

MODEL ENGINEER

Vol. 193 No. 4234

12 - 25 November 2004

COMPETITION
and
LOAN MODELS
WELCOME
for the
74th
MODEL
ENGINEER
EXHIBITION

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FOR
GOLD**

Expert advice

GUILDFORD 2004

Fiftieth anniversary year

THE DELTIC PROJECT
Magnificent model engineering

THE MODEL ENGINEER EXHIBITION
29-31 DECEMBER AT SANDOWN PARK, ESHER, SURREY



WARCO

The widest choice... the best prices!



GH-1322 Lathe ONLY £2,550

inc VAT & Delivery

- 165mm centre height
- 560mm between centres
- Removable gap bed allows 476mm swing 38mm spindle bore
- Supplied with 3 and 4 jaw chucks
- Faceplate
- Fixed and travelling steadies
- Coolant system
- Halogen lighting
- Telescopic leadscrew covers
- Four way tool post

Also available as 750mm between centres.

£2,990.00



BH-600 Lathe

ONLY £1,600 inc VAT & Delivery

For a limited period we will include a revolving centre, tailstock drill chuck and a set of 16mm index lathe tools FREE of charge!

Optional equipment

- Quick change tool post hardened and ground, supplied with 3 tool holders and parting off holder with blade £170 inc VAT with fitting kit to suit BH-600 fitting
- Coolant system £130 inc VAT
- Tailstock die holder £39 inc VAT

- THE ULTIMATE MODEL ENGINEERS LATHE
- HARDENED AND GROUND BEDWAYS
- TAPER ROLLER BEARING HEADSTOCK SPINDLE
- TEE SLOTTED CROSS SLIDE
- POWER CROSS FEED
- NORTON THREAD CUTTING GEARBOX
- 2HP SINGLE PHASE MOTOR
- BACK GEAR WITH 50 RPM LOW SPEED
- 1 3/8" SPINDLE BORE

SUPPLIED WITH ACCESSORIES AT NO EXTRA CHARGE

- 6" 3 JAW CHUCK
- 8" 4 JAW CHUCK
- 10" FACE PLATE
- FIXED & TRAVELLING STEADIES
- FOUR WAY TOOL POST
- IMP/MET THREADING
- STAND, COOLANT TRAY, REAR SPLASH BACK



VMC Mill ONLY £1,450

inc VAT & Delivery

SUPPLIED WITH POWER FEED TO X TRAVEL AT NO EXTRA COST

- ILLUSTRATED WITH OPTIONAL D.R.O AND POWER FEEDS
- TABLE SIZE 26" X 6"
- MOTOR 1 1/2 HP
- AVAILABLE 3MT R8 - METRIC - IMPERIAL



BV-20 Lathe

ONLY £525 inc VAT & Delivery

Optional floor stand £99

- FULL ENCLOSED GEARED HEADSTOCK
- SPEED SELECTION BY LEVER
- PRECISION GROUND VEE BEDWAYS
- LARGE BORE SPINDLE RUNNING ON TAPER ROLLER BEARINGS
- COVERED LEADSCREW
- SET OVER TAILSTOCK FACILITY
- INDIVIDUAL ACCURACY TEST REPORT
- SAFE ELECTRICAL INTERLOCKS TO CHUCK GUARD AND GEAR TRAIN COVER

SUPPLIED WITH:

- 4" 3 JAW SELF CENTERING CHUCK
- 4" 4 JAW INDEPENDENT CHUCK
- FIXED STEADY
- TRAVELLING STEADY
- FACE PLATE
- FOUR WAY INDEXING TOOL POST
- 3MT AND 2MT DEAD CENTRES
- METRIC & IMPERIAL THREAD CUTTING CHANGE GEARS
- SWarf TRAY
- REAR CHIP GUARD

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" HIGH • WEIGHT 230 LB



Warco Mini Lathe

ONLY £375 inc VAT & Delivery

- 3 1/2" CENTRE HEIGHT X 12" BETWEEN CENTRES
- SUPPLIED WITH 3 JAW CHUCK
- FACEPLATE
- THREADCUTTING
- COOLANT TRAY AND SPLASH BACK
- VARIABLE SPEED 0-2500RPM WITH BACK GEAR FOR MAXIMUM TORQUE
- HARDENED AND GROUND VEE BEDWAYS
- ACCURACY TEST CERTIFICATE WITH EACH LATHE
- RELIABLE USA BUILT PRINTED CIRCUIT BOARD - THE HEART OF THE MACHINE
- OPTIONAL ACCESSORIES STEADIES AND VERTICAL SLIDE.

Special offer
Tailstock drill chuck and TCT indexable lathe tool set with each machine.



Warco WMT 300/1

ONLY £799 inc VAT & Delivery

Combination Lathe Mill

- 6" CENTRE HEIGHT X 20" BETWEEN CENTRES
- SUPPLIED WITH:
- 5" 3 JAW CHUCK
- TEE SLOTTED FACE PLATE
- FIXED AND TRAVELLING STEADIES
- VICE
- DRILL CHUCK
- FACE CUTTER
- LATHE TOOL SET
- IMP/MET THREADCUTTING



Warco WMT 300/2

ONLY £1099 inc VAT & Delivery

- SAME CAPACITY AND ACCESSORIES AS THE WMT-300/1 WITH THE ADDED BENEFIT OF A LARGER MILLING TABLE - 17" X 6" COMPARED TO 8" X 6".
- RACK AND PINION FEED TO SADDLE AND LEFT HAND THREADING FACILITY.



Warco WMT 500

ONLY £1399 inc VAT & Delivery

- SIMILAR TO THE SPECIFICATION AND ACCESSORIES TO WMT-300/2. POWER CROSS FEED TO MILLING TABLE/CROSS SLIDE. DEEP THROAT FOR EXTRA MILLING CAPACITY.



WM-20 MILLING MACHINE

NEW

ONLY £3,500

inc VAT & Delivery

- INVERTOR DRIVE - INFINITE SPEED CONTROL
- SPEED RANGE 25 - 1480RPM
- TABLE SIZE 9" X 36"
- R8 SPINDLE
- 1.5HP WILL OPERATE FROM 13AMP SOCKET
- WEIGHT 750KGS



ZX-15 Milling Machine

ONLY £550

inc VAT & Delivery Optional Stand £89

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

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On the cover ...

This photograph of Glen Tomlinson's
 remarkable 1:8 scale working miniature
 18-cylinder, opposed-piston, 2-stroke,
 spark ignition engine was taken at the
 Harrogate 2004 exhibition.

The model follows the principles of the
 Napier Deltic Diesel engine but has been
 designed for spark rather than the
 original compression ignition
 mode of operation.

The prototype engines were used to
 power fast Naval patrol boats as well as
 two classes of English Electric
 Diesel-electric locomotives.

The design has its origins in a Junkers
 aero engine produced prior to WWII
 but only fully optimised post-war.
 For more details of this superb model
 turn to page 586 of this issue.

(Photograph by Mike Chrisp)

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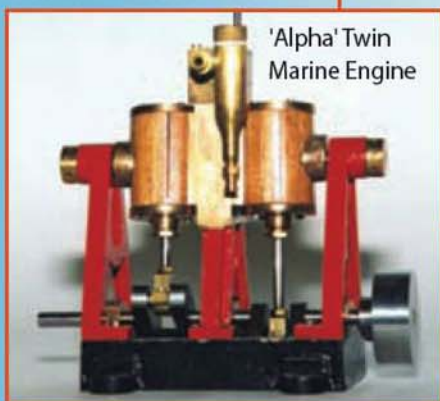
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Waco 1327 Gap Bed Centre Lathe, Well Tool, Stand, 1ph, VGC £1250.00
 Regan Littlejohn 5" Centre Lathe, Variable Speed, Well Tool, 1ph £950.00
 Cowell 500ME Bench Lathe, 3 & 4 Jaw, Faceplate, 3 Port Steady VSSide, Manual, 1ph £1050.00
 Cowell 500ME Bench Lathe, 3 & 4 Jaw, VSSide and Vice, Manual, 1ph £975.00
 Cowell 500ME Bench Lathe, 4 Jaw Chuck, Steady, Manual, Centre, 1ph £875.00
 Pultra 1750 Bench Lathe, Drive Unit, Collets, Chucks, Tooling, 1ph, VGC £1500.00
 Pultra 1750 Bench Lathe, Motor, Well Tool, Collets, 1ph, VGC £1500.00
 Pultra 1770 Bench Lathe c/w Handrest, Tailstock, 10 Collets, No Motor £3500.00
 Danford Startum CNC Bench Lathe, 1ph, Manual £1000.00
 Danford CNC Bench Lathe, 1ph, Manual £1450.00
 Danford M1015 5" x 22" Centre Lathe, Capstock, PCF, Stand, Tooling, Single Phase, VGC £2100.00
 Danford 125TCL Computer Op Bench Lathe, OCTF Manual, 1ph, Choice of 2 £850.00
 Danford 125TCL Computer Op Bench Lathe, Auto Tool, Manual, 1ph £1000.00
 Danford 800 5" x 22" Lathe, PCF, Tooling, VGC, 3ph £1450.00
 Danford 800 5" x 18" Lathe, Tooling, New Single Phase Motor Fitted £1750.00
 Danford CUD 4 1/2" x 18" Lathe, 3 Jaw & Toolpost £500.00
 Danford Model A 4 1/2" x 18" Lathe, Stand, Gearbox, PCF, Tooling, Single Phase £650.00
 Danford Industrial 1130 Centre Lathe, 3ph, GC £1650.00
 Myford Super 70 Longbed, 2 1/2" x 10", Green, 3 & 4 Jaw, Faceplate, OCTF Steady, 1ph £2850.00
 Myford M17 3 1/2" x 18" Lathe, Industrial Stand, Tooling, 3ph £1000.00
 Myford Super 7 3 1/2" x 18" Lathe, Cabinet Stand, Gearbox, Chucks, 1ph £1500.00
 Myford M17R 3 1/2" x 18" Lathe, Stand, 3 & 4 Jaw Chucks, Catchplate, Toolpost, 1ph £1250.00
 Colchester Chymaster S 5" x 20" Lathe, Metric, Tooling, Drive, VGC, 3ph £1500.00
 Colchester Triumph 2000 Gap Bed Lathe, 7 1/2" x 30" Tooling, 3ph £2750.00
 Colchester Student RH Gap Bed, 3 & 4 Jaw, Travelling Steady, Coolant, Collet Chuck, 3ph £1500.00
 OCTF Well Locked After VGC £950.00
 Colchester Student RH, 5" x 25" Tooling, 3ph £950.00
 Colchester Student RH, 5" x 25" Tooling, Lever Op Collet, Coolant, OCTF, 3ph £1250.00
 Colchester Student S 5" x 20" Long Bed Lathe, 3 & 4 Jaw, OCTF Coolant, Manual, VGC, 3ph £1750.00
 Colchester Student 1800 5" x 20" Tooling, Coolant, OCTF VGC, 3ph £1450.00
 Hanston M500 5" x 40" Centre Lathe, Basic Tooling, 3ph £1500.00
 Hanston M500 5" x 25" Centre Lathe, Tooling, 3ph £2250.00
 Hanston M500 5" x 25" Gap Bed, Well Tool, Lever Op Collet Chuck, 3ph £2750.00
 Hanston 140 5 1/2" x 25" Gap Bed Lathe, Tooling, 3ph £950.00
 Hanston LS 4 1/2" x 25" Gap Bed Lathe, Well Tool, Variable Speed Drive, 1ph, GC £1250.00
 Smart & Brown 1024 Centre Lathe, OCTF 3ph £750.00
 Smart & Brown Model L, Capstock, Cut Off Slide, Compound, 1ph £450.00
 Pultra 1771 Cabinet Mounted Micro Lathe, Drive Unit, Well Tool, 3ph £1750.00

DRILLING MACHINES

Theda Arde No 2 & 3 Station Turret Drill Head, 2MT £1750.00
 Spares Available for Felix Star, 7/8 and 10/8 Bore Drills £1750.00
 H & G 224 Bench Drilling Machine, Fitted VSSA 1/4" Drill Chuck, 3ph £1500.00
 Starline Mercury Piler Drill, 3ph £1500.00
 Clearance of Millings, Startline, Progress, Taurus, Felix, Union Piller & Bench Drills, Choice of 25 All Three Phase From £350.00

MILLING MACHINES

Tom Senior Vertical Mill, Turret Head, 3ph, VGC, Collet Chuck £975.00
 Emco PC M1155 CNC Milling Machine, 1ph, Bought New Year 2000 Still As New & Unused £2500.00
 Milling Stand, Manuals etc £2500.00
 Danford Novamill CNC Bench Top Vertical Mill, 1ph, VGC, Manuals, 1996 Machine £3000.00
 Richmond No 1 Universal Mill, Vertical/Horizontal, Swivel Table, 3ph £5500.00
 Bridgeport Turret Mill, 36" x 3", DRG, PE Single Phase From New £2250.00
 Alexander 2A Die Shaper/Grinder, Single Phase, 240 Volt, VGC £750.00
 Tom Senior Universal Milling Machine, Swivel Table, Power Feed, Coolant, Turret Type Head, Plain Vertical Head, Horizontal Arbor & Support etc, Rotary Table, Driving Head, Slotted Head, Auto Chuck, Machine Vice, Excellent Condition, 3ph £2500.00
 User Made Clock Gear Cutting Engine, High Quality, Heavy Swiss Bits £2250.00
 Woony Horizontal Vertical Mill, 3MT Spindle, Swivel Head, 3ph, VGC £1750.00
 Waco M1030 Mill Drill, Stand, Vice, Chuck, 1ph, Immaculate £600.00
 KPR 2000 Turret Mill, Variable Speed, Power Feed Table, DRG, 40 INT Spindle, Vice Collet Chuck, Light, Coolant, Excellent Condition, 40" x 12" Table, SWP, 3ph £2250.00
 Ajax Turret Mill, P/Fed, Coolant, Light, 3ph, 40 INT Spindle, Imperial £1250.00
 Hobbyart BRES Milling Head, 1 MT, 4 Cutter Holders, 1ph £285.00
 BOA Jig Bore/Mill, Stand, Collets, 3ph £1750.00
 BOA Jig Bore/Mill, Stand, 4 Collets, Keyless Chuck, Vice, 1ph £1750.00
 BOA Jig Bore/Mill, Stand, 4 Collets, Drill Chuck, 3ph £1450.00
 Turret VM300 Variable Speed Vertical Mill, 30 INT Spindle, Vice, Collet Chuck, 3ph £1750.00
 Elliott 600mm, Vertical Horizontal, 3 MT Spindle, Collet Chuck, Vice, 3ph £750.00
 Tom Senior Vertical Milling Head, 2MT £799.00
 SP Mill/Drill, NEW, 1ph, 3MT £1450.00
 Stand For Above £1000.00
 Wahl 96 Gear/Prison Hobber £650.00
 Minim 79 Gear Hobber £350.00
 Sherratt Gear Hobber £1250.00
 Geograph Model T1M Well Equipped, 1ph, Excellent Condition £1750.00
 Alexander 2B 4 Spindle Engraver, 3ph £2000.00
 Hauser 3BA Jig Borer, 3ph £1500.00
 Hauser 2BA Jig Borer, 3ph £450.00
 Bachler Precision Leaf Cutting Machine £225.00
 Clock Gear Cutting Machine, Constructed from Claretan T & C Grinder, 1ph £225.00

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Waco CH15 Power Bandsaw, 1ph, VGC £1250.00
 Starline 24-T10 Wood/Metal Vertical Bandsaw, 3ph £495.00
 Starline 18-S Vertical Bandsaw, 3ph, VGC £650.00
 Starline 18-S Vertical Bandsaw, 1ph, 240 Volt £750.00
 Ajax Small Power Bandsaw, 3ph £125.00
 Puma 250 Circular Cut Off Saw, High Speed, Suitable for All, 3ph £250.00
 Quakers & Smith 6" Power Bandsaw, Coolant, Hydraulic Rise & Fall, 3ph £250.00
 Midrange HSB04 Precision Circular Saw, 150mm Blades, 3ph £250.00

