MODEL ENGINEER

Vol. 188 No. 4165

22 March - 4 April 2002 £2.10

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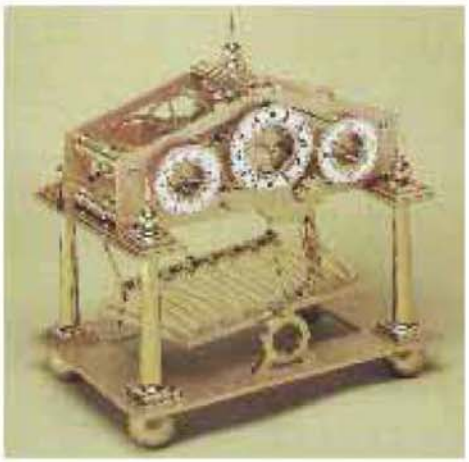

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Model Engineer is published by
Highbury Nexus Special Interests Limited
Nexus House, Azalea Drive, Swanley, Kent BR8 8HU
Tel: 01322 660070 Fax: 01322 616319
www.nexusonline.com
Highbury Nexus Special Interests is a wholly owned subsidiary of Highbury House Communications plc.

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Email: wss@wyvernnet.co.uk
Rates for 26 issues (annual), 13 issues (six months):
UK: £54.60 (annual) £27.30 (six months);
Europe: £69.00 (annual), £34.50 (six months);
RoW Surface: £70.00 (annual), £35.00 (six months);
RoW Airmail: £74.50 (annual), £37.25 (six months);
US Surface: $98.00 (annual), $49.00 (six months);
US Airmail: $113.50 (annual), $56.75 (six months).
Cheques payable to Nexus Special Interests Ltd.
Second class postage paid at Rahway NJ USA.
Postmaster, please send address corrections to Model Engineer c/o Mercury Airfreight International Inc, 2323 Randolph Avenue, Avenue 1, NJ 07001. Usps 011099.
US Subscription Agent: Wise Owl Worldwide Services, 1926 S. Pacific Coast Highway, Suite 204, Redondo Beach, CA90277-6145, USA.
Phone: (310) 944-5033; Fax: (310) 944-9963.
Email: wiseowl@sprintmail.com
Website: www.wiseowlmagazines.com
Visa/MC/Discover accepted.
Canadian Distribution by Gordon & Gotch Periodicals (Toll free 1-800-438-5005).
Model Engineer is published fortnightly.

ISSN 0026-7325

ABC

IN THIS ISSUE

Vol. 188 No. 4165 22 March 2002

On the cover ...

Entries for Class A3 of the recent 71st Model Engineer Exhibition held at Sandown Park Exhibition Centre were of the very highest standard, as were the loan models associated with this class. This close-up view of a magnificent 1:3 scale model of a WWI La Rhone rotary aero engine proves the point. Successful completion and operation of this power plant demanded ingenuity and craftsmanship of a very high order. Builder Alfred Nash was awarded a well deserved Gold Medal and the Bradbury-Winter Memorial Challenge Cup for his efforts. Our comprehensive report on the Engineering Classes begins on page 126 in this issue.

(Photograph by Mike Chrisp)

INDEX to ADVERTISERS

Books to put a Spring in your step!

How to Design and Make AUTOMATA [Addams] £14.50
Brilliant book on the principles and design considerations of making relatively simple automata, although the principles could be extended to more complicated versions. Essentially intended for teenagers taking DT at GCSE, the models envisaged are built largely of wood, cardboard etc, but the could be built in metal. No specific designs, but loads of ideas and clear instructions on how to make things move. 80 page landscape format paperback, chock a block full of illustrations.

Locomotive Valves & Valve Gears (1921) [Yoder & Wharren] £21.60
We have reprinted this again for the THIRD time! Why? Because very simply it is the BEST book on the subject we have come across. Covers valves, valve gears and valve setting clearly and in depth. If it has a fault it is that, because of its date, rotary valve gears are not covered. But on Stephenson's and Walschaert's valve gears, and most of their derivatives, it is superb. 272 pages. 274 drawings, photos and diagrams. Hardbound.

Lost Wax Casting [Feinburg] £14.20
There are few books on the techniques of Lost Wax Casting; in fact for years this has been the only one, and it has just been reprinted, for the fourth time. It is very good and we have sold 100s of copies, but intending purchasers should be aware that it was written to assist Aid workers in the Third World in setting up local craft industries. So we in the so called advanced countries may choose not to use cow dung as the clay binding agent, but take it from us that, as long as you make allowance for such instructions, this is a very sound book on the subject. 74 pages. Well illustrated with drawings and photos. Paperback.

VIDEO and BOOKLET: Reproduce almost Anything with Basic Silicone Mold Making in Rubber, Metal, Rubber & Ceramic [49 mins] £29.95
The beauty of Silicone Mold Making is that, subject only to size constraints, it allows you to reproduce virtually anything exactly, and in fantastic detail, so can be used to advantage by modellers, model engineers, jewellers, antique restorers, car restorers etc, etc. If you are seeking to replicate in metal, then things may become a little more complicated, but you can certainly make replicas at home in rubber, plastic, plaster of paris, resins etc without problems, and have a lot of fun at the same time. This well made video takes you through all the stages of making a basic silicone mold and shows the versatility of the method. The video comes complete with a 44 page booklet which reinforces certain points in the video, and also contains a U.K. source of materials etc. You never know you could start your own molding business and make a fortune using the processes shown here others have!

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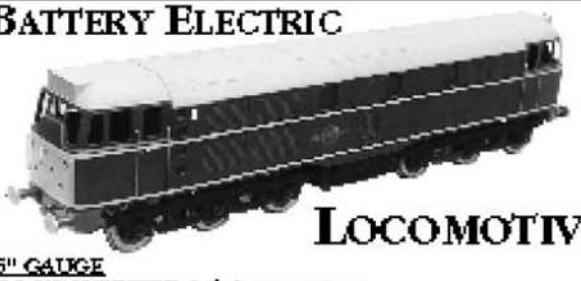

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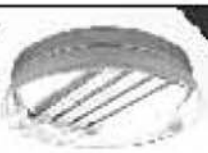

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SMOKE RINGS

With the Editors

Jonathan Hale (left) and Jack Chuter, junior members of Worthing DSME, had a busy time at Brighton ModelWorld 2002 demonstrating their models and talking to interested visitors to their club stand.

How big?

Many years ago, Neil recalls a chat with an experienced and very competent production grinding machine setter. He happened to mention that all his working life he had been asked to grind to 'thous.' or 'tenths of thous.' but nobody had ever told him what a 'thou.' was. When it was explained to him that a 'thou.' is a thousandth part of an inch he was quite surprised that anyone could work to such fine limits, even though he had been doing it for years. Of course, he didn't *need* to know what his units of measurement were to do his job — an inspector used to set up his gauges and told him to work to between the marks on the dial of the DTI. His gauge setting was checked by a master or setting piece. Even so, he seemed to grow six inches in stature that day when he realised what he had been routinely accomplishing every day of his working life. It made Neil realise that nothing should be taken for granted when training someone.

Even when we know the basis of our chosen measurement system it is not always easy to relate it to the size of everyday objects. Experienced model engineers know certain things are of a certain size: a cigarette paper is 0.001in. (0.025mm) thick, a human hair measures up at 0.003in. (0.076mm) diameter which is also the approximate thickness of a sheet of newspaper, a business card is usually 0.015in. (0.38mm) thick, and so on. This knowledge is important as it gives us a 'feel' for the units in use as well as facilitating the intelligent selection of packing materials when, for example, setting up parts for machining.

Without wishing to re-open the Imperial versus Metric debate, one of the reasons that some people are uneasy with the SI system of measurement is probably due to this loss of 'feel'. It is all very well knowing that a micron is one millionth part of a metre but how does that help with choosing the right piece of cardboard to pack up that casting on the milling machine table? The diagram below may be of some interest and assistance to readers who have not grown up with the SI system of units. It may also help those who have grown up with SI units to understand those who continue to use the Imperial system.

Similar diagrams appear on the walls of Standards Rooms the world over and, no doubt, readers could come up with alternative examples to the ones shown. The main reason for the existence of these diagrams is to impress on people just how tiny a micron (0.000039in.) is and the need for the utmost care, in terms of cleanliness and temperature stabilisation, when measuring parts to tolerances of a few microns. However, they also provide an interesting means of comparing the size of things in different units.

The diagram below left is to no particular scale but the relative proportions of the circles are correct one to another. One surprise is the size of a particle of cigarette smoke. It is interesting to speculate on how that was decided upon and whether it is similar in size to smoke produced by steam coal — surely a more proper topic of debate for *Smoke Rings*.

What would Neil's old colleague have thought had he known he was grinding components to a tolerance equivalent to a few particles of smoke? He would probably have observed that achieving the tolerance on some of the jobs he did was rather like chasing smoke and just as frustrating.

Young enthusiasts

Regular readers may recall my photograph with these notes last issue (*M.E.* 4164, 8 March 2002) showing some of the exhibits in the Fareham DSME display at Brighton ModelWorld 2002. Having chosen to travel to Brighton by rail, I wasn't best pleased to have to detrain at Three Bridges and continue my journey by coach. I accept that track maintenance is required and I have no criticism of the coach which was speedy and comfortable, but my travelling time was much increased which reduced the time available to enjoy the event.

My reason for mentioning it here is that on entering the Brighton Centre I was immediately impressed by the numbers of families and youngsters present. The inclusion of 'combatants' from the popular *Robot Wars* TV series the organisers of ModelWorld had succeeded in attracting families to their event. With many other modelling disciplines and a great deal of activity, there was plenty to interest most visitors, and I understand that there was no shortage of these.

My photograph above shows Jack Chuter and Jonathan Hale, junior members of Worthing DSME busy demonstrating their models on their club stand. Recalled Pat O'Keeffe's enquiry in *M.E.* 4150, 13 July 2001 Jonathan drew my attention to his Bassett-Lowke slide valve engine which he purchased at a local car boot sale.

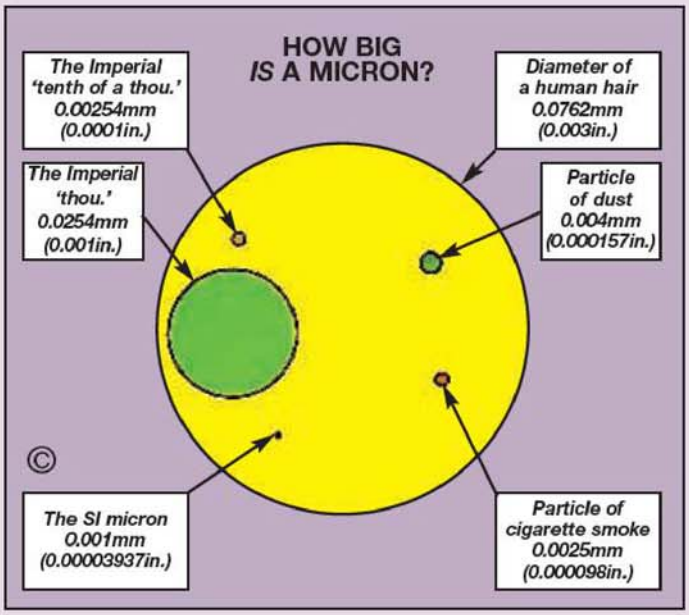
From a report which we were pleased to publish in *M.E.* 4110, 1 January 2000 (see p34/35) some readers may recall that some Worthing DSME members give freely of their time for two 3-day sessions of activity and talks during the school summer holiday at the beginning of August to introduce interested local youngsters to the many delights of model engineering. Judging by the enthusiasm of the two young men with whom I chatted, this appears to be an excellent technique for involving young modellers in our hobby and helping them to learn the craft skills now so regrettably missing from their years of formal education. Our congratulations to all club members who manage to foster an interest in making models of whatever type, and to all such young members of Worthing and other clubs who will hopefully see to it that our hobby doesn't pass into oblivion.

Further information about the Worthing DSME summer courses for young people can be had from John Rea (tel/fax: 01903-203520) who points out that for obvious safety reasons and to ensure that everyone get the attention they deserve, numbers are necessarily restricted.

Crewe Alexandra

Following hard on the heels of Mr Lloyd's recent request for copies of drawings of LBSC's *Netta* in 1 1/4in. gauge (*M.E.* 4161, 26 January 2002), we have just had a similar request from Mark Batchelor for drawings of Martin Evans' *Crewe Alexandra* which seem to be no longer available from Highbury-Nexus or X-List Plans.

If any reader can assist with copies which they are prepared to sell, loan or give to Mr. Batchelor, we would be pleased to pass on any information for him sent to the M.E. Editorial Office, P.O. Box 310, Hemel Hempstead; Hertfordshire HP3 8XL; fax: 01442-269366.



POST BAG

Sentinel engine camshafts

SIRS, - As the designer and builder of a 2in. scale Sentinel DG6/8 Waggon, I have been interested to see John Haining's articles on an S4 waggon. I found the drawings of the S4 camshafts very interesting, what a pity they were so unreadable! (see *M.E.* 4159, 14 December 2001).

Although the Sentinel DG (Double Geared) engine is a duplex one, it uses the same idea of sliding camshafts as the S4, but being duplex requires twice as many cams to be shoehorned into the same space as is available in the S4 engine.

Readers may be aware that the design of my Sentinel DG engine appeared in *M.E.* 3850-3856, back in June 1989. In these articles I discussed the principles of the prototype Sentinel engine design and how I went about making the various components, liberally illustrated with photographs of the scale model engine.

The cam profiles are discussed in *M.E.* 3852 (7 July, 1989), which used the same arrangement of three forward, a drain, and a reverse cam. In *M.E.* 3856 (1 September 1989) I discussed the manufacture of the camshafts. I would recommend the built-up construction approach, which is not difficult to do. Only three profiles are needed for the inlet cams, as reverse is the same profile as the 'start' cam. The exhaust can get away with only one cam profile, as all the forwards can be the same, and the reverse is just a forward cam in a different orientation. The drain, or all open, cam can be circular. The dimensions that I used will obviously need to be scaled up for the S4 model.

As the cams can be much wider than on the DG engine, it will be relatively easy to blend the cams together to get an easy sliding action, provided the valve springs are not made too stiff. I would recommend case hardening the cams. Also ensure that the camshaft bearing journal diameter is larger than the cams! (This is the factor that in practice limits the cam size.) A centre bearing would be essential on a camshaft of the length of the model S4 engine.

I would not advocate allowing any adjustment of the sets of cams on the camshaft, they should be locked on at the correct 90degree intervals. The only adjustment that may be required, depending on the overall design, is phasing the camshafts to the crank position. This can be done, for example, by bolting the drive gear to the hub through which the keyed end of the camshaft slides.

Anyone who has seen my wagon in operation will not dispute that the engine works well, the wagon will do about 10mph on the open road — that's 60mph full size!

Alan Beasley, Essex.

Flexispeed lathe

SIRS, - Prompted by the photograph of Mr. Atkinson's lathe illustrated in *M.E.* 4159, 14 December 2001, I am fairly sure this is a Flexispeed lathe as made by the Flexispeed Machine Tool Co. of Sheffield, now, I suspect, long defunct, and advertised in the 1950s. It was a slightly more expensive competitor to the Super Adept lathe. The manufacturers produced an illustrated leaflet showing some accessories including a 4-jaw chuck, a faceplate and a drill pad, to the best of my recollection.

It appears from the photograph that Mr. Atkinson's lathe was modified by a previous owner: the handwheels do not look original, neither does the addition of the tail of the headstock spindle, perhaps that also.

All of the foregoing is from memory, my leaflet has disappeared during the intervening 50 years or so, but I hope it may be helpful to Mr. Atkinson.

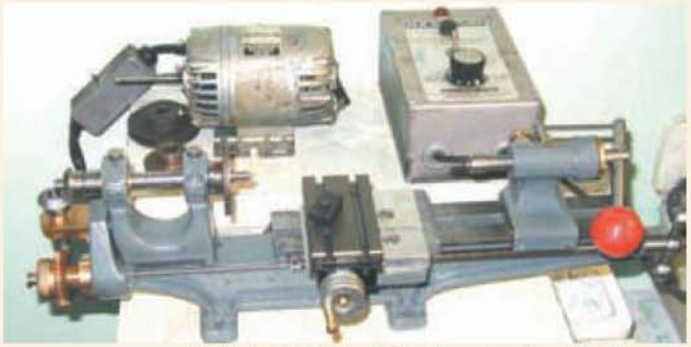
R. H. Craig, Devon.

Portass lathe

SIRS, - Following Mr. Atkinson's request for assistance in identifying his lathe (*M.E.* 4159, 14 December 2001) I hope the accompanying photograph (above) of my own Portass lathe may prove helpful.

As is evident from the photograph, I am in the process of restoring and refurbishing my own lathe and look forward to seeing this little machine back in commission.

Harry Paviour, Gloucestershire.



Mr. Paviour's Portass lathe is undergoing refurbishment.

Lady Stephanie

SIRS, - I read with interest Dr. A. K. Tulloch's letter (*M.E.* 4161, 25 January 2002) under the heading *Check and check again.*

One can only agree with the sentiments expressed concerning errors in drawings causing much waste of time and expensive materials.

I write as a reader of *M.E.* for over 50 years and can well remember when certain designers would never admit to a single mistake in any of their designs, even when asked *"How, please, do you machine a 1/8in. square on a 1/8in. diameter valve control rod?"* Today's contributors seem only too pleased to accept constructive criticism and make corrections where necessary.

I find Dr. Tulloch's comments about the *Lady Stephanie* beam engine difficult to understand. I constructed an engine to this design some 10 years ago and was fortunate to win an award at the Midlands Model Engineering Exhibition with it.

Drawings and castings were purchased from Reeves; to the best of my recollection, I constructed it straight from the drawings with no problems whatsoever, as would be expected with a design from the pen of the late *Tubal Cain.* Certainly not the major problem Dr. Tulloch experienced with the beam.

I worked from published drawings after the magazine articles were completed; perhaps Dr. Tulloch worked from the magazine articles which may have contained an error which was subsequently corrected.

J. R. Lill, Derbyshire.

(Dr. Tulloch has since written to correct a typographical error contained in his published letter. The spacer required was 3/16in. not 3/4in. as stated. Our apologies to all concerned — Ed.)

Painless parting

SIRS, According to the Bard, parting is such sweet sorrow, but for the model engineer there is nothing sweet about the sorrow. We have all suffered that horrible moment when parting off a finished component, the tool dips and digs in, the job rides up, and the tip of the parting blade snaps off with a sickening crack. The results of the disaster are usually a ruined tool, many hours of work ending up in the scrap bin, and several pages being added to the late LBSC's *Dictionary of Railroad Esperanto.*

It was after just such a disaster that I decided to take action. It seemed that the cause of parting-off problems lay in the lack of rigidity of model engineering grade lathes, and if support could be provided for the 'business end' of the tool, all would be well. I made up my 'parting jack' from a piece of scrap 3/4 x 1/2in. mild steel, faced to a length suitable for my Atlas lathe. One end was drilled and tapped 2BA and a commercial bolt and locknut fitted as shown in my photograph (right).

In use, the parting-off tool is fitted into the toolpost and the cutting edge is set as accurately to centre height as possible. The jack is then positioned under the end of the blade holder and adjusted to a tight fit. The jack obviously prevents the topslide from moving, so the tool must be positioned axially with the leadscrew for which a graduated leadscrew handwheel is a useful accessory.

I now find it possible to part off steel bar at least 1 1/4in. diameter without difficulty and silver-steel is no problem either. I'm sure someone else must have come up with this idea before me but I have never regretted the ten minutes or so spent making this useful workshop aid.

I can thoroughly recommend other users of light lathes to make one before they ruin yet another parting job!

M. J. Broad, Norfolk.

Smokebox suggestions

SIRS, - I hope that fellow readers may find one or more of the following suggestions helpful. They all relate to model locomotive smokeboxes.

1: Make the smokebox door-ring a firm push-fit into the smokebox to give full access when necessary, without the work involved in making and fitting a split smokebox.

2: When preparing smokebox pipework, set the boiler in position on the frames without the smokebox, or with a skeleton smokebox, so that you can see what you are doing, and fit the pipework. Tip: watch out for unions which cannot be got at when the full smokebox is fitted! It makes sense to attach your superheater elements to the wet header with unions; this saves much bad language when element replacement is necessary or when you wish to remove them for cleaning the flues.

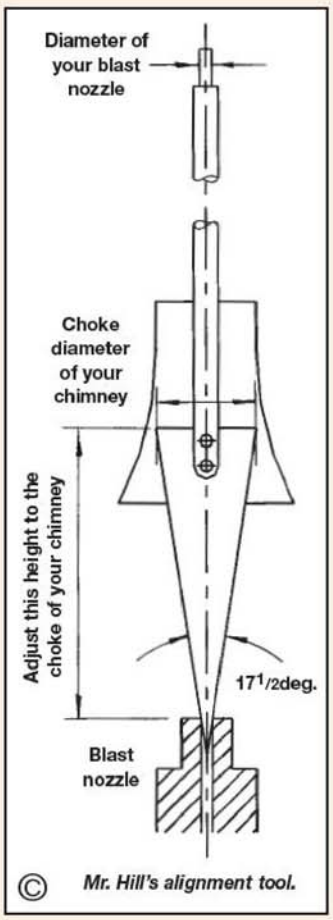
3: At this time, make up spanners to fit and also make a couple of steam pipes with union nuts to go from the wet header to the cylinder standpipe, seal them in bag and place them in your travelling tool box. If you have a superheater failure while running, something which usually occurs when you are some

Mr. Broad's adjustable support improves parting tool rigidity.

300 miles from home, take out the smokebox front and fit them; loss of superheat is much to be preferred to the loss of enjoyment in not being able to run your locomotive.

4: Make up a 17 1/2deg. cone from some sheet and cut it off so that the short side is the same diameter as that of the choke of your chimney/petticoat. Rivet/solder on a length of rod and use this to establish the height of your blastpipe cap to choke. 17 1/2deg. is the angle at which steam comes from a parallel nozzle. This assumes that your cap is screwed on to the blastpipe and you have a locknut under it.

I machined up the one for my 4F from round bar, making a lot of swarf in the process. This method gives more certain draughting than Mr. Greenly's arrangement which may allow air to enter the smokebox down past the chimney's exhaust steam column, thereby weakening the vital smokebox vacuum.



© *Mr. Hill's alignment tool.*

When you have established your blastpipe cap diameter to your satisfaction on the road, you can then reduce the diameter of the other end of your cone-holding rod to that size and use the rod as a tool to finally centre the blastpipe in the chimney. You should have got it about right at the erection stage.

5: An excellent method of tidying up your pipework with clean, close bends is to make use of the 6mm and 8mm copper pipe fittings used by the refrigeration trade, which are miniature versions of the familiar domestic plumbing fittings. They are a touch costly but make a job of which you can be proud to open the smokebox door! I use them all over the loco as I have no wish for my locomotives to be spoiled by the untidy pipework that mars so many otherwise nice models.

I claim little originality for the ideas here which have mostly been picked up over the years from experienced model engineers, absorbed into my own practice, and proven.

John Hill, Devon.

Dimensions and brickbats

SIRS, - I have noticed a recent and growing tendency by contributors to criticise the standard of dimensioning of drawings presented by designers of various models. I am a self-employed professional draughtsman specialising in Patent drawings; I occasionally prepare sets of engineering drawings for clients, based on the original Patent drawings. I prepare my own drawings for workshop equipment, etc. It is extremely easy to make mistakes, needing only a phone call or a welcome cup of coffee to be put down beside one to distract attention.

Errors are also very difficult to spot as the perpetrator 'sees what he/she expects to see'. I have 'debugged' a set of reasonably complicated drawings to ensure absolute accuracy; it took about 100 hours and involved cross checking every 'fit' — longer than to draw them. I am certainly not immune to errors, even after careful drawing of a locomotive based on *Sweet William* to correct for metric gauge steel, I still made one cross member too short because I deducted instead of adding twice the difference between 6mm and 1/4 inch. This was only found when the laser-cut steel arrived in the workshop and was 'tried for size'. This project has had its moments, as there are the inevitable errors in the original drawings, some of which went unnoticed for a while. There was also the little matter of forgetting shrinkage/machining allowance on some patterns …

The advent of CAD programs has reduced the error level, as it is possible to easily project 'guide lines' and draw components using these to ensure a 'fit' (which I did not do for the cross members!) provided always that the original is correct. Errors will still occur as long as human beings are being distracted while preparing drawings. I always make it a practice to cross check the 'fit' between components on drawings whether or not I have prepared them, before cutting material.

While on the subject of drawings, I have some brickbats for some of our contributors:

1: It is extremely bad drafting practice in our sort of work to specify to a closer dimension than is required — specifying in 1/64in. is specifying to 0.0001in., only valid in a very few applications. This fractional measure is also incomprehensible to today's children and young people.

2: Tolerances of fit should be stated using modern practice.

3: As almost all imperial Vernier calipers, micrometers, lathes and mills, etc., are calibrated in decimal inches, why on earth are you still giving dimensions in fractions of an inch?

4: There should be a special hell for those who are still grimly hanging on to antique practice such as the totally indefinable *"one inch bare"* or *"one inch full"*, for all that's wonderful, what sort of tolerances are those? Why not go the whole hog and use *"a rattling good fit"* and a *"bash it in with a sledge-hammer"* fit?

5: It is also bad practice to specify materials in dimensions that are not freely available, while a very few metals are still available in a limited range of imperial measure, the vast majority are only available in metric measure.

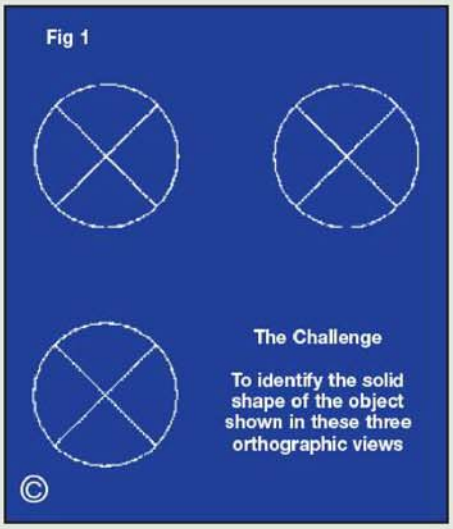
6: As most of the world uses metric measure, how about a few more contributors dimensioning drawings in millimetres, so that the rest of the world can relate to the work? This will at least ensure that their work is not consigned to the rubbish bin of history within a very few years. If imperial measure must be used, please use decimal inches so that those used to metric measure can at least relate to it. This will help those who may be using second hand imperial dimensioned machinery.

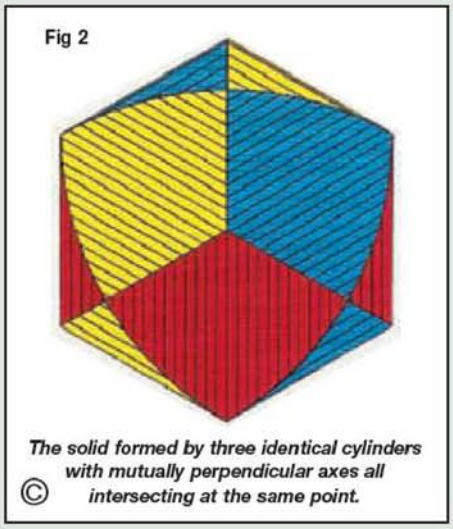
7: I have this awful feeling that some contributors hope that by continuing to use fractional imperial measure on drawings, the 0.00001% increase in demand for imperial dimensions in materials will persuade manufacturers to produce these goods, or governments to revert to imperial measure. I have bad news for them.

