MODEL ENGINEER

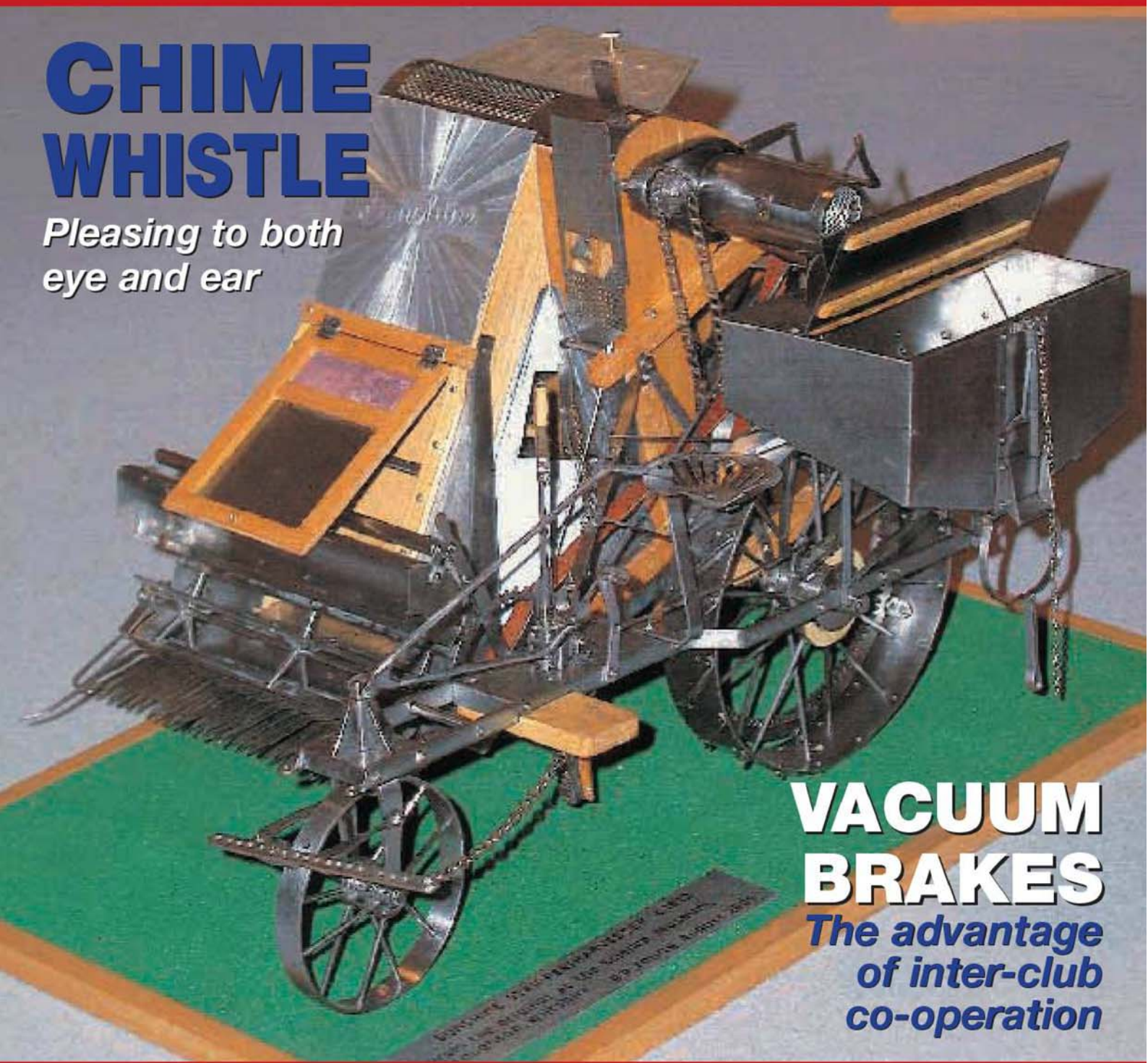
Vol. 188 No. 4167

19 April - 2 May 2002 £2.10

INSIDE:
WORKSHOP PROJECTS

EXHIBITION AND RALLY REPORTS

PLUS YOUR FAVOURITE REGULAR FEATURES



CHIME WHISTLE

Pleasing to both eye and ear

VACUUM BRAKES

The advantage of inter-club co-operation

STEAM MUSEUM

Engineer's Day Out at Swindon

9 770026 732094 67

HIGHBURY NEXUS

Machine Mart
where Quality costs less
SEE OUR WEBSITE
NEW STORE DEAL KENT OPENS APRIL
Clarke 6 SPEED METAL LATHE WITH 12 SPEED MILL/DRILL HEAD - CL500M
£699.95
£822.44
Full range of accessories available
Clarke METAL LATHE - CL300M
£399.95
£469.94
BEST SELLER
Clarke MULTI - PURPOSE VICE - CMV125
£39.95
£46.94
Clarke ARC/TIG WELDERS
£129.95
£152.69
Clarke WORKBENCH - CWB 1250
£49.95
£58.69
Clarke ENGINEERS WORKBENCHES
£119.95
£140.94
Clarke 6 SPEED METAL LATHE - CL430
£579.95
£681.44
Clarke BELT/DISC SANDER - CS4-6C
£59.95
£70.44
Clarke MIG WELDERS
£119.95
£140.94
Clarke BOLTLESS SHELVING
£24.95
£29.32
TIGER TURBO AIR COMPRESSORS
£99.95
£117.44
Clarke ENGINEERING DRILL PRESSES
£33.95
£39.89
Clarke PRECISION MEASURING INSTRUMENTS
Clarke ANGLE GRINDERS
£14.95
£17.57
CAN BE ASSEMBLED AS A SHELVING OR BENCH UNIT
SIMPLE, FAST ASSEMBLY
Clarke SWING ARM & MAGNIFYING LAMPS
£7.95
£9.34
HUGE RANGE
Clarke BENCH GRINDERS
£14.95
£16.98
Clarke TAP & DIE SETS
£12.95
£15.22
Clarke BUTANE GAS TORCH KITS
Clarke AIRBRUSH KITS
£7.99
£9.39
Clarke TOOL CHESTS/CABINETS
£44.95
£52.82
Clarke 12 SPEED MILL/DRILL - CMD1225
£899.00
£1056.33
Clarke TITANIUM COATED 30PC DRILL SETS
£24.95
£29.32
Clarke SOLDERING GUN KIT - CSK100
£14.45
£16.98
KIT BOX INCLUDED
Clarke WIZ OIL FREE MINI AIR COMPRESSOR
£59.95
£70.44
Machine Mart NEW SPRING/SUMMER CATALOGUE!
229
362
VISIT YOUR LOCAL SUPERSTORE OPEN MON-FRI 8.30-6.00, SAT 8.30-5.30
24hr MAIL ORDER
Tel: 0845 450 1800
Fax: 0845 450 1801
Tel: 0845 450 1810
Fax: 0845 450 1811
3 WAYS TO BUY
SUPERSTORES
MAIL ORDER
WEBSITE
OPEN APRIL!
• Catalogue Line: 0845 450 1855
• Collect one from your local branch
• e-mail: sales@machinemart.co.uk
• Order one from www.machinemart.co.uk

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.

EDITORIAL

Editor
Mike Chrisp
Technical Editor
Neil Read
Assistant Editor
Kelvin Barber
Club News Editor
Stan Bray
Technical Consultants
Martin Evans, John Haining, Stan Bray, J. Malcolm Wild FBHI, D. A. G. Brown, H. D. Bickley BSc CEng MIEE.
Editorial Administrator
Sarah White

PRODUCTION

Design
Elizabeth Marfell
Production Manager
Ralph Stringer
Production Administrator
Sifa Symons
Printed by
Polestar (Colchester)
Origination by
Atelier Data Services

SALES & MARKETING

Group Sales Manager
Colin Taylor
Sales Manager
Tony Robertson
Senior Marketing Executive
Rebecca Bradberry

CIRCULATION

Circulation Director
Steve Hobbs
Circulation Manager
Kevin Maloney
Specialist Outlet Development
Emma Stammers

MANAGEMENT

Managing Director
Robert Lehmann
Divisional Publisher
Dawn Frosdick-Hopley
Associate Publisher
Jez Walters

SUBSCRIPTIONS & BACK ISSUES

Direct Subscriptions and Back Issues are available from Nexus Subscription Services, Link House, 8 Bartholomew's Walk, Ely, Cambs CB7 4ZD Phone: 01353 654422; Fax: 01353 654400
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 0011099.
US Subscription Agent: Wise Owl Worldwide Services, 1926 S. Pacific Coast Highway, Suite 204, Redondo Beach, CA90277-6145, USA.
Phone: (310) 944-5093; 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

IN THIS ISSUE

● Vol. 188 No. 4167 19 April 2002 ●

On the cover ...

A prolific builder, Brian Young is a fine ambassador for the Guild of Model Wheelwrights, an organisation of which he is an active member. His most recently completed model is the 1:12 scale McKay Sunshine Reaper/Harvester which graces our cover and gained both a Silver Medal and the John Thompson Trophy. Brian's characteristic style is instantly recognisable, all the mechanical parts of his models function as they should, and he augmented the 71st Model Engineer Exhibition with a fine display of ten other models from his extensive collection. Turn to page 237 in this issue for an illustrated report on the entries in Competition Classes F, G and L

(Photograph by Mike Chrisp)

INDEX to ADVERTISERS

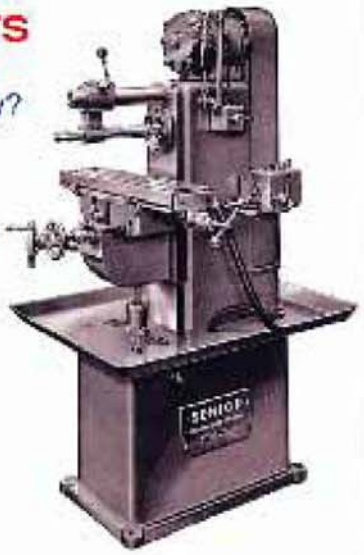
Single to Three Phase Variable Speed Controllers

for Lathes & Milling machines

Need to run 3PH machinery from a domestic supply?
Are you still changing belts and pulleys?
Is your miller too fast even in bottom speed?
If your answer to any of the above is yes....
Then you need to treat your machine to smooth and quiet variable speed operation.

By converting to variable speed control, you can always find the right speed!

We have complete variable speed control packages available for all Myford, Boxford, Raglan, Southbend & Colchester machines. Systems also available for 'Tom Senior' and 'Bridgeport' milling machines. Other machines can be converted, call with your requirements!



MITSUBISHI ELECTRIC **Variable speed drives**

E520 range: 0.4, 0.75, 1.5 & 2.2kW available.

Prices start from just £117.00 + VAT for a 0.4kW.

Multi-function control stations available prewired for use with the Mitsubishi E500 and S500 ranges. Functions of the control station include; START/STOP pushbuttons, Forward/Reverse, Run / Inch, and variable speed potentiometer.

Our complete variable speed control systems comprise of 240V Input E520 drive installed and fully wired into a steel enclosure, complete with a 13A molded mains plug & lead, And with a new High quality, High Torque induction motor.

The complete systems are fitted with the following controls;
Start, Stop and Emergency Stop pushbuttons
Forward & Reverse Motor Direction Switch
3 fixed, pre-set speed ranges: 750, 1500 & 1800 Motor RPM
Variable speed potentiometer control, 175 - 1800 Motor RPM
Run & 'Jog' functions for precise machine control.
Rugged sheet steel enclosure, powder coated in green or grey.

Supplied completely pre-wired for fast & easy installation.

NO WIRING REQUIRED AT ALL.....!!!!!

1/2HP (370 watt)	£395.00 + VAT
3/4HP (550 watt)	£425.00 + VAT
1HP (750 watt)	£438.00 + VAT

All prices are subject to VAT and carriage.
Designed and manufactured in the UK
Full warranty and after sales support available.

ML370/750 systems - with standard foot-mounting DP motor suitable for Myford and other smaller lathes

Systems now available to suit Tom-Senior, Myford VMB, EMCO and other Milling machines.

Call us now for more information and friendly advice.

CENTRE

VISA

M/c'n. credit cards accepted

Newton Tesla

● ELECTRIC ● DRIVES ● LIMITED ●

Tel/Fax: 01925 444773 (6 lines)

www.newton-tesla.com

15 Yrs ANNIVERSARY

SMOKE RINGS
With the Editors

Heat treatment

During a recent lunchtime editorial meeting, the topic got around to the heat treatment of small tools in the home workshop. Neil mentioned that for long, skinny tools like broaches, he favoured tempering the tools in the domestic oven in the manner recommended by *Tubal Cain* in his book *Hardening, Tempering and Heat Treatment* (No. 1 in the *Workshop Practice* series). The hardening could be done in a satisfactory manner on the hearth but tempering is difficult to control even if a sand bath is used. As the discussion continued the question was posed: *"If you can use a domestic oven for heat treatment, can you use a heat treatment furnace for cooking?"*

Neil could recall a European supplier of furnaces who always christened new installations by roasting a pig for all those working on the project, but this was intended to be a once only event in the life of the furnace.

Mike remembered his time as a member of a design team producting the world's first solid state signal generator, which happened to have the model number 2002 — not inappropriate for the timing of this account. Part of the design process involved heating and cooling individual circuit components to determine the effect on stability and accuracy of the units in development. Cooling was arranged by the use of aerosol chill sprays while small industrial ovens were employed for heating. The tell-tale and appetising aroma of hot pies at lunchtime indicated an unsantioned use of this equipment by one of the apprentices seconded to the team. He always seemed hungry so when Mike made a film about the big freeze in the early '70s, by means of editing, this apprentice was seen at regular intervals throughout the film, scoffing what appeared to be a succession of hot meat pies!

While on the subject of ovens, it was also noted that the old-fashioned electric clothes dryer/airer cabinets were ideal for hardening freshly applied paint. The slats across the top of the cabinet provide an ideal hanging facility for items suspended on wires while the expanded mesh platform preventing access to the hot element at the base of the cabinet offers a convenient support for items pressed onto pieces of rod or dowelling. Readers who fancy trying the technique should keep an eye on the 'For Sale' section of their local paper and should be able to pick up a suitable cabinet for a very modest outlay.

However, the following story was deemed to be more in line with the spirit of the original question.

It seems that a certain company based in the Midlands had a very fine automatic tempering furnace with continuous throughput via a conveyor. The exact operating temperature is lost in the mists of time but would have been around 180deg. Celsius. Some culinary genius discovered that if he placed a large potato, carefully wrapped in aluminium foil, on the in-feed conveyor some 55 minutes or so before his shift break then he could enjoy a piping hot, nourishing baked potato for his mid-shift meal. Word got around and before long the entire heat treatment department crew were baking potatoes — a practice restricted to afternoon and nights shifts only to avoid unwarranted attention by management during normal office hours.

All remained well until, one evening, the general manager decided to tour the factory with a very important visitor. One of the high spots of the tour was the automatic tempering line. The visitor was most impressed — until half a dozen hot baked potatoes fell at his feet.

It was a somewhat perplexed departmental foreman who was invited into the general manager's office the following morning to explain the actions of his afternoon shift crew. Such occasions are of course part of the job of production supervisors — finding excuses for things they didn't know were happening in the first place!

Stolen!

Mark Burgess, Editor of the excellent GL5MLA magazine *Turnout* has just informed us that member Martin Rant was recently visited by a burglar or burglars who made off with his WR 08 shunter No. 15107, a GW driver's truck based on Doug Hewson's design with GW plate frame bogies, a black steel 20 ton GW loco coal wagon, a black steel 10 ton GW loco coal wagon, a green Gloucester PO mineral wagon (G. R. Webb), a brown GW fruit 'C' van and a green SR 4-wheel parcels van (with cracked windows). The locomotive and all rolling stock is for 5in. gauge.

Readers are urged to keep a keen look out for these items and anyone able to assist in their recovery is asked to contact Didcot Police (tel: 01235-512929) regarding Crime No. 1248.

Woking Precision Models

Many readers will be aware that Woking Precision Models is a supplier of drawings, building instructions, castings and accessories for the construction of a number of internal combustion engines, including several designed by Edgar T. Westbury. As well as a range of i.c. engines, the Woking catalogue includes some steam engines and workshop equipment. Indeed, Stan Bray's current project, the Ransomes & May horizontal engine, uses castings supplied by Woking Precision Models.

Woking Precision Models, suppliers of drawings, and castings, etc. for a range of miniature internal combustion and other engines, has a new owner.

Dennis Harris, owner of the Woking Precision Models for the past 17 years, has decided to embark on a well-earned retirement and has sold the business to Graham Varcoe in Lancashire. Graham intends to maintain the current list of models and accessories, and perhaps to extend the range on retirement from his current full-time employment a couple of years hence.

A catalogue will be available shortly.

Readers wishing to speak to Graham are advised to call 01706-377508 in the evenings between 6-10pm, including Saturdays and Sundays; an answerphone is available at other times. The new business address is Graham Varcoe, Woking Precision Models, 27 Petts Crescent, Littleborough, Lancashire OL15 8ED.

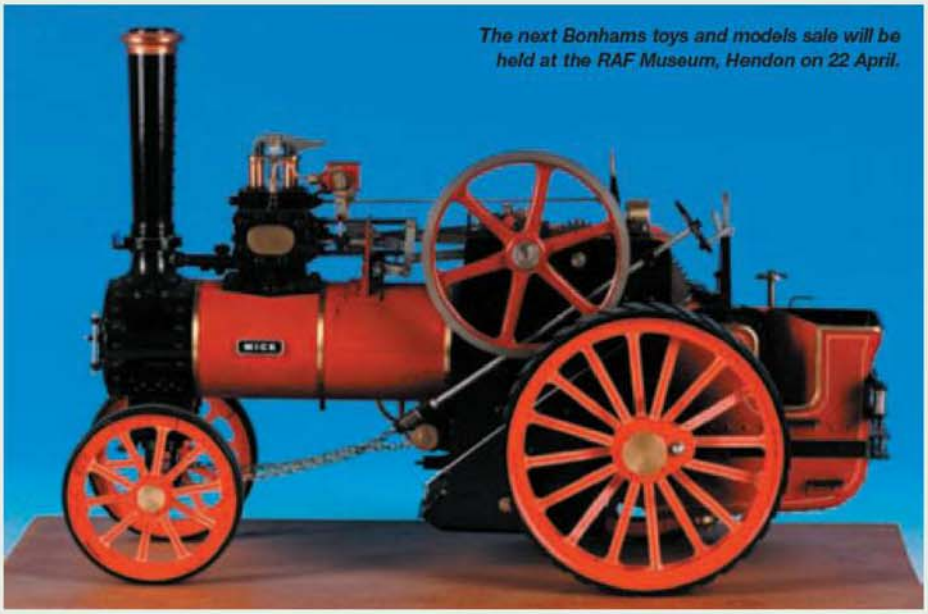
We would like to take this opportunity to thank Dennis Harris for supporting the i.c. engines aspect of our hobby for so many years and to wish him a long and happy retirement.

We also wish Graham Varcoe well with his new acquisition and assure him that i.c. engine enthusiasts will be delighted to know that Woking Precision Models remains in good hands.

Toys and models sale

Information about the latest Bonhams sales arrived with us too late for inclusion in the last issue but just in time for this. Their Chelsea sale has come and gone (10 April) but readers may be pleased to know that the next sale, which includes steam driven traction engines, shipping and trains (price range £100-£3000) is to be held 22 April at the RAF Museum, Hendon.

Further information may be had from Oliver Strebbel-Ritter, tel: 0207-393-3953; email: osr@bonhams.com



The next Bonhams toys and models sale will be held at the RAF Museum, Hendon on 22 April.

POST BAG

Blacksmith's anvils

SIRS, - I was recently browsing through some back issues of *Model Engineer,* when I came across an article by J. N. Maskelyne, in his day a very well respected model engineer and one time technical editor of 'Ours'. He wrote about an anvil purchased by his grandfather at a London auction in 1879 (*M.E.* 1844, 10 September 1936).

This particular anvil originated from a blacksmith in Edgware and was sold as that which had inspired Handel to write his well known composition *The Harmonious Blacksmith.* For a time Handel was organist at St Lawrence's Church in Little Stanmore, the next village. Legend has it that one day while out walking in Edgware he called in at the smithy to shelter from the rain. While watching the smith at work, the musical sound of the hammer striking the anvil initiated a theme in his mind which then formed the basis for his set of variations.

While no direct evidence exists which would prove this story, Mr. Maskelyne put forward some very convincing arguments to support the fact that the anvil in his family's possession could well have provided the inspiration for this work.

One of these arguments involved the fact that when the anvil was struck on its toe, top surface and heel the three notes emitted were a clear ringing E with its harmonic B, a dull C-sharp and a predominant B. These, if struck in the right order, toe - heel - top surface - heel, play out an instantly recognisable phrase.

Even more significantly, the anvil's notes were in exactly the same key as that of Handel's composition. Mr. Maskelyne continued by saying that his grandfather and other members of their family spent many years testing every anvil they came across but never found another that could produce the required sounds.

Although not stated, from Maskelyne's description the anvil would appear to have been of the usual 'London' pattern and from the quoted sizes probably weighed about 1cwt (50kg). It was apparently displayed at the 1936 Model Engineer Exhibition and older readers may perhaps remember seeing it. Does anybody know of its present whereabouts?

In his letter (*M.E.* 4164, 8 March 2002), Mr. Brian Harefield casts some doubt as to whether 'London' pattern anvils were made much before the 1850s. However, assuming that there is some truth in Mr. Maskelyne's story, and since Handel would have written this work in the early 1700s, it would appear that anvils to the general 'London' pattern have been around for some considerable time, but then so have the techniques for working wrought iron. Evidence for water driven tilt hammers and puddling furnaces goes way back into history, nevertheless the thought of manipulating white hot blooms of iron with the primitive tools then available is quite mind boggling.

Perhaps, as we find today when making difficult or complex components, the secret lies in the method of approach.

Bill Steer, Middlesex.

Turning pail?

SIRS, - Some time ago a reader's letter was featured in these columns seeking an explanation for why a toy balloon filled with a lighter than air gas and tethered to the seat of a bus, did not drift outward with centrifugal force when the bus went round a curve.

Here is a similar puzzle which should appeal to every engineer who has ever quenched a piece of red hot steel in a bucket of water and then observed what happens to the flakes of scale produced.

Take a bucket, half-fill it with water and sprinkle in a few grains of sand. The sand will drop to the bottom, showing that the grains are heavier (more dense) than the water.

Now stir the water around in one direction and observe the sand grains. One would expect that the sand, being more dense, would fly with centrifugal force to the outer edge of the bottom, but instead it drifts to the centre.

Can anyone explain this?

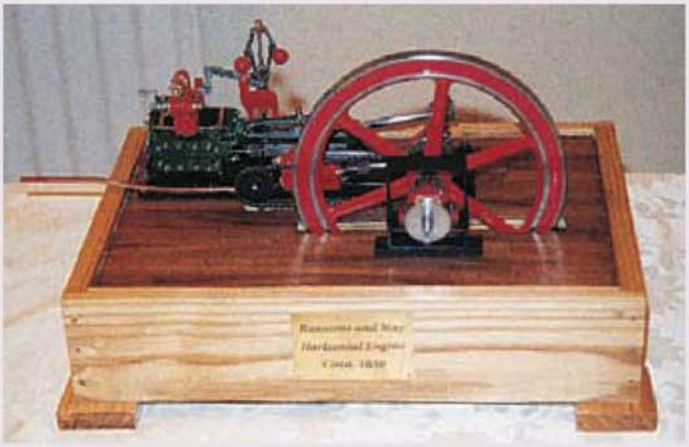
P. J. Williams, Frechen, Germany.

Pulsometer pump

SIRS, - I have no doubt of the ability of a Pulsometer, whether the self-acting two-chamber type, or as sketched by Mr. Garner (*M.E.* 4164, 8 March 2002) to raise water. But it is not an injector, and could not be used to feed a boiler. It wouldn't work.

Both an injector and a feed pump, in their different ways, use the energy of the steam to overcome the pressure in the boiler. If you tried to use a Pulsometer, you'd be opposing boiler pressure with boiler pressure, and nothing would happen!

David Barnes, Kent.



Mr. Howlett's recently completed Ransomes & May horizontal engine.

Ransome & May engine

SIRS, - The accompanying photograph (above) shows the Ransomes & May horizontal engine which I have just finished. Currently being described by Stan Bray, the model took me six months to complete, which is rather longer than it should have taken me under normal circumstances owing to illness and the fact that I was in some considerable pain during the entire period.

Apart from that specific illness (from which I have now fully recovered) I have cerebral palsy which affects my legs, but fortunately not the upper part of my body. Consequently, model engineering has been a lifeline for me.

I am very fortunate in that my wife and I bought a plot of land and built our own house which incorporates an internal workshop — although my wife seems convinced that we built a workshop with a house attached! This means that I can work in a superb, warm environment that is accessible regardless of the weather.

The equipment I used to make the model was a Myford Super 7 lathe, a Myford VMB milling machine and a Warco drill, plus all the usual hand tools.

I am currently working on and making good progress with Anthony Mount's Tuxford's side rod engine as described in *Engineering in Miniature* from January 1996. A fascinating engine with its cylinder set low, Maudslay originally introduced the prototype as a paddle engine in the 1840s. It was re-introduced by Tuxford as a compact farm engine some 20 years later. An alternative version in the form of a steeple engine was also available.

David Howlett, Shropshire.

Centring long bar

SIRS, - I was interested to read Mr. Ellis' advice in his *Letters to a Grandson* (*M.E.* 4144, 20 April 2001) concerning the drilling of centre holes in the end of round bar too long to be drilled in the lathe from the tailstock. With all due respect to Mr Ellis, there is an easier way than the method he describes.

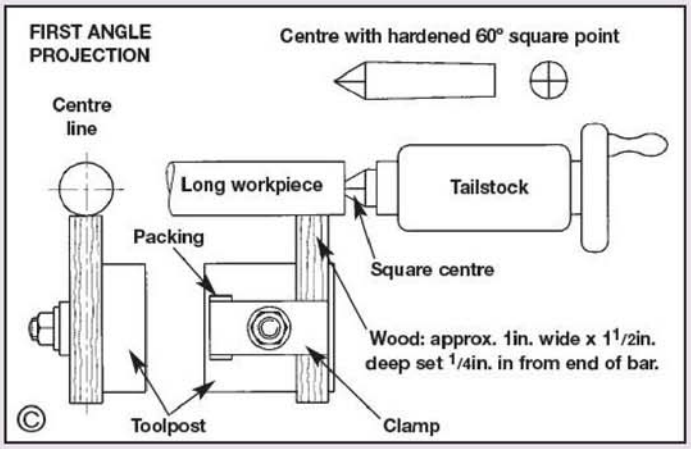
When I started work with a local engineering company over fifty years ago, I was taught to use what they called a square centre. On an ordinary Morse taper shank, instead of a 60deg. cone point at the 'business' end, the point was furnished with four flats ground, filed or machined to form a pyramid shape. These edges were at 60deg., very keen and came to a sharp point as indicated in my accompanying sketch (above right). The square centres which we used were made from cast steel, but silver-steel will do if hardened and tempered after forming the flats. I made mine from a broken taper shank drill.

Let us suppose a 3 1/2in. centre height lathe with 31in. between centres is available, and you need to centre a 2in. bar which is 28in. long. First find the centre of one end of the bar and make a good centre pop there — not a dot, but a deep centre using a punch with more or less the same angle as the required 60deg. centre. Fit the square centre into the tailstock and place the bar between the chuck and the tailstock. Tighten the chuck sufficiently to drive the bar, but not too firmly. If the bar is gripped too tightly, the next operation may be impeded.

Start the lathe running at a fairly low spindle speed, say about 125rpm, put a drop of oil on the square centre, feed it into the centre pop slowly and you will see it start to cut. Stop the lathe.

Fit a piece of wood about 1 x 1 1/2in. section some 8 or 9in. long, into the toolpost as shown in my accompanying sketch. It may be necessary to remove your four-way tool post, if you have one, and clamp the piece of wood in position with a suitable piece of packing at the other end of the clamp.

Re-start the lathe and, using the cross-slide feed screw, take the wood up to the bar so that it just touches the bar about 1/4in. in from the end being centred. Apply a little oil to the end of the wood where it touches the bar and to the square centre again. Feed the wood in slowly, a few thou at a time, and feed in the



Mr. Howarth's method for centring long bar in the lathe.

centre. The pressure of the wood will bring the bar to run true, and when you are satisfied feed the square centre into the bar to deepen the centre hole you have made, to the depth you require.

Stop the lathe and remove the bar from the chuck. All you need to do now is to drill a clearance hole in the bottom of the centre you have made, just as if you had used a centre drill, but I don't advise the use of a centre drill which could damage the true centre you have just cut. I use an electric hand drill that starts slowly and increases in speed the harder the trigger is pressed.

This technique can be used on material of any length and diameter, from the chuck or between centres, up to the maximum capacity of the lathe. I recommend the use of large wooden vee-blocks to support large diameter bar. I have used this method many times, many years ago, and a few times in more recent years. It does work — try it!

Ron Howarth, Lancashire.

Buildability

SIRS, - I have been following the interesting letters on the subject of drawings in these columns and wish to add my contribution.

I have almost completed the construction of a *Simplex* and a *Britannia,* both in 5in. gauge, using drawings from suppliers who sell the various products advertised in the pages of *Model Engineer*.

In the past I have worked on 12in. to the foot scale steam locomotives and have worked continuously in the railway industry from 1954 to date.

I am not personally interested in designing my own locomotive. I simply wish to build a working example from a design that has 'buildability'.