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Bentley 2025 Drill Point Grinder on Cabinet Stand, Some Tooling, 3ph £750.00
 Chalken Radius Grinding Attachment £175.00
 Woony Double Ended Buffer/Polisher, 3ph £750.00
 Myford M12 Plain Cylindrical Grinder, 3ph £1750.00
 Centres for Claretan Tool & Cutter Grinder, Each £35.00
 Turner 6" x 16" Heavy Duty Belt Linisher, Spare Belts, 3ph £500.00
 Taylor Hobson Model G Engraver Cutter Grinder, 1ph £450.00
 Hauser Jig Grinder, Well Tool, 3ph £3750.00
 Jones & Shipman S40 Surface Grinder, Max Chuck, 3ph £1650.00
 Jones & Shipman S40 Surface Grinder, No Chuck, 3ph £850.00
 RJA Tumbler Grinder, 3ph £200.00
 Ecolit Rotary Filing Machine, 3ph £50.00
 Carving 289 Polishing Spindle, 3ph £750.00
 Samard D.E. Tool Grinder/Lapper, Coolant, Light, 3ph £125.00
 Attention & Ellis Dual Lawnmower Cylinder Grinder, 3ph £750.00
 RJA 4" Pedestal Belt Linisher, 3ph £750.00

SHAPERS

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 Box Table & Other Parts for Elliott 10M Shaper LOT £1000.00

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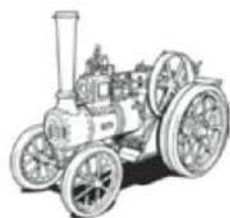
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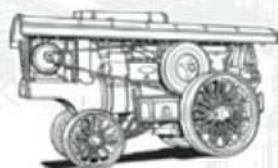


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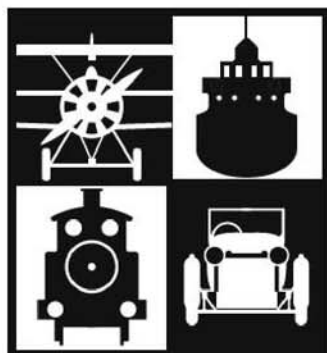


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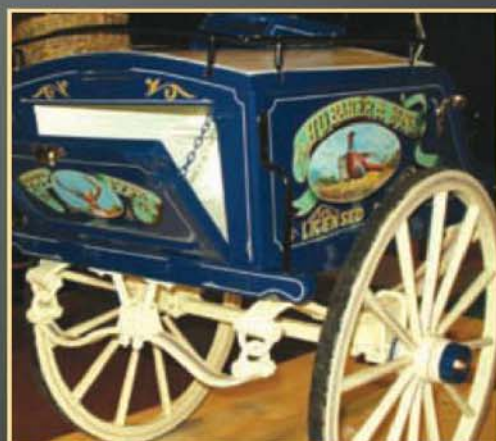
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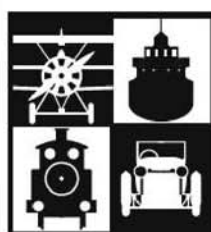
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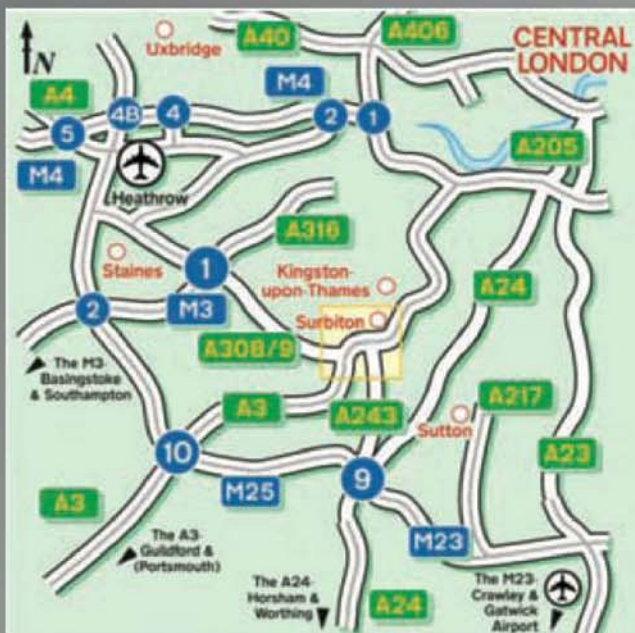
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From M25 North and West: Exit at Junction 10 onto A3 towards London. Exit onto A244 at Esher Common roundabout, signposted to Sandown Park. Turn right onto A307, Esher High Street at T-junction/traffic lights. Sandown Park can be found 1/4 mile along on left-hand side.

From M25 South and East: Exit Junction 9 onto A244 towards Esher, over the roundabout at Esher Common, then as above.

By Train: From London and the North: From Victoria, Waterloo or Clapham Junction to Esher Station (20-30 minute journey). Taxi rank at station or 2/3 mile walk as follows: left onto Station Road, right at T-junction onto A307. Sandown Park can be found 1/2 mile along on right-hand side.

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SMOKE RINGS

With the Editors

Made in Heaven?

Bottles and boxes, jam jars and tins,
Bolts and screws and panel pins,
Nuts and washers, bits of string,
Wire and wood and that Handy Thing,
Tobacco tins in orderly rows,
A box of something tied up with bows,
A model of an old aeroplane,
A propeller that's broken and won't fly again,
A little steam engine that's in for repair,
And an axe for sharpening over there.
A box that contains my grandfather's tools,
A watch with the back off showing the jewels,
There's a lathe and a shaper that help me to play,
A sleepy queen wasp that won't go away,
A spider the size of a half-a-crown,
A box of spare flex that has just fallen down.
A motor bike cylinder waiting for rings,
A clock that's had some new springs.
A bottle marked 'DANGER' — I wonder why,
A glider from next door — they can't make it fly.
There's a brass plaque I was given a long time ago,
The reason's obscure and I really don't know.
Hacksaws and files, pliers and snips,
Nut runners, solder and several mole grips,
Hammers and chisels, sockets and wrenches,
Things being 'worked on' up on the benches,
A grindstone that's hidden away by itself,
A balancing act with some things on the shelf,
Acetylene lamps and a tin of carbide
with a tin of green paint that's laid on its side.
There's split pins and cotter pins, pins to fit glass,
A lawn mower that's sharpened and waiting for grass.
Feeler gauges, thread gauges, a set of wad punches,
Woodruff keys, feather keys, Allen key bunches,
Festooned from the roof, obscuring each wall,
are tin tacks and artefacts kept by us all.
It's surprising the things that you can't throw away,
'Comin'andys' you're bound to want any old day.
It's the place to be happy the whole of your life,
Besides, it's the place to escape from the wife.
Marriages are made in heaven 'tis said,
But they last so much longer if you've got A SHED!

Originally published in Bristol SMEE Newsletter No. 57 and written by David Yea, the above is reproduced here by kind permission of Bristol SMEE Newsletter Editor Dr. Mark Phillips.

Apology

A recent telephone call from John Merrett of Brandon and District Model Engineering Society demonstrated most emphatically that despite having been included in the *Club Chat In Memoriam* panel published in *M.E.* 4232, 15 October 2004, he is very much alive and well!

We offer our sincere apologies for the inevitable distress which our announcement will have caused John's family and friends.

In seeking to discover how the error could have arisen, we find that John sent an e-mailed message to let us know that his good friend Mike Wogan, also of Brandon DSME, had passed away having lost his battle against cancer. Readers may recall Mike's short article describing a leadscrew reversing device for his Chester Centurion lathe published in *M.E.* 4190, 7 March 2003.

Our thoughts are with Mike's family and friends in their sad loss.

Rotary convertors from Boost

David Sharman of Boost Energy Systems, Author of the authoritative feature *Three-Phase Power Solutions* published in *M.E.* 4231, 1 October 2004, has pointed out an incorrect caption to one of the photographs accompanying his article. The phase convertors shown on page 374 are by Boost, not Motorun as stated. We regret any inconvenience which this error may have caused our readers and the companies involved.

David adds:

"Boost Energy, well known manufacturers of single to three phase convertors since 1957, have moved to larger premises to cope with demand. They are now at Park Farm, West End Lane, Warfield, Berkshire RG42 5RH; 'phone: 01344-303311; fax: 01344 -303-312; mobile: 07952-717960; website: www.boost-energy.com

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Christmas cards

The Welshpool and Llanfair Light Railway has produced two new cards for Christmas 2004 depicting wintry scenes on the railway.

One (ref. XC/A) depicts 0-6-0T Beyer Peacock No. 823 *Countess* passing the Cambrian style signal box on arrival at Llanfair station in recent times. The well-filled train is made up of ex-Zillertalbahn and ex-Sierra Leone railway coaching stock.

The other (ref. XC/B) shows a busy scene in the 1920s at the old terminus beside Smithfield Road, Welshpool. 0-6-0T Beyer Peacock No. 822 *The Earl* (unrebuilt) heads a mixed train for Llanfair with Foden steam delivery van *Lady Catherine* simmering nearby.

Priced at £2.99 for 10, £8.50 for 30, £12.95 for 50, any mixture, all post-free, the cards are available from R. E. Cartwright, Owl Halt,



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International Model Boat Show

Featuring club displays, demonstrations and specialist suppliers, the UK's only 3-day marine modelling exhibition returns to the Warwickshire Exhibition Centre 12-14 November 2004.

Displays range from modern power boats to classic warships and dedicated enthusiasts will be on hand to give practical advice on marine modelling. Static models will be complemented by activity on two boating pools while younger visitors are encouraged to try their hand in special sessions on Saturday and Sunday. Experts will be present to answer questions and to demonstrate the art and craft of boat building and knot tying. A comprehensive selection of some 30 specialist suppliers have booked stands and will have everything the marine modeller could need.

With ample free parking, the exhibition is open 10.30am to 5pm each day. Admission prices are adults: £5.50; senior citizens: £4.50; children (5-14): £3.50; family (2+3): £14.50. Check www.meridiennexhibitions.co.uk or call 01926-614101 for further information.

CHUCK, the MUDDLE ENGINEER

by B. TERRY ASPIN



POST BAG

Praise and thanks!

SIRS, - Every now and again things happen that make you realise what a great set of folks make up this splendid hobby of ours.

Back in July I did something I thought that I never would—I ordered a Chinese-made lathe. The service I got from Warco was exemplary. I was put in touch with a local school where I was able to see the same model of lathe in action and talk to the teacher who had ordered it and used it with his pupils—he was simply pleased to share his experiences with someone interested.

Then there was Lindsey at Warco who couldn't have been more helpful. Yes I know it's in their interests, and they were selling me something! I needed the lathe for a particular weekend when a lot of work had to be done re-wheeling a set of passenger vehicles for the Bolton club. The lathe was delivered early on the day arranged and placed exactly where I wanted it—not an easy task, as it weighs 500kg. I have been in touch with the firm since and each time nothing but polite helpfulness. I would add that I have no connection with the company except as a satisfied customer.

Then in September there was my question for information from Mike Chrisp. I left a message on his answerphone shortly after 9am, when I returned from doing some work after lunch there was a message on my answerphone from Keith Wilson who had been contacted by Mike; I returned his call, got the name and 'phone number I wanted, and the same day managed to arrange a visit to see the person in question. Now if that doesn't deserve thanks and praise I don't know what does!

Apart from the hot metal, hours spent bending over various machines, and the frustration when things go wrong, it is of course the wonderful variety and interest of all the people involved in our various pursuits that make what we do so absorbing.

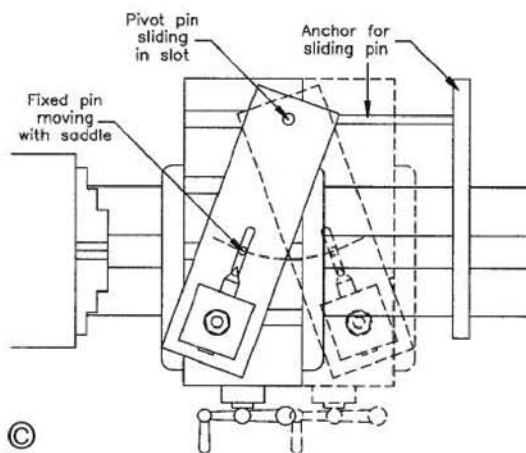
The Rev'd Canon John Roberts,
Northamptonshire.

Rocket propelled?

SIRS, - I wish to express extreme pleasure at the 'rocket propelled' service from Ray Fieldhouse at Chester Machine Tools, who set up my customer base and number late in the afternoon of Wednesday 8 October 2004.

My first order with them was for a 5C spin indexer, a set of ten imperial

Mr. David Upton's ingenious technique for machining a barrel-shaped thread for a locomotive reversing screw.



collets and a 3in. 3J chuck mounted on a mandrel for it. My order arrived less than 24 hours later, at around lunchtime next day! This must be some kind of a record because Ray had told me to expect a turnaround of about five working days.

Such 'off the shelf service' is to be highly commended and I will be getting the mill shortly when funds permit. Ray said the Cobra and table would be a 7-10 day job. Now there's a challenge!

I am currently in the process of upgrading my workshop with a small, dedicated mill and dividing attachments, with an extension table permanently set up for gear cutting and making special Meccano parts for the hobby. I have informed the members of my 'The Half Inch Systems Group' at www.free.hostdepartment.com/h/hisg/ which has a link to our Charter and my main Mecarep site, plus one to Dave Taylor who, in my experience, is one of the best official UK dealers of all Meccano and Metallus products. Dave also sells replica items, specials and parts to his own design for the Meccano hobby.

I hope Ray Fieldhouse and the folk at Chester read this!
Mike Dennis, Kent.

Barrel thread

SIRS, - Following from Mr. Harper's letter (M.E. 4230, 17 September 2004) I note that in the chapter dealing with the period 1866-69 in his book *The British Steam Locomotive*, Ahrons mentions that a number of designers dabbled with combining the reversing lever with a screw, notably W. Bouch on the NER, with a square thread 'torpedo (sic) shaped' screw on which the lever latched. R. Stephenson built a considerable number of locomotives with this gear.

My interest having been aroused, I've thought about how a barrel-shaped screw might be made. I realised that a tool post pivoted on a fixed point at the correct radius could be swung over the required arc

controlled by the movement of the saddle along the lathe bed. I hope the accompanying sketch (above) will show what I have done.

My old ML4 has a tee-slotted table cross-slide with the slots parallel to the lathe bed. I made up a tool post mounted on a base plate pivoted on a pin carried on a block which slides in the rearmost tee-slot. This block is anchored back to the bed so that it remains in place as the saddle moves. At the appropriate radius, a fixed pin in a tee-slot further forward lies in a slot in the tool post base plate to follow the saddle movement.

Set more or less over the pin, the tip of the screw cutting tool will describe the required arc to cut the barrel shape. The feed is applied by adjustment of the cross-slide. The screw thread is cut using the relevant screw cutting train with the tool tip advanced from that used to form the barrel, recognising the lesser radius required. I enclose a barrel screw cut in this way to show that the method works (photograph above—Ed.)

The left hand square screw thread is about 1/8in pitch cut on a 33/8in. radius with a 7/16in. major barrel diameter. The thread form cannot be truly square since its shape changes due to the angularity as the tool moves to the ends.

I hope this may be of interest to other readers.

David Upton, Surrey.

Differential unit

SIRS, - I refer to Malcolm Young's feature *M.Y. Otto Di-Cycle* (M.E. 4230, 17 September 2004).

Mr. Young could have saved himself considerable effort in modifying a Morris *Marina* differential unit by using a ready-made, chain-driven, light alloy cased differential salvaged from one of the many ride-on mowers. These can be obtained either from a scrap yard or re-cycling centre, or maybe from a mower servicing centre. I have personally obtained a couple of these from our local re-cycling centre as a starting point for building a small garden tractor to be

powered by a small 250cc diesel engine I acquired some time ago.