Over the last ten or so years, there has been an intermittent moaning in various correspondence columns about the reduction in the number of model engineers. Considering the foregoing and that most people up to about 40 years of age only know measurement in the metric system, the reduction is not surprising. These would-be future model engineers will be finding many drawings incomprehensible and will turn elsewhere for a hobby. Before 'Offended of Giggleswick' writes, I would point out that I am not another 'blasted colonial', I was born in England, lived there until 31 years of age, am now nearly 60, so was brought up to 1/64ths./firkins/pints and acres, etc. I prepare drawings mostly using SI units and work in both SI and imperial in my workshop, mostly because of the dimensioning of drawings and partly because nearly all my measuring equipment was purchased before metrication in UK and would cost a lot to replace. My lathe is dual dimensioned, both my mills are metric (the horizontal one is a Herbert made around 1930, my shaper is imperial and my pillar drill is metric.

Contrary to all the above, in certain fields components are manufactured to the weirdest of dimensions. Some of these I have seen are made with strength and economy of materials in mind; they are not meant to be repaired and are only reproducible with CNC machining centres. Careful checking of mounting bolt centres baffled me — they were at optimum spacing for the job, not ease of hand work, thickness of walls and struts was to give only the design strength, I doubt that there was more than a couple of grams of surplus material anywhere. The drawings probably only exist electronically. What will the model-maker of the future do? Probably laser scan it and press a button!

Peter J. King, New Zealand.





The solid formed by three identical cylinders with mutually perpendicular axes all intersecting at the same point.

M. Maurel's finished Intriguing Object is polished and mounted on a base. This decorative piece is a challenge to your abilities as a turner.

AN INTRIGUING OBJECT

Jacques Maurel

in France, offers a routine for machining the prismatic solid featured in *Smoke Rings* in our two most recent issues. For convenience, we repeat here the two previously published drawings.

I hope readers will forgive the rather unorthodox method chosen to introduce the little object about to be described. Apart from being an intriguing puzzle it is also a very decorative object (**photo 1**) and a good test of your abilities as a lathe operator.

Material

Any machinable material will do, I used an acrylic plastic which looks like glass when polished and is very attractive. It is also easy to machine using turning tools with 0deg. rake angle like those suitable for brass.

First cylinder

You'll need a cylinder of between 40mm and 50mm diameter and a little longer than the diameter. The diameter must be accurately finished to a known size, and this will become the diameter of the three cylinders. Don't use the stock bar directly without machining because a high degree of accuracy is needed, as I shall explain later. I started from a rough 'cube' sawn from a 50mm thick slab of acrylic and relied on friction to hold it between two pads on the lathe as shown in **photo 2**.

Second cylinder

Having machined the first cylindrical surface, I supported and drove my workpiece between two special V-blocks as detailed in **fig 5**. One V-block is held in a chuck; a 3-jaw self-centring chuck could be used, but for improved accuracy, a 4-jaw independent type would be preferable. The other V-block is supported on a running center in the tailstock to provide a friction hold.

The cylinder was set between the V-blocks, and clamped lightly. It was important to make sure that the material was centered along the V-axis to allow sufficient stock each side for machining.

The position of the V-block in the chuck was then adjusted to ensure that the axis of the cylinder coincided exactly with that of the lathe spindle. For this, I used a plunger type DTI set horizontally and fairly well at lathe spindle height. The chuck was rotated carefully by hand to set the axis of the cylinder approximately vertical (**photo 3**).

Traversing with the leadscrew, the carriage was then rocked to and fro to locate the highest point on the cylinder as shown on the DTI. The leadscrew handwheel index collar was then set to zero. Readers whose leadscrew handwheel index collar cannot be reset should note the reading at this position. The chuck was then rocked carefully by hand to find the lowest point as indicated by the DTI which was set to zero at that point.

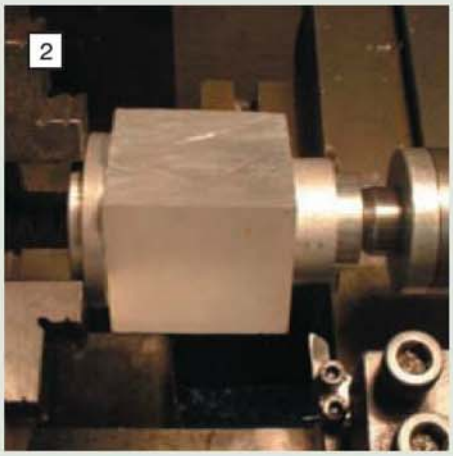
The lathe carriage was moved to the right and the chuck rotated through approximately one half turn to bring the other side of the workpiece ready for checking with the DTI. The carriage was brought to the left, back to its original position as indicated by the zero reading (or the noted reading) on the leadscrew handwheel index collar. The chuck was once more rocked to find the lowest point on the DTI which should agree with the previously set zero reading. Any discrepancy was removed by adjusting the position of the V-block in the chuck by half the indicated value (in the appropriate direction) and the procedure repeated until the DTI indicates zero on both sides of the cylinder.

Having set the cylinder satisfactorily into position, the tailstock was firmed up and locked to bring the running center and V-block tightly against the workpiece. At this point I felt it wise to check that the symmetry of the set up had not been disturbed. Having satisfied myself that everything was in order, I proceed with the machining of the second cylinder (**photo 4**). This should be finished to the same diameter as the first (checking with a micrometer).

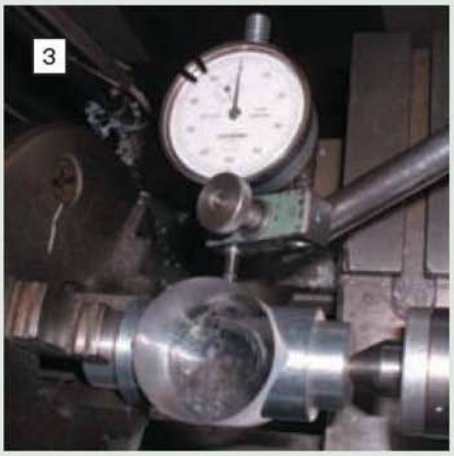
When you get to this stage, I advise you to check that the intersecting edges are true, as shown in **figs 3** and **4**. Figure 3 shows the edges intersecting exactly while figure 4 shows the two cylindrical surfaces of equal (50mm) diameter but with their axes misaligned by just 0.5mm. The distance shown as 'x' is approximately 10mm.

A distance for 'x' of less than 2mm is a good result for a few calculations will reveal that for a difference in diameter of just 0.01mm (approximately one seventh of the diameter of a human hair!), 'x' will be 1.4mm assuming d = 50mm and a good symmetry.

If you are happy with the result of your efforts, remove the workpiece from the V-blocks ready to machine the third cylindrical surface.



Machining the first cylindrical surface. Two pads are used to enable the blank to be clamped between the chuck and tailstock.



Setting up to machine the second cylindrical surface using two special V-blocks locating on the first cylinder to clamp and drive the work.

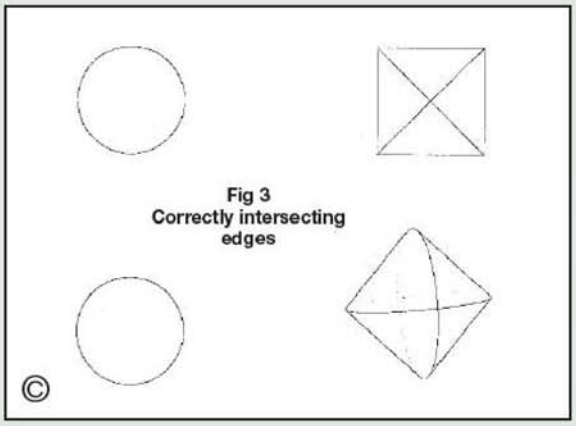


Fig 3
Correctly intersecting edges

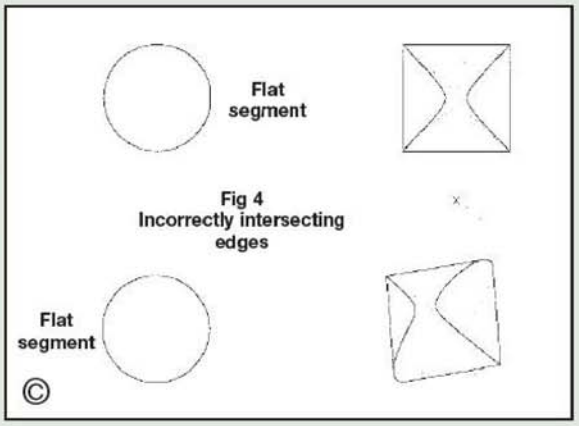


Fig 4
Incorrectly intersecting edges

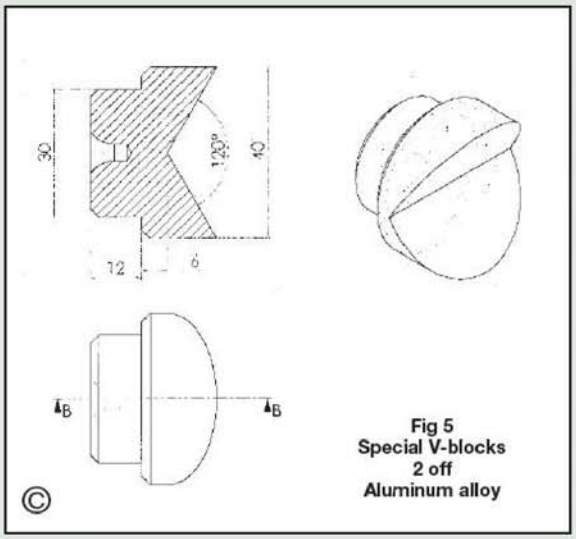


Fig 5
Special V-blocks
2 off
Aluminum alloy

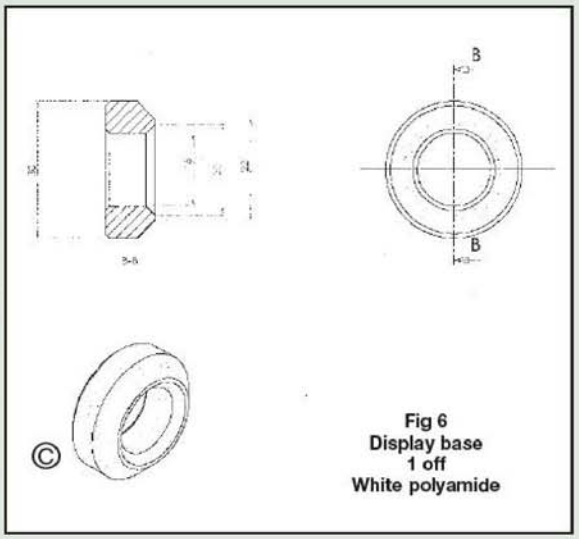


Fig 6
Display base
1 off
White polyamide

along the chucked V-block axis by gentle and careful tapping with a soft hammer.

When you get to this stage, I advise you to check and re-check to make sure all is well and to repeat the checks when the running centre has been tightened to secure the workpiece ready for machining. Finally, make one last check, take a deep breath and machine the third cylindrical surface (**photo 6**).

Finishing

When you have finished the machining to your satisfaction, the facets can be polished quite easily by the use of a felt wheel and polishing paste, particularly if your turned finish is good. Although the process is simple, care should be taken to retain the sharp edges between the faces.

If you like the 'icy' appearance left by a keen and well set lathe tool, it is not necessary to polish the finished object; it's up to you.

Third cylinder

This time I set the workpiece between the two V-blocks, having made sure that their axes are crossed, i.e. with one perpendicular to the other as shown in **photo 5**. Care had to be taken at this stage for the workpiece is very easily moved between the surfaces of the V-blocks. The set-up was gently clamped with the running center in the tailstock. Two adjustments were now required as folows:

1: The position of the workpiece with the axis of the chucked V-block set vertical. This adjustment has already been described in the procedure for machining the second cylinder.

2: The position of the workpiece with the axis of the chucked V-block set horizontal. The procedure is similar but the workpiece is moved

If at first ...

If you make a mistake, you must machine the three cylinders to a slightly smaller diameter. A word of advice: before you do so, mark each cylinder with a felt pen to avoid confusion.

In this event, the last described set up, with the V-blocks crossed must be used to re-machine all three cylinders.

Stand

The object is an attractive item and a definite conversation piece well worth displaying. After all the effort involved in machining the object, a stand would be appropriate to display it properly.

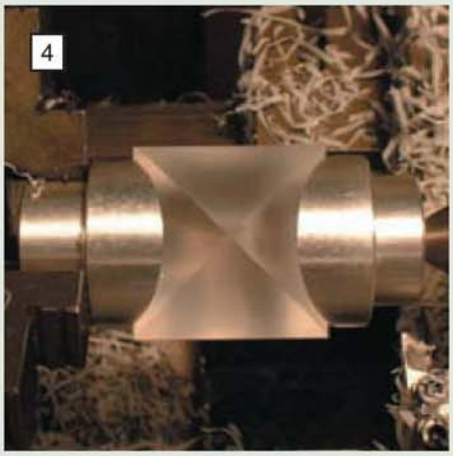
A stand is necessary because, being made up of three intersecting cylinders, the object rolls very easily. My **fig 6** gives details; use white polyamide, or any other soft plastic, to avoid damaging the facets.

V-blocks

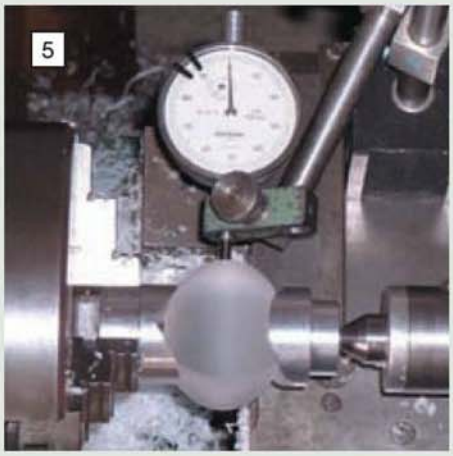
I made my V-blocks of aluminium alloy (dural) as shown in fig 5. Great accuracy is not required since their final position is adjusted in the lathe.

If you have one, use a centre drill with radiused cutting edges to cut the centre hole that contacts the running centre in the lathe tailstock.

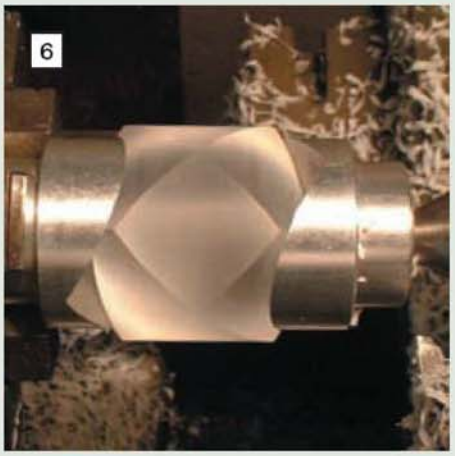
Concerning the V-blocks, one final tip: setting is facilitated by aligning the axis of the vee of the V-block held in the 4-jaw lathe chuck with one pair of chuck jaws.



The appearance of the part after turning the second cylidrical surface. For a good result, all the cylinders must be of the same diameter.



Set up for turning the third cylinder. The special V-blocks are again in use but the one supported by the tailstock is turned through 90 degrees.



The finished turned object still mounted in the V-blocks. The machined surfaces can be finished by polishing or left as machined.

A novel hot air engine powered clock was exhibited by Wilfried Vermeiren and bore the label: Time files at a heartbeat.

Anthony Mount's model Bailey's Vertical Engine. The characteristic 'V' connecting rods are evident in this view.

Anthony Mount's other exhibit was his model of Bailey's Bee *vertical concentric hot air engine currently being serialised in* M.E.

COMPETITION CLASSES

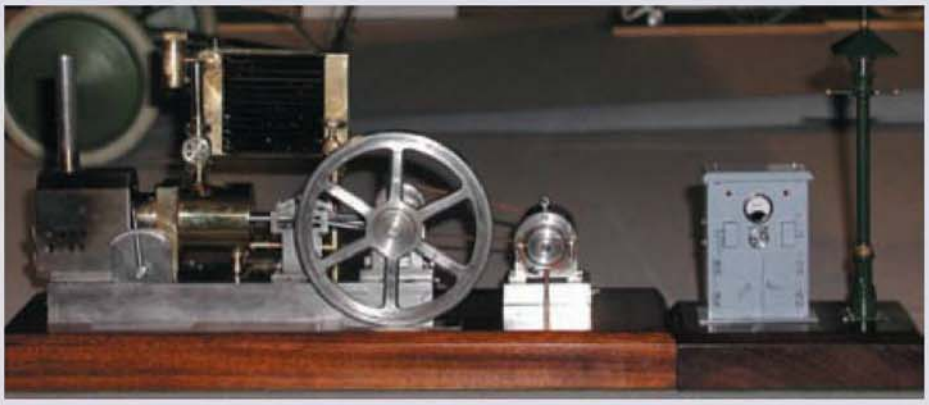
AT THE 71st MODEL ENGINEER EXHIBITION

Class A1: Hot Air Engines

Julian Wood reports:

This class attracted six entries for static display but again none for the F. Brian Thomas Memorial Trophy awarded for engine performance as measured in watts/cc. This is particularly disappointing as The Stirling Engine Society's stand at this year's exhibition attracted large crowds, at times 3 to 4 deep along its 50ft. frontage, indicating an interest which has been growing in recent years and includes demand for readily built designs.

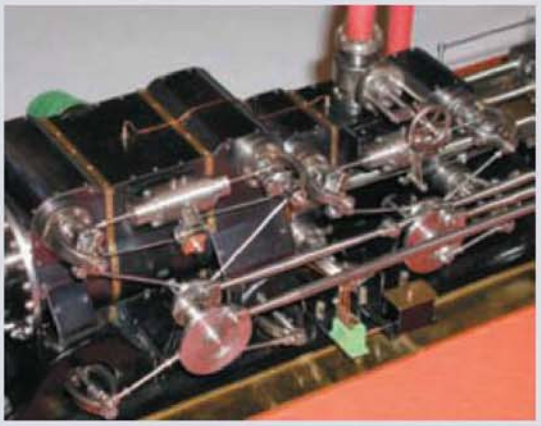
The six display entries included a beautiful and innovative clock from Belgium driven by the heat from a small bowl of hot water, two prototype models now available as kits of castings, a model based on James Stirling's patent design



A Stirling Generator Set built by Brian Marshall featured its own switch gear and lamp post.

Also by Brian Marshall, this model demonstrates the principles of operation of the Reverend Stirling's original engine of 1816.

Ron Roebuck's interpretation of Roy Darlington's popular Noddy *design complete, in this case, with a* Noddy *doll.*



Left: Peter Southworth's magnificent 1:16 scale model of a Pollit & Wigzell tandem compound steam engine showing the wood panelled flywheel and crankshaft.

Above: a closer view of the Corliss valve gear on Peter Southworth's Pollit & Wigzell mill engine.

of 1816, a horizontal engine driving a small generator and a very well finished example of *Noddy,* the test tube and marble engine featured in Model Engineer some time ago.

The clock engine by Wilfried Vermeiren was awarded a Silver Medal. Based on the usual low temperature engine layout, this engine was here made to drive a skeleton clock. No attempt was made to produce any sort of time keeping and indeed the rate dropped with the water temperature. Low temperature hot air engines, as a rule, barely turn their own mechanism and this clock indicated a well designed and built machine. The skeleton layout was very attractive in polished brass and Perspex and included a gear train to drive the hour and minute hands. The power output of the engine came from a diaphragm, an arrangement which avoids the possible leakage and friction of a piston and cylinder, although diaphragm material and tension introduce their own problems.

The two prototype engines by Anthony Mount, now available as kits, were both based on historic engine designs by W. H. Bailey dating from around 1890. The Bailey's Vertical engine is quite unusual with its twin power connecting rods in the form of a 'V' and is fascinating to watch while running. It is not a common mechanism in the hot air engine world but illustrates the ability of apparently inefficient mechanisms to perform well if care is taken over reducing friction. Both designs were very well engineered, substantially designed and would give long service as working models.

The Bailey's *Bee* mechanism is another little known design and combines compactness and relative ease of construction. This is a beta configuration, i.e. the power piston and displacer are in the same cylinder. The displacer rod extends through a gland in the piston and is driven by an unusual bell crank from the crankshaft between the twin piston connecting rods.

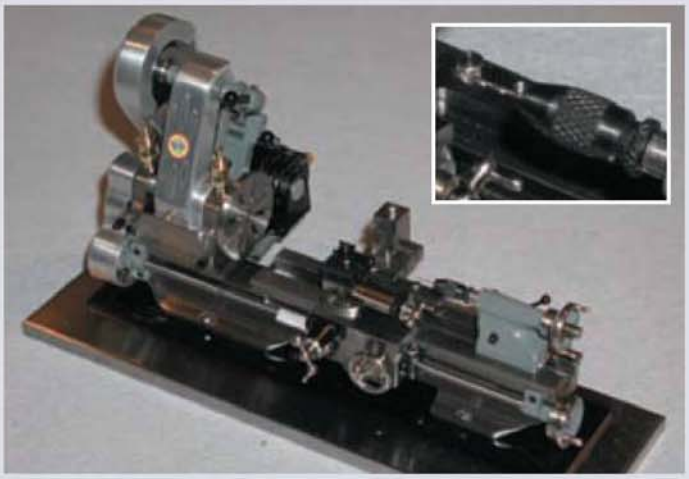
Both engines were finished in a smart, durable red enamel and mounted on polished wooden bases. The Bailey's *Bee* engine was awarded a Highly Commended Certificate.

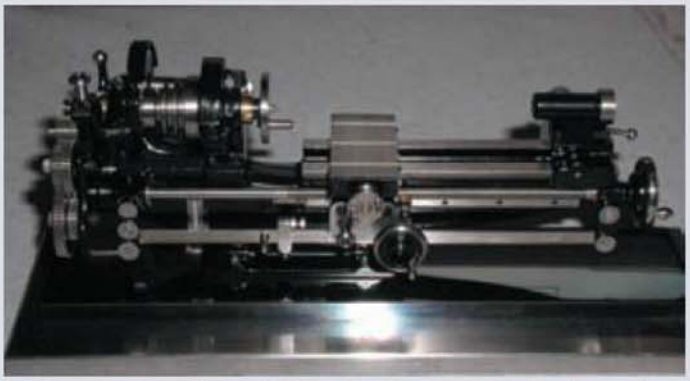
The 1816 Stirling patent engine and generator were both made by Brian Marshall who ran the generator set engine on the Stirling Engine Society's stand during the exhibition. The 1816 Stirling patent engine was awarded a Bronze Medal. The complex linkages used in this design have several critical components and pivot positions; these were seen to be operating correctly and their appearance matched the well-known drawing of the original design. A gear pump, belt driven from the crankshaft, was used to circulate cooling water to a tubed radiator. A generator was also belt driven from the shaft and supplied a neat distribution panel complete with knife switches and meter. The engine was heated by gas supplied from a brass tank on the base. The original design was shown heated by a furnace from which the heat was directed to the hot end of a brick flue, not a practical proposition on a model. The overall effect was of a well-made and pleasingly complex machine.

Brian's other entry was a horizontal engine in the style of a mill engine with a double throw crankshaft, the power piston driving the outer throws via twin connecting rods and the displacer being driven by the centre throw. This engine, like the 1816 engine, was a beta design. It is desirable in Stirling engines for the displacer to sweep a larger volume than the piston by an amount dependent upon the operating temperature. Where the two swept volumes are similar, the temperature difference needs to be large, although such engines may run at a high speed. This engine had equal swept volumes and problems were experienced in getting sufficient heat into it. The burner finally adopted consisted of a ▶

Right: this fine 1:12 scale Shand Mason combined fire and motive power engine is the work of Vic Pugh who made all the parts including the gauges.

Above: despite, Vic claims, the onset of the usual problems associated with advancing years, the detail work on his model can only be described as superb.





Left: Don Hoey's delightful 1:6 scale Myford ML7 centre lathe with (inset) a close-up of the tailstock drill chuck illustrating the superb detailing.

Above: equally eye catching was Don Hoey's 1:6 scale Myford M type lathe.

rectangular open-topped tube containing tightly packed wire wool and fed with propane via the usual mixing tube. The engine drove a purpose-built generator which lit a model street lamp via a voltage regulator.

Ron Roebuck's *Noddy* was a striking model, well made in polished aluminium alloy, brass and copper. Steel ball bearings were used in the test tube which was heated by gas from its own refillable copper tank. A commercial *Noddy* doll, which nodded with the test tube movement, was an added novelty feature. This exhibit was awarded a Commended Certificate.

Class A2: General Engineering Models

Anthony Mount reports:

It was disappointing that the general engineering section only attracted a few entries this year. There are thousands of lovely models that you readers have built, please don't hide them under a bushel; please bring them along to the Model Engineer Exhibition for us all to enjoy.

The largest model was a 1:16 scale Pollit & Wigzell tandem compound mill engine entered by Peter Southworth. This was a lovely model with a tremendous amount of detail. Also supplied was a book showing engravings of the prototype engine. This is always helpful for judges as the more information provided the better. It was evident that the design had been followed faithfully.

Above: a 1:5 scale Chester Mini-Multi combined lathe and milling machine made by Andre Vantomme.

Right: Herbert Stumm's Benier hot air engine with internal combustion.

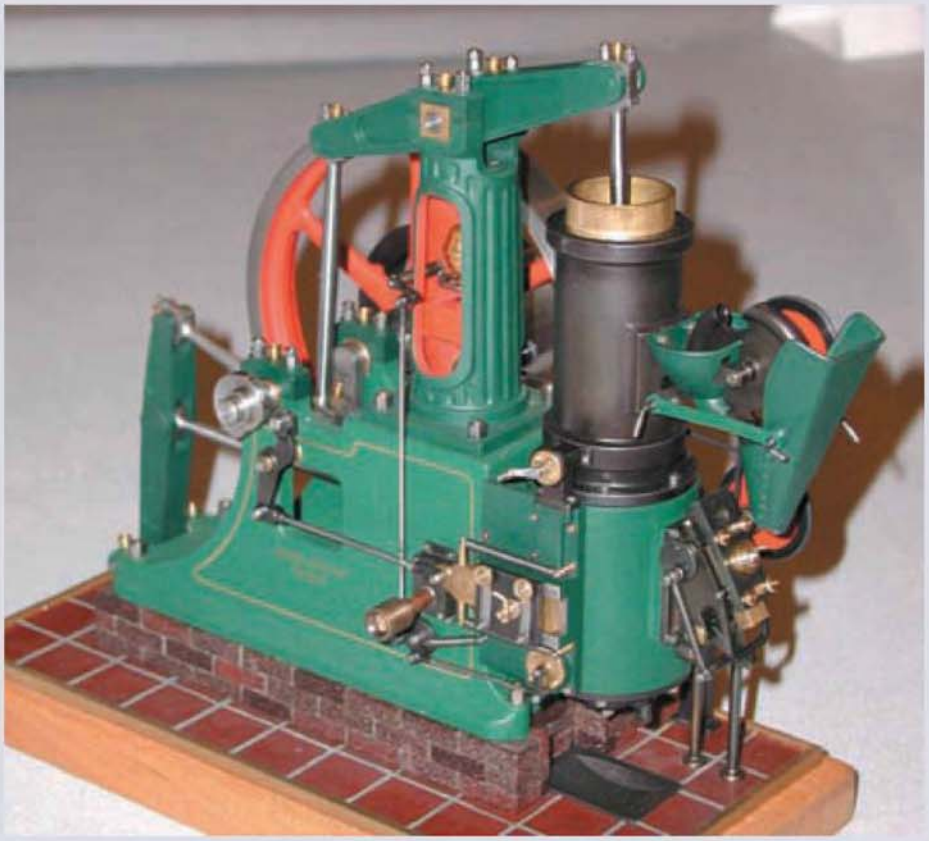
A small point perhaps, but some beading around the main lubricator box had been omitted. The finish generally was very good, but a little more filler could have been used on some of the castings and machining marks were evident here and there on some of the valve gear brackets.

