MODEL ENGINEER

Vol. 192 No. 4221

14 - 27 May 2004

MARTIN EVANS RALLY

22/23 May 2004

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All Welcome! Details inside

CANNON SHARPENER

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- TRAVELLING STEADY
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- 3MT AND 2MT DEAD CENTRES
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- PRECISION GROUND VEE BEDWAYS
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OPTIONAL FLOOR STAND £99

SPECIFICATION:
- CENTRE HEIGHT 4"
- DISTANCE BETWEEN CENTRES 14"
- SWING OVER CROSS SLIDE 5"
- SPINDLE BORE 3/4" CLEARANCE
- SPINDLE SPEEDS (6) 140/1710 RPM
- HEADSTOCK TAPER 3MT
- TAILSTOCK TAPER 2MT
- RANGE OF IMPERIAL THREADS 8-24 TPI RANGE OF METRIC THREADS 0.4MM – 3MM
- MOTOR 1/2 HP 1 PHASE
- DIMENSIONS 38" LONG x 19"WIDE x 15" HEIGHT
- WEIGHT 230 LBS

ZX-15 MILLING MACHINE

Ideally matched to the BV-20 Lathe

Table size	654mm x 150mm
Longitudinal travel	455mm
Cross Travel	145mm
Spindle Stroke	90mm
Spindle Taper	3MT
Diameter of Spindle	63.5mm
Diameter of Column	66.65mm
Throat	165mm
Max distance spindle to table	320mm
Height with head at top of column	1067mm
Width	775mm
Depth	559mm
Spindle speeds	400-1640
Motor	1 phase 1/2hp with F/R switch
Weight	295lb
Head tilting	90-0-90 worm gear tilt mechanism

General dimensions may be subject to minor variations.

ONLY £550 INC V.A.T. & DELIVERY

OPTIONAL STAND £89

New ER-32 LATHE COLLET CHUCK

- LOW COST ACCURATE SYSTEM
- HARDENED AND GROUND
- COLLET CAPACITY 3MM TO 20MM.
- BAR STOCK WILL PASS THROUGH COLLET AND CHUCK
- **100MM DIA £49.00**
- **150MM DIA £59.00**

IT IS NECESSARY TO MOUNT THE COLLECT CHUCK TO AN APPROPRIATE BACK PLATE. WE CAN SUPPLY BACKPLATES FOR WARCO AND MYFORD 7 SERIES LATHES.

- ER COLLETS ARE AVAILABLE IN 18 PIECE SETS 3MM TO 20MM OR INDIVIDUALLY
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- BOXED SET 0F 18 ER-32 COLLETS 3MM TO 20MM £190
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Model Engineer is published by
HIGHBURY LEISURE Publishing Limited
Berwick House, 8-10 Knoll Rise, Orpington, Kent BR6 0PS
Tel: 01689-887200 Fax: 01689-886666
www.hhc.co.uk/modeng
HIGHBURY LEISURE Publishing Limited, a
HIGHBURY HOUSE COMMUNICATIONS PLC
COMPANY

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Origination by
Atelier Data Services

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SUBSCRIPTIONS & BACK ISSUES

Direct Subscriptions and Back Issues are available from HIGHBURY LEISURE Subscription Services, Link House, 8 Bartholomew's Walk, Ely, Cambs CB7 4ZD
Phone: 01353 654429; Fax: 01353 654400
Email: leisure.subs@highbury-wyvern.co.uk
Rates for 26 issues (annual), 13 issues (six months):
UK: £62.00 (annual) £31.00 (six months);
Europe: £75.00 (annual), £37.50 (six months);
US Airmail: $124.00 (annual), $62.00 (six months);
RoW Airmail: £81.00 (annual), £40.50 (six months).
Cheques payable to Highbury 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 Publications, 5150 Candlewood Street, Suite #1 Lakewood, CA 90712-1900, USA
Phone: 562-461-7574; Fax: 562-461-7212.
Email: info@wiseowlmagszines.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. 192 No. 4221 14 MAY 2004 ●

On the cover ...

Originally designed and made by Dr. Philip Woodward, the Woodward Gearless Clock currently being featured in these pages is a novel departure from conventional clock design. This example made by Tommy Williams is based on John Wilding's interpretation of the design and is a particularly well-made and finished example. The decision to display the clock in a picture frame is unusual and stems from a suggestion made by the builder's wife. It forms a delightful conversation piece as well as being an effective means of telling the time. The gearless clock concept holds much interest for the amateur clock maker who is relieved of the task of cutting and accurately meshing the gear wheels which feature so prominently in most conventional clock designs. For Part III of this series, written by a contributor recognised as pre-eminent in promoting amateur clock building, turn to page 552 of this issue.

(Photograph by Tommy Williams)

TURN TO PAGE 581 FOR GREAT OFFERS ON SUBSCRIPTIONS!

INDEX to ADVERTISERS

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SPRING / SUMMER 2004

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Accessories Included

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- Curent range 45 - 180 amps
- Electrode size 1.5 - 3.25mm
- Approx. weld thickness range 1.5-7mm (mild steel)
- Ready to use from the box

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Accessories Included

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- Ready to use from the box

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X6510	Migmate 150 Turbo	$174.99	$205.61
X6515	Migmate Pro 170 (Copper wound)	$279.99	$328.99
X6519	Wheel Kit - for X6508 & X6510	$ 5.99	$ 7.03

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Accessories Included

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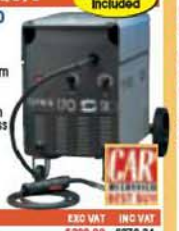
- Current range 25-170amps
- 6 power settings
- Wire size 0.6 - 0.8mm
- Takes up to 15Kgs spools of wire
- 3m professional torch
- Approx. weld thickness range 0.7 - 7mm



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- 3000 rpm
- 13 kgs

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- Detachable handle for use on the side or top

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- Oil free - low maintenance

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- Supplied in blow moulded
- Quick release valves
- Air blow gun & tyre inflator case
- In line oiler with oil
- Variety of air fittings

X7318

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- Noise level 89 db(a)
- Average air consumption 1.4cfm

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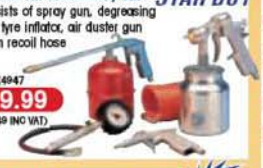

X4947

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NEW!

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SUMMER STAR BUY

- Motor 24v 2400 rpm
- 1.7 Ah Ni-Cad Battery, 24V charger supplied
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- Laser guidance device for fast & accurate setting
- Blade size 190 x 2.5mm, Bore 16mm (5/8")
- Full loading running time 15mins
- Maximum cutting capacity 110x50mm
- TCT blade included
- 2year Warranty

Laser Guidance

X1351

£85.06

($99.95 INC VAT)

10" Sliding Compound Mitre Saw with Laser

NEW!

Laser Guidance

- Mitre range: -55°/00°/+55°
- No load blade speed: 4200rpm
- Saw blade TCT: - 255 x 16mm Bore x 36 Teeth
- Power rating: 2000w
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- Dust extraction facility

X1314

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- Tubular steel sliding rails, extendable from 1220 - 1900mm
- Wheel kit
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*Saw not included

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- Heavy duty metal lance with rubber grips and angular jet
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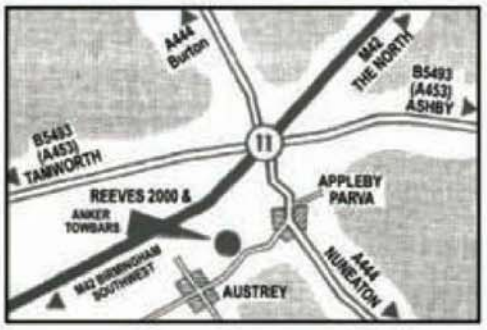

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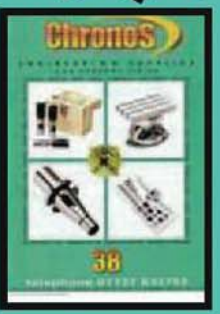

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With the Editors

Competition
Facing this page is to be found a Competition with a very special prize. Peter Cook of Greenwood tools explains that England cricket team captain Michael Vaughan is the son of Graham Vaughan, Sales Manager of Dormer Tools (Sheffield) Limited and since Greenwood Tools are main Dormer distributors, he has a miniature Gun & Moore cricket bat signed by Michael Vaughan to present as a one-off prize in this free Competition.

Readers are invited to use their knowledge, skill and experience to answer the five multiple-choice Competition questions and send their answers in an envelope marked 'Bat Competition' to Greenwood Tools Ltd. 2a Middlefield Road, Bromsgrove B60 2PW. The winner will be the first correct entry opened after the closing date, 31 May 2004. Answers on a photocopied form are acceptable.

Do *not* send your answers to Highbury Leisure Publishing Limited, or to the Model Engineer Editorial Office but to Greenwood Tools at the address printed on the Competition form and repeated above.

BDSME Official Opening
It was with particular pleasure that I was able to accept an invitation to attend the Official Opening of the new track recently completed by members of Bournemouth and District Society of Model Engineers. Readers who follow *Club Chat* will be aware that the society had to move from its original site in Kings Park and was given the opportunity to relocate in Littledown Park.

I understand that Bournemouth Borough Council has been very supportive of the move which has seen the BDSME Littledown track rise from nothing to running the first train in only 51 weeks. The event was very well attended and the Official Opening on 11 April, which will be fully reported in a future issue, was undertaken by the Mayor who expressed her best wishes for the future of the Society in its new location.

Martin Evans Memorial Rally 22/23 May 2004
We would like to remind readers that as part of their Diamond Jubilee Celebrations this year, Tyneside Society of Model and Experimental Engineers Ltd. are holding a special Martin Evans Memorial Rally at their Exhibition Park track site in Newcastle upon Tyne.

TSMEE can accommodate 3½ and 5in. gauge locomotives, camping facilities are available and caravans are welcome by prior notification. Road vehicles can also be operated on site.

Although this event is a Martin Evans Memorial Rally, all locomotive designs will be welcome provided valid boiler certificates and other relevant documents are available.

Further information can be had by contacting TSMEE Secretary Ian Spencer on 0191-284-3438; e-mail: **tsmee.newcastle@virgin.net**

Fifteenth *Tom Rolt* Vintage Rally
We take this opportunity to remind readers of the event to take place Sunday and Monday 30/31 May 2004 at Hendy County Showfield (off A493) Tywyn, Gwynedd.

This special event will feature steam road vehicles, vintage cars, lorries, buses and fairground attractions. Open 10am-5pm both days, other attractions include crafts, models, miniature railway, fairground organs, trade stands, the Tywyn Silver Band, refreshments, real ale tent and much more.

Admission: £3.50 (adults); £2 (children/OAPs); £9 (family). Contact the Talyllyn Railway at Wharf Station, Tywyn, Gwynedd LL36 9EY (tel: 01654-710472; fax: 01654-711755; **www.tomroltrally.org.uk**) for further details.

New event for 2004: Kew Bridge Model Boat Show
The early days of steam have always been an inspiration to model makers. To reproduce the excitement and grandeur of steam power must be one of the most fulfilling aspects of the hobby. Recreating the past in miniature is hugely satisfying and there is nothing like studying the real thing as a prelude to a new project or to provide respite from a current project. A new event in June will give modellers the chance to study steam in both land based and water borne forms at the same time. The Kew Bridge Model Boat Show is being organised jointly between the Kew Bridge Steam Museum and the *Medway Queen* Preservation Society in aid of their respective industrial heritage charities supporting Kew's collection of steam engines and the fund for rebuilding the paddle steamer *Medway Queen*.

In addition to the usual Kew Bridge Steam Museum attractions, which include magnificent Victorian beam engines and narrow gauge railway rides, the museum will be host to displays of model boats from local (and not so local) clubs and individuals. There will be a demonstration pool, sponsored by Pathtrace Engineering Systems, where visitors can see models put through their paces and static displays of waterline and full-hull models of all shapes and sizes. The planned exhibits range

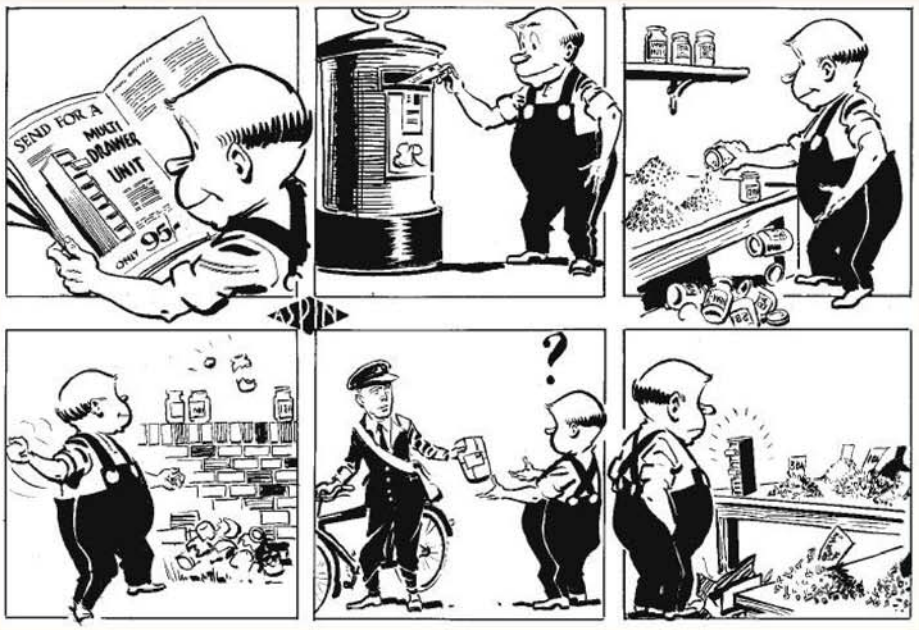
Proceeds from the new Model Boat Show at Kew Bridge Steam Museum 12/13 June presented in conjunction with the Medway Queen Preservation Society will support the Kew Bridge Engines Trust and New Medway Steam Packet Co. Ltd.

from a beautiful 1:32 scale model of *Medway Queen* herself to a 'Fleet Review' of 100 waterline model ships in 1:1200 scale. Many of these latter models are well over 60 years old and museum pieces in their own right. The model display will be supported by trade and society stands to complete a day out with appeal for family and enthusiast alike.

Organised in support of Kew Bridge Engines Trust (Reg. Charity 269285) and the New Medway Steam Packet Co. Ltd (Reg. Charity 296236), the Kew Bridge Model Boat Show will be open 11am-5pm 12/13 June.

Kew Bridge Steam Museum is located in Green Dragon Lane, Brentford TW8 0EN. Normal museum admission charges apply. Further details are available from tel: 020-8568-4757; website: **www.kbsm.org**

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



The late Louis Harling

SIRS, - It is with sincere regret that I record the passing of Louis Harling who died peacefully 14 April this year. Born 10 April 1913, he spent his life in engineering and was one of few remaining with first hand knowledge of working industrial stationary steam engines. In later life he used his almost unrivalled knowledge to assist in the preservation of a number of engines.

An accomplished model engineer working mainly in 1:24 scale, Louis built numerous models of stationary engines, working from measurements of the original, noted on scraps of paper. The scale to which he worked meant that most of his models involved the use of 14 and 16BA fastenings and, with nothing suitable commercially available, he made his own. All his gears were hand filed. If his model was of an engine mounted on a stone plinth, he would find a suitable piece of local stone and cut it into the tiny blocks required to make the plinth.

For many years Louis would show his latest creation to a few friends, make a special wooden box for it, and put it in the loft. From time to time models were brought out and pleasure obtained from running them. He eventually allowed himself to be convinced that such fine work deserved to be seen by a much wider audience and was persuaded to display one at a Model Engineer Exhibition where it was awarded a Gold Medal.

He agreed to enter another the following year with the same result, and having built an average of one a year for many years, he had many more that could have been displayed. Exhibition work, however, was not for him and he spent the latter part of his life happily running his models for his own pleasure and that of his friends.

Louis Harling was a remarkable man who set standards that most of us would like to be able to emulate. He will be missed by all who knew him or had the privilege of seeing his work.

Stan Bray, Lincolnshire.

Elmdon MES

SIRS, - In a recent letter with news of Elmdon Model Engineeering Society, I regret that there was an error concerning the club's new website address which is **www.wythallsteamrail.co.uk** and not as published on page 400 in *M.E.* 4218, 2 April 2004.

I apologise for any inconvenience this may have caused, and hope you will be able to publish a correction.

Chris Giles, Elmdon MES.

You pay your money ...

SIRS, - About fifty years ago, my wife and childhood friend gave me a belated wedding present: a Myford Super 7, something we just could not have afforded in 1948; even church mice did not ask to stay. She bought it from Buck & Ryan in Tottenham Court Road, London who delivered it to Balsham complete with 3- and 4-jaw chucks, vertical slide and so forth, all for £124.

Some ten years back, the bed was worn and the tapered headstock bearing a trifle oval, all from continuous use on nearly everything Stuart (Turner) had on offer, bits for my 3 litre Bentley, a couple of locomotives and the start of the smaller bits of a 3in. scale *Little Samson* traction engine. My call to Myford seeking help was answered with the advice to clean and strip the lathe and give them the bed, headstock, mandrel and cross-slide to be made good, all for around £140.

Paint was lacking here and there, so I stripped it to base, put phosphate primer on the steel, etch primer on the aluminium alloy and then applied three coats of brushing filler undercoat, two of dark battleship undercoat, all with much activity with wet-and-dry, and I took it to Nottingham. I collected it two weeks later, paid up £120 and found to all intents and purposes, I had a new lathe. It's still in almost daily enjoyable accurate use and is a magnificent tool. My sons and friend have all bought old, inexpensive Myfords and followed the same route into excellent refined British engineering. I have profound regard for the foreman and fitters I have met, and for the company as a whole; long may they prosper.

Foolishly, I've twice bought far Eastern manufacture: a mill/drill with a variable angle head which neither my Tom Senior nor Startrite machines had, and a dividing head. The mill/drill came with metric graduations on the traverse and imperial on the longitudinal feeds; there was no way of locking the depth of feed calibration, one of three handles on the downfeed was loose and fell out, and it was not possible to lock the traverse. I gave it away to somebody who enjoys rebuilding things.

The first thing I did to the dividing head was to take it apart, wash out the residual iron dust (21.5 grams) and re-assemble it; it seemed rather nice. It and its tailstock (another 14.6 grams of iron dust) came without the tenons to locate in the milling table tee-slots as normally supplied with such parts. A 'phone call elicited that they were not supplied, so I made my own to find the base screw holes were not in line in the long slot. I made and hardened marking screws and carefully punched to mark my strips. I then found about 1/4in. misalignment between the head and tailstock. A test using a dti revealed that the milled headstock tenon slot was some 3 1/2deg. out of line with the headstok bore. The tailstock appeared to be true.

I abandoned the idea of tenons, set up the headstock using a test bar and dti and at last got around to the simple job I wished to do.

In order to get on with my *Little Samson*, I bought a Colchester lathe in excellent order, while a son at an auction for woodworking machinery returned with the machine vice I wanted — attached to the table of a Bridgeport mill equipped with a dividing head, rotary table and a boring and facing head.

The foregoing all goes to show something or other, but whichever route we take it should be full of joy and make the time pass easy.

I would end by saying how much I cherish your magazine; it is something to look forward to. Your brilliant range of writers: T. D. Walshaw (*aka Tubal Cain* — it's worth consulting *Genesis*) who gave me exactitude and made all things possible; K. N. Harris, J. P. Bertinat, George Thomas, Martin Evans and so many more. And so I greatly appreciate the different approach of Martin Wallis; apart from his *Little Samson* series being enjoyable, he supplies outstandingly good castings as well!

Perhaps I should summarise this as 'you pays yer money and you takes yer choice' — there is no *one* right way.

John McIntyre, Cambridgeshire.

3-phase converter

SIRS, - I have been fortunate in obtaining a Colchester Chipmaster lathe for my home workshop. I now need to be able to run this 3-phase machine on my normal domestic single phase electricity supply.

Has any reader a suitable Transwave unit which is now surplus to requirements (i.e. second-hand) and which they are willing to sell me?

I understand that I require a minimum 3HP capacity and a 5-pin connector since the equipment is fitted with a neutral line.

I shall be pleased to hear from anyone who can help.

Paul Tompkins, Surrey,
tel: 01252-314114.

Heavy loads

SIRS, - I was most interested to see Martin Wallis' article on the moving of heavy loads by traction engine and the splendid accompanying photographs in *M.E.* 4218. 2 April 2004. On page 389 the transport of gun mountings for the battleship *Rodney* is shown but they are not, as described, for the 16in. main armament, but the secondary 6in. mountings which are shown. I discussed this photograph with Tom McTaggart many years ago in Glasgow's Mitchell Library for he had included it in his book *The Big Box* which Martin Wallis mentioned at the end of his article.

When full stripped for transport, the turntables for *Rodney* and her sister *Nelson* in fact weighed some 170 tons, way beyond the capacity of those crude looking trucks behind *Titan*. The turntables for *Rodney* were shipped by coaster via the 150 ton hammerhead crane at the Devonshire Dock, Barrow, and placed aboard by Cammell Laird's own 200 ton floating crane. *Nelson's* were transported down the Tyne from Elswick, and shipped aboard the vessel at Walker by Swan Hunter's 150 ton floating crane *Titan*.

Readers may also be interested in Tom McTaggart's other book on the same subject *Pioneers of Heavy Haulage* which includes many fine shots of traction engines and a variety of early petrol/diesel tractors hauling some truly massive loads.

Brian Newman by e-mail.

Washington

SIRS, - I am nearing completion of locomotive *Washington* to the Reeves design and would like to compare notes with anyone else who is involved with the same project.

I would also like to take this opportunity to thank you all for a most interesting and informative magazine.

Stuart Clayton, Manchester.

Workshop aids for persons suffering the decrepitude of old age

SIRS, - I not only suffer the usual aches and pains of old age, but the aftermath of long-ago traumata sometimes combine to make life difficult. In case I have any fellow sufferers, I extend my condolences, and make this small offering in the hope that it will assist.

My photograph shows two aids

Above: Mr. Ken Rawlings' organ to John Smith's original design and embellished with a fair organ front.

Left: Mr. Derek Cook's scissors jack and small bench table are essential items in his workshop.

which have combined forces to lend a third hand. When I had to climb on a stool to get the drilling machine table above the half-way mark, I made the arrangement visible in the picture. It consists of one of those 'hinged parallelogram' car jacks with a small crank (about 60mm throw) clamped into the operating end of the screw. I kept the long handle in case I want to use the jack as a 'spreader' — it will keep me a respectable distance from the action.

The little table on the bench is one of the most used items in the shop. The vice jaws are (my) elbow height, and the table about 50mm higher. The top is block-board surfaced with Melamine and was originally from one of those old hospital over-bed tables. The remainder provided the foundation for a drive-in watercolour painting station for a young woman with cerebral palsy. Legs are 25mm RHS welded to square plates, and I remembered to drill and countersink the screw holes before welding. Its function is to enable me to maintain a straight back when sketching ways and means, dealing with small mechanisms, looking up tables (the sort you find in books), and it can be used as a sort of surface-plate — accurate enough for many purposes. It also supplies extra space for clutter. I know I should have cleared the bench top before taking the photograph, but I was busy, and somehow it wouldn't have looked right.

The combined operation is necessary when drilling long pieces. At the back of the bench there is a collection of bits of plywood, etc., and a shiny piece of polythene to top the pile which supports one end of the workpiece. Fine adjustment to get the workpiece flat on the drilling table is by means of the height adjuster described above. I could use a rear light to see when the workpiece is 'flat', but as the floor under the bench is horizontal lengthwise, I just use a spirit level on the work. The 35sq. heavy gauge 2m long piece of RHS in the picture was fairly hefty and while the polythene made it reasonably easy to manoeuvre, I could have made it easier still by attaching a clamp and using this to tap the piece lengthways — drilling had to be precise.

I should perhaps add that the roller topped supporter of the 'other' end I use with my splendid Oriental bandsaw doesn't extend sufficiently to be used to the left of the drill, or fall sufficiently to be used on the bench side, and this arrangement is good enough for occasional use.

The drill quill only drops just over 60mm, so if I want to drill holes for bolts in timber over that size, I can give the hole a start using this method, and finish it using a pistol drill, with a guaranteed right angle.

I cannot recommend old age, but the alternative is a bit grim.

Derek Cooke, Western Australia.

Dean Goods locomotives

SIRS, - I am building a pair of GWR Dean goods locomtives for 5in. gauge from old copies of drawings from the now defunct Kennion Brothers of Hertford Ltd.

My progress has halted as the sheet detailing the valve gear, eccentrics and so on between the frames, is missing.

I wonder if any reader(s) can help me find out where I can buy or borrow a copy of the missing sheet?

Ronald Saffery, Kent.

Drummond lathes and mechanical music

SIRS, - I read Ron Etter's articles and Ray Trimbey's letter in *M.E.* 4218 (2 April 2004) with great interest as we still have my father-in-law's Drummond lathe in excellent condition, with its original stand and treadle. The top of the bed surface at the tailstock end is stamped 'MCH B No. 8115'. We also have a chest full of attachments which he made for the lathe.

One of his fine models was featured on the front cover of *M.E.* 4602 (5 April 1951).

I was also pleasantly surprised to see a photograph of my 20-note organ on page 370 of *M.E.* 4218. I have been dabbling with mechanical music machines such as Victorian Organettes and Pianolas for almost 50 years and made this one in 1998 to John Smith's design. In 2000 I made the larger *JS Senior 20* which is musically identical but physically larger and has a number of design refinements.

As a lifelong fairground enthusiast, I decided to design, carve and paint a fair organ type front for it and, as can be seen from the accompanying photograph, I made a working bandmaster. John supplies a copy of my drawing for this figure with his set of plans.

These organs operate on the simplest system possible as the punched paper roll acts as a valve and it was devised by Needham in the nineteenth century for use in reed organettes. In steam engine terms, I suppose it equates to the oscillating cylinder.

Currently, I have almost finished building the *JS Universal 26* which is larger with triple bellows, 26 notes, 4 registers, 70 pipes and a 13 note glockenspiel.

In years gone by, *M.E.* has published a number of articles on mechanical music, including several on rebuilding large disc playing Victorian Polyphons by a Mr. Lee, and older readers may remember Mr. F. G. Buck who was mainly known in connection with model car racing in the late 1940s and 50s but also had a great interest in musical machines.

There are a number of organ designs for home building, including fully detailed and dimensioned ones for a replica Wurlitzer 105.

The British Organ Grinders' Association (tel: 01925-810317) has about 200 members and for an authoritative read, *Barrel Organ* by A. W. J. G. Orge-Hume (ISBN 0 04 789005 3) is superb.

Ken Rawlings, Somerset.

Lacquering

SIRS, - In reply to Roger Castle-Smith's query about obtaining *Duralac*, (*Post Bag, M.E.* 4219, 16 April 2004), it is available from Foxell & James, 57 Farringdon Road, London. EC1M 3JH; tel: 0207-405-1052/2487.

It is available in colourless and in three shades of gold. The smallest size is 1 litre but I don't think it is available by post and may have to be collected.

I. Gurton by e-mail.

Hot stuff!

SIRS, - I have been making some blowlamps; two based on the Rayman model and a diffuser/vaporising type as shown on M5 of Percival Marshall plans. I realise these are old designs but they work well.

I am carrying out trials using a variable needle jet with a gland at the thumbwheel end of the needle valve. I have been using the obselete and now 'frowned upon' asbestos string to pack the gland but this allows paraffin to leak past which is ignited in use and tends to disturb the steady burning of the lamp. I think it will be too hot for 'O' rings; is there a better material to pack this gland?

My thanks in anticipation of any ideas you/your readers may suggest.

Fred Graham, Tyne & Wear.

Celebrating fifty years of the Myford Super 7, Doreen Paviour, Mike Chrisp, Teddy the mascot and Chris Moore cut the cakes on the Myford stand.

Part of an extensive range, the sheet metal working machines from Warco created a good deal of interest.

TRADE STANDS

AT THE 73rd MODEL ENGINEER EXHIBITION

Neil Read
reviews what was available from our friends in The Trade who attended the Exhibition at Sandown Park.

One of the features of the Model Engineer Exhibition that most visitors enjoy is a visit to the various trade stands. The Exhibition has always been fortunate to have strong support from our friends in The Trade. This year it was possible to buy just about anything for model engineering ranging from a model brick to an industrial sized milling machine. Many of these items were at special show prices but buying at the show also has the advantage that carriage costs are avoided provided, of course, that the item purchased will fit in the car. It is also beneficial for customer and supplier to meet face to face as, even if future business is transacted by letter, telephone or the internet, it is always good to be able to put a face to a name.