I hope this information may be of help to any future builders of the *Otto Di-Cycle*.

K. Williams, Isle of Man.

Fusible plugs

SIRS, - With regard to my article on fusible plugs (M.E. 4220, 30 April 2004) I would like to thank all who responded, either by letter to me, or via *Model Engineer*, or by speaking with me personally. Many thanks. The overall response was favourable, and I learned a lot.

In the article I asked if fusible plugs were used in other applications than locomotives and traction engines, to which the answer was yes—they are fitted to stationary steam generators, air pressure receivers in case of fire, and even to some espresso coffee machines. However, they did not appear to be in common use in ship-borne steam plant where water levels apparently go up and down faster than a yo-yo. In fact, most of the owners/drivers of the smaller traction engines in the UK, even if they have the facility for fitting a fusible plug, do not fit one for this same reason.

Many commented about my recommendations to omit the rivet from the fusible plug and use pure lead, saying that for them this had made life much easier. I know of many full size traction engines in the UK which use such a system. However, I cannot personally recommend lead, or anything else, for use in operating pressures of much above 150psi. as I have no experience of operating in this steam pressure regime.

My general conclusions, reached and listed in the article concerning the fitting and use of fusible plugs in the size categories for boilers, found general agreement with what is currently happening in the UK. One person was however, convinced that I have several rivets missing from my boiler for raising the subject at all. Everyone I spoke to was firmly



These photographs illustrate Mr. Frank Hasieber's technique for small i.c. engine crankshaft milling.

of the opinion that when fitted, fusible plugs require periodic inspection during service and that this should take place at the normal hydrostatic test date. The general view was that most UK club boiler inspectors would require advice and possibly some training to inspect fusible plugs, although none saw this as a problem.

My comments on driving skills and the associated plug failures were a little tongue-in-cheek; however the reference to 'idiot plugs' struck a chord with many who pointed out that the plugs did in fact save the neglected boiler from harm. Many felt, as do I, that a small number of our fellows are very cavalier in the operation of model steam equipment, especially in this day and age of the 'sue for everything' brigade.

I have to admit to one error in the article, namely the melting temperature of electronic solder, which I quoted as 100 to 110 deg. Celsius. This, of course, is not correct as most electronic solder melts at higher temperatures, and I have been castigated for this. Nevertheless, the reason for my statement was quite simple — all the soft solder I use is ex-surplus military and has a melting point, as far as I could measure, of just under 110deg.C and was used as a field repair solder. I can only bare my chest and say sorry.

Once again, my thanks to all who have responded, and I am pleased to have been of assistance.

Dick Billington, Bedfordshire.

Machining a crankshaft

SIRS, - I am building my first IC engine, the Whittle V8 aero engine, beginning with the crankshaft. After making a start on the lathe to turn the big end journals eccentrically, I thought there has to be an easier way! My technique is probably unorthodox but it works just great!

I transferred to my milling machine which is fitted with a DRO; what a difference — spacing the webs was so much easier and quicker. The journals are within 1mm of the finished diameter to be finish ground on a tool and cutter

grinder (Jones & Shipman 310). The pieces held by the cable ties are packing between the webs.

My guess is that this method took less than a quarter of the time it would have taken in the lathe. I was able to comfortably take a 1mm cut per pass — about 15 minutes per journal plus another 15 minutes per journal to finish the web faces. My photograph of the V8 crankshaft show the set-up on my milling machine. The other image shows the fixture I made for positioning the crankshaft in the vice for machining the webs. This took about an hour to prepare and made the job much easier than measuring down from the top face of the vice jaws as described by Mr. Whittle.

My approach may be unorthodox when compared to the usual method as described in the original construction feature, but just think of it as another way to skin a cat which I hope may interest some other readers.

Frank Hasieber, Durban, South Africa.

Locomotive livery (1)

SIRS, - Mr. Hennessey asks about the livery details of a New Zealand Railways Ab 4-6-2 Locomotive (M.E. 4231, 1 October 2004).

The fluting on the connecting rods on the Abs was not painted in NZR times.

In his book *Register of New Zealand Railways Steam Locomotives 1863-1971*, W. G. Lloyd shows a photograph of Ab 617 which the caption states was taken in 1916.

This locomotive is the last in the batch to which he refers. As it was only constructed in 1916 it can safely be assumed to be as constructed. The caption says it is "fitted with a short cab, flanged funnel, acetylene generator and headlight. In service, the class exhibited many variations in detail over the years." The photograph comes from the W. W. Stewart Collection. Mr Stewart was an enthusiast, photographer and artist of NZR Steam locomotives.

In 1917, Ab 617 had a brass steam dome and brass boiler bands, not overly polished. The steam pipe covers to the cylinders were also

brass. There is no lining, just black all over, but with two lines or bands of brass or gold at each end of the cylinder cladding. The sand dome does appear to have two horizontal bands similar to North American locomotives of the time. I have a book which contains two coloured paintings by Mr. W. W. Stewart. In the earlier painting this is how he has painted an Ab (1924). The rods appear to be 'bright' steel which is how I have seen preserved examples of NZR Locomotives — not highly polished.

A 1995 photograph showing red rods is probably of the preserved 'Kingston Flyer' examples. I never saw any like this in NZR times, although you couldn't really tell behind all the filth!

The 1917 photograph shows a locomotive with the original cast boiler front and a straight flanged funnel which were standard at the time; they were all changed to the 'flower pot' type later. A steam generator and large headlight were fitted later. The Westinghouse pump was also mounted on the left hand side of the smoke box at this time.

Richard Ashenden, Auckland, New Zealand.

Locomotive livery (2)

SIRS, - Further to Mr. Hennessey's enquiry concerning the livery of a New Zealand Railways class Ab 4-6-2 locomotive, I put the question to Lawrence Boul, a prominent member of The New Zealand Model Railway Guild whose reply was as follows:

"608 was the war memorial locomotive, so possibly it was treated differently. Lining was common early in the c20, but white tyres and painted rods are a more recent affectation as far as I know. Livery has always been basic

black, inside cab, 'hospital green' and red headstocks."

I hope this information is of interest and assistance.

Mick Nicholson, East Yorkshire.

Hardened fastenings

SIRS, - I have an old Tarpen hedge trimmer which I bought second hand in 1972 and have used very heavily over the years. Last week it stopped, the blades seeming to have jammed. The motor was receiving power but couldn't revolve. I dismantled it and found that the reciprocating blade is attached by two 3/16in. BSF machine screws to a non-ferrous follower driven by a rotating cam. The machine screws had sheared, hence the problem.

I couldn't get the threaded bits out of the follower and finally tried to drill them out but failed miserably as they were hardened. All I achieved was to wreck the follower beyond repair.

From my scrap box I found a piece of aluminium bronze from which I made a copy of the follower on my Warco Major, but had only some hexagon headed 3/16in. BSF machine screws for attachment, which I used. They were a bit proud and fouled the gearbox cover when I tried to reassemble it, but a steel spacer remedied that. The machine seems to run very nicely and I've finished the interrupted hedging task, but I am worried that the relatively soft 3/16in. screws will not endure the shearing forces which the reciprocating motion involves.

I do not know if or where one can buy hardened fastenings. I have read of doing one's own hardening, but I am more than nervous of using chemicals in the domestic oven. If anybody can make any useful suggestions I would be very grateful.

With the exception of the blade space adjusting nuts, the entire machine is assembled with round headed slotted screws, doubtless preferred to avoid the problems which the ham-fisted can achieve with a spanner and hexagon heads!

Dennis Randall, Oxfordshire.

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The fine quality of this model electric locomotive is enhanced by being displayed on a properly constructed length of track.



The addition of figures or other features can help the observer appreciate the size of the prototype.

GOING FOR GOLD BUILDING FOR A GOLD MEDAL

Harry Paviour,

one of our respected judges at the annual Model Engineer Exhibition, explains how to build your model with that special 'X-factor'.

Any preconceived notions held by an exhibitor that one can just place a model on the competition table at a major exhibition and walk away with a top award must be quickly dispelled. Success follows many stages which a model engineer must first address and overcome before being in with a real chance.

Anyone who is considered, let alone invited, to judge at a local, national or international model exhibition must consider himself or herself honoured, for such an invitation is a recognition of expertise in a given sphere of the hobby. That said, it seems that many model engineers or model makers from other disciplines, regard the duties of judging as being the most unenviable and most unpopular at any exhibition.

Most of us are likely to be familiar with the saying: "You can't please all of the people all of the time." It seems that as far as model engineering is concerned, you can't please all the people for even some of the time! Model engineers are a special breed of hobbyist, each with their own standards and expectations as to what they would expect to see from the results of the judges' efforts. One can almost compare the role of a model exhibition judge to that of a football referee — and many will have voiced views on the abilities of referees at football matches!

The following notes are intended to provide guidance to those considering submitting their model for competition; I shall explain what the judges are looking for and hope to enlighten those who think they could make a better job of judging than those who currently undertake the task. I shall discuss the steps involved in the judging process, what the judges expect to see, and how their fair and honest assessment results in an appropriate award. It must be realised that judging is not an exact science but is largely based on how the exhibitor has approached each phase of the model building programme.

Factors for consideration

The competitor should consider the following:

- Scale, weight and size of the model.
- Whether the model represents a particular prototype.
- Amount of research necessary.
- Capability of workshop equipment available to build the model to the chosen scale.
- Requirement for parts which will have to be bought in or made outside.
- Whether the model will be built as a regular working model or to showcase standard.
- Whether there is a pre-determined building time to finish the model.
- Arrangements for presenting the model at an exhibition.

The judges will be looking for:

- Completed information on the entry form.
- Supporting information for perusal, including research documents and data, etc.
- Overall style of presentation of the model.
- Information concerning procedures to disconnect or remove covers, etc.
- Quality of workmanship and attention to detail.
- Appropriateness of overall finish, including paintwork, polish on fittings, etc.
- Complexity of details including accompanying tools, etc.
- Suitability of materials used.
- Scale, authenticity and fidelity to prototype (if and as appropriate).

Since it is virtually impossible here to provide headings strictly appropriate to every competition entry, judges in all disciplines will mark their entries under various alternative headings. In all judged classes, a maximum number of available marks is always specified.

Entry form

There is no standard entry form at present for all the model exhibitions held in the UK. Prospective competitors should therefore take time to first very carefully read through the entry form of the chosen exhibition before actually starting to enter the required information. This remark is not intended to be the least derogatory towards

exhibitors, but it has to be recorded that judges have all seen a wide variety of incomplete or incorrectly completed entry forms. Before the entry form is sent off to the exhibition organisers, competitors are advised (if possible) to make a photocopy of it for their own records.

Competitors will of course have to enter their name and address, but space will usually also be provided to tell the judges about your model engineering experience, workshop facilities and other relevant information. In addition to the details of the model, some entry forms also ask for the details of your local newspaper so that they can be informed. The 'no publicity' box can of course be marked with a 'x' if you prefer!

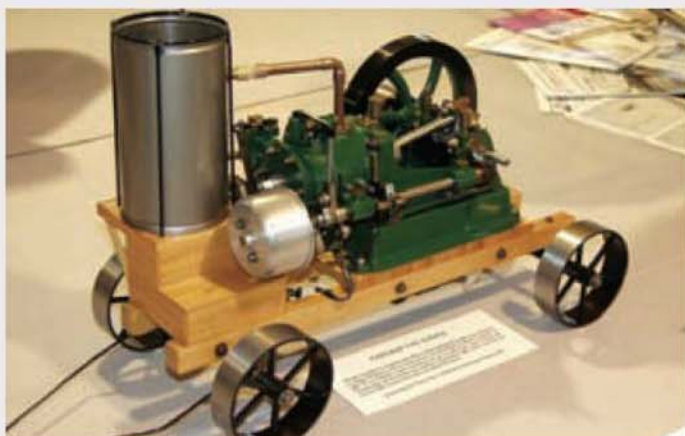
Competitors are often asked if photographs have been supplied and judges' notes provided. It is important that this question is answered. If photographs and/or notes have been supplied and they are not with the model at the time of judging, the judges have the opportunity to locate them. There is also a better chance that they will be returned to you at the end of the exhibition!

It is also important that competitors read any accompanying information sent with the entry form; this may include details of the competition class or section in which you want your model entered. Where the exhibition has a loan section, i.e. non-competition section, be sure that this is indicated on the entry form. It is not unknown for judges to begin work on assessing a model, only to be told by the exhibition stewards that it is in the loan section. This may result in disappointment for the judges as loan models are often of excellent quality. Think carefully before allowing your modesty to prompt you to enter your work in the loan section, you could be doing yourself out of an award.

A final point to note here concerns the closing date for the entry forms to be with the organisers. Only in exceptional circumstances will late arrivals be accepted after the published closing date and it is almost certain that no competition model will be accepted on the actual day of the exhibition or the day of the judging.

Insurance

All competitors should be sure to complete the question on the entry form concerning the value



This model gas engine is made memorable by the addition of a suitable transportation trolley and cooling water reservoir.



Unfinished models such as this Blackburn agricultural engine by Mrs. Cheryl Hill should not be entered in competition but make fascinating loan exhibits.

of the model. While the organisers appreciate the difficulty of putting a value on models, by not completing this section any claim which may arise becomes null and void. A realistic 'guesstimate' of the value of an entry is also required before the organiser's insurers will provide the necessary cover.

Concerning matters of insurance, the exhibition organisers usually indicate that if for any reason a competitor wishes to claim against the insurance company, a claim form obtainable from the exhibition organisers must first be completed. Any damage to the model must also be reported to the organisers immediately, whereupon arrangements will be made for the model to be inspected by suitably qualified persons.

Most exhibition organisers usually indicate that during the period between 'booking in' at and 'booking out' from their exhibition, entries are covered by their insurance. Some exhibition organisers' insurance will actually cover the model while in transit to and from the exhibition, but such cover should be confirmed and not assumed.

If you really want to get an indication of what your model is worth, find a professional model maker and ask what you would be charged for a similar model to be made. Check also if the quote covers labour alone or includes the cost of castings and materials.

Competition rules

All exhibitions operating a competition section will have a schedule of rules with which competitors must comply before they are eligible to take part. Without a schedule of rules, a competition is open to a wide range of potential problems, any of which, for various reasons, could bring embarrassment to the organisers and/or the exhibitor. It is important for all exhibitors to make sure that they are in possession of a set of rules.

If the organisers have not considered or produced any rules, it can only be assumed that the competition/exhibition is being staged on a very informal basis.

Competition rules will usually incorporate the following elements:

- All entries will need to be identified on an official entry form. Some organisers stipulate that a separate entry form is completed for each model, including the estimated value of each model.
- Some organisers may require exhibitors to pay a competition entry fee. This may be required to accompany the entry form.
- Where an entry fee is required, there may be

a reduced rate for juniors. The definition of a junior will normally be a person who has not attained the age of eighteen years.

- Entry forms usually ask the applicant to certify that the exhibit is his/her own work or property, and to indicate which parts or components are not the outcome of his/her own work. In cases where more than one person was involved in building the model, entry into the competition can only be made by one of the parties, and only their work will be eligible for judging. This often presents interesting problems for the judges to resolve — and I cannot give any direct guidance as to how to proceed!
- As previously noted, models will normally be insured for the duration of the exhibition. The exhibitor is likely to be responsible for insurance of exhibits in transit to and from the exhibition.
- The organisers may reserve the right to refuse any entry or model on arrival at the exhibition, and may exercise the right not to furnish a reason for doing so.
- The organisers may reserve the exclusive rights to describe and photograph any models entered for the competition or display and make use of any such photographs or descriptions in any way they think fit.
- The organisers will normally provide arrangements to issue non-transferable passes to the exhibitors on the presentation and registration of their models for the exhibition.
- Some organisers may choose to exclude competition entries from professional model makers, or from anyone with a direct financial interest in the supply of materials and designs to the public.
- The organisers usually reserve the right to transfer an entry between classes.
- The decision of the judges shall be final and no correspondence regarding the awards will be entered into. This condition may seem somewhat harsh, but it is often included to avoid the situation where some less than satisfied exhibitor seeks to enter into long drawn-out wrangling with the exhibition organisers and/or the editors of the sponsoring hobby magazines.