I have formed the opinion from many hours of frustration trying to build these two locomotives that the man who created the drawings has never built the locomotive.

All the drawings I have used are practically useless and drawn by people who clearly have no training in engineering design. It might come as a surprise to some autocratic experts in model engineering that there are standards for drawings and one day perhaps someone will switch to CAD operation and some of the stupid mistakes and dimensional errors will be eliminated.

The real engineers, who build real trains, can calculate in fractions despite being part of a fully metricated industry!

I may write a story of my experiences following the completion of my models along the lines of *I built a locomotive in spite of the drawings.*

J. D. C. Brown, Derbyshire.

Dimensions on drawings

SIRS, - Having read with interest Peter King's letter (*M.E.* 4165, 22 March 2002), I would make the following observations:

1: 1/64in. may equate to 0.015625in. but it does not mean that such accuracy is implied; dimensions given in 1/64in. are generally intended to be used with a spread either way of 1/64in. otherwise a tighter tolerance would have been given.

2: Parts dimensioned in imperial fractions can equally be made using a rule.

3: While it is true that from the commercial point of view, material sizes are moving towards all metric sizes, we tend to use whatever is to hand, or what we have been used to. We are fortunate in the UK that much imperial material is still available.

4: One third of the world (USA) is largely still imperial based, and even the metric world uses BSP as its plumbing/pipe fittings standard, with the most idiosyncratic metric measurements!

Peter is a self confessed *professional draughtsman*, as such his advice is to be respected but not to be taken too seriously.

As regards drawings in electronic form, I assume that *M.E.* relies on many of these. These could be published with the relevant corrections/changes on a website to which we all have access for downloading in their latest, corrected form.

K. A. Willson, Hampshire.

Megabuck methods

SIRS, - The subject of budgets for checking drawings in industry is an interesting one. The advent of Computer Aided Design (CAD) and Computer Numerical Control (CNC) has fortunately reduced (not eliminated) the requirements for checking drawings.

The first feature which assists in reducing checking is the facility of most CAD programs to generate dimensions, by which the object is actually dimensioned by the program exactly as drawn. The result of this is that if a shaft is drawn to its intended size for a sliding fit, and the hole in which it is to slide is also drawn to give this sliding fit, any dimensioning will correctly show exact clearance/sizes. This permits a simple visual check which reveals whether or not the parts are drawn correctly. This feature is realisable, in even the simpler CAD programs within the depth of a model engineer's pocket.

Many CAD programs have a solid modelling feature that at the very least will show the draughtsman/engineer whether his design is of a weird or a normal intended shape! In more sophisticated three-dimensional programs this feature allows parts to be assembled and to rotate, slide, etc. in real time on screen. By means beyond my understanding some programs detect errors of fit and design, particularly that of strength of materials. However the cost of such programs, add-on feature programs and the computer to run them is about equivalent to five years wages, thus putting this option beyond most model engineers.

The most effective check on drawing accuracy, a laser prototyping device, is also not available to model engineers. These devices are arranged to spray a form of plastic wax into a controlled atmosphere chamber in which an armature is mounted to rotate poly-axially. Two or more lasers are set to interact at a variable point of intersection; these set the wax, which builds up on the armature. The lasers are controlled by CNC from a CAD design, with the end result of a three-dimensional model strong enough to test assemblies and fits, etc.

A variation of this is to use a wax designed to be used as a pattern in the lost wax process, from which a metal prototype is centrifugally cast; one of my clients uses this process to make hip prostheses. However, at first sight, the cost of this process is horrendous and only cost effective if in heavy daily use for very high value end products.

Having considered the above, we return to simple CAD and careful work while using the facilities of the CAD program to reduce errors. I do not think it is reasonable to expect the publishers of this or any other model engineering magazine to check drawings submitted for publication. The cost would be that of at least one extra editor per magazine published and I would hear the resultant cry of agony from the corporate bean counters from here in the antipodes! The checking will have to be done by contributors to the best of their abilities, with a standard disclaimer appended.

Users will also have to re-check drawing dimensions before marking out and cutting materials. Clients who are jobbing engineers always take this approach on the first of a batch of assemblies to find all the b....y draughtsman's errors! The awful truth is that the design engineer probably gave the draughtsman a design with errors already built in, and the 'manufacturing engineers' will themselves make further errors, mostly in marking out by misreading measuring equipment. There will also be the errors made while machining, arising from a number of sources. Inevitably some of their errors will cancel out, while others will add, compounding the error.

From the above discussion it is evident that while engineering is in the hands of human beings, there will be errors in dimension. Only very expensive automated, computerised megabuck machining devices will approach the perfection demanded by model engineers!

PS: how else will we keep our useful scrap boxes topped up if we become too accurate?

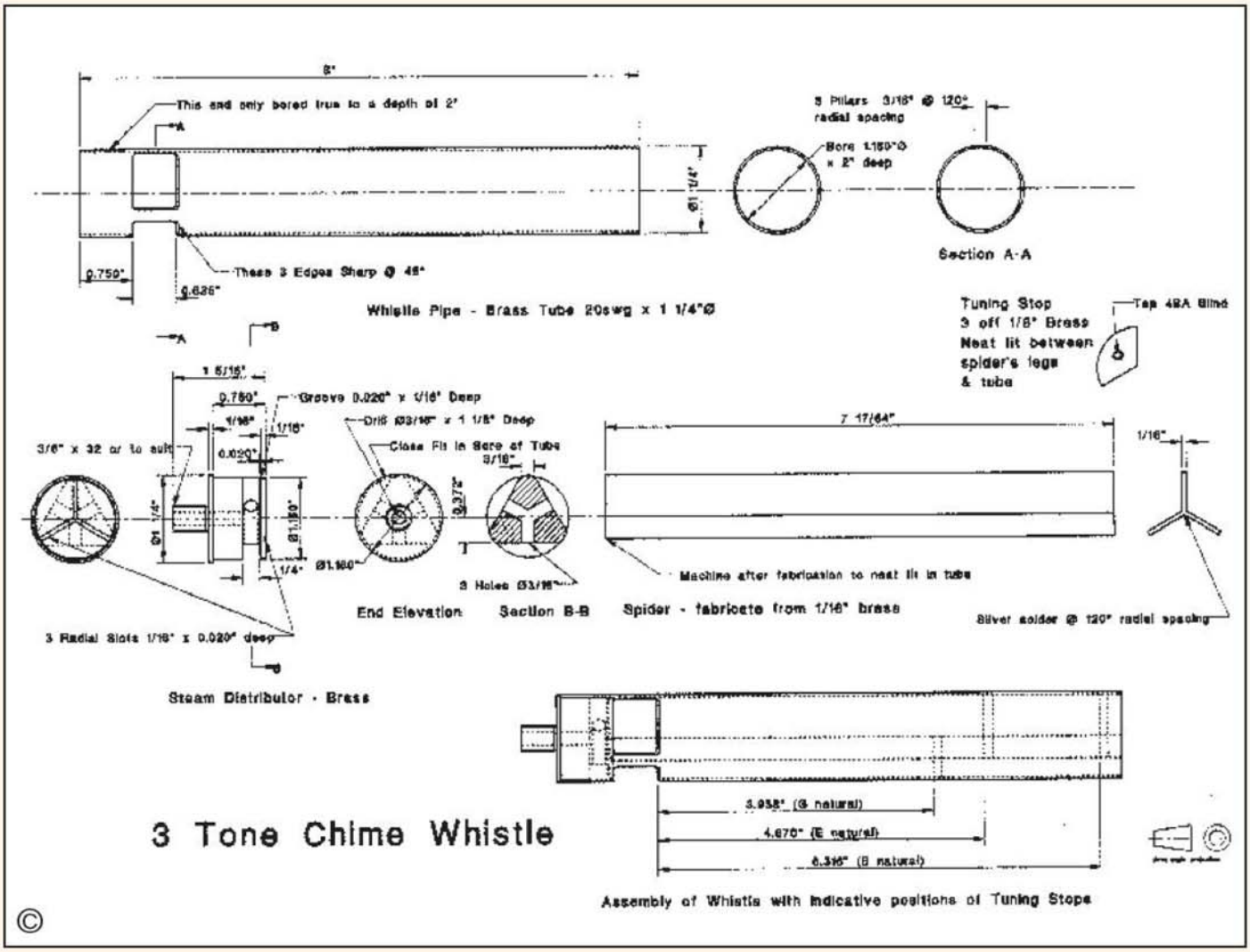
Peter King, Christchurch, New Zealand.

Gunmetal?

SIRS, - With regard to Mr. King's letter, (*M.E.* 4162, 8 February 2002) concerning gunmetal, I wonder if he has actually got gunmetal. I have always found this to be one of the easiest metals to work. It cuts sweetly with HSS tools, takes a very fine finish and the swarf comes off as fine granules which are not sharp to the touch. In short, it is a lovely metal with which to work.

Perhaps Mr King has got hold of some phosphor bronze, or one of the intractable 'brasses', or even an aluminium bronze. The gunmetal I usually work with has a golden colour, if there is a reddish tinge to the colour then beware!

Anthony Mount, Devon.



A THREE CHAMBER CHIME WHISTLE

D. A. G. Brown

describes a single tube design which will be at home on larger locomotives and on steam boats.

It is well over 30 years since I first wrote an article about chime whistles for *Model Engineer*, that being in response to another reader's plea for information on the subject. My original work was geared to fitting such a device beneath a 5in. gauge A4 locomotive. Practical considerations dictated that the three musical notes were produced each in its own tube, so that a nest of three might be fitted almost out of sight beneath a model.

During the past few years I have carried out some development work with the objective of producing a chime whistle with all the chambers in one outer casing. Believe me, this is a horse of a very different colour from the original compromise produced in the 1960s. I have explored the important variables and have produced a design which is pleasing both to the eye and to the ear. I have also adapted it for other musical chords to which I shall allude before the end of this article.

The origin of the A4 whistles is purely American, Gresley having ordered them from New England before the war. They made a real art form of the sound but I always think that the particular choice for the LNER pacifics is so melodic and evocative that it should not be tampered with. It also sounds beautiful across water, steam boat builders please note! My fondest memories date back to my apprenticeship days in Peterborough in 1960; I had some friends in the Cathedral Close in those days and through the ill-fitting window we could hear the call of an A4 as it came through the station shortly after 11pm, on the front of the 'Scotch Goods'.

Natural laws

The wavelength of a note 'λ' is determined by its frequency 'n' and the velocity of sound 'v', according to the equation:

$\lambda = v / n$

In air, the velocity of sound is 1,117ft./s. The frequency of the B above middle C is 494Hz, so its wavelength is 27.1 inch. Now, a whistle tube which is stopped at the far end should be $^1/_4 \lambda$ = 6.8in. long. But we do not know precisely the length of the tube to which that relates, suffice it to say that is somewhere between the point at which the steam emerges and the sharp edge of the tube. That is where experimental measurement takes over.

In order to produce a three-note chord which sounds like an A4 class whistle, we require the length of the longest chamber to be about $6^5/_{16}$ inch. If we add on the other material lengths for steam distribution, and an end stop, this dictates an overall length of 8in. for the whistle tube as shown on the detail drawing.

In order to determine the best compromise values for the various design parameters, I built a small test rig which I could run on compressed air and steam. With it I explored the effects of varying the steam aperture, the length of the voice slot, the diameter of the whistle pipe and the running on steam or air.

Boiling this work down to the problem which we are now addressing, the results are as follows:

1: The diameter of the whistle tube greatly affects the volume of sound produced.

2: The steam aperture works best at about 0.010in. and small variations from chamber to chamber should be avoided.

3: The voice slot length of $^5/_8$in works well and

Dividing head set-up for machining the voice slots in the Whistle Tube. The snug-fitting steel plug to prevent distortion by the chuck jaws is clearly visible. Note also the table stops set to limit travel.

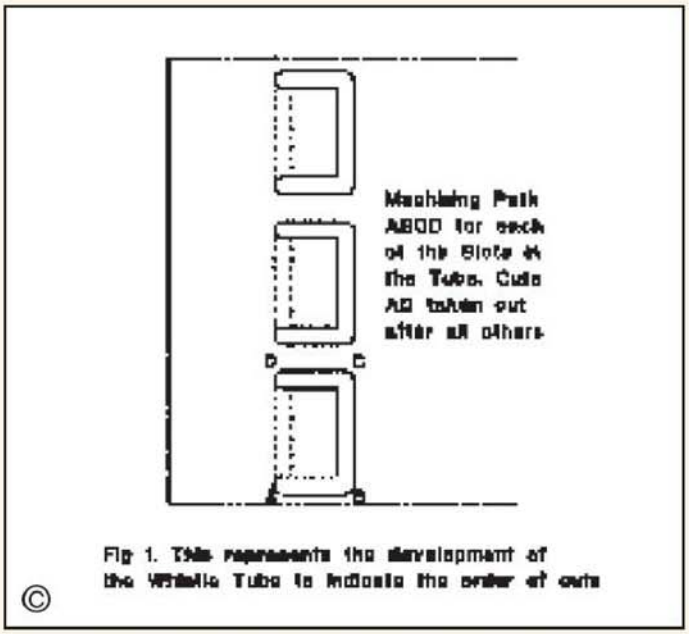


Fig 1. This represents the development of the Whistle Tube to indicate the order of cuts

is a compromise between a raucous screech (if too short) and failure to produce a sweet tone (if too long). This slot length is sensitive to boiler pressure, so if screeching should be encountered due to running at too high a pressure, this can be cured by judicious throttling of the steam supply.

4: Perfect sealing of all joints within the whistle is essential to avoid unwanted sound effects.

5: Running the whistle on steam raises its pitch by approximately one semitone, so the solution to our problem is to make it sound a semitone flat on air (i.e. B, E and G natural). When run on steam, the correct sound of C, F and A flat will result. This variation occurs because the velocity of sound in steam is greater than the velocity of sound in air.

Strictly speaking, the chamber size should vary slightly according to pitch, the lower notes commanding larger chamber size to give equal sound levels throughout the range. (Just observe the obvious increase in bulk among the saxophone or clarinet family as they appear in an orchestra. In practice, as we are dealing with only two thirds of an octave, we can make all the chambers equal in girth.

Construction

The choice of a suitable tube diameter is expedient and is possibly influenced by the material available and the finished appearance required. Theoretically you could use tube of smaller diameter than indicated here, but I know from experience that the smaller you go the more difficult the construction becomes and the sound volume decreases greatly. At the other end of the scale I have built a 2in. diameter model and frightened the horses in the next field! That one has gone to a full-size steam car the other end of Rutland County and I fully expect to hear it one summer evening when the owner sets off!

Start with an 8in. length of 1 1/4in. x 20swg brass tube, (0.036in. wall). Years ago this used to be produced as 'treblet tubing', drawn three times over a die, the result being extremely good concentricity. My recent experience is that there will be perhaps 0.002 or 0.003in. of eccentricity, so we must start by boring the first 2in. of the business end true. You must not squeeze the tube by the chuck jaws without filling the inside of the tube with a close fitting plug.

Fixed steady support will be necessary at the right hand end of the job, but here the inherent eccentricity of the tube makes it impracticable to apply the steady jaws directly to the brass surface. Turn up a 1/2in. long ring of steel or brass say 1 1/2in. dia., bored a snug fit on the brass tube. Fix the ring to the tube about 3/4in. from its end by means of household glue, Loctite threadseal or even soft-solder, thereby making a fair seating for the steady jaws. The examples which I produced cleaned up to exactly 1.180in., so this is the figure to which other dimensions on the drawing relate.

So, we have an 8in. piece of tube with one end bored true to a depth of 2in. and this is the working end of the whistle. You now require another snug fitting plug for the bored end which can be gripped in the jaws of a 3-jaw chuck mounted horizontally on a dividing head (**photo 1**). I cut the three voice slots with a 3mm slot drill, using the following procedure:

1: Check that the milling machine spindle/chuck jaw combination does not conflict.

2. Make use of table stops, if available, to limit the travel of the job beneath the cutter. So, on the assumption that the left hand stop leaves 3/4in. of metal uncut at the left hand end of the tube, set the right hand stop to allow a table movement of (0.625in. minus the cutter diameter).

3. Each of the three voice slots should now be cut out on three sides only, referring to the diagram in **fig 1**, in which I have tried to portray the developed shape of the tube which passes under the cutter. First plunge the slot drill into the tube at point A nearest the chuck.

Secondly, traverse the table right to left under the cutter from A to B so that the cutter takes out the first 5/8in. cut. Thirdly, rotate the dividing head 90deg., which will take out enough metal to leave a 3/16in. pillar between slots. Fourthly, move the table left to right from C to D to cut the remaining straight side of the voice slot. Fifthly repeat the above operation on the other two voice slots.

4. Starting at the original point A, rotate the dividing head 90deg. to finish the first voice slot at the line where the steam will enter. Repeat for the other two slots.

The next job to be done on the tube is to machine the 45deg. sharp edge on the end of the voice slot where the steam impinges. My milling machine head sets over to 45deg., so I was able to carry out this secondary operation without breaking the set-up, but I am aware that many machines do not have this facility. It is just as feasible to set up the dividing head at 45deg. either on an angle plate or adjustable machine vice. Whatever you do, make sure that the chamfered edge is clean and accurate.

Steam distributor

Measure the length of the left hand part of the whistle pipe, which I have indicated at 0.750in., and either shorten it to that figure or adjust the corresponding dimension on the Steam Distributor to match. It is our objective for both walls of the steam orifice to be level with each other.

A piece of brass 1 1/4in. diameter matches the O/D of the whistle, so the first task is to reduce 0.750in. to a running fit in the machined end of the tube. Next reduce the end 1/16in. by 0.020in. on diameter to provide a steam orifice of half that amount. A narrow groove beyond that point greatly assists in final assembly, by avoiding a solder bridge path.

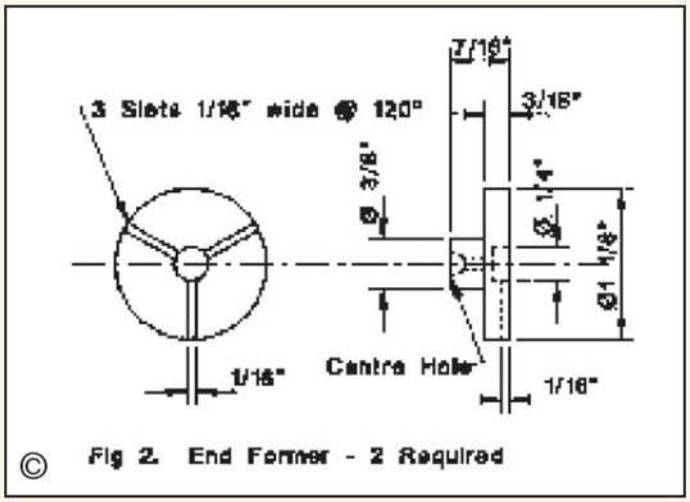
Transfer the job (still in its chuck if possible) to the dividing head and cut the three steam slots 1/4in. wide as indicated to a depth of 0.218in. While in this set-up, drill the three 3/16in. holes in the middle of the steam slots to meet in the middle of the block, taking care when breaking through, not to let the drill snatch. This is one of those cases where, if you do not know where the centre-line of the dividing head is on the Y-axis of the machine, you can easily position the 3/16in. drill above the centre-line merely by touching it say on the 1 1/4in. surface of the brass stock and then moving the table in the Y-direction a distance of (5/8 + 3/32in.) Much better than by eye!

While set up in the dividing head, you can now use a 1/16in. slitting saw to cut the three radial slots, making sure that they line up correctly with the centres of the three 3/16in. lands between the steam chambers. Set the saw just to touch the flat surface of the 1.160in. dia.; move out of the way and lower the quill or raise the table by 0.611in. and take a cut 0.020in. deep. Should the slitting saw slightly overshoot the centre do not worry; a short run-out will be visible after assembly.

We can now return the work to the lathe, cutting it off to length ready to form the steam entry section, gripping the part so that the three 3/16in. lands are under the chuck jaws. Reduce the end to 3/8in. dia. (or to taste) and screwcut 32tpi, finally drilling the steam inlet cautiously at 3/16in. diameter just to break into the already formed steam passages.

Spider

Yes, I am well aware that arachnids have eight legs, but this one has three and divides the chambers of the whistle. Cut from 1/16in. brass, the mating edges should be mitred at 120deg. so that they nestle accurately together. I did this by careful draw-filing and it worked. Make sure that you allow, say 1/16in. of metal for removal after assembly of the spider. Accuracy of the 120deg. spacing is essential, so prepare two end formers (**fig 2**) for application to turning between centres.



© Fig 2. End Former - 2 Required

The 1/4in. hole which separates the three radial slots stops silver-solder from approaching the formers, an embarrassing experience! As you will have guessed, the formers perform two functions; first they position the spider's legs for silver-soldering and secondly they are used for turning between centres.

Make sure that the ends of the three pieces of brass are accurately faced all to the same length. Fit the bits together squeezing gently between the formers, possibly restraining also by means of some wire ties around the outside of the brass strips. Silver-solder paste really comes into its own for this sort of job, but do not compromise, making sure that all the joints look good (**photo 2**).

The assembly of spider and formers can now be turned between centres, (or one end may be held in the chuck), to reduce to fit neatly into the whistle tube. It must be able to slide easily at this stage. Do not try to take cuts greater than 0.020in. deep and make sure that the tool is very sharp to avoid distortion of the spider's legs.

Whistle assembly

The three major components may now be soft-soldered together. Chamfer the end of the whistle tube to induce the solder to run around the joint. Flux everywhere that you want the solder to run, including the 3/16in. lands between steam chambers. In order to avoid capillary attraction into the steam orifices, plug them with slivers of steel shim say 0.006 to 0.008in. thick, even trying the odd catfood tin as a source, with any vestige of tin removed. The shim pieces should be oxidized blue to inhibit solder amalgamation and enough material left proud of the steam orifices to enable their eventual withdrawal.

When it comes to running the solder it should flow anywhere the flux has covered, but do not worry if it does not completely fill the joints between the steam chambers. Apply flux or better still, solder paint to the whole of the spider assembly and when you are happy with the positioning of all three components apply gentle heat and resin-cored solder to the appropriate parts. It is absolutely essential that all the longitudinal joints are airtight.

Tuning

We now have something that looks like a whistle, but for it to work the ends of all three chambers must be stopped absolutely airtight. You will require three tuning stops, a tight fit in each of the chambers. Make these from 1/8in. thick brass and drill and tap a 4BA blind hole in the middle of each. You will probably get only two threads to finish, but that is enough (**photo 3**). Fix a length of studding in the 4BA hole, long enough to be used to verify the alignment of the stop in its chamber. Locknuts and a crossbar as seen in the photograph enable a precise depth of stop to be maintained during the finishing operation.

Squeeze some Plasticine or Blu-Tak around the edges of the stop to form an airtight seal. Adjust the depth below the end of the whistle chamber. If you have access to a piano or other musical instrument you can check for truth of pitch. When you are happy with the result make sure the crossbar nuts locate the assembly accurately. Pull out each stop and clean off all traces of sealant. Run soft-solder around the edge joints, making sure that they are airtight. Clean off and you are ready for the big test.

On the drawing I give some indicative dimensions for the tuning lengths. The actual values required may be slightly different from these, depending upon the tolerances to which you have worked. But I believe that the results will be close enough to make a pleasant sound. On the longest note of the chord, a length difference of 0.013in. causes a frequency change of 1Hz, very annoying if it occurs in the strings of a piano, but barely perceptible among the rich overtones of a steam whistle.

Mounting

For clear operation, the whistle must be mounted vertically so that condensate cannot collect in the chambers. I have drawn a 3/8in. x 32tpi thread for coupling up to the steam supply. This should be at least a 7/32in. pipe and as short as possible. A neat brass cap should also be pushed on to the end of the whistle tube to stop the rain or spray from filling the voids.

Other patterns

During my experimentation process I have tried some other variations and one which I would commend to anyone building a large American locomotive is a four-note chime with a close-pitched harmony of say (B, D flat, F and G).

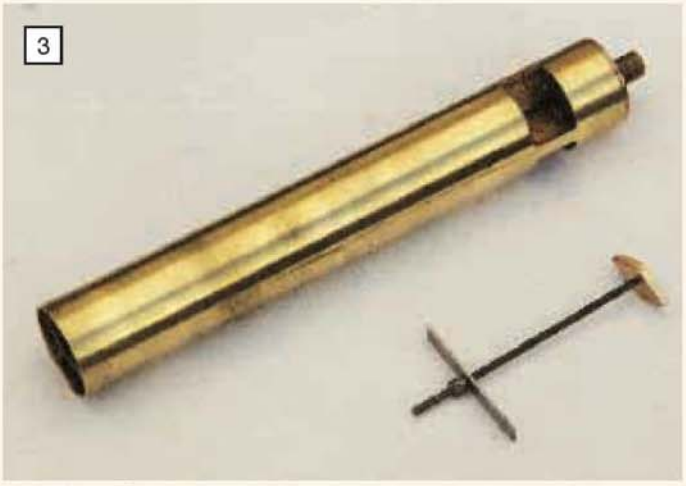
I have discovered two problems with such an assembly which deserve a mention. First, the sound is significantly quieter than with the three-note chime of similar diameter. Secondly, the logical way to make a four-legged spider is from two flat plates slotted together to fit at right angles. They tend to distort during silver-soldering, so my solution is to fit tiny brass retaining pins, four pairs along the length to teach the brass plate manners. The pins are filed away after assembly.

If you want to experiment with four, five or even six note chimes, you should be prepared to increase tube diameter accordingly.

Don't forget the ear defenders!


2

The Spider is shown here after silver-soldering and pickling and ready to be re-mounted between the End Formers for turning between centres.


3

The finished Whistle; alongside is a tuning stop with its 4BA studding, locknuts and crossbar, set for the correct depth.

COVER FEATURE

COMPETITION MODELS

AT THE 71st MODEL ENGINEER EXHIBITION

Class F1: Scenic Dioramas, Architectural and Representational Models

Mike Chrisp reports:

Mrs. May King, an Associate Member of Welling DSME, has delighted us with her previous entries in this category of the Model Engineer Exhibition. These have been in the form of miniatures of a garden shed and of her husband's workshop. Recent alterations to the style of the exhibition have resulted, not so much in the exclusion of Classes F1 and F2 but in their relegation in favour of the more 'traditional' model engineering entries preferred by our 'hard-core' model engineer visitors. Although Mrs. King was prepared to enter her model as a Loan exhibit in this year's exhibition, we felt it appropriate to reinstate Class F1 so that her Room Box could be entered in Competition.

In 1:12 scale, the model represents a Victorian child's nursery circa 1900 and is the result of enjoyable, if diligent research over a two year period. All the items featured, some of which are working toys, were available in 1900 and, with the exception only of batteries, bulbs, electric motors, gear wheels and switches, everything was made by the builder. The 'clockwork' engine and its train, the rocking horse and the paddle steamer paddle wheels are each driven by individual electric motors by way of gearboxes, all situated beneath the nursery floor. The porcelain pottery was thrown, decorated and fired by Mrs. King who also wove the mesh for the fireguard and designed and coloured the carpet.

An attractive feature of this exhibit included the row of switches permitting visitors to operate various working parts of the model. In view of its ingenuity and execution, the judges had no hesitation in awarding a Silver Medal to Mrs. King for her model. Furthermore, since this style of modelling could well introduce new model engineers to our fascinating hobby, Mrs. King has provided considerable further information which will be featured in a forthcoming article about her miniature Victoian child's nursery.

Class G: Model Horse Drawn Vehicles

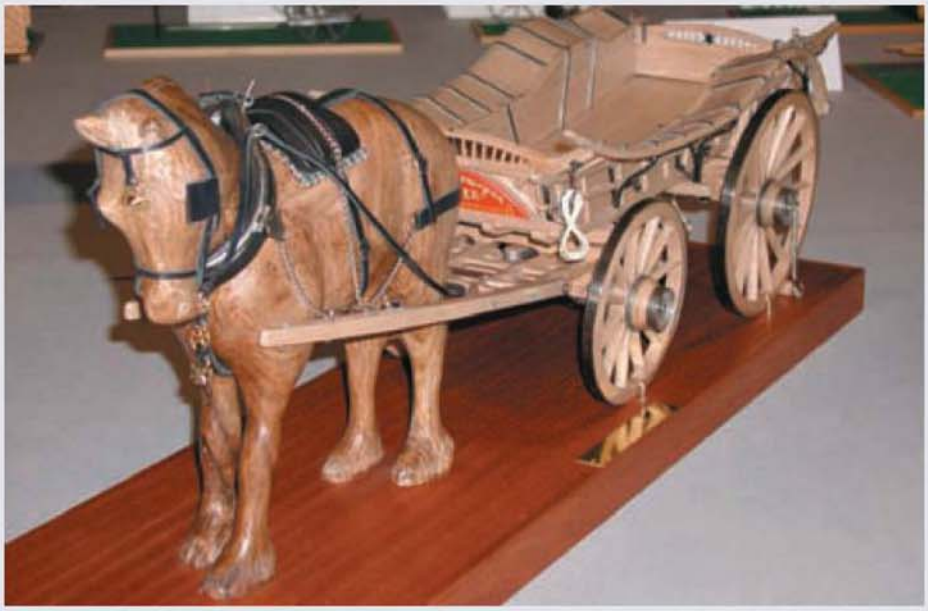
Barré Funnell reports:

There was an encouraging selection of entries in the Model Horse-Drawn Vehicle sections of the show this year, five in all and more than double last year's entries. It was good to see Stephen Atkinson's model of a Glamorgan Waggon. He was unable to turn up last year because the snow arrived in Belfast 24 hours earlier than at Sandown Park, and more severely too, by all accounts. In addition to the Competition entries, Brian Young showed ten of his distinctive horse-drawn farm implements as Loan exhibits, including a couple of reapers, a threshing drum and a muck spreader.