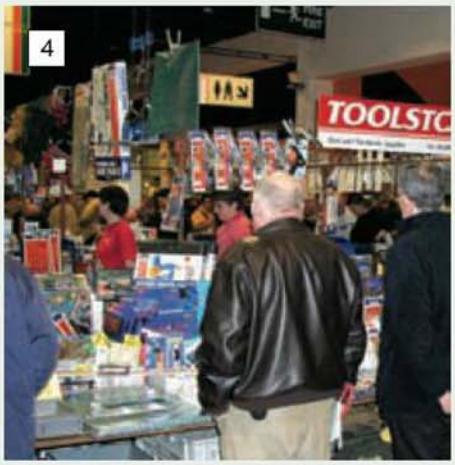
Working around the ground floor hall after arrival, first port of call for many visitors was the Myford Ltd. (tel: 0115-925-4222) stand. This year marks the fiftieth anniversary of the introduction of the Super 7 lathe and this memorable event was celebrated by the cutting of two large cakes baked by Doreen Paviour (**photo 1**). One of these had a photographic image of the Super 7B on top made using vegetable dyes. I managed to get a piece of the cake bearing part of an image of the quick-change gearbox and can confirm that the quality was excellent. I suspect that most visitors thought the same way, as it was all gone within a few minutes. Catering is one of the few professions where, if you do your job well, you have nothing to show for it as all your efforts get eaten.

Other companies offering machine tools and accessories included Warco (tel: 01428-682929), whose range of lathes, milling machines and other engineering equipment seems to grow exponentially. The sheet metal working machines appeared to be especially popular (**photo 2**). Chester UK Ltd (tel: 01244-531631), and Engineer's Tool Room (tel: 01443-442651) (**photo 3**) also had a wide selection of machines and accessories for prospective purchasers to view and compare. For those working in smaller formats Brimarc Associates (tel: 01926-493389) were offering the range of high quality Proxxon machine tools and Arc Euro Trade (tel: 0116-269-5693) also had a selection of well-finished lathes and milling machines on display.

For those in the market for second-hand machine tools and accessories Home & Workshop Machinery (tel: 020-8300-9070) were exhibiting a range of lathes, milling machines, shaping machines and accessories. This well stocked stand repaid careful study as a number of rare or unusual items were to be had. Even I was persuaded to part with some hard-earned cash, an event that caused consternation among my fellow editors and judges who, having learned of this uncharacteristically dissolute act, feared for my state of mind.

With many years of experience in the engineering trade, Mike Bidwell (tel: 01245-222743) was again available to offer advice to prospective purchasers of his selection of machines, accessories and measuring instruments. Several companies including Toolstop (Bracknell) Ltd. (tel: 01344-421718) (**photo 4**), Tools 2000 and AB Tools (tel: 01630-672748) catered for visitors looking for new hand tools like spanners and screwdrivers. There was also a choice of stands offering secondhand hand tools and cutters such as the Tool Shop (tel: 020-8647-0773) (**photo 5**). Displayed under their Engineers Emporium

Business over a mug of coffee on the Engineers Tool Room stand.



An extensive choice of new hand tools was available on the Toolstop stand.

Plenty of potential for rummaging on the Tool Shop stand.

A large crowd gathers around the Chronos stand to take advantage of the latest offers.

A comprehensive range of carbide tooling was available from the JB Cutting Tools stand.

An example of one of the models available in kit form from Modelworks International Ltd.

banner, L. A. Services (tel: 0145-220340) offered a bewildering choice of secondhand machines, models and tools for visitors to sort through and inspect, together with their range of model engine kits. Some model engineers are apt to sneer at those who rummage through piles of blunt cutters being sold at knock down prices but there is no doubt that it is a popular pastime for many. A walk around the halls during exhibition opening hours always revealed that the crowds tended to congregate around such stands and many intense faces could be seen searching for that elusive cutter needed for a particular purpose. In a dangerous world it is a relatively peaceful and harmless occupation and model engineering would be all the poorer without it.

Well known for their special promotions, Chronos (tel: 01727-832793) had a large stand offering a comprehensive range of items of interest to the model engineer including measuring instruments, machine tool accessories, books, small machine tools and cutting tools (**photo 6**). Having recently had occasion to machine some particularly difficult valve steel which work hardened very badly if extreme care was not taken I was particularly alive to the potential benefits of carbide drills, milling cutters and turning tools. Standard high-speed steel tools did not like this material one little bit. I therefore took advantage of some of the offers on the JB Cutting Tools (tel: 01246- 418110) (**photo 7**) stand to stock up on some solid carbide drills and cutters. Ever cheerful Jenny Blackwell tells me that she offers a free postal service so the JB Cutting Tools phone number goes on my workshop notice board in case anyone else comes calling with refractory materials. For those who needed tap and dies and high-speed steel cutting tools, Tracy Tools Ltd. (tel: 01803-833134) was on hand so there was no excuse for not replacing that 6BA tap you broke the other day.

Material for the latest project was available from College Engineering Supply (tel: 01902-842284) and Noggin End Metals (tel: 01782-865428). For fasteners to hold everything together EKP Supplies (tel: 01598-710892) were on hand to with their comprehensive range of nuts, bolts and screws. Judging by the activity on these stands, a good many projects are under way and we look forward to seeing the fruits of their customers' efforts in the form of tools and models at next year's exhibition.

For those who lack the skills, facilities or inclination to scratch build a model but wish to participate in the hobby, it is now possible to buy machined kits that can be simply screwed together. Foremost in this field is Modelworks International Ltd. (tel: 01327-301030) (**photo 8**) who can offer a range comprising locomotives, rolling stock, traction engines, steam wagons and clocks. A wide range of finished model locomotives and model engineering requisites were also available on the Polly Models (tel: 0115-973-6700) stand who now own Bruce Engineering, the business formally run by Bruce and Gerry Davey. It was good to see Bruce and Gerry still on hand to ensure a smooth transfer of the business. Also on this stand was Paul Gammon with his range of lining pens and superheater elements. On duty on the Polly stand throughout the show was also our respected contributor and Exhibition Judge Anthony Mount (**photo 9**) who was available to answer queries about his extensive range of stationary engine designs.

For those with catholic tastes in model engineering and model making it is worth while strolling round the Exhibition looking at things which may not be of obvious interest until you study them more closely. One stand that caught my attention was Grandad's Toys (tel: 01536-722822) (**photo 10**) where demonstrations of the model building materials available seemed to go on throughout the show and I, like many, paused to admire the splendid miniature building and other structures created.

The name of Proops Brothers (tel: 0116-240-3400) has been associated with the Model Engineer Exhibition for as long as I can remember and they always seem to have on offer a useful range of tools and other items of interest to the model engineer. Indeed it was difficult to get near to the stand during the normal opening hours of the show. Perhaps the festive welcome had something to do with its popularity (**photo 11**).

It has not been possible to include all the fifty odd companies who supported MEX 2003 but I trust what has been written here has given readers a taste of what was available. To those companies who supported the show we offer our thanks and trust they had a prosperous end to 2003. We look forward to seeing them and their many customers at next year's event.

Anthony Mount was on hand on the Polly stand throughout the exhibition.

Demonstrations of the products available were carried out on the Grandad's Toys stand.

A wide variety of stock and a cheery welcome were the order of the day on the Proops stand.

The barrel of the 'cannon' with a typical end mill held ready for the sharpening process.

The sharpening device in use with the cutter against the grinding wheel. The carriage is shown in the high position.

THE CANNON
A SHARPENER FOR MILLING CUTTERS

Colin Pape

describes a simple tool of interest to owners of light milling machines.

●*Part I.*

I have a small vertical milling machine which I bought in 1992; I soon found out that it does not give a decent finish when an end mill is used in profiling mode. The cutter leaves ripples on all materials. It does not seem to be due to incorrect cutting speeds and I have put the problem down to head vibration. The vertical column is quite substantial but it is steel and tubular. I find I get a better finish to edges by turning the work on its side and machining the edge using the end cutting teeth of the milling cutter.

This is a pity because the spiral cutting edges are longer than I generally need and these edges could be made to last a long time by changing the vertical position of the cutter. I should add straight away that I have no formal machine shop training and I have adopted this and other practices which would probably make a tradesman wince. That being said, I am not at all sure that my case is unique.

So for me the main cutting edges are those on the end. These are very small and since they do most of the work they need re-sharpening more often than the side edges. From the outset I had a need to re-sharpen my end mills but I did not have access to a re-sharpening service. The options available to me to resolve the problem were few in number. I could

1: invest in a commercial grinder,
2: make a device like the Quorn,
3: make something to just do just what I needed to be done.

Commercial cutter grinders, even second hand, were so expensive that they would never have been cost effective for me, so this option was ruled out. I was not ready to undertake the construction of the Quorn; I bought a book about it but it seemed to me to be a job for people with more skill than I possess. Even the Quorn would not have been cost effective for me and, like the commercial sharpeners, it had loads of features that I would never use. In reality, my most cost-effective solution was to throw away worn cutters and buy new ones. Not a very pleasing solution.

What I needed more than a complicated and expensive cutter grinder was a simple device to sharpen just the end faces, and I did not know of anything that would suit. So, I decided to design and make my own device. Since I had not long participated in one of the splendid summer schools that were run by Loughborough University, where I made most of a model cannon, I based my design on a cannon. It has a barrel and a (gun) carriage. **Photograph 1** shows the barrel of the cannon loaded with an end mill.

All this was about twelve years ago. The device I made has given very good service, and the only modification I have ever made was fairly recently, when I switched from a disc grinding wheel to a straight sided cup wheel. On seeing my sharpener, a recent visitor to my workshop suggested that I write a description of it. This article is the result. My sharpener is permanently mounted against one end of a grinder and **photo 2** shows how this has been done.

Four drawings and several photographs accompany this article but there are no photos of the construction of the device and its parts because I did not take any at the time. When I built the sharpener it was made up as I went along. The drawings shown here are not the originals because there were none. They have been produced by measuring the actual sharpener and I have taken advantage of the opportunity to make a few small changes that I would have been glad to have had in the beginning.

Design objectives

I set out to design a sharpener that would grind the two or four end cutting faces of slot drills and end mills. I wanted to be able to sharpen cutters from 6mm to 20mm diameter and it was essential that each cutting edge would be ground identically and with a minimum of set up operations. I did not want to make any holding devices for the different diameter milling cutters. I wanted a simple and accurate device that could be used instantly. On top of that it had to be really low cost which meant using stock materials and no castings.

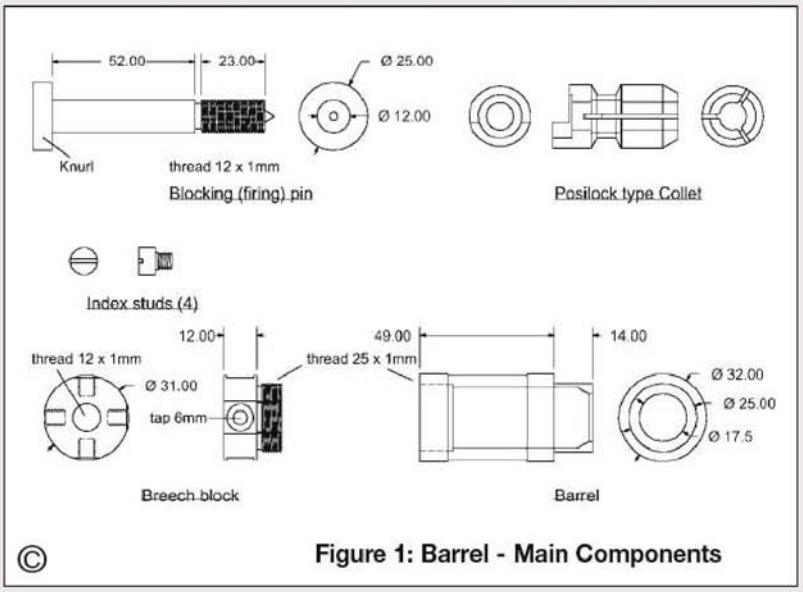


Figure 1: Barrel - Main Components

Meeting the objectives

I was prepared to allocate one end of a small grinder to this application so that I would only have to set up the position of the sharpener once. I did not want to make a set of dedicated cutter holders for this device so I decided to use the milling chuck collets (in my case, Posilock) to hold the cutters in the sharpener barrel. Following from this decision it is clear that the device can be used to re-sharpen any cutter that I can hold in the milling chuck. The grinding angles are pre-set and only the depth of cut needs to be set for each cutter to be sharpened. The operation is very simple and there is no

The barrel dismantled to show the main components. On the left is the cutter in its collet and on the right is the 'breech-block'.

A view of the breech-block assembly showing the indexing studs and the centre or 'blocking pin' which supports the cutter during sharpening.

need for any handles and knobs. I can sharpen the end faces of a four-edge cutter in a minute or two.

Finally, the cost was really low, probably about £20, grinder and grindstone included, plus a few hours work. Once the cost of three end mills had been saved, the sharpener had paid for itself.

The device consists of four main parts: the grinder, support table, barrel, and the carriage which guides and controls the motion of the barrel.

Grinder

A cheap grinder is adequate for this application. It is never going to work hard. Just after I made the sharpener I bought a double-ended grinder for about £15. It has no identifying name and came from Romania. The two grinding wheels were not very good and the power switch was junk, but the motor was good and the 13mm spindle ran in ball bearings with no play. I went out and bought another for dedicated use with the sharpener by which time the price had gone down to £12! I put a good quality straight wheel on the left-hand end of this grinder. When I recently switched to a cup wheel I turned down the left-hand end of the shaft so that it would accept the new cup wheel which came from the UK and had a bore of 1/2in. diameter. This simple job was facilitated by the centres present in each end of the shaft.

Support table

This table needs to be mounted close to the grinding wheel surface. It is the support for the carriage pivot and it should allow the pivot to be positioned close to the wheel. It should be horizontal and rigid. It is clearly visible in photo 2 but no details are given of this component because its design needs to be adapted to suit the actual grinding machine in use.

Barrel

The assembled barrel with a cutter in place was shown in photo 1. The barrel assembly is in turn composed of three main parts, the barrel, the breech-block and the blocking (firing!) pin. These components are shown in **photo 3**. The details of the main barrel parts are shown in **fig 1**. The dimensions are close to the original except that I have shown both raised sections having the same length.

I made my barrel out of a remnant of 32mm round mild steel bar. I think it could be advantageous to use 35mm bar and maybe increase the diameter of the nose section to 26mm. This would give a wider shoulder for the stop collar and the stop collar could have a slightly larger diameter.

The barrel has a main body section and a nose section. The main body has a raised collar at each end. Their diameters are identical. The inside of the barrel is bored to take the milling chuck collets that will be used to hold the cutters. The collets should slide in and out easily. The bore is not used to locate the collets so a tight fit is unnecessary.

At the nose end, the inside of the barrel has a taper. The cutter to be ground is held in the appropriate size milling chuck collet. The breech is unscrewed and the cutter, in its collet, is inserted into the barrel. The breech is replaced and the locking pin is screwed in to push against the end of the cutter. As the locking pin is tightened the cutter/collet assembly is forced into the taper at the nose end of the barrel and a closing force is applied to the collet. The included angle of this taper is fractionally larger than the tapered end of the collet. Because of this, the closing force is exerted at the outer end of the collet, which is ideal.

The result of the blocking operation is that the cutter/collet is located positively inside the barrel by the locking pin at one end and the nose taper at the other, just as it is in the milling chuck.

The breech-block has an outer diameter slightly less than the raised sections of the barrel body so it does not contact the rails. Four indexing studs are set at 90deg. intervals around the cylindrical surface of the breech-block. One pair of studs is always in contact with the guide rails. The four studs provide the pre-set positions (two or four) to select which cutter face is to be ground.

A threaded hole is provided through the breech-block for the blocking pin. **Photograph 4** shows a close-up of the breech-block. The blocking pin serves two purposes. It locks the cutter in position and it provides a convenient handle to raise and rotate the end of the barrel assembly in the carriage guides.

I wanted to use my milling chuck collets as holders for the cutters to be sharpened. I have a Posilock milling chuck and I designed the cannon barrel to takes these collets. In consequence the barrel shown in fig 1 is probably not usable with collets of a different type and would need some modification.

Carriage

The main parts of the carriage are shown in **fig 2**. The job of the carriage is to guide the barrel and to position it accurately with respect to the grinding wheel.

The two guide rails are made from 10mm diameter silver-steel. Flats are machined on them so that they can be securely fixed to the side plates. These flats are 1mm deep. Note that the holes for the fixing screws are not on the centre line but offset by 1mm. This is to ensure that the top of the rails will be above the top of the side plates without having the fixing screws right on the edge of the side plates.

The curious section of the elevator block is to ensure that it will not interfere with the lower index stud on the breech-block. The carriage is attached to the table at just one point. A 6mm screw coming up through the table and into the pivot post makes this attachment.

To correctly grind a cutter, four adjustments are necessary to its position. The carriage provides all four and they are:

1: the angle that the cutter meets the grinding face in the vertical plane,
2: the angle that the cutter meets the grinding face in the horizontal plane,
3: the position of the cutter with respect to the edge of the grinding wheel,
4: the depth of re-grinding cut.

●*To be continued.*

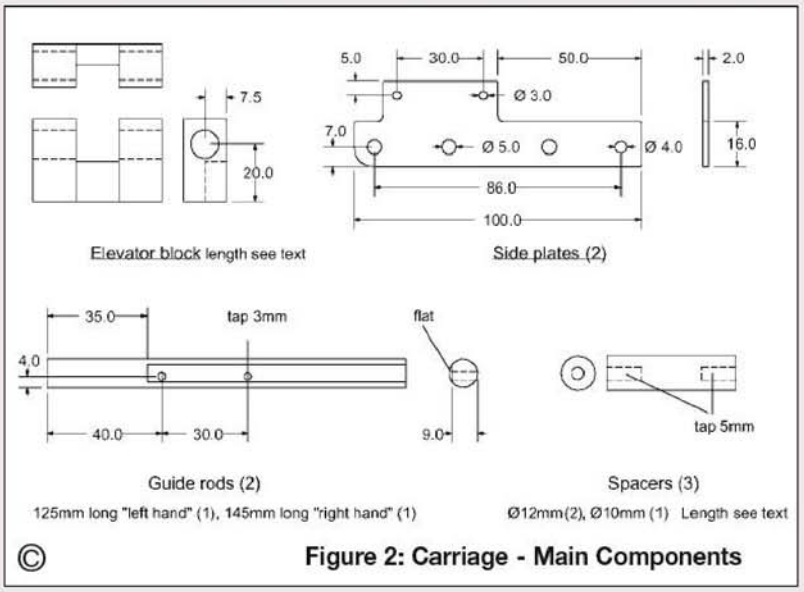
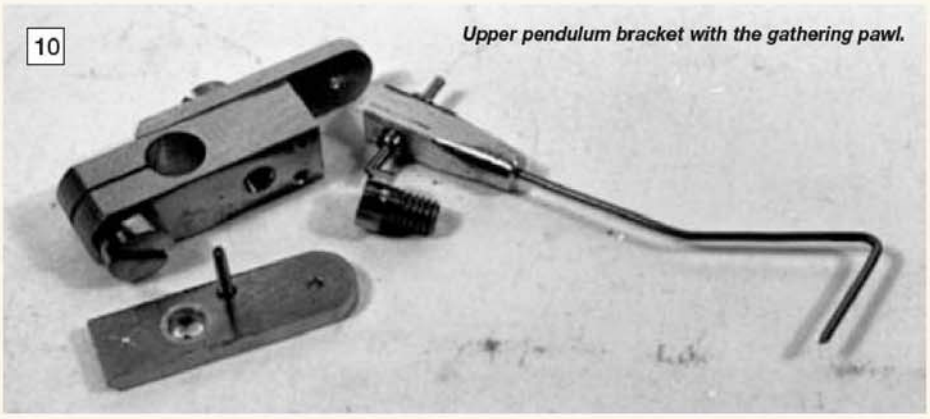


Figure 2: Carriage - Main Components



Upper pendulum bracket with the gathering pawl.

WOODWARD'S GEARLESS MECHANICAL CLOCK

John Wilding FBHI

continues with his account of the construction of this intriguing clock, beginning this instalment with the pendulum fittings.

●*Part III continued from page 440 (M.E. 4219, 16 April 2004)*

The pendulum is completed with the construction of the two clamp type brackets. The upper bracket holds the gathering pawl, the lower one the impulse hook and they are detailed in **figs 6** and **7**. It can be seen that the clamp blocks are formed from 1/4in. square brass. The top one has two side plates in which the bearings for the gathering pawl are pivoted. This assembly is illustrated in **photo 10**.

Since mild steel rod often varies in diameter, it is most important that the pendulum rod is carefully measured. If the rod is undersize, the hole in the block should be made to suit. Little looks worse than a saw slit which is partially closed by its pinching screw because the hole is too large.

The saw slit will be far neater if the work is done in the lathe. Saw blades of 1 3/16in. diameter with a 1/4in. centre hole are readily available from suppliers. They come in different thicknesses and because they are the same diameter they can be assembled in combination to obtain various widths of cut. They can be mounted on a homemade mandrel and held in the lathe chuck. The work is clamped in the tool post and fed into the rotating blade. The thickness of the blade is not critical; I used one 0.5mm thick.

The general procedure with these clamping pieces is to mark out the hole positions as detailed on the drawing. The tapped 5BA hole for the pinching screw is initially drilled No. 36 then opened up halfway with a No. 30 drill. The hole is then tapped and finally the saw slit formed. This might be an opportune moment to mention that the centre distance of the pendulum from the backplate is 1 1/4 inch. Many of the components for this clock operate at that dimension.

The side plates are secured with short 6BA screws and one steady pin in each plate. The steady pin and pivot holes are drilled No. 60.

The gathering pawl is also shown on this drawing together with its mounting block and the pivots. All the wire pawls on this clock are made from 1/32in. silver-steel. Woodward used a thinner stainless steel wire which he obtained from Ken Whiston at that time, a supplier who is now no more than a memory. I have had to use a product which is readily available from the metal suppliers. Here too, Woodward did not make the length of the pawl adjustable; I found this to be inconvenient which is why there is a 12BA cross-drilled hole for a securing screw which enables the pawl to be extended or retracted as required. The 1/8in. square brass rod can most easily be held in the lathe by gripping it in a pin vice as demonstrated in **photos 11** and **12**. In this set-up the No. 67

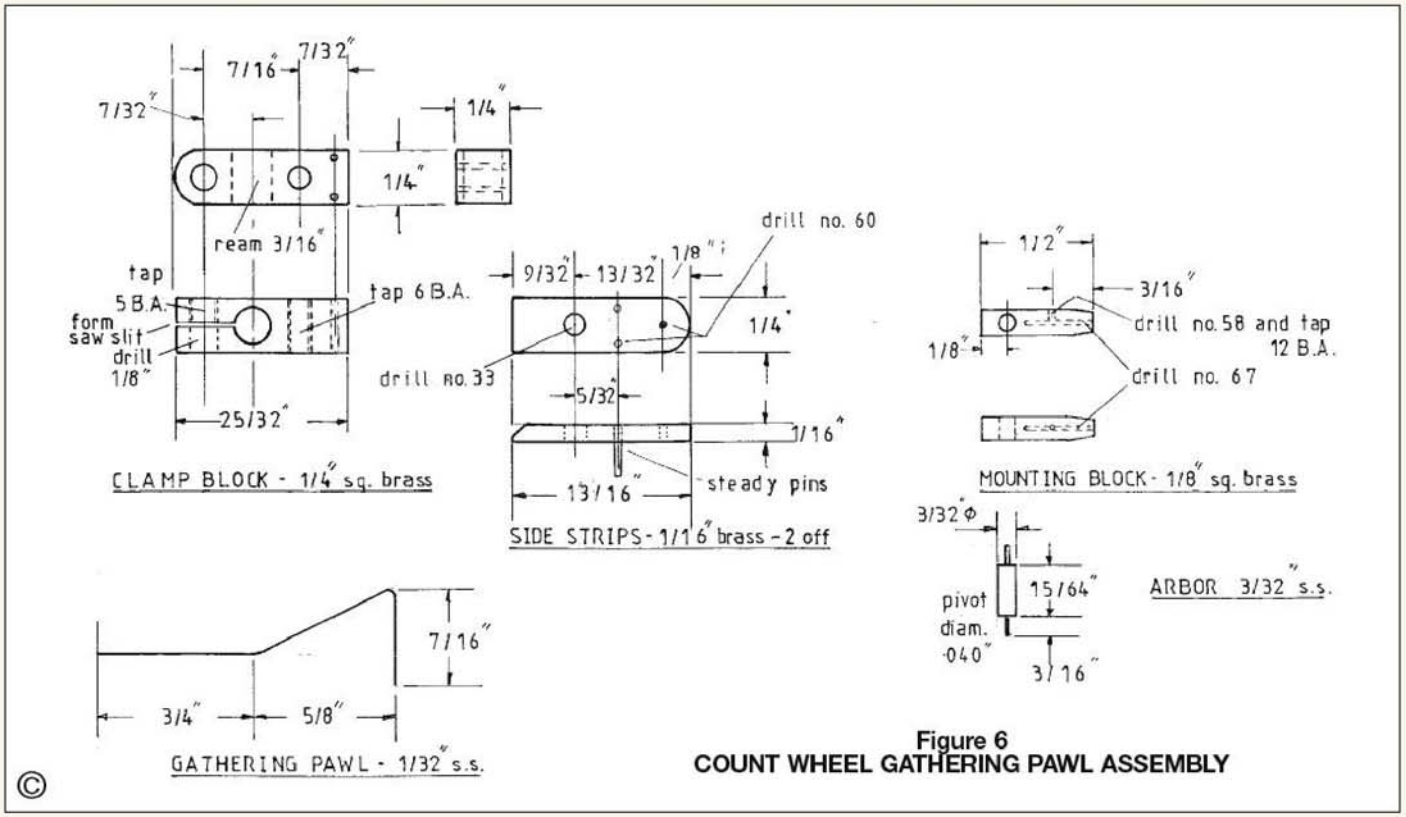
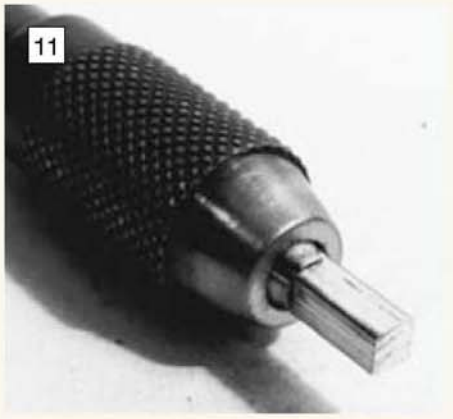
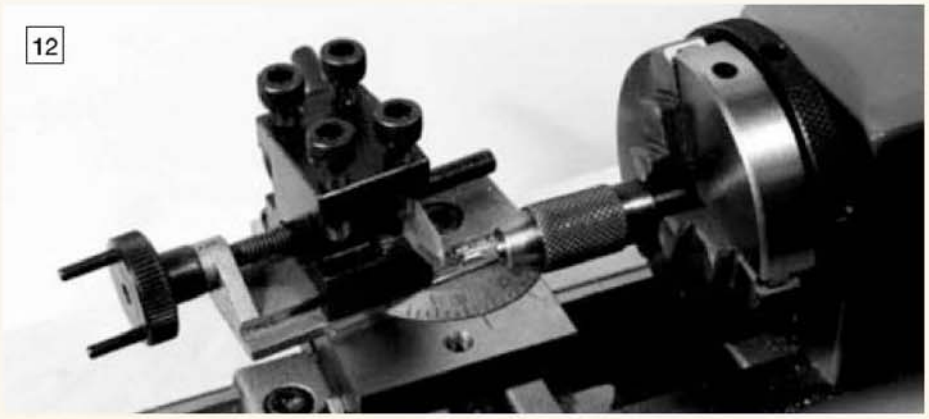


Figure 6
COUNT WHEEL GATHERING PAWL ASSEMBLY

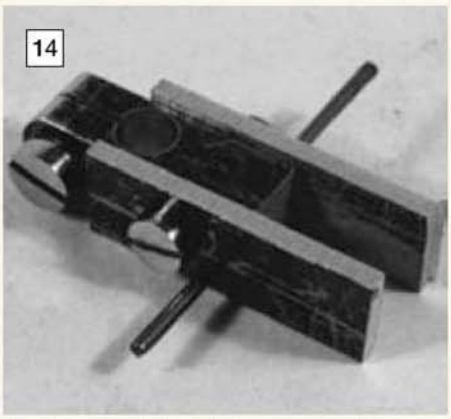


A method of holding 1/8in. square brass.

