass steam and enough for all purposes. It is fairly pure Swindon, but the main points are

a: it is a captive valve, i.e. cannot come unscrewed, and

b: is compact and easy to operate; if made with the handle shown it can normally be operated by one finger.

Sealed by an 'O'- ring, it will last indefinitely. I suggest that this is a useful all-purpose steam stop valve that is not too tricky to make, works well and can be used on almost any locomotive. With $^1/4$in. pipe, it will handle the steam needs of a $3^1/2$ pint injector, possibly more; and that size of squirt is not out of place on a $10^1/4$in. gauge engine.

About the only tricky item to make in this valve is the valve stem, 'tis a bit on the flimsy side from the machining point of view.

If $^3/16$in. diameter stainless steel rod is chucked with only about $^1/2$in. protruding from the chuck jaws, the 8BA bit on the end is easy to deal with; the square portion can also be filed easily; it does not have to be perfect. With about 1in. protruding, the $^1/8$in. portion is easy, followed by pulling the stem out some more. Cut the recess, then the thread. At 24tpi. it is fairly coarse, so screw-cutting is recommended, followed by use of a die to finished the thread to form and size. Pull out a bit more bar, partly part off and cut the recess and bevel, then finally part off. I made a special die for this, for the commercial die I had seemed to be a bit small on the minor diameter and left marks on the $^1/8$in. portion of the stem.

My die was carefully made to clear $^1/8$ inch. Now, I know that the standards of engineering show clearance here, but I had a bit of trouble from scratching — why I do not know. I recommend screw-cutting for these threads, followed by the die as a chaser. It must be remebered that the Whitworth thread is a very coarse one, and cutting it direct on stainless steel using a die is likely to be hard on the die. The life of taps, even in brass, is not overlong, but with a little care and use of a tapping drill a couple of sizes larger than prescribed will save both taps and tempers.

Note that the little cap for the 'O'-ring leaves about $1^1/2$ times the thickness thereof width-ways; a gap which is only just wide enough — you certainly will have work to insert the ring, I have never succeeded; but with the extra clearance it is quite straightforward.

If, rather than 'wood' handles you would prefer to use wheels, they can hardly be made from anything other than metal, most of which are rather good conductors of heat. If you use stainless steel, which has a poorer thermal conductivity than many other metals, hot handwheels may not be quite such a problem but stainless doesn't take paint very well. The small diameter stainless steel stem also attenuates the heat flow; however it is of course your choice. Synthetic resin bonded paper or fabric (SRBP or SRBF, perhaps better known as Paxolin) may be be used; it is easy to machine but is the wrong colour and doesn't take too kindly to paint. I have made many control handles over the years using SRBP but other materials are available including Tufnol and Orcot.

●*To be continued.*

Reminiscent of a 'Rio Grande' but diesel powered.

Passengers travel in open sided, roofed carriages.

RATANGA JUNCTION A MONEX THEME PARK

Mike Thurgood in Cape Town, South Africa, reviews some of its features which may be of interest to model engineers.
●*Part I*

Monex is a South African company primarily concerned with the commercial development and running of large commercial complexes. Their Century City development, which is located about 12km from the centre of Cape Town, currently comprises a large office complex and a Theme Park called Ratanga Junction. When completed, other facilities will include an enormous shopping mall, hotels, a conference centre and residential properties.

The concept of the Ratanga Junction Theme Park is based on an old and dilapidated mining town with a nearby very run down railway junction — early 20th Century mythology brought up to date! And such it looks too, with its brand new derelict buildings! And if that anachronistic statement appears to be stretching the point, come and visit the Theme Park on your next visit to Cape Town. Large areas of corrugated iron sheeting have been installed at precarious angles on various buildings, and other buildings look like they've been transported straight from North Africa. However, for the wary, the more dilapidated-looking buildings really are new, and are perfectly safe.

The Theme Park has four roller coasters which graduate in the thrill they offer from one for quite young persons to the extraordinary Cobra spiral coaster, guaranteed to relieve you both of your false teeth and wig! Passengers ride on this coaster underslung from the track structure whereas conventionally, one normally rides atop the track. Feet and legs therefore flounder about aimlessly although of course, passengers are very firmly encased in their seats. Rides on this

Passenger travel is somewhat exposed!

Locomotive and passenger cars were made in the UK.

Piles of barrels add to the scene of dereliction of this mining town.

The 2ft. gauge railway track runs close by one of the roller coaster rides.

This roller coaster features a cute US type loco along with mock sleepers.

A few old tip-up trucks enhance the mining town theme.

A replica mining town station; note the 2ft. gauge low loader truck at left.