Above: Mrs. May King entered a 1:12 scale Victorian child's nursery for which she made all the items including three working models driven through gearboxes by motors below floor level.

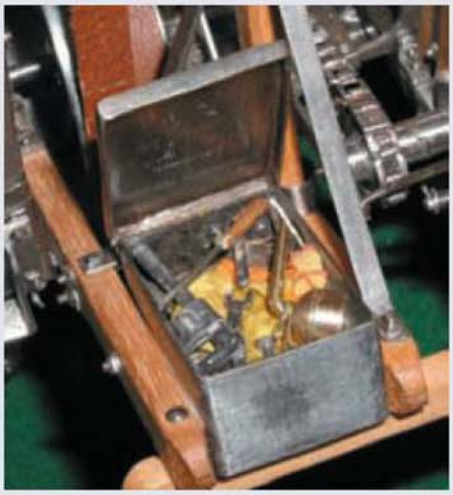
Below: Timothy West's built his 1:8 scale Brush Waggon to a John Thompson design. Well made, the overall effect was much enhanced by the inclusion of appropriate 'accessories'.

Albert Pullen scratch built his Dunton Ledge Caravan to a John Thompson design but the horses and scenery were to the builder's own design. Displayed with the roof raised, visitors could better appreciate the internal detail.



All the way from Northern Ireland , we were treated to Stephen Atkinson's fine 1:8 scale Glamorgan Wagon with a wooden horse hand carved in Irish walnut. The only bought-in items on this model were the delicate chains used.

Albert Pullen in Surrey also showed his Coronation Coach which he scratch built to a Model & Allied Publications plan circa 1975. To 1:16 scale, the model was more representational than accurate but certainly caught the eye!



Prolific builder and active member of the Guild of Model Wheelwrights, Brian Young was awarded a Silver Medal and the John Thompson Trophy for his 1:12 scale McKay Sunshine Stripper/Harvester built with reference to a prototype at the Science Museum at Wroughton in Wiltshire.

John Siddall's 1:4 scale flying model represented a 1916 Fokker AIII of the Austro-Hungarian Air Service. Radio controlled and powered by a Laser 180V engine, the Flair engine cowling shielded a dummy 9-cylinder rotary engine.

I don't recall seeing a Brush Waggon in competition before, and Timothy Smith's model was one of the highlights. It presented something of a judging dilemma, for usually the accessories and additions to a model should not take precedence over the actual vehicle and its standard of workmanship, but without the brushes and other goods this model would be incomplete, and so they came more into the reckoning. The model is from a 1:8 scale plan by John Thompson and was awarded a Bronze Medal.

A Bronze was also awarded (in the Gypsy Caravan section) to Albert Pullen's Ledge Waggon. It is good to see this model with a hand-carved horse in the shafts, and a fractious pony on a lead rope behind. Commercially produced horses and harness do not usually figure much in the judging, although they are considered as part of the 'presentation'. This model was well populated and well presented.

The previously mentioned Glamorgan Waggon also had a hand-carved horse in the shafts. A photograph of the original Clydesdale was supplied; it was a rather uncomplimentary photo, with the horse in winter coat and standing in a dejected pose. It was good to see that Stephen Atkinson stuck to the principles of good portraiture, and produced an enhanced representation! The waggon is from a 1:8 scale design by John Thompson and was Very Highly Commended.

'Degree of difficulty' is one judging criterion, and the Royal Coronation Coach is probably the most difficult model one can choose. Unfortunately the model entered this time was impressionistic rather than accurate, and did not fare well under scrutiny.

The winner of the John Thompson Trophy was Brian Young with his McKay 'Sunshine' Harvester. Built in Brian's usual style, this model was entered with a comprehensive dossier of photographs and sketches of the prototype. Brian claims that all his mechanical models do actually work, gears turns, chains drive and levers ackle something, but he has to lock or de-activate some of the moving parts because he has not worked out the warranty period applying to each machine! This model was placed in the Silver category.

Class L: Scale Model Aircraft

Bill Burkinshaw reports:

Only one exhibit for this class arrived for the exhibition. This was disappointing but the model which did arrive was of considerable interest. The prototype chosen by the builder, Mr. John Siddall, was a Fokker AIII monoplane that was flown by Oberleutnant in der Reserve, Ludwig Hautzmayer of the Austro-Hungarian Air Service. While on service on 15 August 1916, this aircraft was in collision with another AIII during an attack on two Italian aircraft. The fate of Oberleutnant Hautzmayer is unknown.

Mr. Siddall points out that the AIII designation was allocated to Fokker EIII aircraft sold to the Austro-Hungarian Air Service. The main difference between the AIII and the EIII was that the AIII were usually fitted with the Austro-Hungarian Schwarzlose machine gun type MG7/12 instead of the German Maxim LMG 08/15 known as the 'Spandau'.

The working model is 1:4 scale, weighs 18lb. and is powered by a laser 180 V-twin engine. The revolving model 9-cylinder, 100hp Oberursel V.I engine is a dummy. The model is equipped with Futaba radio with gyros on the rudder and wing servos and has an all-moving rudder and tail. The undercarriage is sprung and a tail skid is fitted.

This interesting flying model was awarded a Bronze Medal.

A Frimley Lodge MR pattern vacuum generator unit made by members of Guildford MES. Seen here mounted on a passenger car, its design has been arranged to suit the general lines of the vehicle.

VACUUM BRAKES
THE FRIMLEY LODGE MINIATURE RAILWAY VACUUM GENERATOR

John Jones
of Guildford MES, describes the adaptation and construction of the vacuum generator designed by Peter Gardner of Frimley Lodge MR.
●*Part1*

Before getting too far into this article I must state from the outset that the design of the vacuum generator under discussion is not my own but that of Peter Gardner and his friends of the Frimley Lodge Model Railway Society, to whom full credit must be given. Peter first published details of the vacuum braking system used at Frimley Lodge in his articles published in *M.E.* 4116 and 4118, 24 March and 21 April 2000. It is strongly recommended that you seek out these back issues for further background information on the subject.

Our (Guildford) Model Engineering Society's interest in the subject came about because of the need to establish a better and more reliable source of vacuum for train braking. We fitted vacuum brake linkages to the bogies of both our raised track and ground level track carriages about five years ago using a hand operated vacuum pump. This was not completely successful, due partly to a lack of sustained reliable vacuum and also being unable to make a totally effective non-return valve, so when the 'Frimley Box' was produced we decided to investigate further.

During a subsequent visit to Peter at the Frimley track we learned a great deal. First, their box had been developed over a number of years and, with considerable development of their own, had proven very successful and reliable in use. This seemed good to us, we were not into re-inventing the wheel.

The second point we learned from Peter was that no drawings were available from which we could produce our own boxes. However, he kindly loaned me one of their boxes with the idea that I could produce my own drawings and consequently construct some generators for our own use. The drawings and diagrams that follow are the results of these efforts. From these drawings six boxes have been produced.

In conversation with Peter at the Guildford rally in July 2001, he very kindly gave me permission to pass on any information to others who would like to benefit from his endeavours. My sincere thanks go to Peter and the Frimley Lodge M.R.S.

Advantages of the Frimley System

Several quite distinct advantages accrue from the use of the 'Frimley Box'; it:

1: is simple to make and maintain,
2: uses easily obtainable parts,
3: produces, and holds a reliable source of high vacuum,
4: provides an adjustable level of vacuum,
5: permits the battery to be re-charged without removal from the box,
6: can be used as a portable 12 volt supply for steam raising duties,
7: is ideal for isolating leakage points in the pipework.

This last is achieved by first isolating the faulty carriage then, by elimination, isolating the leaky joint — quite simple using the generator, but almost impossible without.

Using the system at Guildford

A few notes on how the Guildford passenger trolleys have been set up may not come amiss. The diagram (**fig 1**) shows that when a locomotive has no ejector or means of producing its own vacuum, we fit the generator to the rear of the last carriage in the train. The guard has a 'Brakes On/Off' valve for use in the event of an emergency. The driver is also provided with a brake valve to give control of train braking.

In the event that the locomotive does have its own means of producing vacuum, then the vacuum generator is left *in situ* but is left switched off. The locomotive ejector pipe is coupled into the system via a T-piece at the front of the train leaving the driver in full control of braking but still allowing the guard to operate the brakes in an emergency.

In practice, it has been found that when using only the vacuum generator, the far rear end of the train line must be plugged off completely because the vacuum switch inside the box takes care of things, but when using steam produced (locomotive) vacuum, the train line must be terminated using a vacuum limit valve. This must be as far distant from the source of vacuum generation as possible.

The assembly diagram (**fig 2**) shows all the parts within the box together with the associated wiring and pipework.

The Parts List is self-explanatory. Many of the parts were obtained from Radiospares Ltd. although the smaller more common parts may be obtained from your local electronics store such as Maplin or Tandy. The Radiospares vacuum switch is recommended however, since it can be adjusted for level of vacuum. It should be situated in the box for easy removal for adjustment.

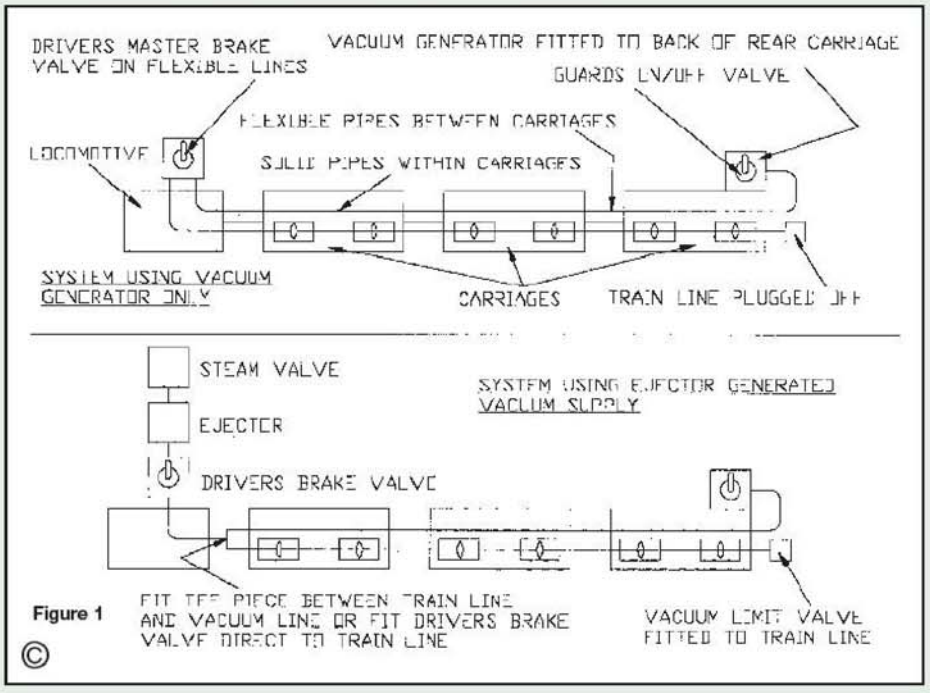


Figure 1

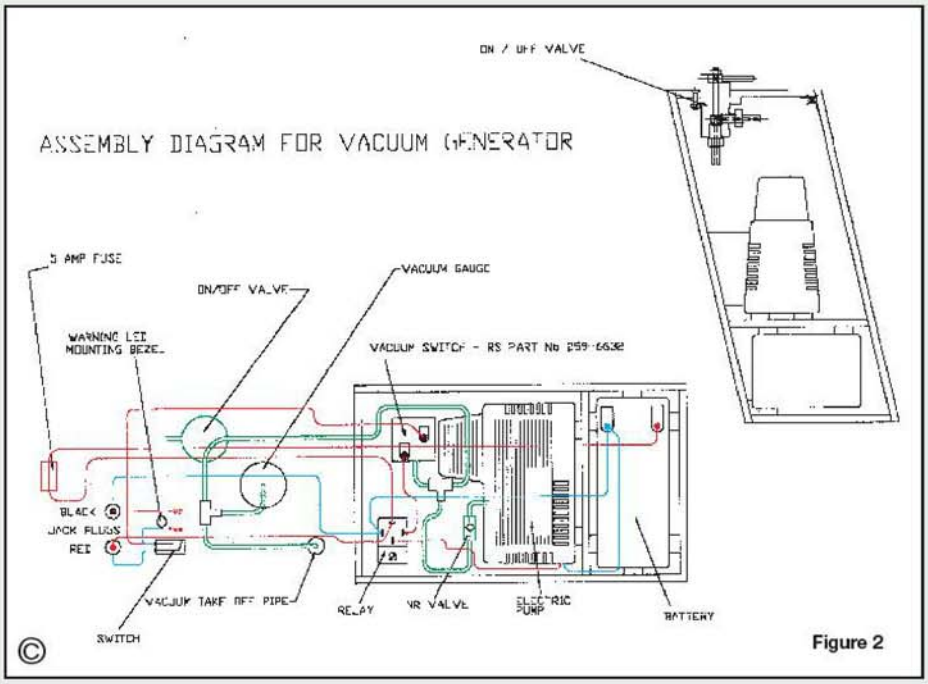


Figure 2

Inside one of the Guildford MES vacuum boxes. This view reveals the battery, pump, valve and pipe work. Individual components can be identified by reference to the drawing (left).

At Guildford we set the vacuum cut-off to a maximum. Although the Radiospares silicone tubing is expensive we have found no better alternative. It is soft and pliable and will fit over solid copper or brass tubing from 3/16 to 1/4in. dia. without trouble and is long lasting. The clear neoprene tube available from DIY stores tends to harden with age and is not user-friendly when it comes to the firm fit required over solid tubes which may vary slightly in diameter. Almost any available vacuum gauge can be used.

The 12 volt car tyre pump was bought from a local motor accessories store. Of Chinese origin its appearance is similar to the one shown in the drawing and the accompanying photograph. A number of such pumps are available which will suit the purpose.

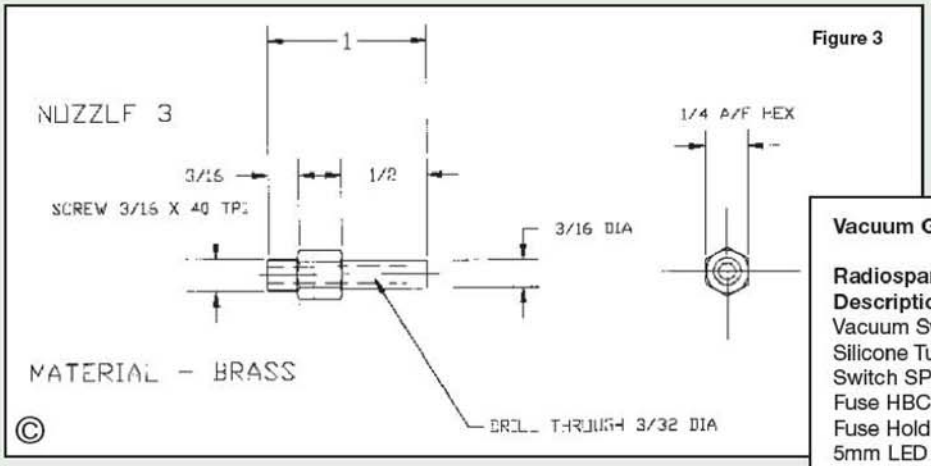


Figure 3

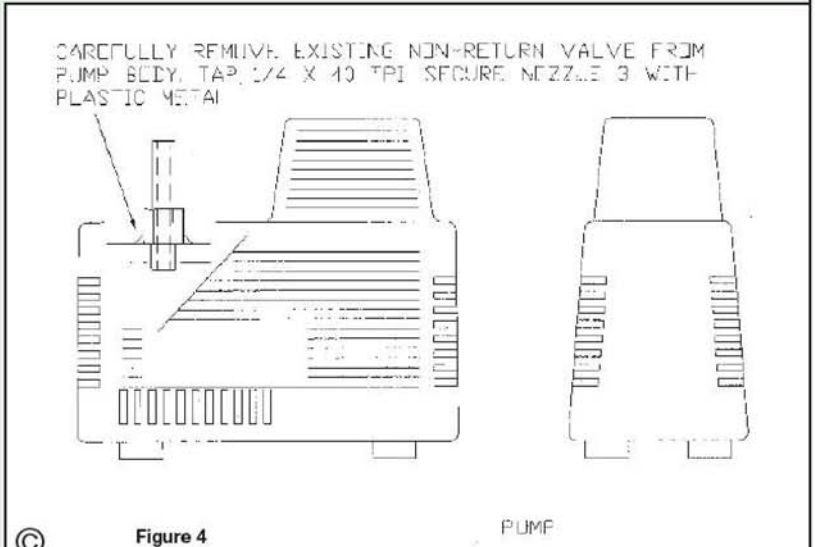


Figure 4

The pump is converted from 'blow' to 'suck' by removing the motor/pump unit from its plastic casing and carefully drilling out the existing reed valve and its accompanying outlet pressure pipe. The drilled hole is then opened up, tapped 1/4in. x 40tpi and the brass stem (nozzle 3) fitted. It is best sealed in place with plastic metal. The pump is fixed securely inside the box with a simple metal bracket. The relay is a standard unit, again from a motor factor. The battery is from Screwfix Ltd.

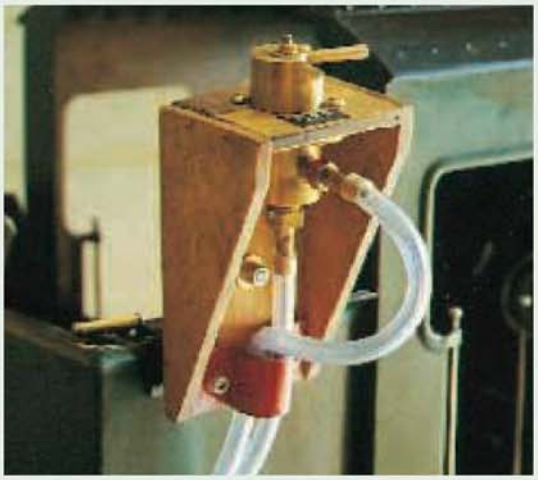
Vacuum Generator - Parts List

Radiospares item Description	Stock Code	No. off per unit
Vacuum Switch 75-270 IN WTR	259-6632	1
Silicone Tube 3.2mm x 3m long	184-5933	1
Switch SPST INS TOG	350-204	1
Fuse HBC Type T 20mm 5A	491-791	1 **
Fuse Holder	268-307	1
5mm LED HE Red 12v	228-5607	2 *
0.2in. LED Clip and ring	589-569	2 **
4mm Terminal Black	423-201	1 *
4mm Terminal Red	423-239	1 *
4mm Plug Black	444-179	1 **
4mm Plug Red	444-208	1 **
0.25in. Blade Receptacle	433-133	20***

Note: items * supplied by RS in packs of 5.
items ** supplied by RS in packs of 10.
items *** supplied by RS in packs of 100.

Other Items:

Vacuum Gauge	1
In-line check valve (fish tank suppliers)	1
12 volt electric car tyre pump	1
Relay	1
Screwfix sealed lead acid battery 12V/7AH Ref no. D7822 (95 high x 150 long x 65mm deep)	1
O-rings ref: 006 1/4in. x 0.07in. section.	2 per on/off valve.
Assorted plywood, hinges, catches, varnish, screws, etc.	



Left: an On/Off switch mounted on a locomotuve for operation by the driver who then has control over train braking.

Right: One of the car tyre pumps used by Guildford MES in their vacuum boxes. Similar examples are available in many car accessory shops; it is wise, however, to check the size of the casing.

The in-line check valves used are the answer to one of our prayers and have been found to be totally reliable in practice, that is assuming no swarf from the drillings in the pump find themselves down the tube. Don't even bother to try to make these valves. Go to your local pet shop and buy the check valves supplied for small fish tanks and aquariums. They cost the grand sum of £1.99 each!

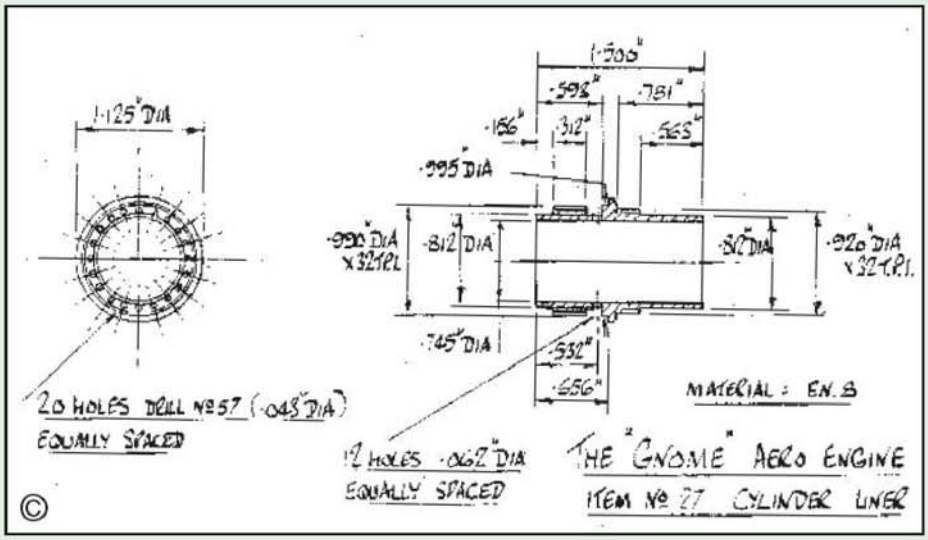
●*To be continued.*

BUILDING A 1:5 SCALE GNOME ROTARY ENGINE

Rowland Lowe

makes a start on the cylinder liners and cylinder heads for this popular aero engine.

●*Part IV continued from page 133 (M.E. 4165, 22 March 2002)*



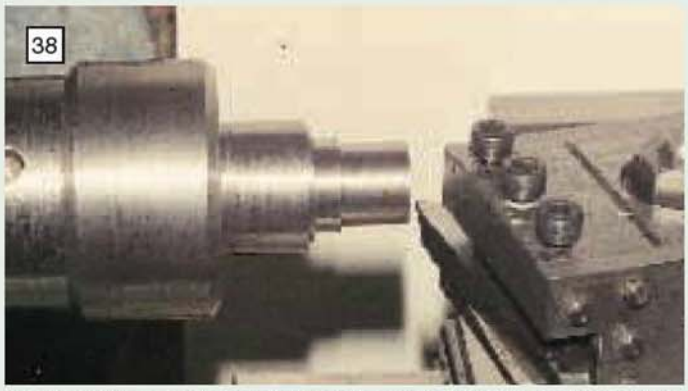
Photograph 37 shows my own set-up for machining the lower portion of the cylinders. The main tool post carries a knife tool, preliminary drilling of the bore is done from the tailstock, and a home-made two-way indexing rear tool post carries a thread cutting tool and a parting tool ground to the correct width for the groove housing the twelve transfer port holes.

The first stage in making the cylinder liners is to cut blanks from EN8 steel bar a little over $1\frac{1}{2}$in. long and face both ends.

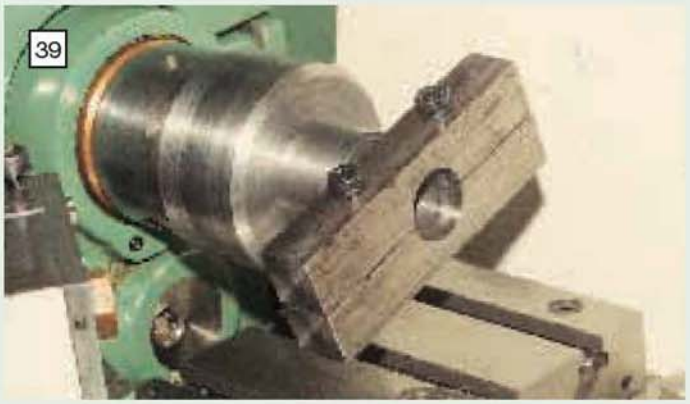
The next stage is shown in **photo 38**; the cylinder is held in a slave chuck made to the same dimensions as the cylinder mountings in the crankcase. If carefully made, such a chuck grips with a high degree of repeatability and can also be used as a thread gauge to ensure the components are interchangeable. The thread on the major diameter cannot safely be cut under power without special equipment; I advise the use a mandrel handle. The threading tool is also used to chamfer the cylinder liner base flange.

Machining will soon thin down the cylinder walls, and should a workpiece become tight in

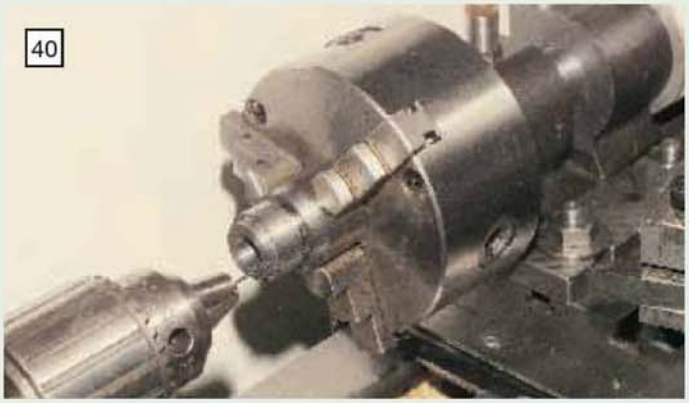
The lower part of the cylinder liners is machined using a knife tool in the main (front) tool post, a screwcutting tool and a parting-off tool in the indexing rear tool post and a drill in the tailstock.



The top outer part of the cylinder liners was turned with the workpiece held in a master and slave chuck. This technique ensures both concentricity and repeatability between components.



The cylinder removal device, designed to assist with the removal of tight cylinders from the master and slave chuck.

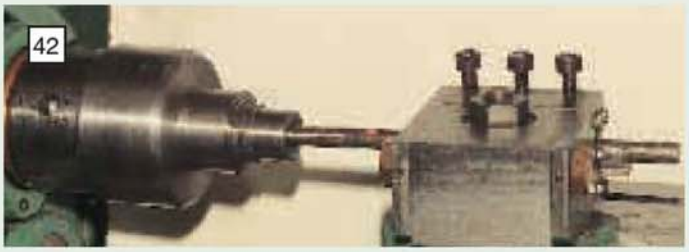


Drilling the vertical transfer ports from the headstock, with the workpiece held in the dividing head mounted on the lathe cross-slide

Left: drilling the horizontal transfer ports in the cylinder liners.

Above right: the cylinders were bored to leave 0.001in. stock on diameter for honing to a finish.

Below right: honing the cylinder bores to size and finish using a hone from Bruce Engineering.



the chuck, attempts at its removal may cause distortion. To avoid this, make the clamp shown in **photo 39**; the construction is apparent from the photograph. The two pieces are held in the 4-jaw chuck with the hole centre running truly and a sheet of writing paper between them. Drill and bore to a push fit on the cylinder. When the paper is removed, slight tightening of the bolts provides a secure grip.

Photograph 40 shows the vertical transfer ports being drilled. Set-up the dividing head between centres and mount the workpiece on the spindle. The cross-slide is traversed into position and twenty No. 52 holes drilled using the highest lathe speed available. Rotate the base of the dividing head through 90deg. and drill the twelve horizontal ports (**photo 41**).

To bore the cylinders, each is held in the slave chuck copy of the cylinder seat. I found that EN8 laps out slowly, so first bore all cylinders undersize, hone the boring tool and take fine finishing cuts over all cylinders to within about 0.001in. of finished size; a good finish is important. **Photographs 42** and **43** show the boring and honing operations, the latter using with a Bruce Engineering cylinder hone (usual disclaimer). Note the protection for the lathe bed. Check each bore with a simple bore gauge.

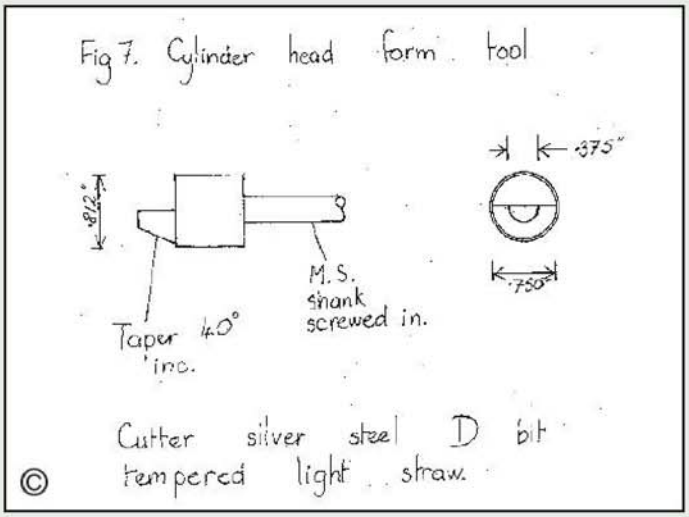
Cylinder heads

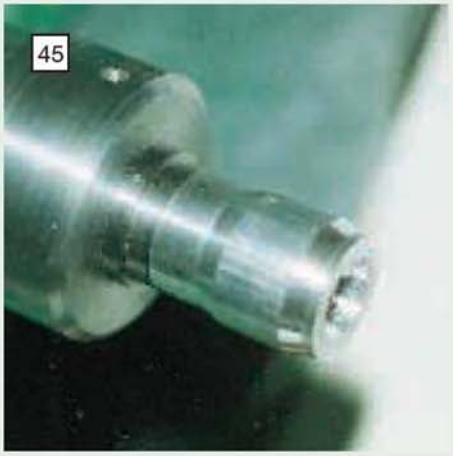
These are easily made from aluminium alloy. Saw off pieces and face them to length. Chuck truly — I used a slave chuck (**photo 44**) — drill and bore the lower part of the interior as far as the tapered portion, and shape the lower outside profile as shown. The inside can be screwcut by using a mandrel handle, but an invaluable device is an automatic leadscrew release that allows screwcutting to be completed under power employing a reliable clasp-nut release. My own lathe is fitted with a simple form of this device which involves no dismantling or modification of the lathe and is easily disengaged.