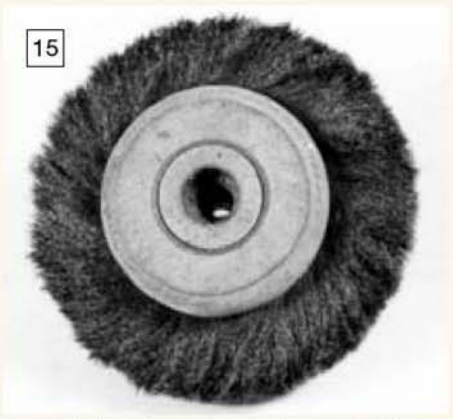


Machining the chamfer in the Unimat 4 lathe.

Holding clamp (ref 1) with the two side pieces clamped together for drilling the pivot holes.



Another stage in the fitting of the side pieces to the clamping block.



A soft steel burnishing brush; the wire in this particular brush is only 0.002in. diameter.

size axial hole can be drilled and a taper machined or filed at the end.

The two side pieces can be held together with a 6BA nut and bolt for drilling the two pivot holes (**photo 13**). A stage in the construction of this assembly is shown in **photo 14** where the steady pins are being fitted.

Impulse pawl.

This is similar to the gathering pawl in that the same 1/4in. square brass clamping piece is used. However, the pawl itself is mounted on a stud in the form of a 10BA screw carrying a mild steel bearing. This needs to be made smooth with emery sticks in the lathe and finished with the pivot burnisher.

A useful tool for bringing up a final finish is a soft wire rotary brush; I show one in **photo 15**. However, I have been unable to find these recently. With a wire diameter of only some 0.002in., the 'bristles' are very fine and soft. The

A steel bearing impaled on a length of pegwood and ready to offer up to the burnishing steel wire brush shown above (photo 15).

last ones I purchased came from Hutchinson, a shop in Clerkenwell which has now vanished. If such a soft brush can be found, then the bearing can be impaled on a length of pegwood and offered up to the rotating brush (**photo 16**). Although an angle is specified for the pawl, it is not critical. One of the advantages of using wire pawls is that they may be easily bent for adjustment. This pawl needs to be tangential to an imaginary circle whose centre is the suspension point of the pendulum. This will give the best action when setting up the escapement.

These two pendulum fittings can be seen on the pendulum in fig 1 and photo 2 shown in Part I of this series (*M.E.* 4217, 19 March 2004). Two numbers 55 and 100 are shown on these pendulum fittings; these indicate the distances in millimetres from the point of suspension to the centre of each bracket. These positions are not critical but are good starting points.

Pillars and cocks

These are shown in **fig 8**. The centre arbor cock is supported on two 5/16in. diameter pillars. They screw into the back plate and a tommy bar hole is provided so that they can be drawn up tight. The alternative procedure is to use hexagon stock. I did this on occasions as can be seen in some of the pictures. The count wheel bridge is supported on similar pillars but these may be tapered. The ▶

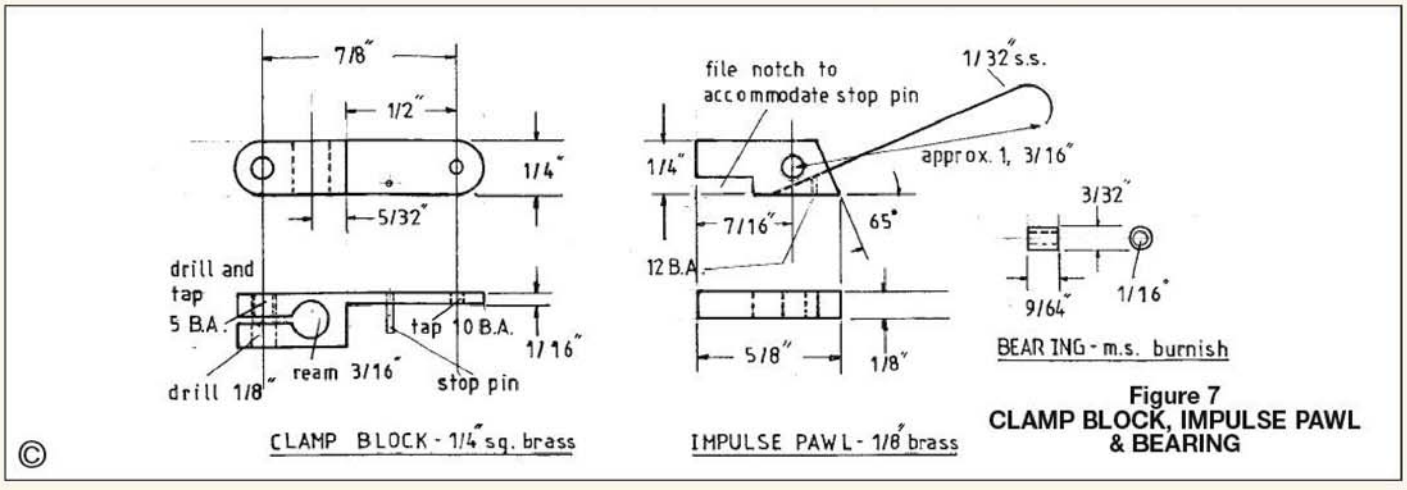


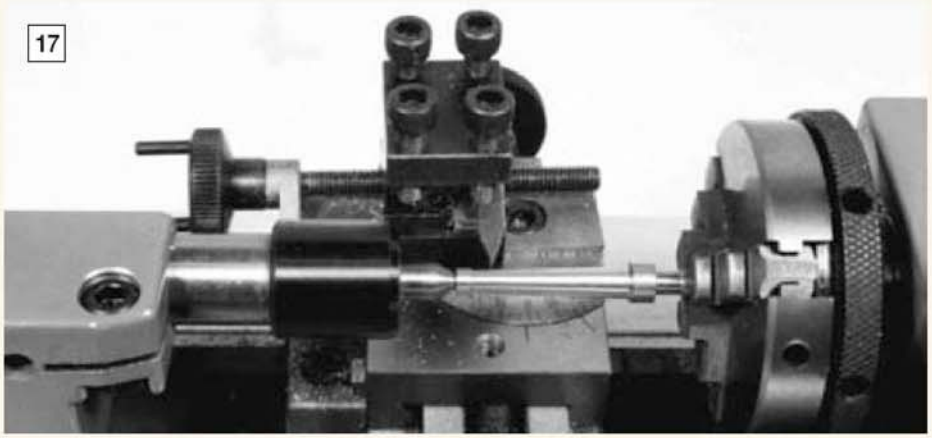
Figure 7
CLAMP BLOCK, IMPULSE PAWL & BEARING

machining of these items is straightforward. The photographs here show the Unimat 4 being used.

The general procedure is to grip the stock while it is in the cylindrical state in the 3-jaw chuck. Assuming it is reasonably accurate, face the ends and complete the drilling and tapping according to the drawing. The work is then set up with tailstock support so that the length is available for turning the taper. This is illustrated in **photo 17**. The 6BA thread at the base of the pillar is not gripped by the chuck jaws which are likely to damage the threads; an adaptor is made as in **photo 18** which shows short lengths of 1/4in. diameter brass which have been drilled and tapped at their ends to suit 10, 8, 6 and 5BA threads. These adaptors are held in the chuck and the pillars screwed into them. I have a complete set of these for all the BA sizes. Being anxious to get on with making the clock, beginners are understandably often reluctant to make these jigs and other such devices, but they are essential for carrying out work successfully. Even if well endowed with a good selection of accessories, lathes still require these homemade fittings.

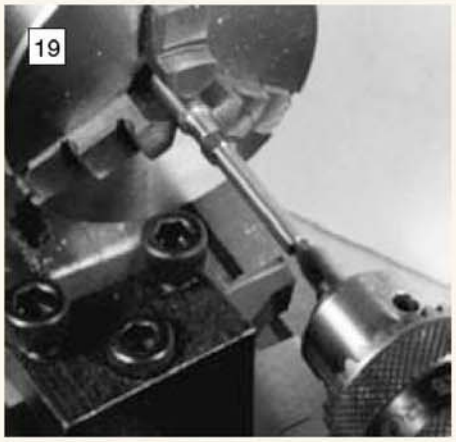
A further example of work held in this manner is given in **photo 19**. The pillar here is steel; note the top rake on the tool.

The Unimat 4 makes an excellent little drilling machine; in **photo 20** I show it set up for this operation. It offers a good range of speeds and the drill chuck will accept drills up to 5/16in. diameter. In **photo 21** I give an example of drilling in progress; here the bridge piece has been fixed to the back plate with 6BA screws and the pivot holes drilled through both components together.



Set-up in the Unimat 4 for taper turning a pillar.

Hollow threaded mandrels for use in the lathe.



Turning a steel pillar or stud.

An alternative procedure would be to drill the pivot holes in both components individually then use the drill itself to locate both parts, clamp the bridge piece to the plate and drill the pillar holes through both components. Those in the plate are tapped 6BA and those in the bridge piece are opened up to No. 33 size.

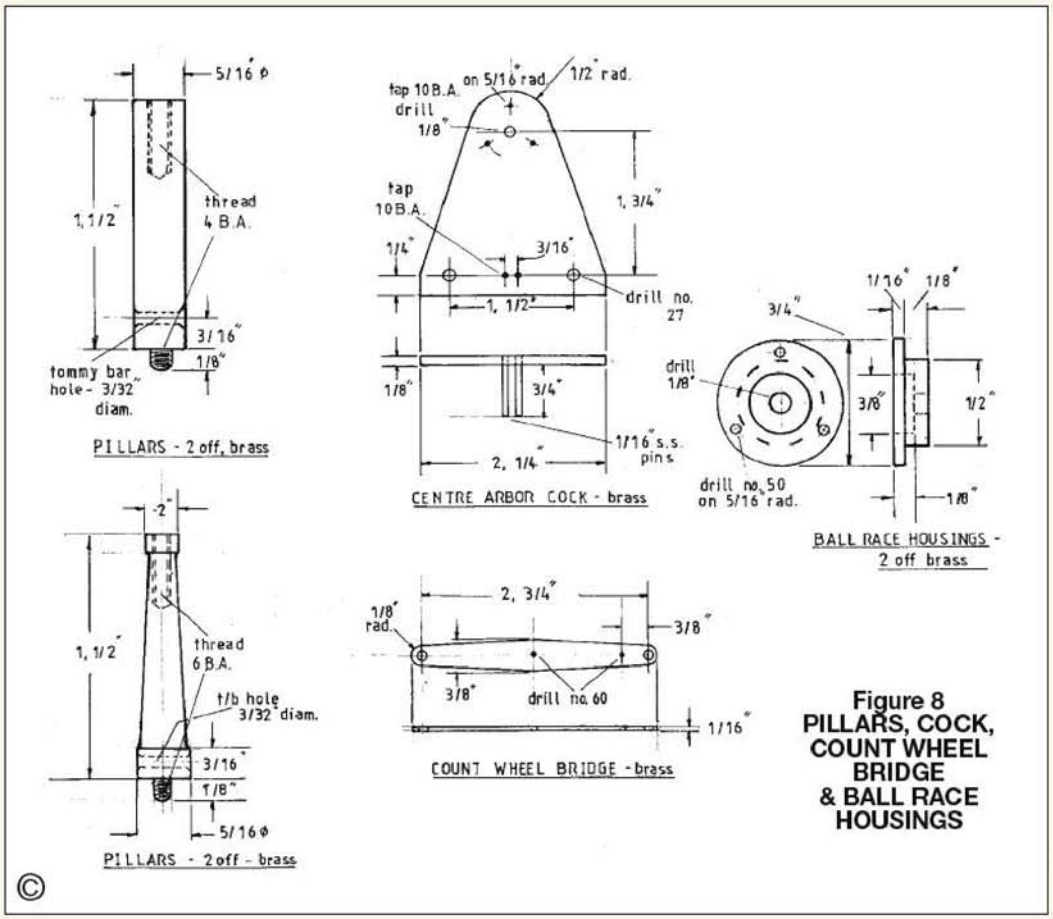


Figure 8 PILLARS, COCK, COUNT WHEEL BRIDGE & BALL RACE HOUSINGS

Ball race housings

These items are dimensioned in fig 8. The centre holes in these housings are made 1/8in. and the pivot holes in both the cock and the backplate are also drilled this size. A length of 1/8in. silver-steel is then passed through the cock, backplate and both housings so that the 10BA holes in the housings can be used to spot through for the screw holes in both the cock and the back plate.

The housings are bored out to be a nice close fit on the ball race. It is not necessary to make them a force fit; they are prevented from falling out by lightly crimping them. This is done with a punch having a diameter of about 1/16 inch. This is positioned half over the edge of the hole and given a gentle tap. This can be done in two positions which I have tried to show in **photo 22**. However before doing this the 1/8in. centre hole should be opened out to 3/16in. to give generous clearance for the 1/8in. arbor; this also applies to the holes in the cock and back plate. This procedure should result in correct alignment of the centre arbor.

References

1: The construction of this clamp is

The Unimat 4 set up as a drilling machine.

Drilling the pivot holes in the bridge piece and back plate.

A ball race secured in its housing by two light pin punch indentations.

fully described in my book *Tools for the Clockmaker* published by RiteTime Publishing Ltd., 18 Woolmer Way, Bordon, Hampshire GU35 9QF; tel: 01420-487747 or it can be purchased from J. M. Wild at 12 Norton Green Close, Sheffield S8 8BP; tel: 0114-274-5693.

●*To be continued.*

FOR YOUR BOOKSHELF

THE CONSTRUCTION OF A ST. PAULS CATHEDRAL SKELETON CLOCK

by Eric Woof

Published by RiteTime Publishing

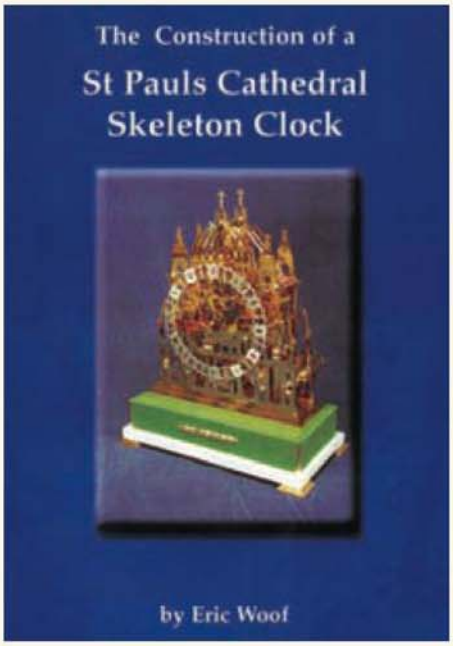
Price £60

This book describes in some detail how to build a clock whose outline is designed to represent the well-known St. Paul's cathedral in London. It is a relatively complex clock with a spring driven, eight-day, triple fusee movement, quarter chime (Westminster on four bells, plus one hour bell), anchor escapement, maintaining gear in the going train, locking plate chimes (self correcting), rack striking mechanism, pin chime barrel and rafter frame. At $19^{5}/8$in. high, $15^{3}/4$in. width, $8^{5}/8$in. depth overall, the finished timepiece is quite large and weighs 35 pounds. This book covers all aspects of its construction, including the bells, and comes complete with an envelope containing full size drawings of the frames and dial to help the builder cut out these complex items. It is recommended that the prints are glued to the brass plates and the required shapes cut directly from the drawing rather than trying to mark out all the various features.

Prior to his retirement, Eric Woof, the author of this work was engaged in design work relating to the electrical generation industry. His engineering experience is evident in the layout of the book as each part, no matter how small, is given an individual item number which is listed in tables and cross referenced to both the general arrangement drawings and the text. For this reason the author has been able to recommend that, other than the plates which should be made first, the clock parts can be made in any order as preferred. A check on several of the components listed showed that the cross referencing is quite thorough; it is very easy to pick a part, trace its drawing and where it is dealt with in the text, and check what it looks like on the relevant photographs. The drawings appear to be reproduced from the author's original hand drawn items and in the main are clear. However, some of the drawings of the smaller items do need careful scrutiny to decipher all the detail.

The text of the work is well written and direct in approach. This is understandable as there are many parts to be made and economy of words helps keep the size of the book down to 183 pages. Nevertheless, there are many helpful asides and advice on special tooling items and techniques. The text is illustrated throughout with black and white photographs which are very helpful in illustrating the procedures followed. They also reveal that although Mr. Woof's workshop facilities are more than adequate for the tasks required, they are not lavish, a fact which should encourage those whose workshop resources are also limited. Indeed, it is pointed out early in the text that the only commercial machines used in the construction of the clock were a Myford ML10 lathe and a $^{1}/2$in. capacity pillar drill.

It is clear as the book proceeds that Mr. Woof set out not just to build a clock for telling the time but wanted to do as much of the work as possible himself. He also wanted to enjoy the experience. The only purchased parts appear to be the main springs plus a few ancillary springs. For these reasons the book should appeal to others than those who want to build the clock. There is, for example, advice on making gear cutters and filing square holes in components. The advice on bell manufacture would assist anyone engaged in a project involving such items.



This is not an inexpensive book, however it must be regarded as essential reading for anyone wishing to build a clock of this type. Armed with a copy, the amateur clock maker could set out on the tasks involved with every confidence that a working clock will be the end result. Compared to the cost of the materials for the clock and the investment in time that such a project requires, the cost is unlikely to be a major consideration. The casual reader will learn much from its pages but cost may preclude its purchase. It is however a fine piece of work which achieves what it sets out to do.

The Construction of a St. Pauls Cathedral Skeleton Clock by Eric Woof is introduced with a foreword by John Wilding and is published by **RiteTime Publishing Limited, 18 Woolmer Way, Bordon, Hampshire, GU35 9QF; tel: 01420 487747**. It is published in paperback at a cost of £60, which includes full size prints of the front and rear plates and the clock face. ***N.R.***

A photograph showing the various stages in producing the cam boxes. The sequence is explained in the text.

Left: Stack of cam box blanks after machining and bending. Centre: stack bonded together on a temporary pin. Right: faced to length and bored.

BRISTOL *HYDRA*
THE NEXT TWELVE MONTHS

Brian Perkins

describes the operations necessary to complete the cam boxes.

●*Part X continued from page 445 (M.E. 4219, 16 April 2004)*

With the prospect of making 32 cam boxes, it is times like these that my wife notices a sudden desire on my part to take more of an interest in domestic matters and the pages in my diary for most of September and all of October 2003 are noticeably empty. Various jobs around the house were completed during this time although I was taking the occasional time off to at least *think* about the problem.

I had thought about investment castings but was concerned about the detail involved in the thin finning. I made up a dummy unit to use as a pattern for a rubber mould which turned out quite well, and I thought I might make the inner shape in brass to use as a core and then cast low melting point alloy around it to give the finished shape. This also went reasonably well but it was difficult to obtain the depth of finning I was seeking, and holding it for final machining could have been difficult, as it is with all castings. As for investment casting, quite apart from the difficulty and expense of obtaining the necessary investments and castings, I felt it would be extremely difficult to remove a satisfactory wax impression from the mould.

Having made the pattern by fabricating from a number of machined components and being pleased with the overall effect, there is an entry in the diary for 3 November as follows:

"Decision Time — Fabricate cam boxes!" followed by innumerable exclamation marks.

So domestic duties resumed their back seat and I had my friendly sheet metal company shear me 35mm wide strips of 1.5mm aluminium alloy strip which I then cut into squares with a hole in the centre of each. These were then mounted on an arbor in sets of eight and turned into discs. These discs were then chamfered individually to give the necessary tapered form to the fins. During my previous experiments I had produced a bending tool to form the 30deg. bend in the blanks and this was done to all 290 blanks (I must have some spares).

The embryo fins were then bonded together in sets of eight onto a dummy spindle so that they could be mounted in the lathe for facing the bottom of the stack to length and boring a register for the drill jig for the four holes through the stack.

The top bodies were now turned from 1in. dia. bar, including the internal counterbore for the cam, and then milled; first the octagonal flanges at each end, and then the underside of the body to suit the previously milled profile in the top of the stacks of fins.

Another drill jig allowed the drilling of the four matching holes in the body and then the diameter of the body was reduced to its finished dimension of $^{13}/_{16}$in. and the radius on the end of the body was produced with a form tool. This form tool was made by filing a groove with a round diamond needle file in the corner of a high speed steel tool bit, something I would not have believed possible until I tried it.

After producing the $^{3}/_{16}$in. dia. bosses the whole assembly was bonded together and popped into the oven to cure. Meanwhile I produced the bushes in which the tappets were to run and worried about how I was going to hold the assemblies to bore them out to accept the bushes.

After several false starts, with more and more complicated ideas, I came up with the notion of a simple pot fixture. This could be held in the 3-jaw chuck with the component held in place by a couple of 3mm cap screws tapped into the bottom of the pre-drilled bosses. Something that was looking like a difficult job had suddenly become easy — the simplest ideas are always the best. It only remained to bore for the tappet inspection bosses, which had been turned and tapped previously, and to make and fit the bottom flange, and the whole assembly, including the bush, could be bonded together.

The bottom flange is basically $^{15}/_{16}$in. square, but with two sides machined to a radius, and is 0.032in. thick with a $^{3}/_{4}$in. dia hole through the centre. Again I kicked around various ideas but

Left: turning fixture for boring cam boxes. Centre: drill jig for fins. Right: drill jig for top body.

Left: Parted off bottom flange. Centre: Bar machined to profile. Right: Drill jig for gearbox and adaptor.

Rear cam boxes shown with their gearbox and adaptor. Note the aid to identification on the lower sample.

A display board made up to show some of the parts that need to be produced in order to build the **Hydra.**

Machining a chamfer on the gearbox. The length of the support bar is machined to facilitate work setting.

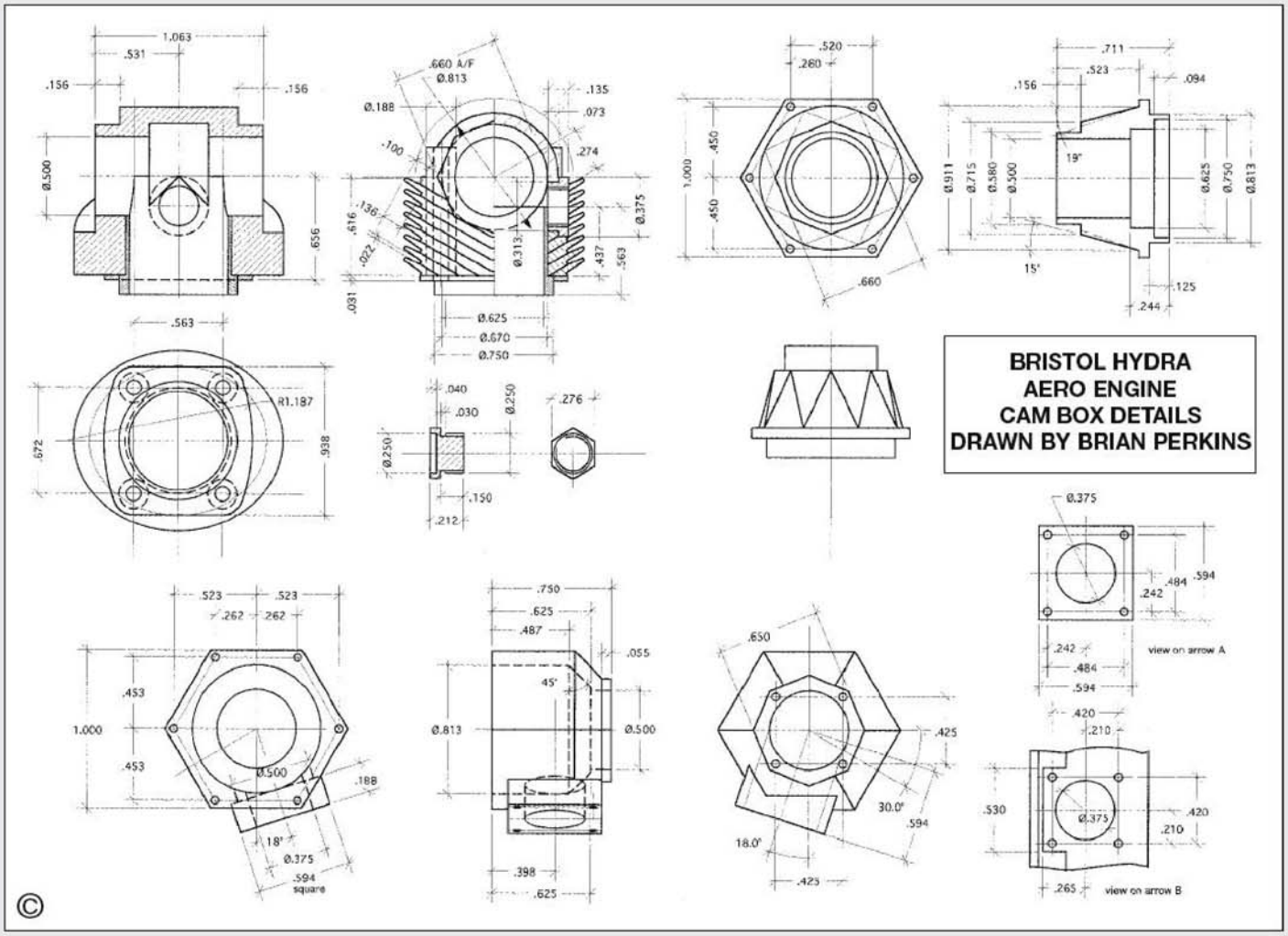
arrived at turning and milling a length of material to the correct profile and then simply parting off to form washers of the correct thickness.

I now had 32 cam boxes, 16 of which were ready to use on the front cylinders but the other 16 for the rear cylinders had to be fitted with adaptors to mount the gearboxes carrying the drive gears. These adaptors had to match the octagonal flange on the end of the cam boxes, and had to have a hexagonal flange on the other end to match the hexagonal form of the gearbox, which in turn had to be tapered down to the octagonal flange for the end fitting.

Because the cam boxes are mounted at 30deg., and the side face of the gearbox has to be vertical for the cross-tubes, a certain amount of concentration had to be used when milling the various ends, particularly as the exhaust side gear boxes also had the mounting for the primary drive shaft. A series of sketches eventually convinced me that I knew what was needed, but it was a great relief when I actually landed up with four left hand inlet side, four right hand inlet side, four left hand exhaust side with drive shaft bosses and four right hand exhaust side with the same bosses.

I now have to be careful to keep them with their matching components while I drill and tap for the 448 12BA fastenings required. Oh joy! Perhaps I should have built the 3-cylinder *Lucifer* as suggested by people at the trust.

●*To be continued ...*



AN ENGINEER'S DAY OUT
THE SCOTTISH MARITIME MUSEUM

Clyde Puffer Spartan *now converted to diesel power at the Scottish Maritime Museum.*

Roger Backhouse explores a museum which sets out to celebrate the once supreme heritage of British ship building.

Looking at the River Clyde now it is difficult to believe that shipyards here once produced more than half the total world tonnage of shipping. Now almost all the shipyards have gone but the memories live on, preserved in three linked museums in Glasgow, Dumbarton and Irvine.

Henry Bell began the world's first successful steamboat operation on the Clyde with the *Comet*. He is commemorated by a monument in Helensburgh. A replica is based at Greenock while the original engine is in the Science Museum in London. Although the small harbour was used by many small boats taking coal from Ayrshire pits, Irvine itself was not a major shipbuilding centre but it is the major centre for the Maritime Museum. Of unusual historical significance, the museum building was originally the Linthouse Engine Shop of Alexander Stephens and Sons, shipbuilders at Govan, Glasgow, erected in 1872 for the manufacture of large marine engines. Following threats of demolition it was re-erected here in 1991 as the museum's main centre.

Machinery and equipment

A key part of the museum is equipment used in shipbuilding and marine engineering. This varies from massive lathes to small drills, punch and shear machines. It includes the dies used in forming boiler heads and even the wooden patterns used to cast the turbine housing for the *Queen Elizabeth 2*.