Inside looking out: enjoying a ride on the 2ft. gauge scenic railway.

coaster are stopped in high winds for safety reasons. These four roller coasters comprise only a small part of the activities in the Theme Park.

So what's this commercial plug got to do with model engineering, you may be asking? Well, superficially, not very much until you actually start to investigate in somewhat more depth, looking at the potential for modelling some of the full scale scene, including a 2ft. gauge scenic railway track round the park, a magnificent horizontal mill engine, 2ft. gauge Garratts, and a Fowler tender loco and, not the least — roller coasters! I will deal with the following four items separately: the light 2ft. gauge scenic railway, the horizontal steam mill engine, a modified 1914 Fowler 0-4-2 tank locomotive with tender added, which has been refurbished, and four 2ft. gauge Garratt locomotives which will remain as static displays in their derelict state for the foreseeable future. I have also included some brief notes on the present state of industrial preservation in South Africa.

Light 2ft. gauge scenic railway

This track more or less traces a circuit of the Ratanga Junction Theme Park. The loco is a much simplified version of an old-type US 4-4-0 steam loco with tender, something like a Rio Grande type, but with a tall chimney instead of a spark arrester; **photo 1** shows it just entering a crossing. The loco is very basic with open-ended cylinders and no valve gear! No, it's not actually operated by pedal power, but by a diesel motor mounted in the tender; note the repair patch on the tender side to emphasise its antiquity! The original loco type, though not this version, is a typical subject for serious model engineering in the States, usually in $7^1/4$in. gauge. Both the loco and passenger cars were in fact, constructed by a British firm for the Theme Park.

The passenger cars are roofed, but open-sided, as can be seen in **photos 2** and **3**. Another view

The Monex Ratanga Junction theme park features several small lakes.

Take-off loop from the 2ft. gauge railway to the locomotive workshops.

The route passes a pair of derelict 2ft. gauge Garratt locomotives.

A view of the 2ft. gauge locomotive with swing boat ride in the background.

of the train is shown in **photo 4**, and the track is seen in **photo 5** with numerous barrels which are a part of the derelict mining town scenario, piled up at all sorts of odd places round the track. **Photograph 6** shows another view of photo 5. The oil drums and part of the track are running near to one of the roller coasters, while **photo 7** shows what looks like a train running on the same coaster. Note the distinctly odd and unsafe-looking mock sleepers, laid between the proper structural supports for the coaster track which are at regular intervals. I wonder, has any model engineer yet tried modelling a roller coaster?

Photograph 8 shows a few old tip-up trucks obtained from a mine or quarry, but these are most unlikely ever to be seen in real action again.

Swing boat drive mechanism.

'A priceless example of … craftsmanship.'

One of the artificial stone 'drawbridge' towers.

The impressive Cobra spiral roller coaster.

Photograph 9 shows the train at a replica mining town station, with a genuine 2ft. gauge low loader truck on the left in the photo. **Photograph 10** was taken looking along the coaches; the structure of their sides and roof is clearly seen.

Photograph 11 shows the track running over a re-entrant from a small lake. Interestingly, the area on which Ratanga Junction was constructed included a small wetland area and local environmentalists got very uptight about the possibility that this area might disappear in the construction work for the theme park. In the event, Monex agreed to incorporate this wetland into the theme park, hence the presence of the small lakes. The building seen in the background of photo 11 is typical of those to be found around and about the Theme Park, dropped down from somewhere in Algeria!

Photograph 12 shows the take-off loop, left foreground, from the 2ft. gauge scenic railway to the loco workshops, where the track has been laid with heavy duty steel rail. The end of the workshop appears in photo 29 in a later part of this series. Other 'typical' Theme Park buildings can be seen in the background of this photo. **Photograph 13** shows the derelict Garratt locos in the background, the far left one being partly hidden by trees. **Photograph 14** is another view of the mock steam loco; I would expect the wood in the tender to eventually disappear for braai wood (for *braai* read *barbecue*).

The structure in the background is a quite large swinging 'boat' which is swung and braked by an electrical motor-driven wheel and pneumatic tyre working by spring friction contact on the underside of the 'boat' body (**photo 15**). Although it looks as though the 'boat' body is dipping in the lake in photo 14, it isn't, of course, as can be seen in photo 15 with the lake in the background behind the concrete wall. The 'boat' had swung up and towards me, right above my head, as I took this photo, in which the drive mechanism can be clearly seen. No, there was no risk of my head being decapitated by the body of the 'boat'!