Failure to comply with the schedule of rules may eliminate the model from competition. In such a case the exhibitor may ask the organiser to have the model transferred to a non-competitive section or class.

Supporting information

Most judges will wish to take into consideration the age of the model maker, the amount of his or her previous experience, and the extent of the workshop facilities available. It is not uncommon for a first-time competition entrant to walk away with a Gold Medal or First Certificate as well as a trophy with a first attempt at model making.

For example, after studying the entry form, the judges may find that the exhibitor is well beyond retirement age having spent his working life in an office. Maybe he lives on the tenth floor of a block of flats and his wife only lets him use the kitchen table for model engineering in the evenings. Indentured toolmakers with a comprehensive workshop 'eat your hearts out'!

When preparing reports on the exhibits within the competition classes, there have been many occasions in the past when I have found it necessary to make specific reference to the lack of information supplied for the judges.

The greater the extent of information supplied with the model, the better the judges will be able to understand and appreciate just how much research and work has gone into the model. Photographs, drawings, locations and areas of research are all helpful.

Details of the available patents which were investigated to gain the detailed information should also be made available. Sketches of specific components made at a museum or other location at which the prototype is kept should also be included. If model boats are your interest, don't forget to put on your wellies!

Include reference to any specialist training undertaken to carry out a specific operation. Some two or three years ago, I had the pleasure of judging a ploughing engine built by a competitor who had enrolled on a welding course and gained a coded welder's qualification just so that he could build and weld up his own steel boiler.

All such information should be included along with a list of your workshop equipment. If you attended night school during the winter months then say so. If you wish to have all this information displayed for the public to see, then indicate that on the entry form too. A photograph album is an acceptable way of presenting the supporting information.

Displaying the model

In the matter of presentation, the exhibitor really enters into a partnership with the exhibition organisers. However, when it comes to the type of stand fittings available, the exhibitor is very much in the hands of the organiser.



This portable engine is displayed on a properly made base with a miniature shovel.

Very seldom now do we see the style and quality of display stands used at former Model Engineer Exhibitions staged at the Horticultural Halls, Seymour Hall, Wembley, Olympia and Alexandra Palace venues.

While accepting that high quality display stand presentation is costly, I would observe that the coloured fabric covering the display surfaces, aluminium alloy stanchions and guard-rails and high levels of display lighting to illuminate every angle of the models, ensured that every competition or loan model was shown off to its best advantage.

I am sure that models on these stands were displayed at a higher level from the floor than the usual village hall tables now so frequently seen at model exhibitions. This enhanced the enjoyment of a dad's day out. It is all part of a father's responsibility to lift his children to a suitable viewing level while explaining the identity and purpose of all the technical bits.

Loose fittings

In many situations, the provision of a full range of fittings or tools can make a considerable difference to the success of a competition entry, gaining additional marks to lift a model from one award level to the next.

However, I would be remiss if I were not to issue a word of warning about showing loose fittings and tools with your models. Regrettably for the hobby, these extras which you have provided to complement the model can go adrift from the display. Loss always causes upset and sadness for both the exhibitor and the organisers when the exhibitor has to report that, for example, a set of miniature tools is no longer with the model at the end of the show.

Loose items accompanying any model should be displayed either:

- securely attached to a display board accompanying the model, or
- under a glass case which is not easily removed.

An alternative is to display the loose items for judging purposes only, with a request for them to be removed from the model to the security of the organisers office to await collection at the end of the show. The disadvantage with this last suggestion is that only the judges get to see the additional workmanship which complements the model.

Displaying and complementing the model

Arriving with a model, which may have taken several years to construct and paint, and simply placing it on the table is not the best way to

indicate to the judges and exhibition visitors that your model is special and worthy of a top award.

Railway locomotives should be displayed on a short length of display track. I don't mean a spare or old length of used track from the club's railway in the park. Your length of display track should be on a polished wood plinth with scale wood sleepers, chairs and scale ballast. You may also wish to include a set of buffer stops with the associated red lamp. Why not provide a brass plate on the side of the plinth with the name and class of the locomotive, your name and the start and completion dates of building?

If you really want to show everyone that your model is special then put the model, track and base in a display case. One of the advantages of providing a display case is that you can then exhibit all the fittings, tools and other odds and ends. Other benefits are that the case will protect the model from inquisitive fingers and dust. There have even been occasions when I have felt that the exhibitor has made a better job of the display case than the model!

Depending on the model, a suitable case with appropriate ground or waterline presentation can complement a road locomotive, model boat, aircraft, etc. Even a simple stationary engine deserves to be displayed mounted on a base or plinth. I can recall a 1:6 scale (2in.) road locomotive at an exhibition where the builder had obviously spent hours in the remnants section of a carpet warehouse — the model was standing on a suitable piece of carpet that resembled grass and certainly showed off the model to advantage.

The provision of low level lighting to illuminate specific areas of the model will help to show off those normally in shadow. Such illumination should be discreetly managed to avoid spoiling the overall presentation with unsightly wiring or over-sized light bulbs.

Information for the judges

It is very important that the exhibitor provides for the judges and the official photographer clear and concise instructions on how to remove the display covers from the model. The information may include appropriate instructions as to how to uncouple the engine from the tender, or release the brakes, plus any other specific points that may need to be carried out before the model can safely be moved or lifted. If, for whatever reason, it should *not* be moved, this too should be clearly stated on the entry form.

Exhibitors should note that it is not unusual for the exhibition stewards to have to reposition your model from its original location on the table — or floor in the case of a large or heavy model, where you were asked to deliver it. Larger models, or later additions to the exhibition classes, may require careful rearrangement to display it or them to best advantage. It may even be necessary to relocate a model to another display table. It is important that exhibitors emphasise on the entry form any special procedures to be followed should any of the exhibition officials have to move your model.

The judges like to see photographs of your work against the full size prototype on which your model is based. Photographs, sketches, old documents and drawings obtained during research in preparation for building your model are very



Photographs and working instructions are helpful when trying to judge tooling exhibits.

welcome. It may also be instructive to provide appropriate photographs of special machining operations and to exhibit any relevant patterns which you have made, and maybe even a spare casting.

To assist in the assessment of 'suitability of materials', an inventory of the materials used in the construction of your model will be helpful.

Arising from your research and development of specific components, the judges will be interested to see the evolution of your techniques for the production of such items but don't worry, we won't laugh! However, please do not submit a boxful of failed attempts which should preferably reside quietly in that 'come in handy' box under the bench.

All this additional information is not normally displayed for the public to see. In most situations it is removed from the display to await your arrival and collection with your model at the end of the exhibition.

Quality of workmanship

Of all the sections included for discussion in these notes, it is the quality of your workmanship which really demonstrates to the judges and visitors the level of your ability to produce a special award winning model. It is here that the skill of the competitor is most evident, setting as it were the hallmark of the entry.

During construction, each component should be treated as though it is a complete model in itself and capable of withstanding the closest individual scrutiny. For example, the judges will be looking for well fitted coppers, neat silver- or soft-soldering, rivets undamaged by hammer marks, and the near but not total absence of tooling marks, having due regard to the scale of the model.

If you found tooling marks on your full size prototype, then you should reproduce them to the scale of your model. A word of advice — you must indicate to the judges that these marks are to scale, as per the full size prototype.

Quality of workmanship includes the appropriate paint/varnish finish. It should be understood that an unpainted model will not attract full marks. There is no doubt that an unpainted model exposes the quality of the workmanship normally hidden under paint. Ask yourself how many prototypes have you ever seen out on the roads or rails devoid of any paint work?

Exhibiting a model in 'photographic grey' is quite acceptable and will gain good marks, but do indicate to the judges that this is how the prototype was photographed way back in 1928, or whenever.

Attention should be paid to finish and detail, invisible joints, machine marks etc. This is why it is so important, as part of your research, to take

numerous close up photographs of every aspect of the prototype. But beware — if you are lying under a traction engine or road roller on a rally field to get a detail picture of the ash pan configuration, check that the driver is not about to drive off!

Any model made to a very small scale will demand a scale finish, which may be almost mirror-like in appearance. Don't think that this can be achieved by polishing out the coarse marks; such an approach may be totally inappropriate and will actually lose you marks. A sense of proportion must also be evident; oversize union nuts, bolt heads, flange thickness and other badly proportioned details should be avoided. Use of the argument that, for example, steam cannot be scaled for a working model will only be accepted in limited circumstances, e.g. in the case of boiler flue tubes.

Judges know that in 1:12 scale (1in.) a prototype $\frac{3}{4}$ in. bolt is about halfway between 10BA and 11BA; to be precise, $\frac{3}{4}$ in. scales to 0.0625in. for which 11BA is more suitable. A model with bolts which look wrong will be marked down — easy substitutions are really frowned upon.

Tyres which have been shrunk on to railway locomotive wheels, for example, will gain more marks than simulated tyres cast integral with the wheel centres. Rivets should not be used for fixing the horns to the locomotive frames where fitted bolts were used on the prototype. Most of us have taken short cuts in the past to get our early projects running on the club track.

Although I personally do not like using the word 'fault', exhibitors should be aware that this is what the judges are actually looking for. It is the attention to the finer points and details which is the most vulnerable to close scrutiny, however trivial they may seem. Absolute perfection in workmanship should be the aim of every competitor aspiring to a major award. To quote the philosophy of many eminent model engineers, the expression "*that will have to do*" should never feature in your vocabulary.

Finish

How often have we heard or perhaps read in these pages that a very well made model was spoilt by a poor paint finish or inappropriate lining? Successful finishing of a model is an art and a skill which require planning, careful preparation, initial practice on a few trial pieces, and the right frame of mind to carry it out.

Where appropriate, the paint must be of the correct texture and thickness and not so thick as to obscure fine detail and riveting. Colour is difficult to judge, especially in artificial light. In most cases judgement must be subjective, for example Great Western green has been interpreted in an infinite number of shades; the judges of locomotive classes can be relied upon to have a pretty good idea. If, in following your research, you have based your model on a locomotive when it was painted in a particular shade, be sure to indicate this to the judges so that there can be no argument as to whether the painting is correct.

Don't get carried away with polished brass and copper, etc. A lot of polished metal in the wrong places on a model will lose marks if it was not



Traction engines, like railway locomotives, look better if given something to stand on.

there on the prototype. On the other hand, entries in the horological and scientific classes will be expected to have the heads and ends of all the steel screws polished to a mirror finish. Judges will be looking for clocks with well-proportioned dials, silvered chapter rings and brass contrasting back plates. Such brass plate work should be well polished, including the edges, and if applied, lacquering should be carefully executed. Modern instruments should be carefully grained and, if appropriate, clear lacquered, but care must be taken to preserve sharp edges.

Traction engines with painted strakes and tyres will certainly lose valuable marks, as will those with chimney caps machined from solid when they should have been spun from sheet material. Photographs revealing your efforts at producing the spinning will certainly enhance your marks.

Although it can be found in the most unlikely places on a prototype, chrome, copper or silver plating should be used with the utmost caution. Some years ago I attended a Chester steam rally at which there was a Ruston Proctor engine with a chromed reversing lever. The owner/driver informed me that this was how it had been turned out in 1928 for the engine's first owner. If you should visit the Science Museum in South Kensington, London, look for the famous model showman's road locomotive *Supreme* by S. Harris which has chromium plated detail fittings just like the prototype.

Deeply scratched and highly polished is about the worst type of finish that can befall a model. Finally, don't listen to those who tell you that a coat of paint will hide a multitude of building sins.

Complexity

This heading was originally called 'quantity of work' and accorded with the saying "*a good big 'un will always beat a good little 'un.*" There is very little merit in spending hours turning huge chunks of metal into swarf. Judges pay more attention to the intricacy of component parts rather than their size.

Complexity is a high mark-scoring factor in many clock exhibits, not only due to the complicated components in a three-train clock but also for the careful planning of their assembly. Similar observations apply to model internal combustion engines, particularly the radial aero engines and other multi-cylinder engines now coming to the fore at exhibitions.

To be quantified, complexity requires considerable experience on the part of the judges, and it is here that their own model making ability and experience enables them to make valid assessments.

Suitability of materials

In many models the use of incorrect materials is very obvious. Brass tyres instead of iron on farm wagons will always lose marks. On the other hand, brass castings skilfully camouflaged by painting when the prototype would be in cast iron may be overlooked. This is often the situation with scale railway locomotives where the model engineer has obtained commercially available gunmetal cylinder castings instead of prototypical iron castings.

The exhibitor must be sure that his paint will not chip to reveal the subterfuge.

Copper boilers are obviously considered suitable even though the prototype would undoubtedly have been steel.

Cast aluminium alloy wheels on traction engines should be avoided. Like plated components, aluminium alloys should be used with caution. Although aluminium was isolated as long ago as 1827 it was not until the advent of electric furnaces that its full potential could be realised, a fact which provides a date for its first commercial use. I should perhaps mention in this context that one particular well-known author describes the construction of a small traction engine in which copper rivets are used to secure the steel strakes onto aluminium wheel rims. This should not cause a problem provided you indicate to the judges that the construction of your entry is as specified in the designer's written instructions.

Authenticity or originality

Sometimes referred to as 'fidelity to prototype' or 'originality' if the model is of a freelance design, authenticity applies to models of items which existed in full size form. This category can cause the judges the most concern unless the competitor provides them with documentary evidence of truth of representation or fidelity to the prototype. Such evidence should include an account of the research involved in preparing the model. However expert judges may be in their specific class, they cannot be expected to be familiar with every detail of every model they may be called upon to assess. The more information provided, the easier it is for the judges to assess the model and the better it is for the competitor as far as results are concerned.

As a general rule, if a competitor produces an exquisite piece of workmanship, it is reasonable for the judges to assume that he or she has taken equally great care in researching the subject and that what is entered is basically correct. In the case of sloppy workmanship, the opposite can be assumed.

In original design work, sound basic design will score good marks. It must, however, have a practical full-size application and comply with what is termed 'sound engineering practice.'

One final word of advice: never entertain the term "*That will do!*" It will let you down when the marks are awarded.

References

Competitors' Information 1997 published by Argus Special Interests Limited.





The model Deltic engine on display at the Harrogate 2004 exhibition. The ignition arrangements can be seen in this photograph.



The author (left) enthralled visitors with details of the manufacturing techniques applied to his engine.

Clen Tomlinson

shares with us some of the secrets of his spectacular model of this famous and versatile engine.

THE DELTIC PROJECT

My model is a working 18-cylinder, opposed piston, 2-stroke, spark ignition engine. It is based on, that is it follows, the design principles of the Napier *Deltic* Diesel engine to a linear scale of 1:8. The design was produced from a single cross-sectional drawing of the marine version as published in *Model Engineer* plus the dimensions of the bore and stroke. This original drawing was photocopied and enlarged onto several A4 sheets, each with a different scaling factor.

The internals of the engine are to scale, that is the bore, stroke, connecting rod length, porting positions and dimensions are accurate to within 5% (rounding off metric equivalents of inch dimensions). This gives a model capacity of approximately 160cc, hence the logo; *Deltic 160* on the crank covers. The following are the major deviations from the prototype design:

- The cylinder centre distances have been increased to allow greater cooling volume around each liner.
- The connecting rods do not have split big ends due to scale space/strength restrictions. This has involved the design of built-up crankshafts with ball race main and big end bearings.
- Externally, the design was changed to accommodate ignition distributors, sparking plugs and multiple oil pumps (one pressure and three scavenge). A great deal of external decoration has also been added.