The tapered part of the interior is cut by means of a form tool made from silver- or other direct hardening steel; I have some lorry half-shaft material that is ideal. The tool is drawn out in **fig 7**.

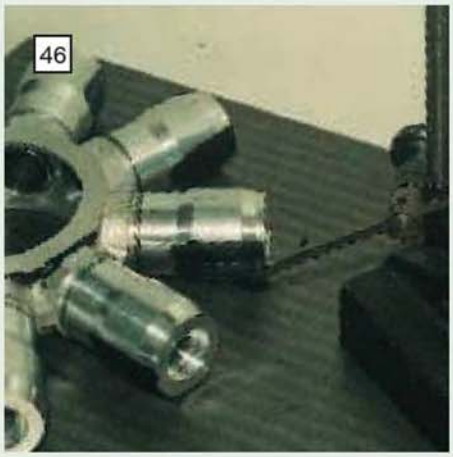
Prepare a slave chuck onto which the cylinder head blanks can be screwed. This is a copy of the cylinder above the mounting flange, but not bored. The top portion of the head is mounted on ▶

The first stage in machining the cylinder heads, once more using the master and slave chuck.



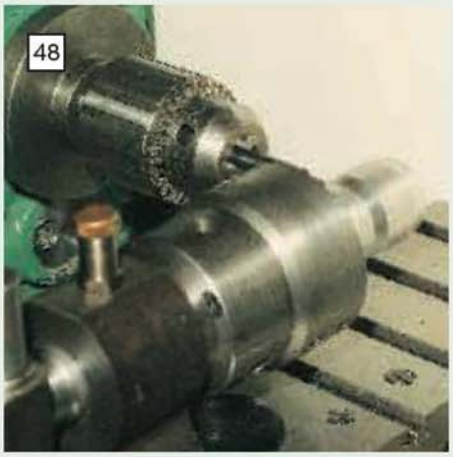


Stage two in machining the cylinder heads; here the outside profile is receiving attention.

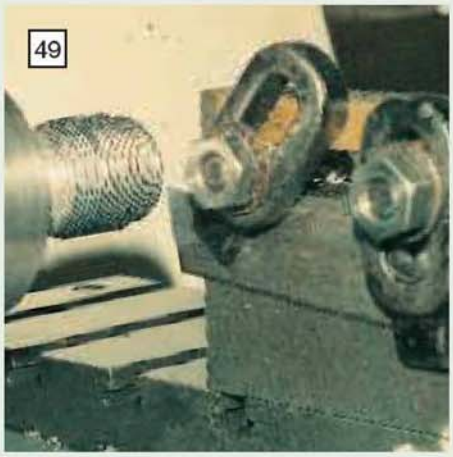


Marking out the sparking plug positions, stage one: using a surface gauge and surface plate.

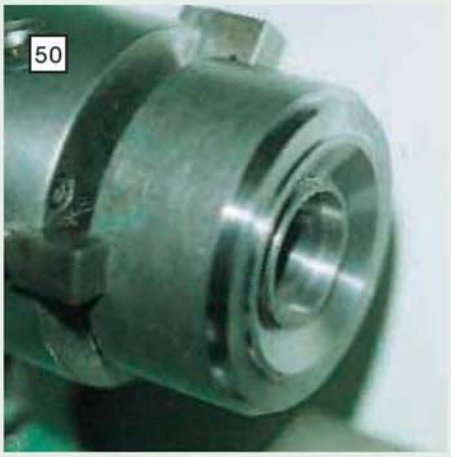
The second stage of marking out for the sparking plug locations.



With the worpiece held in the dividing head and milled from the lathe spindle, the sparking olug recesses are machined.



The cylinder head fins were machined using a tool ground up from an old hacksaw blade and secured to an angle plate.

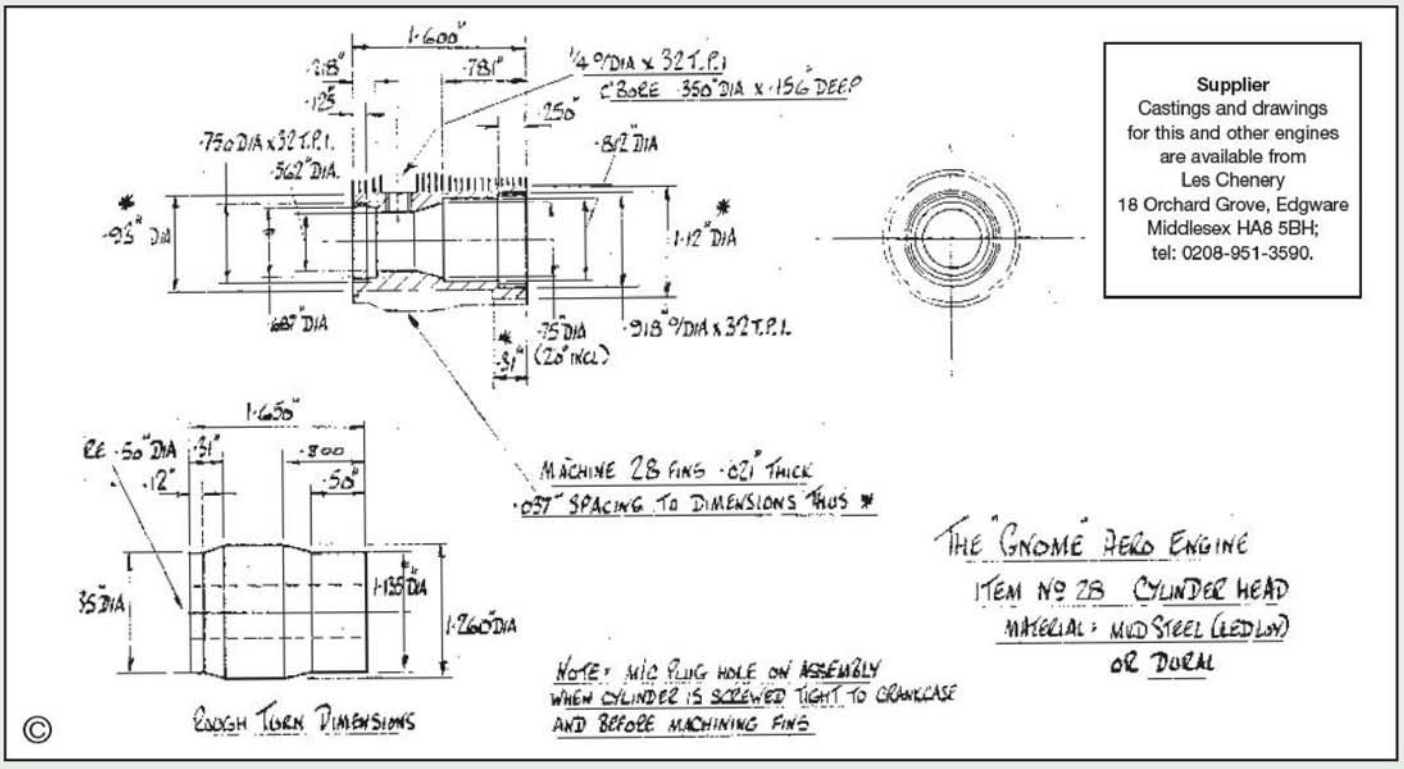


Rear ball bearing housing in the crankcase face beng machined with the workpiece gripped in a 4-jaw chuck.

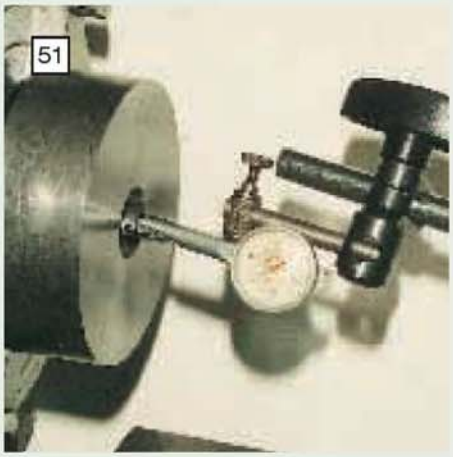
the chuck and counterbored, screwcut, and the outside turned (**photo 45**).

The next step is to mark the sparking plug positions. As each cylinder head screws on to its own cylinder, the position of the sparking plug will depend on where the cylinder head stops against the cylinder base flange. This must be kept in mind from now on, and each cylinder and its associated head must be kept to the same numbered cylinder seating on the crankcase. I kept a board with pegs numbered 1, 2, 3, 4, 5, 6, 7, 8 and 0 to match the crankcase numbers.

To mark the sparking plug positions, assemble the cylinders and cylinder heads on the crankcase and lay the assembly on a surface plate or the



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.



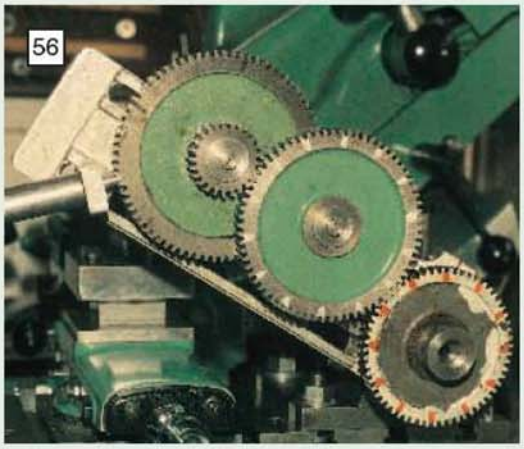
Setting up the rear ball race housing for preliminary boring of the outer bearing recess.

Rear ball race housing mandrel for use when finishing the rotating parts.

Rear ball race housing with all turning work completed

Marking the Top Dead Centre positions on the rear ball race housing.

A spindle mounted cutter was used to cut the keyway in the rear ball race housing.

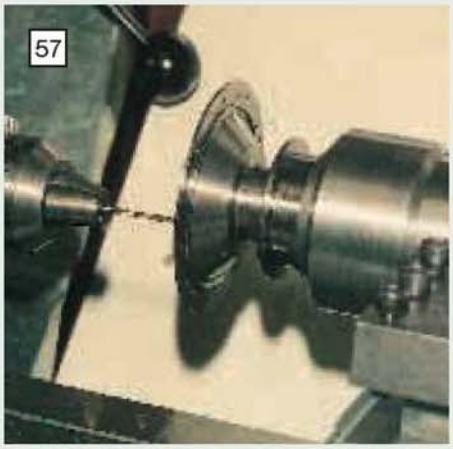


The Sparey dividing head set up for driling the mounting studs in the rear bearing housing.

lathe bed (**photo 46**). Set the height gauge to the cylinder centre height and scribe a line along the axis of the work as shown.

Next, set the height gauge to 13/32in. and mark at right angles to the previous lines, with the cylinder head standing on its head end (**photo 47**). A most important point is that the sparking plug position determines which side of the crankcase is to the front of the engine. The sparking plugs are on the leading side as the engine rotates; note the front and rear carefully.

When all the positions are marked, each sparking plug recess is drilled, counterbored and tapped (**photo 48**), remembering to counter the drilling thrust by pressure from the tailstock. A very good method for making the counterbore required can be found in *M.E.* 3953, 17 September 1993, page 333.



Care is necessary when drilling the mounting stud holes in the now delicate rear bearing housing.

The last stage on the cylinder heads is to cut the fins. I did not feel confident of my ability to grind a suitable tool off-hand, but sorted through old saw blades until I found a piece of suitable thickness. The teeth were ground off, and clearance ground on the front and top. The tool was clamped to an angle plate (**photo 49**) and worked well.

As was pointed out earlier, in this engine everything revolves round the crankshaft, and in order to maintain true running from this stage, when possible the main rotating parts are finish machined in their assembled positions, with the lathe axis in line with the crankshaft axis. By this means any errors that may creep in are corrected as each part is assembled. In order to maintain this accuracy, each part must be consistently assembled in the same relationship to its predecessor, and for this reason top dead centre (TDC) is marked on each part during preliminary machining, and these marks are then kept in line in all subsequent assemblies.

Rear ball bearing housing

A steel blank is faced off at each end. At one setting, the mounting face to the crankcase, the inner bearing housing and the bore between the housings are machined to size. The bearing should be a push fit in its recess. Take special care with this fit — it can be a little easier and secured with Loctite bearing fit on final assembly. The result is shown in **photo 50**.

Next reverse the blank and set to run true in the 4-jaw chuck (**photo 51**). Machine the bearing recess to depth but leave the diameter a few thou. undersize for finishing.

Now prepare the most important mandrel so far (**photo 52**). This could be mounted to run true in a 4-jaw chuck, or by using the 'No. 1 jaw' method in the 3-jaw chuck. I much prefer the master and slave set-up, not only for accuracy but also for reliable repeat setting. The mandrel is a light press fit in the bore between the bearing seats, with a drawbolt and washer to draw the workpiece truly onto the mandrel. The rear shoulder on the mandrel fits the bearing housing recess.

Set up the housing on the mandrel with the inner bearing recess fully bedded down next to the headstock. The workpiece will now run true to the required axis.

Now finish the second bearing housing to final diameter. When this has been done, finish-turn the outside. **Photograph 53** shows this stage complete, including the screw thread in the outer bearing seat.

The housing is now set up on the dividing head spindle mounted on the cross-slide, and TDC marked as in **photo 54**. Also mark the edge of the flange to ensure visibility on assembly.

This done, the keyway is milled (**photo 55**), remembering to give tailstock support against cutting forces.

The holes for the mounting studs now have to be drilled. The dividing head can be set-up to give 2deg. spacing, which is sufficient. **Photograph 56** shows the set-up, which is: 1st stud driver 75t, driven 25t, 2nd stud 70t, 3rd stud 60t. Each tooth advanced on the 75t driver gives an interval of 2 degrees. **Photograph 57** shows the drilling in progress.

●*To be continued.*

BUILDING A MINIATURE UNIVERSAL LATHE

Colin Barter

describes a capstan slide for his remarkable little lathe.

●*Part V continued from page 143 (M.E. 4165, 22 March 2001)*

At the time I was constructing the compound slide rest, I began to scheme out a capstan slide for the little lathe (**fig 12**). With six tool positions, it was intended for the production of small screws, etc. from small diameter rod to a possible maximum of 5/16in. diameter. Some work I had done on small tool systems on my 3in. lathe had shown that, apart from being fiddly to set up, they were quite successful.

I decided that the capstan would be lever operated and that a tool travel of 2in. would be ample. To ensure that the capstan slide was always well guided, the slideways would be 4in. long. I set out the slideways and capstan head on paper to determine the principal dimensions of the slides. To obtain adequate support for the tails of the tools, the capstan head could not be less than about 2in. diameter. With only 1 1/4in. centre height, and the top surface of the cross-slide 7/16in. above the lathe bed, only 13/16in. was available for the capstan head and its associated slide. The capstan head had to be tilted forward slightly (approximately 6 1/2deg.) so that the tools cleared the rear of the slide and the operating lever as the head rotated. The capstan slide also had to clear the cross-slide.

Construction of the capstan slide

I had a block of mild steel suitable for the base slide and which fitted the lathe bed, but it wasn't deep enough, so an intermediate plate was required. I had a piece of higher grade and harder steel on which I could machine vee ways on both faces to fit a vee way on the top of the base slide and the vee way on the underside of the capstan slide. This harder steel would work much better with mild steel and I could make the capstan slide in mild steel. This was made from a piece of 2 x 5/8in. steel bar.

The base slide was machined from a piece of 1 x 1 1/2in. mild steel bar, all the machining being done on my 5in. stroke shaper. In addition to the necessary machining, metal was also machined away to reduce the weight of the base slide. The slide straddles the bed and adjustment for fit is obtained by a long, axially adjusted gib strip. This takes care of the sideways fit; for the bottom/top clearance, the fit of the slide bottom plate is adjusted to give the required closeness of fit.

The clamp for the base slide is arranged in this bottom plate. A horizontal screw with a knurled knob has a wedge shaped nose which forces a small matching wedge shaped clamp plate against the underside of the lathe bed. The slide ways for the intermediate plate and the capstan slide are 3/16in. deep with 60deg. vee angles and are fitted with long tapered gib strips (**photo 14**).

The next interesting (or hazardous) operation was the machining of the angled top to the capstan slide. I found that I could mount it at about the correct angle in the 4-jaw chuck with the centre of the capstan pivot pin correctly located. The angled face was carefully machined and the hole for the pivot pin bored and screwcut 9/16in. x 26 threads per inch. A pin was turned and left oversize with the thread cut in the lathe to a close fit in the capstan slide.

This pin was made with an extension on the threaded side so that when screwed home into the slide, the projection at the back would allow the slide to be held in the 4-jaw chuck for final facing of the angled surface and turning the pin to size. This was necessary to ensure that the pin was truly at right angles to the adjacent surface, and also to allow the machining of the edge of a cover plate which projects into the space below the capstan.

The capstan turret was then turned and bored for the indexing ring, the pivot pin and space for the indexing mechanism. The index ring was made from a high carbon steel (a piece of an old file) and six pins machined from the solid on one face using a simple indexing system mounted on the vertical slide. It was made a light press fit in the turret, hardened and tempered and secured in place with three screws. The tapered outer turret diameter was turned with the head mounted on a close fitting mandrel machined in place on the 3in. lathe. Machining of the tool mounting holes was left until the slide was completed and fully assembled on the little lathe.

Turret indexing and locking

Before I could proceed further with any machining I had to finalise the capstan turret indexing and locking system. The indexing system had to rotate the turret accurately to its next location and the locking system had to secure the turret until the hand-operated screw was tightened.

The shapes of the components to achieve these motions, together with the slots and holes, positions of stops or levers, all had to be schemed out on paper. I had to get it right to avoid ending up with scrapped components or, worse still, a scrapped slide. In fact, before achieving the results I wanted, several small items had to be remade. A plate protects the components located inside the capstan slide. The forward edge of this plate projects under the rear edge of the capstan turret and this has to be machined to match the slope of the turret seating. The milling of

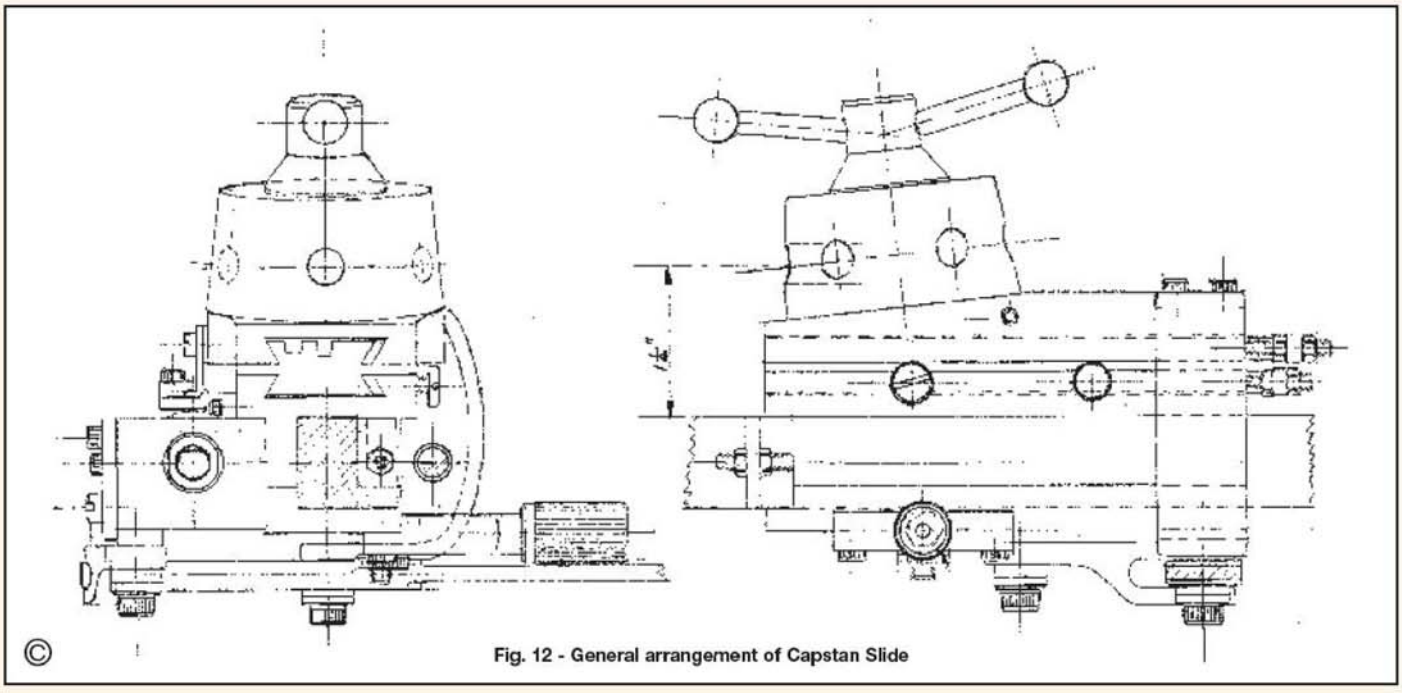
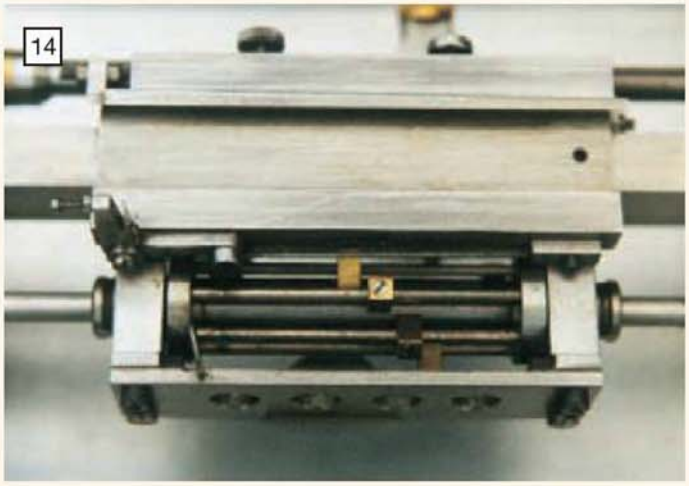


Fig. 12 - General arrangement of Capstan Slide



Capstan base slide showing the long tapered gib strip and the rotating stop bar assembly with adjustable stops.

Turret slide with turret removed; the end of the intermediate slide and gib strip is visible at the right hand side. On the top of the slide is the cover plate over the turret indexing mechanism.

the recess for the cover plate and fitting the plate was carried out before the final machining of the turret seating, associated pivot pin and the various slots and recesses.

With the plate fitted, the pivot pin was screwed into place and the seating and pin diameter finished to size. This is where the extension of the pivot pin at the back or underside of the slide proved its worth. With this work completed the now redundant extension was cut off.

The capstan turret could now be mounted in place, the outline of the turret was marked on the slide and, similarly the outline of the intermediate slide was marked on the underside. The surplus metal was sawn away and the outline filed to shape, care being taken in the final stages to keep the edges flat and square with smooth curves where necessary and to match the edge of the intermediate slide plate and the cylindrical surface of the capstan turret (**photo 15**).

Capstan turret indexing system

The capstan indexing system comprises a thin flexible finger to rotate the head, and a locking plate that locks the head once it has been rotated to its next position. The tilting of the head on the slide has the advantage that it allows the indexing finger and the locking plate to pass under the rear raised edge of the capstan head.

One of the difficulties I had to overcome was how to achieve the auto-rotation of the capstan head when the slide was drawn back to its rearward position. Usually in mechanisms that are required to lock or allow a further operation to commence, the slide or moving part strikes a pin or latch. In my small slides with such limited space it took me a little time to devise a solution. I decided that if I machined slots in the top of the intermediate plate, pins or levers mounted in the capstan slide could project into the grooves and strike or ride over ramps or pins located in the slots to achieve an operation at the correct position of the slide as it moved forwards or backwards.

The capstan head indexing could now be resolved. The indexing finger has a spur at its rear end which passes through an elongated hole in the capstan slide into a slot in the intermediate plate. When the slide is moved back, the spur comes against a stop in the slot, arresting its backward movement. The slide continues to move backwards bringing the indexing pins into contact with the finger which, pushing on a pin, rotates the head to the next position. All it required was care in getting the finger piece to the right length and setting the stop in the right place (**photos 16** and **17**).

Once the head has been indexed to its next position, it has to be accurately locked until the hand screw is tightened. My first arrangement was a plate moving in a close fitting slot with a notch in its end to trap the index pin. However, clearance in this slot allowed a slight rotation of the turret. The index pins are at a radius of 0.375in. and a tool point could be at a radius of 2 inches. Thus, if there was a 0.001in. clearance in the slot, the tool tip could move about 0.0055in. which would not be acceptable for some situations.

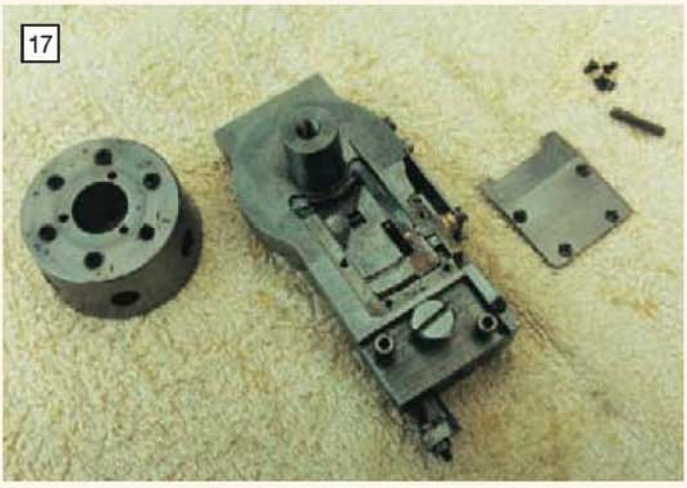
Looking at the locking plate I realised that if I cut it into two parts at an angle of 45deg., the spring loaded half would push the other part with its notch into contact with the index pin and, at the same time, the 45deg. angled edges would push the plates into close contact with the edges of the slot. There would be no clearance and hence no incidental movement. All I needed was a means to withdraw the locking plate at the right slide position.

This was achieved by means of a small lever working in a hole in the capstan slide with its end protruding into a slot in the intermediate plate. As the slide moves rearwards, the end of the lever rides over a ramp positioned in the slot and pulls the spring loaded half of the locking plate clear of its mating half. At the same time, the flexible finger, operating via the adjacent slot, indexes the capstan head to its next position, the rotating pins pushing the now unlocked part of the locking plate clear.

With indexing complete the slide is moved forwards and the locking lever clears the ramp allowing the locking plate to return to the locked position. The locking plate and indexing finger are concealed in cavities machined in the top of the capstan slide and covered with the previously mentioned cover plate.

●*To be continued.*

The turret slide and a view of the underside of the turret showing the indexing ring and tool clamps.



The turret indexing and locking mechanism is concealed beneath a cover plate. The small tappet which is pushed out to engage the stop bar operating lever can be seen on the right hand side.

B. Feaver's 4in. scale Ruston Proctor steam tractor passes interested spectators.

The Hutsons, S and J, entered a 2in. scale Clayton steam wagon and a 2in. scale Fowler traction engine. In the parade, and with its 'phantom driver', the tractor towed the wagon.

MODEL STEAM WEEKEND AT AMBERLEY

Ann Hatherill
enjoyed another successful two-day event at the working museum in West Sussex.

The weather, unusually fine throughout the weekend of 22 and 23 September, added to the enjoyment of the spectacle of over 70 model steam road vehicles of all types. Entries came from far and wide with Richard Olds from West Cornwall the furthest travelled, as usual.

The engine owners appreciated the use of the museum's internal roadways which included long runs and a hill. No doubt it made a pleasant change from bumpy grassland at rally fields. Each day the engines assembled for a grand parade, the commentary being given by Gordon Hatherill.

After dark on the Saturday evening those staying on site were treated to a ghost train ride on the 2ft. gauge railway. As the train puffed its way through the woods, skeletons and the like provided the appropriate scary effects. The rail group had gone to considerable trouble and had managed to keep their plans secret.

There were some trade stands and model engineering exhibits including aircraft, model boats on a pool, Meccano and toyshop steam. Attendance on the two days was excellent with a total of over 1400 visitors. Those present considered it to be one of the best model steam weekends held at the museum. The event was organised by Derek Kilburn who retired from his post of museum engineer earlier in the year.

The next model steam weekend will be held on 21 and 22 September 2002.

Above: The SM&EE put on a display of stationary engine models in the tram shelter. Roy Darlington's solar powered hot-air engine, seen here benefiting from the sunshine, generated much interest.

Above left: A 1in. scale model of an Avro Lancaster bomber made by John Slade. Radio controlled, the model has four i.c. engines and, at the time of writing is yet to have its test flight.

Left: Mike Hall drives the late Cyril Sweet's Wren locomotive on the 7 1/4in. gauge passenger carrying track.

Mary Crabb driving the 1925 Leyland bus off with a full load of passengers. Sharing the museum roads with over 50 model steam road vehicles requires full concentration!