On walking around the Theme Park one comes across a 'fixed' drawbridge, or a fixed 'drawbridge'? with magnificent artificial stone towers, one of which is shown in **photo 16**. Its non-working lifting and lowering handwheel is shown in **photo 17**, a priceless example of the expert handyman's craftsmanship in times long past! Finally, I can't end this section without at least one photo of a part of the dominant feature of the Theme Park: the extraordinary and scary, Cobra spiral coaster (**photo 18**). At my age I haven't had a ride on it, nor do I intend to do so!

●*To be continued.*

CLUB CHAT
With Malcolm Stride

UK News

The latest edition of the *Coupling Rod* from the **National $2^1/2$" Gauge Association** reports a visit by Frank Johansen to the Wirral Society in April to attend a party to celebrate his 90th birthday. Frank is one of the early members of the association and was a regular runner with his *Flying Scotsman*. May we join in wishing him a belated happy 90th birthday? They also report that my predecessor on this column, Stan Bray, has purchased a set of $2^1/2$in. gauge New Zealand Kb class locomotive drawings. Stan joins the association as an honorary member. The South Eastern Area summer rally at Worthing started dull but was blessed with a sunny warm afternoon. David Markwick's NZ Kb class loco was displayed in the steaming bay. Much progress has been made, but there's still lots to do. First on the track was John Llewellyn with his *Fayette*; they had a good run. Ron Lane's recently completed *Green Arrow* struggled when the locomotive became very stiff; it is thought this may have been due to insufficient clearances in the bearings. I must admit to being one of those model engineers who believes in allowing space for the oil. After all, metal parts can only wear when they rub against each other! John Cook prepared his S15 but had to abandon the attempt when a union cone broke. Peter Gardner got his *Netta* going and had a good run at speeds approaching scale speed. Andrew Dick steamed *Josie* but had problems maintaining steam pressure. Ian Gorsuch steamed his unpainted Atlantic and had a good run. Tom Glinister's *Gwen Elms* did not do so well with a performance reported as being closer to a single cylinder locomotive. The companion *Steam Chest* journal from the Association has some comments on using tender mounted axle driven water pumps. This sounds like a great idea to keep the bits easy to get at, but it obviously involves another high pressure connector to the tender.

We have had news from Ivan Hurst, Chairman of the **Ascot Locomotive Society** that work will commence on the race course site in Spring of 2004. This means that the last members' steam up will have taken place on 5 October. We hope that the society will be back in action as soon as possible but in the meantime we are sure that members will be welcome at other tracks in the area to keep their hand in. (Apologies for the late entry of this item, but it was delayed in the recent Nexus office move)

The recent public outing run by **Bournemouth DSME** for J. P. Morgan was voted a big success, everybody involved having an enjoyable day and the public awareness of the society being raised significantly. A proposition to make Mr. and Mrs. Ganderton and Mr. and Mrs. Baker life members for the work they have put in for the society over many years was agreed unanimously. The council is planning an official opening of the new track but no date has yet been set. On 19 November the society is presenting an evening of archive films by Jack and Anne Bath.

Goffs Park Light Railway, home to the **Crawley Model Engineers** has been having problems with the track buckling due to the heat of this summer, but have nevertheless had some good running days despite the heat. Due to this, on 8 August John Wilks' *Crampton* was derailed on its first run but John managed to catch it by the spectacle plate before it tipped fully over. The track men managed to get most of the track open, so out and back runs were provided over 75% of the circuit. The track apparently shrunk back when the sun went in and the takings were boosted by two small boys who arrived with about £30 in a polythene bag and had several rides. At a later event one member was observed taking pictures with *"his new digital camera."* Perhaps he could send some of his photos to *Club Chat* for publication, it is always good to see as well as read about all the activities.

The recently formed **East Somerset SMEE** is reporting good progress with negotiations for the track site with a building being dedicated for members' use and detailed discussions taking place on the lease for this and the track. The society has a new website up and running on **www.essmee.org.uk** which has latest news and lists of club events. The club has a good programme of winter talks including a talk on 'Industrial Locos' on 20 November by Peter Evans. Contact Patrick McCormack on 01749-689037 for more details.

The **Erewash Valley MES** barbecue night on 14 July was well attended and everyone enjoyed themselves in the good weather. The only ones who perhaps didn't were the 'workers' who spent their time cooking and serving, running the tombola, raffle and car parking. The drainage improvements are working well and are continuing. The cover of the newsletter carries a picture of the German pacific locomotive 18-201 which is still certified for 180kph running. The club visit to Peterborough SME went well and was attended by a good number of members with locomotives. The club is now planning for Bonfire Night celebrations and a visit by Santa Claus in December.