The engine has three banks of six cylinders arranged on the sides of an equilateral triangle. There are three 'V12' crankcase assemblies, one at each corner of the triangle. There are thirty-six connecting rods and pistons with six pistons operating in one set of cylinders and opposed by pistons from the crank at the opposite end of that cylinder block. The exhaust and inlet ports in the cylinder walls are opened and closed by the pistons.

The model is now approximately 90% complete with the major structures in place including crankshafts, connecting rods, cylinder liners, timing/phasing gearing, scavenge blower, exhaust manifolds, sparking plugs, distributors, oil and water pumps. No castings were used in the construction of the model, the entire

assembly being machined from the solid and made to look like castings.

The engine is currently assembled with tight, slide fit pistons (without rings) installed to check the accuracy of machining and assembly and to prove that it is possible to assemble the engine with all piston assemblies fitted to the rods. I am happy to report that it does go together and that it rotates freely.

The oil pumps, with the full flow filtration system, are complete together with the manifolds for the oil spray to the crankshafts and scavenge

return from the two top crankcases. The water pump, with feed and return plumbing, is also complete. The scavenge blower, together with pressure relief and control regulators is now in place. The current project is the ignition equipment.

The eighteen sparking plugs are fitted and if the engine is to run at the modest speed of 5,000rpm it will require 90,000 sparks per minute. If it were ever to get to 20,000rpm (it is tiny inside) that would be 360,000 sparks per minute! I am building a six-element infra-red

About the author

I am a 71 years-old retired electro/mechanical engineer, living in West Sussex, England. Upon leaving school I was apprenticed into the motor vehicle industry where I qualified as a motor vehicle technician. Experience was subsequently gained on cars, commercial vehicles, agricultural tractors and equipment, civil engineering plant and equipment and motorcycles. I also designed and built many special purpose machines, road and race cars and bikes and managed a sports and racing car department.

In middle of this time, two years were spent in National Service (draft) in the Royal Air Force. Some 13 months, five days per week, eight hours per day were spent in the classroom being trained as an aircraft flight and navigation instrument technician. I learned more in that period than in my life to that point!

During the mid-1960s a change was made into scientific manufacturing and three years were spent making small high-speed (500k rpm) turbines and free piston engines for use in cryogenics for liquefying Helium.

I then took training in education and joined a large manufacturing company to set up and run their engineering training school. I progressed to group training manager and finally to group personnel and training manager. The company designed and built large electro-magnets for atomic particle physics research. We also specialised in new manufacture and refurbishment of underwater weapons and designed and built ion implanters for the electronics manufacturing industry.

During the early 1970s I joined with three other senior managers to set up a new company operating in similar areas of technology. This company developed into one of the leading magnet manufacturers in the world. As Engineering Director I was responsible for tendering, design and manufacture of tooling for production. We designed and built large resistive and super-conducting magnets and associated equipment for atomic particle and fusion physics research projects throughout the world.

I have been involved in many projects in the USA including the Brookhaven National Laboratory, Long Island New York; NAL, Chicago; the Super-conducting Super Collider, Texas; Boeing, Seattle and Starwars.

I have always been one to make or 'improve' things including many relatively simple model steam and internal combustion engines.

In retirement I had been slowly developing my workshop and enjoying life. Then my wife died very suddenly some four years ago. I needed something to totally occupy my mind for the waking hours and that is where the *Deltic* came in. I had been thinking about such a project for some time!

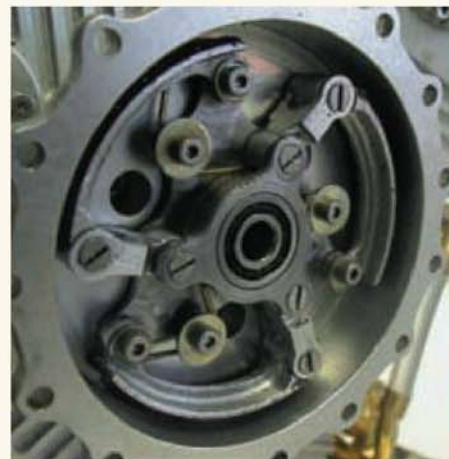
I am also currently completing the restoration/improvement of a 30 year-old BMW 3.0CSi coupe I have owned for 20 years. I have another BMW car and two motorcycles to look after. I also have two grandsons to 'train'. The next model engine will be another Napier — the *Sabre*. This is an 'H', twenty-four cylinder sleeve valve unit. I am working on the design and it is some challenge!



The connecting rods for the model engine. Thirty-six are required.



Machining the 'ringless' pistons for the assembly trials on the CNC milling machine.



A close view of the fine machining applied to the blower drive arrangements



One of the cylinder liners. These were machined from cast iron. The position of the ports is crucial to engine performance.



Only two more to do! One of the crankshaft assemblies complete in its crank chamber with con-rods and pistons.

optical trigger unit to mount on the end of the bottom crank. Each of these triggers will control one of six CDI modules. The final major project

will be the production pistons with their rings (two compression and one oil control). In practice I may not populate all of the grooves.

Crankshaft assemblies

As stated above, due to the relatively small scale and lack of space it was not felt safe to have split big ends to the connecting rods. The crankshaft is therefore of the 'built-up' design. This has enabled an all ball bearing assembly to be designed. During this process it was not considered practicable to press the components together with the required degree of accuracy. The assembly is therefore bonded together from slide location fit components followed by threaded and bonded pins at each joint. Three are fitted axially at the main bearing to web joints and two radially at the big ends. Each of the three crankshafts is assembled from 118 components, comprising:

- Seven main bearing shafts.
- Six big end shafts.
- Twelve crank webs.
- Nine main bearing races.
- Twenty-four big end bearing races.
- Thirty-six main bearing locking pins.
- Twenty-four big end locking pins.

A relatively simple but accurate indexing assembly fixture was used to sequentially bond the components starting from the drive end and followed by a big end complete with con-rods and the next main from six down to one. On completion, the assemblies spin freely in the fixture and the main bearing frames.

A single test assembly was first constructed to test the bond strength. This failed at number one big end at a static torque of 17ft.lb. force. This is more than adequate to achieve my wildest dreams with regard to power output. With the subsequent addition of the threaded locking pins I am confident about the static strength of the assembly but remain apprehensive regarding the high frequency torsional stresses applied to the relatively long and thin six cylinder shafts.

Napier Deltic prototype history

The prototype for this model is the Napier *Deltic* opposed piston two-stroke cycle Diesel engine range, used primarily in Naval fast patrol boats and mine sweepers today, but also to power two classes of English Electric Diesel-electric locomotives. The engines were produced as nine-cylinder units (three banks of three cylinders) or as the subject of this model, as an eighteen-cylinder engine (three banks of six cylinders).

The principle has its roots in a German Junkers aero Diesel engine of the 1920 to 1940s period. This engine was an opposed piston two-stroke Diesel with one bank of six cylinders arranged vertically with two six throw crankshafts, one at each end of the cylinders.

D. Napier & Son Ltd. had a license to develop this unit as the *Culverin* aero engine in 1935. However, it was not until after World War Two, the design being by then in the hands of the English Electric Group, that a use was found for the unit as a lightweight high-speed marine Diesel engine. This application required a couple of inspirational design leaps. The first was the realisation that if one more crankshaft was added then two more banks of cylinders could be added in the configuration of an equilateral triangle. The second was that if one crankshaft was arranged to rotate in the opposite direction to the other two, then the relative phasing of the whole assembly for port timing 'fell into place'. This design produced an extremely compact, strong but lightweight unit with almost perfect natural balance.

With 18 cylinders each having a bore of



5.125in. and a stroke of 7.25in. per piston or 14.5in. per cylinder, this engine had a swept volume capacity of 5,384in.³ or 88.3 litres. Three stages of development led on from the initial design. The first stage involved the fitting of an engine driven blower for scavenging; turbo-charging and turbo-charging with charge cooling followed. Finally 'compounding' using an axial turbo-compressor unit within the triangular central void was added.

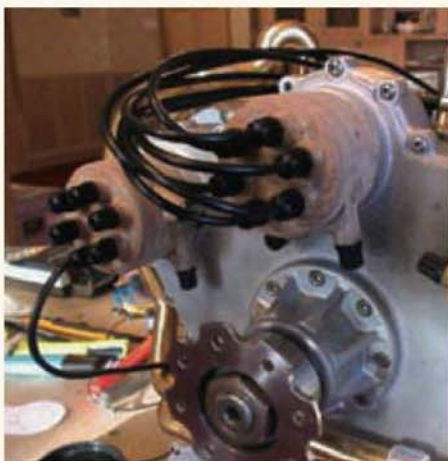
The performance ranged from 1,650bhp at 1,500rpm for locomotives to 2,500bhp at 2,200rpm 'sprint rating' for FTB's (bmep 92.lbf./in.²) both mechanically blown. This rose to 3,700bhp at 2,200rpm (bmep 130lbf./in.²) when turbo-charged and charge cooled. Note that the complex '*Deltic Compound*' prototype reached 5,600bhp output on test during 1956.



Crankshaft assembly. The crankshafts are built up using engineering adhesives for assembly.



Two of the three crankshafts. Note the arrangement of the con-rods with one forked and one plain rod per big end journal.



The spark distribution arrangements on the model engine.



Further details of the ignition arrangement. The prototype was of course a Diesel.



Some of the gearing required. Note the superb machining of the gear case.

Cylinder block and liner assemblies

The cylinder blocks are machined in three parts: the centre section, exhaust and inlet ends. Annular rings around the ports are machined into the mating faces, the exhausts exiting to the outside as per the prototype but the inlets to the inside only.

The cylinder liners are machined from grade 17 cast iron and are of the same design as the prototype with four annular grooves machined over the length for cooling water. The two central grooves are interconnected by a series of axial grooves. At each end of the liners and between each annular groove there is an O-ring.

Each cylinder liner has a discrete cooling arrangement with water entering via a drilling through the block and into the ring to the outer end of the exhaust ports. Water then passes through drillings in the block to the first of the central grooves, and into the second central groove via the axial grooves. From here it has to pass out of the block on the inside face through external banjo fittings to pass over the inlet porting and back into the final annular groove, then out via a final drilling.

The liners are located in position by threaded bushes through the blocks which also receive the sparking plugs. The block assembly is held together by twenty-eight M4 cap head screws threaded into the centre section.

Timing/phasing arrangements

The timing and phasing of the crankshafts was designed to be identical to the prototype. The entire design was taken from the single cross-sectional

drawing mentioned earlier. When viewing the engine from the front (non-drive, blower or free end) the cylinder blocks are identified A, B and C clockwise with A to the left, B at the top and C to the right. The bottom crankshaft is therefore designated C/A and runs in the clockwise direction with A/B and B/C running anti-clockwise at the top left and right respectively. Number 1 big end of each shaft is at this end. All of the pistons are of identical design but are required to perform the secondary function of opening and closing

either the exhaust or inlet ports in the liners. When viewed from the front, the exhaust ports of block A are at the left bottom, those of B left top and C right top.

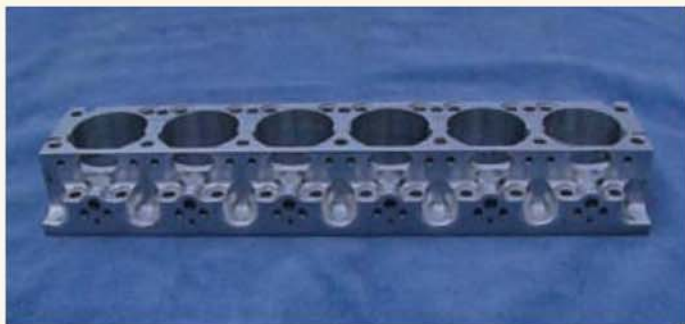
The firing order for each shaft in my engine follows standard six-cylinder practice at 1, 5, 3, 6, 2, 4. They are however 60deg. not 120deg. shafts as this is a two-stroke. Each of the 18 cylinders fires once in every one revolution of the engine or a power impulse every 20deg. (I have subsequently discovered that the prototype engine has non-standard crank sequences with the order of numbers 6 and 4 reversed giving the crank order of 1, 5, 3, 4, 2, 6).

The firing sequence in each triangular bank of cylinders is identical, cylinders B, C and A firing at 40deg. intervals. The firing intervals per bank are therefore: 0, 40, 40, 280 degrees. The firing order for my complete engine is: C1, A4, B1, C5, A1, B5, C3, A5, B3, C6, A3, B6, C2, A6, B2, C4, A2, B4. For the prototype all the 4s should be changed for 6s and *vice versa*.

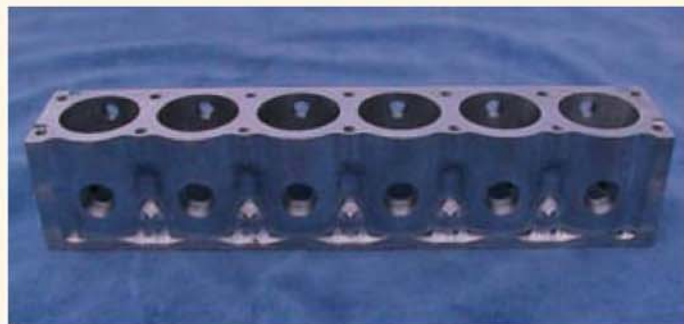
As with all modern internal combustion engines, the valve timing is designed with 'lead and lap'. To this end the exhaust piston leads the inlet piston of the relevant cylinder by 20deg. of crankshaft revolution. This means in effect that the effective top dead centre (TDC) position, i.e. when the crowns of the two pistons in a cylinder are at their closest, does not occur when either of the big ends is at its TDC position. The exhaust is 10deg. after TDC and the inlet 10deg. before. It is easier to express all of the port timing in relation to bottom dead centre (BDC) of the piston related crank.



The three main bearing frames photographed during manufacture.



Each of the three cylinder banks consists of three 'castings'. This is one of the end type.



One of the central cylinder members. No castings were used in constructing the model and all components were machined from solid material.

The port timing for my engine equates to:

- Exhaust opens 71deg. BBDC (68)
- Inlet opens 54deg. BBDC (53.5)
- Exhaust closes 71deg. ABDC (68)
- Inlet closes 54deg. ABDC (53.5)

If this is corrected in relation to effective TDC, the port timing becomes;

- Exhaust opens 81deg. BBDC
- Inlet opens 44deg. BBDC
- Exhaust closes 61deg. ABDC
- Inlet closes 64deg. ABDC

The exhaust period is therefore 142deg. (136) and the inlet period 108deg. (107) The exhaust lead is 37deg. (34.5) and inlet lag 3deg. (5.5).

The figures in brackets above are the actual values from the prototype, which are published in relation to exhaust TDC and have been adjusted to the same base as my model.

Running plans

This project has grown over a period of time from initial thoughts through to the first simple design that could be made with the usual workshop equipment. The acquisition some eighteen months ago of a small Denford bench top 2.5-axis CNC milling machine prompted a revisit to the entire design. What has evolved is what I have today.

One thing is certain, this engine has to run! I am under no illusions as to how difficult that will be. The prototype is a large Diesel and engine speed/power output is controlled entirely by direct fuel injection volume. The thermo-dynamics of such a small engine are such that it will never operate as a compression ignition engine. It has to be spark ignition and fuelled with either petrol or a suitable gas.

There is no natural induction stroke and therefore it has to be force scavenged and charged when both pistons of a cylinder are relatively stationary

at the outer ends of the cylinder with both ports open. It is going to be very difficult to obtain throttle control as any attempt to throttle the scavenging air or boost pressure reduction is likely to have a greater adverse effect on scavenging than charging. I intend to keep the blower/manifolding layout true in principle to the prototype so carburation either side of the blower is out. To this point I have assumed that obtaining sufficient boost from a relatively small diameter impeller will not prove too difficult. The plan is to drive the impeller at six times crank speed.