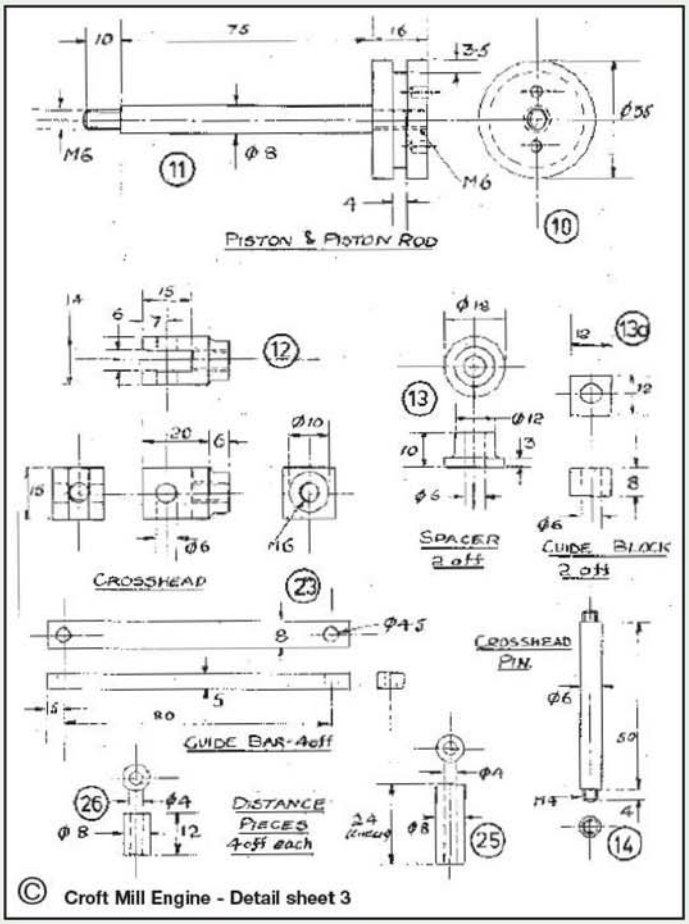
Mary Crabb, the museum's only volunteer lady bus driver starts the 1925 Leyland bus, one of the museum's resident bus fleet.

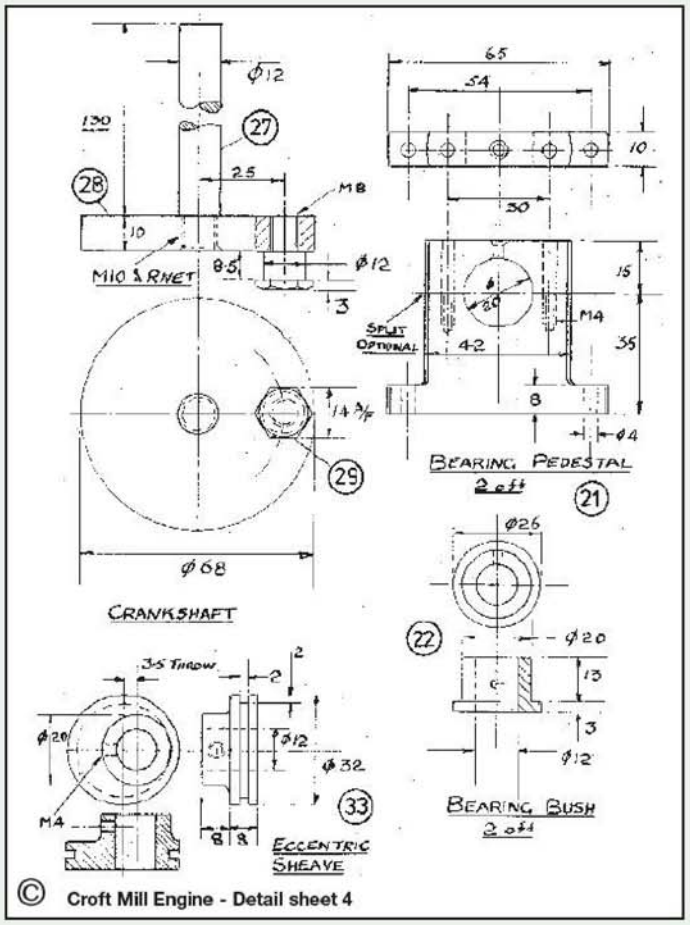
Pat Neilson's 6in. scale American Case traction engine was the largest model at the event. The smokebox door bears the eagle emblem carried by most Case traction engines.

Richard Olds (seated at right) with a friend on his 4in. scale Fowler Showmans road locomotive. This engine is complete with a fairground organ which is not shown here.

D. Davidson driving his Super Sentinel tractor gives a lift to his dog Ben.

Brian Brooks drives his 3in. scale McLaren road locomotive.





THE 'CROFT' MILL ENGINE

John Bertinat
continues work on his school project.

●*Part II continued from page 138*
(M.E. 4165, 22 March 2002)

Piston and piston rod
(Parts 10 & 11, Detail Sheet 3)

In the absence of a casting, the piston is conveniently turned on the end of a length of brass rod, the outer diameter being left 0.5-1mm oversize to allow for final turning on the rod. If facilities exist, the threads on the rod should preferably be screwcut to ensure that they are truly axial. The fit of the piston on the rod should be on the tight side since this is intended to be a permanent attachment and may be assisted by Loctite if necessary.

Normal erection and dismantling is from the crosshead end and will be facilitated if two blind holes are drilled in the top of the piston to accommodate a pin key. To ensure concentricity of piston and rod, the final skimming of the piston to fit the cylinder may be undertaken with the rod held in a 4-jaw chuck in which the rod is set running truly by means of a dial test indicator. A close sliding fit of the piston in the cylinder should be aimed at. With the aluminium alloy cylinder and brass piston, no expansion clearance is necessary since the thermal expansion rates for the two materials do not differ greatly.

Crosshead assembly
(Parts 12, 13, 13a & 14, Detail Sheet 3)

This assembly comprises a forked crosshead, two spacers, two guide blocks and the crosshead pin. The crosshead fork is conveniently formed on the end of a piece of bar material which could be made 15mm square if the length of each spacer is reduced by 0.5mm. A 6mm dia. cross hole is first drilled and preferably reamed at 7mm from the end of the previously faced bar.

To cut the fork opening, I normally grip the bar at centre height in the lathe tool post and use a slitting cutter of appropriate width mounted on an arbor between lathe centres. To relieve the load on the milling cutter, I usually pre-drill at the bottom of the fork opening and then saw out the bulk of the material, leaving the milling cutter to clean up to size only. The embryo crosshead may then be sawn from the bar and re-mounted in a 4-jaw chuck for finishing. The remainder of the crosshead components are simple machining jobs and should require no special comment.

Guide bar assembly
(Parts 23, 25 & 26, Detail Sheet 3)

The four guide bars are shown as being made from 5 x 8mm material (approx. 3/16 x 5/16in.), this being the most reasonable size for appearance and function, but slight variations are acceptable, according to available material. Any variations will necessitate adjustments to the dimensions of adjacent parts. The fixing holes are drilled 4.5mm for 4mm studs to provide a small degree of adjustment.

The distance pieces (26) should be made a shade over their 12mm nominal length, to provide an easy sliding fit for the guide blocks (13a). The longer distance pieces (25) are best left until the cylinder and guides can be erected on the bedplate so that their actual lengths may be checked. The guide bar assembly is attached to the bedplate by four M4 studs whose length (nominally 5.4mm) can be determined at the erection stage.

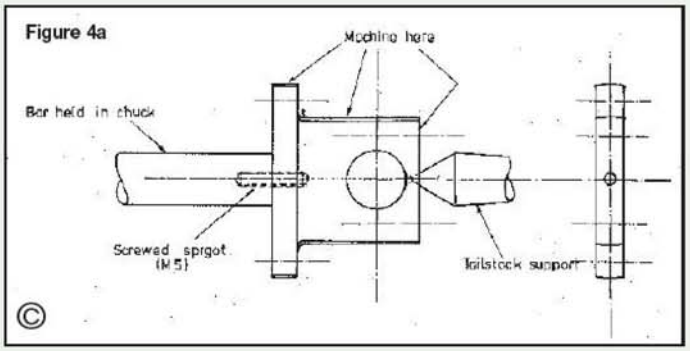
Crankshaft assembly
(Parts 27, 28 & 29, Detail Sheet 4)

If a sufficiently straight piece of 12mm dia. bright mild steel is available, this could be used for the crankshaft as a simple alternative to either the use of precision ground rod or turning the shaft between centres from larger diameter stock. The drawing shows a threaded connection between the crankshaft and the crank disc, but this could be replaced by a press fit if desired. If the threaded connection is adopted, some form of locking is necessary, either by riveting over as shown on the drawing or by the use of Loctite.

The disc (28) may be cut from 10mm thick plate, sawn and filed roughly to shape and finish turned after assembly with the shaft. Care should be taken to ensure that the tapped hole to receive the crankpin is square with the disc. The crankpin (29), which is made detachable to avoid having to use a split big end on the connecting rod, is turned from appropriate hexagon stock, again taking pains to ensure an accurate and close fitting thread. This thread should be undercut at the shoulder to ensure that the crankpin tightens up squarely against the crank disc.

Bearing pedestal and bush
(Parts 21 & 22, Detail Sheet 4)

The pedestal could be cut from 10mm thick steel or alloy plate, but in the present case a simple aluminium alloy casting was supplied. The drawing



shows the pedestal split for the bearing bush, but construction was simplified by omitting this feature and employing a bearing bush with a single flange pressed into the housing. Thus the only essential machining on the pedestal is the boring for the bearing bush and the facing and drilling of the base.

The bearing centre is marked out on the face of the casting, leaving an allowance for subsequent machining of the base, and the work is then mounted in a 4-jaw chuck with the marked centre running truly and the work protruding sufficiently from the chuck to enable the face of the casting to be cleaned up; this face will act as a datum for subsequent operations. The hole for the bearing bush is now drilled, bored and reamed, after which the casting is transferred to an angle plate/faceplate set up for machining the base to dimensions and, if desired, cleaning up the top edge of the bearing.

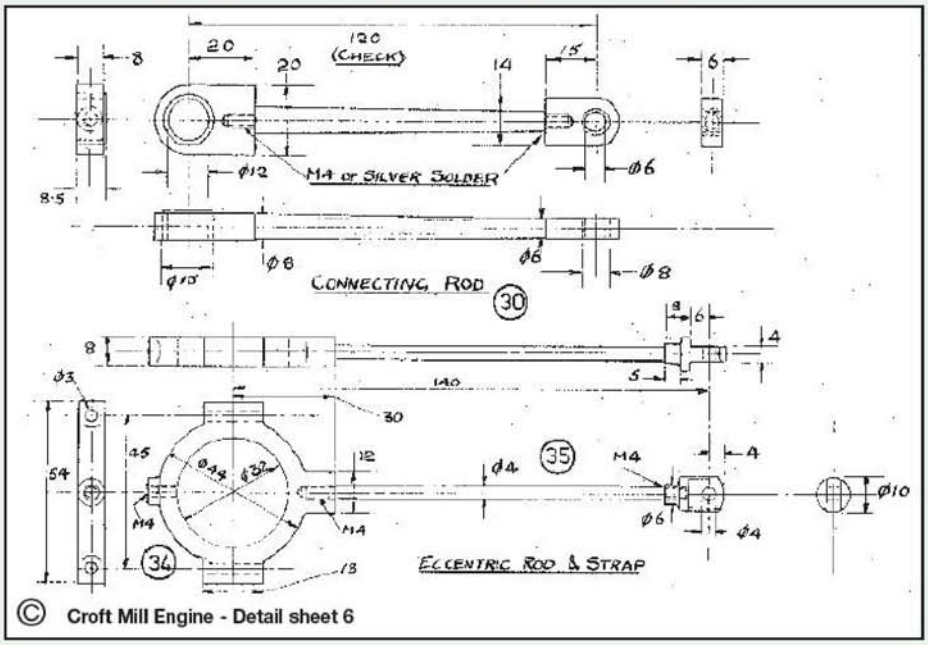
If this component is cut from the solid, some further machining of the sides of the work is desirable, and the curved profile shown on the drawing may be obtained by mounting the work on a spigot screwed into a tapped hole in its base and mounted in a 3-jaw chuck as shown in **fig 4a**.

The bushes (22) may be turned from brass rod and, after pressing into their housings, an oil hole is drilled 1.5mm and countersunk.

Eccentric sheave
(Part 33, Detail Sheet 4)

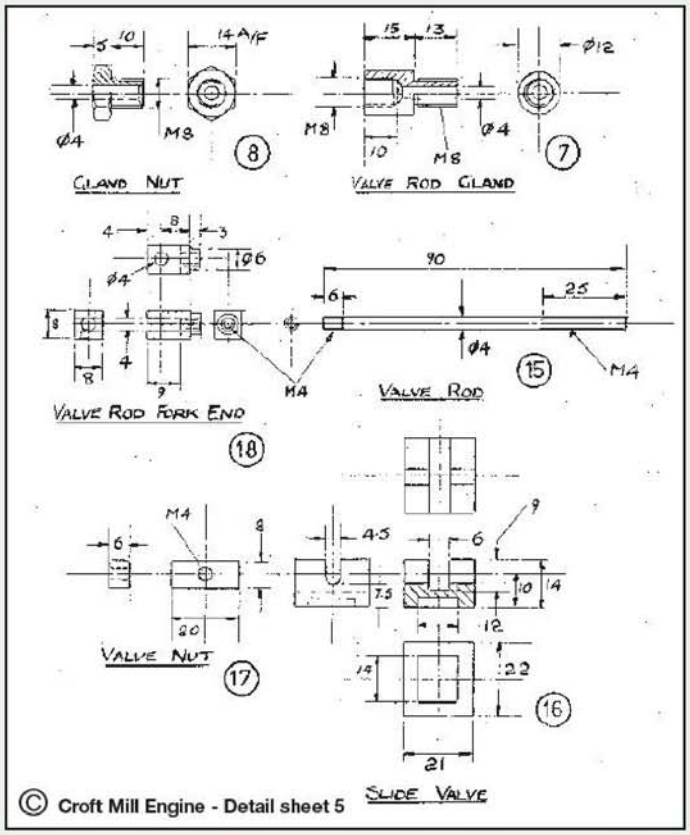
In this simplified form of eccentric, the strap is located laterally by means of a shouldered screw, the end of which locates in a groove in the sheave; this construction eliminates the necessity for splitting the strap. The sheave is most readily turned from, say 35mm dia. bar of length sufficient for the sheave plus a chucking piece. This chucking piece is turned to about 25mm. dia., and finished with a sharp shoulder to provide a positive location for future operations.

The work may then be mounted by this chucking piece in a 3-jaw chuck for turning the sheave and cutting the groove in the portion of the blank nearest the chuck, i.e. with the material for the boss outboard of the chuck. The work may then be transferred to a 4-jaw chuck, held by the chucking piece at the required eccentricity (3.5mm) and the boss turned, drilled and reamed 12mm dia. The chucking piece is then removed and the rear face of the sheave cleaned up.



Valve chest components
(Detail Sheet 5)

These comprise the valve rod and its gland, together with the slide valve itself. In the absence of a casting, this valve (16) is conveniently made from a block of brass finished at 21 x 22 x 14mm; of these three dimensions the 21mm length is the most important since it controls the steam supply to the cylinder and is allied to the 18mm overall length of the port system (see Detail Sheet 1). These dimensions provide a steam lap of $^1/_2$ (21 - 18) = 1.5mm, and if the overall length of the ports differs appreciably from 18mm, the valve length should preferably be adjusted to maintain the 1.5mm overhang or steam lap.



The exhaust cavity in the valve may be produced by end milling which of course will produce rounded corners to the cavity instead of the square corners shown on the drawing and which could be obtained if a casting were available for the valve. The transverse slot in the back of the valve is to accommodate the driving nut (17) which latter should be an easy fit in this slot. It is essential that the fit of these components and that of the valve rod in its slot is such that the valve can seat *freely* on the valve face of the cylinder block.

The remaining components on Sheet 5 should require little comment; the valve rod gland and its nut (7 and 8) are plain turning jobs and the valve rod fork end (18) is a smaller version of the main crosshead fork.

Connecting rod
(Part 30, Detail Sheet 6)

This component has been reduced to its simplest form, viz. bushed blocks for the big and little end bearings and a separate rod. The latter is shown tapered, but a further simplification would be to use a plain 6mm dia. rod.

Silver-soldered joints for attaching the big and little ends would be stronger than the screwed connections, the parts then being located by plain 4mm dia. spigots; the fillets of silver-solder produced at the joints would improve the appearance.

Eccentric strap and rod
(Parts 34 & 35, Detail Sheet 6)

The strap (34) could be a simple casting. The drawing shows lugs for a standard split strap, but splitting is not essential with the sheave as designed. Hence the M3 holes for securing the halves of the strap may be likewise dispensed with unless it is desired to add the bolts for appearance. A single M4 screw, with its end reduced to 2mm. dia. to fit the groove in the sheave, provides lateral location.

●*To be continued.*

LETTERS TO A GRANDSON

"... tap at it patiently until it came loose." ***This 1905 Robey engine was one of a pair built for Bass and installed in a maltings in Sleaford, Lincolnshire where it worked until closure in 1959. Now preserved at the Bass Museum in Burton-on-Trent, it is steamed regularly. The Bass Museum is well worth a visit.***

M. J. H. Ellis

suggests that we should 'look before we leap' and be prepared to modify our opinions in the light of personal experience.

●*Part XXXVII continued from page 27 (M.E. 4163, 22 February 2001)*

Dear Adrian, what I am going to tell you may not relate directly to model engineering proper, but I think that it is sufficiently close to the subject to make it worth mentioning. While I was cutting the grass, the engine of the lawn-mower suddenly cut out, suggesting that the sparking plug had become fouled. When I took it out I found that this was indeed the case, so I cleaned and replaced it, fully expecting that no other attention would be needed.

However, the engine still would not start, which caused me to doubt whether my treatment had been effective. It also raised the question of whether two faults had developed at the same time; as a rule very unlikely, apart from the special case in which either a single cause has produced two different effects, or one fault has been the cause of another. But I couldn't see how either of these things could have happened in the present case, and proceeded to check whether the plug was sparking properly.

Taking it out again, I laid it on the engine, which I proceeded to turn over. But the sunlight was so bright that I could not tell whether there was a spark or not, so I did as I would have done in my motorcycling days, caught hold of the lead and tried again. I did not feel the slightest shock, and began to wonder if the magneto was at fault. But why should that have happened? Eventually, the truth became apparent when I tried the plug again, this time holding it, as I thought, in contact with the engine, but in fact with my hand on the engine and a finger touching the lead. Now there was no doubt about it — the magneto was certainly functioning!

The point of the story is this: never had this test ever failed to work in the past, over a period of at least 60 years. But now it had, and the reason could only be that the machine was mounted on solid rubber tyres and I was wearing my steel-toe-cap shoes which have thick rubber soles. In consequence, the machine was so well insulated that there was no return path for the high-tension current, so I felt no shock. Without thinking deeply about it, I had always supposed that the electrical capacity of a human body would be sufficiently great that the flow of current just to charge it up would cause a perceptible shock. But I was wrong, and the moral is, that one ought always to be prepared to abandon a belief, no matter how cherished, when once it had been proved to be false.

The old-fashioned magneto is no longer used for cars and, in my opinion it is a change for the worse, since it was always possible in the good old days to get going, even if the battery had run down. But they are still to be found on stationary engines, and the following piece of Grandpa-lore is worth remembering. It applies to the most common type of magneto, where both the primary and secondary windings are on the rotating armature, which carries the contact-breaker on the non-driving end. The spark is produced when the contact-breaker interrupts the current in the primary winding, which is composed of comparatively few turns of heavy-gauge wire. I have just measured the resistance of such a winding, and it was less than one ohm. As the voltage produced in the secondary when the current in the primary suddenly ceases is in rough proportion to its strength, it follows that the primary circuit must contain no unnecessary resistance, even of the order of an ohm or less.

I discovered 60 years or so ago that it was possible to improve beyond belief the performance of a magneto which produced hardly any spark at all, simply by taking off the contact-breaker assembly, dismantling it, and cleaning it up until it was bright every place where the current passed from one piece of metal to another. This included the two points, the spring and its seatings, and the male and female cones on the rear of the contact-breaker and in the armature end, respectively. (I have forgotten the central bolt which secured the contact-breaker to the end of the armature).

This was no flash-in-the-pan, as I have used the same-treatment on other magnetos since then, and in no instance did it fail to be successful. I was so pleased with my success that I well remember the car concerned; it was a Lea Francis tourer, one of the better and more desirable makes which, alas, have long since been ousted from the market. In the 1930s, they could be bought second-hand and in good order for around £10 or so. Most of them had a right-hand gear lever and hand-brake, which left the deck clear for amorous frolics.

Clearly, this line of reminiscence has gone far enough, I can hear the howls of derision from your dear father. So let us turn to more sober matters, in the form of warnings against lurking dangers which I should have told you about earlier.

A correspondent to *Model Engineer* once related how he had tried to speed up fitting a chuck onto the mandrel of his lathe by starting it on its thread and then setting the lathe in motion. When the time came that he wanted to take the chuck off again, he found that it had jammed itself on so firmly that he simply could not budge it, and was finally obliged to un-bolt the chuck and turn away the back-plate. Even that must have carried an element of risk, in avoiding damage to the mandrel nose. After reflecting on this difficulty, I think that I would have un-bolted the chuck in any case, in order to reduce the moment of inertia of the object to be removed. Then I would have considered how best to hold the mandrel solidly.

Engaging the two pairs of gears comprising the back-gear without releasing the pulley would have been a possibility, but it would have meant risking breaking the teeth of one of the cast-iron gears. It would have made better sense to bore out a block of soft material, aluminium or brass, to take the mandrel by its largest diameter, and slit it in order to hold the mandrel in the vice. I realise that it might have been necessary to take the mandrel out first, in order to measure the appropriate diameter, and then replace it to perform the boring operation, but it would have been worth the trouble. There is a lot to be said for the old Latin tag *festina lente* — make haste slowly.

Once the mandrel was securely in the vice, a couple of bolts and nuts through the holes in the back-plate would have allowed a fair degree of torque to be applied with a bar, coupled with moderate taps from a hammer. The combination of both is often more effective than either alone.

When I was a young fellow at Manchester, there was a chap in the office who had started his career in the Post Office as a telegraphist at Warrington. He related at the tea table that in the hey-day of the cotton mills there were gangs of men who specialised in the dismantling and removal of heavy machinery such as mill engines. What I particularly remember him saying was that when a large nut proved difficult to loosen, a man would tap at it patiently for hours on end if necessary, and although the effect of each individual blow was imperceptible, in the end the nut would come loose.

Furthermore, he said that these gangs were adept at moving heavy machines by very simple means, including levers, wedges, and rollers, or perhaps jacking-up in stages and inserting packing underneath. The mention of 'jacking-up' reminds me of a prize piece of folly on my part, which could easily have resulted in neither you nor your father ever being born at all. I had some work to do under the Sunbeam 14 which was my pride and joy, (Yes, I was sold on classy cars in those days).

Simpleton that I was, I jacked up one hind wheel and took it off. Then I went round, jacked up the other hind wheel, and took that off as well. Then I crawled beneath the car and began, to dismantle the torque-tube from the rear of the gearbox. Only when the car swayed a little above me did I realise the danger in which I had placed myself. The moral of that little story is obvious; use only one jack at a time, and even then, if you are going underneath, supplement it with really solid packing.

Your affectionate Grandpa.

●*To be continued.*

AN ENGINEER'S DAY OUT
THE MUSEUM OF THE GREAT WESTERN RAILWAY

Roger Backhouse
is enthusiastic about his visits to an interactive and lively presentation celebrating a proud heritage.

STEAM: the Museum of the Great Western Railway is very different from traditional museums. Unlike others it sets out to give a strong sight and sound experience of the GWR, and Swindon Works in particular. Exhibits are not simply on show alone, they are made part of recreations of scenes from railway life. Not everyone will like it but the museum is brilliantly set out and a credit to Swindon Borough Council who commissioned it, and the designers who created the displays.

Swindon was intimately connected with the GWR from the foundation of the works here in 1843. It grew to house most of the railway's locomotive, carriage and wagon building, employing thousands of men in hundreds of different trades. With Daniel Gooch as the first works manager, Swindon became one of the first Company towns, and the company was responsible for building hospitals, churches and a Mechanics Institute. The Museum is housed in one of the original 1846 works buildings.

Unlike today's manufacturers who like to outsource as much as possible, the Great Western tried to make everything in-house, even the furniture for its hotels. It developed a large bureaucracy to serve the network. For example, the stores served the whole of the GWR; if a stationmaster wanted a new broom head it had to go back to Swindon for replacement!

Many industrial museums pay little attention to the workers who created and operated their machines. STEAM is different. It displays the human side both through tableaux and by means of video films throughout the Museum. They give an impression of railway life that static exhibits cannot, however well presented. Video interviews with former staff do not pull their punches. One describes his work in the Swindon foundry simply as 'hell' but others praise the comradeship they experienced. A signalman's wife describes how she often took the children out for a walk in the rain in order for her shift working husband to get some sleep.

The museum starts with a spectacular and much photographed scene: a giant picture of a 2-8-0 tank engine being lifted. It then moves on to the first of the tableaux created from one of dozens of extremely life-like figures. This is a workman reprimanded for lateness and looking suitably sheepish. Nearby a typist works in an office. There is information about the stores before a mock-up of a carriage body workshop.

Just around the corner, two women are represented repairing a 42xx 2-8-0 tank engine. Although the works were traditionally all-male, women were later employed in the offices and increasing took lighter jobs such as upholstering.

2-8-0T locomotive No. 4247 nears the completion of its restoration at Swindon Works which is part of the Steam Museum.

Recreation of a scene from WWII with women workers repairing a 42xx 2-8-0 tank engine.

A life-size figure of Isambard Kingdom Brunel stands in the Steam Museum.

A recreation of the carriage building workshop in the Steam Museum.

The Scammell **Scarab** *truck was used by many rail operators in the 1950s.*

A travelling crane on display in the GW Designer Shopping outlet (formerly Swindon Works).

During the World War II more women took on work in machining, stores and repairs. Examples of equipment from the machine shop are displayed.

The GWR was very much Brunel's creation. He has a place of honour in a section about building the railway which also features the replica of the broad gauge locomotive, *North Star.*

The locomotive interest is well displayed. The highlight is arguably *Caerphilly Castle* set over a pit to allow inspection from below. Those who remember the cramped conditions at its former home in the Science Museum will appreciate the generous space in this museum. Not far away is No. 6000 *King George V* complete with the bell presented by the Baltimore & Ohio Railway. There is a Dean Goods. One of the last GWR designs, Hawksworth's pannier tank 9400, is on show as part of the display dealing with goods traffic. A diesel railcar completes the motive power adjacent to examples of GWR and BR coaching stock.

Other cameos include a country station complete with refreshment room, a goods depot complete with mechanical horse recognising the vital importance of rail freight, and an enjoyable feature on the holiday traffic created by the Great Western. The railway did an enormous amount to publicise the joys of Devon and Cornwall, though one might question the truth of the poster that claimed Cornwall was warm enough for sea bathing in February — advertising hype is clearly nothing new! The GWR generated its own holiday traffic through the annual 'Trip' holiday week when the works shut down and almost the whole town went away to Weymouth, Weston-Super-Mare or further afield on special trains provided, of course, by the Company.

The museum has plenty of things to do as well as look at and these are aimed at different age groups. Several activities are suitable for younger children including arch building, shunting with model trains and a Punch and Judy show to operate. For older children and adults there are other activities; one example is a signal cabin with levers to pull. So it all makes for a very interactive museum. The absolute high spot is a simulator of a locomotive cab. Stand on the footplate, pull the whistle chain and watch through the spectacle glass as the West Somerset Railway goes past whilst the floor sways beneath your feet synchronised with the beat of the exhaust steam. It is a near-accurate experience of a locomotive footplate, lacking only the dirt and the smell of coal and oil.

Additional interest is provided by a viewing gallery overlooking the Great Western main line and the restoration area where locomotives and rolling stock are being rebuilt for preserved railways. It reveals a good link of the skills of the past continued to the present. At the time of my last visit the 2-8-0 tank engine No. 4247 was being restored.

Purists may think that there is not enough technical information on display. The technology is

The broad gauge replica locomotive **North Star** *is also at Swindon.*

Caerphilly Castle *has moved to Swindon from South Kensington.*

Foundry patterns and core boxes represent the original Pattern Shop.

The essence of a foundry has also been recreated at the Steam Museum.

played down in favour of a more general effect, yet the museum has been carefully thought out for widely differing audiences and is one of the best I've visited for giving an idea of what it meant to be a railway or engineering worker.

Most of all, it is fun!

My first visit was on a holiday Saturday for a *Thomas the Tank Engine* weekend and the Museum was very full. However, I found it much quieter and a real delight to go round on my second visit one Sunday afternoon. You could go round in an hour, but to get the full benefit I'd recommend allowing much longer.

Reaching the Museum

STEAM is about ten minutes walk from Swindon Station by way of a long tunnel under the tracks. There is also plenty of car parking for the nearby Macarthur Glenn Designer Outlet shopping centre. The museum is fully accessible for visitors in wheelchairs.

The Museum is open all year; there is an admission charge. Opening hours from November to March are 10am to 4.30pm and from April to October 10am to 6pm. Apart from a café the museum has a well stocked shop. Special events and talks are held during the year and there is a gallery for special exhibitions.

Contact

Telephone: 01793-466646; fax: 01793 466614; Website **www.steam-museum.org.uk** or write to: The Steam Museum of the Great Western Railway, Kemble Drive, Swindon SN2 2TA.