The boarding-in of the flywheel was nicely done, but a wood with a finer grain would have suited the scale more closely, but that is nit-picking.

My only reservation related to the engine room floor which seemed to be a terracotta coloured plastic material with finely scored lines to represent tiles. Unless this was the colour of the original floor, my view is that individual tiles of contrasting colours, as so often used in the full size engine rooms, would have set the engine off a treat. The engine thoroughly deserved its Silver Medal and it was also awarded the Tom Nevins Memorial Trophy.

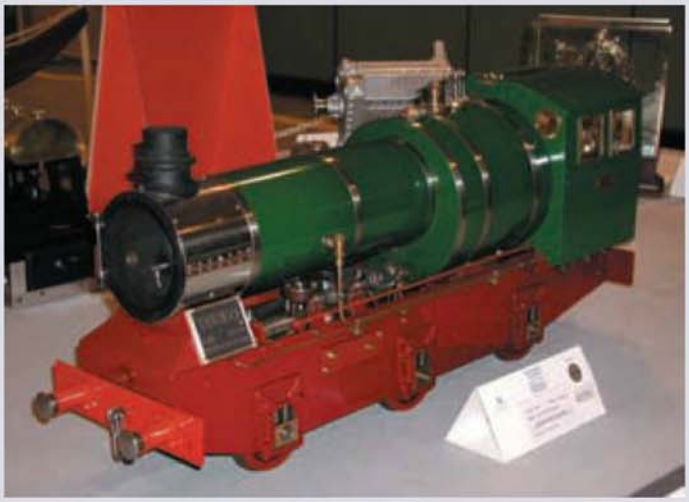
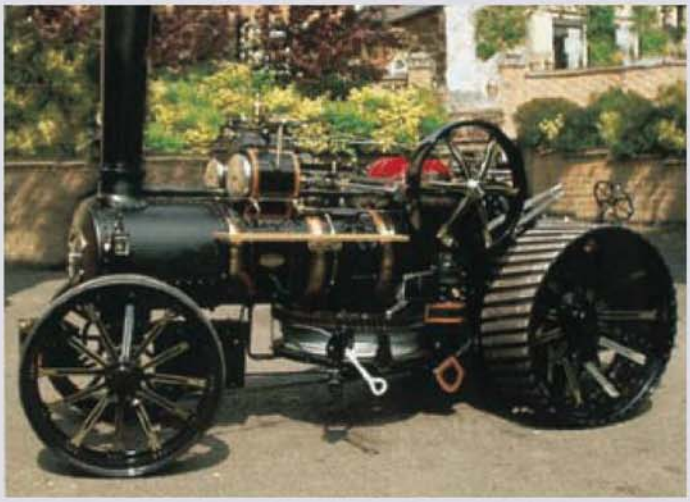
Also on display was Peter's steam turbine locomotive *Turbo*. This experimental locomotive was fully described by Peter in these pages (*M.E.* 4136, 29 December 2000) and his article graphically illustrated the perils of attempting something a little out of the ordinary. Indeed, so different was this exhibit considered to be that the judges decided to classify it as a general engineering exhibit rather than as a locomotive. If the SMEE track ever comes to Sandown, perhaps we can be treated to the sound of this engine running under steam. This fine effort was awarded a Sliver Medal and the Edgar Westbury Memorial Trophy.

Herbert Stumm always seems to delight in finding unusual prototypes for his models. This year he exhibited a 1:12 scale model of the Benier hot air engine with internal combustion. This engine has a power piston reciprocating vertically above a closed furnace and a horizontal reciprocating air pump that draws air through the furnace when the power piston is at the bottom of its working stroke. The working piston and the air pump piston are linked via a rocking beam reminiscent of those used on steam driven beam engines. The intake of air is heated and expands pushing the piston up. At the top dead centre position, a valve opens and the piston pushes the used air and hot gases out of the cylinder driven by the momentum of the flywheel. Herbert has found it impossible to scale nature and the engine will not run like the real thing. The small mechanism just chokes up with





Ian Cornish exhibited his Dreibeiner & Troika *steam toy, a fabricated brass V4 oscillating engine and a part-built traction engine based on* Little Ben.

Peter Southworth's 5in. gauge, 0-6-0 turbine locomotive Turbo *proves that the pioneering spirit in the sphere of model engineering is not yet dead.*

Steve Elliot's superbly finished and detailed 3in. scale Fowler Class Z7 ploughing engine awaits its first ploughing contract.

soot and dust from the fuel. However, it does perform quite happily on compressed air. This model was beautifully made and finished, and was awarded a Gold Medal.

In a completely different field was a steam fire engine from Vic Pugh. This was another fine model that, again, included masses of detail; not only much finely executed brass turning for pumps and valves, but nice panel work for the superstructure.

Here too a drawing was supplied of the prototype that showed how little the builder had to work with to produce this beautiful three-dimensional model. This model was awarded a Gold Medal and the Bill Hughes Trophy.

A compete change of emphasis came about with two little engines from Ian Cornish that were representative of steam toys from the late nineteenth century. The first was an example of the *Dreibeiner & Troika* steam toy described in these pages not long ago (*M.E.* 4146, 18 May 2001). The second entry was a more substantial multi-cylinder oscillating engine, made primarily from brass. They were great fun and were both Commended.

We may have been short on entries but we did cover a broad range of work. Don Hoey entered two miniature lathes in the loan section. Both were not quite completed, but the major work was done. One was of a Myford M type and at approximately 150mm long would fit snugly in the hand. Some very fine detail was evident and most of the parts seemed to work. To the same small scale (1:6), and to the same high standard, was a Myford ML7. I hope when they are complete they will be entered into competition. I understand that these two miniature lathes are part of a series of models being built by Mr. Hoey to show the development of the 3½in. lathe, and that the choice of scale is dictated by the stroke of his lathe cross slide. If the builder can be persuaded, a model of a round bed Drummond and the Myford Super 7 would make fine companions to the existing models to form a quartet of lathes taking us from the beginning of popular model engineering up to the present time.

Mr. Andre Vantomme chose an unusual prototype for his model, namely a Chester Mini-Multi combined lathe and milling machine to 1:5 scale. The result was a charming little model built using only simple equipment and the help of a home-made milling machine. Cast iron and steel were used for the construction and the maker claims it is fully functional. I think tweezers would be required to operate the hand wheels, as my fingers were not small enough. This model was awarded a Highly Commended Certificate.

Class A4: Mechanically Propelled Road Vehicles

H. Paviour and R. Heugh report:

Once again the new venue at Sandown Park appeared to find favour with both competitors and visitors with a generous allocation of space for everyone, including the trade stands. Although the entries in class A4 were low this year, the judges were pleased to note that most contestants had heeded their guidance, given in previous reports. Namely, they had provided documentary evidence of research carried out in establishing the authenticity or originality of the prototype.

A 3in. scale Fowler Class Z7 ploughing engine weighing in at 8¼cwt. was entered by Steve Elliot. At 22 tons, these were the largest ploughing engines built by Fowlers and were generally too large for use in the UK. Most were exported for plantation use in Africa and Burma. It was obvious from the outset that here we had a truly magnificent model. The builder had gone to considerable lengths to get details of his engine from the prototype and had also obtained copies of the original Fowler works drawings that are available from Reading University. It seems that most of Fowler's drawings and plate glass negatives are now at Reading. Other potential builders of Fowler locomotives may care to make a note of this.

We very often find that model builders have had some kind of assistance in building their engines, usually with boiler construction. Not so Mr. Elliot. He boldly took a course at Luton University and thereby obtained a coded welder's certificate. His subsequent steel boiler was tested to 360lb./in.² with no problems. This is far in excess of the required working pressure and very commendable indeed. The machining, boiler fittings, painting and lining were all completed to an extremely high standard. We were very impressed with this engine as everything everywhere was correct and a delight to behold. A more perfect engine would be difficult to imagine. The judges had no hesitation in awarding a Gold Medal and the Aveling-Barford Trophy to Mr. Elliot for this outstanding exhibit.

A 1:24 scale *Little Ben* engine based on a design serialised in these pages (*M.E.* 4142, 23 March 2001) entered by Ian Cornish was withdrawn from competition. The judges considered that insufficient work had been carried out for them to include it in the competition class. However, we feel confident that if the same standards of workmanship and ingenuity continue to be maintained until completion, then a favourable award could then be made.

●*Continued on page 144.*

BUILDING A 1:5 SCALE GNOME ROTARY ENGINE

Rowland Lowe

deals with the crankcase of this challenging project.

●*Part III continued from page 26 (M.E. 4163, 22 February 2002)*

The pattern as drawn on the plans is shown in **photo 21**. A vertical core could prove difficult to insert into a sand mould without damage, and may also cause problems when the two halves of the mould are brought together.

Moulding is facilitated by dispensing with the core, and a simpler pattern is shown in **photo 22**. A further useful modification is to raise the cylinder seats by 1/16in. to increase the machining allowance. Drawings of the modified pattern are given in **fig 4**.

My castings were made at a local foundry, and some observations concerning the material used may be helpful. The first castings were made in LM 4, a metal often chosen for ease of casting. On machining, however, I was not very happy with the grain showing in the metal. Further castings were made in LM 25 and heat treated to refine the grain. This gave a much better result.

When the casting is received, it should be checked for flaws or misplacements. It may seem that I am unduly cautious about setting up, but I speak from experience! There are a number of surfaces to be machined, and a failure to clean up when a good deal of work has been done can be expensive.

Fettle up the casting by removing flash, etc., and file one side to lie flat on the faceplate. Check that all 9 cylinders on the casting are, as nearly as possible, equidistant from the faceplate. Get the best compromise you can. **Photograph 23** shows a convenient way of initially positioning the casting on the faceplate to which it is lightly clamped for final adjustment. The dividing head is first set up between centres and the cross-slide locked. The casting is held in the outside jaws of the 3-jaw chuck and the saddle moved until the casting rests against the faceplate whereupon it can be clamped.

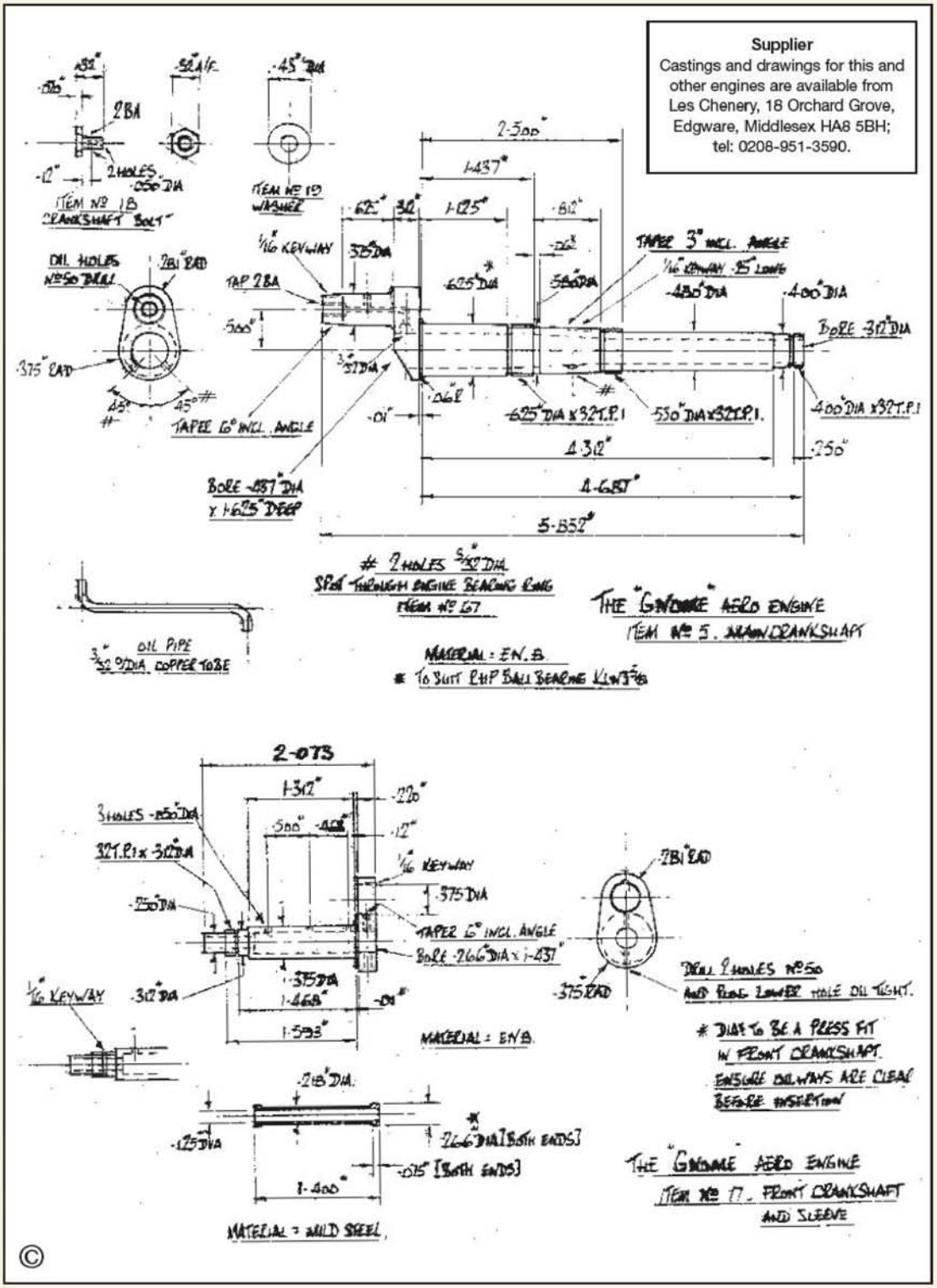
Photograph 24 shows a further check on the casting. Better safe than sorry! Find the centre of each cylinder seat and mark with a centre punch. Using a 45 tooth gear, index the casing round and check that all 9 cylinders are equi-spaced around the periphery.

Photograph 25 shows yet another check on the outside edge of the crankcase. This cannot be machined between the cylinder bases, and any noticeable error will cause the crankcase to appear to be eccentrically mounted on its cover plates.

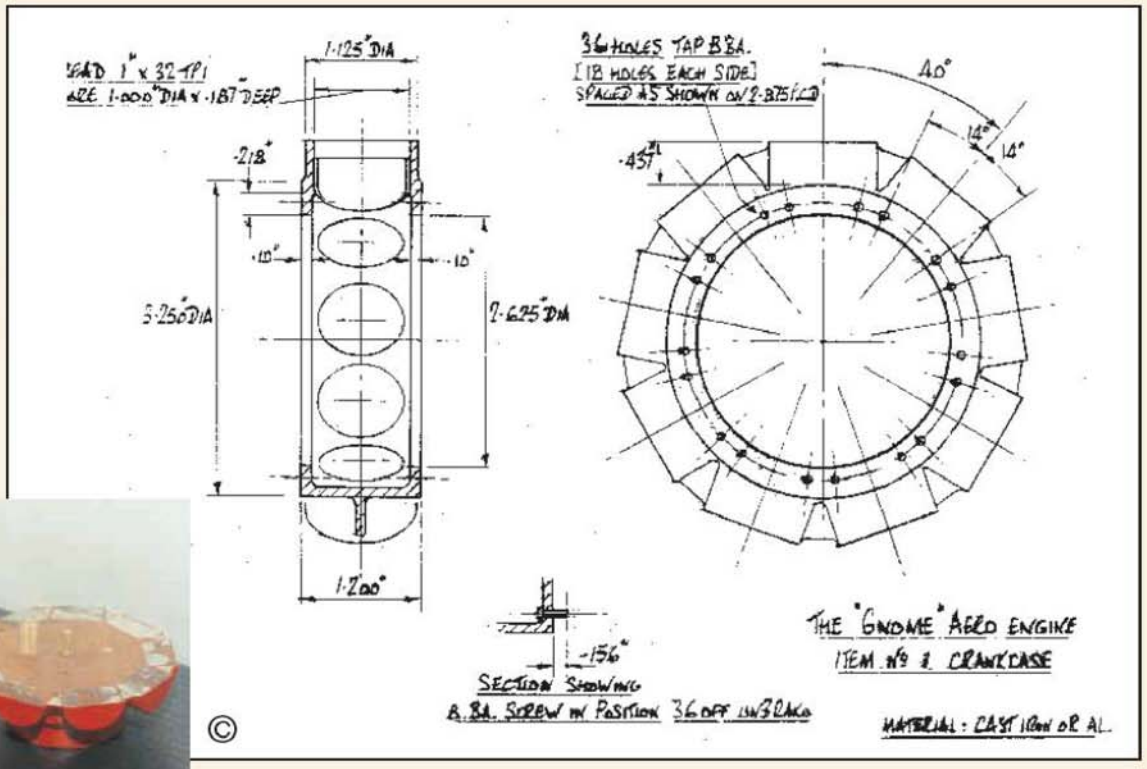
Some fittings will be required for accurate positioning of the crankcase for machining; these are detailed in **figs 5** and **6**. They consist of a disc

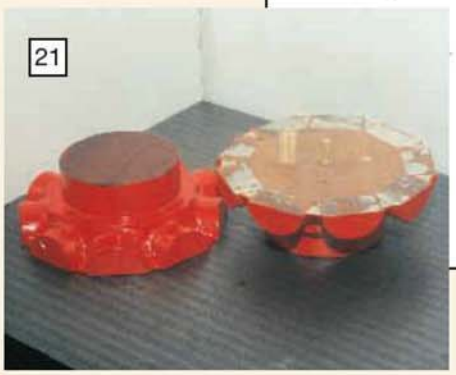
Supplier

Castings and drawings for this and other engines are available from Les Chenery, 18 Orchard Grove, Edgware, Middlesex HA8 5BH; tel: 0208-951-3590.



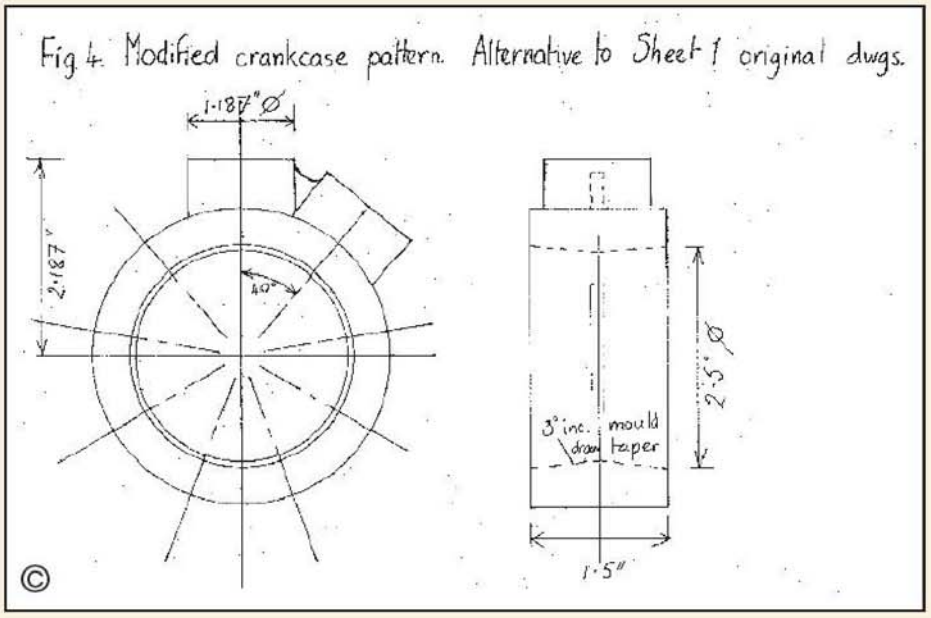
of steel plate, a mandrel extension to fit the lathe mandrel (2MT for a Myford) threaded to accept a drawbar (2MT blanks are commercially available), a clamping bar, 1/4in. dia. bolt and an angle plate specially fitted for correct location both on the faceplate and for the casting. **Photograph 26** shows the

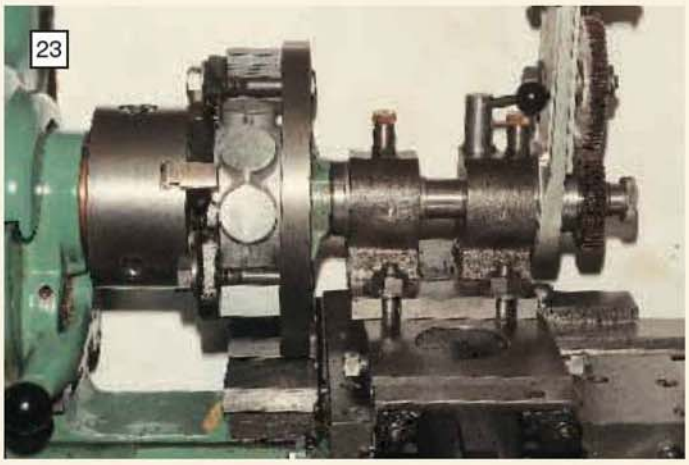




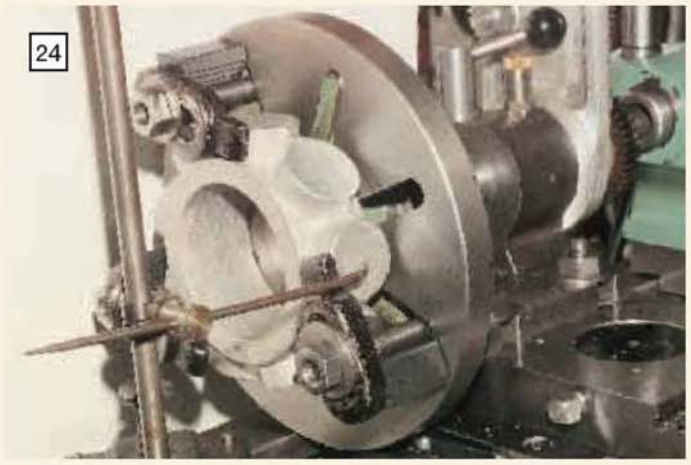
The original pattern for the crankcase. To simplify the moulding process, the decision was taken not to use this pattern.

The modified crankcase pattern. This pattern avoids the use of a core.

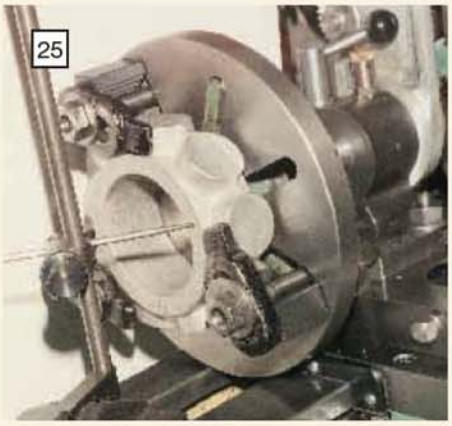




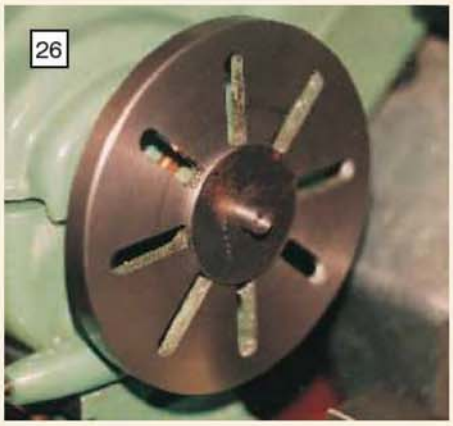
A convenient way of centring the casting on the faceplate using the dividing head on the lathe cross-slide.



The first check for cylinder positions. The casting and faceplate are still mounted on the dividing head on the lathe cross-slide.

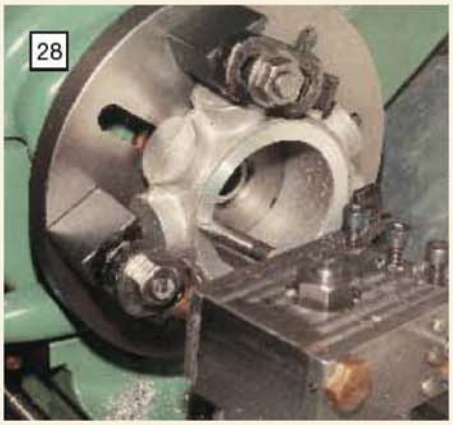


Checking the truth of the outer edge of the crankcase, using the surface gauge again.

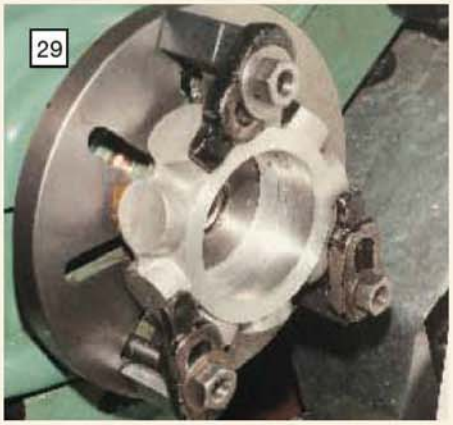


No. 2 Morse taper mandrel and locating disc in position on the faceplate.

Crankcase machining angle plate in position on the faceplate with locating disc and mandrel.



Making the first facing cut on the crankcase casting.



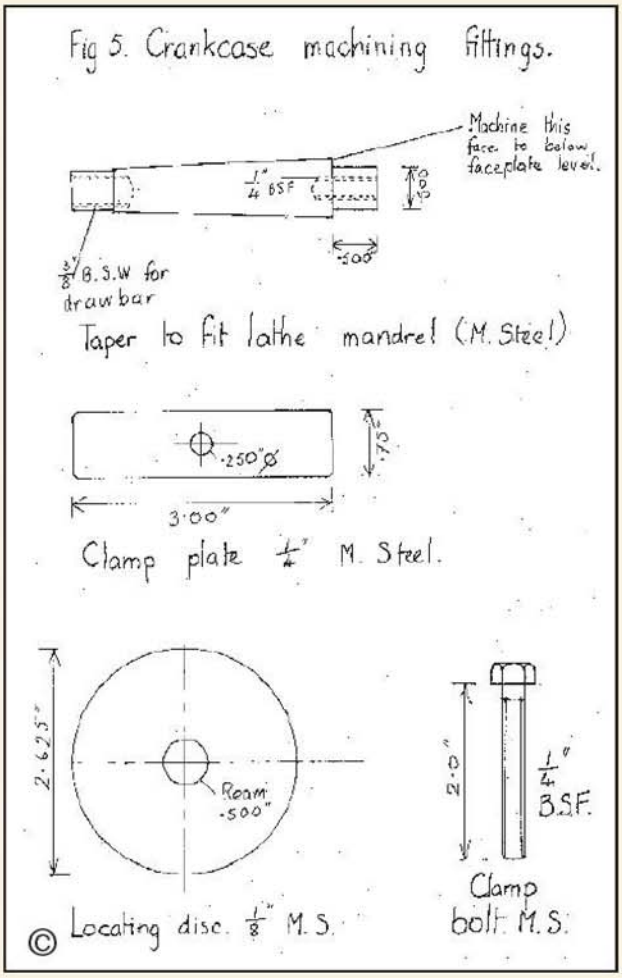
Crankcase front; stage 1 of the machining completed.

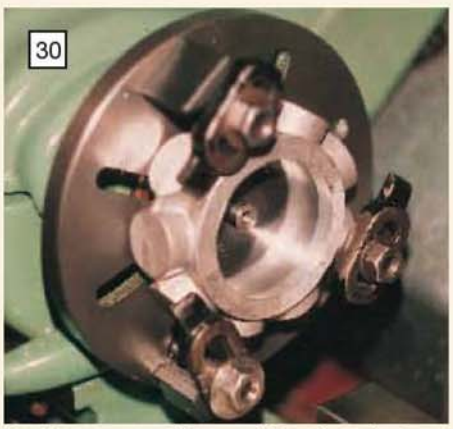
locating disc in position on the faceplate, and **photo 27** the angle plate in position.