Arthur Boddily's superb Austin racer took the Midland Federation Trophy and pride of place on the Northampton SME stand at the recent Town and Country Festival at the RASE, Stoneleigh.

Fylde SME member, Ron Strachan, was awarded the Brian Sandbank Silver Salver for his $7^1/4$in. gauge 'O' Class 0-4-4 NER tank loco. Ron prepared his own drawings using CAD because no detailed drawings are available. Congratulations are due to Ron who was also one of the members who recently attended the Ribble Valley Live Steamers.

Mr. M. Baker from **Ilford & West Essex MRC** is trying to dispose of the surplus magazines from the club library. Among other things, he has two dozen boxes of *Model Engineer* dating from 1930 to 1990. He is compiling a catalogue of the 90 assorted boxes of titles and can be contacted on 01708-452728 (day and evening).

Recent events involving **Leicester SME** included the 'Spokefest' held in Abbey Park near the club track. This was a festival of cycling and included some very unusual versions including a circular seven seater machine. Some of the 'pedal pushers' sampled some rides on the track and at least one LSME member, Chris Berry, sampled the seven seater cycle. The club hosted visitors from Oxford SME recently and locomotives included Mick Tandy's *Black Five* and Peter Lawson's *Loch Laiden*.

The names of Trophy winners at the Whissendene Rally organised by **Melton Mowbray DMES** have been published and are as follows. *President's Shield*: Brian Marshall; *Lord Gretton Memorial Bowl*: Norman Smedley; *Melton Mowbray Challenge Cup*: Peter Nixon; *Bill Newcombe Cup*: Dave Robertson; *Falcon Challenge Cup*: Eddie Lancaster; *Stapleford Cup*: Stewart Jackson; *Stokes Trophy*: Peter Heath and *Rutland Shield* by Dave Calvert. A good selection of trophies indeed, and our congratulations to all the recipients.

The weekend of 4/5 September 2004 has been set aside for the Diamond Jubilee celebrations of **North London SME**. A celebration dinner is also planned for the Autumn. The hot summer weather has prompted some reminders about watching out for fires when running and also for 'kinks' in the track. The marine section open day took place after some effort to clear a sudden infestation of blanket weed in the weeks before the event. The water level was also the highest seen at the Colney Heath site and involved an 'unscheduled paddle' to sort things out. Some 15 visitors arrived with a dozen boats before lunch and more than 24 more arrived after lunch but with no boats! The model car section reported an eventful trip to Uden in Holland for an eight hour race. I won't go into full detail but it involved ostriches, hen nights, Elvis and a nurse and a big wheelie bin full of bottles. After this the team gained second place in the race.

The newsletter of **Norwich DSME** has a new Editor in the form of Allan Berry. Having done that job in the past I wish him all the best. Allan reports a very interesting talk by Barry Draper on microscopes. Barry brought some of his collection and explained the history of such things. The newsletter carries a photograph of the cake presented by the Womens' Institute at the recent exhibition at the Hewitt School. Bill Roebuck has described the fitting of Southern valve gear to his *Tich* with a very good description of the gear itself. Bill has some 'anomalies' with the result and will no doubt appreciate some advice.

In Memoriam

It is with the deepest regret that we record the passing of Stanley Marsden of Norwich DSME. The sympathy of staff at *Model Engineer* is extended to the family and friends he leaves behind.

The Honorary Secretary of **Saffron Walden DSME** walked the track on the hottest day of the year and was surprised that it was still laying basically flat. Some of the bends had moved out about $1^1/2$in. but stayed flat or with a slight lift which would be pushed down by locomotives. The newsletter includes a photograph of an interesting looking dual gauge 'flexy point'. Hopefully we will hear how this works in the future. Phase one of the new signalling system is coming to life with four of the ten signals now functioning. This incorporates an automatic 'calling on' function to avoid unnecessary delays.

The **Sutton SME** winter programme includes a talk by Peter Woolhouse on 13 November on the 'History of the RNLI'. Further details can be obtained from Mike Dean on 020-8657-5401.

Members of **Tyneside SMEE** had a talk on the building of the 'Steam Elephant' by Jim Rees, Keeper of Industry at Beamish Museum (where the 'Elephant' has been in service for the past year). Jim had slides to illustrate the building process and highlighted some of the compromises needed to cope with current health and safety legislation (including brakes!). The Editor reports that most of the recently replaced old trackwork has now been removed from their site and plans are being made for new steaming bays and ground level track. John Moore has donated a 28in. ride-on mower to the club which should ease the task of grass cutting in future.