Models

There are comparatively few models on display. One of the earliest is a quarter size model of the 'steeple' engine made by Tod and McGregor for the P&O liner *Simla* of 1854. It is unusual to find a model of this scale but the reason is that it was used to promote the firm's products at the Paris Exposition Universelle of 1855.

Perhaps the most unusual is the half engine room model used for shipyard reference in the 1970s. Although comparatively crudely finished, this accurate wooden model was used to enable pipe runs, etc., to be carefully planned, saving costly changes in construction. Nowadays this sort of planning would be done using CAD software.

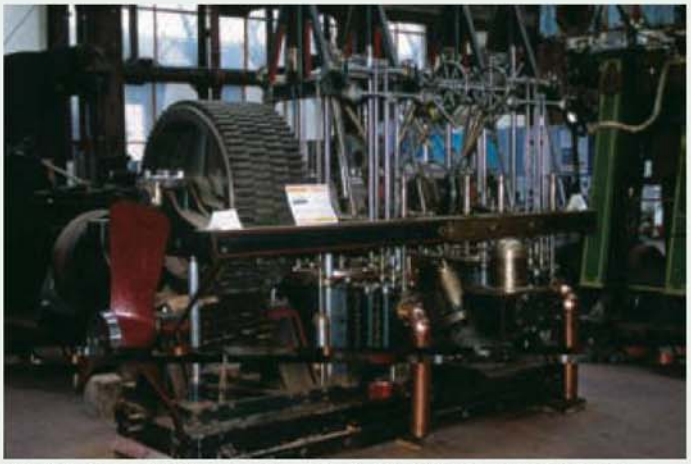
Engines

Several engines are on show. Among my favourites are the two-cylinder compounds built in large numbers for the Clyde puffers and other small ships. Probably the most significant engine is the turbine built by Denny Brothers of Dumbarton in 1901. Charles Parsons invented the revolutionary steam turbine and demonstrated its speed in spectacular fashion with the *Turbinia* at the Spithead Naval Review. The Admiralty adopted it for naval vessels but commercial shipping lines were reluctant to move away from their tried and tested compound engines. Dennys built the Clyde steamer *King Edward* to demonstrate the effectiveness of the steam turbine in commercial use. It was highly successful and

This gas engine from Aberdeen harbour swing bridge was originally used to create the necessary hydraulic power.

Cut away for training submarine engineers, this 'Polar' diesel engine is from HMS Oracle.

Steam Yacht Carola *at the Scottish Maritime Museum.*



Quarter size model of a steeple engine built in 1854 for a Paris Exhibition. The original engine powered the P&O ship Simla.

the steam turbine became standard for the world's passenger liners.

Diesel engines are represented in the collection.

Turbine blades from TS King Edward, *the first turbine engined commercial ship.*

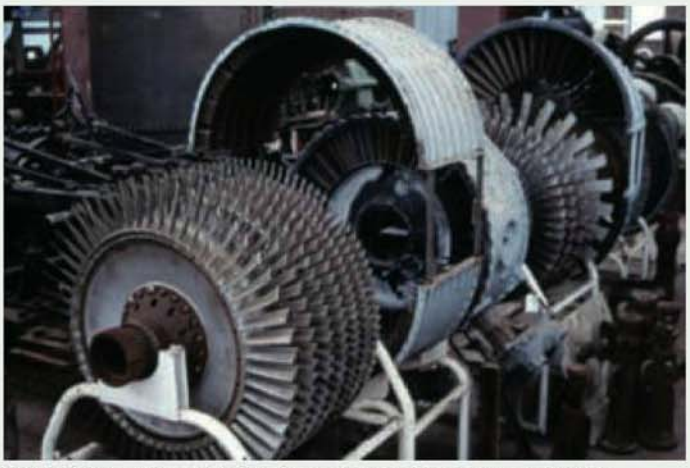
The 'Polar' engine once powered many British submarines. There is one on display cut away from previous use in training submarine engineers. Port installations used a considerable number of engines. An example is the gas engine of 1904 once operating a hydraulic pump to operate a swing bridge at Aberdeen harbour.

Ships

Drawn up on a slipway, a short distance from the main museum building is the iron clipper ship *City of Adelaide*. This may be restored one day. Further along, the museum collection of historic ships is tied up at pontoons. First among these is the Clyde 'puffer' *Spartan*. The 'puffers' were immortalised by the *Para Handy* stories of Neil Hector Munro and films like *The Maggie*. They carried out coastal trades along the Clyde and West Highland routes although the design was first used on the Forth and Clyde canal. The *Spartan* is not typical of the breed. It was built in England in 1942 as an Admiralty victualling ship and was converted to diesel power in 1962, losing the characteristic funnel before the wheelhouse though at least the crew gained more living space. Even now the accommodation is cramped.

The yacht *Carola* is still steam powered. Built in 1898 at Scott and Sons yard at Bowling, Dumbartonshire, she is believed to be the oldest sea-going steam yacht in the world. Like many small steam boats she has a twin cylinder compound engine. Other boats include the last Irvine harbour tug, damaged beyond further use while dumping sub-standard explosives in the sea, and a most unusual sloop fitted with a wind turbine which unlike most yachts could sail directly into the wind.

A detail of the quarter size model steeple engine illustrated above.



This turbine engine is displayed so as to reveal its inner construction.

Turbine engine from TS King Edward.

An electric powered hydraulic pump.

The unusual retractable bridge across Irvine harbour entrance.

Other attractions

Irvine has other points of interest. A local tenement flat has been restored to recreate a 1920s shipyard worker's home open as part of the museum. Alfred Nobel built his explosives factory nearby at Ardesier and a part of the peninsula is now home of the 'Big Idea' inventions centre billed as the opportunity to discover 'one thousand years of mind blowing inventions', inspired in part by the many great Scottish inventors. The centre is targeted at children and is very popular.

The centre is reached by an unusual retractable bridge across Irvine harbour entrance. Each night the centre section is pulled back. Although claimed to be unique in the world another Scottish engineer, Thomas Telford, designed something similar in the 1820s for St. Katharine's Dock, London, where it can still be seen. It is true that there is still work to do in developing the museum. At the time of my visit much remained to be done in labelling and presenting exhibits but it has great potential.

Other museums

Other branches of the Scottish Maritime Museum are *Clydebuilt* at Braehead Shopping Centre which presents the story of Glasgow and the Clyde with lots of hands-on displays and working engines. Across the Clyde at Dumbarton, the Denny Ship Model Demonstration Tank is open to the public. This was set up by Peter Denny in 1882 in the first efforts to make hull design more scientific. Wax hull models could be tested in a tank the length of a football pitch. It is still in use today although the associated shipyard has closed. There is an excellent model of the shipyard in its Edwardian heyday in the National Maritime Museum at Greenwich.

Roller detail of the retractable bridge at Irvine.

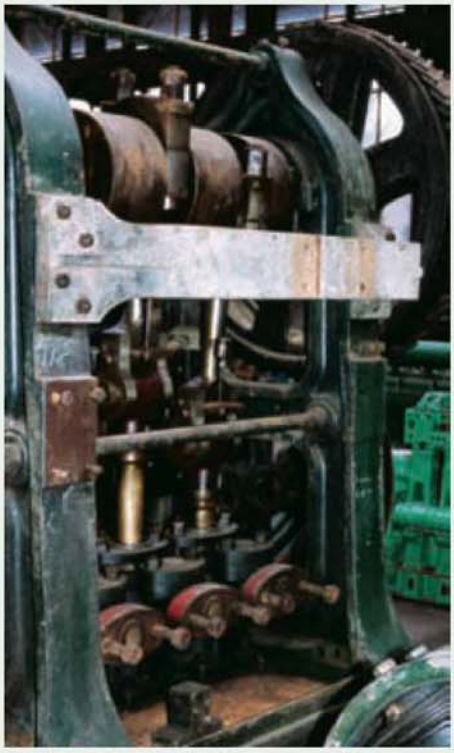
Opening times and charges

The Scottish Maritime Museum Irvine is open every day in Summer 10am-5pm but in winter only the wharf area is open 10am-4pm. Details from 01294-278283 or website **www.scottishmaritimemuseum.org**

There is an admission charge. At the time of writing, adult tickets are £2.50 and a family ticket is a very reasonable £5. These cover admission to all three museums within a 12 month period.

How to get there

The museum is less than 10 minutes from Irvine Station which has a quick service to Glasgow. Irvine is well under half an hour by train from Glasgow Prestwick. Thanks to Ryanair flights it is now much cheaper to reach Ayrshire from South East England.



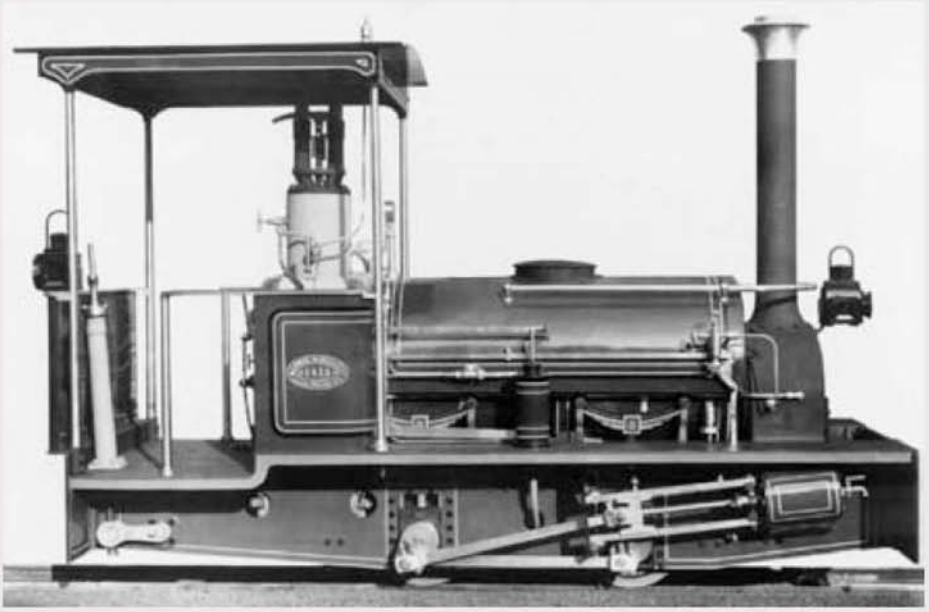
The three-throw hydraulic pump used to power the swing bridge at Aberdeen harbour.

This half engine room model was built for shipyard reference in the 1970s.

This vertical boiler was originally from a small steam ship and later used for soil sterilisation.

Derek Brown and Mark Smithers describe *Anna*, a new locomotive for 7¼in. gauge based on an early Manning Wardle design that inspired the 'Quarry Hunslets'.

●*Part II continued from page 435 (M.E. 4219, 16 April 2004)*



The final variant of the '6 by 8' Manning Wardle was represented by two locomotives (Maker's Nos. 1818 of 1913 and 2039 of 1924) supplied to the Argentine Ministry of Public Works in Buenos Aires. To all intents and purposes, they were an updated version of number 1201 constructed for the same customer in 1890. Buffers were fitted to all three on arrival in Argentina.

ANNA

A MANNING WARDLE LOCOMOTIVE FOR 7¼in. GAUGE

In deciding the approach to be taken to the design of *Anna*, the first point to note is that as many of the distinctive technical features of the original specification as is practicably possible will be incorporated into the model. This principle will often apply even if it conflicts with the dictates of orthodox practice that have influenced many previous designs. For this reason, for instance, the eccentric driven feedpump will be retained and not replaced by a second injector. Secondly, although it has been decided to follow the 'Chatham' rather than the 'Woolwich' specification, *Anna* is not intended to be a model of any particular class member. The adoption of this approach will allow the incorporation of as many of the most attractive features of the basic specification as possible. The only major constraint on the choice of details will therefore be one of chronological consistency.

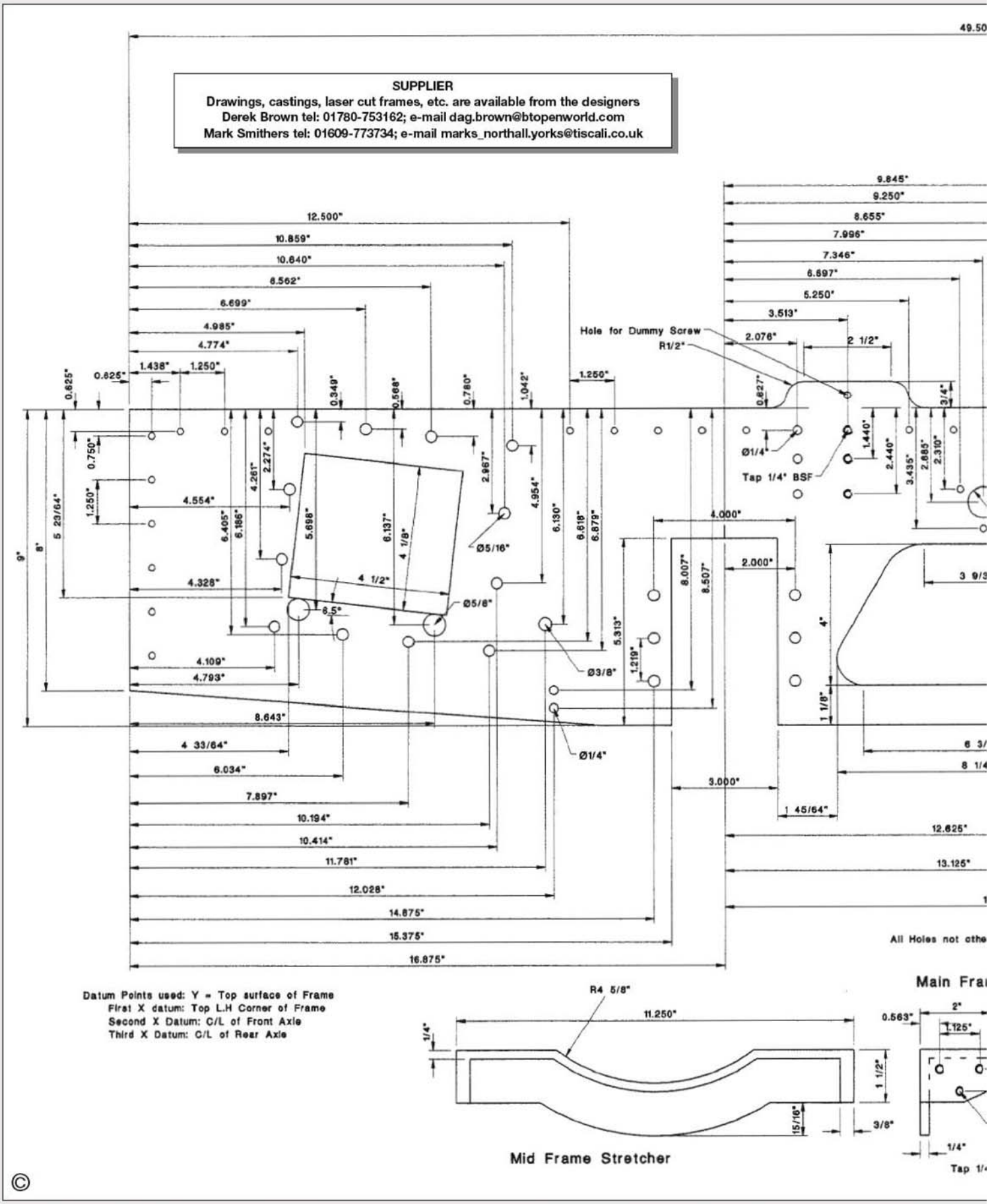
Given that the basic specification was constructed over a period of 53 years, it follows that the choice must be made as to which historical period *Anna* will represent. In making that choice, it is felt that one cannot overlook the importance placed upon the basic type in such important 1870s sources as *The Engineer, Engineering* and Vignes' *Technical Study*, The detailed design approach that will be adopted therefore is that *Anna* will represent the Manning Wardle '6 by 8' 0-4-0ST as it would have been supplied new to a colliery or quarry system in 1872 or 1873. Practical considerations have determined that the scale of the model will be 4½in. to the foot, giving an approximate full size track gauge of 19in. and therefore a slight element of the *Locke* class about the finished result. Discussion of specific details will be undertaken at the relevant points in the text. At this stage it only remains to recommend to readers a model inspired by an important trend setting design that changed the course of history of mechanised rail transport and paved the way for the development of many of our best loved narrow gauge steam locomotives.

Construction details

From the introduction it is clear that there is quite a wide range of prototypes from which we could have chosen the model to be made. The one now to be detailed incorporates the best features, including an ornate canopy around the cab space and full sized buffers which are aesthetically pleasing. At a later date we shall detail a suitable tender which will give much needed extra water and coal storage space, as well as a comfortable driving position. In their Leeds works Manning ▶

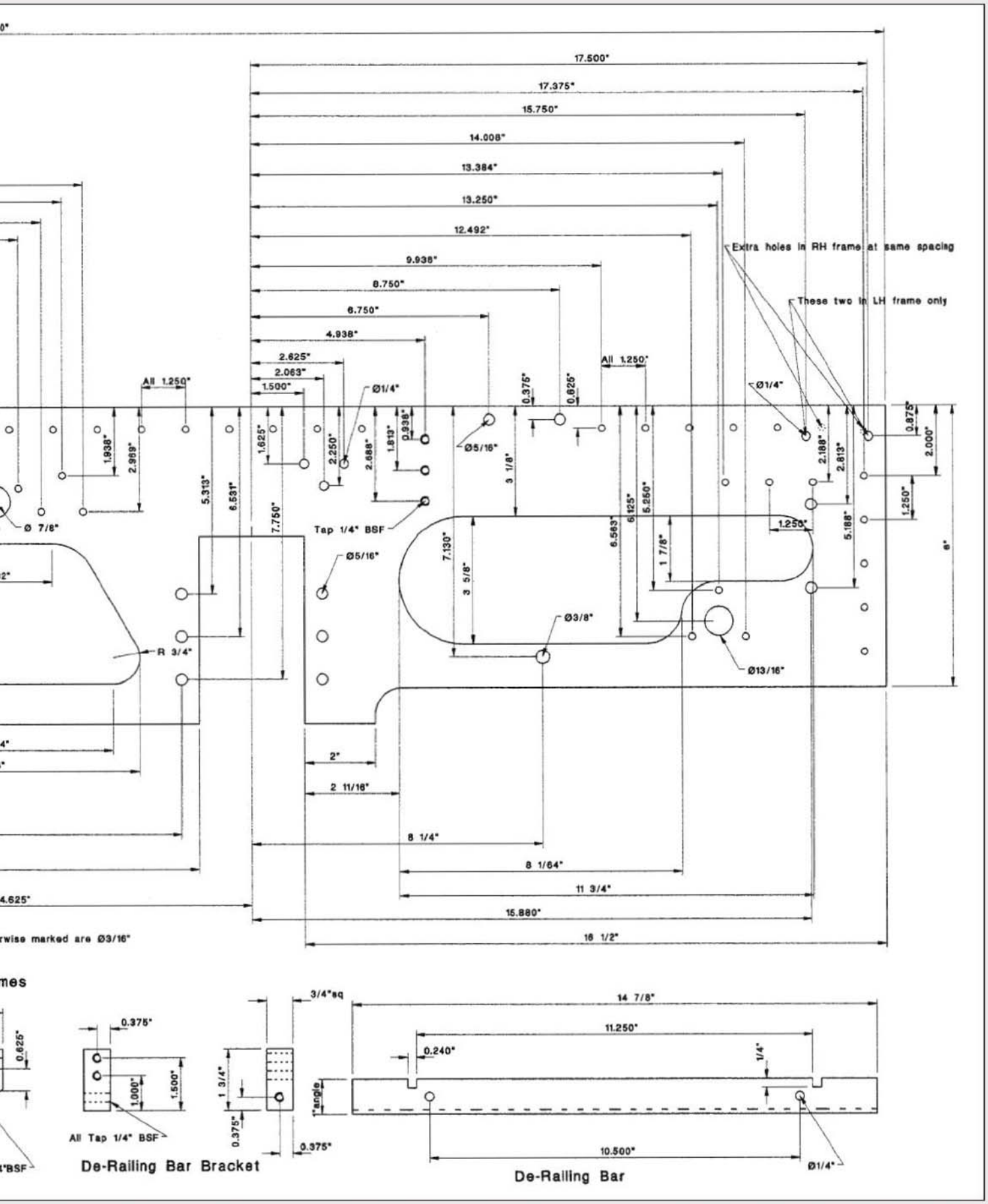
Manning Wardle 482 of 1873 **Albert Edward** *seen at work in the Arsenal in 1918. The engine had been fitted with a new boiler by its owners in 1914, hence the peculiar horizontally hinged smokebox door and Neath pattern spark arrester.* **Albert Edward** *was sold to J. F. Wake of Darlington in 1919.*

This view of **Albert Edward** *shows in close-up the modifications made to the cab at the Arsenal. Also in evidence is a replacement injector, apparently used in conjunction with an original pattern water inlet cock on the saddle tank.*



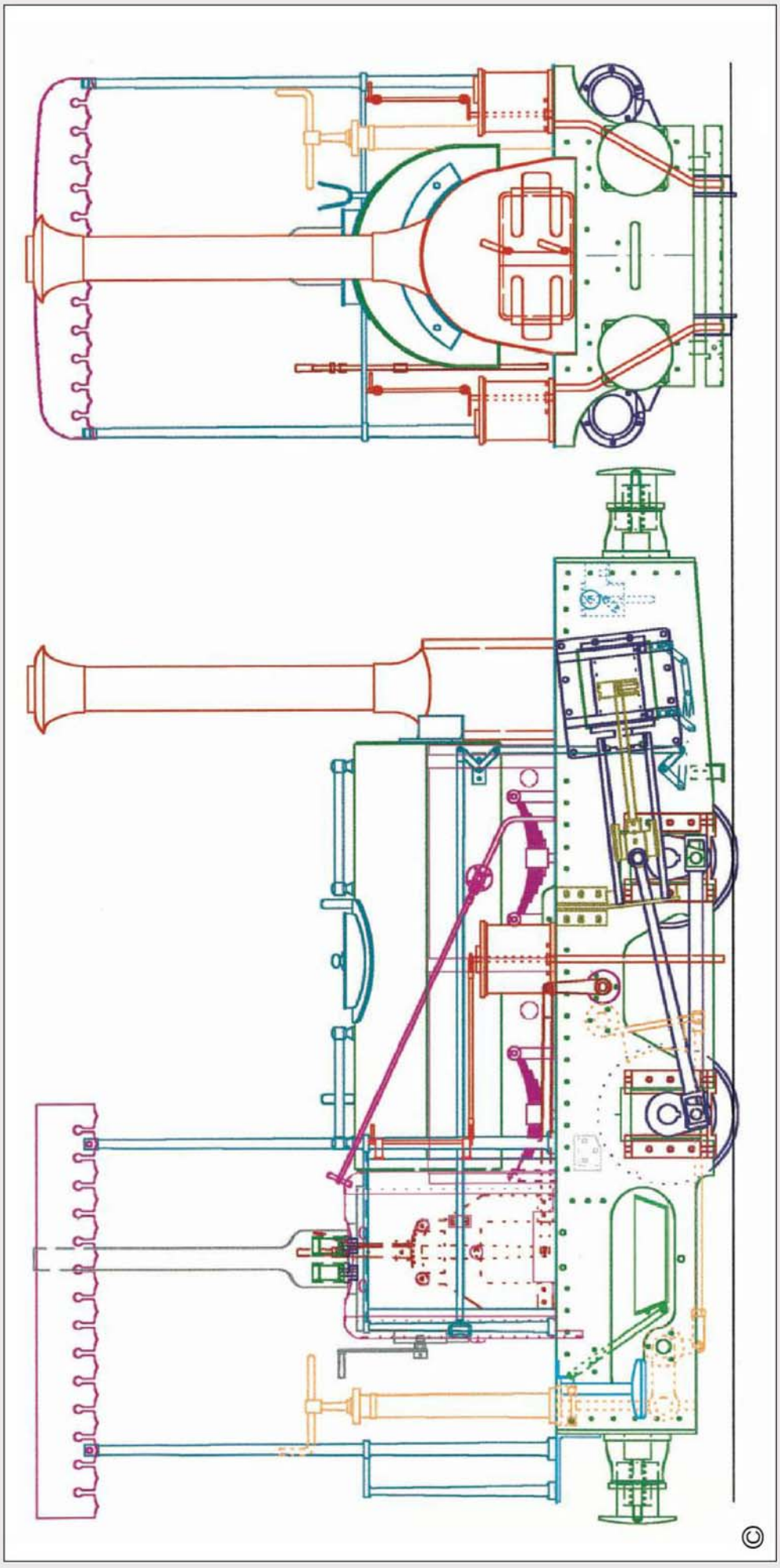
Wardle employed some standardisation of components, with the result that items such as buffers, sanders and handrails are really designed for standard gauge locomotives, looking a trifle heavy in 18in. gauge; nevertheless this is surely what gives the present design its charm.

Scaling down from the original to 7 1/4in. gauge, a scale factor of 4 1/2in. to the foot has been chosen, i.e. 3/8 full size. Bearing in mind the ability of the original design to accommodate a wide range of gauges, true scale gauge therefore works out at 19 1/3in., well within the tolerance of the original's ability to be spread. Furthermore, for our transatlantic brethren who may be constructing in 7 1/2in. gauge, this is allowed for in



the design of the wheelsets. Much of the design owes its origin the success which the author has had with the quarry Hunslet; originally of John Milner's design, many of my own ideas and details have been proven on this very robust locomotive which many readers will already know from its operation around the country on various tracks.

All the details fit at present tightly onto no fewer than 17 A2 sized sheets of paper on which the CAD program has reduced them typically by 3 or 4 to 1 scale. Even at quarter size the drawings are legible, although for commercial production these 17 sheets will be further split up merely to make them more legible, such are the huge advantages of CAD!



It is our intention to define all the positions and holes required for each part as it is presented. Thus it is assumed that co-ordinate drilling methods will be used as standard, enabling components made at a later date to be manufactured with a guaranteed fit without having to clamp components together and drill through from one to another. Such antiquated practices are anathema to me, as well as being a confounded waste of time.

As an example, if you know accurately the distance between wheel centres, this gives the basis for machining the coupling rods, without further experimentation. The objective is, therefore, to drill all the required holes in the frames initially, so that all swarf will be made at the machine tools and not on the job! If you have never tried these methods to date, perhaps now is the time to start. You will save an enormous amount of time. The drawings and castings for the project will be available through the authors, contact details being published from time to time in these pages.

General arrangement drawing

These were originated as devices to check the fit of the various components as they were drawn. We can therefore say with confidence that things will fit properly. The arrangement drawings portray each side of the locomotive, which demonstrates the subtle differences that exist in particular in the plumbing for the injector and axle pump.

Mainframes

The outlines of these items are available as a laser-cut pair. Advantage has been taken of modern technology to spot *all* the holes in their correct positions. In this respect all that is required is to check sizes, drilling and tapping as indicated on the drawing. It is our aim to provide all the holes without the need to strip down again and position others at a later date. Few constructors will have a milling machine whose table can accommodate the whole of the frames, so for those who really enjoy hard slog on 6mm plate we have chosen a series of three datum points, each of which can be used in turn and from which the dimensions spring.

It is assumed that the top edge of the frames is straight; laser cutting is accurate to within about 0.002in., quite accurate enough for our purposes. If you are in any doubt you should take a very light cut to clean up the top datum edge of the frames, before the drilling commences. It will be observed that the small section which sticks up above the frames' straight top edge is to anchor the leading spring assembly, which would otherwise conflict with the motion bracket. In this design the decision was taken to provide coil springs, disguised to look like leaf spring; at the risk of offending the purists it can be said with confidence that the arrangement works and cuts out the fiddle of making working leaf springs.

●*To be continued.*

LETTERS TO A GRANDSON

M. J. H. Ellis

continues with the manufacture of his flap valve injector.

●*Part LXIII continued from page 455 (M.E. 4219, 16 April 2004)*

Dear Adrian, I left you abruptly in my last letter, with the taper of the combining cone for the injector taken as far as was safe, as shown by the fact that the test drill (No. 70) fell short of going right through by only a matter of 15 thous. or so.

Having reached this point, you can now turn the drill around, insert the fluted end, and apply LBSC's test by way of confirmation. His test is to twirl the drill between your finger and thumb while applying gentle pressure to it. If it turns freely, you have not gone far enough with the reamer, whereas if it sticks, you have. I have always found that if I had followed the procedure which I have described, the drill did in fact stick, and the cone, when completed, performed satisfactorily. However, I must explain that I only do things in the way I told you because I had found LBSC's method unreliable. I may have been at fault myself, but I thought that the drill was sticking, and proceeded to the next stage, which is simply running the (in this case No. 70) drill through the short remaining distance. But many of the injectors failed, and I could only put it down to errors in the cones. The correctness of this conclusion is supported by the fact that since I changed my method the results have been much better. My way may take a little longer, but it leaves nothing to chance.