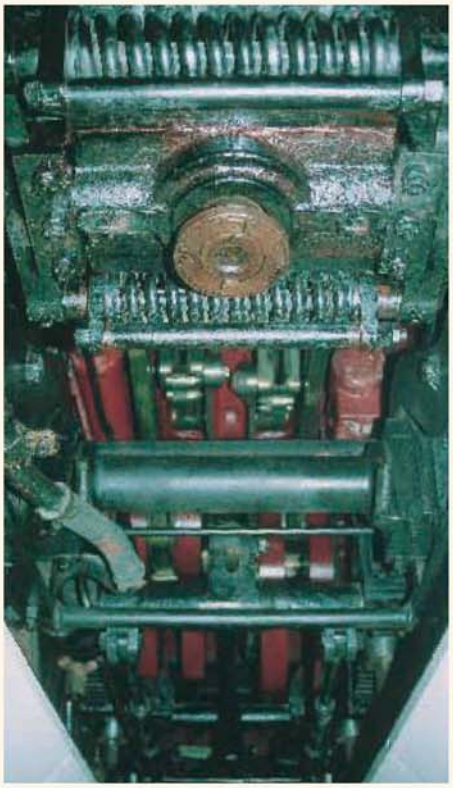
Other attractions in the area

Some of the original railway houses just south of the railway have been attractively restored. One is open to the public. Admission is free to holders of STEAM tickets.

The National Monuments Record is housed in former railway offices in the triangle between the Bristol and Gloucester lines. This has a vast collection of photographs and drawings, including many of railways, available by appointment. There is also an exhibition gallery.

STEAM is next to a large Designer Shopping Outlet. This is housed in former works buildings which have been sympathetically restored for their new use. It is one shopping centre an engineer can walk round more happily than most! A drawback is that traffic around the area can be very heavy at weekends. A compensation is having a cup of tea next to a former Great Western locomotive in the café area. Anyone wanting an alternative to the café can try the Pattern Store Bar at the other side of the shopping centre which contains a number of railway relics.

The Science Museum large exhibits collection is nearby at Wroughton. The Great Western Railway Society has a good collection at the former engine shed at Didcot, about half an hour away by train, and the Crofton Pumping engine on the Kennet and Avon Canal is not too far away.



Caerphilly Castle *is displayed over a pit to which visitors have access.*

Hagley Hall *in the Food Hall of the Great Western Designer Shopping Outlet.*

Pride of the Western: No. 6000 **King George V** *at the Steam Museum.*

KEITH'S COLUMN

LOGGER
AN AMERICAN TYPE 2-8-2 LOCOMOTIVE
for 5in. and 7¼in. gauges

Keith Wilson deals with the rear truck for *Logger* before discussing some welcome offers of assistance concerning the prototype and introducting a 7¼in. gauge version: *Slogger*.

●*Part III continued from page 141 M.E. 4165, 22 March 2002.*

Rear pony truck of the locomotive located by the writer. Several readers have come up with further information and offers of assistance with measurements and photographic detail of the prototype.

Having no drawings of *Logger* I have had to make several intelligent (?) guesses at the rear pony truck. At first the two trucks came out rather differently, but then a good look at the enlarged photograph of the front pony showed that it was more like the rear one than I had thought. So, apart from the top plate, they are virtually identical. This may or may not help in making the things.

The hole in the front top is for the side-control pin, the slot in the rear one is for a similar pin, but this is not for side control; it can help in locating.

The general arrangement drawing is purely illustrative at this stage, it will gradually increase as parts are described.

Logger feedback

I am delighted by some 'feedback' on the matter of *Logger*. Adam Harris of Camden Miniature Steam Services has forwarded some useful information. His first point is that 'loggers' were invariably oil fired, not log-fired as I had erroniously supposed. The fire risk is obvious and practically universal — Louisiana being an exception due to the fact that it is always rather damp in the swamps. Even with oil firing, during the high summer the locomotives had mesh spark traps fitted — fire in dry woods being somewhat less welcome than the proverbial pork chop in a synagogue, even at half-price!

I regret that when I was looking at the prototype, the idea of its being offered as a constructional series was but a vague thought, or I would have spent much more time on examination and photography. Again from a photograph, when in full working order the boiler and cylinders were lagged and clad; it seems that the one I saw is being gradually restored — however, I saw no-one nearby engaged in this sort of work from whom I could have learnt better. Of course, in those days asbestos was used universally as an insulator, but when it became a dirty word it had to be removed. Incidentally, it is the 'blue' asbestos fibres that are really dangerous, the white variety much less so. However, due the obvious difficulty of getting the difference across to the average member of the public, both have been tarred with the same brush, so to speak.

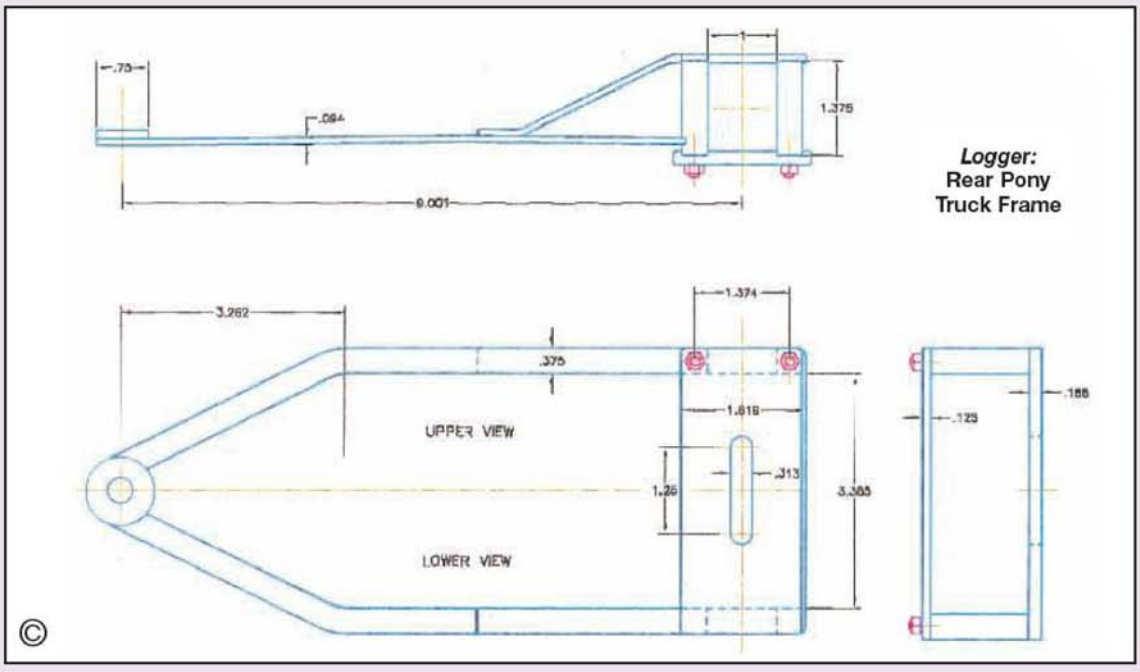
Of course, on the temporary short tracks prevailing in the outback or boondocks, locomotives tended to be Shays, Climaxes, or Heislers, whereas many of the bigger logging companies had 'main-line' types, some very large and powerful such as Mallets (pronounced 'mal-lays').

My very grateful thanks to friend Adam Harris. It is a splendid demonstration of Keith's Second Law, to wit:

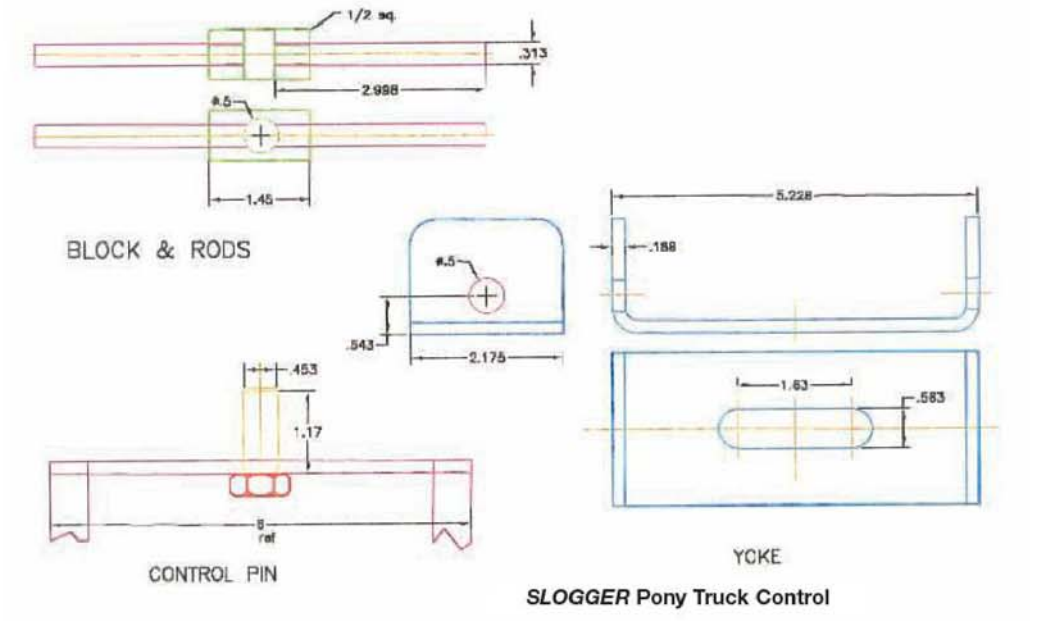
"It is one thing to remain silent and be thought a fool, it is another thing to open your mouth and remove all doubt. But it is best of all to open your mouth, be thought a fool, and ultimately learn the truth for all to see."

Then one evening came a 'phone call from a Gentle Reader (Clive Ellis) on Vancouver Island. He and some pals are going (at time of writing) to get more photographs in large numbers, together with some measurements, etc. Also, he states definitely that it is a Baldwin — not a Porter, as suggested by Adam. Whereas with GWR locomotives I would know a bit more about it, here they are the experts, therefore who am I to argue? It seems that it is in the process of being restored but is taking some time, hence the lack of cladding.

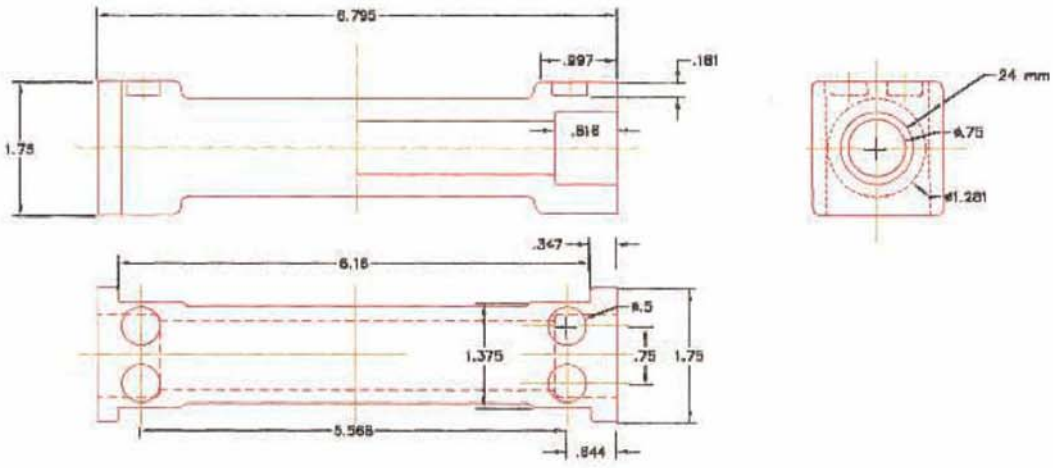
So we may look forward to a much better detailed *Logger*, and at their request, also in 7¼in. as well as 5in. gauges. Why not 7½in. , you may well ask? My answer is that to convert from 7¼in. to 7½in. gauge is a matter of jacking out the wheels and some bits of motion by ⅛in. each



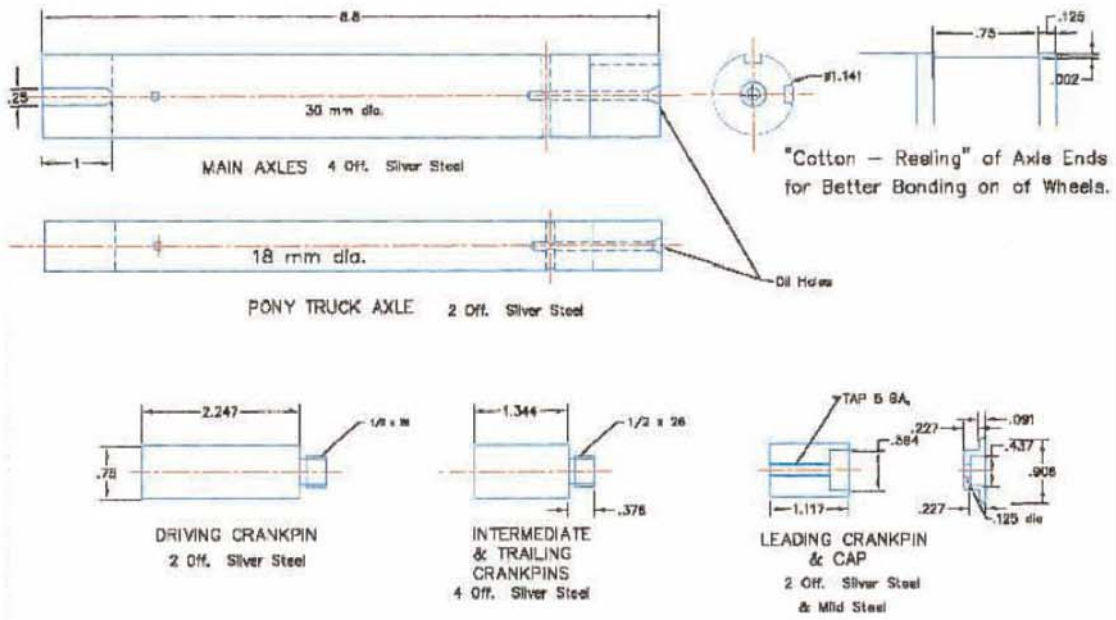
***Logger:* Rear Pony Truck Frame**



***SLOGGER* Pony Truck Control**



***SLOGGER* Pony Truck Axlebox**



***SLOGGER* Axles and Crankpins**

side, somewhat easier than cropping off frames, axles, and whatever — having done it a couple of times I should have at least a vague idea of what is involved. Since 7¼in. is more prevalent than the other, it makes a lot of sense. From my point of view, it is little more than pressing a couple of buttons on the computer. So we meet *Logger's* big sister: *Slogger*.

Now I am aware that unlike us, America is not being sold down the river inch by inch into the metric system of measurements, however much easier for children to learn than the Imperial system it may be. Remember the times at school spent chanting:

12in. = 1ft.
3ft. = 1 yard.
5½ yards = 1 rod, pole, or perch.

Been fishing lately?

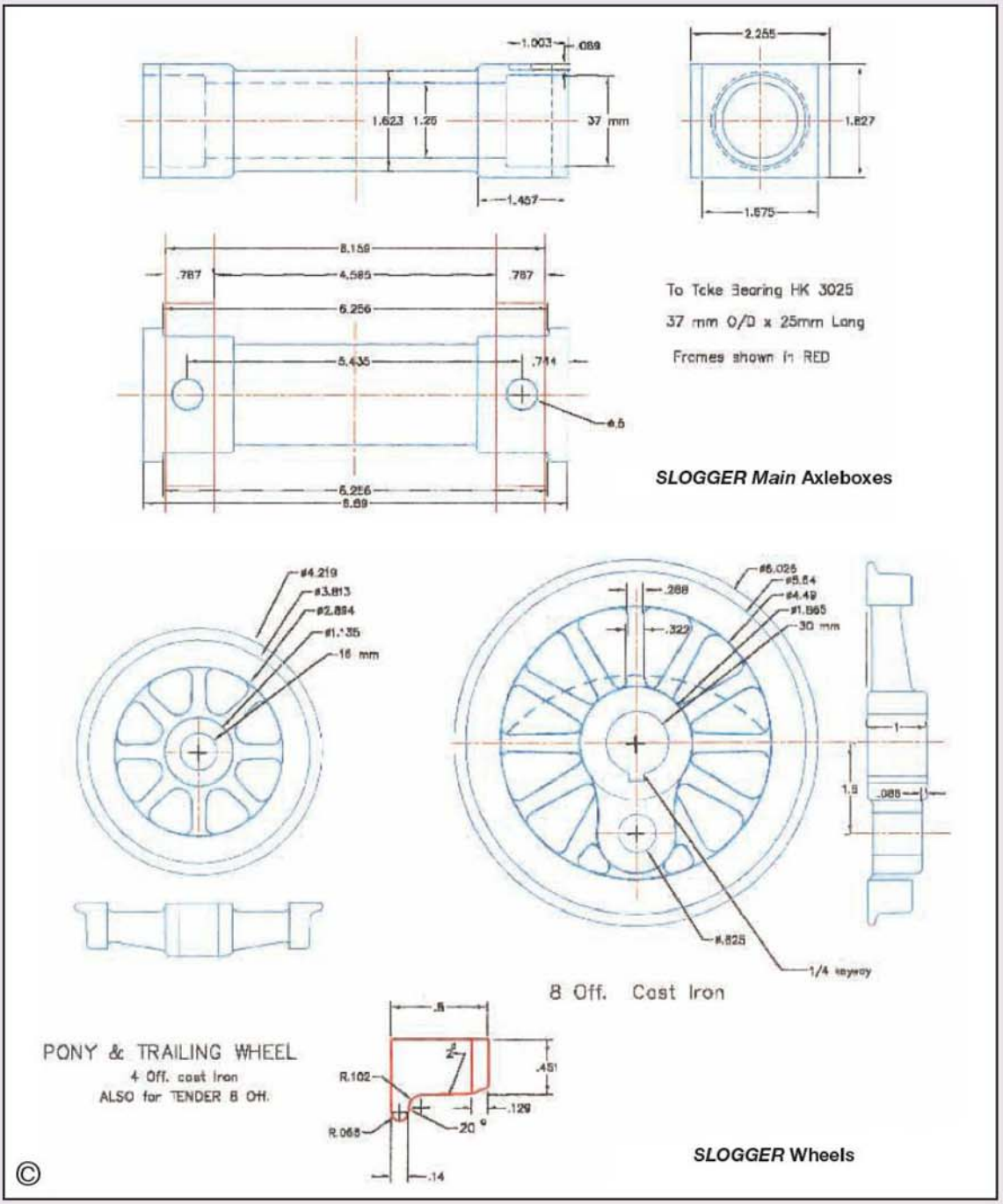
And so on, but who has bothered with these rods, poles and perches the last hundred years or so? Not forgetting roods and a few others, such as gills, hogsheads (or hog's heads), firkins, truggles, quones, and so on. Whereas the metric system can be learnt in one day.

Although the addition of *Slogger* is mainly for our friends across the pond, I have specified metric sizes for axles and bearings, the reason being that they are more easily obtainable out of the States and, incidentally, are also a little thinner — very useful when squeezing quartz (!) into pint pots. The nearest imperial sizes can be used and will work just as well. Take your choice.

I suspect that the world will be all metric one day. Apart from some engineering applications, on the whole it is a better system.

It is safest to get the bearing sizes settled first, for their size range is not infinite — it is far safer to settle on axle sizes to suit available bearings.

At time of writing, two others have also contacted me, Maurice Foord (on the island) and Joe ▶



Carroll, the latter by letter. He rightly takes me to task on the errors I made in my first estimates of our *Logger* and has put me right on several other matters. All criticisms are gratefully received, especially constructive ones like these. I do not see too much point in historical details, suffice it to state for the present that Baldwin built it as No. 57409 in November 1923. It was sold to Donovan Corkery Lumber Co. of the USA, reboilered and sold to Comox Logging in 1937 which company used it as their No. 11.

It was put on display at Ladysmith in 1962. Sifting through all the present knowledge, she appears to be undergoing gradual restoration, hence my belief that she wasn't lagged. A book on *Logging by Rail* is on its way, courtesy of Camden Miniature Steam Services, which I am told contains pictures of 'our' logger. Both owners, *with* cladding. With any luck, some of these photographs might appear in due course, provided that we can square things with the copyright holders.

Because of these sources of information, a spanner into the works was put. I had already done a great deal of design/drawing work based on estimations of scale as discussed in Part I. A reasonable logging-looking locomotive would have materialised in fair proportions, but I could have been quite some way out in precise 'scale' sizes. This should be verified or amended shortly, but meanwhile printer's deadlines loom ever closer. So I have settled this issue for such parts as are independent of exact scale. Axles, axleboxes, etc. are dependent more on gauge than on scale, so it is these on which I shall concentrate in this issue. Incidentally, these notes are being updated/corrected almost daily.

Talk about the eleventh hour. With editorial deadlines looming ever closer, I was informed of just one vital dimension. You will recall from Part I how I got the various sizes of vital parts from an estimation of where the rails were exactly under the stack, and no doubt the information will be of use for persons in a like position. But this vital dimension, the driving wheel diameter of 44in., I back-checked on the photographs to find that I was only just over 4% out; metaphorical pat on the back.

So oodles of midnight oil correcting such drawings as needed it (things like axles, axleboxes, etc. were 'standard' but wheel diameters needed correction) and I hope we are now 'all set'. The information means that I can — and must — do a better overall job.

It might be possible in some cases to give just one drawing, with a list of dimensions for both locomotives, but I tried it with one drawing and it more than doubles the work I have to do. It is not practical merely to enlarge the *Logger* drawings (a matter of a couple of key-presses on the computer) for this obviously can lead to strange results, such as bearings halfway between two standard sizes, which is hardly constructive.

I am delaying the mainframes a little longer so as to produce a better job. So ...

Having recently described axles and cannon boxes there is no point in repeating the instructions so I will just add a word or two on driving wheels. It is most important that all driving wheels match in diameter and crankpin settings, I think the reasons are fairly obvious. So get the wheels faced off roughly (i.e. not quite to finished size on the tread and flange), bored and reamed to suit the axle.

The safest way to get the crankpin holes accurately located is by using a jig. Now it is very easy to knock up a jig from an odd piece of steel, but don't be mean with the jig size. The first time I did this (1953) as far as I recall I grabbed a bit of steel only 1/8 thick — no use at all, even for the 2 1/2in. that I was building. Go for at least 3/8in. thick, 1/2in. is better. Mark it out, drill and ream two 3/4in. holes at 1.063in. centres, the other one 3/4in. dia. This particular dimension of 1 1/16in. is not critical to a few thou, what matters is getting all the wheels to match. Prepare a couple of silver-steel bushes and harden them; there's no need to temper them. One bush is 1/4in. bore (ream it) and the other is 1/2in. bore (ditto).

Also required is one mandrel, as drawn. This need not be hardened, but the 1/2in. diameter must be very close — a push fit in the jig, therefore a push fit in the wheel. The slot in it should be as accurate as you can get it. On no account use an end-mill for this, it will cut wide. Use a 5/16in. slot

Drilling for the crankpin. The precise angular location is not as important as consistent radial location. The bush is fully hardened silver-steel.

Broaching the keyway in a wheel seat using a proprietary broach in its matching bush. The location of keyed wheels can be guaranteed.

A four flute end mill (left) and a two-flute slot drill (right) of similar diameters.

Above: A commercial broach; it is located in a bush in the bore through which it is pushed.

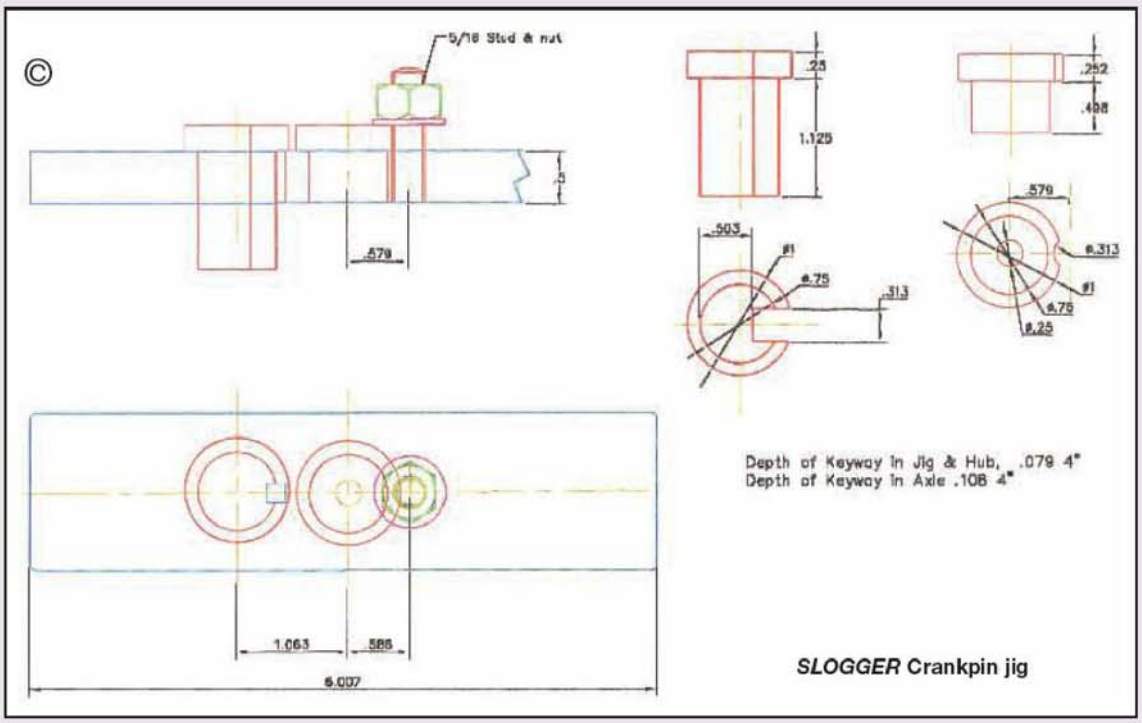
Below: the cutting ends of an end mill (left) and a slot drill (right).

drill. I shew a photograph of slot drill (two flutes, no central hole) with an end mill (four flutes, hole clearly visible) together with a 3/16in. broach. These are based on tool steel 3/8 x 5/16in.; alas they are not cheap. Please note that dimensions given in the text are for *Logger* generally, *Slogger* is approximately 1.45 the size. I will try to remember to mention it when giving *Slogger* an airing.

Note that the body of the jig is rather longer than absolutely necessary. This is to permit clamping to the wheel, for it is well to get the crankpin hole reasonably well aligned, it will look most horrible if not. Also, a 3/16in. square broach would be confoundedly fragile, so the standard is based on 5/16in. wide base; they are supplied with some tee-shaped shims — mine are several of 0.03in. thick, with one each of 0.02in. and 0.01 inch. This means that cuts can be made of as little as 0.01in. (ten thou) at a time if desired, but I find that 0.030in. cuts are practical, the smaller ones being used to bring the slot to the nearest figure over the ideal depth. The broach must be steadily pressed through, on no account hammered, unless you are extremely rich. It is best to measure the depth of keyway right across the bore, ***not*** from the edge of the keyway. Thus the internal measurement across the jig bore should be just over 0.829in., and (later) the distance on the axles should be just under 0.642 inch.

When I first tried this pattern of jig, I was naturally somewhat concerned, but I need not have worried. On putting a close-fitting pin in the central hole of a wheel and putting another wheel on top, with a silver-steel crankpin in its hole, of course, it rested on the lower wheel, but as I gently rotated the upper wheel, the point came when it lined up and the pin slipped down under its own weight. There was no discernible play or backlash, so the method was accurate to something much less than 0.001 inch.

When ready to cut the keyway, use the mandrel to guide the broach (as if it were not obvious) and a crankpin through the bush and the wheel to hold everything in line. It is a good plan, before cutting the guiding keyway in the jig body to fix the mandrel in place firmly in the jig, I see no reason why it should not be Loctited home permanently. Get the thing aligned so that the keyway points directly towards the crankpin hole.



***SLOGGER* Crankpin jig**

●*To be continued.*

CLUB CHAT
With Stan Bray

UK News

City of Oxford SME has been obliged to postpone their Dreaming Spires Rally, originally scheduled for 13/14 July, to 27-28 July. Further information is available from their website at **www.cosme.org.uk** or from Secretary, Chris Kelland at 40a Kingfishers, Grove, Oxfordshire OX12 7JN; tel: 01235-770836.

A well attended dinner late last year had an atmosphere of an old-fashioned Christmas celebration for members of the **Guild of Model Wheelwrights**. To add to the fun, anyone using a sentence containing the word 'wheel' was fined £1. This raised a total of £40 which was donated to the Children in Need appeal. Among numerous requests to attend various events, the Guild has been approached by the Wolverhampton Art Gallery which is planning a long-running exhibition about the Agricultural Revolution from the 18th century. Members have a good number of suitable models and no doubt between them they could demonstrate most relevant vehicles. Secure glass cases will be provided for the display of the models. Many museums have exhibits that could be a source of information or interest to members. The Guild has therefore drawn up a list detailing what can be found at each museum. Although by no means complete, 80 sites housing over 1,000 exhibits have already been listed and are still being added to.

We learn that the **Model Steam Road Vehicle Society** annual rally will again be held on Tewkesbury Rugby Club grounds. The model tent, trade stands and of course, the engines themselves will be augmented by the usual range of entertainments. The rally, which attracts an increasing number of models each year, will be held on 29/30 June and the organisers would be pleased to hear from anyone who would care to participate, whether by exhibiting a model or running a vehicle. Visitors wishing to just view the proceedings will also be very welcome. Further information can be had from Ann Freeman (01452-301731) or Chris Stubbings (01925-815305).