World News

Australia

Member No. 96, of the Hornsby ME Co-operative in New South Wales has suggested a better use for the new library building. He wonders if it could be put to better use as a place to provide *"respite care for burnt out diesel locomotive drivers. A place where the drivers could come, perhaps alone or in small numbers and spend a short time in the peace and quiet of the tranquil surroundings of Galston."* He also suggests that provision of a TV and a selection of steam locomotive tapes might assist the recovery of these *"battle weary souls."* Model locomotive driving must be tough in Australia! The site has also suffered in the recent drought; several trees have had to be removed and hazard reduction burning is to be carried out. The club has decided not to replace the $3^1/2$in gauge rail on the inner loop when track replacement is commenced. The track will therefore be exclusively 5in. gauge. Brian Day has taken over as Chief Boiler Inspector after Ross Forsyth stood down following many years of service in the post. A good selection of locomotives attended the recent 'D-Day' (diesel day) event including Ian Hoerlein's unusual Queensland Railways railcar which looks like a motor coach on bogies. A group of approximately 25 'Wednesday Geriatrics/Workers' *(their words!)* paid a recent visit to Cockatoo Island and had a very interesting tour of the old facilities and workshops. This was helped by member Brian Day who proved to be a fund of knowledge on the history of the industrial development.

Canada

Members of **British Columbia SME** enjoyed a good 'Trainfest' event including a chicken dinner on the Saturday evening. The number of passengers carried was in the top ten ever at around 1100 despite the rain on Saturday afternoon. The club took 20 feet of portable track and Walter Pruden's Canadian Pacific No. 374 to the local Science World. The locomotive was hooked up to the building's compressed air supply so that it could be run back and forth and the whistle blown. This attracted considerable interest. Member John Ostler has produced an exhaustive list of standard whistle signals to be used when driving. These are from the standard North American Railroad whistle signals.

Dave Powell, a past President of **Toronto SME** achieved a record score in the recent OMLET event hosted by Golden Horseshoe Live Steamers at their Hamilton Park Track. At a recent meeting John Nicolades brought his recently completed radio controlled F1 Ferrari complete with disc brakes and 3hp engine.

New Zealand

The Micrometer, newsletter of **Auckland SME**, carries an article on the Denbigh mill manufactured at one time in Tipton in the UK. There is also reference to a useful internet link for those wanting information on machine tools: **www.lathes.co.uk** has a range of useful information and is well worth a visit. At the August 'Bits & Pieces' evening Kevin Ryan showed a horizontal engine which was produced from a Graeme Quayle designed kit. The engine was reputed to run on *"breath pressure"* and the comment was made that *"Perhaps one of our more voluble members could effect motion."* Derek Simons brought along a printer's rule marked in 'points' and this led to a discussion on various types of rules resulting in the tale of someone who used a pattern makers shrinkage ruler and wondered why his work turned out larger than expected. Roger Van Ryn brought along a Van de Graaf generator which was fired up later in the evening and being low power was used to generate sparks jumping across to members' fingers. The society has an excellent web site on **www.asme.org.nz**

Hutt Valley MES has gained initial planning approval for the first stage of the proposed track alterations. A model will now be built to check the feasibility of the 'up and over' configuration. Progress has also been made on the preparation of the area for the new storage tracks.

Maidstone MES reports a recent burglary during which the brand new security locks were cut off. Some tools and the newly acquired microwave oven were stolen. I have no doubt that unfortunately many readers will have experience of this sort of situation. Mike Wheelwright reports his visit to the IMLEC 2003 event at Ashton Court, the home of the Bristol Society here in the UK.

At the recent AGM of **Otago MES**, member Ian Bacon was presented with a badge acknowledging the fact that he had been a member for 50 years. Congratulations to Ian, perhaps we could have news of other equally long serving members of societies?

CLUB DIARY

A minimum of 6 weeks notice is required for diary entries. Clubs and Societies are asked to include a telephone number for the assistance of would-be visitors.

OCTOBER

31 **Hereford SME.** *Peter Korrison: Brighton Radial Tank.* Contact Richard Donovan: 01432-760881.
31 **Historical MRS (Essex Area).** *Dan Glading: GOG Video/Slide Programme.* Contact Jem Harrison, 27 Colne Place, Basildon, Essex SS16 5UZ.