A little still remains to finish the combining cone. While it is still held in the collet, put the 3/16in. reamer in the drill-chuck and flare out the entry so that the water can flow in freely. Our mentor says *"radius out the end to about 1/8in. diameter"* but I can be rather more precise and say *"to as near as possible, 115 thous."* It is here that the water is metered, and the gap should not be too wide, or the water will have to be regulated by the water cock. You may say to yourself *"It's all right for Grandpa to pontificate in this fashion, but there are other things to consider also. Different reamers could well give different profiles, besides which, the length of the steam nozzle affects the gap as well."* I would be pleased if you did think such a thing, because you would be right. However, there is this to be said: once the combining cone is in position, there is not much that can be done about it, whereas if the water supply is insufficient, it is always possible to retract the steam cone by inserting a thin washer beneath its flange to get the injector working, as I have proved on at least one occasion.

Now has come the time to separate the two parts of the cone by heating them gently to melt the solder, and I recommend doing so over a receptacle, be it only a tin, containing water, so that the tiny parts cannot roll away and get lost. You can warm up the delivery end until the solder melts, and wipe it off with a cotton rag, following which you should catch it up in the collet and turn a snout by facing back the tinned end by 10 thous. Take a very light skim around the bore with the curved reamer, it need be no more than just visible, to make things easy for the jet after it has crossed the gap between the two halves.

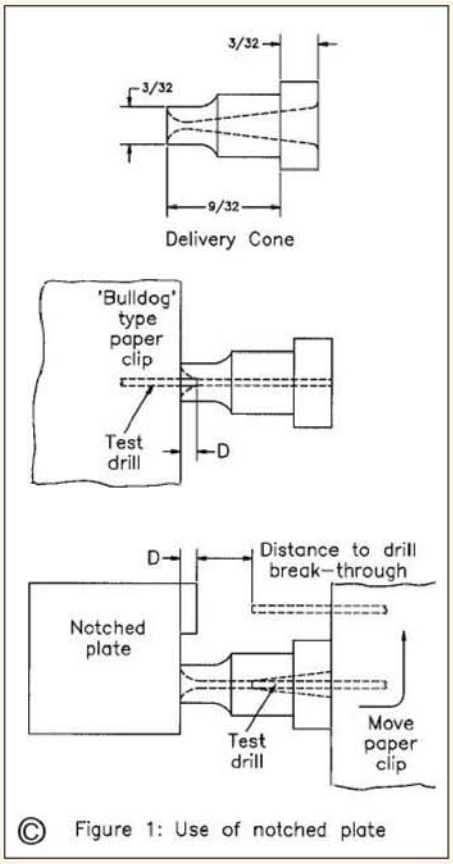
This part has now been finished, and you can put it away somewhere safe while you finish the other part by holding it in the collet and facing off the tinned end until the length of the little cylinder is reduced to 1/8in. (0.125in.) as measured by the micrometer. Finally, turn a 10 thous. long snout on this part also, and the job is finished, apart from removing any little burrs from the ends of the two pieces by threading them onto the 3/4in. reamer and turning it gently. You can check at this point that the gap between the two is 1/32 (0.031) in., as it will be if you have done your work properly. Note that my procedure should ensure this, irrespective of what the thickness of the layer of solder may have been.

By the way, I told you to make the collet about 1in. long, first because although one half the length would have served the present purpose, the longer one would be more suitable for other jobs such as holding valve rods for turning. Besides, the cones, being over-size in the reamed bore, would be rather a tight fit, and so the extra length made it possible to press a suitable size of screwdriver into the slot to release the cone without the risk of damaging it.

Delivery cone

We now have the other two cones to make, so what about making a start on the delivery cone, which has the smallest bore of the lot, so getting the most fiddling part over and done with?

Unlike the combining cone, both the others have a 'throat', or narrowest place within the bore, from which the so-called cone increases in size in either direction. Because of this, the technique of boring out the cone has to be modified. First, the taper bore is formed at one end, and its depth measured by how far the test drill goes in. Suppose this distance is D thous. Then you make a stepped plate from a scrap of metal, the depth of the step being also D thous. Reaming is now performed from the other end, and the distance the test drill has yet to go is to the edge of the stepped plate. I hope my sketch makes this clear (**fig 1**).



© Figure 1: Use of notched plate

Hold your stock in the 3-jaw with a good 1/2in. projecting, face it off, and reduce it to a bare 7/32in. diameter for a length of 1/2in.; you can test the diameter with a 1/4in. x 40tpi union nut, if you have any made, or the female end of the double ended adaptor would do as well. Now turn a length a trifle short of 9/32in. to a few thous. over 5/32in. and reduce the first 1/8in. to form a snout with an end diameter of approximately 3/32 inches.

Before going on to the more delicate reaming operations, it would be as well at this point to take down the parallel part outside to a *"fairly tight push fit"* (LBSC's words) in the injector bore, extending, it at the same time to its full length of 9/32 inches. You may recall that in one of my earlier letters I explained my reason for doing this after turning the snout on the end, which was that if the parallel part was turned first to be a good fit in the bore, the subsequent turning of the nozzle end would be liable to raise a ridge on the end of the parallel part which it would be difficult to remove.

Now that this hurdle is cleared, we can proceed to the boring-out part of the business by forming a centre in the end with your little pivot drill, and drilling in as before, this time with an 0.5mm. (No. 76) drill for 5/16in. or so. By the way, I have quoted the drill sizes for these pilot holes as specified by LBSC, but I see no necessity for them to be so little less than the finished size, which latter, of course, is critical. I have never tried using a smaller drill than the size he specified as the pilot; there would have been no point in doing so, apart from satisfying my curiosity, as I had already invested in drills of every size which he specified. Of the six drills which make up the set needed for making injector cones, if my surmise is correct, it could be possible to save the cost of the two larger 'pilot' sizes, but it could not apply to the delivery cone pilot drill, which, incidentally, is already tiny enough.

Now bell out the end of the nozzle to leave a thin rim (I doubt whether this is critical, but I am following instructions), and this end will be finished with. Cut the work off the stock, leaving enough to face off the flange to 3/32in. thick, and hold it reversed in the collet. Being only 5/16in. deep, the pilot hole will not be visible, so after facing off the flange, make another centre and drill in to meet it, using either the same drill or, if you are careful to go no further than necessary, a somewhat larger one; this would reduce the work to be done by the reamer, and also conserve the life of the 0.5mm. drill.

You must now enlarge the hole with the 1 1/8in. taper reamer, making use of the stepped plate and a 0.52mm. (No. 75) drill to test how far you have to go. As before, when the 'gap' is reduced to about 15 thous. turn the drill around and drill right through. Bell out this end also with the 3/16in. reamer to about 1/8in. diameter, and the cone, like this letter, is finished.

Your affectionate Grandpa.

●*To be continued.*

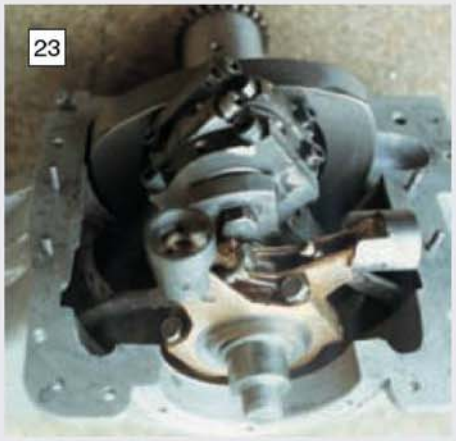
FOWLER STEAM WAGON

Tony Webster

describes the valve gear used in the unusual Fowler V-twin steam engine.

●*Part V continued from page 449 (M.E. 4219, 16 April 2004)*

A pair of gunmetal castings is required to make one eccentric rod. The circular rings are used later for the universal joints.



A view of the underside of the crankcase showing the crankshaft, flywheel, big ends and eccentric straps.

The eccentric (Part No. 8687) is straightforward. The groove in the outer surface is to accommodate the inner flanges of both eccentric straps. Each face is drilled for oil to feed a small drilling to the eccentric surface.

The eccentric straps and rods are each made from two gunmetal castings. This enables a slot to be cut into which the valve rod is connected. **Photograph 22** shows the bare castings, which are each chucked in the 4-jaw and the big and little end projections faced at the same setting to leave them 3/32in. proud of the slot area. Using a square file, a V-groove is cut in the machined face of both halves where the big end bolts will be. Clamp the machined faces of a pair together and silver-solder the joint. Drill these mating grooves out to 3/16in. diameter. The grooves help keep the drill on track. Cut the big end in half, clean up the faces and bolt the caps back on. Chuck and bore the big end to fit the eccentric, not forgetting the inside flange. Offset in the chuck and drill and ream for the little end and the mid-position hole, through both sides of the slot, for the valve-rod. The end of the little end is drilled for an oil hole.

The pivot pin runs in the reversing guide piston (Part No. 8734), which has cut-away sides to allow the eccentric rod to oscillate to a considerable angle — nearly 90 degrees.

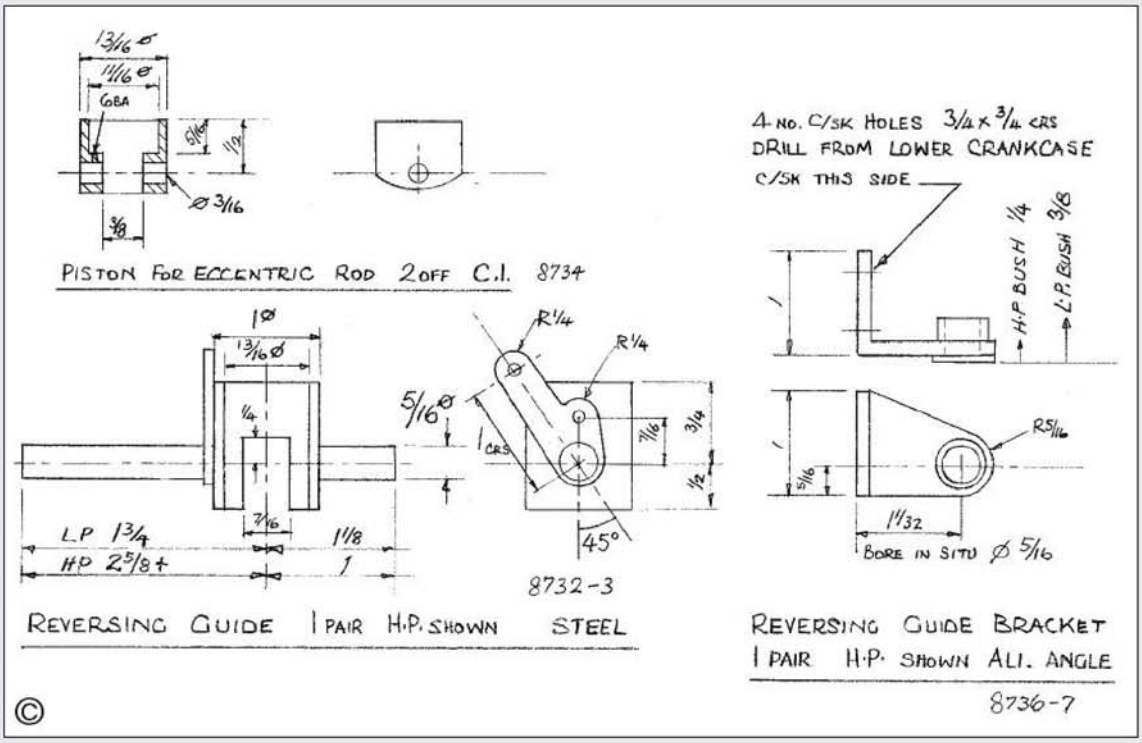
The reversing guide (Parts Nos. 8732 and 8733) in which this piston slides is mounted on trunnion bearings. These trunnions must be on exactly the same centre line as the guide cylinder bore. To achieve this, proceed as follows. Drill a piece of round bar for the guide undersize and cut a piece of 3/8in. or 10mm dia. bar. Drill a 3/8in. dia. cross-hole in the larger piece and silver-solder the two together. The reversing guide lever is fitted at the same time. Note that the high-pressure trunnion is longer and passes through the front of the crankcase lower half and has a lever fitted which in turn connects to the reversing lever. These two guides are also handed. Chuck by the end of the large diameter, making sure that the trunnion is in line with a pair of jaws and a horizontal line across both ends of the trunnion. Drill the original undersize hole to remove the 3/8in. dia. piece across the middle.

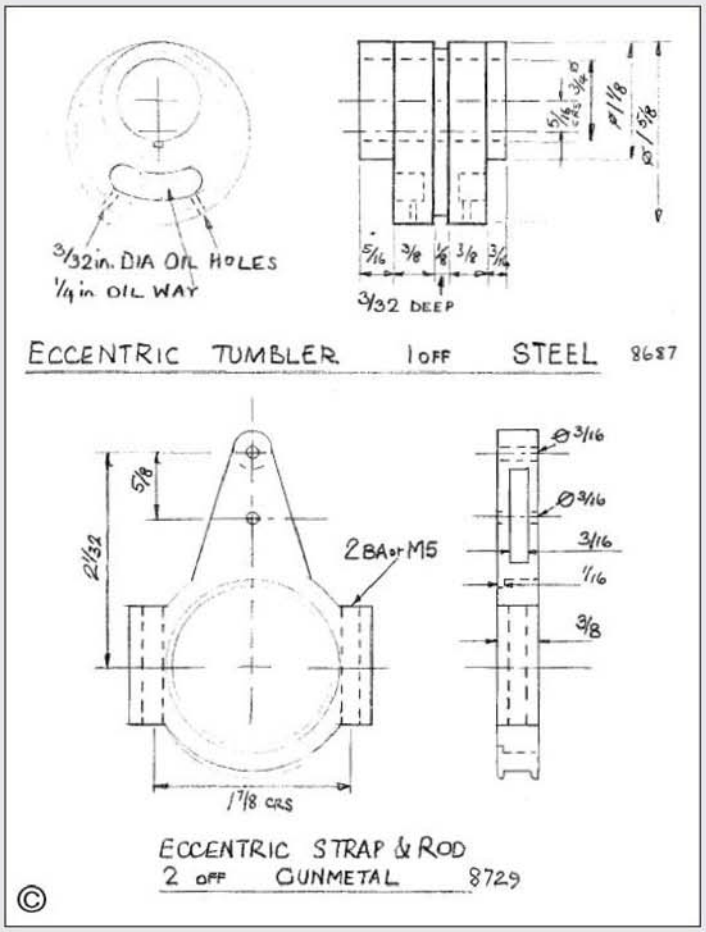
Bore to a sliding fit for the reversing guide piston. Using a sharply pointed tool in the tool post, mark the trunnion rod ends with a horizontal line. A spirit level is used on each jaw to ensure that the appropriate jaw is horizontal. The two marks should then be exactly at 180deg. to each other.

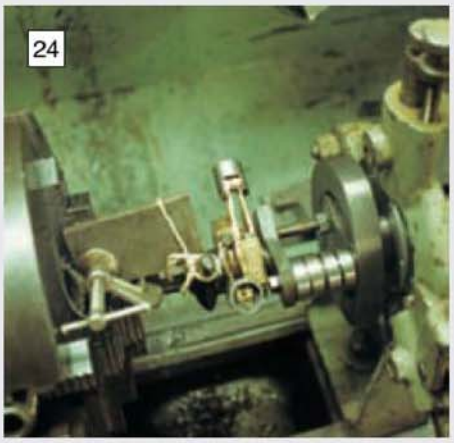
A vertical mark is also made by rotating the chuck and passing the ends of the 3/8in. dia. piece across the point of the same tool. Note that the radius will be different for the two ends and cross-slide adjustment will be needed but *do not move the carriage*. You should now have a cross on each end of the trunnion. Remove from the chuck and centre dot the two crosses. Chuck a small centre drill and, with the opposite end held on a centre in the tailstock, centre each end. Set up between centres and turn the 3/8in. dia. to 5/16in. or 8mm, depending on the size of the Oilite bearings you have obtained. Change end for end and repeat. You should now have the 5/16in. trunnion centred exactly on the cylinder bore. The reversing guide lever is drilled for a 1/8in. pin where the link (Part No. 8739) to the opposite side is pivoted. The link goes in front of the high-pressure and reversing guide lever and behind the low-pressure lever.

The front trunnion passes through a bush in the crankcase. The rear trunnion passes through a bush in an aluminium alloy angle bracket (Parts Nos. 8736 and 8737) which is bolted to the inside of the crankcase lower half. I found it best to bolt both of the angles to the lower crankcase side and then set up the lower crankcase in the lathe to drill and bore both the front and angle bracket to accept the bearing bushes. This ensures that they are in line and parallel to the main crankshaft, etc.

Note that the left hand low-pressure valve gear is driven by the front half of the eccentric, thus the reversing guide is further forward and the angle







A test assembly of the crankshaft in the lathe. Note the use of a bolt as a jack to prevent the crankshaft distorting.

support for the rear bearing is also further forward. The angle bracket for the high-pressure side is cut away to make way for the crankshaft. The eccentric generates to-and-fro movement, via the eccentric rod, in the reversing guide piston, which slides in the reversing guide. In mid-gear this cylinder is at 90deg. to the steam cylinder.

When the guide is turned on its trunnions it imparts an up-and-down motion to the middle hole in the eccentric rod. When the guide is turned the other way it imparts a down-and-up motion and thus the engine crankshaft is reversed.

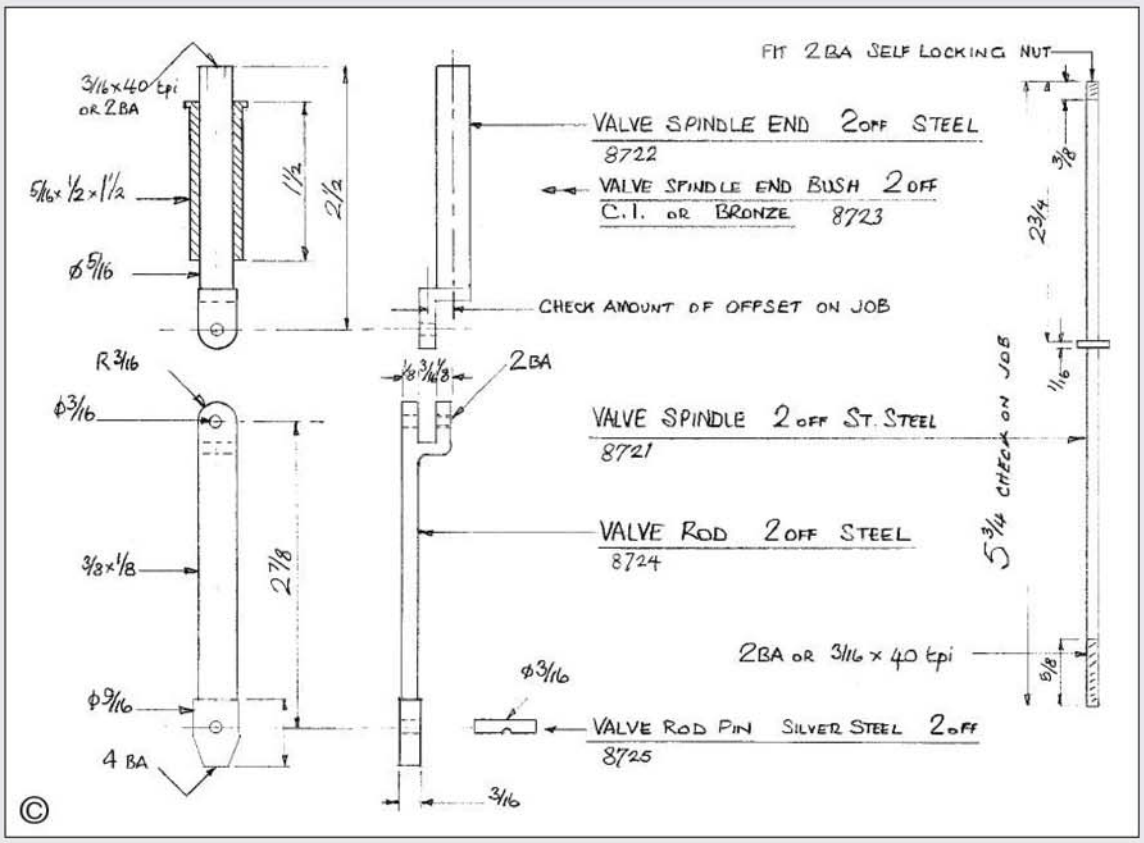
In that middle hole in the eccentric rod is a hardened pin which also passes through the cylindrical end of a flat valve-rod (Part No. 8724). The pin is held from turning by a grub screw in the end of the cylindrical portion at the end of the valve rod. The upper end has an offset fork where the valve spindle end is pivoted, and passes through a bush (Part No. 8723) in the wall of the upper half of the crankcase. The positioning and drilling of this hole will be detailed later.

The valve spindle end is drilled and tapped 3/16in. x 40tpi for the valve spindle and final adjustment of the valve bobbin. The valve spindle has a collar pinned and retained at the lower end of the bobbin and a self-locking nut at the upper end. The valve bobbin has separate end pieces to allow the piston rings to be fitted (see drawing in Part III of this series on page 329 in *M.E.* 4217, 19 March 2004). The hole in the centre of the bobbin is oversize to allow the bobbin to centralise on the bore without influence from the valve rod.

To drill the hole for the valve spindle end bush, assemble the main steam cylinder and lower cover to the trunk-guide flange. Make up a 6mm diameter drill rod and pass it through the bobbin and gland and drill through the crankcase at 1 3/8in. offset from the cylinder centre line. Both valves are offset by 1 3/8in. but make sure you use the correct cylinder on each side. This is because the steam cylinder to valve cylinder distance is different, the angle of the cylinder casting on the trunk guide will be different; but the offset away from the centre line is 1 3/8in. in both cylinders.

The front crankshaft bearing housing cover is machined completely from the rear while being held in the chuck by the chucking piece. This latter is cut off and the casting faced as a final operation. The important size is the length of the spigot that traps the ball bearing against the circlip in the housing. This circlip simplifies the machining of the bearing housing by eliminating the need for a stepped bore. Chuck the bearing housing by the edge of the flange, making sure that the face of the flange can be skimmed flat.

Turn the outside to fit the crankcase and bore to suit the ball bearing. Make a groove for the circlip and face off the inside face of the casting. The housing must fit snugly in the crankcase. It is better to have to unbolt the crankcase halves to free the housing than to have it loose and supported only by its fixing studs. With the crankcase halves temporarily bolted together, fit the front crankshaft bearing housing and drill and tap for its fixing studs. There are three studs in each half.



●*To be continued.*

The original design of quick-change gearbox cover plate and metric screw cutting table fitted to the Warco BH600G lathe.

Milling the grooves leading to the 5mm dia. pin holes in the gearbox cover plate on the milling machine.

FINE TUNING A WARCO BH600G LATHE

Anthony Mount

discusses modifications made to the quick-change gearbox.

●*Part XVI continued from page 437 (M.E. 4219, 16 April 2004)*

At the end of September 2003 I attended the first Warco Open Weekend at Chiddingfold and had a great time. Incidentally, it is being repeated this year on 4/5 September. While there I noticed that the gearbox covers on the latest BH600 lathes were modified. Grooves had been machined in, running from the bottom of the cover to the pin hole. This good idea guides the pin to the hole and prevents any marking of the cover plate. **Photograph 1** shows the original gearbox cover. Once back home, off came my cover for modification.

I had taken it off previously, so second time was easy, but if this is your first time there are a couple of points to watch. First, the cover has four cap head Allen screws to remove, but there are two roll pins as well and these are more difficult. After removing the Allen screws I managed to get the workshop knife under the cover and prised it off, working first one side and then the other. Another thing to watch for is the slider mechanism behind the engagement handle. This comes off with the cover and can fall as it is not retained internally.

The second item to remove is the leadscrew engagement lever. This is also held on with a roll pin, which must be tapped out with a punch. Do not knock it out all the way with the punch but only far enough to be able to grasp it with a pair of pliers for final removal. This is because under the handle is a sprung loaded ball, and we do not want this to fly out and get lost. So pull the pin out with the pliers while pushing the handle in with the other hand. Release it slowly so as to be able to catch the ball as it drops out. Now you can see the gears for the first time, in my case covered in a huge amount of grease.

Next, you can examine the gearbox cover. The back of mine was not machined and my first thoughts were to give it a skim to true it up by end milling, so giving a flat surface parallel with the front which would make clamping down easier. However, on second thoughts, I decided not to machine it as the cover is quite thin and I did not want to weaken it further.

This meant that I had to use shims when clamping it down on the milling machine table to get things level. As you can see in **photo 2**, the angled bottom edge of the cover conveniently drops into a T-slot bringing the cover square, and a packing strip goes underneath to bring the cover level.

My pin holes were 5mm diameter so a 5mm slot drill was used to machine the slots 1mm deep. While the spindle is stationary, the slot drill was used as a locating pin to position it in the right place above the hole and only then was the slot machined. Do not be tempted to position the cover under the slot drill while it is in motion. One false move and you will have a slot where you did not want it. Incidentally, I wonder why we call a three or four-lipped cutter an end mill and a two-lipped cutter a slot drill — why not a slot mill?

While I had the cover off, and thinking of other lathes I had seen in the past, it seemed a good idea if I could put some letters and numbers above the holes. This would make it even easier to locate the right holes when setting up the box for screw cutting rather than counting along. Fortunately, I have access to an engraver so it was an easy job to engrave in the numbers and letters as seen in **photo 3**. But I realise that not all readers will have access to an engraver, so here are a few other ideas on affixing numbers and letters. While on the milling machine, a slot drill, say 6mm dia., could be used to put shallow counterbores above the holes. Then get some numbers and letters printed on paper and, after cutting them out, glue them into the counterbores. Rub-on numbers and letters are available from stationers which could perhaps be used, if they will adhere to cast iron. They could be varnished over to protect them. I would not attempt to stamp on the numbers in case the cast iron cover should break under the hammer blows.

Photograph 4 shows the cover back on the machine, and I think you will find the grooves an improvement in guiding the levers, while the numbers and letters make it easier to position the levers as well as enhancing the look of the cover.

You may have noticed from the photographs that the metric thread chart is not the original. At about the same time I was told that on the Chester 'Craftsman' lathe, a very similar machine to the BH600, that the metric screw cutting chart had a mistake on it. This is for a lathe with an imperial leadscrew, the same as mine. I had already cut some metric threads with no problem, but decided to check it out.

The chart is in three parts divided up according to the gears used on the change wheel studs. Even though the lathe has a quick-change gearbox, additional threads can be cut using change wheels, and a 127-tooth gear provides the metric conversion to the 8tpi leadscrew.