What I have in mind when the time comes is to drive the engine at about 1,000rpm and once satisfied there is lubrication and cooling flow, turn on the ignition and squirt something into the blower intake. From that point a long development programme begins. However, I do intend to record that first attempt on video!



GUILDFORD RALLY 2004

Malcolm Stride

presents a personal report of an event with much to interest each and every visitor

It seems appropriate in this 50th anniversary year of Guildford Model Engineering Society to share with our readers a brief history of the society.

The club was originally formed in 1954 as the Guildford Model Yacht, Power Boat and Engineering Society with around 20 members who met in the

basement of a house in the town. An annual exhibition has been held from its inception and it was at the first of these that founder member Nan Selley asked the then Mayor, Councillor Nicklin if it was possible for the council to help with finding a site for the club. Councillor Nicklin had been Nan Selley's headmaster at school. The result of this approach is the fine site which we see today, operated by the current membership of around 230. Members celebrated their society's jubilee over the weekend of 5/6 July when some 200 members and friends attended, including Vic and Nan Selley, and Stan Quantrill and Vic Banks from the original

founding group. I am indebted to John Jones (another founder member at the age of 17) for providing this information.

For my report on this year's rally, I have concentrated on the more unusual items which caught my attention. This does not mean that those whose efforts are not mentioned are in any way inferior — far from it. In fact the very high standard of models at Guildford always means that there is insufficient room in this journal to include them all.

So what did catch my eye? On the traction engine field, the first was the Atkinson Wagon



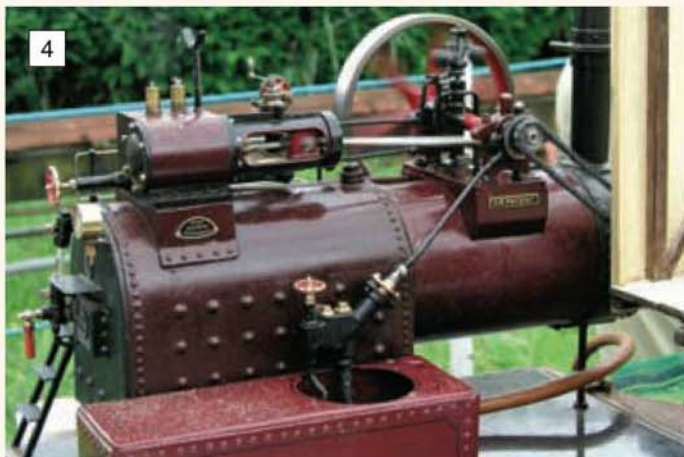
Bruce Fleet's oil-fired semi-flash boilered Atkinson Wagon ran very well.



This Scammell 'Mechanical Horse' in Southern Railway livery was built by Dennis Hoad.



Younger visitors to the rally loved Jim Cusworth's Tiger 1 tank which fires blanks and water jets.



4
This plant provided the motive power for Heinz Muller's workshop.



5
Heinz Muller's multi-bladed tree saw produced eight planks in a single pass.



6
A turbo prop engine from the Gas Turbine Engine Builders Association.



7
Ron Hankins' Bentley BR2 rotary engine impressed all who saw it run.

built by Bruce Fleet from Swindon MB&EC (photo 1). An unusual feature of Bruce's version of this well-known wagon was that it is oil fired via a semi-flash boiler. The model was performing very well and made no smoke at all, so the burners were obviously well set up.

Also on the rally field was a 1:3 scale 3 ton Scammell 'Mechanical Horse' in Southern Region livery (photo 2). This was built by Dennis Hoad and was powered by what looked to be a four-stroke lawn mower engine. Unfortunately when I saw this vehicle Dennis was having spark plug trouble and so I did not see it run.

Once into the main site I was 'attacked' by the Tiger 1 tank being operated by Jim Cusworth (photo 3). This large and well detailed model was complete with sound effects and a blank firing

gun which, no doubt, made a few spectators jump. The younger visitors loved it but, as some found out, a water cannon was also built into the gun and was occasionally used to good effect.

Also running outside was the 1:5 scale steam powered tree sawing plant built and operated by Heinz Muller. (photos 4 and 5). This was actually hard at work sawing miniature trees into planks, cutting each tree into eight planks in a single pass with its reciprocating multi-bladed vertical saw. The boiler was fired by propane and the sawing plant was built into an attractive building, complete with work bench and other details to add realism. In action, the saw was fascinating to watch.

After this it was off to the model tent demonstration area where, as usual, members of the Gas Turbine Builders Association were

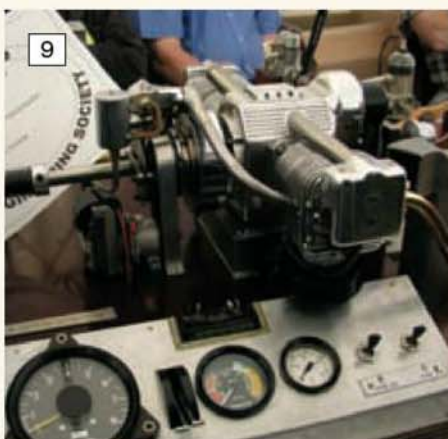
making lots of noise with their Hi-Tec engines. These included turbo prop engines (photo 6) as well as straight gas turbines. This area always attracted considerable attention when demonstrations were taking place.

Alongside the GTBA was the demonstration area of the IC Engine Builders Group which also had a variety of engines running. Many spectators were very interested in Ron Hankins' Bentley BR2 rotary engine (photo 7). From the comments I overheard, many had never seen such an engine in action and were amazed that the whole thing rotated.

After this it was time to head inside the tent, not least because of a short sharp shower of rain! Immediately inside I came upon Clen Tomlinson's magnificent Napier Deltic engine (photo 8),



8
Clen Tomlinson reckons his model Napier Deltic engine is some 18 months from completion.



9
Bill Connor's flat twin petrol engine was displayed on the IC Engine Builders Society stand.



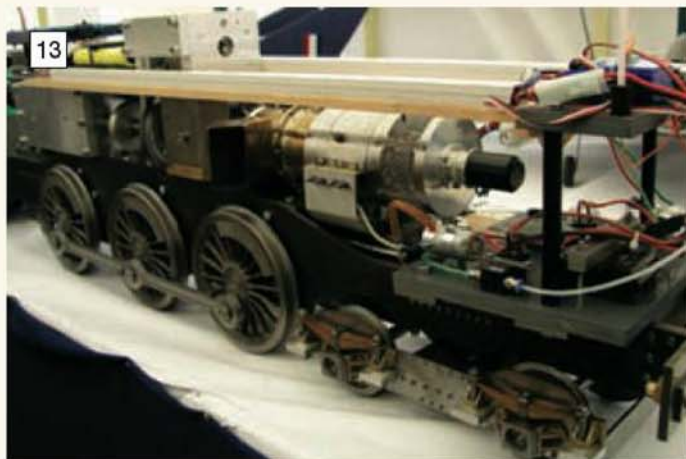
10
Des Adeley's part built 2 1/2 in. gauge NZR class A6 locomotive is making good progress.



Gerard Veenhuizen's unusual model 'Local Railway 0-4-0 Locomotive'.



A part-built 5in. gauge Armstrong Goods engine by David Ball.



Tim Coles displayed his well engineered 5in. gauge gas turbine locomotive.



Pierre Bender's experimental 7 1/4in. gauge gas turbine locomotive.

much photographed already but now with the ignition components starting to take shape. Clen estimated that he had another six months work to finish his engine but said it would probably take him 18 months. He declined to react when I suggested that this meant it should be running in time for Sandown 2006!

Among the superb variety of engines on the IC Engine Builders display was a very nice flat twin petrol engine with full instrumentation and controls by Bill Connor (photo 9).

Moving on to some steam items, the National 2 1/2in. Gauge Association had on display a part built New Zealand Railways A6 class locomotive and tender by Des Adeley (photo 10). Readers may recall recent *Club Chat* reports about this Association project.

A locomotive with a 'different' configuration to its motion work was the 'Local Railway 0-4-0 Locomotive' in 7 1/4in. gauge by Gerard Veenhuizen (photo 11). As you will notice from the photo, this engine had its cylinders located between the front and rear wheels on each side. This arrangement obviously puts the weight in the right place between the axles.

The next model to catch my eye was an unfinished 7 1/4in. gauge GWR 2301 class 0-6-0 Armstrong Goods engine and tender by David Ball (photo 12). This was almost complete although unpainted so that visitors could appreciate the excellent workmanship. It will be a very fine locomotive indeed when completed.

I have saved the most spectacular items for last. These were two gas turbine locomotives by Tim Coles and Pierre Bender. I found these an interesting contrast. On the one hand we have Tim with his commercial *Wren* turbine with full digital control in a very nicely engineered 5in. gauge model GT3 gas turbine locomotive chassis (photo 13). In contrast, we have Pierre with his very experimental home developed 7 1/4in. gauge model built using parts from lorry turbochargers (photo 14). Both locomotives performed well and made several laps of the Guildford tracks with no apparent problems. The acceleration in both cases was quite amazing and in Pierre's case caught your reporter unawares.

When Pierre was given the go ahead to join the main track, there was a 'woomph' followed by a couple of

'pops' and then he was off like a rocket leaving this reporter with a fine photograph of his back view disappearing into the distance. Tim's take off was much more controlled, doubtless thanks to the electronic controls on his turbine and the fact that he was balanced high on a ground level riding truck on the raised track. I eventually managed to get photos 15 and 16 showing the models in action. We believe this journal has reported a world first with photos of both of these models running at Guildford on the same day and I think both gentlemen deserve our congratulations for their pioneering work.

All in all the rally was a very interesting event, well up to the usual excellent standard we have come to expect from this long established club.



Tim Coles' radio controlled gas turbine locomotive impressed onlookers on the raised Guildford track.



Pierre Bender's 7 1/4in. gauge experimental gas turbine locomotive utilises parts from lorry turbochargers.

Anthony Mount

describes the base, flywheel and rocker shaft components for these models of fine Victorian engines.

● Part III continued from page 438
(M.E. 4232, 15 October 2004)

The base (Part 02) of the engine is supplied as a lost wax casting. Set it up bottom outwards in the 4-jaw independent chuck, with packing under the jaws to clear the top flange. Face off the underside as shown in photo 7, skim the inside clean and face off the underside of the top.

Reverse and use the self-centring chuck to grip on the inside of the casting. Face off the top surface and follow by boring out the location hole for the cylinder. Now we need a groove in the top face into which the column will fit. Make up a little trepanning tool in the form of a D-bit. Bring the edge of the tool against the side of the cylinder hole and zero the index dial. Measure the bottom of your column, which should be 58mm diameter. Divide the column diameter (58mm) by 2 to give 29mm, and the cylinder hole diameter (22.5mm) by 2 to give 11.25 millimetres. Subtracting these figures gives us $29 - 11.25 = 17.75$ millimetres.

Move the tool sideways by 17.75mm and feed it into the base to form the groove. Gradually increase the width of the groove until the column pushes in. The outside of the column foot is parallel but the inside tapers so the column will tighten as it goes in. Do not make the inside too tight as it is painted and the groove will need to accommodate the thickness of paint. If it is too tight the paint will be damaged during assembly.

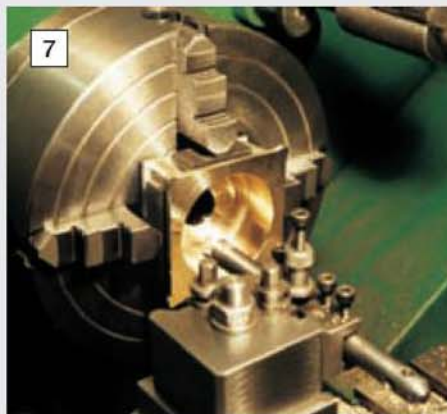
Set up a dividing head on the cross-slide and mount the engine base on the dividing head for drilling the cylinder fixing holes and the base fixing holes (photo 8). The base can be set up for positioning these holes by squaring off the lathe bed. Drill the holes in the corner lugs for the fixing bolts — these are only dummies. The real fixings are holes drilled and tapped in the corners of the base where there is plenty of metal for an M5 (2BA) thread.

The last job on the base is to face off the bracket pads; this can be done on the milling machine with the base held in the milling vice and using an end mill. Drill and tap for the rocker bracket. Coordinates can be used once more to position these holes which are tapped 8BA.

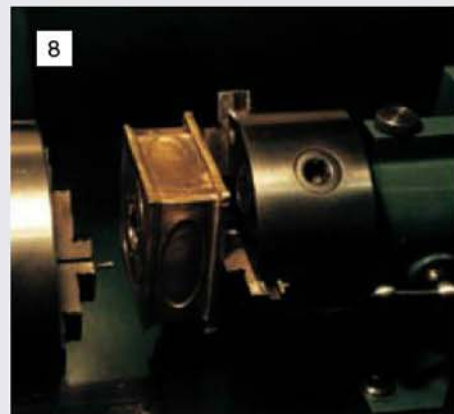
Flywheel - Part 03

The flywheel is supplied as an iron casting which I know most builders prefer for a stationary engine as it is the right colour to match the original. However, be prepared — machining iron is a very dirty job and everything in the vicinity of the lathe will end up covered in fine black dust. I have just finished machining some cast iron, and have spent the last three hours cleaning everything down, including the milling machine, which had not been used and is some three metres away from the lathe!

I am not aware that cast iron dust has a detrimental effect on health, but in these safety conscious days it might be a good idea to wear a



Boring the underside of the base in the 4-jaw chuck. It is a brass investment casting.



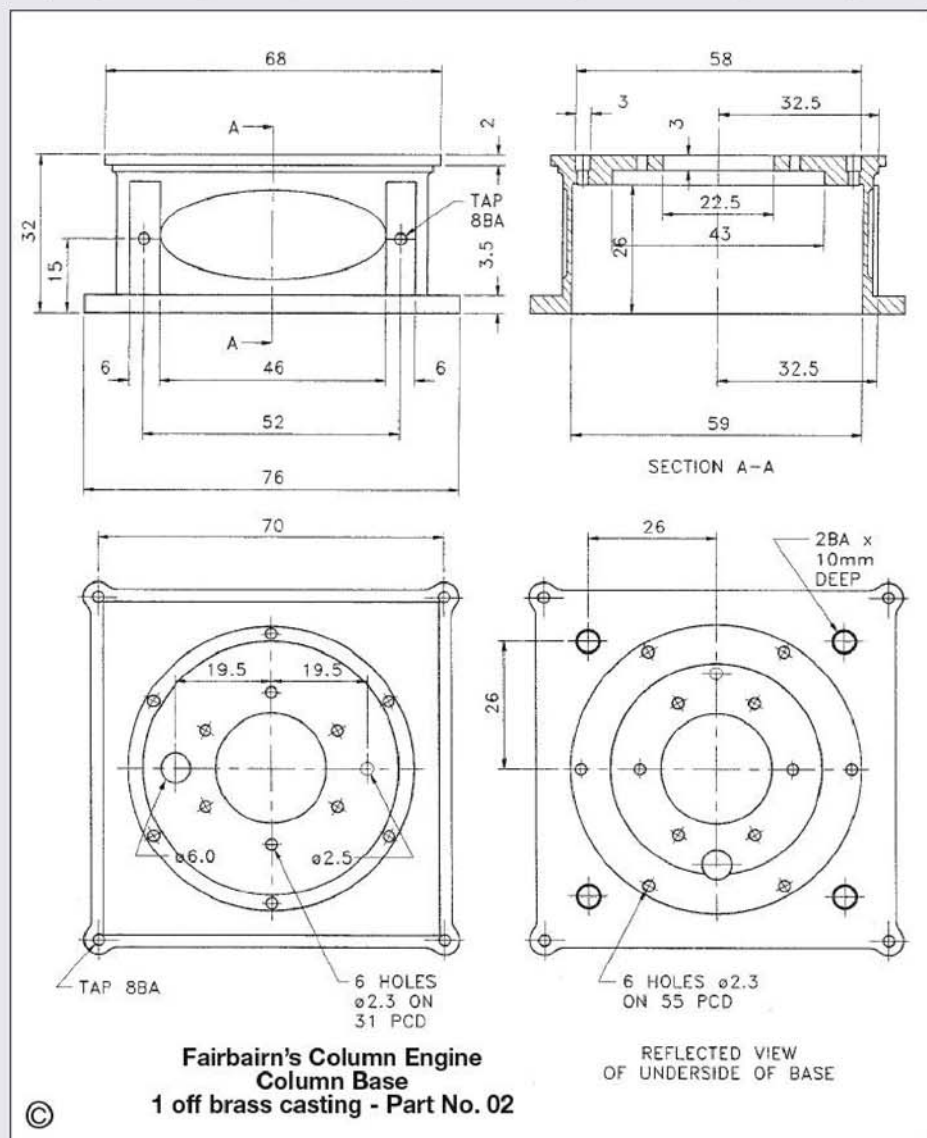
Drilling the cylinder and base fixing holes using the dividing head on the lathe cross-slide.