NOVEMBER

1 **Isle of Wight MES.** *Track & Pond.* Contact Ken Stratton: 01983-531384.
1 **North London SME.** *Hallowe'en Night fun at Colney Heath.* Contact David Harris: 01707-326518.
1 **Romford MEC.** *Fireworks Night.* Contact Colin Hunt: 01708-709302.
1 **SM&EE.** *W. J. M. Cairns: Unusual Engines.* Contact David Boote: 01202-745862.
1 **Society of Ornamental Turners.** *AGM.* Contact N. S. Edwards: 01234-359392.
1 **Surrey SME.** *Steam into the Dark.* Contact John Cook: 020-8397-3932.
1 **York City & DSME.** *Bonfire Steaming Event.* Contact Ken Bateman: 01904-421445.
2 **Bure Valley Rly. (Friends of).** *Teddy Bears Day.* Contact Paul Conibeare: 01263-733858.
2 **Cheshire Live Steamers.** *AGM.* Contact Tricia Sturgeon: 01606-48586.
2 **Hornsby ME.** *Sailing Day.* Contact Ted Gray: 9484-7583.
2 **Leicester SME.** *End of Season Run & Bonfire Party.* Contact Raymond Wallis: 01162-858824.
2 **North London SME.** *Colney Heath Winter Working Parties Commence.* Contact David Harris: 01707-326518.
2 **South Durham SME.** *Running Day.* Contact B. Owens: 01325-721503.
3 **Historical MRS (London Area).** *John Lewis: GWR Railmotors.* Contact John Millbank: 0208-948-0556.
3 **Lancaster & Morecambe MES.** *Review of 2003.* Contact Harry Carr: 01524-411956.
4 **Romney Marsh MES.** *Alan Crotty: South African Railways.* Contact John Wimble: 01797-362295.
4 **South Durham SME.** *Meeting.* Contact B. Owens: 01325-721503.
4 **Stamford MES.** *Bits & Pieces.* Contact David Ash: 01780-751211.
4 **Surrey SME.** *Video Night.* Contact John Cook: 020-8397-3932.
4 **West Wiltshire SME.** *John Laverick: The Thames & Severn Canal Restoration.* Contact R. Nev. Boulton: 01380-828101.
5 **Andover DMES.** *Bits & Pieces.* Contact John Berry: 01960-882616.
5 **Bradford MES.** *Auction.* Contact John Mills: 01943-467844.