Photograph 28 shows the first facing cut. Take the cut nearly to the outer edge, but then stop to check the truth of the outer diameter. If satisfied, complete the cut. Machining the inside of the crankcase is straightforward. **Photograph 29** shows the front faced, the majority of the width of the interior turned to finished diameter, and the front wall back faced and bored.

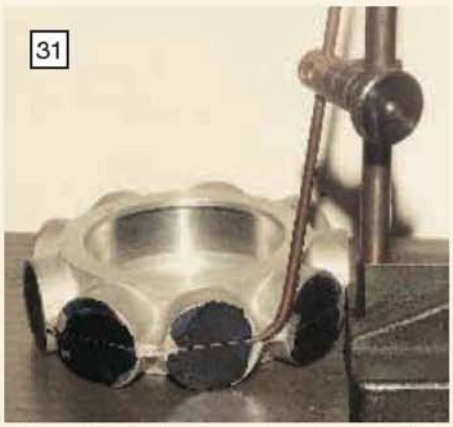
It may now be necessary to secure the casting by placing the tapered mandrel in the headstock and securing the drawbar *hand tight only*. Jammed tapers cause much grief! Secure the casting by means of the clamping bar and bolt so that the dogs can be released, and just enough taken off any overhanging cylinder seats to allow the machined face to sit firmly on the faceplate when it is reversed. The mandrel and locating plate will be required for centring the crankcase when it is reversed to face, bore and back face the un-machined side. **Photograph 30** shows this set up.

Photograph 31 shows the marking of a centre line on the part machined crankcase.

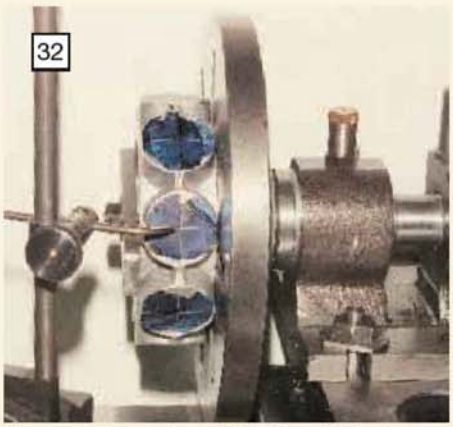




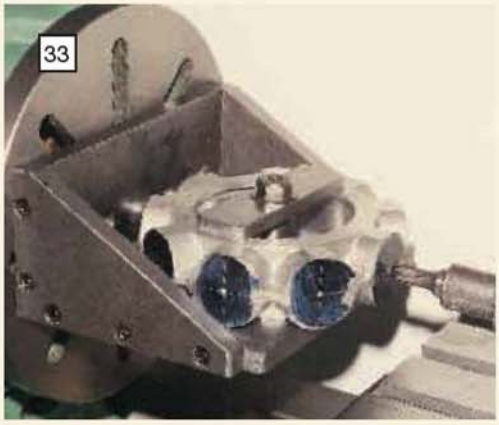
Crankcase reversed for machining the other face. Note the use of the locating disc.



Marking the cylinder centre line using the surface gauge on the surface plate.

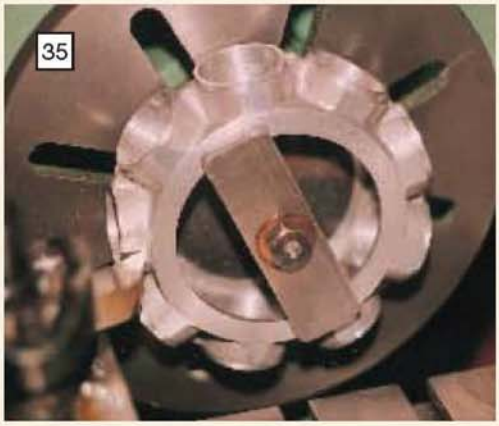


The second stage in marking the cylinder centre lines using the dividing head on the lathe.

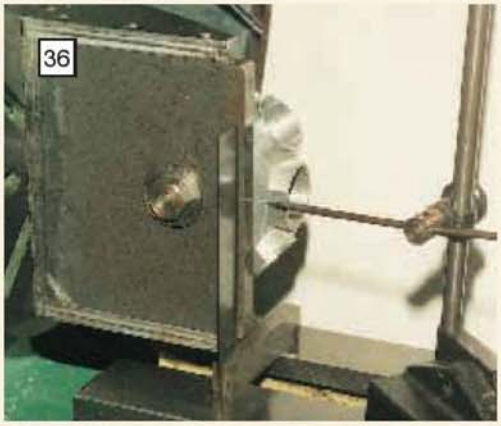


Indexing the cylinders for machining using the special angle plate mounted on the faceplate.

The casting after the cylinder bases have been machined.



Final facing off of the front and rear of the cylinder seats.



Marking the crankcase top dead centre positions. Note the use of a square on the lathe bed to ensure the faces of the crankcase are vertical.

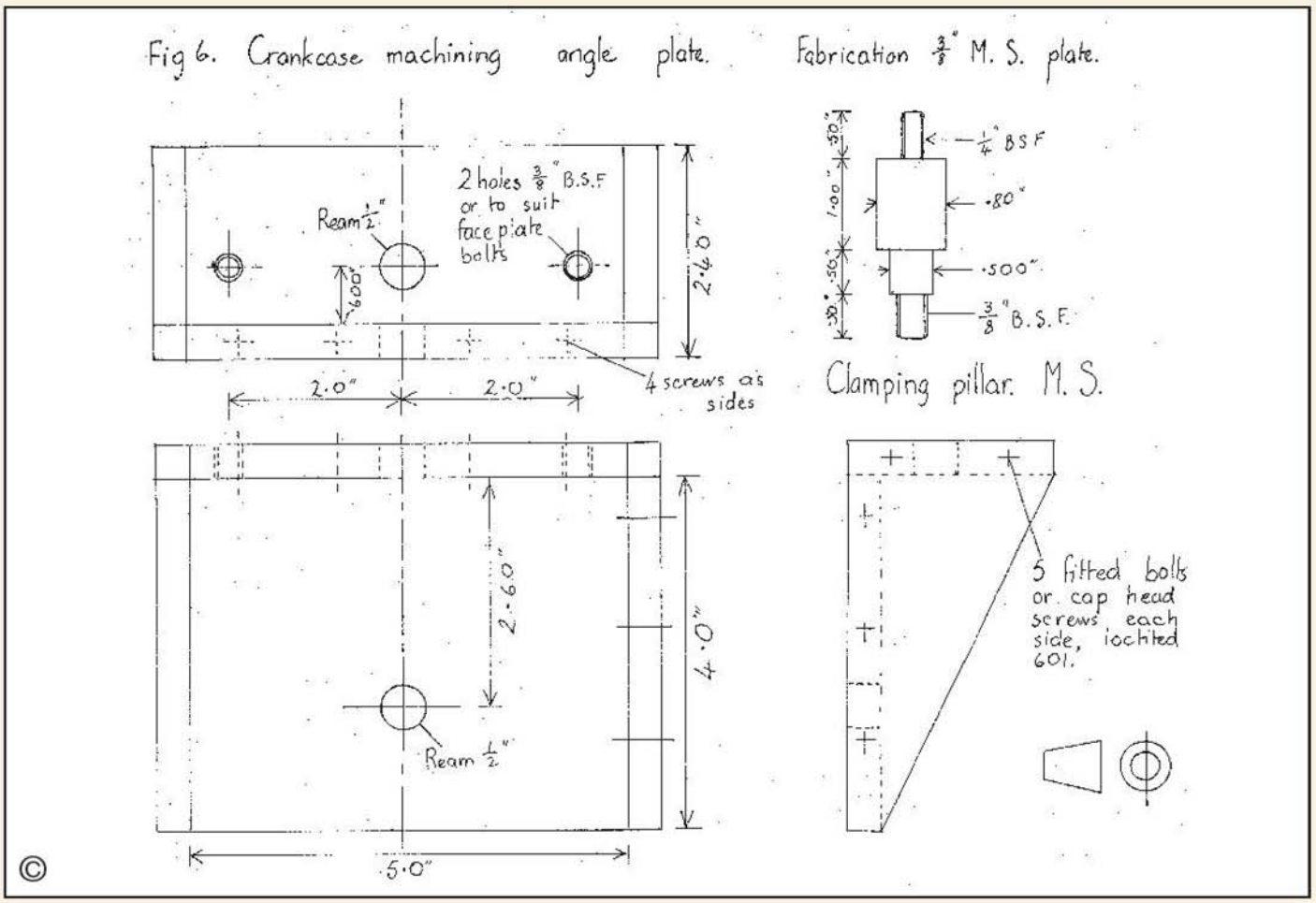
Photograph 32 shows cylinder centre lines at right angles to those just marked. My dividing mandrel is bored 2 MT to take the mandrel extension and clamping plate, and a 45 tooth change wheel is indexed every 5 teeth for the 9 centres. We are now ready to begin machining the cylinder seats.

As will be seen when set up as in **photo 33**, the special bracket ensures that each cylinder seat can be correctly centred for machining, and the method of indexing is also shown.

Photograph 34 shows the cylinder bases machined. A large diameter centre in the tailstock can be used for re-centring machined seats if required. **Photograph 35** shows the final facing off of the cylinder seats to the correct 1.125in. dimension. The cylinder positions can now be numbered 1, 2, 3, 4, 5, 6, 7, 8, 0 (to avoid confusion with 6). The direction of rotation is *clockwise from the rear*. Finally, mark top dead centre on both sides of the crankcase as shown in **photo 36**, using a square to set the bracket vertical and with the scribing gauge at centre height. This is important for later assembly.

The crankcase is now complete and the two highest constructional hurdles have been cleared.

●*To be continued*



WEIGHT DRIVEN EGG TIMER

John Wilding FBHI

completes this elegant domestic timepiece with advice on finishing.

●*Part X continued from page 77 (M.E. 4164, 8 March 2002)*

The lifting lever which was shown on the drawing fig 131 (see *M.E.* 4163, 22 February 2002) is another example of a modification which I decided on. Originally it was a press fit on its collet but I later fitted it with two 10BA screws. The hammer arm is threaded 7BA each end for screwing into the hammer head and lower fixing. When drilling these components they can be conveniently held in a pair of toolmakers clamps as demonstrated in **photos 137** and **138**. The collet for the lower fixing of the hammer arm is made a permanent fit on the 2 1/4in. arbor with Loctite 601. A No. 55 hole is then drilled right through the collet wall into the arbor for a 10BA screw securing the inner end of the spring. The outer end of the spring is fixed to a mounting stud also shown on the drawing fig 131.

Finally, a tapered pin is hammered into the upper part of the mounting bracket to act as a stop for the hammer arm. This can be seen in both photos 133 and 134 (see *M.E.* 4163, 22 February 2002). This stop pin should be positioned so that when at rest, the hammer head is some 1/8in. away from the bell. Final adjustment is made by bending the hammer arm. When the hammer arm is pulled back and released it should snap back under the tension of the return spring and strike the bell. If the hammer bounces back and strikes the bell a second time, the head is too close to the bell.

Bell

This can be obtained from Walsh or Meadows & Passmore. Both firms list inexpensive bells suitable for this application. The diameter needs to be no more than 65mm and the depth some 20mm. The bell standard was shown on the drawing fig 27 (see *M.E.* 4157, 30 November 2001).

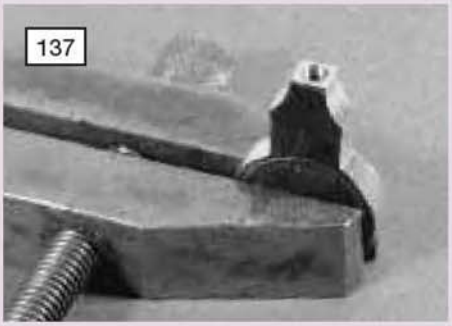
Setting up the strike

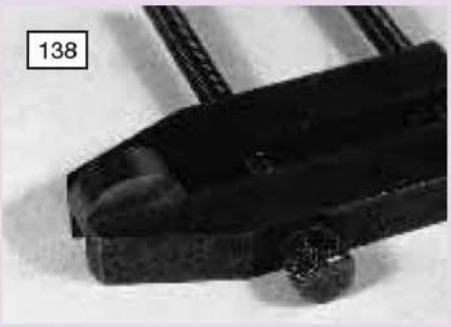
With the strike unit mounted on the cross strut, the lifting arm should be set so that it points to the centre of the minute wheel. The pin at the rear of the minute wheel should start to raise the lifting arm during the last minute of the action, and release it when the hand is pointing to the 6 minute numeral. It may be necessary to use the 2BA die to increase the length of thread on the end of the minute wheel collet. If necessary, a drop of Loctite screwlock, which is a lower strength adhesive than the 601 retaining compound, can be used to secure the hand in the correct position but I did not find this necessary on either of my timers.

When the hand is pulled forward the lifting pin should be free of the lifting lever and the wheel teeth free of the 2-pin suspended lantern pinion so that the time can be set.

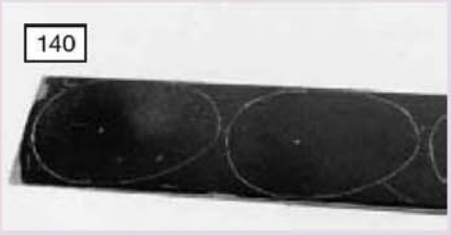
Dial shields

These take the form of eggs evenly spaced around the dial ring. On the first timer I secured these with Araldite, but on the second timer they are silvered and I made them detachable as it is is desirable that they can be removed in the future if re-silvering is required.

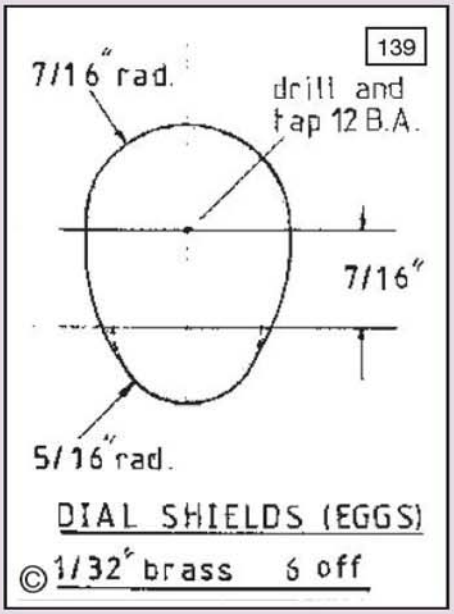


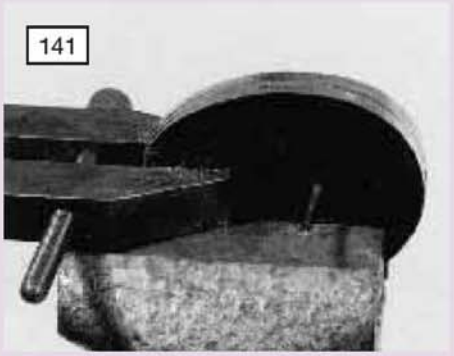


Top and above: small and awkward components can often be held securely in toolmakers clamps for drilling.



The 'egg' shields can be marked out on a strip of 1 x 1/32in. brass.





The shields can be threaded onto the No. 60 drill and then gripped in the vice for filing in batches.

The shields are dimensioned on the drawing **fig 139**. They are cut out from 1/32in. brass strip as shown in **photo 140**. A No. 60 hole is drilled in each one; this will be tapped 12BA so that shields can be secured to the dial ring from the back with 12BA screws. Although each one can be marked out individually, it is quite satisfactory to mark out the shape on a postcard and cut this out carefully. This is then used as a template for the six shields which can be threaded on the No. 60 drill and clamped in the vice as illustrated in **photo 141** so that all six can be filed up together.

It should be noted that the two radii given on the drawing are not joined by tangential lines. They should be blended with the use of French curves. The securing 12BA screws should be shortened to bring them flush with the shields.

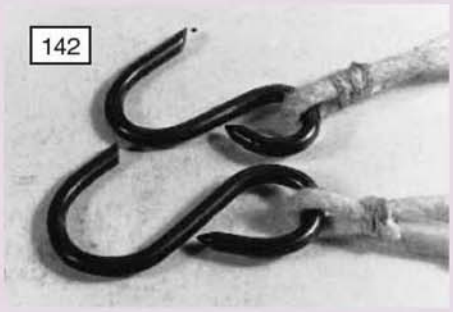
Silvering is optional but I think it is worth doing. I silvered mine, together with the two pendulum bobs. Silvering salts are readily available from all the suppliers given in the first part of this series. It is a simple process which can be carried out in the kitchen sink and instructions are supplied with the salts. After silvering, the components should be lacquered.

I show an illustration of the way I attached the piping cord to the hooks in **photo 142**. Button or carpet thread is used to secure the loop and Sellotape or a blob of glue can be used to prevent the cord from fraying. It is desirable to fit a simple stop arm at the bottom of the back plate. This is illustrated in **photo 143**. It is a piece of wire with a right angled bend at one end and a loop at the other which is secured with a 5BA screw and washer as shown here. The distance from the loop to the arm should be about 1 1/8 inch. In use, the arm locates in the loop of the piping cord and limits the upward travel of the jockey weight. Without this arm, the weight disappears upwards inside the mechanism and becomes difficult to pull down when winding. The piping cord needs to be 8ft. in length to give a full six minute run.

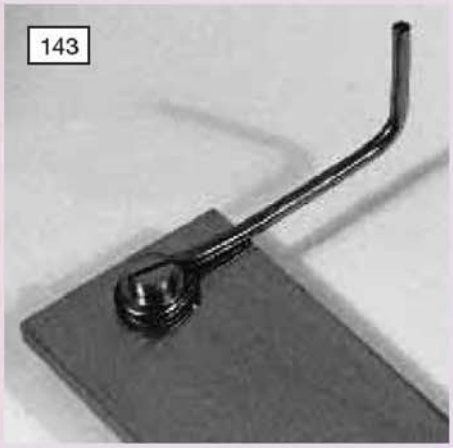
Self-adhesive numerals on the shields are available from RiteTime publishing (ref 1). It is, however, quite easy to engrave Roman numerals on the shields using the Unimat 4 and I will be covering this in an appendix to this series.

General finishing

The first task on the plates is to knock out the register pins, which are no longer required, and plug the holes with brass wire or brass taper pins. These are filed flush using camera film as already described, to avoid marking the plates.

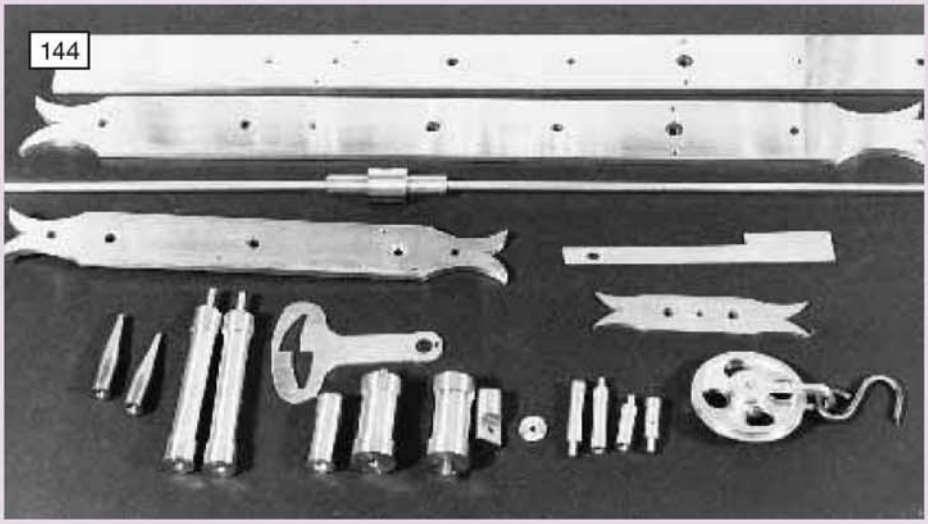


Above: method of attaching the piping cord to the hooks. Note the neat formation of the latter.



Right: stop arm fitted at the bottom of the back plate to prevent the jockey weight rising too far.

Two cheap rolled thread 5BA screws before and after polishing.



Parts from the prototype timer which have been lacquered.

It is important that where a mechanism is totally exposed it should be nicely finished. There are several ways of finishing brass. The edges of the plates, cross struts and bridge pieces should all be drawfiled, finishing with No. 4 or 6 cut files. Where the fishtail decoration involves two edges meeting at an internal intersection, this must be really sharp and finished using knife edge files each of which has had one of the faces ground or stoned to remove the teeth.

Flat areas can be grained using emery or wet or dry papers wrapped around half a wine bottle cork which has been split lengthways. It is no good using a piece of wood in this role, it is not sufficiently resilient. Round components can be rotated in the lathe and grained with emery sticks. The general procedure in this work is to remove blemishes, such as scriber marks, with 220 grit wet and dry paper used wet. Nothing coarser than this should be used. This can be followed by 300 and then 600 grit papers. This should leave a fine grained appearance. If you want to proceed further then use a 1200 grit paper and finally a leather buff stick impregnated with Solvol Autosol automotive polish.

There is sometimes confusion over the different polishing papers available today. The wet and dry papers which are readily available from DIY shops are generally satisfactory but the emery papers traditionally used by clockmakers are still available from material suppliers. They, together with emery sticks, are numbered differently going down from grade 3 which is coarse through 2, 1, 0, 00 to 000 which is the finest. Then there is crocus paper. The latter works better after it has been used for a while.

Lacquering

It is customary to lacquer the stationary parts in a clock. These include the plates, pillars, cocks, bridges and other parts which may be handled such as the pendulum bob. The moving parts such as the wheels, the barrels and the 'between-the-plates' parts are not normally lacquered.

The traditional lacquers used by clockmakers are shellac based and applied with a cotton wool swab well squeezed out. The parts are literally only wiped over. The lacquer is not put on with a brush which would result in it penetrating the pivot holes. This lacquer is 'touch dry' almost immediately but is best left overnight before the parts are handled for pegging out the holes. The holes are not pegged out before lacquering. In **photo 144**, I illustrate some of the parts on my first timer which were lacquered.

Screws

The ends of the threads where they are visible should be burnished. To do this the screw must be held in the 'screwhead holding tool' previously described and illustrated (*M.E.* 4157, 30 November 2001). The end is nicely rounded with a fine file and then burnished. The 1/4in. wide combined pivot file and burnisher is not satisfactory for this work, it is too narrow and will keep slipping off the work. You need a 1/2in. wide x 4in. long clockmaker's pivot file and burnisher (**ref 2**). This is a fine file on one side and a burnisher on the other. The burnisher must of course be 'made' as previously described. Burnishing is so quickly done, you should obtain a mirror polish in less than ten seconds. The same treatment should be carried out on the ends of the pivots which should all glisten.

The heads of the screws are burnished as well. The screw is held in a pin vice which itself is gripped in the 3-jaw chuck on the lathe. This is gentler on the screw threads. The side of the head is filed with a No. 6 cut file and burnished as before. The face of the screwhead cannot be polished in the lathe by this method as you will find you cannot reach the centre, only the edge of the head will show any signs of acquiring a polish. You need circular laps which are rotated in the lathe while the screw is held in a 'V' block on the milling table and then advanced against the lap. This procedure is demonstrated in my last book (ref 3). However, the heads of both cheese and countersink head screws can be polished quite simply by fitting the screw in a pin vice.

The pin vice is turned upside down and held as low down as possible. The screw face is then rubbed on three squares of emery paper laid on a hard flat surface such as a surface plate or a sheet of ground glass. The three grades of paper can be No. 2, 00 and crocus used in that order. The No. 2 grade will remove all the machining marks and the other two will bring up a mirror polish. The screw heads are pulled across a soft clock brush after each paper to remove the grit so that it doesn't contaminate the next grade. I used to demonstrate this procedure when at the Model Engineer Exhibition and onlookers were amazed when I showed how a mirror polish could be obtained in less than 30 seconds.

In **photo 145** I show two screws. They are both cheap, rolled thread screws which I have used throughout the construction of this timer. You can see the difference in the finish. The one on the right has been polished by exactly the methods just described.

The two weights can be left in their natural colour in which case it is a good idea to apply Jenolite which will prevent rusting. Alternatively, they can be blacked as I suggested for the hand. If preferred, they can be painted.

That concludes the construction of the timer but as I have already mentioned, I am producing an appendix which will cover certain procedures which have occurred to me since writing the series, especially various procedures involving the use of the Unimat 4 lathe which I have not been able to cover satisfactorily because the accessories were not available at the time.

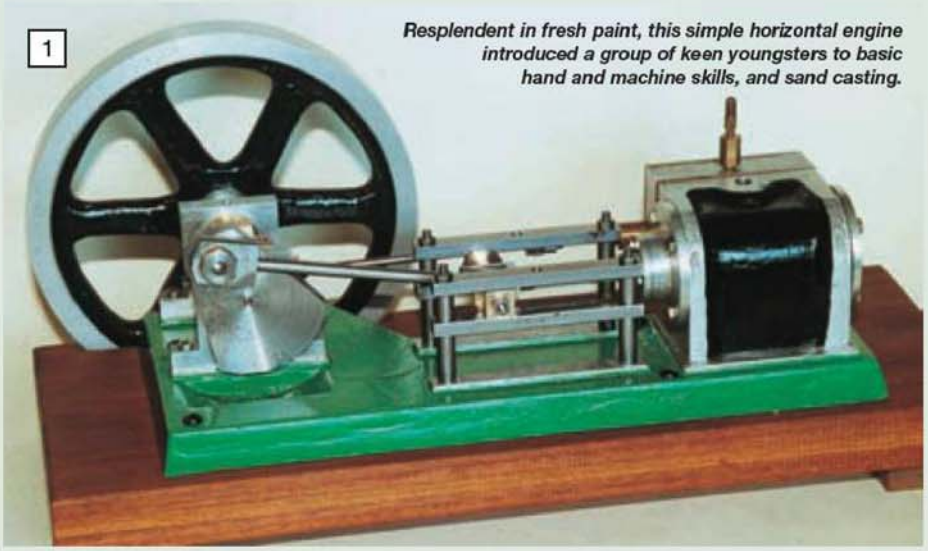
References

1: A set of the six self-adhesive numerals necessary for this timer is available from RiteTime Publishing, 18 Woolmer Way, Bordon, Hampshire GU35 9QF; tel: 01420-487747; fax; 01420- 474647.

2: J. Malcolm Wild, 12 Norton Green Close, Sheffield S8 8BP; tel: 0114-274-5693 can supply a suitable tool for this process.

3: Lapping screw heads in the lathe is illustrated in my book *The Construction of a 3/4 Second Pendulum Battery Electric Clock* published by RiteTime Publishing.

●*To be continued.*



Resplendent in fresh paint, this simple horizontal engine introduced a group of keen youngsters to basic hand and machine skills, and sand casting.

THE 'CROFT' MILL ENGINE

John Bertinat

presents a simple slide valve horizontal engine design with which he re-introduced 'metalwork' to a group of keen schoolchildren.

● *Part I*

It all started with an invitation from the Neighbourhood Engineers Group of the Institution of Mechanical Engineers, addressed to retired professional engineers to lend a hand in making schools aware of some of the aspects of the engineering profession. Although I have been retired from professional engineering (teaching) since 1973, I found myself back in the workshop of a local school (Ludlow), assisting with an after-school engineering club. The workshop was chiefly orientated towards GCSE woodworking projects and the only available engineering machines were a rather 'well used' Boxford lathe and a well worn Fobco drill. These, together with other sundry small tools, were the remnants from the now obsolete craft training which was discontinued in schools many years ago. Also available, and to prove very useful, were facilities for producing simple castings in aluminium alloy.