The first and second batches worked out okay, but the third batch was wrong. This is for pitches 4.5, 2.25, 1.8, 0.9, and 0.45 millimetres. Only the first and last of these are standard metric pitches,

METRIC THREAD TABLE

mm	127/120 40/40			127/120 40/32		127/120 30/32	
	1	4	6	1	6	1	4
A	6	4.8	4	7.5	5	4.5	
B	3	2.4	2	3.75	2.5	2.25	1.8
C	1.5	1.2	1		1.25		0.9
D	0.75	0.6	0.5				0.45
E		0.3	0.25				

INCH THREAD TABLE

TPI	A	B	C	D	E
1	5 3/4	11 1/2	23	46	92
1	3 3/4	7 1/2	15	30	60

FEEDING TABLE mm/inch

127/40	1	2	3	4	5	6	7	8
D	42 .0165	37 .0148	35 .0138	33 .0131	30 .0120	28 .0110	26 .0101	24 .0094
E	210 .0082	185 .0073	175 .0069	165 .0065	150 .0060	140 .0055	130 .0050	120 .0047

EXISTING THREAD CHART TO WARCO BH600G LATHE

METRIC THREAD TABLE

mm	127/120 40/40			127/120 40/32		127/120 30/40	
	1	4	6	1	6	1	4
A	6	4.8	4	7.5	5	4.5	
B	3	2.4	2	3.75	2.5	2.25	1.8
C	1.5	1.2	1		1.25		0.9
D	0.75	0.6	0.5				0.45
E		0.3	0.25				

INCH THREAD TABLE

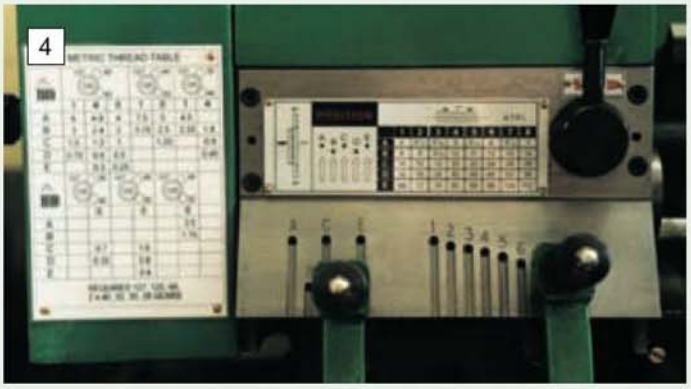
TPI	A	B	C	D	E
1	5 3/4	11 1/2	23	46	92
1	3 3/4	7 1/2	15	30	60

FEEDING TABLE mm/inch

127/40	1	2	3	4	5	6	7	8
D	42 .0165	37 .0148	35 .0138	33 .0131	30 .0120	28 .0110	26 .0101	24 .0094
E	210 .0082	185 .0073	175 .0069	165 .0065	150 .0060	140 .0055	130 .0050	120 .0047

MODIFIED THREAD CHART TO WARCO BH600G LATHE ©

Engraving the identification letters and numbers on the cover plate. Other methods are described in the text for those without engraving facilities.



The modified quick-change gearbox cover and revised metric screw cutting chart attached to the author's lathe.

4.5 being the pitch for M42 and M45 and 0.45 is the pitch for M2.2 and M2.5. As one is very large, one very small and the others non-standard I do not suppose anybody has ever used them.

The problem is the 32-tooth gear on the input shaft to the gearbox. However, all is not lost as by substituting a 40-tooth gear, which is in the change wheel set provided, it all works out correctly. This exercise set me thinking about other threads. I had already noticed that 0.8 pitch, used for M5, was missing from the chart so I looked for other missing SI pitches, and found 0.35, 0.4, 0.7, 0.8, 1.75, 3.5 and 5.5 had all been omitted. I was however able to find gear ratios to cut these pitches but did need extra gears in the form of 55, 48 and 28 tooth wheels.

The change gears for this lathe are 1.25 module. Of the three gear catalogues I have, only HPC Gears (tel: 01246-268 080) seemed to stock them. However, they need to be bored out and the keyways cut. To mount the gears for machining I bored out soft jaws to grip on the periphery of the gears. For the keyway, I drilled a couple of 2mm holes within the area of the keyway, used a junior hacksaw to saw down from the bore to the holes, and a piercing saw to remove the resulting central web. After that the ragged slot was filed to fit the key. I often wish when using a piercing saw that coping saw blades were available with finer teeth and suitable for cutting metal. The larger and stronger blades of the coping saw would be most useful for metalworking.

For those interested I give below a manual method of working out the gears needed. A spreadsheet on a computer can also be used and will reveal many combinations of gears and threads. For example, to find a 6mm pitch as shown on the original chart using 127, 40, 120 and 40 tooth gears we have the ratio:

(127 / 40) x (40 / 120) = 5080/4800
= 1.0583333

From the chart we find that 6mm pitch uses the gear levers set to A1 which, according to the machine's imperial screwcutting chart gives 4tpi.

Therefore 6mm pitch = 1.0583333 x 4tpi
= 4.2333332tpi

Thus (25.4 / 4.2333332) = 6mm pitch

If we are starting from scratch we can find some of the information required by dividing the pitch into 25.4. Using 6mm pitch again:

(25.4 / 6) = 4.2333333tpi

We can then use a combination; in this case:

(127 / 40) x (40 / 120) = (5080/4800)
= 1.0583333

and (4.2333333 / 1.0583333) = 4tpi

So we need to set the box to 4tpi

So we can divide 25.4 by the pitch required, which will result in a number that we can call α. We then use a combination of gears that will result in a number that will divide into α leaving a round figure that also appears in the imperial screwcutting chart.

Now let us try a pitch for which we do not know the answer from the original chart. I found 5.5mm pitch quite awkward so we can work through that.

First let's put down what we know.

(25.4 / 5.5) = 4.6181818tpi

We have two gears 127 and 120 tooth.

The gearbox needs to be set to an imperial pitch and, purely as a guess, I tried 8tpi. From this we can put:

(4.6181818 / 8) = 0.5772727

So we can now write down an equation and see what is missing.

(127 / ?) x (? / 120) = (? / ?)
= 0.5772727

Now we need one of the other gears and it is a case of trial and error. However, as there was a 30 tooth gear in the standard set I tried that, giving a bit more to the equation.

(127 / ?) x (30 / 120) = (3810 / ?)
= 0.5772727

Almost there! If we take 3810 and divide by 0.5772727 we get:

(3810 / 0.5772727) = 6600

So the equation then becomes:

(127 / ?) x (30 / 120) = (3810 / 6600)
= 0.5772727

Now only one gear is missing, which can be found from: (6600 / 120) = 55

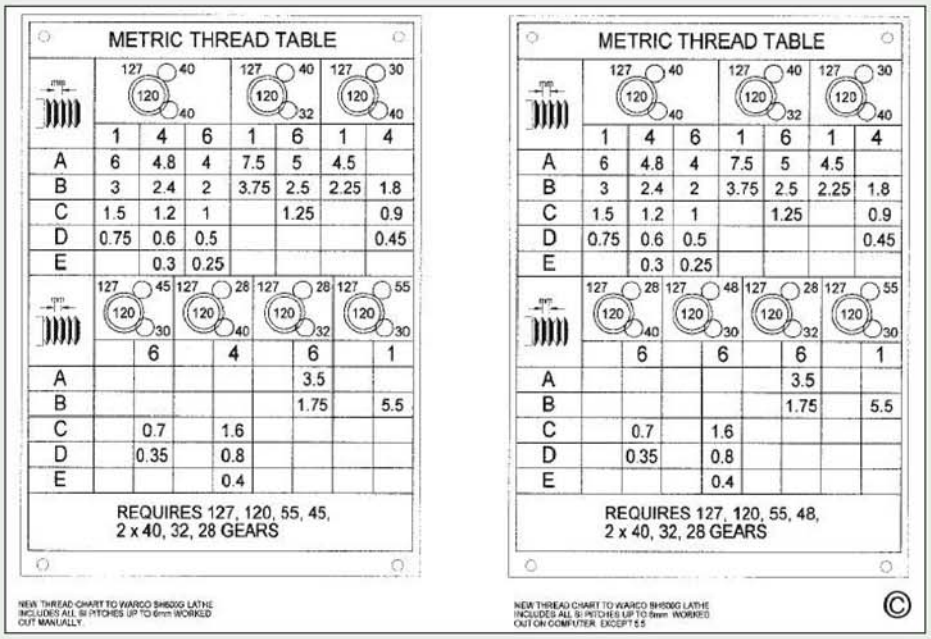
So 30 and 55 were the missing gears.

It will also work out with 42 and 77 tooth gears but have a go at working out the equations for yourself with these two gears.

The accompanying chart shows in reduced size the original gearbox settings, the revised settings and the additional settings for the extra SI threads. Readers who require full size copies of these charts (free of charge) may send a SAE to the *M.E.* Editorial Office at PO Box 310, Hemel Hempstead, Hertfordshire HP3 8XL. I had mine laminated and used it to replace the original chart. Have the charts laminated separately and trim them to within 2mm of the paper edge. If you have them laminated side by side, when trimmed the edge of the paper is exposed and there is the chance of oil seeping in from the exposed edge.

The copy of the original existing metric, imperial threads and feed settings, can be cut up and the imperial and feed settings part can be laminated separately and put in another position on the change wheel cover, so that all can be seen at a glance.

It would be interesting to read an exhaustive study of quick-change gearboxes, history, application, metric and imperial, dual (if this is possible), how to get odd pitches from an individual machine, etc. Martin Cleeve wrote an excellent book on screw cutting for the change wheel equipped machine, which covers nearly every aspect of screw cutting, but he was rather dismissive of the quick-change gearbox. Now that the quick-change gearbox box is so widely available on model engineering lathes it would render a great service if someone were to provide a book on this topic.



KEITH'S COLUMN

GIVE A LITTLE WHISTLE!

Keith Wilson

investigates the mysteries of steam whistles and shares correspondence concerning troughs and speeds.

●*Part XXX continued from page 454 (M.E. 4219, 16 April 2004)*

Much has been written (and for that matter, plenty has been said) on these subjects and there is little doubt that much more will be written and said in due course. However, some notes here (pun deliberate!) may prove of use/interest.

Such items can be scaled and make a sound but I know of no way they can both be scaled *and* make the correct note. So it seems best that we use dummy whistles in the right place, and put the sounding whistle 'down below' where it is not so obvious. It may be superfluous to mention, but the whistle *must* be mounted mouth-downwards, or at the very least horizontal with the mouth underneath. For if not, then it will not take long 'ere the pipe fills up with condensation. Result: the note will get higher and higher until it either goes ultrasonic or just gives out a gurgling sound. Disconcerting!

In most engines there is room for a whistle just below the hanging plates (valance plates). For double-framed puffers however, this ain't so. For one thing, hanging plates are actually the outer frames and between outer and inner it is necessary to get brake gear, injector feed, driving wheels and so on. In the case of vacuum fitted double-framers, we have to find room for the vacuum reservoir, the brake cylinders, the drawbar, and several other pipes (such as blowdown from water gauge) between the inner frames at the back. Not easy.

Clearance is limited (and how!) and we not only have to get all these bits in place, but remember that they must all be reachable from outside, with outsized tools to boot. Faced with this little problem, some experimental tricks were tried with some success.

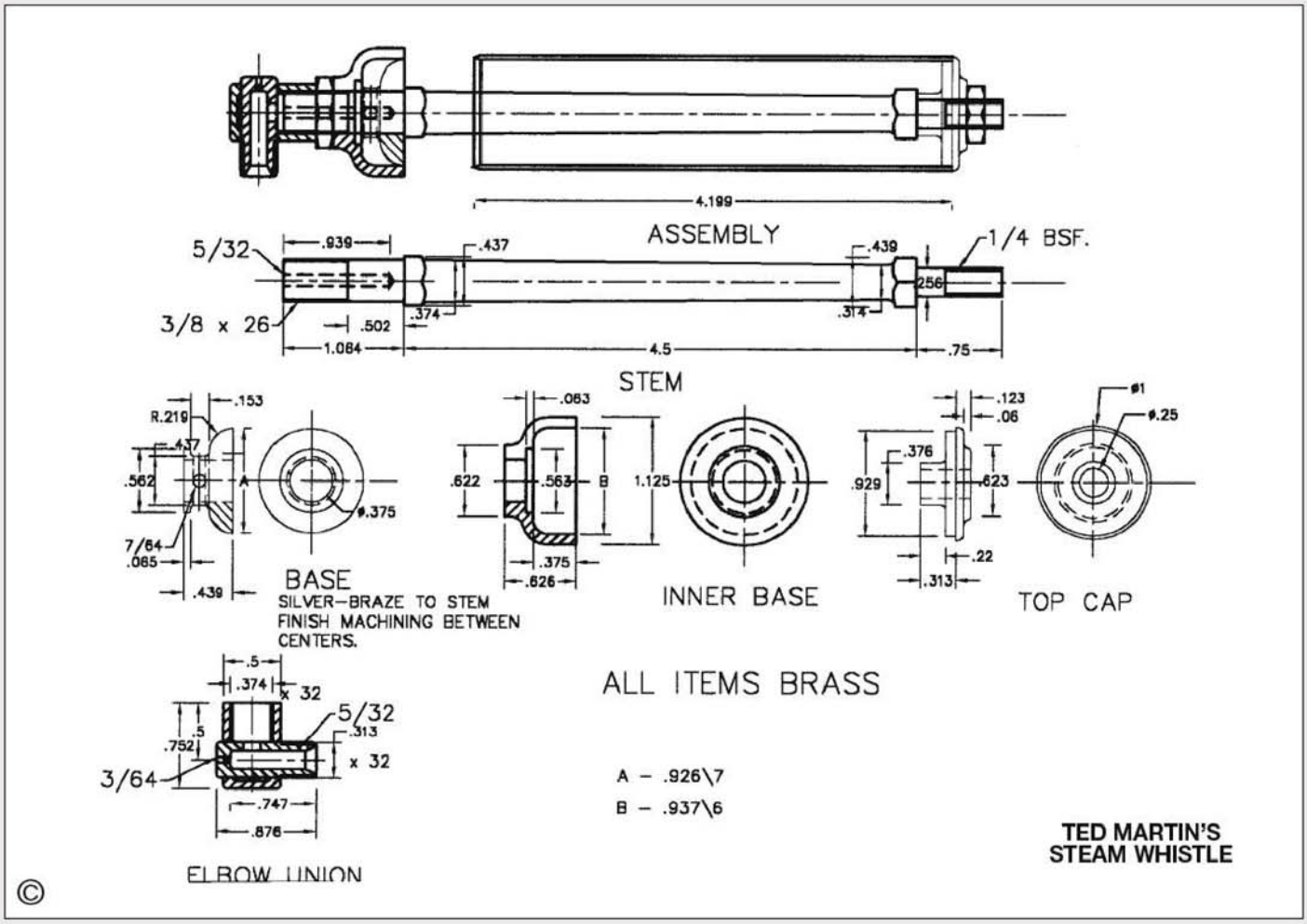
Ted Martin has done some experimental work in making 'bell' type whistles and has succeeded where I failed. For I had made sixteen bell-type whistles for my batch of eight giant Prairies. Each and every one of them blew eardrums out on compressed air, but despite being adjustable all I could get the (censored) things to do in steam was to make a loud hiss at about the correct frequency. Useless.

Ted had the advantage of a little more time to spare, for I had made most of his locomotives for him. The results of his labours are shown here. *All* credit must go to him. Although I have as yet not made one to this design, I have seen them (and heard them!) at work on his stud of locomotives. In most cases, they can be mounted vertically between frames; note that there is a little drain hole in the bottom of the angle fitting. This is needful, for perforce condensation takes place in the supply pipe and has to be blown out before all hell breaks loose in the sound chamber.

I have had much success with organ-pipe types, and drawings for these are shown here.

If made fairly accurately, they work noisily, which of course is all to the good. A useful addition is the angle connection shown. When these are mounted horizontally, drainage is automatic. However, the use of the angle fitting can make life a little easier.

For reasons of time, I have only shown here the modified 'top in' type; if you want to make the more usual type, then leave out the central pipe and of course the hole in the top cap. The bottom cap needs only to have its lower end made with a union fitting for the pipe and of course does not require to be drilled right through.



A pair of 'top entry' whistles.

The little bit of the labial (the floor of the pipe) marked as 100deg. is tricky to file, but quite easy to mill, especially if you have a rotary table. It can be done 'vertically' leaving sharp ends, or 'horizontally' leaving rounded ends to the cutout, which should be 0.025in. deep. This end fitting can be inserted directly into the lower end of the tube after cutting out the 'mouth', which need not be nicely curved at the top; flat works just as well. Just a wee dab of soft solder of the plumber's variety will ensure its retention; make sure that the solder does not fill up the gap. If it does, then the easy way out is to cook up the end again with a certain amount of air pressure on the input end. When the temperature reaches the melting point of the solder, it will blow out (mind your eyes!) to leave the perfect gap. The top cap needs to be sealed with soft solder, for leaks are best avoided.

In view of the cramped conditions, methought of possible ways of improving matters, and a certain amount of development work resulted in what I have named the 'top feed whistle'.

Basically it is obvious — once it has been pointed out! The top cap is drilled right through 3/16in. dia. and has a length of copper tube silver-brazed into the end remote from the threaded portion. The bottom cap is drilled 3/16in., but not right through. Otherwise, it matches the bottom cap on the 'normal' whistle. I have just knocked out four of these whistles — result deafening on air; will have to wait awhile for performance on steam to be assessed, but I have no doubts on the matter.

It may look tricky to assemble this flute, but if you set in the lower cap first, soldering it in, then the top cap complete with inner tube can be shoved in the top, a tiny bit of juggling will set in the lower end of the inner tube into its socket. Once the top is sealed in, it is an easy matter to put a wee dollop of solder onto the lower joint, working through the mouth of the whistle.

After cleaning up, mere lung pressure should be enough to sound the beast; if nothing doing try the compressor. It is possible that some of the solder 'may have done gotten itself' into the wrong place; if you suspect this then to keep air pressure on while cooking up the whole shebang — actually the bottom is probably best to start with — will enable surplus solder to blow itself out and the hooter will pick up and ring out loud.

With whistles of this type hanging direct on the ends of their supply pipes I see no reason for any other form of support. They are likely to be well tucked in anyway.

Wilson's Words of Wisdom:
If a fact does not fit in with a cherished theory, this in no wise affects the truth of that fact.

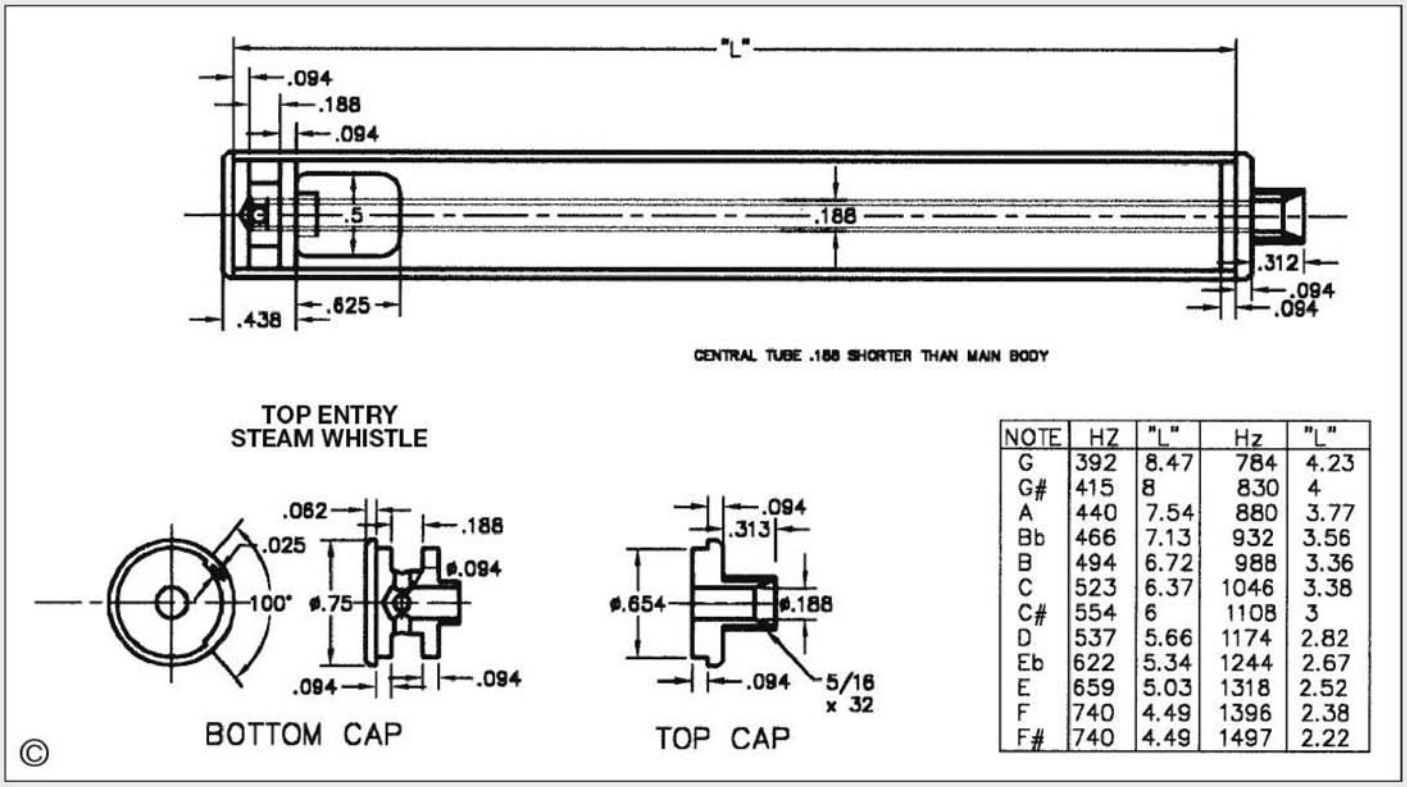
No-one knows why!

So far as I am aware, there is no accepted scientific theory as to precisely how a steam whistle works, but for the time being we shall just have to understand and accept that it does. After all, it took a large number of years to understand how an organ pipe of the flue variety, as distinct from reeds, actually worked. It took high-speed photography plus smoke-loaded air-blown pipes to solve this one. A book on whistles entitled *The Engine's Moans* published by Astragal Press in America, deals with histories of whistles; said book confirms my first sentence in this paragraph — however, it is worth reading.

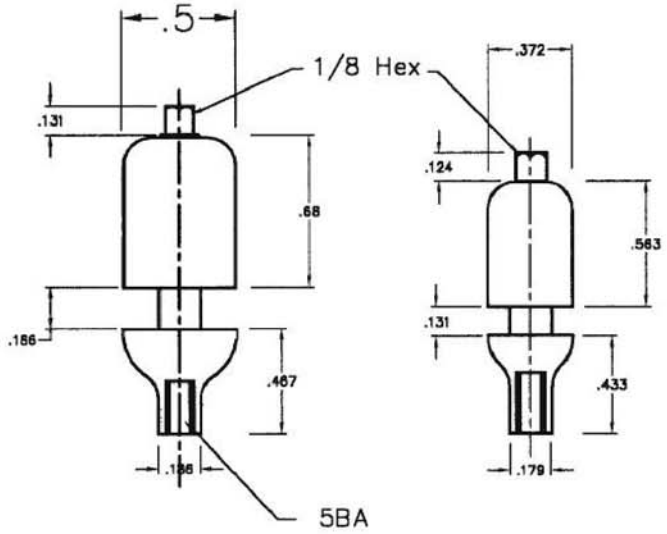
Another crafty whistle-wangle is to purchase an 'Acme' referee's whistle, but get the metal one rather than the plastic variety. Dig the pea out (it is, or was, just a piece of cork); a little bit of fiddling about will enable a steam supply pipe to be fitted, and there you are.

I did this 50 years ago on my first ever steam locomotive (*Mary Ann*, a Darlington J39 by LBSC in 2 1/2in. gauge) and discovered that the frequency of the note depended largely on pressure of steam; hence by careful manipulation a nice loud wolf-whistle can be produced.

A few years ago, a builder approached me with a genuine Stanier whistle off a Black Five, asking me what size pipe would be needed. I could only make a guess, and recommended nothing smaller than 1/4in. diameter. I was not very hopeful, but I was wrong. He mounted it between the frames of his *Simplex*, fed it with a generous valve and pipes, and behold — it worked! I understand that on its first run he did not blow it at first, but trundled on ▶



NOTE	HZ	"L"	Hz	"L"
G	392	8.47	784	4.23
G#	415	8	830	4
A	440	7.54	880	3.77
Bb	466	7.13	932	3.56
B	494	6.72	988	3.36
C	523	6.37	1046	3.38
C#	554	6	1108	3
D	537	5.66	1174	2.82
Eb	622	5.34	1244	2.67
E	659	5.03	1318	2.52
F	740	4.49	1396	2.38
F#	740	4.49	1497	2.22



Dummy whistles on a 7¼in. gauge GWR Prairie locomotive.

DUMMY GWR STEAM WHISTLES

round the track gloating a bit – I'll bet he did! Coming near to the club hut, he hoicked heftily on the chain and blew a mighty blast. It seems that the club door had never known so many people to pass through it at one go. But I'll bet it knocked his pressure back a bit — no moan without groan!

That reminds me of being in the NASA set up at Cape Canaveral when the broadcast system informed everyone that the big Jumbo was just landing with *Challenger* mounted thereon. A door just in front of me burst open, and I would not be believed if I guessed just how many people passed through it in about 5 seconds! I got my camera up but was just too late to catch the Jumbo, but no-one else managed it either.

It brings home the sheer size of the Saturn 5 rocket to note the time it takes to walk from one end to t'other. At 14ft. diameter, the actual rocket engines take some thought, and I believe that on take-off some 80,000 horsepower goes into the pumps alone.

How had we got to Florida? Well, we purchased a Hoover washing machine a couple of years previously and were lucky enough to win the associated competition. Oddly enough, and as unlikely as it seems, the Cape is one of America's larger nature reserves. Eagles' nests are not rare sights, and one has to keep an eye open for alligators, especially at night. The largest nature reserve in Britain is the combined area of grassed motorway sides.

A few years ago I built a couple of Hunslets, and from sheer cussedness decided to put a multiple-piped chime whistle on them. As I recall, I fitted them into a straight horizontal pipe with a hefty valve. I deliberately chose notes that made a wild sound: C, Eb, F#, A, making a diminished 7th chord. I am playing about with designing a single-pipe chime whistle for my next batch of locomotives.

I include a scale-size drawing of dummy Swindon whistles to 10:78 scale, exactly right for 7¼in. gauge locomotives.

Water troughs and locomotive speeds

We have the time and the space for a couple of letters from friends re the above.

"Hi Keith, — The drawings you show for the Logger/Slogger *tender trucks are of a type known in the US as Arch-Bar trucks. These were in general use by about 1870 and continued to be made well into the 1920s. They were used on freight cars (fitted with coil springs), cabooses (cabeese?) and tenders (fitted with elliptical leaf springs). They were inexpensive and gave good service when speeds were low.*

"A few American railroads had water troughs, although in the US they were known as 'track pans'. The New York Central was one of the few with track pans which allowed them to build tenders with larger coal capacity. The NYC 'Niagara' S1 class 4-8-4 locomotives which were used on the 928 mile New York to Chicago route, had 14-wheel 'centipede' tenders with a water capacity of a mere 15,000 imperial gallons which allowed them to carry 42 long tons of coal and enabled them to run through from New York to Chicago with only one stop for coal! The coaling docks straddled the main lines so that the locomotive did not have to be uncoupled from its train. The ash pan would be emptied at the same time. These locomotive were averaging 26,000 miles a month, I wonder if any Swindon, Doncaster or Crewe built engines could have managed this sort of performance?"

"Is anyone supplying the castings for Logger/Slogger*? Regards ..."*

"Hi Keith, — I have just read your latest article in this week's Model Engineer *and the final paragraph set me thinking about locomotive speeds. Until about 1930 there was a rule of thumb in the US which said that a locomotive's normal maximum speed was the same in mph as its wheel diameter in inches. That is to say, a locomotive with 60in. diameter driving wheels was good for a maximum speed of 60mph. After this date about 20% could be added to the speed because of better cross balancing."*

"All locomotives have a wheel diameter speed of 336rpm so that at this rotational speed the locomotive speed is the same in mph as its wheel diameter in inches. I can't remember the diameter of the Highlander *driving wheels, but I think it was about 10in. so to be going at 31mph the wheels must have been revolving at something near 1,000rpm! This must have been a well-balanced engine."*

"Before WW2 there were many reports in the US that, due to heavy counterbalance weight being added to the wheels for cross balancing the reciprocating and revolving weights, the driving wheels were lifting off the rails at high speed. To ascertain just what did happen under these conditions, special slip tests were run over greased rails on the New York Central in 1938 with one of the latest 4-6-4 'Hudson' type locomotives equipped with roller bearings on all axles and light weight moving parts."

"The tests showed that only a very slight wheel lift off the rail actually occurred at the top slipping speed of about 700rpm. These locomotives had 79in. diameter drivers so that at 700rpm the equivalent speed would be about 170mph! The absence of damage to the locomotive or the track during these tests, indicated a well balanced and well proportioned piece of machinery. After the tests there were no more complaints and the condition was recognised as an inherent balancing characteristic of the two-cylinder locomotive engine, as is the condition of maximum torque position of the crankpins with resultant 'quarter slip,' or uneven tyre wear, on the driving wheels."

"I have never heard of these problems affecting British two-cylinder locomotives. Maybe this is because the maximum piston thrust is so much lower in this country than the US.

"Have you heard of any of these problems with locos in this country?

"Regards, Malcolm Young."

Arising from the above, if a GWR 2-cylinder locomotive did pull away hard from a stop (rush-hour suburban services), this surging could be clearly felt. The average 5-coach suburban stock on these trips had a 61xx Prairie on the front, bunker first if Paddington bound, and I have noticed this surging more than once.