5 **Bristol SMEE.** *Mike Keighley & Bob Lilley: The Fell Locomotive.* Contact Trevor Chambers: 01454-415085.
5 **Cardiff MES.** *Firework Display.* Contact Trevor Jenkins: 029-2075-5568.
5 **Chingford DMEC.** *Bits & Pieces.* Contact Martin Masterson: 0208-989-5552.
5 **Guildford MES.** *James Hill: Model Gas Turbines.* Contact Dave Longhurst: 01428-605424.
5 **Leeds SMEE.** *Bonfire Night Steam-Up and Supper.* Contact Colin Abrey: 01132-649630.
5 **Tyneside SMEE.** *Guy Fawkes Night Steam-Up.* Contact Ian Spencer, 0191-2843438.
5 **West Riding SLS.** *Bonfire, pie, peas & loco night running. (Weather permitting!)* Contact David Batty: 01924-363908.
6 **Cardiff MES.** *Tony Bird: Repairing a Tower Clock.* Contact Trevor Jenkins: 029-2075-5568.
6 **Leyland SME.** *Video Night.* Contact Mark Entwistle: 01772-422411.
6 **South Lakeland MES.** *Meeting.* Contact Adrian Dixon: 01229-869915.
6 **Sutton MEC.** *Bits & Pieces.* Contact Mike Dean: 0208-657-5401.
7 **Canvey R&MEC.** *On the Table.* Contact David A. Clark: 01375 846921.
7 **Colchester SMEE.** *F. Beckett: Essex Sailing Barges 1800-2000.* Contact L. G. Hammond: 01376-511686.
7 **Frimley & Ascot LC.** *Annual Dinner.* Contact Bob Dowman: 01252-835042.
7 **Maidstone MES.** *Videos and Cakes.* Contact Martin Parham: 01622-630298.
7 **North London SME.** *General Meeting.* Contact David Harris: 01707-326518.
7 **North Norfolk MEC.** *Dr. Cooke: Charles Babbage.* Contact Gordon Ford: 01263-512350.
7 **Portsmouth MES.** *Meeting.* Contact John Warren: 023-9259-5354.
7 **Rochdale SMEE.** *Auction Night.* Contact Mike Foster: 01706-360849.
7 **Romford MEC.** *Competition Night.* Contact Colin Hunt: 01708-709302.
8 **Reading SME.** *Club Running.* Contact Graham Bustin: 01189-615450.
8 **Romney Marsh MES.** *Bonfire Night Barbecue & Steam-Up.* Contact John Wimble: 01797-362295.
8 **Stockholes Farm MR.** *Running.* Contact Ivan Smith: 01427-872723.
8 **Sutton Coldfield MES.** *Bonfire Party.* Contact Neal Harrison: 0121-378-3992.
9 **Hornsby ME.** *Running Day.* Contact Ted Gray: 9484-7583.
9 **Surrey SME.** *Members Steam-Up.* Contact John Cook: 020-8397-3932.
9 **Sutton MEC.** *Track Day.* Contact Mike Dean: 0208-657-5401.
10 **Bedford MES.** *Darjeeling & Himalayan Railways.* Contact Ted Jolliffe: 01234-327791.
10 **Erewash Valley MES.** *AGM.* Contact Jim Matthews: 01332-705259.
10 **Frimley & Ascot LC.** *Meeting.* Contact Bob Dowman: 01252-835042.
10 **Melton Mowbray DMES.** *Captain Douglas Davidson: 40 Years at Sea.* Contact Phil Tansley: 0116-2673646.
10 **Saffron Walden DSME.** *Club Night.* Contact Jack Setterfield: 01843-596822.
11 **Basingstoke DMES.** *Auction.* Contact Ian Shanks: 01420-561741.
11 **King's Lynn DSME.** *David Dew: An Alternative to the Norton Gear Box.* Contact Mike Coote: 01533-673728.
11 **Stafford DMES.** *Clubroom Night.* Contact Chris Dobbs: 01889-270533.
11 **Sutton Coldfield MES.** *John Owen: Flying; Things ain't what they used to be, a Pilot/Instructor's view.* Contact Neal Harrison: 0121-378-3992.
12 **Chingford DMEC.** *Phil Kingham: Building a 4F.* Contact Martin Masterson: 0208-989-5552.
12 **Harrow & Wembley SME.** *Ted Brooks: London's Bridges.* Contact Dr. Roger Greenwood: 020-8427-2755.
12 **Norwich DSME.** *Auction.* Contact Paul Reed: 01603-462925.
13 **Cardiff MES.** *Forum.* Contact Trevor Jenkins: 029-2075-5568.
13 **High Wycombe MEC.** *Meeting.* Contact David Savage: 01494-527402.
13 **Historical MRS (Sussex Area).** *Roy Hickman: Scenic Topics.* Contact Terry Cole, 17 Coombe Drive Steyning West Sussex BN44 3PW.
13 **N. W. Leicester SME.** *D. A. G. Brown: Computer Aided Design.* Contact John Elliott: 01455-847040.
13 **Sutton MEC.** *Peter Woolhouse: History of RNLI.* Contact Mike Dean: 0208-657-5401.
13 **Worthing DSME.** *Club Auction (Members Only!)* Contact Bob Phillips: 01903-700642.
14 **Colchester SMEE.** *D. Soggee: Out & About The Railway.* Contact L. G. Hammond: 01376-511686.
14 **Hereford SME.** *Chris Rayward: My Role with Engineering in Miniature.* Contact Richard Donovan: 01432-760881.
14 **North London SME.** *Martin Dawes: End of the Line.* Contact David Harris: 01707-326518.
14 **SM&EE.** *Visit to The Globe Theatre.* Contact David Boote: 01202-745862.
15 **Erewash Valley MES.** *Steaming Day.* Contact Jim Matthews: 01332-705259.
15 **York City & DSME.** *The Falkirk Wheel.* Contact Ken Bateman: 01904-421445.
15/16 **Kew Bridge Steam Museum.** *Live Steam Model Railway Show.* Information: 020-8568-4757.
16 **Frimley & Ascot LC.** *Club Run.* Contact Bob Dowman: 01252-835042.
16 **Hornsby ME.** *Sailing Day.* Contact Ted Gray: 9484-7583.