When we first entered the scene, the main project in progress was the making, largely in wood, of lineside accessories for a Gauge 1 railway layout incorporating an all-plastic electric locomotive with steam outline and dummy valve gear, together with plastic rolling stock. Some degree of Civil Engineering had been incorporated into the bridges, etc. along the track, but this project did not involve other important aspects of engineering.

After some discussion, the lathe was restored to working order and our first project was a large oscillating engine, the design of which the teacher resurrected from an early craft teaching manual. In addition to fairly simple machining, the project introduced some simple pattern making and casting and all were thrilled when the finished engine worked under compressed air. Following this, I suggested a simple slide valve engine as demonstrating more nearly how the bits and pieces of their plastic locomotive worked, and one which could mostly be constructed by an enthusiastic group of pupils.

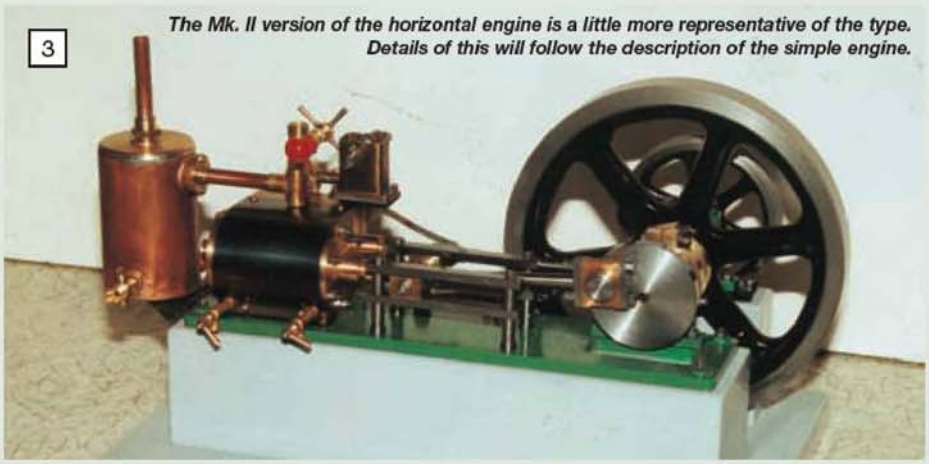
Figures 1 and **2** show the engine I schemed out for this purpose and **photo 1** shows the finished prototype which was not entirely the pupils' work. Aluminium alloy was used for the main castings, to enable them to be made in the school; these castings included cylinder components, bearing pedestals, base and flywheel. The use of aluminium alloy also eased the problem of thread tapping, and to further ease this problem it was arranged that no thread below M4 would be used. In accordance with modern teaching practice, metric dimensions were employed throughout.

Aluminium alloy castings were prepared in the school foundry.

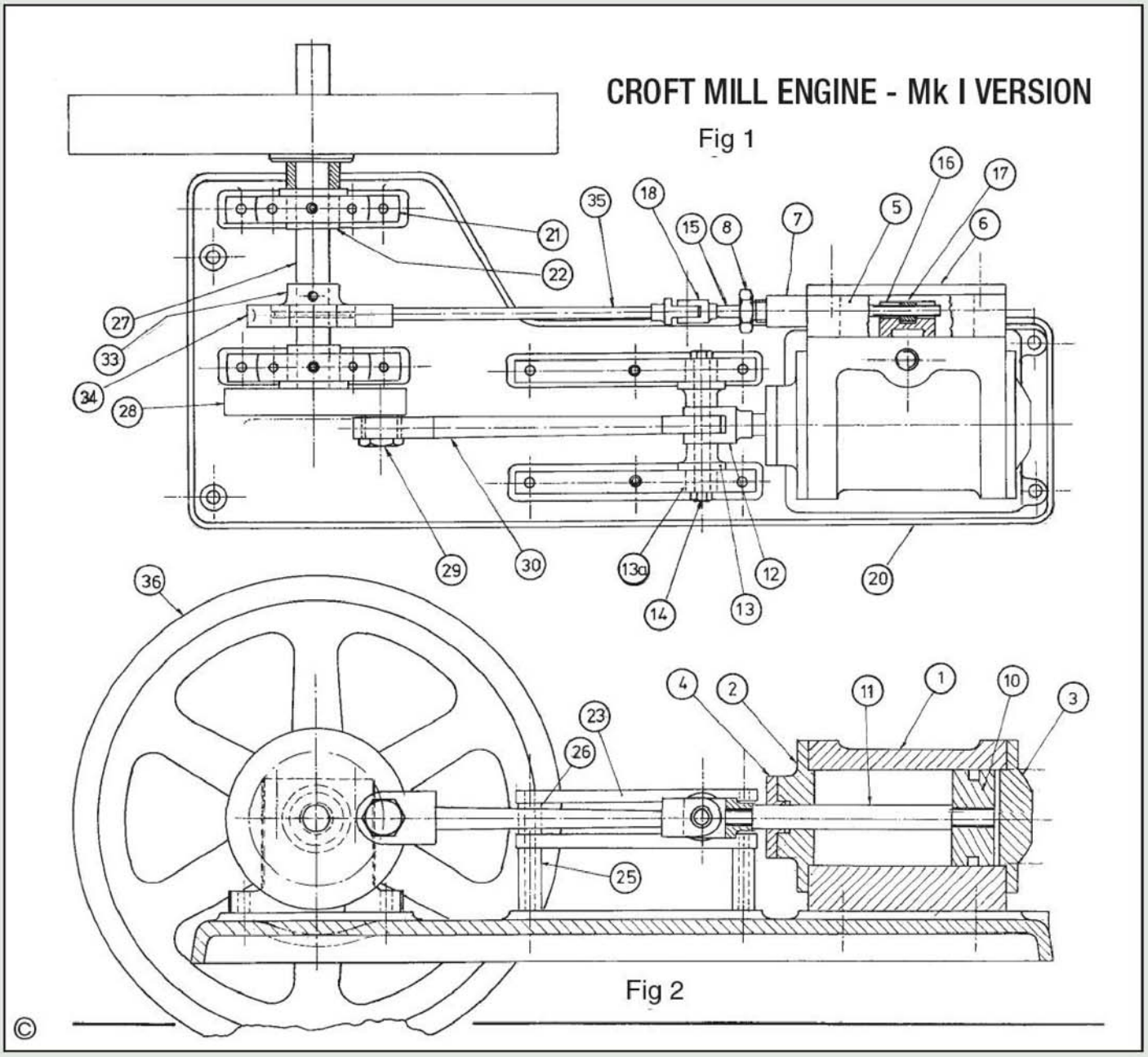
It had originally been intended to make the engine base from flat plate, but the unexpected availability of the casting changed this; incidentally the base was cast without the hollow underside. **Photograph 2** shows the castings for the base and the cylinder, for simplicity the latter being cast without a core. Despite some misgivings regarding the soundness of the solid chunk of metal, the cylinder machined up satisfactorily.

The general layout of the engine follows in simplified form what was general practice for many full-size industrial engines towards the end of the 19th and early in the 20th century. Most of these engines had overhung disc or balanced cranks, with an occasional example of a full-crank design, as in the Stuart 8, 9 and 10H models. In some cases the flywheel, and possibly a drive pulley, were mounted outside the bearings, as in our engine, permitting the use of a one-piece bedplate, but in larger engines the flywheel was placed between the bearings, necessitating the employment of a separate support for the outer bearing. It is hoped to provide an example of this latter form of construction in a Mk. II version of the engine which I have made up (**photo 3**).

The four-bar crosshead guide which was extensively used, has been adopted for the model since it consists of a number of relatively simple parts which can readily be replicated if mistakes are made. Some industrial engines were fitted with trunk guides, this feature often being incorporated in the base casting; I prefer this type of guide for the crosshead since, although it involves



The Mk. II version of the horizontal engine is a little more representative of the type. Details of this will follow the description of the simple engine.



somewhat heavier machining, if this latter is carried out correctly, automatic alignment of piston and crosshead is assured. This feature also will be offered as an alternative in the Mk. II version.

Again for simplicity, the cylinder block is bolted to the bedplate from the underside of the latter, an arrangement which could not be generally applied in full-size practice. This anomaly could be overcome if desired by machining extra material from the underside of the cylinder block and fitting, by means of six countersunk screws, a mounting plate which extends, say 9mm beyond each end of the cylinder block, thus providing a flange at each end of the latter which could be bolted to the engine bedplate in the normal way.

When scheming out this design, it was intended to employ only castings which were already freely available, the school castings were an unexpected bonus. I had intended to employ a flat steel or alloy plate for the engine bedplate. My own Mk. II engine employed a locomotive outside cylinder set as supplied for LBSC's *Hielan Lassie* purchased very many years ago from the 'original' George Kennion of Shoreditch, but any similar 3 1/2in. gauge locomotive casting would do, with possible detail dimensional adjustments.

I used a flywheel intended for a Stuart No. 1 Engine (Stuart's ref. 31-50-00010) because a casting was to hand, but any similar wheel would do, including the somewhat lighter Stuart ref. 31-50-70081, or that supplied by Reeves for their Tangye engine. The eccentric strap is a standard 3 1/2in. gauge locomotive type casting; all other parts may be fabricated.

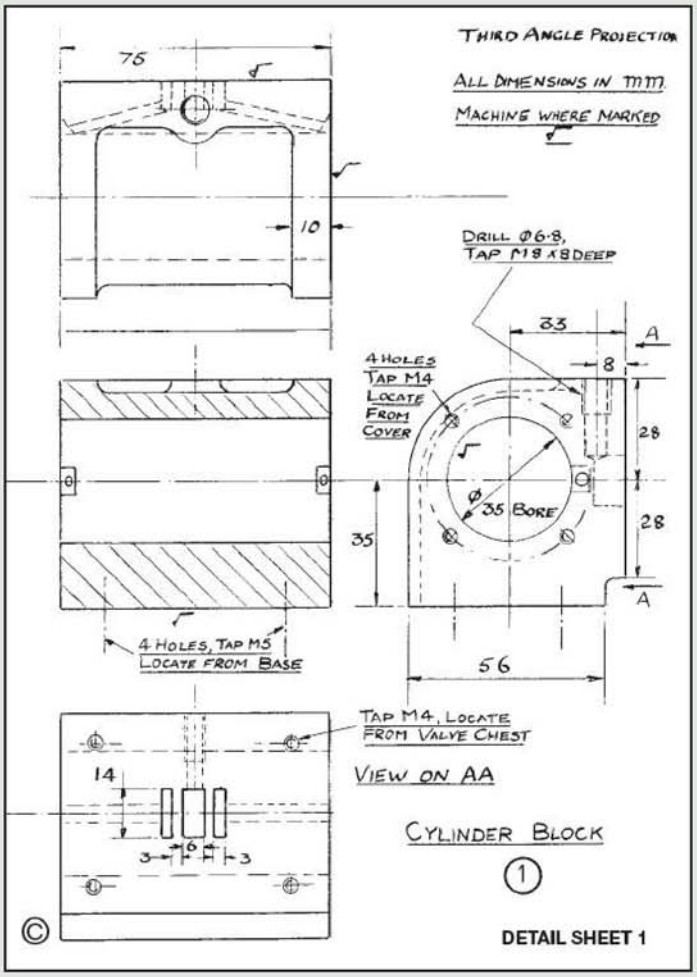
The general description to follow will deal with all working parts first so that they may be checked as a unit with the base.

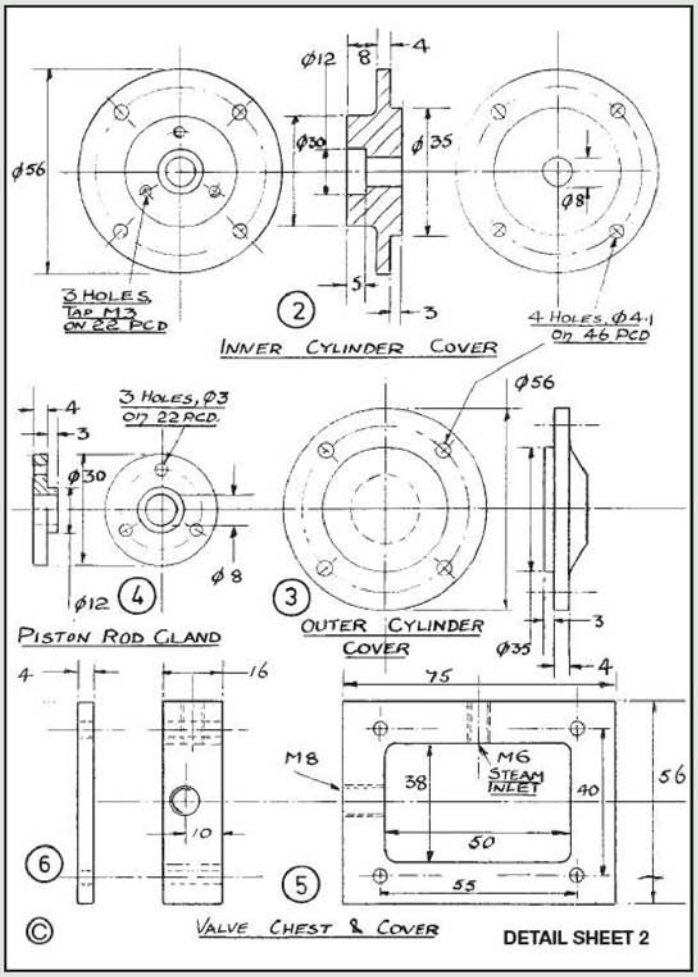
Cylinder block
(Part 1, Detail Sheet 1)

After marking out the bore centre, having plugged the core hole if necessary, this item is most readily mounted in a 4-jaw chuck, inner or cover end outwards, and set with the marked centre running truly and with the sides of the casting perpendicular to the chuck face in both directions. With a solid casting, preliminary drilling is necessary and for the later stages of this process some 1/2in. dia. shank blacksmith's drills were used. For the finish boring operation a sharp, stiff boring tool, set with its cutting edge a shade *above* centre height is employed. For an aluminium alloy casting, the top rake of the tool needs to be increased slightly to ensure a good surface finish. Finally at this setting of the work, the end of the block is faced and an identification mark provided to ensure that this end is assembled with the inner or crank end cylinder cover.

For facing the other end of the bore, the casting may be reversed in the 4-jaw chuck with the already machined end face butted firmly against the chuck face. Some builders may wish to mount the casting on the lathe saddle and finish the bore with a between-centres boring bar, but the lathe to which our pupils have access has no T-slotted boring table. The top of the cross-slide is machined flat but only has a single T-slot adjacent to its rear edge. One could possibly get by, using an angle plate attached to the cross-slide by T-bolts in this single slot, the cylinder then being strapped to the angle plate.

The normal method for machining the valve and bolting faces of the casting is to use an angle plate bolted to the lathe face plate, with the cylinder casting bolted to the angle plate by a long bolt through its bore. Snag No. 2: the school lathe has no faceplate, so we were again obliged to make use of the angle plate bolted to the top-





slide, with the casting secured to the angle plate by means of a long bolt through its bore. The facing was carried out using a flycutter mounted in the lathe chuck. Incidentally the absence of T-slots in the cross-slide could be overcome, provided that said cross-slide has a flat face, by drilling and tapping, say M8 holes at convenient points in its surface into which appropriate studs could be fitted, these holes being plugged with M8 socket grub screws when not in use, to prevent their becoming clogged with swarf.

The steam ports are shown on the drawing with square ends but if produced by end milling, these will be rounded. Incidentally, the milling and drilling of the ports and passages was arranged to be carried out by yours truly due to absence of facilities in the school workshop.

Cylinder covers and piston rod gland
(Parts 2, 3, & 4, Detail Sheet 2)

The piston rod gland on the inner cover (2) has been designed for use with an O-ring, but if a locomotive cylinder set is used, there may not be sufficient metal for the O-ring gland and a conventional packed screw type may be used. The important requirement for the inner cover is the concentricity of the piston rod/gland bores and the cylinder mounting spigot. I usually machine the piston rod/gland bores first and then mount the work on an *in situ* turned mandrel for machining the cylinder mounting spigot and the outer circumference.

The bore for the piston rod is dimensioned at 8mm, but it is desirable to provide slight clearance here since the piston rod is (or should be!) adequately guided by the piston at one end and the crosshead at the other; and to obtain perfect alignment at the three locations is asking rather a lot. The gland packing or O-ring should be capable of dealing with a slight amount of movement. Incidentally it is easier to obtain a reasonable clearance if a 5/16in. dia. piston rod (0.3125in) is used in conjunction with an 8mm (0.3150in.) cover bore; the use of full metric dimensions viz. 8mm piston rod with 8.1mm bore provides more clearance than should be necessary.

Finally the holes for the M4 cover attachment bolts are marked out and drilled. In the absence of a dividing head, the hole positions may be accurately marked out on a piece of stiff paper having a central hole to fit the cover spigot. With this placed in position, the bolt hole centres are punched through to the cover and the holes drilled. Operations are similar for the outer cover. I usually drill and tap a shallow central hole in the underside of the cover to enable it to be mounted on a threaded mandrel for machining its underside.

Machining work was carried out on the school's refurbished Boxford lathe. Here the valve chest is being tapped to accept the valve spindle gland.

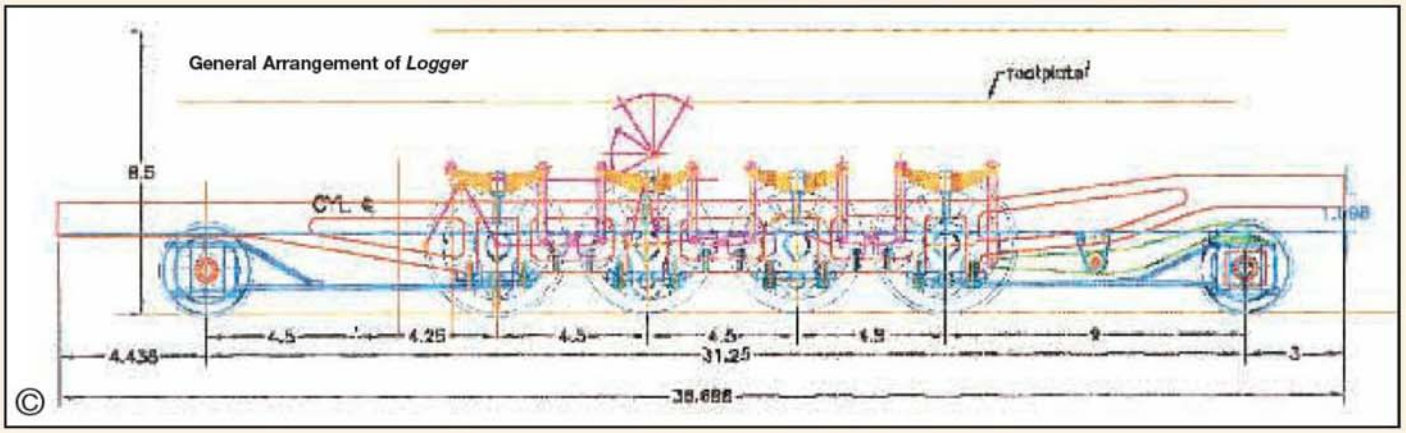
Valve chest and cover
(Parts 5 & 6, Detail Sheet 2)

We had an aluminium alloy casting available for the valve chest, this being cast without the valve rod gland. If standard locomotive castings are used, the gland boss is integral, offset to accommodate the locomotive valve gear, and usually appears on both ends of the casting to provide support for a tail rod. The current design calls for a single central boss so that the cast bosses must be removed and be replaced by a single central boss screwed into the casting. The increased length of the central boss compensates for the omission of the tail rod guide.

The first operation on the valve chest is the machining of the front and rear joint faces to bring the casting to its 16mm thickness and for this operation the work is mounted in a 4-jaw chuck. To machine the outer edges of the chest and to drill and tap for the gland boss, the casting is traditionally mounted on an angle plate attached to the lathe faceplate and the edges faced in sequence (**photo 4**).

The valve chest cover is cut from a piece of 4mm thick aluminium alloy plate. The four fixing holes for the M4 studs may now be drilled 4.1mm in the valve chest and the holes spotted through to the cylinder block and the valve chest cover. After drilling and tapping the holes in the cylinder block, the valve face of the latter should be lightly lapped to remove burrs and machining marks. The contents of the valve chest will be dealt with later.

●*To be continued.*



LOGGER

AN AMERICAN TYPE 2-8-2 LOCOMOTIVE FOR 5in. GAUGE

Keith Wilson

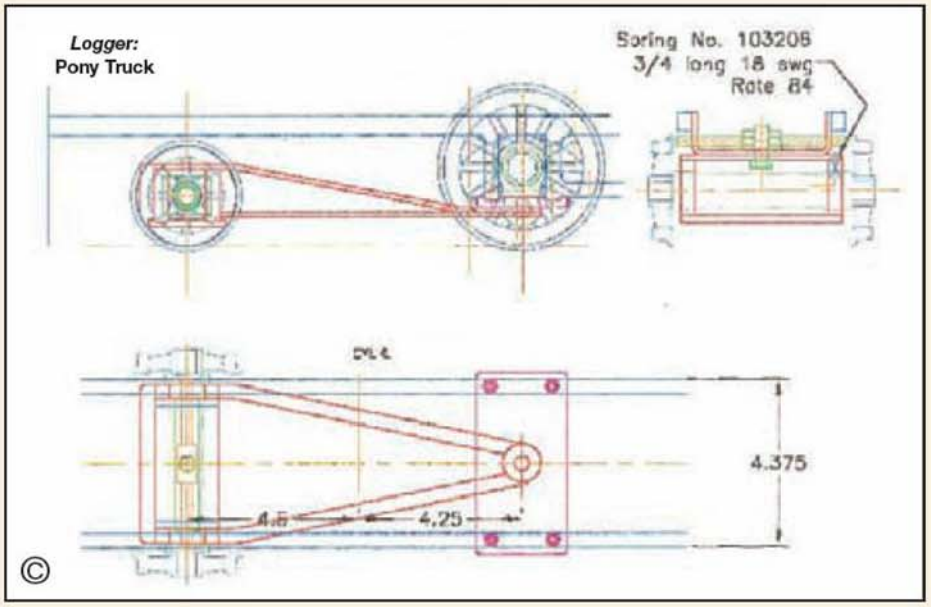
begins work on his new locomotive, starting with the front truck.

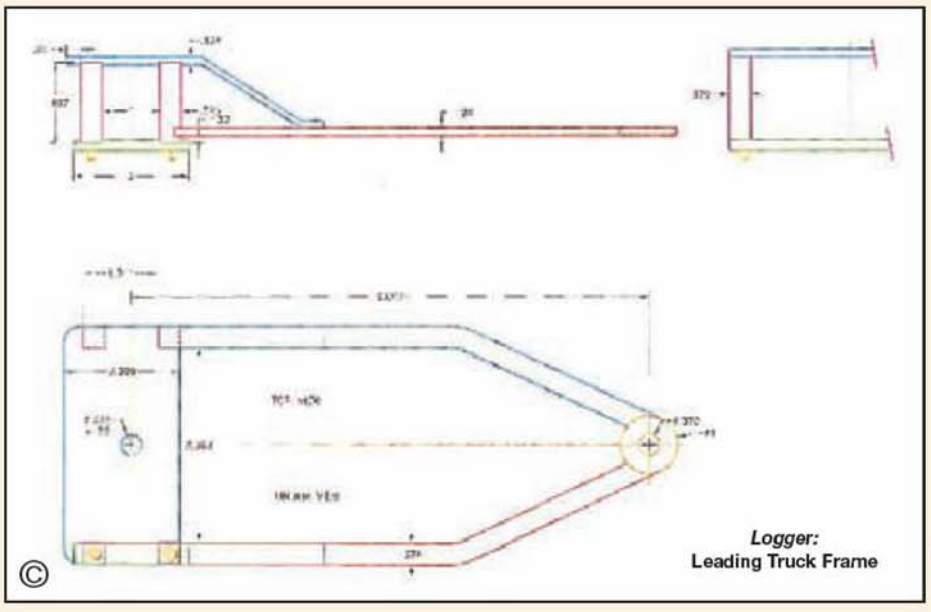
●*Part II continued from page 35, M.E. 4163, 22 February 2002.*

So to the first article on the actual construction of our *Logger*. Although to start with the main frames is customary, I dislike this practice, preferring to wait for a while. The likelihood of errors is very little greater than with other parts, but the consequences are somewhat greater in view of the fundamental nature of the frames. In our case, these are bar frames and therefore much thicker than the usual English plate-frame system. Available as pre-profiled slabs, probably by plasma cutting, they will not need overmuch machining; in fact I am trying to keep this design simple and basic. I am not, of course, too familiar with American locomotive practice, but with the aid of one or two reference books will try to avoid too many clangers along these lines.

I believe that the term for a leading 2-wheel truck (pony) is of American origin anyway, so I see no harm in sticking to the term. Ours is of simple bar-frame construction (common practice at Swindon for bogies and ponies) and is arranged for a certain amount of side control. This aids in smooth running if not overdone. I have also tried to get easy access for removal, not that it should often be necessary, but when it is needful it sure can be a right pain.

The bar-frame construction, it will be noted, bears much similarity to that shewn for the 47xx being described concurrently. In our sizes, the leading truck, be it 4 wheel or 2, seems to be somewhat more liable to adverse effects from damage; this seems mostly due to lifting on and/or off the track. Guard irons are especially vulnerable, and it can be advantageous to make them a bit stronger than 'scale' albeit fitting them on with bits weaker than 'scale'; it is a matter of choice. Whether to suffer the slings and arrows of outrageous thumps breaking bits off or merely bending them, 'bending them straight' later or merely re-bolting.





The top plate could well be one big plate with the two braces reaching backwards towards the pivot all one bit, alternatively they can be arc-welded as separate bits. I have shewn the pillars/horns as recessed into this plate, this makes for greater strength plus ease of locating same. In the case of the keeps, it is advisable to put a tie-bar across to connect these two, it makes for a useful bit of stiffness where same is desirable.

Side control is not quite so sophisticated as the 'snap-to-centre' system used on GWR designs (and many others) which gives a positive minimum sideways load directly the locomotive departs from the straight and narrow. Side control is not so important in small sizes anyway (many small designers omit it) but is useful. It is provided here by a pair of fairly light springs, much lighter than the 'support' springs bearing on the top of the cannon axlebox. I doubt if side control was applied to the prototype for it could hardly have often reached such speeds as would warrant it; however, in our case I am certain that scale speeds will be greatly exceeded. Although I am aware of some of the side loadings applied to full-size engines, this factor is one that cannot be 'scaled', mainly because of the wretchedly sharp curves up with which we have to put.