Plans are in hand for a complete rebuild of the **Birmingham SME** station to provide a wider platform with a canopy and booking office. The existing footbridge will be moved to the garden railway to save the aching backs of members who at present have to bend down to get inside. Logbooks have been introduced for the club locos which should improve control over their use and maintenance. A long-term supporter of the Muscular Dystrophy Society, the club will again be holding a fund-raising day on their behalf. There will also be a special day for the Birmingham Heartlands Leukaemia Support Group, another local charity.

David Jerome of **Amnerfield MR** at Burghfield near Reading asks us to inform readers that the society will be holding two special events this year. At the first on 6/7 July, all visitors with steam locomotives will be welcome throughout the weekend. The second, on 3 August is a one day non-steam event when any visitors with suitable locomotives will be welcome to run on the 5-7¼in. gauge track. Further information is available from David Jerome (0118-9700274) or Peter Morgan (0118-9733786).

Peterborough SME has been obliged to rearrange the dates of this year's events and we accordingly announced that since it would clash with their 20/21 July locomotive rally, the club would be unable to organise their popular Sacrewell Farm and Country Centre Rally this year. So great was the disappointment of the farm owners and members of the club whose main interest is in model traction engines, plus those wishing to attend with their models, that the rally and the club open days will both go ahead. Last year over 50 model road vehicles were in steam at the Sacrewell Farm Rally and a similar, or possibly greater number are expected this year. Well worth a visit in its own right, the farm is well signposted just north of Peterborough on the A1. By holding the two events at the same time, the club will provide intending visitors with the opportunity to visit both events which, taking into account all the other attractions in the area, should make for a memorable weekend. There is the opportunity to visit the Nene Valley Railway Railway World Museum and a 10¼in. gauge railway in Ferry Meadows. The city itself boasts a good shopping centre and a lovely cathedral, both of which are but a short distance from the club events. Not far away, at Pinchbeck is one of the oldest preserved beam engines in the country and a museum showing the history of the fen drainage system. Some caravan and camping facilities are available for each event and there is also a large site at nearby Ferry Meadows. Further information about the locomotive rally, at which there are also facilities for model road vehicles, can be obtained from Tony Meek, e-mail **tony@meek2.freeserve.co.uk** (01778-345142). Further details about the traction engine rally are available from Peter Jackson, 19 Kingfisher Road, Whittlesey, Peterborough PE7 1YF.

Members of **Crawley ME** will be exhibiting at the Crawley Model Rail Exhibition over the weekend 27/28 April and will no doubt be hoping that their display will bring their activities to the attention of the public. Several intrepid members braved bad weather in order to maintain the public running commitment in February. However, the weather was so bad that those present eventually decided to retire to the clubhouse for a nice warming cup of tea. Alas, this was not to be as the water supply had been turned off following an earlier fire at the cricket pavilion. Unfortunately, this was the same supply as used by the model engineering society and so with no cuppa, everyone went home somewhat peeved! An extra rail is being laid in the track to cater for 2½in. gauge models; Crawley appears to be one of an increasing number of clubs to do so. A rule has been introduced requiring all steam locomotives used for public passenger hauling to be fitted with spark arrestors from now on. All locomotives and rolling stock must also have facilities to fit a secondary safety chain when passenger hauling.

An evening listening to John Lee talk about railway posters proved both interesting and enlightening for **Norwich DSME**. Members learned how different artists imposed their own particular style on the subject, which was at its height in the days of the big four. They also heard about the collection of over 4,000 different posters held at the National Railway Museum at York.

Negotiations for the new **Bournemouth DSME** track site have at long last borne fruit and the club has now been offered an initial 5 year lease on a site at Littledown, with an offer of a further 21 years to follow. The local authority has set aside some money towards the cost of the new track but it will not meet all the expense, the remainder of which will have to be met by the club. A contractor, engaged by the council, will see to the initial stages of construction which will include foundations for the track, station building and engine shed. This work will also include connection to the water, electricity and sewage systems. Members will attend to track laying; they probably wouldn't entrust this important task to anyone else anyway. In the shape of a large dumbell, the track will accommodate 3½, 5 and 7¼in. gauge models. There will be parking facilities and it will be possible for cars to be driven right up to the steaming bays for loading and unloading purposes. Funds will not allow the construction of the station building for a while but with some 35 years of experience at Kings Park members are quietly confident that their new track will be of a really high standard and no doubt will attract many visitors.

Members of **West Riding SLS** were invited at short notice to visit the Idle Moor premises of Israel Newton for a guided tour of the works. This 200 year old company specialises in repairing boilers for preserved locomotives and traction engines. The opportunity was eagerly seized upon and those who went were able to see a number of locomotive and traction engine boilers under repair and new ones in construction. Although involving a fair bit of welding these days, flanged plates are still made by working red hot steel sheet, and the company still uses hot riveting for some work. The visit proved to be both educational (nobody will complain about the work involved in flanging plates for a 5in. boiler after seeing that) and an opportunity to see work continuing by the same system as used by factories in Victorian times. We recently informed readers about two burglaries at the track site and are now pleased to say that most of the items stolen, including two Aristocraft Coaches, have been recovered. This stroke of good fortune occurred when the location where they had been hidden was accidentally stumbled upon!

Chris Eddison, a young member of **Bradford MES**, was awarded second prize in the National Young Engineers Competition. He designed and built a portable battery charger energised by flowing water and/or sunlight. The 80 entries were judged at the National Railway Museum, giving Chris the opportunity of a free visit when he went along with a school party including some younger entrants to the competition. While other entries were being judged he was free to roam the museum where he was told that he could only ride on the 7¼in. gauge railway if he had a responsible adult to look after him. Little did the well-meaning person who made this remark know that Chris regularly drives his own locomotive on the club track!

In Memoriam

It is with the deepest regret that we record the passing of the following members of model engineering societies, the sympathy of the staff at *Model Engineer* is extended to the family and friends they leave behind.

Trevor Beresford	*Canterbury SMEE*
Bryan Bristow	*St Albans & District MES*
Frank Cox	*Reading SME*
Douglas Hodgson	*Bradford MES*

With the track adjacent to the site entrance completed, a concreted level crossing has now been installed at **Saffron Walden DMES** giving members direct access to the car park with the facility to move models to the steaming bays from there with a hospital style trolley. Point work and signals are now top priority; it has been decided that switched frogs will be used on the points as these are less discerning of variations in wheel profile. Signalling and point work is automatically controlled. A signal box in the form of a miniature portable building and based on the one used for the estate railway, will contain a train indicator board and overriding controls. It will have room for one operator who will only be required at special events when extra supervision is needed. A plug and socket system will enable the signal box to be removed for maintenance if required.

The **Wigan DMES** AGM was attended by 33 members, some of whom had to keep watch on members' cars as there have been many recent thefts of and from vehicles. *Runner of the Year Trophy* for the member doing most public running during the year was awarded to Gary Hampson during the meeting. Brian Woodward, Chairman for the past year, stood down from the position and Geoff Buckley, who has been Vice Chairman for the same period, was elected in his place. Roles were reversed when Brian Woodward was then elected as Vice Chairman.

World News

South Africa

Having earmarked a number of jobs to be done last year, members of **Pietermaritzburg MES** are pleased that not only have they all been completed but others were also taken on and finished. Included among these was a new track extension complete with a large bridge. With work over and summer rapidly approaching, this has now been tried and tested during public running and it is settling down well; it is also proving popular with members. Last year saw an increase in membership and since it is the society's turn to host next year's National Steam Meet, the more hands there are the better!

New Zealand

A shortage of members willing to participate in portable track events is causing **Southland SME** to reconsider their viability and to consider concentrating on their own track site. They are not alone in this as most societies report similar situations. It seems that few enjoy carting a portable track to a venue, setting it up and then taking it down and away after an exhausting time trying to cope with the public. The proposed boating pond is likely to have been completed by the time this is published, which means that another popular side of the hobby is now available to the many members who have built model boats. Members were recently able to enjoy the fourth of the Ghost Branch Line Tours organised by the club. These are trips by coach, so popular that this time they filled two, visiting the remains of discontinued railways.

A number of **Canterbury SMEE** members attended a meeting of the **Model Engineers Association of New Zealand (MEANZ)**, hosted by **Palmerston North MES** and while there George Johnson was presented with the prize for the smartest small model traction engine. Members of the Canterbury society are busy making parts for the new track they anticipate building at a local showground. Approval to do so from the local authority was expected to be effective from January this year, so by now the actual laying of the track will no doubt have commenced. Work has also begun on the construction of ten new passenger trolleys and sponsorship is being sought to defray their cost. Brokellys Pub have already sponsored them for a tonne of steel towards track construction.

Australia

Adelaide MRS has published the centenary issue of their lively newsletter *The Narrow Gauge*, something of a double celebration as it coincided with the end of their 25th year of running at Railway Park. Like most societies they do not rest on their laurels and now have a track extension built by extending from a head shunt. Two charity days organised by the club during the summer had very different results. One on behalf of a kindergarten was a real bonanza with lovely weather attracting large crowds; the second for the benefit of another local children's organisation was a disaster, the day turning out very cold and wet with the result that very few people wanted rides.

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.

APRIL

7-26 May Talyllyn Railway. *First Class for Sunday Lunch.* Enquiries: 01654-710472.

19 Rochdale SMEE. *George Howard: Stanley Tools.* Contact Mike Foster: 01706-360849.

19 Romford MEC. *Alan Bayford: Traditional Buildings of Essex.* Contact Colin Hunt: 01708-709302.

19 Steam LS of Victoria. *Gathering.* Contact Graham Plaskett: (03) 9750-5022.

20 Chesterfield MES. *Running Day.* Contact Mike Rhodes: 01623-648676.

20 Historical MRS (Scottish Area). *Meeting.* Contact Richard Crockett: 01896-750730.

20 Steam LS of Victoria. *Club Run.* Contact Graham Plaskett: (03) 9750-5022.

20 West Riding SLS. *AGM.* Contact Margery Bradley: 01977-685782.

20/21 Barrow Hill Engine Shed Society. *Spring Gala.* Contact Kate York: 01246-472450.

20/21 Bournemouth DSME. *Luscombe Valley Cobweb Run.* Contact Mike Baker: 01202-383653.

20/21 Erewash Valley MES. *Steaming Weekend.* Contact Jim Matthews: 01332-705259.

20/21 Meridienne Exhibitions. *Large Scale Model Rail Exhibition* at the Warwickshire Exhibition Centre, Fosse Way, near Leamington Spa. 10am-5pm daily. Adults £4.50, Senior Citizens £4, Children £2.50, Family (2+3): £11. Enquiries: 01926-614101.

20/21 Guild of Model Wheelwrights *at Avoncroft Museum,* Bromsgrove, Worcestersire. Contact Biddy Hepper: 01492-623274.

20/21 Worthing DSME. *Club Exhibition.* Contact Chris Devenish: 01903-268158.

21 Frimley & Ascot LC. *Club Run.* Contact Bob Dowman: 01252-835042.

21 Guildford MES. *Running Day.* Contact Dave Longhurst: 01428-605424.

21 MELSA. *Heritage Awards Run.* Contact Graham Chadbone: 07-4121-4341.

21 N. W. Leicester SME. *Running Sunday.* Contact John Elliott: 01455-847040.

21 Nottingham SMEE. *Visitors' and Members' Rally.* Contact Gerry Chester: 0115-9259096.

21 Oxford (City of) SME. *Running.* Contact Chris Kelland: 01235-770836.

21 SM&EE. *Visit to Crossness Engines.* Contact David Boote: 01202-745862.

21 Sutton Coldfield MES. *'Towns Twinning' Steam-Up.* Contact Roger Timings: 0121-308-5875.

21 York City & DSME. *Running Day.* Contact Ken Bateman: 01904-421445.

22 Bedford MES. *Wilstead Remembered.* Contact Ted Jolliffe: 01234-327791.

23 Historical MRS (E. Lancashire/N. Manchester Group). *John Lingwood: Beam Compensation for Model Locomotives.* Contact John Sykes: 01706-823989.

23 Romney Marsh MES. *Track Meeting.* Contact John Wimble: 01797-362295.

23 Sutton Coldfield MES. *Meeting.* Contact Roger Timings: 0121-308-5875.

24 Chingford DMEC. *Auction.* Contact Martin Masterson: 0208-989-5552.

24 Harrow & Wembley SME. *Meeting.* Contact Dr. Roger Greenwood: 020-8427-2755.

24 Historical MRS (Bedford Area). *The St. Pancras District of the Midland Main Line in the 1950s.* Contact John Chamney: 01442-851214.

25 Leyland SME. *John Robinson: Engineering the Eurofighter.* Contact Alan Wilson: 01942-715072.

25 Sutton MEC. *AGM.* Contact Mike Dean: 0208-657-5401.

26 Chichester DSME. *AGM.* Contact Brian Bird: 01243-542266.

26 Colchester SMEE. *AGM.* Contact L. G. Hammond: 01376-511686.

26 Frimley & Ascot LC. *Skittles Evening.* Contact Bob Dowman: 01252-835042.

26-28 Meridienne Exhibitions. *The National Woodworking & Woodturning Exhibition* at the Warwickshire Exhibition Centre, Fosse Way, near Leamington Spa. 10am-5pm daily. Adults £7, Senior Citizens £6, Children £3, Family (2+3): £16. Enquiries: 01926-614101.

26-28 Guild of Model Wheelwrights *at Midlands Woodworking & Woodturning Exhibition,* Leamington Spa. Contact Biddy Hepper: 01492-623274.

27 Historical MRS (Bristol Area). *Peter Davies: West Coast Main Line 100 Years Ago (Part 3).* Contact Gerry Nichols: 0117-973-1862.

27 Mashonaland SME. *Meeting: Video.* Contact Ian Andrews: 263-4-882893.

27 Surrey SME. *Visit to Nene Valley Railway.* Contact John Cook: 020-8397-3932.

27 York City & DSME. *Best Work of the Year.* Contact Ken Bateman: 01904-421445.

27/28 Fylde SME. *Club Exhibition.* Contact Alan Reid: 01253-882872.

27/28 Kew Bridge Steam Museum. *Magic of Meccano Show.* Information: 020-8568-4757.

27/28 *Sussex Model Rail 2002*, *Model Railway/Engineering Show* at Crawley Leisure Centre, Haslett Avenue, Crawley, West Sussex. 10am-5pm. Adults £3.50, OAP £2, Child under 14 £1.50, Family (2+2) £9, Children under 5 Free. Information: 01903-750410.

28 **Amberley Museum.** *Veteran Cycle Day.* Contact Derek Kilburn: 01798-831370.
28 **Ascot LS.** *Members' Steam-Up.* Contact Tony Alderman: 01932-854393.
28 **Basingstoke DMES.** *Traction Engine Day.* Contact Ian Shanks: 01420-561741.
28 **Chichester DSME.** *Steam on Sunday.* Contact Brian Bird: 01243-542266.
28 **High Wycombe MEC.** *Driving Course.* Contact David Savage: 01494-527402.
28 **Isle of Wight MES.** *18th Model Locomotive Rally.* Contact Ken Stratton: 01983-760762.
28 **MELSA.** *Sunday in the Park.* Contact Graham Chadbone: 07-4121-4341.
28 **National 2½in. Gauge Ass'n.** *Northern Area Rally* at Brighouse & Halifax ME. Contact Clive Young: 01233-626455.
28 **N. W. Leicester SME.** *Traction Engine Rally.* Contact John Elliott: 01455-847040.
28 **Steam LS of Victoria.** *Barbecue.* Contact Graham Plaskett: (03) 9750-5022.
29 **Canterbury DMES.** *Meeting.* Contact Granville Askham: 01227-463295.
30 **Basingstoke DMES.** *Meeting.* Contact Ian Shanks: 01420-561741.
30 **Chelmsford SME.** *Les Hammond: Great Eastern Trams.* Contact D. Blake: 01376-324205.
30 **Romney Marsh MES.** *Track Meeting.* Contact John Wimble: 01797-362295.
30 **Stafford DMES.** *Meeting.* Contact Chris Dobbs: 01889-270533.

MAY

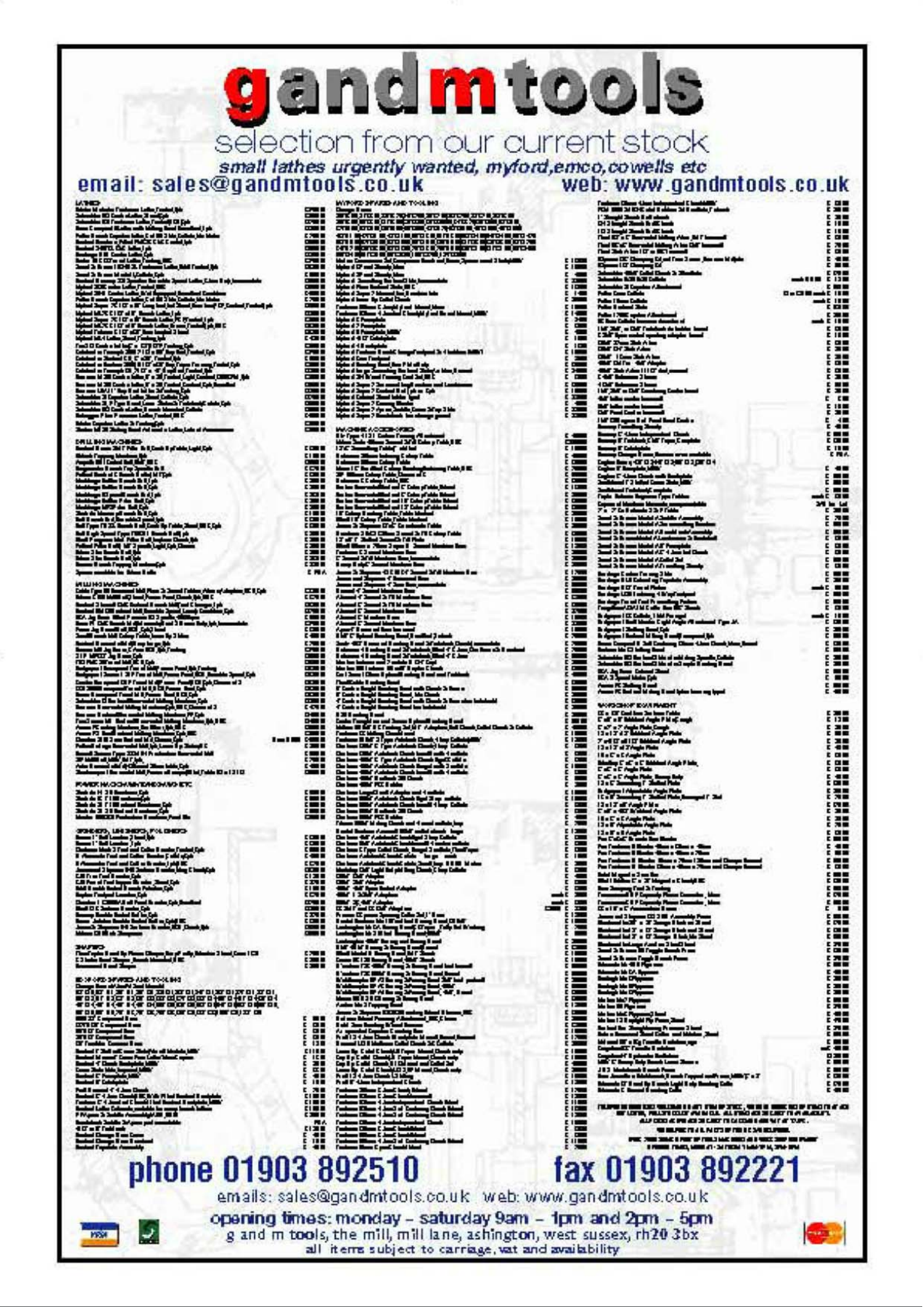
1 **Bradford MES.** *Meeting.* Contact Gordon Eddison: 01943-864217.
1 **Bristol SMEE.** *Joe Nemeth: Scaleway Signals.* Contact Trevor Chambers: 01454-415085.
1 **Chingford DMEC.** *Boys and their Bikes.* Contact Martin Masterson: 0208-989-5552.
1 **Hull DSME.** *Richard Lamb: Replica Early Locomotives.* Contact Chris Parsons: 01964-630563.
1 **Tyneside SMEE.** *Meeting.* Contact Malcolm Halliday: 0191-262-4141.
2 **Sutton MEC.** *Bits & Pieces.* Contact Mike Dean: 0208-657-5401.
3 **Vale of Aylesbury MES.** *Photographic Competition.* Contact Clive Ellam: 01296-623433.
3 **Maidstone MES.** *Guest Speaker.* Contact Martin Parham: 01622-630298.
3 **North Norfolk MEC.** *N. Digby: Liveries.* Contact Gordon Ford: 01263-512350.
3 **Portsmouth MES.** *Bits & Pieces.* Contact Bob Aldred: 023-92-523366.
3 **Rochdale SMEE.** *Meeting.* Contact Mike Foster: 01706-360849.
3 **Romford MEC.** *Competition Night.* Contact Colin Hunt: 01708-709302.
4 **Dockland & E. London MES.** *Track Meet.* Contact P. M. Jonas: 01708-228510.
4 **Isle of Wight MES.** *Track & Pond.* Contact Ken Stratton: 01983-760762.
4 **National 2½in. Gauge Ass'n.** *Spring Rally* at Rolfe Lane. Contact Clive Young: 01233-626455.
4 **SM&EE.** *David Boote: Jigs, Fixtures and Tools.* Contact David Boote: 01202-745862.
4 **The Society of Ornamental Turners.** *Meeting.* Contact N. S. Edwards: 01234-359392.
4-6 **Urmston DSME.** *21st Day Steam.* Contact Bryan Cantwell: 0161-485-5174.
5 **Bedford MES.** *Juniors' Track Day.* Contact Ted Jolliffe: 01234-327791.
5 **Forncett Industrial Steam Museum.** *Model Engineers' Day.* Contact R. F. Wilson: 01502-714905.
5 **Guildford MES.** *Diesel & Electric Day.* Contact Dave Longhurst: 01428-605424.
5 **Leeds SMEE.** *Steaming Day.* Contact Edwin Hughes: 01757-707454.
5 **Leighton Buzzard NG Rly.** *Teddy Bears' Holiday.* Enquiries: 01525-373888.
5 **Reading SME.** *Running.* Contact Graham Bustin: 01189-615450.
5 **Surrey SME.** *Steam-Up.* Contact John Cook: 020-8397-3932.
5/6 **Chesterfield MES.** *Steaming at Papplewick.* Contact Mike Rhodes: 01623-648676.
5/6 **Elmdon MES.** *Running* at Museum of Transport, Wythall. Contact Chris Giles: 0121-458-1291.
5/6 **Oxford (City of) SME.** *Running.* Contact Chris Kelland: 01235-770836.
6 **Cardiff MES.** *Steam-Up & Family Day.* Contact Trevor Jenkins: 029-20755568.
6 **Peterborough SME.** *Bits & Pieces.* Contact Tony Meek: 01778-345142.
6 **Stockholes Farm MR.** *Bank Holiday Running.* Contact Ivan Smith: 01427-872723.
6 **Sutton Coldfield MES.** *Bank Holiday Monday Steam-Up.* Contact Roger Timings: 0121-308-5875.
6 **Guild of Model Wheelwrights** *at Sandwell Farm Park*,West Bromwich. Contact Biddy Hepper: 01492-623274.
7 **Romney Marsh MES.** *Track Meeting.* Contact John Wimble: 01797-362295.
7 **Taunton ME.** *Trophy Night.* Contact Don Martin: 01460-63162.
8 **Chingford DMEC.** *AGM* Contact Martin Masterson: 0208-989-5552.
8 **Historical MRS (East Midlands Area).** *A visit to an 0-Gauge Layout.* Contact Mark Shipman: 0194-983-6311.
8 **Norwich DSME.** *Auction.* Contact Barry Steel: 01603-743372.
8 **St. Albans DMES.** *Meeting: Driving a Steam Locomotive.* Contact Roy Verden: 01923-220590.
9 **High Wycombe MEC.** *AGM.* Contact David Savage: 01494-527402.
9 **Leyland SME.** *5in. Gauge Night.* Contact Alan Wilson: 01942-715072.
9 **N. W. Leicester SME.** *Fish & Chip Supper.* Contact John Elliott: 01455-847040.
10 **North London SME.** *Andrew Pullen: Aster Locomotive Models.* Contact Tony Dunbar: 01992-465625.
10-12 ***The 2002 National Model Engineering Exhibition & Modelling Show*** at the Great Yorkshire Showground, Harrogate. Trade Information: 01751-473780; Club/Exhibitor/Advance Bookings: 01977-661998.
10-12 **Guild of Model Wheelwrights** *at Model Engineering & Modelling Exhibition,* Harrogate. Contact Biddy Hepper: 01492-623274.
11 **SM&EE.** *Visit to Beech Hurst Track.* Contact David Boote: 01202-745862.
11/12 **Kew Bridge Steam Museum.** *Wells, Water Wheels & Mystery.* Information: 020-8568-4757.
11/12 **Romney Marsh MES.** *Open Weekend.* Contact John Wimble: 01797-362295.
12 **Amberley Museum.** *Vintage Motorcycle Show.* Contact Derek Kilburn: 01798-831370.
12 **Sutton MEC.** *t* Contact Mike Dean: 0208-657-5401.

gandmtools

selection from our current stock

small lathes urgently wanted, myford,emco,cowells etc

email: sales@gandmtools.co.uk **web: www.gandmtools.co.uk**



phone 01903 892510 fax 01903 892221

emails: sales@gandmtools.co.uk web: www.gandmtools.co.uk

opening times: monday – saturday 9am – 1pm and 2pm – 5pm

g and m tools, the mill, mill lane, ashington, west sussex, rh20 3bx

all items subject to carriage, vat and availability

SEE US AT HARROGATE 10TH -12TH MAY

CHRONOS LIMITED

Telephone Sales Hotline 01727 832793

TOP QUALITY INDEXABLE TOOLING!

MT2 SHANK INDEXABLE ENDMILLS

Tapped 10mm for a drawbar

Code	Head Dia	Tips	Price
IMH21	16mm	1	£29.95
IMH22	20mm	1	£32.95
IMH23	25mm	2	£34.95
IMHS	Spare Tips (each)		£ 3.60

MT3 SHANK INDEXABLE ENDMILLS

Tapped 12mm for a drawbar.

Code	Head Dia	Tips	Price
IMH31	32mm	2	£36.00
IMH32	40mm	3	£37.95
IMH33	50mm	3	£39.95
IMHS	Spare Tips (each)		£ 3.60

R8 SHANK INDEXABLE ENDMILLS

Tapped 7/16 unf for a drawbar

Code	Head Dia	Tips	Price
IMH81	32mm	2	£44.95
IMH82	40mm	3	£46.95
IMH83	50mm	3	£48.95
IMHS	Spare Tips (each)		£ 3.60

SET OF 3 1/2 INDEXABLE BORING BARS

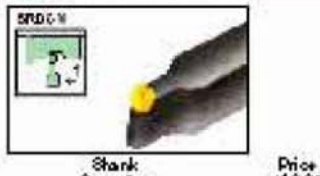
Brand New and Exclusive to Chronos!!

Code		Price
XXI3SET		£46.00
XXI30	Spare Tip	£ 2.95

SCLCR BORING TOOLS FOR YOUR LATHE

Type	ISO Code	Code	Price
SCLCR6mm	S06KSCLCR06	SCB306	£19.95
SCLCR8mm	S08KSCLCR06	SCB308	£19.95
SCLCR10mm	S10KSCLCR06	SCB710	£19.95
SCLCR12mm	S12KSCLCR06	SCB712	£22.95
SCLCR16mm	S16KSCLCR06	SCB716	£24.95
Spare tip	CCMT060204	CCMT060204	£ 3.60

NEW PROFILING TOOL



Code	Shank	Price
PRT06	6mm Sq.	£16.95
PRT08	8mm Sq.	£17.95
PRT10	10mm Sq.	£19.95
PRT12	12mm Sq.	£22.95
PRTSP	Spare Kennametal Tip	£ 3.40

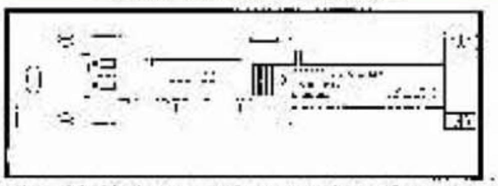
SCLCR SET OF 7 ASSORTED TOOLS

Code	Size	Price
SCIND01	8mm set	£89.95
SCIND02	10mm set	£94.95
SCIND03	12mm set	£99.95

SET OF 5 ECONOMY INDEXABLE LATHE TOOLS

Code	Item	Price
2531400	1/2 set	£32.00
2501400	3/8 set	£26.95
2521400	1/4 set	£24.95
TCMT11020	Spare Tip (5/16, 3/8, & 1/2")	£ 2.95
SPR3	Spare Tip (1/4")	£ 2.95

NEW DIGITAL SCALE UNITS

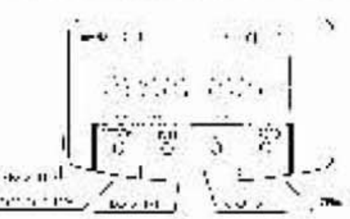


Read metric or imperial with direct conversion and zero button. Graduated 0.01mm/0.0005". Stainless steel construction. Available Horizontal or Vertical.