16 **N. W. Leicester SME.** *Running Sunday.* Contact John Elliott: 01455-847040.
16 **York City & DSME.** *Running Day.* Contact Ken Bateman: 01904-421445.
17 **Lancaster & Morecambe MES.** *Slides & Humour.* Contact Harry Carr: 01524-411956.
17 **Leicester SME.** *Auction.* Contact Raymond Wallis: 01162-858824.
17 **Salisbury DMES.** *Malcolm Frost: Miniature Steam Vehicles.* Contact Pete Parrish: 01980-610346.
18 **Cardiff MES.** *Steam-Up & Family Day.* Contact Trevor Jenkins: 029-2075-5568.
18 **Chesterfield MES.** *Karl Janncey: Railway Videos.* Contact Mike Rhodes: 01623-648676.
18 **Nottingham SMEE.** *Meeting.* Contact Graham Davenport: 0115-8496703.
18 **Romney Marsh MES.** *John Wimble: Down Memory Lane.* Contact John Wimble: 01797-362295.
18 **South Durham SME.** *Afternoon Steam-Up.* Contact B. Owens: 01325-721503.
18 **Surrey SME.** *Mr. Setter: Chilton.* Contact John Cook: 020-8397-3932.
18 **Taunton ME.** *Auction.* Contact Don Martin: 01460-63162.
18 **West Wiltshire SME.** *Andy Johnson: North American Holiday.* Contact R. Nev. Boulton: 01380-828101.
19 **Andover DMES.** *Neil Rose: Fine Scale Loco Co.* Contact John Berry: 01960-882616.
19 **Bournemouth DSME.** *Jack & Anne Bath: Archive Films.* Contact Mike Baker: 01202-383653.
19 **Chingford DMEC.** *Meeting.* Contact Martin Masterson: 0208-989-5552.
19 **Guildford MES.** *Bits & Pieces.* Contact Dave Longhurst: 01428-605424.
19 **Historical MRS (North West Area).** *Edgar Richards: North Wales Main Line.* Contact David Goodwin: 01224-880018.
19 **Leeds SMEE.** *Jumble Sale.* Contact Colin Abrey: 01132-649630.
19 **MELSA.** *Meeting.* Contact Graham Chadbone: 07-4121-4341.
20 **Cardiff MES.** *Cyril's Film Night.* Contact Trevor Jenkins: 029-2075-5568.
20 **East Somerset SMEE.** *Patrick McCormack: Industrial Full Size Steam 1964-1968.* Contact Roger Davis: 01749-677195.
20 **Frimley & Ascot LC.** *AGM.* Contact Bob Dowman: 01252-835042.
20 **Isle of Wight MES.** *AGM & Bring & Buy.* Contact Ken Stratton: 01983-531384.
20 **Leyland SME.** *Quiz Night.* Contact Mark Entwistle: 01772-422411.
20 **Reading SME.** *Winter Talk.* Contact Graham Bustin: 01189-615450.
20 **Sutton MEC.** *Auction.* Contact Mike Dean: 0208-657-5401.
21 **Rochdale SMEE.** *John Swarbrick: Constructing a 7¼in Gauge 45xx.* Contact Mike Foster: 01706-360849.
21 **Romford MEC.** *Photo Talk.* Contact Colin Hunt: 01708-709302.
21 **Romney Marsh MES.** *Video Evening.* Contact John Wimble: 01797-362295.
22 **Chesterfield MES.** *Running Day.* Contact Mike Rhodes: 01623-648676.
22 **Historical MRS (Bristol Area).** *Steam in Cornwall.* Contact Gerry Nichols: 0117-973-1862.
22 **Historical MRS (Scottish Area).** *Meeting.* Contact Richard Crockett: 01896-750730.
22 **Hornsby ME.** *Family Day.* Contact Ted Gray: 9484-7583.
22 **SM&EE.** *Rummage Sale.* Contact David Boote: 01202-745862.
23 **MELSA.** *Bracken Ridge.* Contact Graham Chadbone: 07-4121-4341.

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- BCA Jig Borer/Mini Mill.Stand,Collets,3ph,GC £1250.00
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- Kearney & Trecker 2D Vertical Mill,Large,Old £ 500.00
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- Hurco Varispeed Turret Mill,Power Feed,DRO,3ph £1850.00
- Schaublin 12 Vertical/Horizontal Milling Machine,3ph £1250.00
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- Perris 350 Circular Cut Off Saw,3ph £ 650.00
- Qualters and Smith Power Hacksaw,3ph, £ 250.00
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- Startrite 20RWF Bandsaw,VGC,fitted welder £1450.00
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- Myford MG12 Cylindrical Grinder,Coolant,Manual,3ph £1500.00
- Taylor Hobson Model 6 Engraver Cutter Grinder,1ph £ 450.00
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SHAPERS

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MYFORD SPARES AND TOOLING

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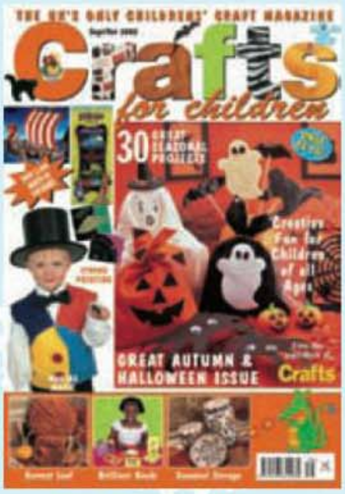

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