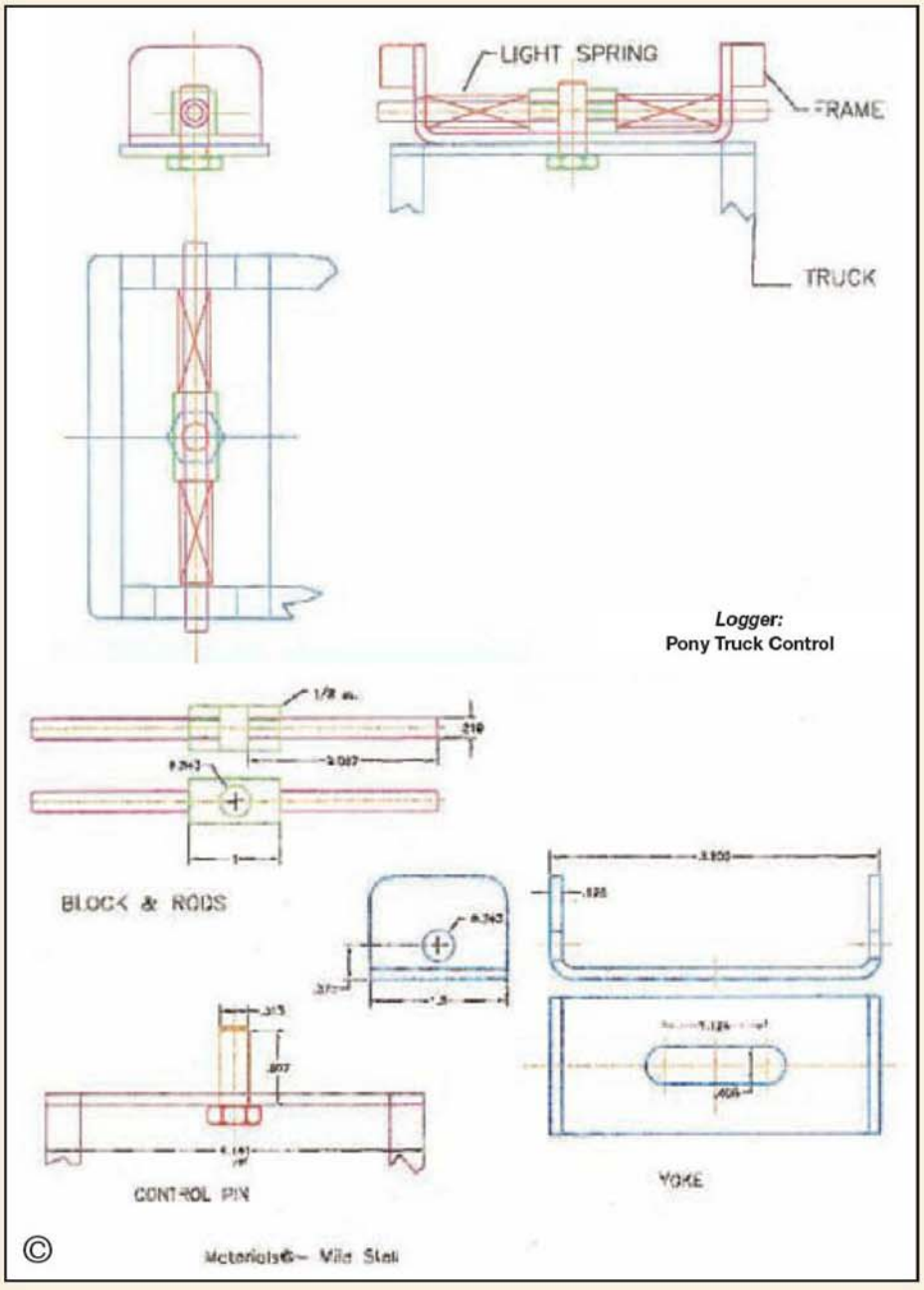
I tried scaling these figures several years ago in conjunction with a batch of four Kings. The bogies promptly derailed on the first curve, so I reduced the loading by about 60%, which cured the derailing problem but left no definite knowledge as to 'how much'. However, the main point is that the bogie bogey (I've looked forward to that one for some time!) was cured.

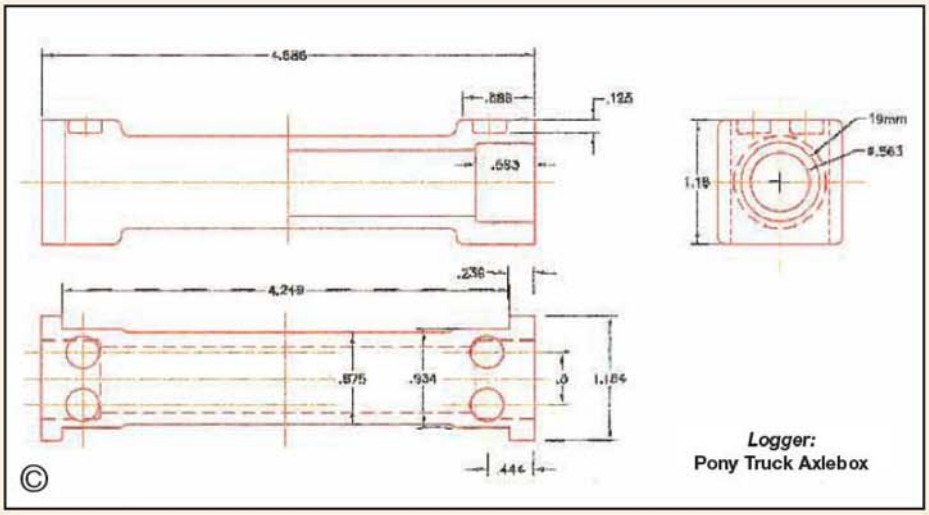
The construction is fairly simple. The Yoke mounts between the frames, I have not shewn any actual fixing as it is probably best welded; if you want to bolt it, the exact sizes and locations of bolts are not vital. I have mentioned before how tricky it is to get a bend just where you want it, and to get the yoke bends in place use the welding torch with one hand and a hammer in the other.

If the Control Pin is threaded just enough to screw into the top plate and be locked by the nut underneath, that should be all the fixing it needs. In theory, the slot in the yoke should be curved, but the amount of clearance required as determined by our old pal Pythagoras comes out to be a minute fraction over 0.018 inch. I was rather tickled to note that the calculator built into my computer promptly spat out the answer to about 20 decimal places — there's accuracy for you!

By the same token, side play needed in the holes across the yoke is the same within close limits.

However, it helps if the two rods are concentric, or dead in line. An easy way to ensure this is to screw-cut the threads on these pins, following up with a die as 'chaser'. The hole through the block can be done right through from one end, or one pin put into half the hole and gripped in lathe chuck to drill and tap the other hole. For a pair of control springs, I suggest beginning with a 22swg. spring, modifying accordingly as experience dictates.



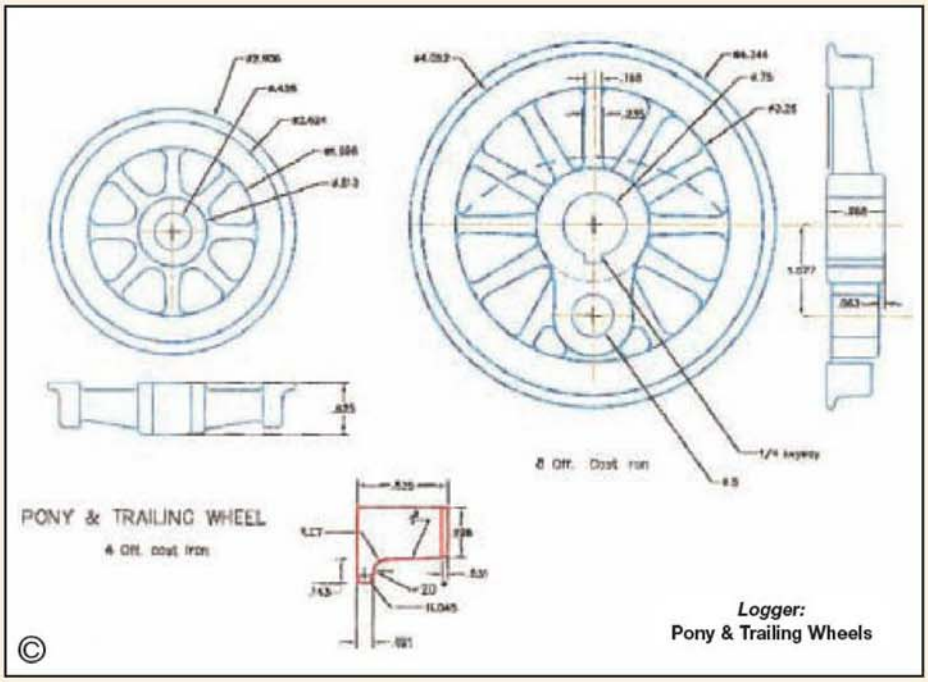


Cannon box

I am given to understand that this is not the strictly correct term for these items, but a: you know just what I mean and b: offer me a better term and I will use it.

To machine these items is clearly tricky, for surfaces, bores, etc. must be correctly positioned. However, since there are six of these things altogether (the tender has a different arrangement) it is worth while spending some time on the machining procedure.

If using castings, then to get the bores lined up requires some use of a fixed steady combined with between-centres techniques. If your smallest self-centering chuck (not the tailstock type) will go into the rough bore of the casting it helps a lot; if not, then set up the casting in the 4-jaw and get



Logger:
Pony & Trailing Wheels

Front truck wheel with 8 spokes, whitewashed tread and nature much in evidence!

the chuck end to run as truly as you can. No need to overdo it though. Using a plug in the outer end, support it with a 'revolting' centre in the tailstock. Machine part of the central round portion true, just long enough to accept the jaws of the fixed steady. Make this part at the outer end. Then remove the tailstock set up, replacing it with the fixed steady. Now bore out the outer end, leaving it true to size. Face off the end. Change end for end and, as far as possible, get the previous bore running truly (this is where the smallest self-centering chuck, etc. pays off) and repeat the process of boring. Check the central hole right through.

Milling the outside to profile locating from the bores is now straightforward.

If making from solid, the same general procedure is followed, with the exception of needing to drill right through. This will probably need to be done from both ends. It is a good idea to put in a grease nipple fitting in the forward side about the centre — reason obvious.

Wheel 'em in, Sarge!

The wheels for *Logger* are quite small, and therefore will take less time to machine than *Saints* in 7¼in. gauge. Although the tender wheels do not look the same as the pony wheels, I see no reason why they should not be identical for our loco, apart from the larger bores in the tender wheels to permit cannon axles. So get hold of a dozen castings, and machine them accordingly.

If they are reasonably good castings, then put them in a 3-jaw chuck, boss outwards, i.e. flange towards chuck. Now, old Curly's method was back outwards, and this has much to commend it. Still, if as sometimes happens, the rough tread is not concentric with the front, then you could well end up with an attack of 'wobbilitis'. This can be cured to a great extent by using a 4-jaw independent chuck for the first operation.

After checking how much material to take off, face off the centre boss, centre-drill and ream to required diameter. The outer rim face is done at this setting, and the outer diameter may be tackled — watch out for kamikaze operation of tool on chuck jaws. In cases of larger-gauge locomotives, it is sometimes possible to machine the entire front of the wheel this way, but in 5in. gauge it could be difficult due to flange width. Either way, make sure that at least part of the outside diameter is cleaned up, for then it makes life easier to grip in the chuck in order to machine off the back faces.

Once this is done to all the wheels, they can be mounted on a central spigot or mandrel and pressed up against the faceplate to do the rest of the outside, including taper, chamfer, etc. This gives a good wheel; but there is a slightly better way, giving greater concentricity. Once the casting is cleaned up, but not down to finished sizes, bond the wheel onto its axle (wash joints with acetone, apply Loctite 601) and when set fine-turn the wheels and axles assembly to finished size between centres.

Although in theory wheels pressed or bonded onto axles should run truly, in practice there always seems to be a little bit of wobble left over. I have found this on some 406 wheel sets, and nowadays use the on-axles method exclusively. It can be done even with crank axles, especially if the crank axle is left whole between webs until afterwards.

The rear truck has much in common with the leading truck, except that there is no need for side control, for any amount of running tail-first is unlikely. A thing that will be noticed is the rather flimsy construction of the framework. It has virtually nothing to do except push a pair of wheels along the rails; however, the vertical load on the compensating beam is another matter. There may or may not be compensation for the leading truck on the prototype. Our American colonists are keen on such devices, but nothing shows on the photographs so I cannot be sure. It would certainly be a complication, tucked up between the cylinders.

What about Compensation for us, Guv?

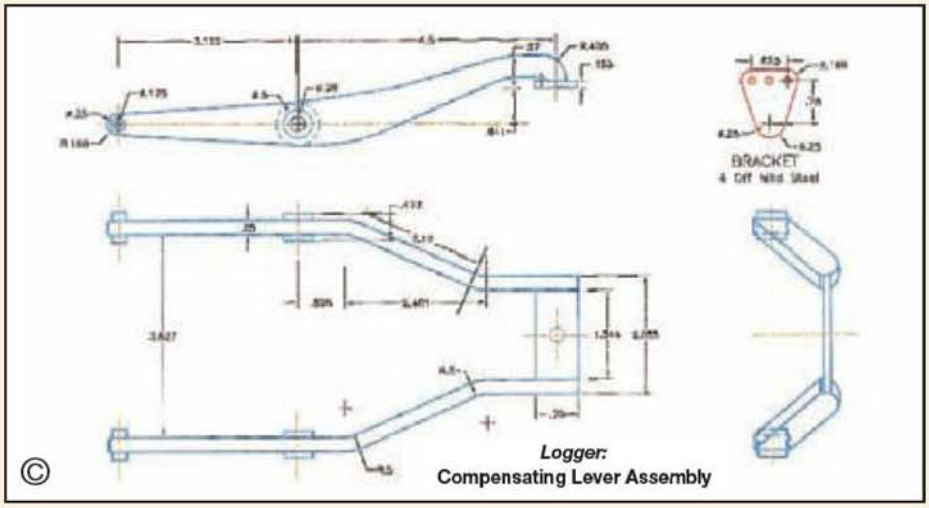
Now, I have mentioned getting bends in the right places before, but this time we have some hefty bits to bend. The long way is the shortest in the long run — as usual!

Note that the offset is 0.984in., which at first looks disconcerting. However, (useful word) it is almost exactly 63/64in., so near to 1in. as makes no odds. If, therefore, the pesky thing can be mounted between two suitable blocks and squeezed, it will go generally towards the required shape You will find it very hard to do this without a hefty press (I am feeling too lazy to calculate the load needed, take it from me it's pretty certainly more than you have got) — unless you heat the bit up at the points of bend. It is easy enough to locate these, simply a matter of measurements.

Grip the job in your biggest vice, using a couple of bits of steel 1in. thick. Tighten the vice to a good tight grip, then apply the torch (oxy-acetylene) to the bend zones. As they get to red heat, the vice will become quite slack, so apply some more 'oomph' to the handle, keeping the bends hot. If you haven't done this before you will be nicely surprised at just how easily the job is done.

Profile the outer shape, drill the two boss-holes and silver-braze the bosses in. If the holes in the bosses be left undersize, reaming out after cleaning up from the heat operations — not that we need high precision here — you will end up with snug-fitting compensation beam unit.

● *To be continued.*



Logger:
Compensating Lever Assembly

BUILDING A MINIATURE UNIVERSAL LATHE

Colin Barter

describes the evolution of his miniature lathe by introducing an ingenious shape turning facility.

Photographs by Gerry Collins

●*Part IV continued from page 23 (M.E. 4163, 22 February 2001)*

The new wide cross-slide with the new saddle components started me thinking about what other facilities, if any, I could built into the saddle. The obvious one was to have a split nut to engage/disengage the leadscrew. Space was so limited that I could only fit a half nut but this was 1 1/4in. long and is operated by a lever on the front of the saddle. A very neat arrangement was achieved and at the same time swarf guards were added to protect the leadscrew.

The next facility was power drive to the cross-slide feedscrew. This would require a drive shaft along the length of the lathe, and the best place for this was at the rear or back of the lathe. If I added a drive shaft, why not add a shape turning facility or relieving facility using shaped cams? Further consideration of this idea suggested that, because of space limitations, the cams would have to be arranged on a horizontal spindle with the motion transmitted to the cross-slide by means of a cranked lever. The amount of travel required would not be much and the lever system could accommodate the anticipated movement. I searched through my collection of little gears and found a pair of spiral bevel gears that would suit the shape turning camshaft drive, and some spur gears suitable for the cross-slide feedscrew drive. What I still needed was a worm and wheel. There was a good worm and wheel in the box but it was 80:1 reduction. This may not have been suitable for the drive I required but would be ideal for a little dividing head.

I decided to make a worm and wheel using a 1/2in. Whitworth thread form for the worm and a 1/2in. BSW ground thread taper tap to hob the wheel. The worm was straightforward, I turned this in mild steel and, when completely finished, it was case hardened. I sketched out an arrangement of the two gear systems to prove that it could all be fitted in. Two of the small gears in the feedscrew drive were double the face width of the other gears in the train so that it was a simple matter to arrange axial travel for a gear in the train to be used to engage/disengage the feedscrew drive.

The operating rod for this passed under the saddle to the front of the lathe where it could be operated by a little trigger shaped handle. It did not take me long to realise that if I provided an interconnecting lever between the leadscrew half nut system and the feedscrew system, these two motions could be interlocked so that when one was engaged the other was disengaged. A further refinement was to shape the collars on the feedscrew-operating rod that engaged the interlock lever, so that by turning the trigger through 90deg. the interlock could be defeated.

When I started turning with the new compound slide rest one fault quickly showed up. This was caused by small fragments of swarf clogging the teeth of the gear train at the rear of the cross-slide. This was solved by fitting a cover plate to protect the rear of the cross-slide, the gear train and the feedscrew. A second similar plate is used to provide the connections between the cross-slide and the shape turning attachment.

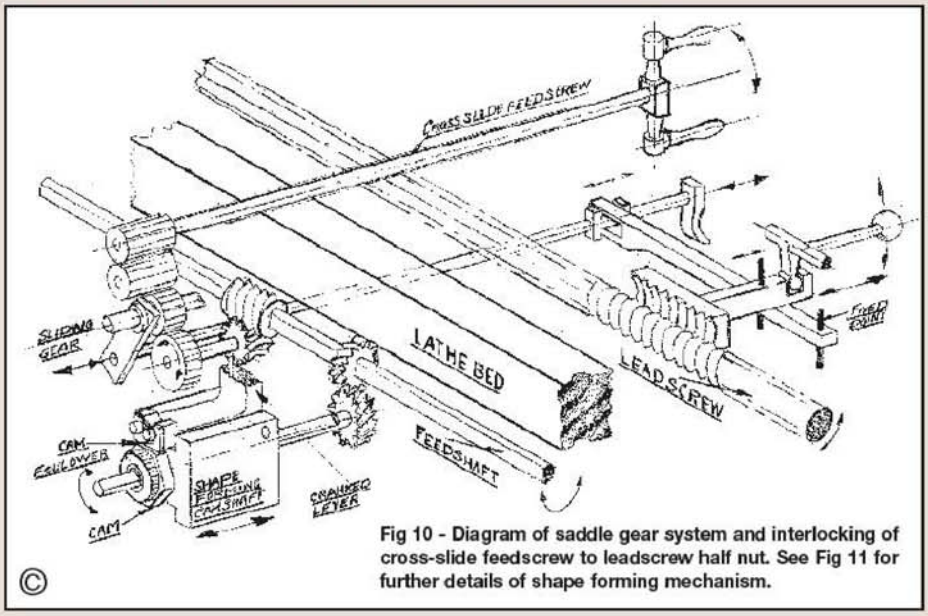
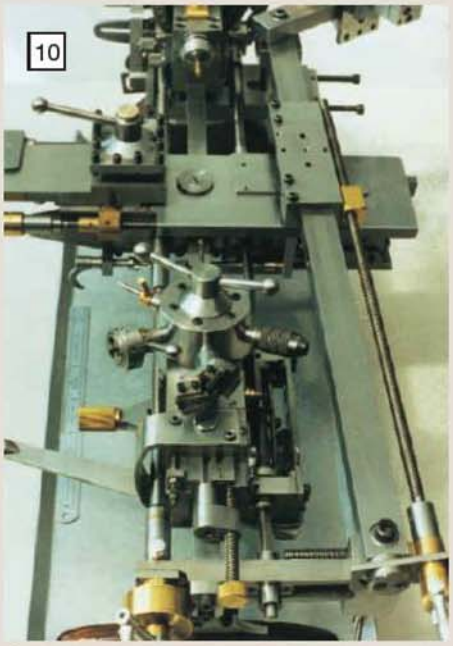
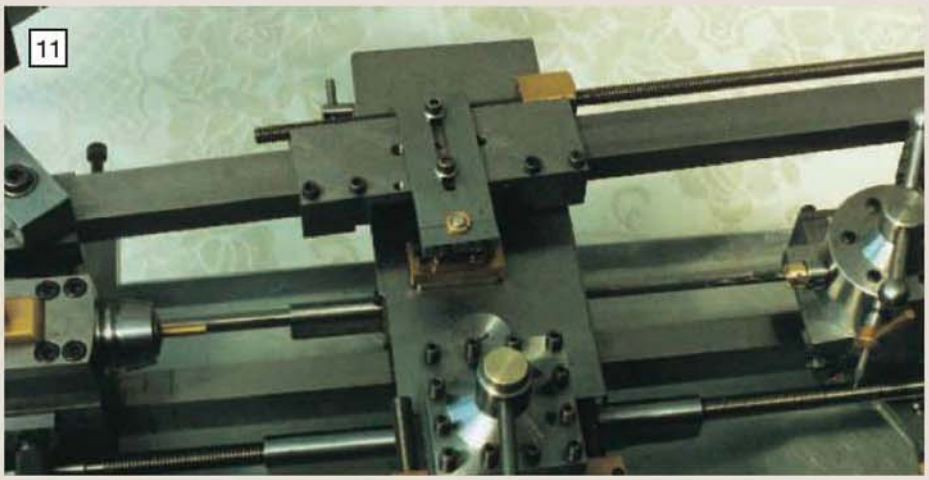


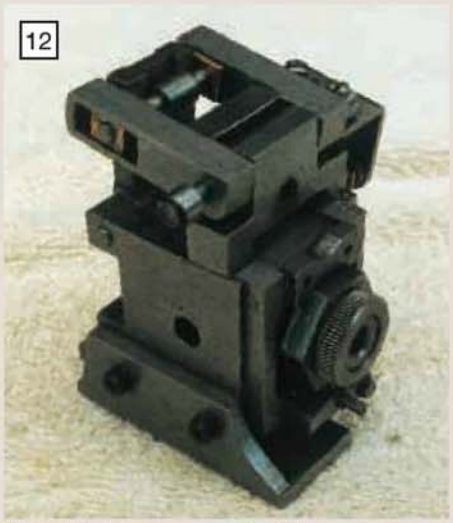
Fig 10 - Diagram of saddle gear system and interlocking of cross-slide feedscrew to leadscrew half nut. See Fig 11 for further details of shape forming mechanism.



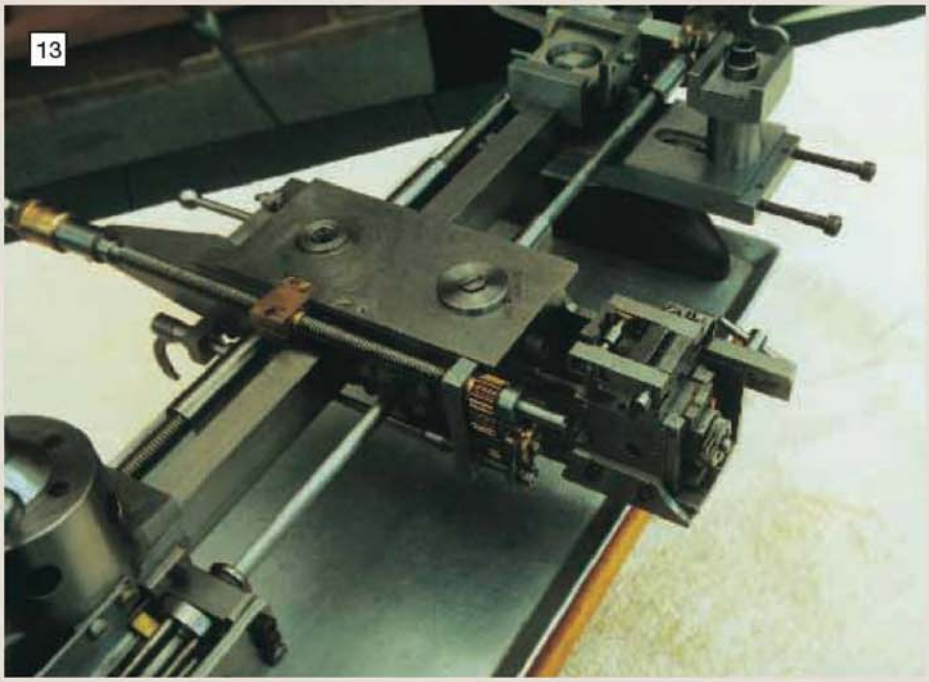
A view showing the auxiliary bed with its long slide and feedscrew. Note: that the top slide has been rotated through 90deg. for taper/shape turning and the cross-slide feedscrew nut is disconnected.



This view shows the connection between the cross-slide and the long slide on the auxiliary bed for turning long tapers. The connecting link is a ball joint.



Shape turning cam assembly with hexagon cam fitted. The cam follower is just visible under the cam. At the top is the tilting roller frame with its roller. Just visible is the top of the cranked lever which transmits the movement of the cam follower to the roller.



Shape turning cam assembly mounted on its platform at the rear of the cross slide. Also visible is cylindrical support for the auxiliary bed, the headstock baseplate and the bedplate which secures these components together.

Shape turning

Returning to the shape turning system; I used the spiral bevel gears for the cam drive and then started to think about how to transmit the motion of the cranked lever to the cross-slide. A spring return system would be required and it seemed that the easiest way to transmit the lever motion to the cross-slide was by means of a little roller mounted in a frame which would transmit the motion of the cranked lever to an anvil plate mounted on the cross-slide. It would have to include some means of adjustment, to allow for different positions of the cross-slide. Also when in use, the cross-slide would have to be disconnected from the feedscrew.

Adjustment of tool position would be achieved by the top-slide which could be set in line with the cross-slide. As I pondered on these little problems, it occurred to me that if I mounted the camshaft in a block that could slide endwise it could simplify the adjustment of the shape turning system. I had already decided to make the drive shaft along the back of the lathe 1/4in. diameter with a pronounced flat along its length. With a suitably shaped insert dovetailed into the bosses of the worm and spiral bevel driving gear, the drive shaft could drive the two gear trains wherever the saddle was positioned along the lathe bed. I could use a similar drive shaft arrangement for the camshaft.

In parallel with the shape turning mechanism I was also considering means to achieve the turning of long tapers and copy turning using a template mounted adjacent to the cross-slide. A further development occurred which was, if I connected the shape turning mechanism to the taper turning system I could perhaps turn a tapered, fluted column with the flutes reducing in size as the diameter reduced. It would require the little roller frame which worked with the cranked lever to be connected by way of a sliding link which could be fixed to the taper turning system so that as the diameter reduced, the stroke of the flute forming gear would also be reduced and a tapered fluted column produced.

Auxiliary bed

The taper turning system that evolved comprised a separate or auxiliary bed, parallel to the principal lathe bed. Space consideration limited its position to the rear of the lathe and above the cross-slide with sufficient clearance to allow the free movement of the cross-slide and shape turning attachments. At the tailstock end of the lathe it would have to be supported by some form of bracket off the lathe bed. The solution finally adopted was a new bracket system that supported the leadscrew, the saddle gear system drive shaft and a slide to support the auxiliary bed. This slide was fitted with an adjusting screw permitting close adjustment of the taper angle (**photo 10**).

At the headstock end, the auxiliary bed was supported on a cylindrical support that in turn is supported off a headstock clamping plate. This plate had two positions for the auxiliary bed support increasing the angular setting range available. Later a larger plate, which may best be described as a bedplate made in 1/2in. thick material, was fitted. This has three positions for the angular settings, plus, additional tapped holes for fitting other items. The auxiliary bed mounting positions were accurately measured to 15.75in. (approximately 400mm).

All this work resulted in a considerable rebuild of the original lathe but as most of the components are small they did not take long to make. The complete cross-slide, shape-turning gear, the feedscrew driving gear and the interlock with the leadscrew nut system is complex and is best understood by reference to the schematic diagrams **figs 10** and **11** and **photos 10, 11, 12** and **13**.

To finish off this work, a long slide was made to fit the auxiliary bed and the means to connect this to the cross-slide or shape-turning gear added. When these items were all connected there was considerable binding and friction due to slight inaccuracies. The problem was considerably improved by employing ball joints using softened balls from ball bearings. Later, a larger section auxiliary bed and a much longer slide were made to obtain a more rigid and easier moving slide system. The longitudinal drive shaft was completed with a bearing and gear quadrant system enabling it to be connected to the headstock by way of a train of change wheels.