FAIRBAIRN'S COLUMN ENGINE

mask. A look at the filter afterwards will give some food for thought. After machining cast iron, I have often made a mental note never to work with the stuff again. That said, it is a useful material — where would we be for machine tools without it? One of my friends machines nearly everything, including cast iron, under a copious

flow of 'suds' which immediately washes the swarf away. He has no problems with dust while at the other extreme, I machine nearly everything dry — and do! We all have our little foibles.

At 200mm (8in.) diameter, machining the flywheel is well within the capacity of most model engineer's lathes. A year or so ago I took





The pair of rocker brackets after separation and machining. They are supplied as one casting.



The partially finished rocker strap. It was decided to machine rather than bend this component.

delivery of a 150mm (6in.) centre height Warco BH600 lathe and have therefore been able to grip the flywheel in its 200mm independent chuck for machining. Builders with a 3 1/2in. Myford or similar lathe will need to use a faceplate to get the flywheel into the gap which will accommodate 250mm (10in.) diameter.

Start by removing any flash from the spokes and file them smooth with nicely rounded roots at the boss and rim. Clean up the inside of the rim too. Clamp the flywheel to the faceplate using bolts through plates across the spokes. I prefer to interpose a plywood disc between the casting and faceplate. This gives full support to the flywheel rim while a hole at the centre of the plywood disc will clear the flywheel boss.

Measure the thickness of the wheel and take equal amounts from either side of the wheel to keep the spokes central. Face off the rim, then the edge, bringing the rim to its finished diameter. Chamfer the edge and turn the boss. Centre, drill through and open out the bore to a little under the

finished size. Fit a boring tool and finish the bore to a light push fit on the crankshaft. If you are using bright mild steel for the shaft you will find it is always a little under nominal size. This means that a reamed hole will give a sloppy fit and is one of the causes of flywheel wobble.

I find that boring cast iron to a good fit on a shaft can be quite difficult. Careful work results in what seems to be a good fit and then, after inserting and removing the shaft a few times, the fits suddenly becomes loose. It seems that the fine dust already mentioned remains in the bore tricking one into a false impression of a good fit. It helps to push some pipe cleaners down the bore to remove the dust before trying the shaft in place.

Reverse the flywheel and set it to run true to face off the other side and profile the boss.

If you have the equipment, now is the time to cut a slot for the key. The bore is a little small for the usual type of keyway broach or slotter. I suggest you turn up a tight fitting plug for the bore and drill a hole half in the plug and half in

the flywheel. Knock out the plug and use the half round hole in the bore as a guide to file in a slot.

Rocker bracket - Part 04

The rocker brackets are supplied as nice little round lost wax castings. The pair are supplied as a single casting which needs to be sawn in half to start with. Set up in the milling machine vice to mill off the flat flange face and drill a 2.3mm hole in the centre for the fixing stud. Lay the casting on its side in a drill vice and drill through for the pivot bearing bush. The hole is already centred in the casting. **Photograph 9** shows the completed brackets.

Rocker pivot bearing - Part 05

Two rocker pivot bearings are needed. They can be turned up from brass to a tight push fit in the brackets and reamed for the pivot shaft.

Rocker shaft - Part 06

The rocker shaft is turned from a length of 8mm (5/16in.) diameter mild steel. Part off from the parent bar and machine the ends to bring it to length. Set up the dividing head on the cross-slide and drill and ream a 3mm dia. hole in the centre of the bar. Change to a 4.5mm slot drill and counterbore the end of the hole to a depth which gives a full seating to the arm. If, like mine, your dividing head was bored out on the lathe cross-slide, you are guaranteed that the cross hole will be in the centre of the shaft.

Grip in the 3-jaw chuck and reduce the end to 2.5mm diameter for a length of 6mm, and the adjacent section to 4mm diameter for a short length. Set over the top-slide to 2deg. and turn the taper. The shaft is then reversed to turn the other taper — but how to hold the shaft? Chuck a length of 12mm diameter mild steel bar and drill 2.5mm diameter for 30 millimetres. Counterbore 25mm deep with a 4mm drill, then counterbore again 6mm deep with an 8mm drill.

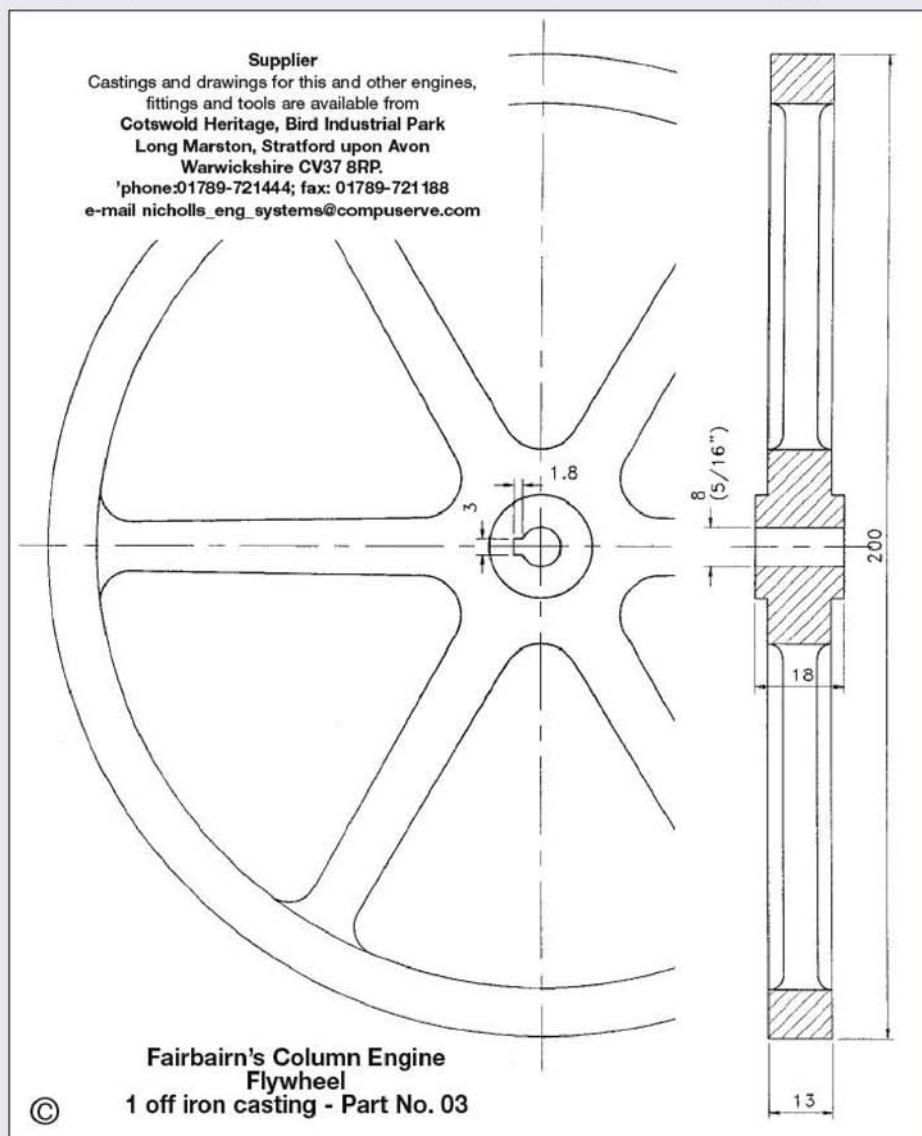
Using a hacksaw, cut down the length of the collet right through the centre. Part off just beyond the end of the saw cut. Then saw down at approximately 90 degrees to the previous saw cut, starting at the bottom where the metal is thickest, but on approaching the top leave a short section of material intact so that the collet does not fall in half.

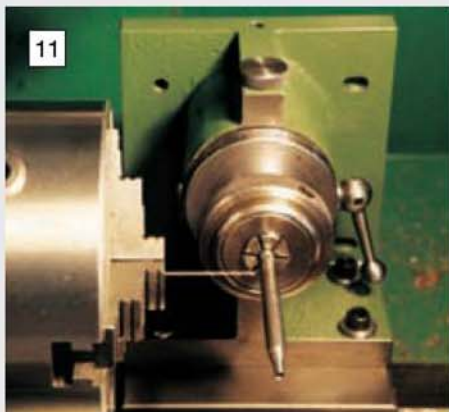
The tapered end of the rocker shaft can be pushed into the collet, the shaft being held on the 2.5, 4 and 8mm diameters. When tightened up in the chuck the saw cuts will allow the collet to close, gripping the rocker shaft. The other end of the shaft can now be turned. However, do take shallow cuts as the rocker shaft is only supported along part of its length within the collet.

Rocker strap - Part 07

The strap to the rocker arm could be bent up from a piece of strip. But, since it is so small, I think you will find it easier to machine it from the solid. It is also easier to make it as if you were making a pair, so start by facing off the ends of a piece of 1/4in. square mild steel to a finished length of 30 millimetres.

Mill equal amounts off either side to bring it to 4mm thickness. Set up in the machine vice on the milling machine and drill a 4mm hole 3.2mm from each end on the centre line through the





Co-ordinate drilling the holes in the rocker arm using a dividing head on the lathe cross-slide.



Rocker shaft and arm. The finished sub-assembly repays the care taken in its machining.

wider face. Join these two holes together with a 4mm slot drill. **Photograph 10** shows the strap at this stage. Turn it through 90deg. and drill the 1.6mm holes, 1.6mm apart at the location of the wedge slots. Enlarge the holes into slots with a 1.6mm slot drill. Square out the corners with a ground down needle file. Round off the ends, saw in half and clean up.

Rocker-eye bearing - Part 08

The bearing for the rocker-eye is just a small brass bush.

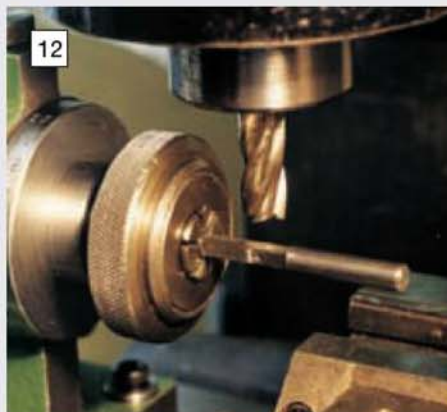
Rocker arm - Part 09

I have been a little devious with the rocker arm in that the end of the arm in the full size engine is formed into an eye which fits over the shaft boss and is held in place with a key. For this model I have increased the shaft boss diameter to that of the eye and furnished the end of the arm with a pin which fits into a hole in the shaft. The appearance of the end result is the same but it is easier for us to make.

Start with a length of 1/4in. dia. mild steel about 30mm overlength. Face off the end and turn down the pin to fit the shaft, then reduce a short length to 4.5mm diameter. Mount the dividing head on the cross-slide, pointing along the slide. Use a collet to hold the shaft material, fit a centre drill in the chuck and feed in until it just touches the end of the shaft. Turn through half the diameter of the centre and zero the dial on the end of the shaft. Feed in 60mm and spot the shaft, change to a 1.4mm drill and drill right through the shaft. Move the cross-slide another 1.6mm (61.6mm in coordinates) and drill another 1.6mm hole. This operation is seen in **photo 11**.

This is the location of the wedge mortise, so change to a 1.6mm slot drill and remove the waste material from between the two holes. Rather than cutting on the side of these fragile slot drills I find a series of plunge cuts, moving the cross-slide only a few thousandths of an inch each time, soon cuts the mortise with a lot less strain on the slot drill and one's nerves.

Change back to a centre drill and reposition



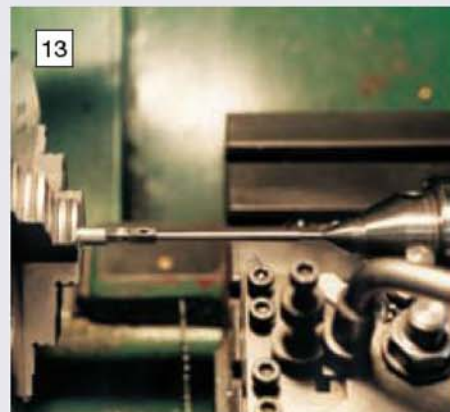
Milling the square on the rocker arm on the vertical milling machine.

the cross-slide to 66.7mm on the feed dial coordinates. Turn the arm through 90deg., spot the hole and drill through 2mm only.

Move the dividing head with the arm to the vertical milling machine and mill the square on the bearing end (**photo 12**), the job being indexed around four times to generate the square.

Chuck the embryo arm in the lathe and centre the end of the pin with a small centre hole. Give tailstock support and, after setting the top-slide over 1deg., turn the taper of the arm in shallow passes. The setup is shown in **photo 13**. Take care as this is a slender shaft and it would be a shame to wreck it after all the work put in so far.

With the taper complete, hold the arm by the

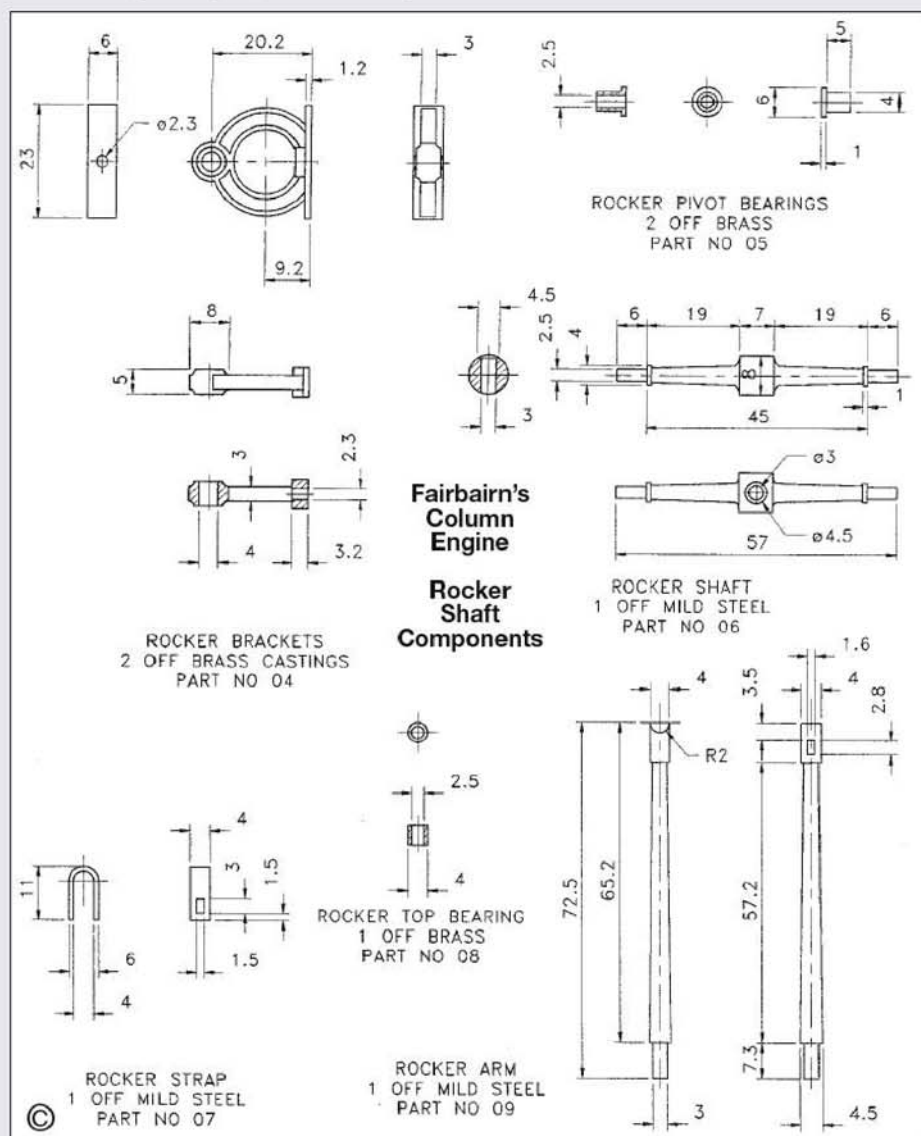


Turning the rocker arm taper. Light cuts are advisable to avoid damage to this delicate part.

square in a drilling vice and open out the 2mm hole to 4mm. As drills can often drill oversize and you do not want to damage the drill vice jaws, use a 3.8mm drill instead of a 4mm one. Remove it from the vice and you will find the end of the arm breaks away easily on the centre line of the hole.