I heard a few days ago (time of writing) that there is in existence a photograph taken inside the cab of a Princess Coronation with the speed recorder showing 125. Does anybody 'out there' know of this photograph? It would certainly alter history a bit! I see no reason to doubt the possibility of this feat, but I can see a big reason for keeping it quiet! I wonder what the maximum recorded speed on a passenger train (as distinct from a test train or 'mail special') is? I have notes of 112.5mph on *Dryslwyn Castle* from the locomotive inspector (Jack Hancock) who was on the footplate, and there is a note from the late O. S. Nock in similar position on a King at 105 plus. Both were passenger trains in regular service. Also, as I have mentioned before, every King, Castle or Star, and probably Saint as well was tested at a steady 100 on coming out of shops. If on arrival back at Swindon the bearings were still cold, it was passed as okay. Any questions?

●*To be continued.*

A view of part of the Oberlandkanal railway system.

Another view of the railway. Note the cable guides between the rails.

A canal boat being carried out of the water on one of the specially built platforms.

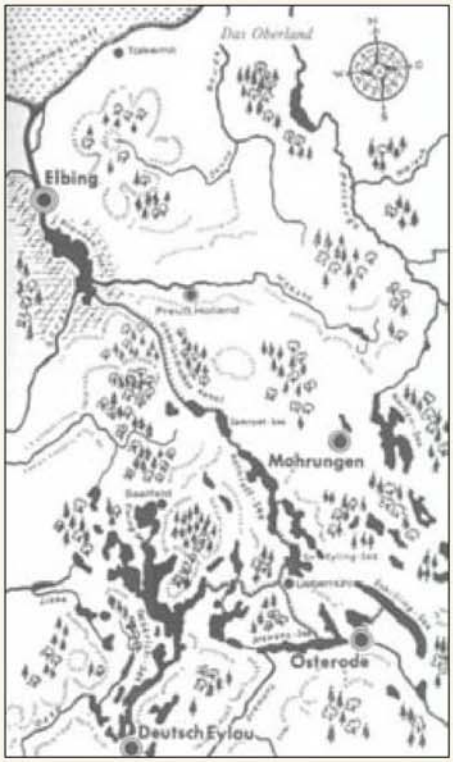
THE OBERLANDKANAL SHIPLIFT

Patrick Williams

in Germany, was prompted by John Olsen's recent series on European canals to describe a novel example of Polish canal engineering.

In his series on European canals, shiplifts and locks John Olsen mentions a shiplift in Poland. Here is a brief description and some photographs taken during a visit in 1990.

The retreating glaciers of the ice age left a plateau of many lakes, called the Oberland, in the north of Poland to the south of the Frischer Haff and the town of Elbing. In the mid-nineteenth century this area was part of East Prussia and, with the beginning of industrialisation, the existing road and rail facilities were inadequate to transport agricultural products and timber to the city of Elbing and hence to Königsberg and Danzig. It seemed logical therefore to connect the lakes with a waterway to provide a method of transport, and in 1837 Georg Steenke, a civil engineer from Königsberg, started to plan the 'Oberlandkanal' with a length of 195km, from Deutsch-Eylan to Elbing.



Steenke's greatest problem was that, to get from the upper pool at Buczyniec (Buchenwald) on the edge of the lake plateau down to the level of Lake Druzno (Drausensee), a height of about 100 metres had to be overcome. Using normal canal construction methods, this would have needed some 30 locks. His unusual solution was to build five inclined planes or slipways to join the intervening canal stretches, and covering the 99.5 metres of height difference in some 9.23 kilometres.

At each slipway the boats, one at the top and if possible, one at the bottom to balance, are positioned in the water over a wheeled platform and then pulled by cables out of the water and along the inclined plane to the next canal stretch. Power came solely from water at the upper level being channelled down to turbine houses at each slipway. The boats had to be standardised at a maximum length of 24.5 metres.

Georg Steenke designed and built the system from 1845 to 1860, with an extension to Caluny from 1874 to 1881. The whole enterprise cost 5.5 million Marks, and was approved by the then King Friedrich Wilhelm 4th.

The information board giving further details of this extraordinary feat of 19th century canal engineering.

Currently only one passenger boat per day in each direction passes along the 195km canal from Osterode to Elbing, the journey there and back taking 11 hours. Our guide advised us that the shiplift was believed to be unique in Europe, but that there was another one of very similar design in America.

A canal boat makes its journey along the railway. The system accomodates boats up to a maximum of 24.5 metres in length.

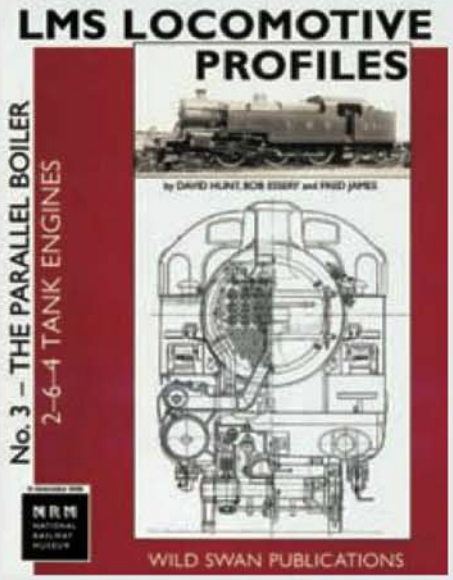
FOR YOUR BOOKSHELF

LOCOMOTIVE PROFILES FROM WILD SWAN PUBLICATIONS

We have received five books for review from Wild Swan Publications Ltd. These are Nos. 3, 4 and 5 of a series profiling LMS locomotives plus Part 4 of a series on Midland Engines. The fifth book is a pictorial supplement designed to accompany No. 5 of the series on LMS locomotives. The books have been written in association with the National Railway Museum and the main profiles contain many drawings from the NRM archives together with an excellent range of photographs from a variety of sources illustrating the locomotives at work during their various stages of development. The text in each volume is an exhaustive treatise covering in detail the origins of the design, its features (and failings) and subsequent evolution.

I have approached my reviews of these books with some trepidation. The problem with some books on locomotives is that the author(s) expect the reader to be knowledgeable before picking up the book. However, here the authors have succeeded in assembling a series of books, each of which is authoritative and interesting without assuming specialist knowledge on the part of the reader.

The heritage available to the keen student of steam railway locomotives in the UK is a large one and, for those researching a particular type or class, trawling through the enormous mass of available data can present a daunting prospect. All locomotives tended to go through a series of modifications and changes during their commercial lives and most builders can only expect to portray the prototype at one particular point in what might have been a long and eventful life. Even so, finding out the exact specification of the locomotive at the chosen moment in time is not



easy as the data is often fragmented or held in various archives and museums. For those whose interests lie in the locomotives specified in the titles of these books, an excellent place to start your research would be within their pages.

If you are building a model of one of these locomotives or have an interest in any or all of the locomotive designs portrayed then these books will form an important addition to your bookshelf. They are highly recommended to the serious student of locomotive design.

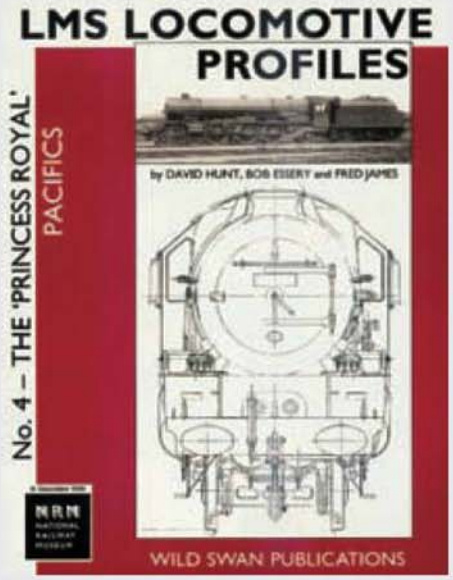
All five books are published in A4 portrait (vertical) format with soft covers (illustrated).

Written by David Hunt, Bob Essery and Fred James they have been prepared in association with the National Railway Museum and are published by **Wild Swan Publications, 1-3 Hagbourne Road, Didcot, Oxon OX11 8DP; tel: 01235-816478.**

LMS Locomotive Profiles No. 3 Parallel Boiler 2-6-4 Tank Engines

ISBN: 1 874103 72 0; Price: £10.95.

This book is the third in a series profiling LMS locomotives. First in the series deals with the rebuilt 'Royal Scots' while number two is dedicated to the Horwich 'Moguls'. Its 64 pages are divided into an introduction followed by a section on the origins of the design. There then follows a substantial section on the construction



and modifications, followed by a most interesting chapter dealing with the engines in service. The final chapter covers the various liveries applied to these attractive locomotives over the years. Useful appendices are included for quick reference.

LMS Locomotive Profiles No. 4 The 'Princess Royal' Pacifics

ISBN: 1 874103 86 0; Price:£14.95.

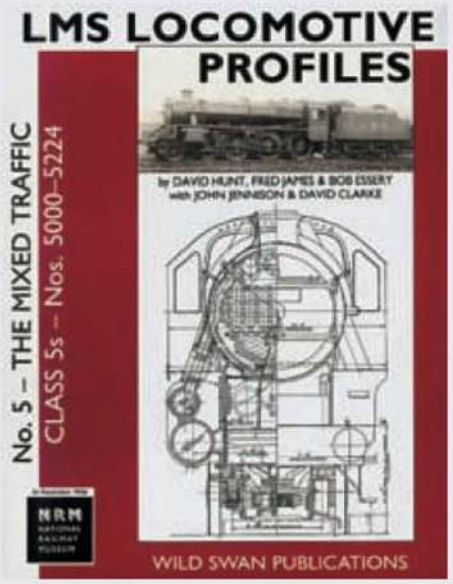
This 112 page book deals with the handsome 'Princess Royal' Pacifics and follows the format described above. Once again, the text commences with an introduction and then deals with the origins of the type. The construction and modifications carried out during service are then dealt with. Separate chapters cover the tender, some examples of the uses to which these locomotives were put during their service lives, and their livery. Again, the text is well illustrated throughout with period photographs and drawings. Useful appendices are included.

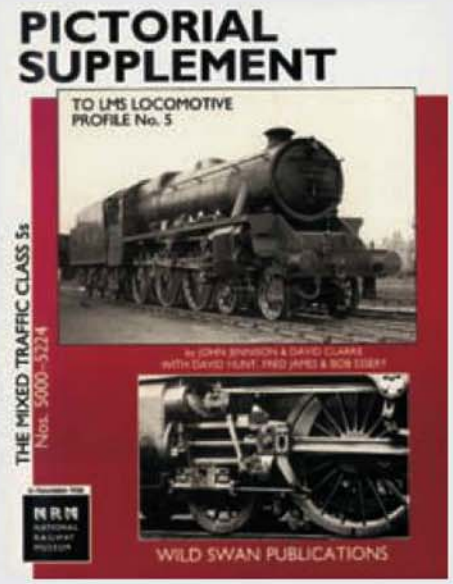
LMS Locomotive Profiles No. 5 The Mixed Traffic Class 5s Nos. 5000-5224

ISBN: 1 874103 87 9; Price: £14.95.

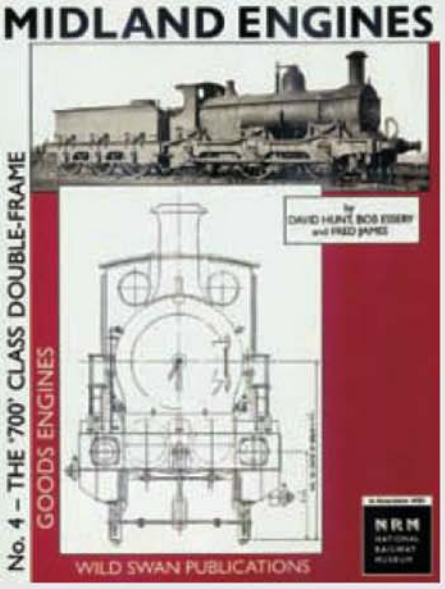
Pictorial Supplement to LMS Profile No. 5

ISBN: 1 874103 83 6; Price: £12.95.





John Jennision and David Clarke join Messrs Hunt, James and Essery for these books on the famous Class 5s or 'Black Fives' and its format departs from that described for the other books in this series. To adequately cover the 892 locomotives of this class built over seventeen years by three railway works and two private builders, it has been decided to publish the work in three parts. The first part, which is the volume under review, covers the 225 locomotives built in 1934 and 1935. Simultaneously with each part will be published a pictorial supplement so that as much as possible of the photographic material collected can be released to the reader without the individual books becoming too thick or unwieldy. This policy enables the first part to be released now while the remaining parts of the series are still in preparation. Once again the authors have produced a thorough yet very readable treatise on the chosen locomotive.



Midland Engines No. 4
The '700' Class
Double-Frame Goods Engines
ISBN: 1 874103 73 9; Price: £13-95.

This book is the fourth in a series examining Midland Railway locomotives in detail. The first deals with '1833' and '2228' Class Bogie Passenger Tank Engines, the second with Class 3 Belpaire Goods Engines and the third with the Class 2 Superheated 4-4-0s ('483' class rebuilds). Like its stable mates dealing with LMS locomotives, this book is really a treatise on the chosen subject matter and is both very readable and informative. The quality of the photographs is excellent and an amazing amount of detail is crammed into its 102 pages. The book follows the format now established for this series. After a detailed introduction, the reader is given the origins of the '700' Class engines followed by full details of their construction. A separate chapter is devoted to the tender before we are given photographs and details of the engines in service. A final chapter deals with the complex issue of the painting and lettering schemes applied to these locomotives during their long service life. Again a detailed appendix is supplied for quick reference.

The *Locomotive Profiles* described here are available from **Wild Swan Publications, 1-3 Hagbourne Road, Didcot, Oxon OX11 8DP; tel: 01235-816478.** ***N.R.***

A SOUTHERN RAILWAY MERCHANT NAVY CLASS LOCOMOTIVE IN GAUGE 1

Roger Thornber
descibes the tender chassis.
●*Part XV continued from page 443 (M.E. 4219, 16 April 2004)*

When Part I of this series was published several people informed me that I had the wrong tender for this locomotive. Bob Shaw and Arthur Tayler were particularly helpful in their information and I found A. J. Fry's book *Bulleid Power* gave tons of information. I was forced to agree that I was wrong, so have redrawn the tender to give a more representative version.

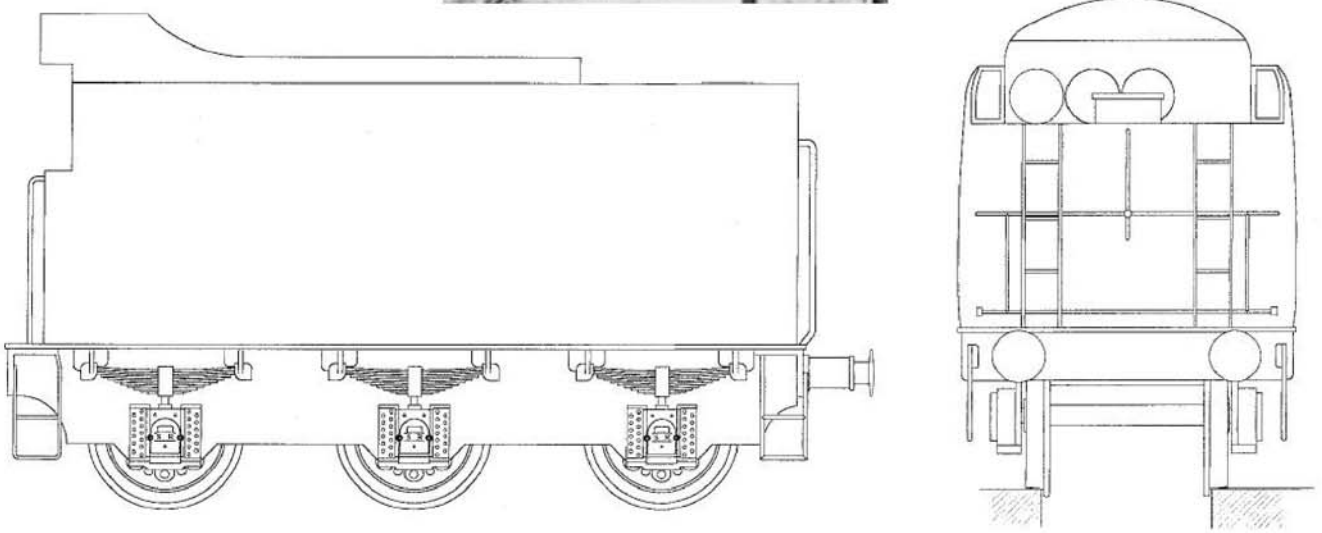
Three series of tenders were designed for the Merchant Navy class. The first ten with locomotives 21C1 to 21C10 were of 5000 gallon capacity.

The second batch of ten were of 5100 gallon capacity and fitted to locomotives 21C11 to 21C20. Both these tenders had 6ft. 1in. + 6ft. 1in. wheelbases. Later engines were fitted with a 6000 gallon tender with 7ft. 0in. + 7ft. 4in. wheelbase. The tender shown in the General Arrangement in Part I was 6000 gallons but modified to suit the rebuilt locomotives. This G/A represents the second batch of tenders.

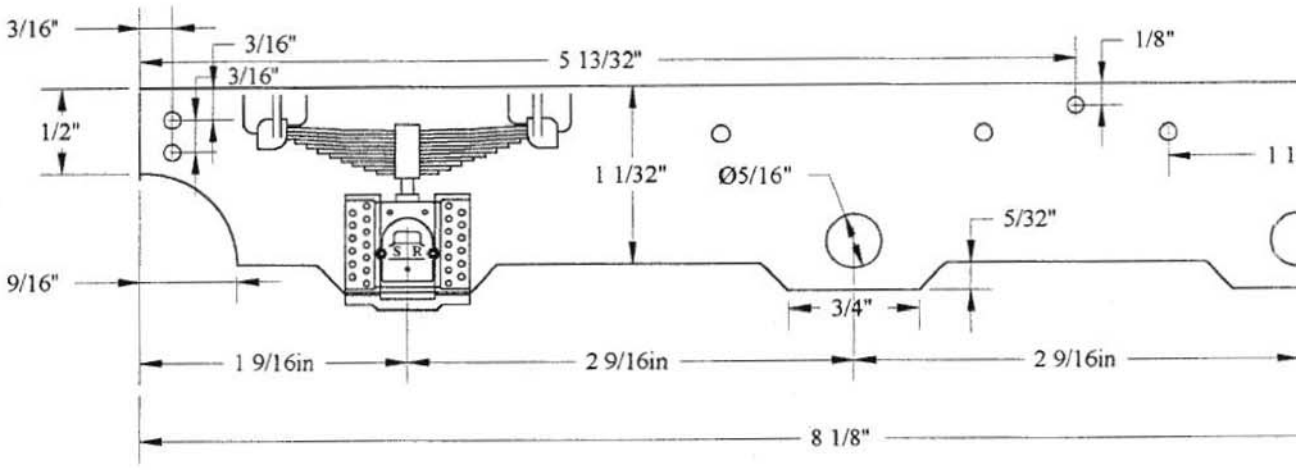
The three dimensional sketches have also been redrawn, but the photos of my actual model will not now show the 'as drawn' version. They will, however, give a good indication.

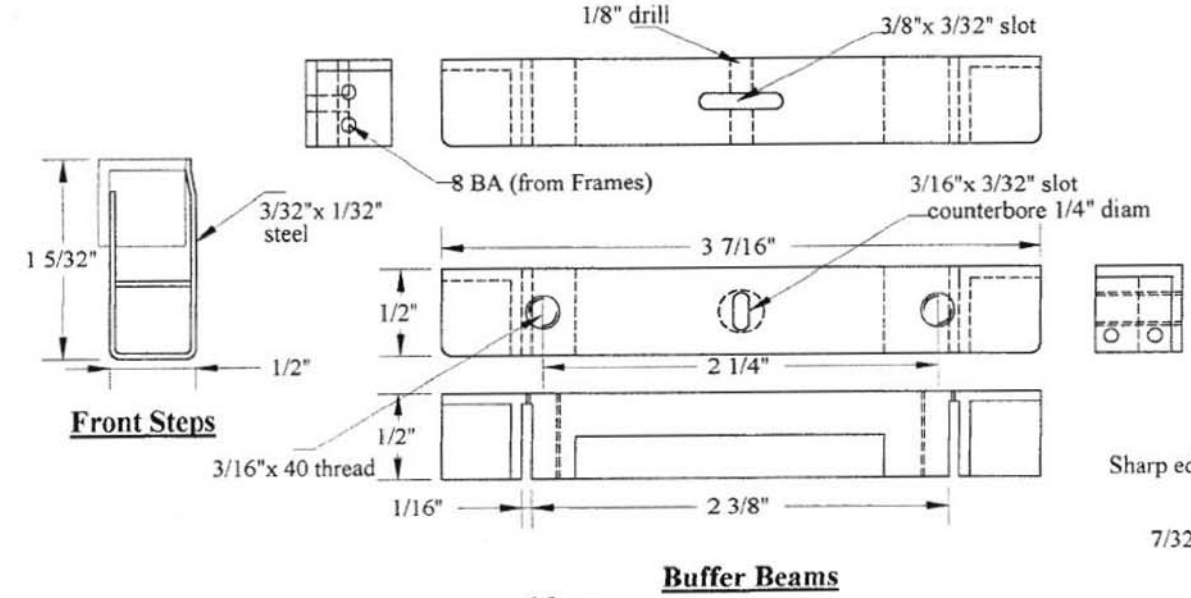
The tender chassis is conventional. No springing ▶

Full-size 5100 gallon tender; note characteristic details of the type. (Photo: G. Heiron collection)



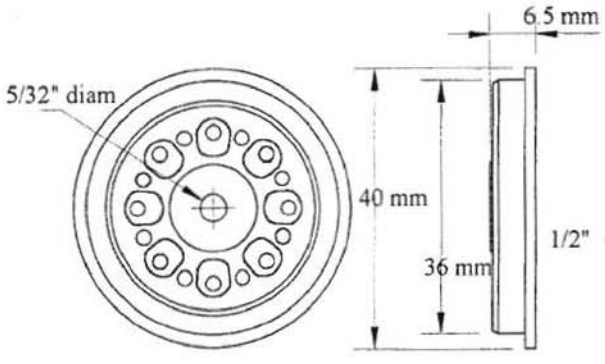
© GENERAL ARRANGEMENT OF A 5100 GALLON TENDER FOR A SOUTHERN RAILWAY MERCHANT NAVY CLASS LOCOMOTIVE FOR GAUGE 1



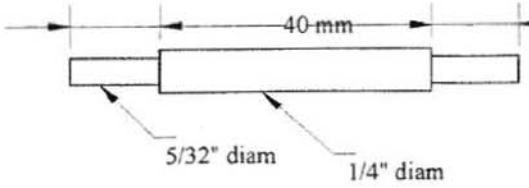


Front Steps

Buffer Beams



Wheels (to G1MRA standards)



Axles

5100 GALLON TENDER FOR A SOUTHERN RAILWAY MERCHANT NA
FOR GAUGE 1 BY ROGER THORNBER

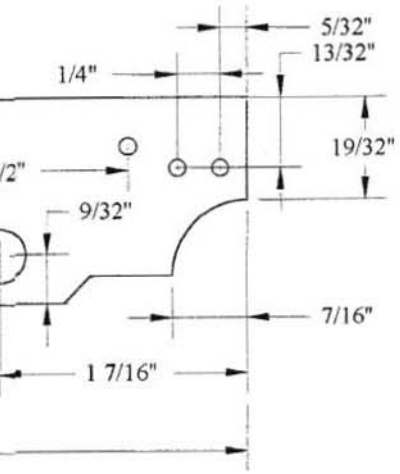
is shown but adequate lateral movement should be allowed on all axles and some vertical movement on the centre axle. Wheels and axles are again to G1MRA standards.

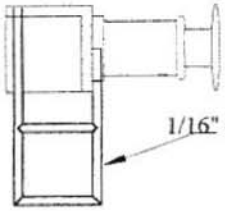
The chassis is attached to the bodywork by two bolts on the front foot plate and two angle brackets mid-way between the centre and rear axle.

It will be noted that the tapped holes for the buffers are partially in the buffer beams and partly in the frames. The frames were initially attached to the buffer beams and the whole assembly held on the vertical slide while the holes were cut with a 5/32in. slot mill. Make sure these are deep as they have to accommodate the buffer spindles when the buffers are compressed.

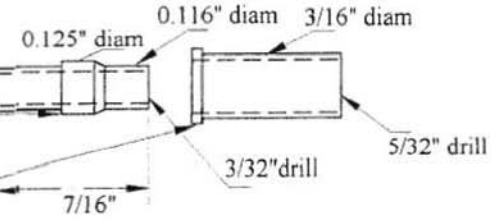
As with the locomotive, the tender steps are attached to the buffer beams — the front ones of 3/32 x 1/32in. strip, whereas the rear ones are of 1/16in. round material.

The emergency water pump is arranged vertically. This takes up less space than the more



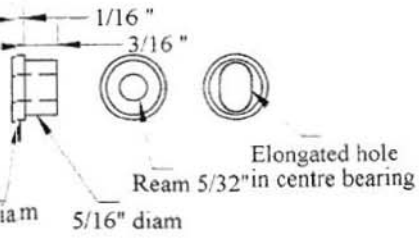


Rear Steps



r/Loco coupling glands

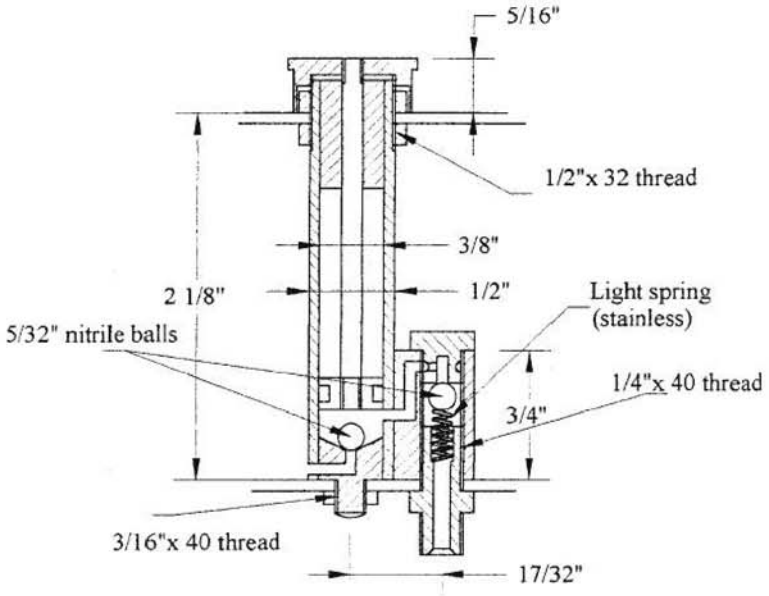
full size)
2" o/d PTFE tubing
be over inner bush - then push outer bush over both
ndard 1/4"x 40 gland nuts



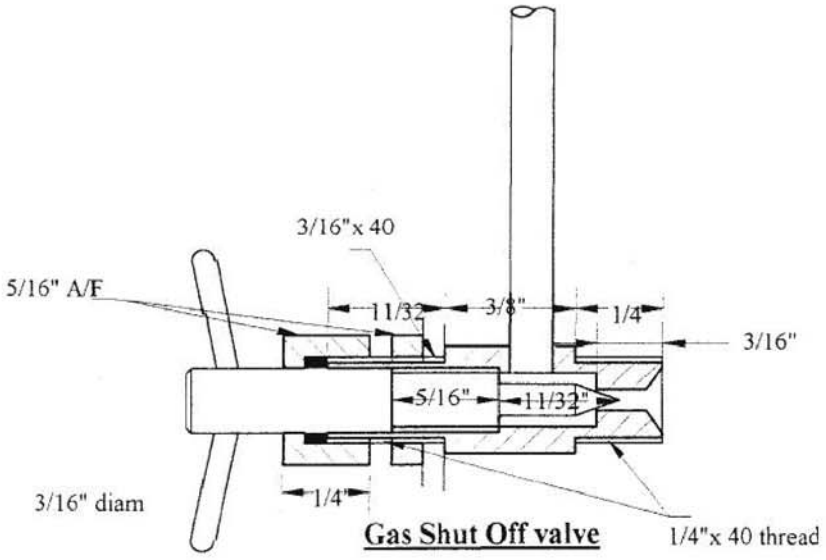
Bearings

VY CLASS LOCOMOTIVE

The tender chassis of our gauge 1 locomotive is of conventional construction, unsprung but with vertical and lateral play of the axles in the axleboxes.