Code	Size	Type	Price
SU6HZ	6"/150mm	HZ	£49.95
SU6V	6"/150mm	VT	£49.95
SU12HZ	12"/300mm	HZ	£69.95
SU12V	12"/300mm	VT	£69.95
SU24HZ	24"/600mm	HZ	£126.00
SU24V	24"/600mm	VT	£126.00

LCD DIGITAL READOUT BOX

This LCD digital unit is used to display the outputted data by connecting with capacitive digital instruments (such as digital scale unit, digital height gauge, etc.) It has the functions of setting zero at any position, inch/metric interchange and sold/normal display interchange to meet all kinds of needs. The measured value is preserved when the power is cut off. With the magnetic back cover it can be mounted at any place that the operator can see easily.



Code	Price
TSUC0	£55.00

ALL PRICES INCLUDE VAT AND DELIVERY UK MAINLAND

phone for FREE Catalogue

CHRONOS LIMITED
Unit 8 Executive Park, 229/231 Hatfield Road, St.Albans, Herts AL1 4TA
Telephone 01727 832793, Mobile 07974 353185, Fax 01727 848130
Email sales@chronos.ltd.uk, Online catalogue www.chronos.ltd.uk

ONLINE??

VISIT OUR WEB STORE AT www.chronos.ltd.uk

SECURE ON LINE SHOPPING FOR THOUSANDS OF TOOLS

ALL PRICES INCLUDE VAT AND DELIVERY TO UK MAINLAND

MAIL ORDER / TELEPHONE HOTLINE 01727 832793 (5 LINES).

MODEL ENGINEER CLASSIFIED Advertisements

Send to Model Engineer Classified Department, Nexus Special Interests, Nexus House, Azalea Drive, Swanley, Kent, BR8 8HU. Tel: 01322 660070, Fax: (01322) 616319
All advertisements will be inserted in the first available issue. There are no reimbursements for cancellations. All advertisements must be pre-paid.
The Business Advertisements (Disclosure) Order 1977 – Requires all advertisements by people who sell goods in the course of business to make that fact clear. Consequently all trade ads in *Model Engineer* carry this 'T' symbol

WORKSHOP EQUIPMENT

MYFORD ML7 LATHE, totally reconditioned May 2001, reground bed & saddle at Myford Works, complete with cabinet stand. £950 ovno. Tel: 01204 492063 (Bolton).

DORE WESTBURY MILLING MACHINE, motor, m/c vice cutters, collets, etc. £373. Tel: 01623 479722 (Notts).

BOXFORD MODEL B and Emico compact 5 lathes for sale. Tel: 01623 456237 for details and price (Notts).

ABWOOD 6 inch swivel tilt vice £125. J&S universal grinding vice £75. Tel: 01270 587750 (Crewe).

MILLING MACHINE WANTED, Dore Westbury or similar in good working order, call with details. Tel: 01629 53442 (Derbys).

QUORN, 95% finished, c/w motor and wheels. £250. Swallow Tel: 01306 886196 (Dorking, Surrey).

LATHE TOOL BITS, various sizes, types from £2 each, 3 jaw chuck £5. Tel: 07978 359263 (Wrexham).

CHURCHILL CUB GEAR BOX, s/c power feeds, face plate, chuck stand, good condition. £350. Tel: 01788 571759 (Rugby).

HIGH PRECISION compound cross slide tee slot table 7x4 unused £250, various tooling, sae please. Tel: 01708 473013.

FOR SALE complete workshop ML10 bench drill, 6"d/e grinder tools, materials, fixings. Tel: Alan 01727 861469 (Herts).

4" MACHINE VICE, v.good condition, only £35. Tel: 01564 8232223.

FOR SALE

WARCO 220 LATHE

Metric, 3J chuck, faceplates, ER25 collets, QC toolpost with holders, T/S drill chuck, centres, tee-slotted table for cross-slide, on own stand, £650 o.n.o. AMOLCO metric milling machine, collet chuck (metric & imperial), m/c vice, extended column, £500 ono. Buyer collects.

Tel: John Haine 01799 584773

MYFORD ML7 LATHE

3½" x 19" Bench Model, 3 jaw chuck, clutch unit, change wheels, 4 way tool post, leadscrew handwheel, milling attachment, suds tray, reconditioned by Myford.

Suit model maker.

Excellent Condition. £900 ono

Tel: 0121 554 2746

BARGAIN

MICHELL LATHE

OVER 3FT BETWEEN CENTRES. MANY ACCESSORIES. £300.

S.A.E. for details to:

337 HARLAXTON ROAD, GRANTHAM NG31 7JT

Tel: 01476 562066

PUBLICATIONS

MODEL ENGINEER MAGS, most years, from 1965, phone your requirements, 20p each plus postage. Tel: 0181 726168 (Guernsey).

WANTED, Collet chuck, closer etc., cut off slide for a Raglan Little John lathe. Tel: 01847 851602 (Caithness).

MODEL ENGINEER MAGAZINE 1943 to 1952 unbound, good condition. £120 plus carriage. Tel: 01580 761355 (Kent).

WANTED instruction manual for an Astra AR5-E Tool and cutter grinder. Tel: 01847 851602 (Caithness).

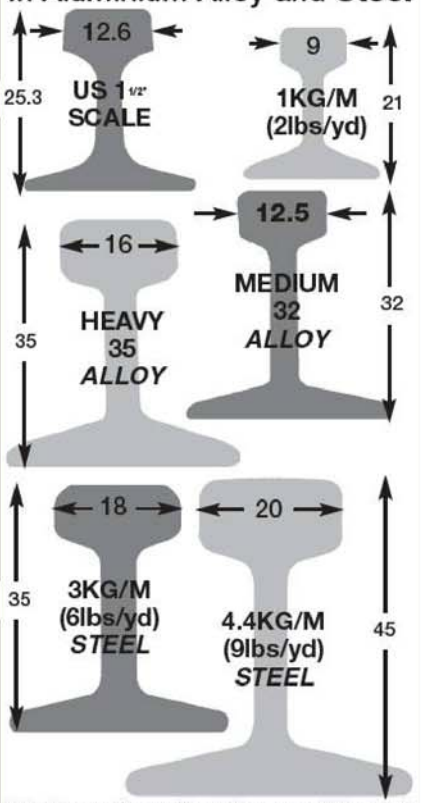
M.E., M.E.W., E.I.M., pile over four feet high. £12. Tel: 02380 76975 (Southampton).

MODEL ENGINEER 1940–1998, E IN M 1979–1998, ENGINEERING BOOKS.
SEND YOUR REQUIREMENTS TO:
THE TOOL BOX, COLYTON, DEVON EX24 6LU
Tel/Fax: 01297 552868

THE MINIATURE RAILWAY SUPPLY CO. LIMITED.

FLAT BOTTOM RAIL

In Aluminium Alloy and **Steel**



All the above section are offered with a range of fittings to suit. Other larger steel rail sections and fittings are also available.

The Miniature Railway Supply Co. Limited.
42 Stratford Way, Boxmoor, Hemel Hempstead, Herts, HP3 9AS, England
Telephone, Fax & Answerphone: 01442 214702
www.miniaturerailwaysupply.com

BLACK-IT!

Easy to use Chemical Blacking for Iron and Steel
Produces a professional satin black finish in less than 15 minutes
Standard kit (4 X 500ml) ideal for modelmakers **£27.99**
Large kit (4 x 2 Litres) **£64.99**
Black-it! kit for Brass £18.99
All prices include VAT & next day delivery
Pixel-Plus, Bryncroes, Pwllheli, Gwynedd LL53 8EH
Tel/Fax 01758 730356 Access, Visa & Switch accepted
For more details, visit our web site at www.black-it.co.uk

HI-TEC 3-PHASE CONVERTERS

Speed Controls, Fwd & Rev Switches, 12 volt & 24 volt dc. to mains 230 volts ac full sine wave inverters. Static and Rotary Phase Converters 0.8 kW to 45 kW to run 3-phase 415 volt machinery from a Single Phase. We can also supply Transformers and Components.

Website: www.phaseconverters.co.uk

BOOST ELECTRICAL ENGINEERING
Tel: 01959 534073 Fax: 01959 532726

WANTED MODEL ENGINEERS WANTED

BEFORE 1990 WANTED FOR SPANISH FRIEND. PREFER FULL YEARS BUT NOT VITAL

Tel: 0208 440 5825
(Barnet)

SOCKET SCREWS

Cap. Csk. Button. Set (Grub). Shoulder
METRIC. BA. BSF. BSW. UNF. UNC
Hexagonal & Slotted Screws Nuts & Washers.
Dowel & Spring Pins. Dormer HSS Taps & Drills. Draper Tools.
NO MINIMUM ORDER **PROMPT SERVICE**
Send 4 x 1st class stamps for our latest catalogue (refundable)

Special offer ***** **Workshop Discount Pack** *****

36 packets of socket, hexagonal and slotted screws up to a max. size of 2BA - 1/4" - M6. Various threads / lengths. Catalogue value of pack is over £35.00
Pack on offer to you for only £16.50 + £2.15 p/p
Send for this offer and benefit from a very useful stock of screws in your workshop.
You will not be disappointed. Refund guaranteed.

EMKAY SCREW SUPPLIES (ME)
74 PEPYS WAY, STROOD, ROCHESTER, KENT ME2 3LL
Tel: 01634 717256 www.emkaysupplies.co.uk *Mail Order Only*

R.A. ATKINS

MYFORD ML7 LATHES, choice	£575
MYFORD SUPER 7 LATHES, from	£850
MYFORD SUPER 7B LATHES, from	£1,150
SMART & BROWN SABEL 4"×18" LATHE, well equipped	£675
HARRISON M250 30" LATHE, TOOLED	£2,500
BCA BENCH JIG BORER, rotary table	£600
WARCO MILL DRILL, POWER FEED, STAND	£595
HARRISON HORIZ MILL, vert head	£700
DOWNHAM MINI BORER, well equipped	£1,150
BOXFORD AUD 22" LATHE	£825
PROGRESS ½ No. 1 PILLAR DRILL, choice	£125
SENIOR SLIDING VERT QUILL FEED HEAD M1	£750
BOXFORD VERT MILLING SLIDE & VICE	£225
MYFORD VERT SWIVEL SLIDE	£110
MYFORD DIVIDING HEAD, 2 plates unused	£450
UNIMATE LATHE, UNIMAT MILL, each	£200

100'S MODEL ENGINEER TOOLS & EQUIPMENT – WE URGENTLY REQUIRE TO BUY WORKSHOPS

HUNTS HILL HOUSE, HUNTS HILL, NORMANDY, GUILDFORD, SURREY GU3 2AH
Tel: (01483) 811146 Fax 811243

COMPLETE HOME WORKSHOPS AND MODELS PURCHASED. DISTANCE NO OBJECT

Tel Mike Bidwell on 01245 222743

READER SERVICE

As a service to our readers, below you will find the latest dates that we can accept copy on the free ads for a particular issue. We hope that you find this useful and would like to thank Bruce Engineering in Middlesex for this suggestion.

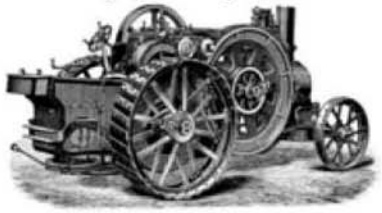
ISSUE	LATEST COPY DATE	PUBLICATION DATE	ISSUE	LATEST COPY DATE	PUBLICATION DATE
4170	2nd may	31st may	4176	25th july	23rd august
4171	14th may	14th june	4177	7th august	6th september
4172	28th may	28th june	4178	21st august	20th september
4173	13th june	12th july	4179	5th september	4th october
4174	27th june	26th july	4180	19th september	18th october
4175	11th july	9th august	4181	3rd october	1st november

MODELS

STATION ROAD STEAM

Steam models • Workshop services
Hot air engine manufacturers

Locomotives, traction engines, stationary engines, boilers, books and accessories bought, sold and part-exchanged. Machining work undertaken. Wide range of interesting items available.



A small selection of our current stock

2 ½ inch scale Fowler Showmans Road Locomotive
4 inch scale Foster traction engine
1 ½ inch pre-war Aveling & Porter traction engine
2 ½ inch gauge 3-cyl "Helen Long" 4-8-4T built 1929
Finely-detailed 5 inch gauge GWR 15xx 0-6-0
5 inch gauge Sweet Pea • Stuart beam engine
Exhibition quality 7 ¼ inch NYC & HRR 4-4-0
7 ¼ inch GWR 1366 Pannier tank • 5 inch Simplex

Part-built & restoration projects including

5 inch Dukedog • 5 inch Hunslet (professional boiler)
1 ½ inch scale Bassett-Lowke Burrell traction engine
3 inch scale Burrell DCC Showmans Road

Good prices paid for all live steam models in any condition. Prompt, courteous service with immediate collection and settlement throughout the UK.

Lists on request by post, fully illustrated and priced catalogue online at

www.stationroadsteam.com

Tel/Fax Reading +44 (0)118 971 3739

Call Today 01322 660070

---

3 inch scale BURRELL TRACTION ENGINE, silver medal 1980 M.E. Exhibition, unused since, in show case. £8,000 offers.

Tel: 01255 670356 (Essex)

Private Collector interested to purchase (fair price paid) 2½" gauge Flying Scotsman Locomotives (prefer Bassett-Lowke built), though would consider otherwise. Spirit or coal fired, would also purchase part built or requiring complete overhaul. Also required 2½" scale brass track, points, etc.

Distance no object. Box Number: 426

SELF CATERING HOLIDAY COTTAGE near Colyton, East Devon, sleeps 4, Pecoma Seaton Tramway six miles. Tel: 01404 871217.

Grandad's Toys

117 HIGH STREET, BURTON LATIMER, NORTHAMPTONSHIRE NN15 5RL (01536 722822)

Retail, Trade & Mail Order

Moulded Clay Miniature Bricks, Roof & Floor Tiles. Scales: 1:10, 1:12 & others. (Send s.a.e. for samples)

www.grandadstoys.co.uk

WANTED set of gears spoked rear wheels, other parts for "Minnie", one inch. Tel: 01422 256969 (West Yorks).

CABIN CRUISER, 54" lg, 18" wide o/vall, c/w engine, many brass fittings, inlaid deck, professionally built, incl. sturdy trolley, all in new condition, must be seen. £650 ono. ¾hp compact engine, brand new, never run, a snip at £50. Tel: 01268 417662 (Essex).

CLAYTON U/T 90% complete, Morewood boiler, extra gear fitted as M.E. Trailer complete, all dwgs, ME copies featuring it. £1,250. Tel: 0208 684 3974 (Croydon).

MEMLIN ENGINEERING. For sale "Minnie" and "Juliet" boilers both built to a high standard, fully silver soldered throughout, complete with test certificate. Also copper boilers built to order. Short head times. Tel: 01354 658220 Mob: 07904 242277.

PRIVATE COLLECTORS SALE, first class working 31/2 inch steam locos Brittania £3,800. Black 5 £4,250. Marina £3,250. Mint 9F Evening Star. Tel: 01785 661936

WANTED ***TWO FEED, DISPLACEMENT LUBRICATOR, WITH TWO SIGHT GLASSES*** **WANTED**

Sold by Reeves to Don Young design.

BRAD E. SMITH, 7474 S. 74TH ST., FRANKLIN, WI 53132–9756, USA
Email: corlissbs@aol.com

COOKHAM MANOR, 5" gauge GWR 4–6–0 professional standard, completed chassis and all running gear, brakes, smoke box fitted, running boards and splashers, commercial copper boiler, tender parts with materials, twin lubricators. £3,000
JULIET, 3.5" gauge 0–4–0 rolling chassis with pump, excentrics, buffers, machined parts including cylinders, coupling rods, copper boiler well advanced, new set of drawings, ME instructions. £385
FURY, 5" gauge 4–6–0 three cylinder, compound locomotive, advanced stage, engine with valve running gear motion, smoke box, tender and boiler partly built, set of Martin Evans drawings plus original workshop plans and photos. £1,350
RARE OPPORTUNITY, Peveril Isle of Man 2–4–0 5" gauge, advanced stage, professionally built with all photos/drawings, copper boiler materials, flanged plates, tubes, etc, twin lubricators £1,200
TRACTION ENGINE, large, well advanced stage, copper boiler, four wheels complete with tyres, axles, twin cylinder, valve and motion, fitted crank, gears cut, tender finished £1,750

Tel anytime 01483 274464 (Surrey) or mobile 0776 2326878 – Packing & delivery arranged if required, free of charge on the UK

TONY GREEN
Steam Models

Stationery, Wheeled and Marine Models – Mamod, Wilesco, Unit Steam Engines and MSS. Spares for most models including Hornby Rocket. Secondhand, Restored and Collectors Models sometimes available. MSS Loco and Spares. Steam and R.C. Boat Kits – Midwest, Artesania Latina and Mantua Range.

SEE US AT MAJOR EXHIBITIONS AND RALLIES.

Visit our web site: **www.tgsm.co.uk**

or send four first class stamps for full catalogue to:

19 Station Road, Thorpe on the Hill, Lincoln LN6 9BS
Tel: 01522 681989 Fax: 01522 683497
Email: tgsml@btinternet.com

VISA EUROCARD MasterCard

MAJOR CREDIT CARDS ACCEPTED

5" GAUGE POLLY LOCOMOTIVES
turning your dreams into reality . . .

If you have ever dreamed of building and driving your own steam engine then the range of POLLY LOCOMOTIVES is meant for you!

Polly Locomotives are freelance steam locomotives designed in a 19th Century style. The kits are manufactured to a high standard and incorporate many traditional features that appeal to all enthusiasts from beginner to the committed club member, and can be driven for pleasure in the garden or club track. Depending on the model, they will pull six to eight people providing pleasure for family and friends.

They are available in five different models:–

- Polly I 0-4-0 Side Tank Locomotive (approx. 6 person capacity)
- Polly II 0-4-0 Tender Locomotive (approx. 6 person capacity)
- Polly III 0-4-0 Side Tank Locomotive (approx. 8 person capacity)
- Polly IV 0-6-0 Tender Locomotive (approx. 8 person capacity)
- Passenger Driving Truck

The complete locomotives are supplied in kit form with assembly drawings and a full set of instructions. They are straightforward to build, but we will always be pleased to help with queries.

FOR FURTHER INFO ON THE POLLY MODELS RANGE
TEL: 0115 8491560 (Mobile: 07790 116339)
189a DERBY ROAD, LONG EATON, NOTTINGHAM NG10 4LQ.

INTERNAL COMBUSTION ENGINES

DRAWINGS, CASTINGS, MATERIALS, SPARK PLUGS, TIMING GEARS, ETC AVAILABLE

FOR A RANGE OF DESIGNS INCLUDING:

- 0.8CC & 5CC DIESEL
- 6CC TWO STROKE
- 10CC GLOW PLUG
- 2 CYL. 30CC O.H.V.
- 4 CYL. 30CC O.H.C

WORKSHOP EQUIPMENT

DRAWINGS AND CASTINGS FOR MILLING ATTACHMENTS, BORING HEADS VERTICAL MILLING MACHINE ETC

RADIAL & STATIONARY STEAM ENGINES

ILLUSTRATED CATALOGUE AND PRICE LIST £1.50

WOKING PRECISION MODELS
27 Petts Crescent, Littleborough, Lancashire, OL15 8ED

DON'T DELAY CALL TODAY! 01322 660070

PLEASE MENTION ME WHEN REPLYING TO OUR ADVERTISERS

COPPER BOILERS

COPPER AND SILVER SOLDERED BOILERS FOR LOCOMOTIVES, TRACTION, MARINE AND STATIONARY ENGINES. PRIORY BOILERS

R.L. RADBOURNE,
THE SUMMER HOUSE,
COOK HILL PRIORY,
ALCESTER,
WARWICKSHIRE B49 5LN
TEL: 01789 765412

GENERAL SERVICES

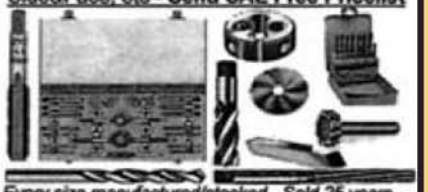
PICADOR Plummer Blocks, Handwheels, Pulleys, Flexible Couplings, 'Lubronze' bushes and other transmission products
FREE CATALOGUE AND LISTS
TOWNLEY TIMES
Harehill, Todmorden, Lancs. OL14 5JY
Phone 01706 814931 Fax 01706 812382

THE PEATOL LATHE

£160 including 3 or 4 jaw chuck. Milling attachment and other accessories available. Centre height 2½" distance between centres 9½". Full details send 2 x 2nd class stamps.
Peatol Machine Tools, M.E.W, 19 Knightlow Road, Harborne, Birmingham B17 8PS Price inc. VAT

Call Today 01322 660070

TAPS & DIES
Also: Drills, Reamers, Endmills, Slotdrills, Stubdrills, Toolbits, Slitting Saws, Cutters Side&Face, etc - Send SAE Free Pricelist



Every size manufactured/stocked - Sold 25 years -
EXCELLENT 1st QUALITY HQSS TAPS & DIES
Fax/phone Enquiry/Orders - ***SAME DAY POST***
BSW,BSF, UNC,UNF, Metric, BA, Cycle, BSP, ME
Individually or in Wooden & Metal Boxed Sets
Our brands: 'T&D-HQS' & 'ZN' & 'TOTEM'
DISTRIBUTORS REQUIRED
THE TAP & DIE CO.
445 West Green Road, London N15 3PL.
Tel: 020 8888 1865 Fax: 020 8888 4613

www.eternaltools.com
secure ordering online
DIAMOND WHEELS
All Shapes for all machines:
Quorn, Kennet, Bench Grinders
Prices from: £34.95 inc VAT

"Bring life to old carbide tools"
Eternal
tel/fax: 020 8880 0974

TOOLCO
The home of good quality used tools and machinery
www.toolco.co.uk
or send for full itemised stocklist.
Unit 4, Ebley Ind Park, Ebley, Stroud, Glos GL5 4SP
Important: Phone for opening times before travelling.
(Just 4 miles J13 M5 Motorway) Tel: 01452 770550
E.Mail: sales@toolco.co.uk Fax: 01452 770771

TRUE PHASE CONVERTERS
ESTABLISHED FOR 60 YEARS

- RUN THREE PHASE MACHINES FROM A SINGLE PHASE SUPPLY
- REVOLUTIONARY DESIGN
- OUT PERFORMS OTHER CONVERTORS
- MONEY BACK GUARANTEE

DANEBURY ELECTRIC LTD
PHONE, FAX OR EMAIL FOR COLOUR BROCHURE
email: truephasesales@danebury electric.co.uk
Tel: 01202 524888 or Fax: 01202 530940

RJ WOODS *POOLE DORSET*
Engineering Services
Machined parts to your requirements, from drawing, sketch or sample.
Castings machined, components fabricated. From a single part to a whole assembly. Personal Service.
Telephone or fax 01202 671169

MODEL ENGINEERING SERVICES
Machining ★ Fabrications
Copper Boilers ★ Welding etc.
Eddie Ions 01670 855124

MODEL MAKING METALS
1/32in. to 12in. dia. bright steel,stainless steel, bronze, spring steel, brass, aluminium, silver steel, steel tubes, bolts, nuts & screws, tap dies + drills, white metal casting alloys. Fine materials, chain, plastic, Lathe milling machines and equipment, new and secondhand.
Mail order nationwide and worldwide callers Mon.-Fri. 9-5pm.
Access/Visa welcome
Send now for a free catalogue or phone:
Milton Keynes Metals, (formerly Flapstock Ltd.), Dept. ME, Ridge Hill Farm, Little Horwood Road, Nash, Milton Keynes, MK17 0EH Tel: (01296) 713631 Fax: (01296) 714155

PLEASE MENTION ME WHEN REPLYING TO OUR ADVERTISERS

Model Engineering Supplies (Bexhill)
Visit our new web site – see the complete loco/rolling stock catalogue.
www.model-engineering.co.uk
E-mail us at: diesel@17bexhill.fsnt.co.uk
or birdman@moravel.freeserve.co.uk
Model loco/rolling stock catalogue £1.25 inc. postage.
Model engineering supplies catalogue £1.00 inc. postage.
Visit our shop to see our raw material stocks, used equipment etc.
Phone/Fax. 01424 223702 Mobile 07808 212236
17 Sea Road, Bexhill-on-Sea, E. Sussex TN40 1EE
www.model-engineering.co.uk

MODEL ENGINEER

LINEAGE/SEMI DISPLAY COUPON (Model Engineer) Advertisement Dept. Nexus Special Interests, Nexus Media, Azalea Drive, Swanley, Kent, BR8 8HU.
No reimbursements for cancellations.

FOR ENTHUSIASTS BY ENTHUSIASTS
HIGHBURY NEXUS

PLEASE TICK ONE BOX ONLY

☐ WORKSHOP EQUIPMENT ☐ MODELS & MATERIALS ☐ BOOKS & PUBLICATIONS ☐ SERVICES ☐ GENERAL

PRIVATE SALE/TRADE SALE (DELETE NON-APPLICABLE)

TEL. NUMBER					

ALL ADVERTISEMENTS MUST BE PRE-PAID. NO REIMBURSEMENTS FOR CANCELLATIONS.

I enclose my Cheque/Postal Order* for £ .....for .....insertions,
made payable to Nexus Media Ltd.
(*Delete as necessary) or Please debit my Mastercard/Barclaycard No. Expiry Date

£ ..... for ..... insertions.

Name .....
Address .....
.....
.....Post Code .....
Daytimes Tel. No .....
email ..... @ .....
Signature .....Date .....

PRICE GUIDE – Tick one box

18 words or less **FREE!! (private sales only)** ○
18-25 words, in colour **only £10** ○
26 words + in colour **£15** ○
Private ad, in box, full colour, endless
word count – 2.5 x 1 **£25** ○
3 x 1 **£30** ○
3.5 x 1 **£35** ○

THE ESSENTIAL WORKSHOP LIBRARY

from NEXUS SPECIAL INTERESTS BOOKS

MODEL ENGINEERING BOOKS

Building Simple Model Steam Engines
Tubal Cain

Building Simple Model Steam Engines II
Tubal Cain

Model Engineering - A Foundation Course
Peter Wright

Model Engineers Handbook
Tubal Cain

The Model Locomotive from Scratch
B. Terry Aspin

Introducing Model Traction Engine Construction
John Haining

The Countryman's Steam Manual
John Haining

An Introduction to Robotics
Harprit Sandhu

The Amateur's Workshop
Ian Bradley

The Amateur's Lathe
L.H.Sparey

WORKSHOP PRACTICE SERIES

Hardening, Tempering & Heat Treatment — WPS 1
Tubal Cain

Vertical Milling in the Home Workshop — WPS 2
Arnold Throp

Screwcutting in the Lathe — WPS 3
Martin Cleeve

Foundrywork for the Amateur — WPS 4
B.Terry Aspin

Milling Operations in the Lathe — WPS 5
Tubal Cain

Measuring & Marking Metals — WPS 6
Ivan Law

The Art of Welding — WPS 7
W.A.Vause

Sheet Metal Work — WPS 8
R.E.Wakeford

Soldering & Brazing — WPS 9
Tubal Cain

Saws & Sawing — WPS 10
Ian Bradley

Electroplating — WPS 11
J.Poyner

Drills, Taps & Dies — WPS 12
Tubal Cain

Making Small Workshop Tools — WPS 14
Stan Bray

Workholding in the Lathe — WPS 15
Tubal Cain

Electric Motors — WPS 16
Jim Cox

Gears & Gear Cutting — WPS 17
Ivan Law

Basic Benchwork — WPS 18
Les Oldridge

Spring Design & Manufacture — WPS 19
Tubal Cain

Metalwork & Machining Hints & Tips — WPS 20
Ian Bradley

Adhesives & Sealants — WPS 21
David Lammas

Workshop Electrics — WPS 22
Alex Weiss

Workshop Construction — WPS 23
Jim Forrest & Peter Jennings

Electric Motors in the Home Workshop — WPS 24
Jim Cox

The Backyard Foundry — WPS 25
B.Terry Aspin

Home Workshop Hints & Tips — WPS 26
Edited by Vic Smeed

Spindles — WPS 27
Harprit Sandhu

Simple Workshop Devices — WPS 28
Tubal Cain

CAD for Model Engineers — WPS 29
D.A.G.Brown

Workshop Materials — WPS 30
Alex Weiss

Useful Workshop Tools — WPS 31
Stan Bray

Unimat III Lathe Accessories — WPS 32
Bob Loader

Making Clocks — WPS 33
Stan Bray

Please add £1 p&p for single book orders and 50p for each additional book ordered.

Send payment with your name, address and telephone number to:
Nexus Customer Services, Nexus House, Azalea Drive, Swanley BR8 8HU.
Cheques made payable to Nexus Media Ltd. or phone 01322 616300.

Chester UK Ltd

Clwyd Close
Hawarden Ind Estate
Hawarden
Nr. Chester
Flintshire
CH5 3PZ

Introducing the new DB range of Lathe's

From **£880**

Mini - Multi

From **£350**

Price include VAT & Delivery UK

Conquest Lathe

£445

Price include VAT & Delivery UK

920 Lathe Deluxe

£850

Price include VAT & Delivery UK

Model B-Super

£725

Price include VAT & Delivery UK

Comet Lathe

£1155

Price include VAT & Delivery UK

Centurion

£1395

Price include VAT & Delivery UK

Craftsman Precision Belt Drive

£1725

Price include VAT & Delivery UK

Cub 620/630

From **£2460**

including VAT

Call for our latest Tool Catalogue
01244 - 531631

Visit our Website for more Information
www.chesteruk.net

E-mail us at
Sales@chesteruk.net