● *To be continued.*

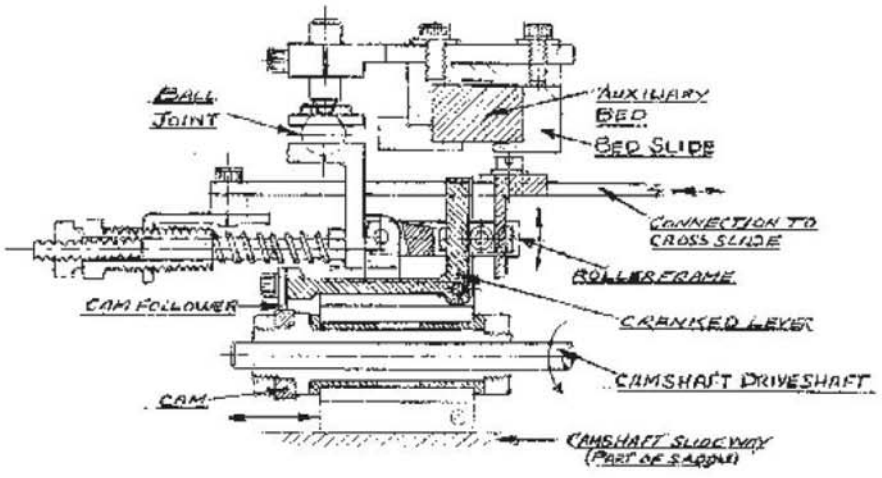


Fig 11 - Arrangement of shape forming mechanism with connections to auxiliary bed and cross-slide (not to scale).

COVER FEATURE

Mr. Alfred Nash's superb 1:3 scale model of a WWI La Rhone rotary aero engine is featured on our cover; note the prominent electroformed transfer ports and see-saw valve rocker assemblies.

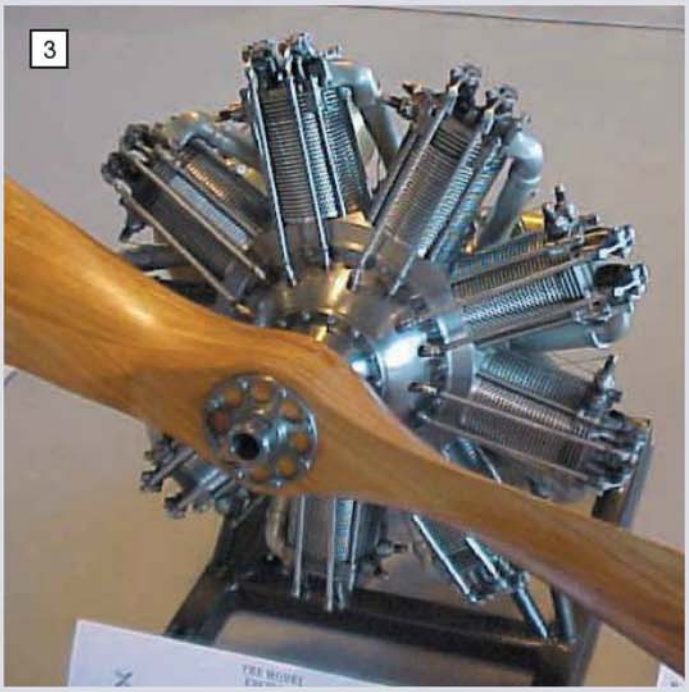
COMPETITION CLASSES
AT THE 71st MODEL ENGINEER EXHIBITION

Class A3: I.C. Engines
David Boote and Neil Read report:

This competition class (Class A3) was not particularly well supported this year in terms of the number of exhibits entered. However, the standard of the engines on display was second to none.

The 1:3 scale Le Rhone, 80 hp, World War I rotary aero engine exhibited by Alfred Nash was an excellent example of this complex engine **(photo 1)**. The Le Rhone engine had poppet valves that were actuated by a single rocker pivoted centrally in the manner of a seesaw **(photo 2)**. The rocker was actuated by a bell crank, and rod which alternately pushed and pulled the bell crank to operate the valve required. Aero engine enthusiasts have advised us that the cam mechanism required to operate this valve gear is complex and challenging to replicate in miniature form. In particular, clearance between the inlet and exhaust cams is small and it is all too easy for the mechanism to jam. How Mr. Nash overcame these issues we are not told but doubtlessly care in machining and fitting played a large part.

Another feature of the Le Rhone engine were the very prominent transfer manifolds between the crankcase and the inlet port in the cylinder head. Mr. Nash had modelled these by using electroforming technology. For those unfamiliar with this technique, it involves depositing the metal required (in this case copper) onto a cathode in an electro-plating bath. The cathode is made the same shape as the item required although due allowance must be made for the thickness of the deposited material. Mr. Nash used Wood's metal for the cathodes so that he could melt them out after the copper deposit had been built up. A new cathode was therefore required for each of the two manifold components for the nine cylinders. To facilitate

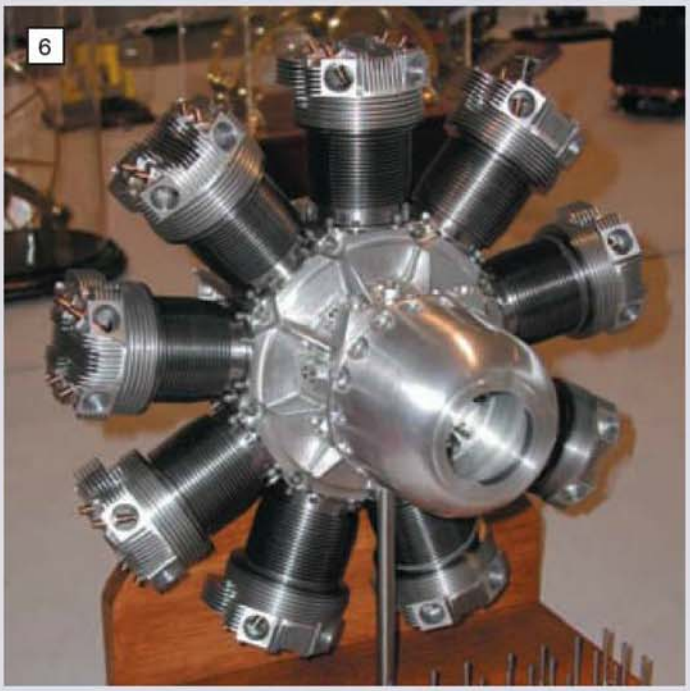


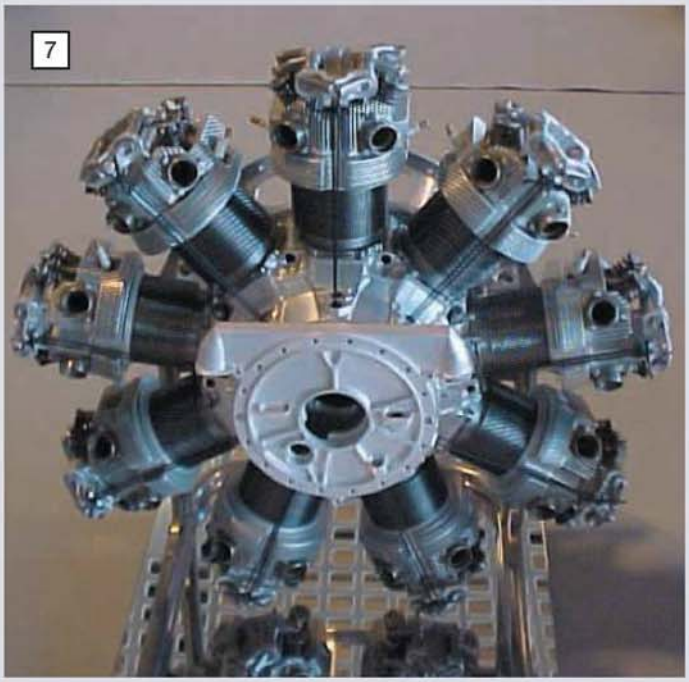
Left: Mr. Daniel Robin gave successful demonstration runs with his Bentley BR2 engine throughout the exhibition.

Right: Fine quality machining on Mr. Robin's Jupiter.

Left: Cylinder base detail of Mr. Robin's Jupiter engine.

Right: The standard of workmanship in Mr. Robin's part finished Bristol Jupiter Mk. VIII engine is superb.





Left: one of the two Bristol Mercury *Mark VIII engines under construction as displayed by Mr. Mike Tull.*

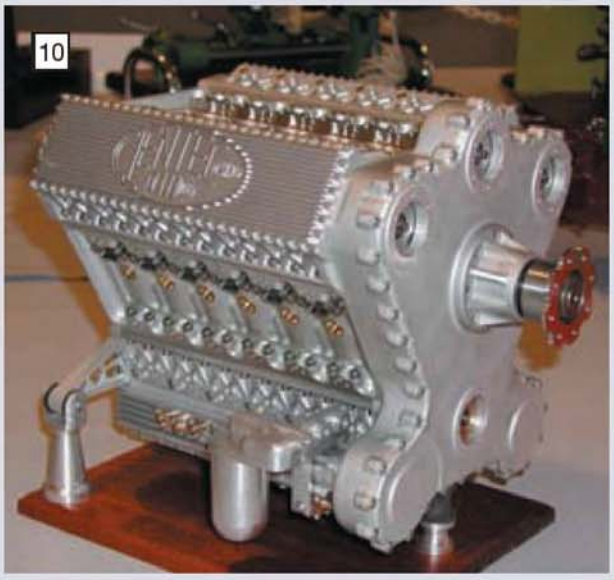
Above right: details of the valve gear on the 4-valve Mercury *engine cylinder heads.*

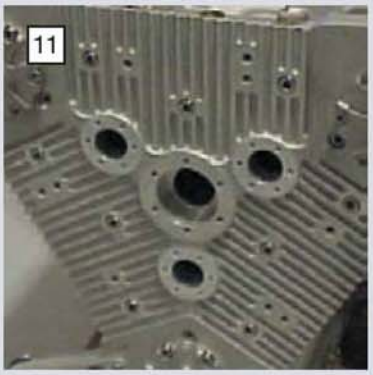
Right: close scrutiny of the Mercury *engine crankcase detail reveals another engine being built to a very high standard of machining quality.*

consistent results, female moulds were made for casting the Wood's metal cathodes.

Electro-forming a substantial thickness of copper is not as easy as might at first be imagined. The rate of deposition must be slow and it is important to maintain the plating bath temperature and acidity. To build up the thickness achieved on the model manifolds (0.04in. or so) must have taken, perhaps, two full days in the vat. The results are well worth while with no hint of porosity to spoil the highly polished finish. Mr. Nash has promised us a short article about his engine and, we hope, outlining his techniques. This fine engine was awarded a Gold Medal and the Bradbury-Winter Memorial Challenge Cup.

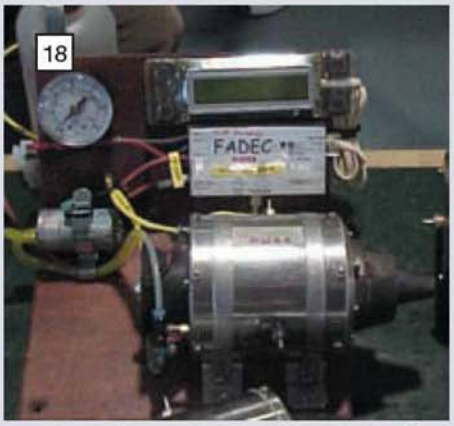
Daniel Robin exhibited not one but two aero engines. One was the 1:4 scale Bentley BR2 which won a gold medal at last year's Exhibition (**photo 3**). Mr. Robin was at hand for the whole of this year's show and proved that the engine runs as well as it looks by giving demonstration runs three or four times daily. The other example of Mr. Robin's work was a part-built 1928 Bristol Jupiter Mark VIII radial engine in 3:10 scale (**photo 6**). The Jupiter engine began life during World War I at Brazil Straker before being acquired by the Bristol Aero Company. Throughout its long service life it achieved an enviable reputation for power and reliability. The Jupiter used four poppet valves per cylinder, thus increasing the complexity of the cylinder head finning and the valve drive arrangements. The quality of the machining on the model was well up to the standard achieved on the Bentley engine. Particularly pleasing was the attention to details like the radii at the bases of the cylinder ▶





Left and above: Mr Clen Tomlinson's model Deltic *engine is being machined from the solid and reveals what can be done with patience and considerable expertise.*

Below left: this 12-cylinder aero engine must sound splendid when running. Below: Brian Perkins' Aquila engine has recently been described in these pages; these views are of the sleeve valve gear train and the engine casing.



Left to right: Eric Offen runs one of his engines. A colleague assists Mike Murphy (in ear defenders) to prepare a gas turbine engine. The demonstration rig.

head fins (**photo 4**) and the neat relieving of the cylinder base (**photo 5**). We understand that no castings have been used in the construction of the engine and the main components have been machined from the solid. A copy of the original service manual for this engine was on display in which is mentioned that the prototype had 4-valve, pent roof cylinder heads cast in Y-alloy. Mr. Robin has completed the valves and these were on display with the other components. We look forward to seeing the engine when finished and equipped with the special reduction gear and 4-bladed airscrew for which it was designed.

Mr. Mike Tull exhibited two incomplete models of the Bristol Mercury Mark VIII radial aero engine in 1:4 scale (**photos 7**, **8** and **9**). At the chosen scale, the model engine has cylinder dimensions of 35.5mm bore and 41.275mm stroke giving a total displacement 367.8cc (40.8cc per cylinder). The compression ratio is 6.25:1. The engines have 4 valves per cylinder and the prototype was designed for use with a centrifugal supercharger. Mr. Tull had obviously made good use of CNC machining technology to produce the main engine casings and the overall finish was excellent. The fins on the cylinder heads and barrels were particularly well executed and gave an excellent scale appearance to the engines.

Unfinished models are not usually included in the competition classes of the Exhibition. However, like us, many visitors appreciate seeing unfinished models, as one is often better able to examine the details. Our thanks must therefore go to Mr. Robin and Mr. Tull for allowing us to see inside their new models and admire their skills in recreating these interesting engines.

Our thanks must also go to Mr. Clen Tomlinson for his 70% complete 1:8 scale Napier Deltic engine (**photos 10**, **11** and **12**). Most readers will be familiar with the name of this engine if not the details of its construction. The prototype engine was an 18-cylinder, opposed-piston, two-stroke diesel and was designed for locomotive and off-shore marine applications. The excellent construction notes supplied by Mr. Tomlinson also gave some background to the development of these engines. Apparently, the design has its origins in an engine designed in the late 1920s by the German company Junkers for aircraft applications. This had 6-cylinders arranged vertically with two six-throw crankshafts, one at each end of the cylinders. The design came to the UK after World War II and it was realised that, with the addition of one further crankshaft, the design could be extended to give the 18-cylinder Deltic layout.

Each cylinder on the Deltic engine was of 5.5in. bore and 7.25in. stroke. This gave a total capacity 6,200 cubic inches or 101.1 litres. Initially the engine produced 2500bhp at 2000rpm but, with development, this rose to 3700bhp at 2100rpm.

The model built by Mr. Tomlinson has a capacity of 160cc and is designed to run on spark ignition. Other deviations from the prototype include:

1: Cylinder centre distances have been increased to give a greater water volume.
2: The big ends are not split.
3: The external design has been modified to accommodate magnetos, sparking plugs, and multiple oil pumps.

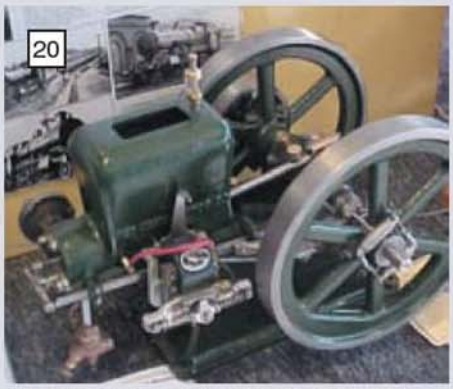
No castings have been used to create the engine, all components being machined from the solid on a Denford $2^1/2$ axis CNC milling machine. Mr. Tomlinson informs us that he is a beginner in the field of CNC machining. Looking at his Deltic engine we are left to speculate on what he will achieve when he becomes proficient! This is truly a remarkable model.

Engines are designed to run and do work. This aspect of the Exhibition was taken care of by Eric Offen and his team. The demonstrations of the Bentley BR2 engine by Mr. Robin have already been noted, and these were interspersed with demonstrations by Eric of a range of aero engines (**photo 16**). These demonstrations were always well attended by the visitors who seemed quite prepared to brave the very cold weather which we experienced during the Exhibition, to go outside and see and hear their favourite engines. Inside, Eric always had a range of static exhibits for the visitors to enjoy (**photos 13**, **14** and **15**).

Also popular were the demonstrations given by Mike Murphy and his team from the Gas Turbine Builders Association (**photos 17** and **18**). One has to seriously question preconceived notions of realistic engine speeds when considering these engines. The demonstration engine seemed happy to run at speeds of around 160,000rpm. Lowest sustainable speed was 36,000rpm. Perhaps surprisingly, the materials that go to make up these engines, with the exception of the vaporiser sticks (made from Inconel), are standard steels and aluminium alloys. For example, the front diffuser is made from aluminium alloy (HE30), the nozzle guide vane is free machining stainless steel and the rotor shaft is EN24. However, to withstand the high speeds, the rotor bearings are special and comprise bearing steel inner and outer rings fitted with crowded (no cage), ceramic balls. We would imagine that careful machining of the rotating parts of the engine is critical to maintain balance in the finished engine (**photo 19**).

A careful check on the club stands showed that only two internal combustion engines were on

The component parts of a gas turbine engine include a rotor shaft assembly (in the cradle), a diffuser (front left), a vaporiser stack (centre), and a nozzle guide vane (front right).



Mr. R. Field's barn engine was displayed on the Ickenham DMES club stand. Ignition is by means of a Minimag magneto.

Mr. John Carter's diminutive 0.8cc diesel engine was to be found on the Guildford MES club stand.

Mr. Dennis Monk's top-slide turret stop.

Dr. Peter Clark's accessories for his Schaublin lathe were accompanied by comprehensive notes.

display. The Ickenham DSME had a very fine 1:4 scale barn engine made by Ralph Field (**photo 20**). This was nicely finished in green paint work and was a good example of the type of engine once a common sight on farms up and down the country.

Tucked away on the Guildford MES stand was a diminutive diesel aero engine of just 0.8cc made by John Carter (**photo 21**). This was easily missed as it was rather swamped by the other exhibits on this well laid out and popular club stand. However it was well made and finished and well worth a look while admiring the larger items.

In conclusion, we would like to thank all who brought along internal combustion engine exhibits to the MEX2001. It certainly gave us much pleasure in admiring your handiwork and, through these words and photographs, we hope we have given readers who did not attend the Exhibition a taste of what was on offer. We hope to see you all again next year.

Class A5: Tooling and Workshop Appliances

Neil Read reports:

Only two entries were received for this class but fortunately a number of loan items were also on display to swell the numbers and provide visitors with a variety of work to view. This also led to some confusion as many were puzzled as to why certain items had been given an award when others had not; perhaps in future, the class of entry will be made more clear on the exhibit information card.

Peter Clark of Southwold is a regular supporter of this aspect of the exhibition and always takes a good deal of care to display his work in a way which not only shows it to best advantage but also fully explains its use and purpose. Often his display includes items of tooling for his Schaublin 70 lathe. For those who are not familiar with this particular machine, it is possibly one of the finest instrument and horological lathes available. It is made in Switzerland to very high standards and is consequently relatively expensive. You may get the impression that I rather covet a Schaublin but probably cannot afford it, and you would be right on both counts!

This year, Peter's display was of a number of unusual lathe accessories (**photo 23**). One thing that caught my eye was his approach to the humble wax chuck. Wax chucks are used by horologists to machine delicate parts. The part to be machined is fixed to the wax chuck using turner's cement or shellac, and to facilitate this it is necessary to apply gentle heat to the chuck and the part. Although the part can often be mounted on the chuck off the machine, setting the part to run true must be done with it running on the spindle. On a relatively massive lathe like the Schaublin the spindle tends to act as a heat sink and rather more heat than is good for the headstock bearings needs to be applied to achieve the required result.

Peter tackled this problem by making a holder for the wax chuck that places it forward of the main spindle bearing and is relieved to reduce the metal available for heat transference. To enable the new, rather delicate looking holder to resist the turning forces it has been made of EN24 steel. Also on display was a variation on the lantern chuck. This chuck is also one much used in horology but with application in model engineering. It is often used for the machining of the ends of screws and similar work. Here the concept had been adapted to hold balls and similar shaped articles. Peter's exhibit earned him a well-deserved Bronze Medal.

Mr. Graham Tyler's tool and cutter grinder to the original Quorn design by Prof. Dennis Chaddock was a Medal winner at a previous M. E. Exhibition and therefore was presented in the loan section of MEX 2001. Superbly finished, it was accompanied by a comprehensive boxed set of accessories.

Dennis Monk of Derby is also a regular supporter of the Exhibition both as an exhibitor and a Judge. His tooling exhibit of a top slide turret stop reflects one of his interests, which is making his lathe produce multiple parts as near identical to one another as possible. Model engineering often requires the production of batches of parts, and the wear on the cap head screw length stops on Dennis' device (**photo 22**) shows that it has been well used in his workshop. Dennis tells me that he has some notes prepared on the making and use of this little device and we may be able to publish more details in due course. A Commended Certificate was awarded to this exhibit.

Amongst the loan exhibits, the most outstanding entry was the Quorn tool and cutter grinder and boxed accessories (**photos 24** and **25**) by Graham Tyler. The workmanship and finish on this machine and its fittings was second to none and several members of the public enquired why it had not been awarded a medal, unaware that it had done so in a previous M.E. Exhibition and was therefore a loan exhibit. The fitted tool case was a joy and it would seem that Mr. Tyler is just as accomplished at woodwork as he is in metalwork. As someone who finds paintwork a particular problem, I was particularly impressed with the beautiful finish obtained on the castings of this Quorn. This was a very fine exhibit and we offer our congratulations to Mr. Tyler on his workmanship.

Peter Spenlove-Spenlove is not only a regular supporter of the Exhibition but is a regular contributor to these pages. His loan exhibit of a gentle puff blowgun was, as we would expect, beautifully made and well presented complete with a neatly coiled length of nylon tube. A notice with the exhibit explained that this was how to coil nylon tube to avoid tangles.

Further loan items on display included the bending rolls, graduating tool and Eureka form relieving device made by your humble scribe. These are well known tooling items and photographs were published in a recent article so modesty forbids further comment!

In conclusion, I would thank all who took the trouble to exhibit this year and encourage more readers to enter next year. The Judges really are interested in seeing your work and original concepts are just as important in terms of marks as the execution and finish. If you really cannot bear to enter the competition class, then please consider entering in the loan class. Workshop equipment is always a popular topic of discussion among model engineers and most can boast at least one piece of tooling which has helped them in the past. Why not let everyone see it so that we can all benefit from your experience?

CLUB CHAT
With Stan Bray

Members of Saffron Walden DMES spent some of their Christmas break at work on the Audley End estate railway to the benefit of both organisations.

UK News

A note in a recent **Melton Mowbray DMES** newsletter seeks practical suggestions from members for making a wind generator to supply sufficient electrical energy to keep the 12-volt batteries at the track site topped up. After some sterling work by a dedicated band of people to get the track ready, the club New Year's Day Steam-Up went ahead as planned; five locomotives, including the club owned *Lilla*, were operating during the day.

It seems that plans to relocate the **Ascot LS** railway have not yet progressed very far. The hold up appears to be due to delays by the Local Authority in processing the various planning applications associated with the move, not only from the model engineering society, but also from other bodies involved in the scheme. When the move is approved, members are hoping that they will be allowed to retain the use of their present storage facilities until replacement buildings are available for occupation. Meanwhile, it has been decided to organise a full spring and summer programme, anticipating that they will probably still be at the present site on 4 August, the 10th Anniversary of their first occupation. A Members' Steam-Up is planned to celebrate this special occasion.

Molehills are creating difficulties for **Sutton Coldfield MES**. The little varmints are popping up everywhere, so obviously they must be railway enthusiasts! Two intrepid members obtained a foul smelling concoction and after they had spent many hours laying it around the place, it was believed the moles had disappeared. Not a bit of it; the moles are made of sterner stuff and are back in force, apparently having invited all their mates along! The work to eliminate them has therefore to start all over again. Moles or not, the club has produced an enterprising programme for 2002 that includes a Town Twinning Steam-Up on 21 April and the Midlands Federation MES Annual Rally on 23 June.

Cardiff MES is well ahead with plans to host the 12th Welsh National Locomotive Rally at Heath Park, Cardiff on 8-9 June. The ground level 5-7¼in. and the raised 3½-5in. gauge tracks will be available, as will the 16mm narrow gauge and gauge 1 layout. There is room to run model road vehicles; the 18in. gauge tramway and their massive '00' layout will be operating. A barbecue will be held on Saturday evening and members of the trade have been invited to attend. It sounds like being quite an event. The track is not far from junction 32 of the M4 motorway, some limited caravan accommodation is available but bookings for this must be made early and to do so, or to obtain further information about the rally itself, readers are invited to contact Trevor Jenkins at 89 Celyn Avenue, Lakeside, Cardiff CE23 6EL; tel: 029-2975-5568. We can assure readers that you need not be Welsh or to have Welsh origins to participate, all are welcome as long as they have a current boiler certificate if they are bringing a steam locomotive, and the appropriate documentation for a road vehicle.

We have been asked by the Association of Model Railway Clubs to draw readers' attention to the Bristol Model Railway Exhibition, which will be held 3-5 May at Thornbury Leisure Centre, Alveston Hill, Thornbury. The doors are open from 2-8pm on the Friday, 10am-7pm on Saturday and 10am-5pm on Sunday. A considerable number of model railway layouts in various gauges will include some of the larger variety that are of interest to model engineers and there will be numerous trade stands. Parking is free and there is a regular free bus service from Bristol Parkway Station.

Members of **Northampton SME** are always pleased to welcome visiting model engineers to their track on days allocated for public running, full details of which are published in *Club Diary*. The track is in Delapré Park, London Road, Northampton and, being immediately off the A43 ring road, is easily found.

New security measures are being put in place by **Basingstoke DMES** following a burglary at the club premises last November. The only property stolen was a video recorder but, as is so often the way, the club house was left in a terrible mess and repairs to the window used to gain entry proved expensive. In addition to improved security at their premises, the society is also advising members to ensure that their models are easily identifiable by stamping or etching some form of identification on them. Several committe changes were approved at the AGM, including John Dixon taking over the post of Chairman from John Harding who had held the position for the last nine years; Ian Shanks remains as Secretary and may be contacted at Beverley Farm, Five Ash Road, Medstead, Alton, Hampshire GU34 5EJ; tel: 01420-561741.

Many readers look forward to the annual Model Engineering Show at the Forncett Industrial Museum, which has usually been held on the first Sunday in November. However, it did not take place last November, the date having been moved to the first Sunday in May. The reasons for this change in date were that the almost inevitable bad weather made it difficult for people to transport models to the museum, and that it was decidedly uncomfortable for anyone wanting to run model road vehicles outside. While the date may have changed, the format remains as previously and, together with the models on display with compressed air as well as steam available for anyone wanting to have their models in operation, the magnificent collection of full-size engines will also be operating on steam. The museum will be open to the public from 10am-5pm, with refreshments available all day long in the delightful old-fashioned tea-room. Although held in a museum devoted to stationary steam engines the Model Engineering Day encompasses all forms of model engineering and anyone is welcome to enter models. Models intended to be operated must have adequate insurance cover, but for those shown as static models, third party insurance is covered by the museum. The event is largely a social one, with exhibitors and visitors inclined to spend most of the day in conversation. Well worth a visit, the change of date will certainly help to make life more comfortable. Further details, including how to enter models, can be obtained by sending a stamp addressed envelope to R. F. Wilson at 6 Broadland Close, Worlingham, Beccles, Suffolk. NR34 7AT; tel: 01502-714905.