Vertical Pump



Gas Shut Off valve

conventional type of pump. It also allows the front of the tank to be sealed with a floor to the coal area if radio control gear is to be fitted. As can be seen, the pump is fitted with two ball valves in the inlet and outlet side. It could be argued that the outlet valve is unnecessary as the feed goes through the axle driven pump (two valves) and then the backhead check valve. However, I feel that it is best to have the pump as a self-contained item. The knob on the top of the pump replaces the filler cap but is rather overscale as I felt that this made it easier to operate, particularly with the vacuum cylinders where they are.

Even though there are some 5 check valves in the system, leakage can occur. It is somewhat disturbing, in the middle of a run, to see the tank filler cap (pump ram) start to rise. This can be prevented as shown by making it so that the filler may be slightly screwed onto the top thread of the pump body.

●*To be continued.*

CLUB CHAT
With Malcolm Stride

UK News

Readers of this column may remember that some months ago there was mention of an unusual six cylinder steam engine owned by Gerald Buitendach of **Rand SME**. In response to this I have received a copy of the construction manual for this engine from Graham Pohl in Wellington, New Zealand. Graham has passed a copy to Gerald and we thank him for his efforts. Graham, meanwhile, is himself looking for a copy of the drawings for a *Perseus* horizontal engine that he has recently acquired.

Basingstoke DMES has a new secretary, Guy Harding, who can be reached at Beverley Farm, Five Ash Road, Medstead GU34 5EJ (tel: 01420-561741). Guy has taken over from Ian Shanks who has now been elected Chairman of the society.

Members of **Birmingham SME** are hoping to arrange a trip to the home of the 'Acme Thunderer', J. Hudson & Co. in Birmingham. Hudson's make the well-known whistles of that name used by the police and also by railways in the past and, I believe, in slightly less noisy form by football referees. It is interesting that one of my local rail companies has started using whistles again because the blast apparently makes us passengers move faster and the trains are keeping better time as a result. Didn't you just know that it would be the passengers' fault that the trains run late! The society is planning a new raised track station and volunteers are being sought for the project.

As a result of a breach of security at the track site at the end of last year, **Brighton & Hove Society of Miniature Locomotive Engineers** is investigating the installation of an intruder alarm. Members are recovering from their efforts with the 26th 'Modelworld' exhibition at the Brighton Centre. The newsletter contains several tributes to member Peter Fagg's superb 5in. gauge King Arthur class locomotive *Sir Bors de Ganis* which deservedly walked away with a Gold Medal and two other trophies at the Sandown Model Engineer Exhibition. Lest those who saw this magnificent model should doubt it, it is built as a working model.

March sees the opening of the passenger hauling season at the Goff's Park Light Railway operated by **Crawley Model Engineers**. Members found recently that 'yobbos' had tried to kick the track off the support pillars in one area and some big hammer and spanner work was needed by members to put things right. Various maintenance tasks have been carried out over recent weeks and attention has been given to increasing the speed of the 'Simplicity' electric locomotive. Members enjoyed a talk by Jim Hatfield on his Sentinel wagon. Jim reports that solid tyres get hot when run at excessive speed but water cooling helps, although this can result in six wheel drifts on roundabouts!

Members of **Fylde SME** are to investigate replacement of their BoBo electric locomotive by *"examining what's on offer at Harrogate."* This is after no further progress in repairing the existing locomotive has been possible. The newsletter carries a general arrangement drawing of a 'Ross Yoke' Stirling engine. The Ross Yoke was originally designed for steam engines in around 1850.

Keighley DMES hold its public open days on the third Sunday of each month between April and October inclusive. Running takes place from 2pm until 5pm. The society has raised 3½ and 5in. gauge tracks and further information can be obtained from Programme Secretary Mr. E. D. Haigh (tel: 01535-610731).

Kew Bridge Steam Museum is holding its annual Historic Fire Engine Rally shortly after publication of this issue on Sunday 16 May. The event will run from 11am until 5pm and further details are available from the museum (tel: 020-8568-4757) or from the internet at **www.kbsm.org**

Members of the **Model Steam Road Vehicle Society** have designated the Air Ambulance Service as their charity again this year and are hoping to raise a good sum on their road run collection for this excellent cause. The club has gained five new members since the publication of their last newsletter. A tip in the newsletter is that tallow or even lard used when reaming will give a truer hole than when cutting with suds. The society had a talk on rules (of the measuring type) by Mick Taylor who arrived with a large collection of rules including Volume rules, Capacity rules and even Calipers for measuring horse collars. One of the oldest rules known to exist is a carpenters rule from the *Mary Rose* dated from 1545. Mick described examples of many other different types during his talk.

Visit the Historic Fire Engine Rally at Kew Bridge Steam Museum on 16 May.

North London SME has imposed severe restrictions on car parking at its Colney Heath track site in the hope that the grass will recover in time for the running season. I have no doubt that if it is anything like my own lawn, in a few weeks members will be complaining about having to mow it! The completion of a new pondside shelter by members of the boating section is reported. The newsletter includes, among others, a photograph of members levelling the ground around the pond with ice clearly visible on the water, hardy fellows these model engineers! The society's 2½in. gauge *Dyak* is to be made available to members to run during the coming season. The society is hosting a visit by the **Gauge 1 Model Railway Association** on 22 May.

Norwich DSME is looking for more junior members, so if any readers are aware of budding model engineers in that area please point them at membership secretary Raymond Snelling at 35 Colindeep Lane, Sprowston, Norwich NR7 8EG. The club has carried out an extensive overhaul of the passenger carrying trucks over the winter period with the checking of wheels, bearings and brake gear and the fitting of secondary springing. The team is now planning an overrun brake test on all vehicles. The raised track signalling system is under way. In order to raise funds for the ground level track, members are being invited to buy a metre of track for £10. One member has already bought the first 100 metres of new track. The newsletter also contains a full list of the books available in the club library. This sounds like a good thing to do from time to time as it tells members what is available. Member Stanley Fitt is looking for a replacement displacer tube for his horizontal hot air engine. The original was the bottom 2½in. of a 'Steradent' tablet container which, in the days when the engine was built, were made from 31/32in. diameter aluminium alloy tube. Now made of plastic, unfortunately the modern replacement does not work as well!

Tony Meek of **Peterborough DSME** has sent details of their programme for 2004 which includes two major events: a Miniature Locomotive Rally on 12/13 June and the Sacrewell Miniature Steam Gathering on 17/18 July. Further information can be obtained from Tony (tel: 01778-345142). The club is also to host a 1 August visit by members of **Erewash Valley MES** when they take over the track and, as Tony says, *"give us a bit of a rest."*

Ill health has forced the secretary of **Reading SME** to stand down; the task is being carried out jointly by Chairman, Gary Williams (tel: 0118-940-1405) and Treasurer, Jim Brown (tel: 0118-958-7247) until a volunteer replacement can be found or coerced to take over. The club workshop weekend training sessions have re-commenced this year when members with little or no engineering experience can extend their knowledge by using the workshop equipment safely under supervision.

World News

Canada

William Chatham gave members of **Hamilton MEC** an interesting presentation on the role of the engineer in the history of Hamilton. The information was researched by William and *"a dozen or more other volunteers."* The talk covered a wide range of topics including harnessing of water power, the digging of canals, railroads, steel mills, bridges, etc. Member John Burgess has made himself a filing machine for small work and has reversed the action to use a downward cut. The machine features a tilting table and was made *"at a model engineer's price."* Ray LaPointe demonstrated his miniature beam engines which are based on early wooden beamed originals. Harry Saville, who apparently likes *"plenty of wheels"* brought the leading truck for his 4-10-2 Canadian Pacific locomotive. Harry explained the more intricate machining operations required on some of the links. Julius Combos showed a pair

In Memoriam

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

Dave Aston	*Fylde SME*
Peter Barber	*York City DSME*
Terry Giles	*Model Steam Road Vehicle Society*
George Sallis	*Brighton & Hove SMLE*
Peter Wilson	*York City DSME*

of Myford lathe steadies using needle rollers instead of the more usual rubbing pads. Julius reports no problems with these in use so far.

Montréal Live Steamers have produced a very fine logo for their 70th anniversary meeting from 1-4 July. Further information from **www.trainweb.org/mls**

Ottawa Valley Live Steamers are discussing the possible effect of the potential closure of the museum at which they are based. This is as a result of a proposal by the City Council to cut the local heritage budget to zero. Members (and outsiders) are being encouraged to write to their Councillors to express their objections to this proposal. The newsletter also contains a full list of the work done during the 53 work days to November last year, and it is an impressive list indeed. Congratulations are due to all who gave freely of their time and effort.

Dave Sage of **Toronto SME** has an electrolytic method for removing rust from steel parts. He immerses the object in a washing soda solution and connects the negative lead from a battery charger to the part and the positive lead to a sacrificial steel plate. Dave reports that *"five to ten minutes should see the part thoroughly cleaned."* Tim Hall ran his unusual vertical steam engine which *"makes a lot of hissing and aspiration noises"* when running. This is due to the unique piston and valve arrangement. Alan Mee showed a gear hobbing attachment for the Myford lathe. This uses the hob between centres and the gear blank is rotated using a drive from the lead screw. Depth of cut is controlled by the cross-slide. The newsletter contains a tip which may prove useful, under the heading Haide's Law: *"If you have a difficult task to do, give it to a lazy man. He is sure to find an easy way to do it."*

New Zealand

At the time of writing, members of **Auckland SME** are preparing for their annual Easter Exhibition. We hope that this was successful and look forward to reporting the event in a future issue. The 'Tuesday Club' is appealing for more members to join them. Apparently it is not all hard work as the group *"start at around 09:30, have plenty of tea/lunch breaks and finish early afternoon."* At the February 'Bits and Pieces' evening, member Alan Emerson showed a *"complicated piece of woodwork"* which turned out to be a model of Baker valve gear to allow Alan to appreciate how it worked. Greville Wills showed a stainless steel superheater from his *Simplex* which had developed cracks along its length. Obviously that particular grade of stainless steel was not as tough as expected. Alan Pritchard has made a fibre optic device for looking down deep small holes. This consists of a piece of fibre optic cable attached to a small torch. The cable is only 2mm dia. and can therefore fit down small holes to check thread depth or whatever.

Otago MES has produced a draft driver's licence for those carrying out public running duties. The proposals link the licences to training (or sufficient experience) in all aspects of running locomotives for the public. The club recently hosted a visit by 300 Girl Guides who were celebrating their 'Founder's Day'. The *"voracious appetite of these young women"* resulted in some 770 sausages being cooked and 30 loaves used. The cooking was carried out on three barbecues which were kept busy throughout the whole event. A shower of rain caused a stampede for shelter except for the *"five stalwart locomotive drivers who kept to the task of providing rides."* Fortunately, the rain was short lived. As the report commented *"round and round the locos went; sizzle, sizzle, went the sausages; drip, drip, went the tomato sauce ..."* The recent Festival Week was judged a great success with the use of a 'walk

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.

MAY

15 **Basingstoke DMES.** *Members' Running Day.* Contact Guy Harding: 01256-844861.
15 **Historical MRS (London Area).** *Bernard Weller: Modelling the Easy Way.* Contact John Millbank: 0208-948-0556.
15 **Historical MRS (Scottish Area).** *Guest Speaker: Steaming on the Clyde.* Contact Richard Crockett: 01896-750730.
15/16 **Chesterfield MES.** *Open Weekend.* Contact Mike Rhodes: 01623-648676.
15/16 **Guild of Model Wheelwrights** *at Tolkien Weekend, Sarehole Mill, Moseley, Birmingham.* Contact Biddy Hepper: 01492-623274.
16 **Bristol SMEE.** *Public Running Day.* Contact Trevor Chambers: 01454-415085.
16 **Chichester DSME.** *Driver Training.* Contact Brian Bird: 01243-542266.
16 **Frimley & Ascot LC.** *Club Running.* Contact Bob Dowman: 01252-835042.
16 **Keighley DMES.** *Open Day.* Contact K. Parkin: 01274-564866.
16 **Kew Bridge Steam Museum.** *Historic Fire Engine Rally.* 11am-5pm, Adults: £5.20, Concessions: £4.20, Children (5-15 years) £3, Family: £15.95. Information: 020-8568-4757.
16 **Oxford (City of) SME.** *Public Running.* Contact Chris Kelland: 01235-770836.
16 **Pinewood MRS.** *Public Running.* Contact Ivan Hurst: 01276-28803.
16 **Plymouth MSLS.** *Running.* Contact John Brooker: 01752-671722.
16 **Saffron Walden DSME.** *Running Day (public prn).* Contact Jack Setterfield: 01843-596822.
16 **Southport Model Engineering Club.** *Diesel Day.* Contact Craig Skelland: 07867-973443.
16 **Taunton ME.** *Public Running Day.* Contact Don Martin: 01460-63162.
16 **Teesside Small Gauge Rly.** *Running.* Contact Mike Aslin: 01642-724255.
16 **York City & DSME.** *Running Day.* Contact Pat Martindale: 01262-676291.
17 **Lancaster & Morecambe MES.** *Canon Gretham: Settle to Carlisle Railway.* Contact Harry Carr: 01524-411956.
17 **Model Steam Road Vehicle Soc.** *Modellers' Evening.* Contact Geoff Miles: 01869-247602.
17 **Peterborough SME.** *ModelWorld: Visit & Demo.* Contact Tony Meek: 01778-345142.
18 **Chesterfield MES.** *Tony Finn: Lathe History.* Contact Mike Rhodes: 01623-648676.
18 **South Durham SME.** *Evening Steam-Up.* Contact B. Owens: 01325-721503.
18 **Taunton ME.** *Andy Webb: Welding Demonstration and Instruction.* Contact Don Martin: 01460-63162.
19 **Bournemouth DSME.** *Malcolm Bowditch: Cordite Factory at Holton Heath.* Contact Mike Baker: 01202-383653.
19 **Guildford MES.** *Bits & Pieces.* Contact Dave Longhurst: 01428-605424.
19 **Leeds SMEE.** *Gordon Smith: Mild Pop Safety Valves.* Contact Colin Abrey: 01132-649630.
19 **Maidstone MES (UK).** *Members' Afternoon Playtime Run.* Contact Martin Parham: 01622-630298.
19 **West Riding SLS.** *Leeds Traction Engine Club Visit.* Contact David Batty: 01924-363908.
19 **West Wiltshire SME.** *Boiler Testing & Steam-Up.* Contact R. Nev. Boulton: 01380-828101.
20 **Isle of Wight MES.** *Meeting.* Contact Ken Stratton: 01983-531384.
21 **Brighton & Hove SMLE.** *Fun Run Evening.* Contact Mick Funnell: 01323-892042.
21 **Canvey R&MEC.** *On the Table 2.* Contact Brian Baker: 01702-512752.
21 **Chichester DSME.** *Driver Training.* Contact Brian Bird: 01243-542266.
21 **Frimley & Ascot LC.** *Skittles.* Contact Bob Dowman: 01252-835042.
21 **Rochdale SMEE.** *Members' Bits & Pieces.* Contact Mike Foster: 01706-360849.
21 **Romford MEC.** *David Carson: Tales of the Tube.* Contact Colin Hunt: 01708-709302.
22 **Chesterfield MES.** *Running Day.* Contact Mike Rhodes: 01623-648676.
22 **Historical MRS (Bristol Area).** *Somerset & Dorset Slide Show.* Contact Gerry Nichols: 0117-973-1862.
22 **Hornsby ME.** *Family Day & Boiler Inspection.* Contact Ted Gray: 9484-7583.
22 **National 2½in. Gauge Ass'n.** *Southern Railway Designs Rally at Worthing.* Contact John Cook: 020-8397-3932.
22 **Old Locomotive Committee.** *AGM.* Contact Peter Gardner: 01252-541999.
23 **Harlington LS.** *Public Open Day.* Contact Peter Tarrant: 01895-851168.
23 **MELSA.** *Bracken Ridge.* Contact Graham Chadbone: 07-4121-4341.
23 **Staines SME.** *Passenger Day.* Contact Stan Bishop: 01784-241891.
23 **Surrey SME.** *Visiting Clubs Day.* Contact John Cook: 020-8397-3932.
23 **Teesside Small Gauge Rly.** *Running.* Contact Mike Aslin: 01642-724255.
22/23 **Tyneside SMEE.** ***Martin Evans Rally.*** Contact Ian Spencer, 0191-2843438.
22/23 **Guild of Model Wheelwrights** *at Arley Hall, Knutsford.* Contact Biddy Hepper: 01492-623274.
24 **Bedford MES.** *Treasure Hunt.* Contact Ted Jolliffe: 01234-327791.
24 **Hornsby ME.** *Meeting & Social.* Contact Ted Gray: 9484-7583.
25 **Basingstoke DMES.** *Stationary Engines.* Contact Guy Harding: 01256-844861.
25 **Historical MRS (East Lancashire/North Manchester Area).** *Ian Rathbone: Painting & Lining Models.* Contact John Sykes: 01706-823989.
26 **Historical MRS (Bedford Area).** *David Eatwell: Railways of Bedfordshire.* Contact John Chamney: 01442-851214.
26 **Southland SME.** *AGM.* Contact Peter Stark: 03-21-89702.
27 **Brighton & Hove SMLE.** *Workshop Evening (Prior notice required).* Contact Mick Funnell: 01323-892042.

round' microphone to provide information for visitors on what was happening around the hall. One of the greatest successes, with a thousand tickets sold, was the N-gauge layout raffle. In addition to the locomotives and other steam models, boats were operating on the pond and for the speed merchants, tethered cars and hydroplanes were running.

Southland SME recently held an evening train run for the Otatara playgroup and had a good turnout. The Sunday boating regatta on 22 February was a success with around 15 boats available for running and some others on display. The weather was kind but was even better in the evening when everyone had packed up! Our photograph shows the fine Southlands boating lake in use.

The Southlands boating lake in use.

South Africa

During a recent working party, the station roof of the **Durban SME** was removed by member Jimmy Ingram using a chainsaw. Presumably this is in preparation for future replacement. Dave Meiring suggests a way of setting very small cuts on a lathe. He sets the top slide over at a small angle and uses the top slide to set the cut. Because of the angle, 10 'thou' on the top slide indicator becomes a much smaller amount based on the Sine of the offset angle used. Dave's particular problem was machining a new chuck back plate. It has been suggested that small copper boilers should be tested once and then there is no need to retest, assuming that the boiler is built to a recognised design and has not been modified or damaged. This suggestion is based on the fact that there are no accessible records in the last 80/90 years showing that anyone has been injured due to a boiler failure. This on the surface sounds like sensible 'risk analysis' not the *"there is a very remote possibility ... therefore ban it or produce copious amounts of paperwork"* approach which seems to be the norm in this country. What do others think?

Thank You!

We take this opportunity to express our gratitude to all who send us copies of their Club magazines and other information for inclusion in this column and the *Club Diary* listing.

United States

The Crank Calls, newsletter of the Bay Area Engine Modellers Club, reports that all officers were re-elected at the recent January meeting. Secretary remains Bob Kradjian who can be contacted on 650-343-7585 or e-mail **bkradjian@aol.com** At the recent 'Bits & Pieces' meeting several engines were on show including a Wall in-line four, two hit and miss engines, and a part built quad overhead cam shaft V8 with titanium valves described as being *"in the finest tradition of hot rodding."* John Vlavianos had some home castings for another V8 to his own design. The newsletter also carries photographs of Clen Tomlinson showing his amazing Naper *Deltic* engine at the Pacific Rim Show in Oregon. Lots of information can be found about Clen's engine on **www.craftsmanshipmuseum.com/Tomlinson.htm**

27 **Leyland SME.** *Injectors/Mechanical Pumps – Members' Forum.* Contact Mark Entwistle: 01772-422411.
27 **Worthing DSME.** *Des Adley: 2½in. Gauge.* Contact Bob Phillips: 01903-243018.
28 **Historical MRS (Essex Area).** *Gary Stanford: Network Rail 'Track Maintenance Progress'.* Contact Jem Harrison, 27 Colne Place, Basildon, Essex SS16 5UZ.
28 **North London SME.** *Workshop Evening.* Contact David Harris: 01707-326518.
29 **Bedford MES.** *AGM.* Contact Ted Jolliffe: 01234-327791.
29 **Brighton & Hove SMLE.** *Public Running Day.* Contact Mick Funnell: 01323-892042.
29 **Woking MRS.** *Visiting Locos Day.* Contact Ronald Dewar: 01932-343331.
29/31 **Bedford MES.** *Exhibition Weekend & Traction Engine Rally.* Contact Ted Jolliffe: 01234-327791.
29-31 **Great Western Soc.** (Didcot Railway Centre). *Spring Holiday Steamings.* Contact Jeanette Howse: 01235-817200.
30 **Amnerfield Miniature Railway.** *Public Running.* Contact David Jerome: 0118-9700274.
30 **Bristol SMEE.** *Public Running Day.* Contact Trevor Chambers: 01454-415085.
30 **Chichester DSME.** *Steam on Sunday.* Contact Brian Bird: 01243-542266.
30 **High Wycombe MEC.** *Public Running.* Contact David Savage: 01494-527402.
30 **MELSA.** *Sunday in the Park.* Contact Graham Chadbone: 07-4121-4341.
30 **Teesside Small Gauge Rly.** *Running.* Contact Mike Aslin: 01642-724255.
30 **Woking MRS.** *Friendly Locos Day.* Contact Ronald Dewar: 01932-343331.
29-31 **Guild of Model Wheelwrights** *at Harts Barn, Longhope, Gloucestershire.* Contact Biddy Hepper: 01492-623274.
30/31 **Cardiff MES.** *Open Days.* Contact Trevor Jenkins: 029-2075-5568.
30/31 **Elmdon MES.** *Public Running.* Contact Chris Giles: 0121-458-1291.
30/31 **Malden DSME.** *Public Open Days.* Contact John Mottram: 01483-473786.
30/31 **Oxford (City of) SME.** *Public Running.* Contact Chris Kelland: 01235-770836.
30/31 **Talyllyn Railway.** *Tom Rolt Vintage Rally.* Enquiries: 01654-710472.
31 **Brighton & Hove SMLE.** *Public Running Day.* Contact Mick Funnell: 01323-892042.
31 **Bristol SMEE.** *Public Running Day.* Contact Trevor Chambers: 01454-415085.
31 **Northampton SME.** *Monday Steam Up – Visitors Welcome.* Contact Pete Jarman: 01234-708501 (eve).
31 **Saffron Walden DSME.** *Running Day with Barbecue (Public pm).* Contact Jack Setterfield: 01843-596822.
31 **Stockholes Farm MR.** *Spring Bank Holiday.* Contact Ivan Smith: 01427-872723.
31 **Surrey SME.** *Public Running.* Contact John Cook: 020-8397-3932.
31 **Taunton ME.** *Public Running Day.* Contact Don Martin: 01460-63162.

JUNE

1 **South Durham SME.** *Meeting.* Contact B. Owens: 01325-721503.
1 **Stamford MES.** *Andy Clarke: Kit Locomotives.* Contact David Ash: 01780-751211.
1 **Taunton ME.** *Stationary Engine & Locomotive Running.* Contact Don Martin: 01460-63162.
2 **Bradford MES.** *John Holroyd: Around Britain by Rail.* Contact John Mills: 01943-467844.
2 **Pinewood MRS.** *Committee Meeting.* Contact Ivan Hurst: 01276-28803.
2 **Tyneside SMEE.** *AGM.* Contact Ian Spencer, 0191-2843438.
2 **West Wiltshire SME.** *Steam-Up.* Contact R. Nev. Boulton: 01380-828101.
2-5 **Guild of Model Wheelwrights** *at Royal Bath and West Show, Dulverton Pavilion, Near Shepton Mallet.* Contact Biddy Hepper: 01492-623274.
3 **South Lakeland MES.** *Meeting.* Contact Adrian Dixon: 01229-869915.
3 **Sutton MEC.** *Bits & Pieces.* Contact Mike Dean: 0208-657-5401.
3 **Talyllyn Railway.** *Chris Awdry's Duncan Day.* Enquiries: 01654-710472.
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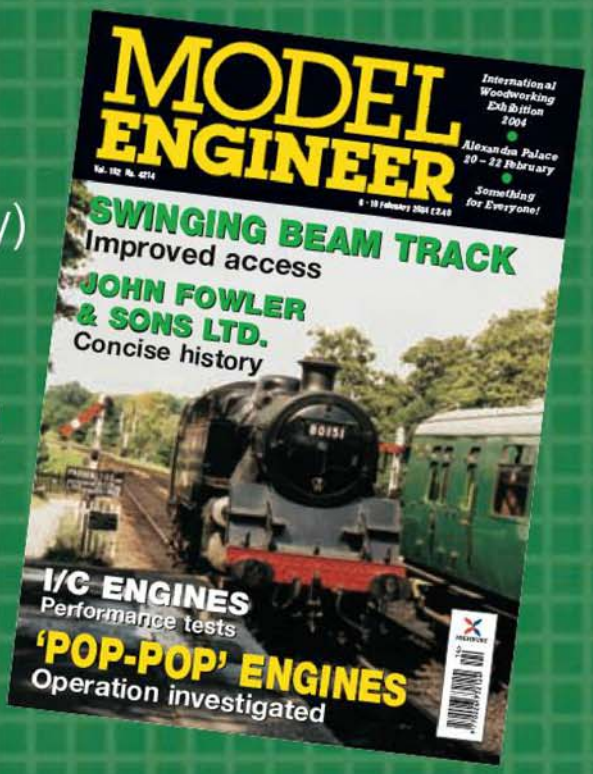

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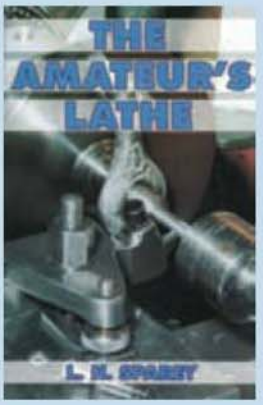

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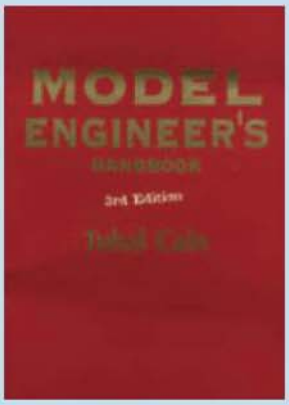

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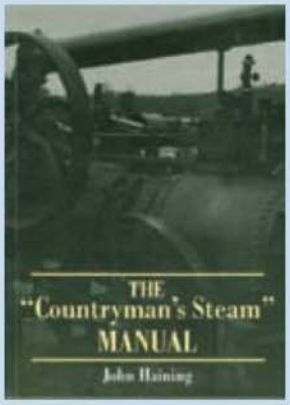

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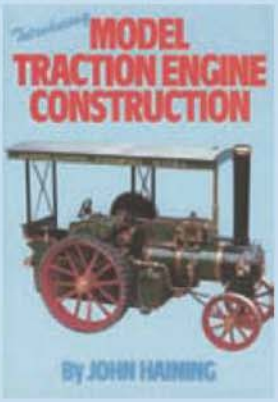

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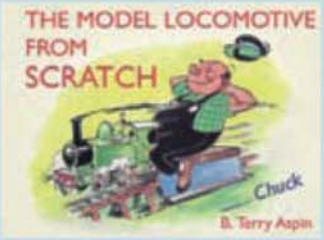

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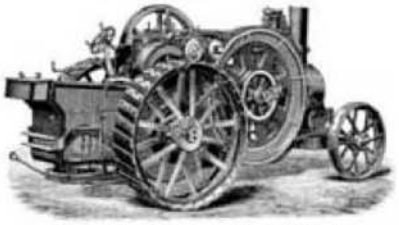

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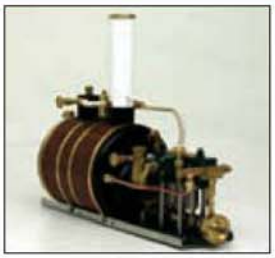

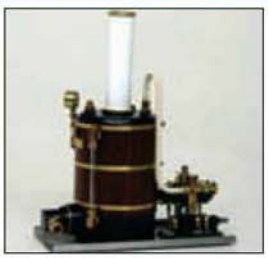

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