Despite of the cold weather, the **Erewash Valley MES** New Year Day Steam-Up saw a really good turnout of locomotives and at least one member took the opportunity to use the ground level track even though it is not yet completed. Prior to that they held their Santa Specials, complete, of course, with Santa Claus and a Station Master in top hat and tail coat. During the past few years these specials have become a very popular local attraction with everyone having loads of fun; perhaps the most rewarding thing must have been the number of people who sought assurance that the event would be repeated next Christmas.

Another society heavily involved during the Christmas period was the **Saffron Walden DMES**. In this case, however, it was not with their own railway, but by giving assistance to the estate railway at Audley End. Club members work as paid assistants carrying out various duties ranging from car park attendants to relief locomotive drivers. The estate railway reported that passenger numbers were higher than in any previous year and the money raised will help make up the shortfall caused by its closure during last year's foot and mouth disease crisis. Catering rights were given to the club and most members donated their remuneration resulting in a boost to club funds which will go a long way to completing the ground level track. The New Year started with a club running day depite the fact that it was extremely cold, the water supply was frozen and water therefore had to be brought to the site in cans. A sufficient quantity was provided by this means to keep a number of locomotives in operation and, probably more importantly, to keep a supply of hot tea on the go! Exactly how much tea was drunk is difficult to estimate as beer and mulled wine were also available. By all accounts the day was also a test day for some of the seven locomotives that were to go to Sinsheim in Germany later in the month, where they provided the greatest number of models of any British Club.

The annual **Isle of Wight MES** Locomotive Rally will take place

this year on Sunday 28 April and, in addition to the tracks, the pond will also be in operation. Visitors renewing their acquaintance with this popular event will find a few changes including, of particular note, the tunnel extension. Plans are also in hand for the club to hold another exhibition in November and members are being urged to finish projects, where possible, in readiness for display. The appreciation of the society for the work and dedication over the years by Tom Chapman and Norman Godfrey was demonstrated at the AGM by electing them Vice Presidents. At the same time, honorary life membership was bestowed upon Ken Stanton who is now unable to take the active part in club activities that he once did.

Members of **North London SME** recently had the opportunity to examine in detail a very unusual and historic steam locomotive, built by the long defunct Stevens Model Dockyard Company. A 4-4-0 with slip eccentric valve gear and to a gauge of 3 1/8in., the model is typical of its age, being strongly built of brass with dummy side tanks and a large spirit container beneath the cab floor. The backhead fittings consist of a regulator and two try cocks and although the paintwork is badly worn, the locomotive, which is nicely finished, is basically in excellent condition. Members have been invited by the Lloyds Railway Society to join them on the Kent and East Sussex Railway in April. The outing includes an overnight stay in a hotel with a six course meal, a rover ticket for the railway, and a special visit to the Romney, Hythe and Dymchurch Railway, with a ride on the train and a visit to the sheds and workshops.

During the winter, attention has been given to the club locomotive by members of **Romney Marsh MES**. The steaming qualities of the *Sweet Pea* came under discussion and it was decided that this would be improved if the boiler were de-scaled next time it was due for a hydraulic test. A new boiler for *Minx* was ordered from a commercial supplier and has been delivered, so all that remains is to make and fit a new steam turret before it is fitted to the locomotive. The electric locomotive was deemed to require no attention. Steady progress on the clubhouse extension continues, and the donation to the club of a ride-on mower, albeit requiring some attention, will make grass cutting somewhat easier this summer. The club Open Days are scheduled for 11/12 May, and the track will be open from 10am-5pm each day.

Kinver & West Midlands SME is to hold a special Open Weekend and Exhibition on 22/23 June to celebrate their 40th Anniversary. As yet we have no other details, but anyone interested in the event should contact club Secretary, Mike Harrison at 24 Goodrest Avenue, Halesowen, West Midlands B62 0HP; tel: 0121-602-2019.

As well as their presence at Wembley in late January, members of **St Albans DMES** participated in a local model railway exhibition and were therefore kept pretty busy during the early part of the year. The display at the model railway show was particularly successful and resulted in several enquiries from potential new members. The next priority is to organise a number of spring and summer running dates at the track which they obtained and on which they did a lot of work last year without having much time to enjoy it due to the effort involved in bringing it to a safe and suitable condition for running.

Aptly named *Phoenix*, **Reading SME's** electrically powered club locomotive has literally risen from the ashes, as the burnt-out wiring has been renewed and the opportunity taken to improve the operating controls, including fitting a controller that will allow very slow running. One problem with any club locomotive is the number of people who drive it, inevitably some who are not completely familiar with the controls, which can result in damage to the system — the locomotive's not theirs! In an attempt to avoid this in future, a photograph and full description of the operation of the controls has been published in the club newsletter with additional copies posted on the walls of the clubhouse. A request for members to turn out their drawers and clamber into their lofts to find historic information about the club has resulted in the discovery of a great many photographs, old news sheets and newspaper cuttings which should enable a really good club history to be compiled. If memory serves correct, about 30 or so years ago the club carried out a series of boiler tests that proved rather enlightening, perhaps these will be re-published as part of the history.

A burglary during December at the **Lancaster & Morecambe MES** club house resulted in the theft of some railway pictures on display on the walls, a guard's hand lamp and a microwave oven, plus the inevitable damage that these intruders invariably cause. The club has since fitted bars to the windows and door, and a new alarm system has been installed, but all of these security measures take valuable time and funds to put in place. Despite this, time was still found to lift the inner track circuit during the early part of the winter; the old ballast was removed and new limestone chippings laid in its place. Tie bars have been fitted between every third sleeper. Compressed air pipes have also been buried alongside the track in readiness for the new signalling system and a large compressor and air tank have been installed in the signal box. A new quarterly newsletter is to be published to keep those members unable to attend all the meetings up-to-date.

Chris Kelland, Secretary of the **City of Oxford SME**, has kindly pointed out that the contact telephone number we gave for him is his mobile telephone number, which he cannot always guarantee to answer. His home telephone number, with BT answering service, is 01235-770836; this is the better number by which to contact him. He also informs us that the club website, which has been updated and should be expanded during the course of the coming year, has moved to **www.cosme.org.uk** and the club e-mail number is **info@cosme.org.uk**

World News

Canada

Ottawa Valley LS is experiencing serious problems from vandals who have visited their site four times in the last few months. Each visit has resulted in quite major damage, all completely mindless, the culprits obviously being concerned with seeing how much damage they can do. Despite this, work continues on extending and upgrading the tracks, but OVLS members must feel rather like a collective King Canute, trying to turn back the incoming tide.

Once again the **British Columbia SME** Christmas Railway at a local shopping centre proved an unqualified success with a good financial reward for the club and excellent relations with the general public, many of who returned time after time for rides. The railway was operated for a total of 395 hours over a period of 39 days and it is estimated that some 25,000-30,000 passengers were carried during that period. The combined mileage of the trains during the event is estimated at 450 miles. Even after all that effort, a good number of people were happy to turn out for the annual Frostbite Meet and, although most appeared to be content to talk and enjoy the lunch, some were still only too keen to get their locomotives out and have a run.

South Africa

To preserve the memory of late member Jack Prince a garden style seat bearing his name has been installed at the foot of a bridge over the track, opposite the clubhouse of **Durban SME**. To minimise the possibility of theft by vandals, it has been cemented securely in position. A lunch was organised in the club house at Christmas and, although this was originally intended to be outside in the grounds, bad weather put a stop to that. Nevertheless it was a nice social event that gave families of members the opportunity to go along and enjoy themselves.

Not many passengers turned up for the first of **Pietermaritzburg MES'** running day of the year. Although there was a good turnout of members, the lack of passengers is believed to have been because it was still the summer holiday period coupled with the fact that the very warm weather no doubt took people to seek other forms of pleasure. However what with clouds and silver linings, those members present took the opportunity to enjoy themselves and to have their first ever run on the new track extension. This has been built over the last few months and adds a further 250 metres of track with some quite fierce gradients that will keep drivers on their mettle.

New Zealand

Contractors have been engaged to repair the boating pond used by **Southland SME** although members have had to clear it out first. It is anticipated that there will be an increase in the number of people using it when the work is finished because in recent times it has leaked so badly that it generally contained insufficient water for boats to operate. Having proved successful in other club tracks where only a single expansion joint is left, it has been proposed to weld the rail joints which are proving to be troublesome; it seems that these other club tracks do not suffer from problems caused by the heat.

In Memoriam

It is with the deepest regret that we record the passing Thomas Jackson and John Munro, two members of Sutton Coldfield MES. The sympathy of staff at *Model Engineer* is extended to the family and friends they leave behind.

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.

MARCH

22 **Colchester SMEE.** *J. Wright: Building Skeleton Clocks.* Contact L. G. Hammond: 01376-511686.
22 **Hereford SME.** *Bits & Pieces.* Contact John Arrowsmith: 01432-265151.
22 **Historical MRS (Essex Area).** *Meeting.* Contact Jem Harrison, 27 Colne Place, Basildon, Essex SS16 5UZ.
22 **Romford MEC.** *Bob Sharp: Upminster Windmill.* Contact Colin Hunt: 01708-709302.
22 **Worcester DME.** *AGM.* Contact M. Lane: 01905-425972.
23 **Chesterfield MES.** *Running Day.* Contact Mike Rhodes: 01623-648676.
23 **Historical MRS (Bristol Area).** *HMRS AGM.* Contact Gerry Nichols: 0117-973-1862.
23 **Hornsby ME.** *Family Day.* Contact Ted Gray: 9484-7583.
23 **Southern FMES.** *AGM.* Contact Brian Thompson: 01920-830629.
23/24 **Camden Miniature Steam Services.** *Open Weekend.* Contact Adam Harris: 01373-830151.
23/24 ***London Festival of Railway Modelling Exhibition*** at Alexandra Palace. Advance booking (to 8 March 2002): Adults: £7, Children: £3.50, OAP: £6.50, Family (2+3): £19. Information and Ticket Hotline: 01778-391134.
24 **Basingstoke DMES.** *Members' Steam-Up.* Contact Ian Shanks: 01420-561741.
24 **Hornsby ME.** *Special Run Day (Larool).* Contact Ted Gray: 9484-7583.
24 **MELSA.** *Bracken Ridge.* Contact Graham Chadbone: 07-4121-4341.
24 **Steam LS of Victoria.** *Barbecue.* Contact Graham Plaskett: (03) 9750-5022.
25 **Bedford MES.** *Wainwright's Auctions.* Contact Ted Jolliffe: 01234-327791.
25 **Canterbury DMES.** *AGM.* Contact Granville Askham: 01227-463295.
25 **Hornsby ME.** *Meeting.* Contact Ted Gray: 9484-7583.
26 **Chelmsford SME.** *Dave Carson: Rails around San Francisco.* Contact D. Blake: 01376-324205.
26 **Historical MRS (E. Lancashire/N. Manchester Group).** *Peter Hall: Tempsford, The Anatomy of a Station.* Contact John Sykes: 01706-823989.
26 **Stafford DMES.** *Seminar: Small Locomotive Management.* Contact Chris Dobbs: 01889-270533.
26 **Sutton Coldfield MES.** *Meeting.* Contact Roger Timings: 0121-308-5875.
26 **Wigan DMES.** *Bits & Pieces and Nobel Cup Competition.* Contact Bob Connor: 01257-423048.
27 **Birmingham SME.** *Bits and Pieces.* Contact John Walker: 01789-266065.
27 **Chingford DMEC.** *P. Kingham: Book Binding.* Contact Martin Masterson: 0208-989-5552.
27 **Guildford MES.** *AGM.* Contact Dave Longhurst: 01428-605424.
27 **Harrow & Wembley SME.** *Fred Pugh: Industrial Steam in the 60s.* Contact Dr. Roger Greenwood: 020-8427-2755.
27 **Historical MRS (Bedford Area).** *Glues.* Contact John Chamney: 01442-851214.
27 **Staines SME.** *Cheese and Wine Evening.* Contact Mike Kingham 01932-788793.
27 **West Riding SLS.** *Meeting.* Contact Margery Bradley: 01977-685782.
28 **Cardiff MES.** *Club Chat.* Contact Trevor Jenkins: 029-20755568.
28 **Hull DSME.** *Members' Current Projects.* Contact Chris Parsons: 01964-630563.
28 **Leyland SME.** *Meeting.* Contact Alan Wilson: 01942-715072.
28 **Sutton MEC.** *Models Old & New.* Contact Mike Dean: 0208-657-5401.
29 **Kinver & West Midlands SME.** *AGM.* Contact John Campbell: 01384-891244.
29 **Tonbridge MES.** *First Running Day.* Contact D. C. Brunning: 01732-352153.
29-31 **Bedford MES.** *Weekend of Action.* Contact Ted Jolliffe: 01234-327791.
29-31 **Furness MRC.** ***Model Railway & Transport Exhibition*** at Forum 28, Duke Street, Barrow in Furness, Cumbria. Friday : Midday-6pm; Saturday : 10am-6pm; Sunday : 10am-5pm. Adults £2.80, Concessions £1.40. Contact Ian Edwards: 01229-583595.
29-1 April **British Columbia SME.** *Easter Meet.* Contact Sean Laurence: (604) 931-1547.
29-1 April **Leighton Buzzard NG Rly.** *Easter Fun.* Enquiries: 01525-373888.
30 **Rotherham DMES.** *Society Exhibition.* Contact Ken Staniforth: 01709-703794.
31 **Ascot LS.** *Members' Steam-Up.* Contact Tony Alderman: 01932-854393.
31 **Durban SME.** *Errol Koch: Casting Demonstration and Members' Running.* Contact David Martin: 031-5635755.
31 **Huddersfield SME.** *Opening of New Track.* Contact Graeme Hollyhead: 01484-452760.
31 **MELSA.** *Sunday in the Park.* Contact Graham Chadbone: 07-4121-4341.
31 **North London SME.** *Start of Running Season.* Contact Tony Dunbar: 01992-465625.
31 **Peterborough SME.** *Start of Running Season.* Contact Tony Meek: 01778-345142.
31 **Portsmouth MES.** *Start of Running Season.* Contact Bob Aldred: 023-92-523366.
31 **Reading SME.** *Running.* Contact Graham Bustin: 01189-615450.
31 **Romney Marsh MES.** *Easter Track Meeting.* Contact John Wimble: 01797-362295.
31 **Talyllyn Railway.** *Duncan's Easter Egg Specials.* Enquiries: 01654-710472.
31 **York City & DSME.** *Easter Special Steaming.* Contact Ken Bateman: 01904-421445.
31/1 April **Chesterfield MES.** *Steaming at Papplewick.* Contact Mike Rhodes: 01623-648676.
31/1 April **Elmdon MES.** *Running* at Museum of Transport, Wythall. Contact Chris Giles: 0121-458-1291.

APRIL

1 **Northampton SME.** *Easter Monday Running Day.* Contact Pete Jarman: 01234-708501.
1 **Peterborough SME.** *Bits & Pieces.* Contact Tony Meek: 01778-345142.
1 **Stockholes Farm MR.** *Running.* Contact Ivan Smith: 01427-872723.
1 **Sutton Coldfield MES.** *Easter Monday Steam-Up.* Contact Roger Timings: 0121-308-5875.
2 **Basingstoke DMES.** *Meeting.* Contact Ian Shanks: 01420-561741.
2 **Oxford (City of) SME.** *John Andrews: Logie Baird's Early Days of TV.* Contact Chris Kelland: 01235 770836.
2 **Romney Marsh MES.** *Wilf Watters: Film Evening.* Contact John Wimble: 01797-362295.
2 **Taunton ME.** *Boiler Test Night.* Contact Don Martin: 01460-63162.
3 **Bradford MES.** *Meeting.* Contact Gordon Eddison: 01943-864217.
3 **Bristol SMEE.** *Brian Perkins: Aero Engines.* Contact Trevor Chambers: 01454-415085.
3 **Chingford DMEC.** *Bits and Pieces.* Contact Martin Masterson: 0208-989-5552.
3 **Guildford MES.** *Owen Russell: Locomotives of the LNER.* Contact Dave Longhurst: 01428-605424.
3 **Hull DSME.** *Alan Smith: Designing & Building a Model Car in Wood.* Contact Chris Parsons: 01964-630563.
4 **Cardiff MES.** *Bits & Pieces.* Contact Trevor Jenkins: 029-20755568.
4 **Historical MRS (North West Area).** *Norman Lee: LNWR Modelling.* Contact David Goodwin: 01224-880018.
4 **Sutton MEC.** *Bits & Pieces.* Contact Mike Dean: 0208-657-5401.
4 **Warrington DMES.** *Club Auction.* Contact Bill Underwood: 01606-891225.
5 **Vale of Aylesbury MES.** *Railways Remembered.* Contact Clive Ellam: 01296-623433.
5 **Maidstone MES.** *Bits 'n Pieces & Fish 'n Chips.* Contact Martin Parham: 01622-630298.
5 **North Norfolk MEC.** *Mr. Hewson: Wagons for Ground Level Model Railways.* Contact Gordon Ford: 01263-512350.
5 **Portsmouth MES.** *John Spence: A Mixed Box of Slides.* Contact Bob Aldred: 023-92-523366.
5 **Rochdale SMEE.** *Meeting.* Contact Mike Foster: 01706-360849.
5 **Romford MEC.** *Competition Night.* Contact Colin Hunt: 01708-709302.
6 **Dockland & E. London MES.** *Track Meet.* Contact P. M. Jonas: 01708-228510.
6 **Isle of Wight MES.** *Track & Pond.* Contact Ken Stratton: 01983-760762.
6 **National 2½in. Gauge Ass'n.** *Hook Get Together.* Contact C. Young: 01233-626455.
6 **SM&EE.** *Andrew Pullen: The Lion and the Thunderbolt.* Contact David Boote: 01202-745862.
6 **Welling DMES.** *Open Day.* Contact Reg Hawes: 0208-859-1952.
7 **Amberley Museum.** *Vintage Car Show.* Contact Derek Kilburn: 01798-831370.
7 **Plymouth MSLS.** *Start of 2002 Running Season.* Contact John Brooker: 01752-671722.
7 **Reading SME.** *Running.* Contact Graham Bustin: 01189-615450.
7- 26 May **Talyllyn Railway.** *First Class for Sunday Lunch.* Enquiries: 01654-710472.
8 **Bedford MES.** *AGM.* Contact Ted Jolliffe: 01234-327791.
8 **Frimley & Ascot LC.** *Bits & Pieces.* Contact Bob Dowman: 01252-835042.
8 **Historical MRS (London Area).** *Meeting.* Contact John Millbank: 0208-948-0556.
8 **Melton Mowbray DMES.** *Barry Jordan: Model Machine Tools.* Contact Phil Tansley: 0116-2673646.
8 **Saffron Walden DSME.** *Club Night.* Contact Ken Archer: 01763-852911.
9 **Dockland & E. London MES.** *Meeting.* Contact P. M. Jonas: 01708-228510.
9 **Northampton SME.** *Bits & Pieces.* Contact Pete Jarman: 01234-708501.
9 **Romney Marsh MES.** *Track Meeting.* Contact John Wimble: 01797-362295.
9 **Sutton Coldfield MES.** *John Penny: Something Astronomical.* Contact Roger Timings: 0121-308-5875.
10 **Chingford DMEC.** *K. Catchpole: History of the Longmoor Military Railway.* Contact Martin Masterson: 0208-989-5552.
10 **Harrow & Wembley SME.** *Exhibition/Competition Night.* Contact Dr. Roger Greenwood: 020-8427-2755.
10 **Historical MRS (East Midlands Area).** *Alan Sibley: Loco Chassis Construction & Industrial Slides.* Contact Mark Shipman: 0194-983-6311.
10 **St. Albans DMES.** *AGM.* Contact Roy Verden: 01923-220590.
11 **High Wycombe MEC.** *Meeting.* Contact David Savage: 01494-527402.
11 **Leyland SME.** *Embarrassment Evening.* Contact Alan Wilson: 01942-715072.
11 **N. W. Leicester SME.** *David Hulse: Early Steam Engines.* Contact John Elliott: 01455-847040.
11 **Sutton MEC.** *Steve Earl: South Eastern & Chatham Railway.* Contact Mike Dean: 0208-657-5401.
12 **Colchester SMEE.** *H. R. Mothersole: Paddle Steamers on the River Elbe.* Contact L. G. Hammond: 01376-511686.
12 **North London SME.** *Meeting.* Contact Tony Dunbar: 01992-465625.
13 **Cardiff MES.** *Steam-Up & Family Day.* Contact Trevor Jenkins: 029-20755568.
13 **York City & DSME.** *Meeting.* Contact Ken Bateman: 01904-421445.
14 **Gas Turbine Builders' Ass'n.** *Fly In* at Sculthorpe, Norfolk. Contact: Tom Wilkinson: 01508-570977.
14 **Leeds SMEE.** *Steaming Day.* Contact Edwin Hughes: 01757-707454.
14 **Saffron Walden DSME.** *Running Day.* Contact Ken Archer: 01763-852911.
14 **Sutton MEC.** *Track Day.* Contact Mike Dean: 0208-657-5401.

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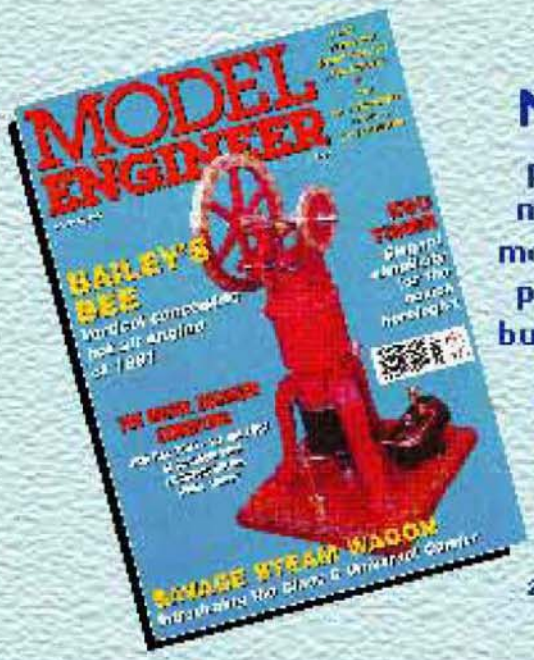

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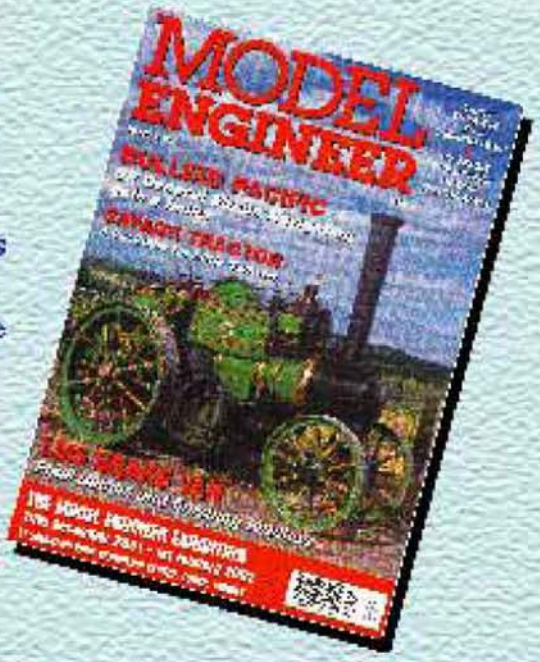

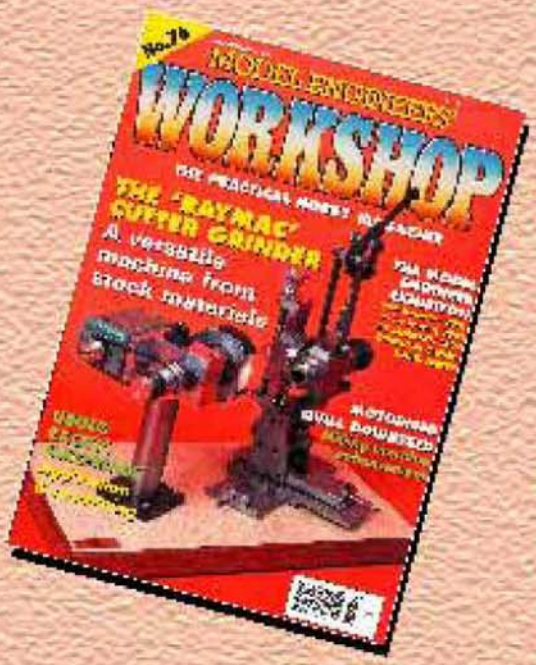

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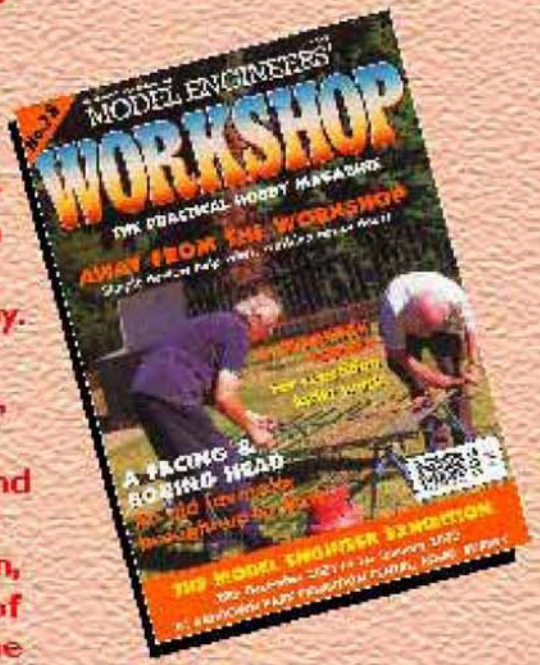
is ideal for enthusiasts who operate a home engineering workshop for both model construction or to support an engineering related hobby. The magazine covers machine and hand tools, accessories and attachments, materials and processes, and provides guidance on the selection, commissioning and use of tools and equipment. The essential guide for any workshop.



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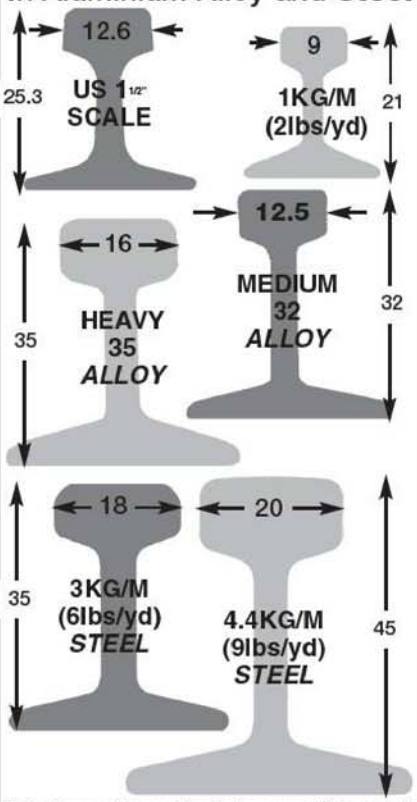

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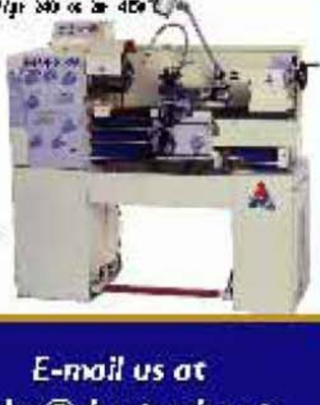

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