The last job is to square out the corners of the wedge mortise. I have ground down a rectangular needle file for just such jobs. The arm can be fixed to the shaft using Loctite 603 retaining compound; 603 was current when these notes were written, but check, as the types and codes have been known to change in the past. **Photograph 14** shows the completed pivot and arm.

● To be continued.



Neville Evans

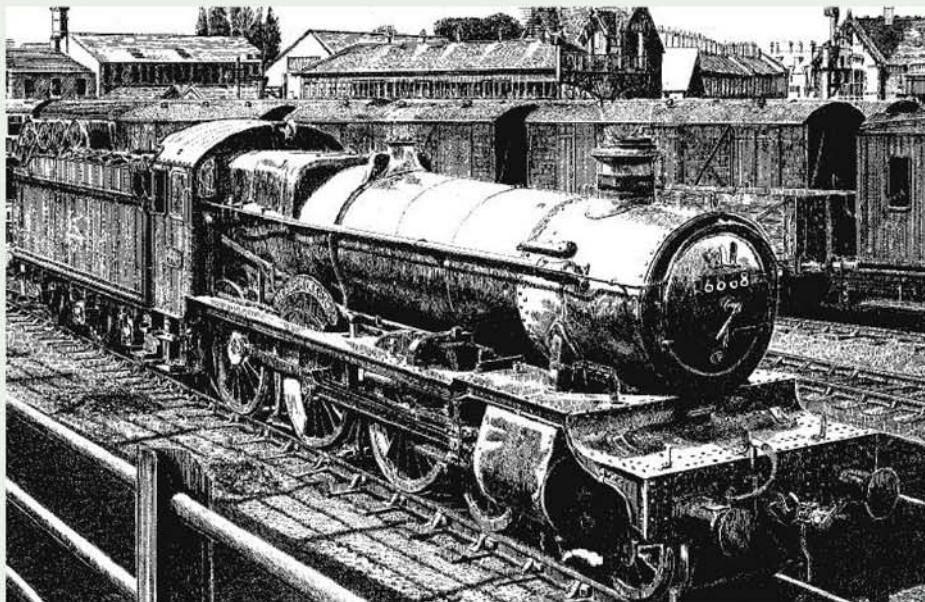
discusses the safety valve and top feed arrangements and the valances and footsteps before introducing a handy rivet head embossing device.

●Part XII continued from page 448
(M.E. 4230, 15 October 2004)

The safety valve assembly is pretty well the same as has been described many times for *Torquay Manor*, *Swindon* and *President*. My version however has been redesigned internally by my friend Gordon Smith for maximum efficiency and incorporates in-line clack valves, with banjo fittings in the valve bush to improve accessibility and ease of construction. I am firmly of the belief that it's better to make half a dozen small, easy things, than one big, complex thing that can lead to the loss of days of work if you make a cock-up at the last moment. It's all pretty simple, but please follow Gordon's carefully calculated dimensions in the all-important shroud and ball parts of the valve. The springs are Ref. LC-029B-14-SS, free length 1.25in. 1.0625in. long, set at 90psi. and are available from the usual purveyors of small locomotive goodies.

I was tempted to try a supposed improvement, by incorporating a sliding guide underneath the spring. The idea was that it would prevent any waywardness on the part of the ball valve as it seemed to me to be stuck on the end of a rather long stalk. I am assured though by Gordon, that he has tried it and has found that the flow of steam around the ball is enough to keep it held above the hole in the approved manner.

The banjo bolts can with advantage be made from stainless steel. I find it convenient as well as cheap to machine down largish stainless steel bolts. These give good quality, free cutting stainless at budget prices. What I do is to centre the offending bolt by holding it by the shank in the tailstock chuck and tightening the lathe jaws firmly on the hexagon head. Release the tailstock chuck. Machine down to size, drill the centre



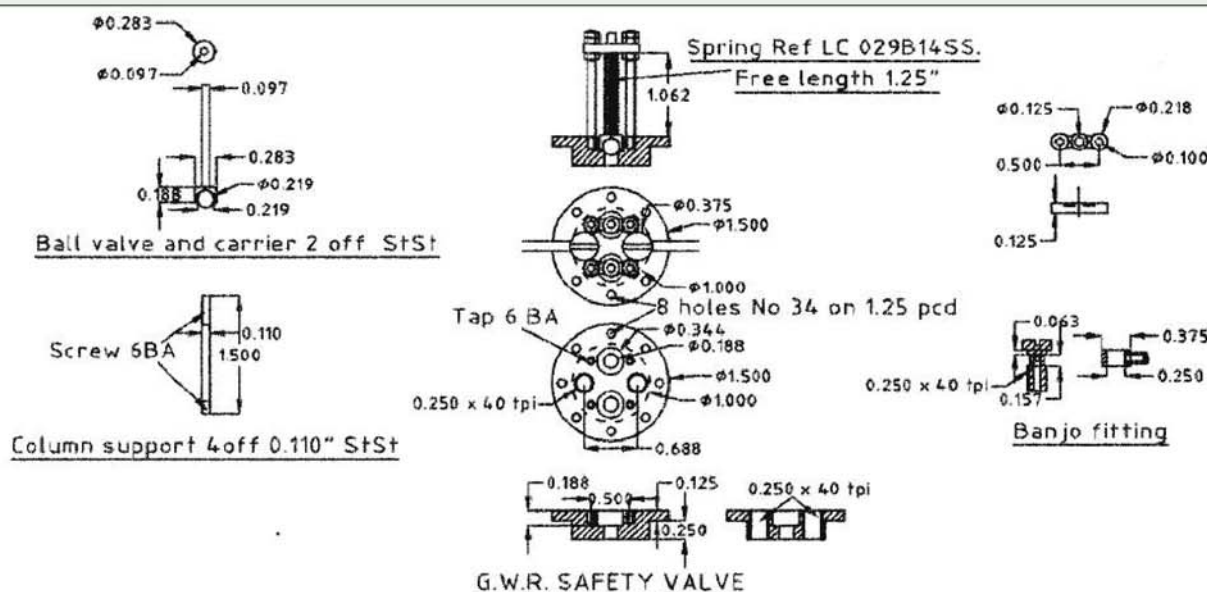
PENRHOS GRANGE

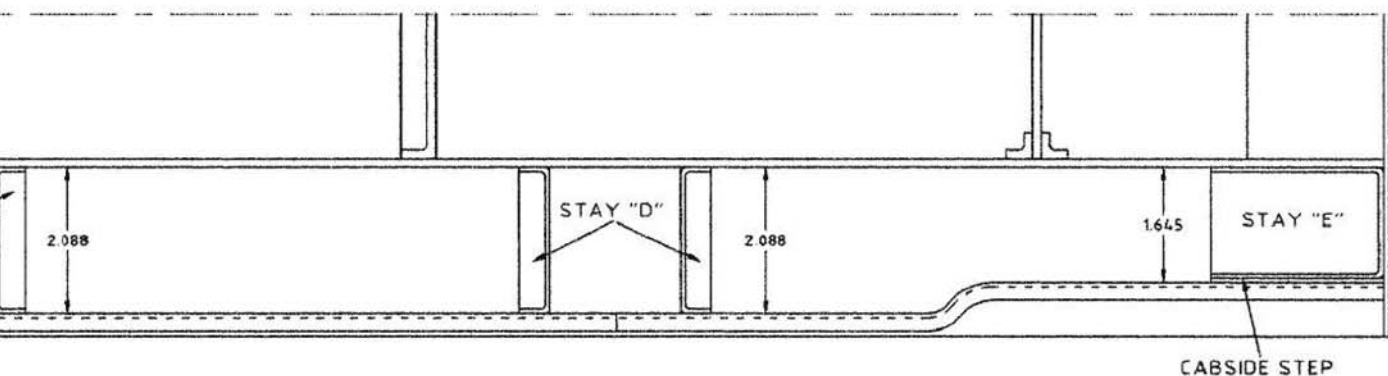
hole, and machine out the waisted part of the bolt if desired. I then screwcut the shank to whatever size and finish by running up the appropriate die in a tailstock die holder. I reverse in the main chuck, and machine off the head to suit. Note that on these particular fittings it is necessary to use a round banjo bolt head with a screwdriver slot, for reasons of limited clearance. Banjo fittings are so useful, that I've drawn three types. They all have their uses, just pick whichever seems to be the most appropriate.

I've spent some time trying to miniaturise a clack valve so that it will fit into said banjo bolt with the obvious advantages of accessibility and interchangeability, but so far all I've done is to convince myself that a $\frac{3}{8}$ in. diameter bolt represents the lower limit of size. The problem is that the minimum injector delivery pipe size for 5in. gauge is $\frac{5}{32}$ in. diameter, which means a hole of about $\frac{3}{32}$ in. to give reasonably free passage of water. I'm still working on it however, and haven't yet given it up for lost. Meanwhile I am specifying in-line clacks which will be hidden behind the valances.

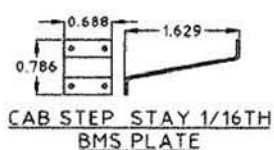
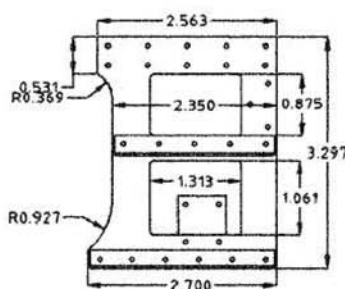
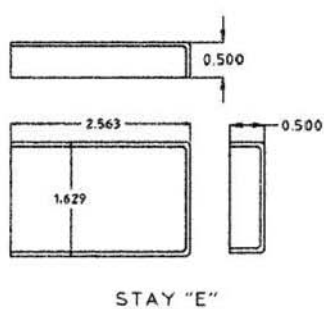
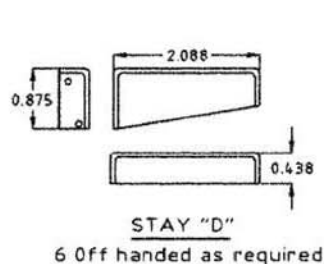
Valances and steps

The valances shown in the large drawing are quite close to scale and can be milled down from $\frac{1}{2} \times \frac{1}{2}$ in. brass angle which is a standard section and is obtainable from our advertisers. Polly Models (phone: 0115-973-6700) are willing to mill down this section to the required size for those who don't have the necessary facilities. The actual size as fitted to many GWR locos is 6 x 3in. which scales out at 0.531 x 0.265 inch. I don't think however that anyone will notice if we use $\frac{1}{2} \times \frac{1}{4}$ in. and a coat or two of paint. Note that the angles are held onto the running boards by means of a row of round headed $\frac{5}{8}$ in. bolts. The heads themselves are just over 1in. diameter or close to 0.100in. to scale, which presents the problem of size. I suggest that a $\frac{1}{16}$ in. brass rivet is as close as you can get, unless you make your own. It is possible to screw a $\frac{1}{16}$ in. rivet shank 10BA. There are quite a few techniques that will work including holding it in the hand with a clamp and hoping for the best. I have tried an arrangement similar to that for machining banjo bolts, except that the rivet head is held in a split collet of the

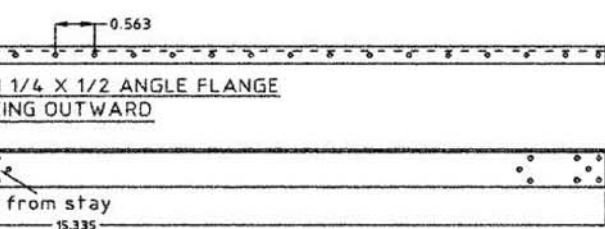




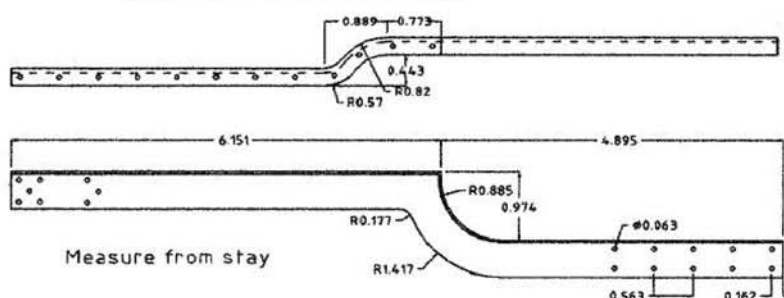
RE 1/16th" dia EXCEPT
HERE SHOWN



CAB STEPS 1/16TH BMS PLATE



AND VALANCE SHOWING
FITTING BOLT DETAILS



Practical rivet embosser

A few days ago I picked up the tool shown in the accompanying photographs from my friend Mark. It represents the culmination of several years of development by Mark to attain the ultimate rivet embosser. There are obviously many other uses that the tool can be put to, such as metal punch, which I can leave to your imagination and ingenuity. I know that Keith Wilson doesn't like the idea of embossed rivets as he believes that

they can't reproduce the original accurately enough, however, with a little judicious emerying and a coat of paint you can modify the appearance to almost anything you like. The enormous advantage of speed (on a long run, I can easily put in a rivet per second), coupled with the fact that it is the only real way of reproducing scale rivet heads in 5in. gauge, certainly tip the balance as far as I'm concerned. Bear in mind that a 1/16in. diameter rivet head would have a shank of less

than 1/32in. and in 1in. scale represents approximately a 3/4in. diameter rivet head in full size. A rivet of this size, is to my mind a bit too small for comfort. For ease of operation the press can hardly be beaten. Push your material against the fence, put in the first rivet, slide along until the rivet pops off the edge of the anvil and *ditto* *repeato* to the end of the row.

The tool is based around an Axminster No.1 arbor press, Cat. No AP1. which can be bought



These photographs show the construction of a practical rivet embossing device based on an Axminster No. 1 arbor press.

1: Complete machine.

2: Return spring.

3: Fence, anvil and spike.

4: Spike, anvil, stainless steel bolt and jigs.

delivered for about £30. There are cheaper alternatives to be found for £17 or so. I bought one — it was junk, and was taken back to the shop. It appears that the larger and more colourful the adverts, the shoddier the products they offer. The photographs show the basic set-up that Mark has perfected, which is made from standard 10mm and 8mm steel sections screwed rigidly to the base. A point to note is that the embossing tool, which takes the form of a spike, is first fitted into the head and then brought down onto the steel base to mark the position for the anvil hole. The anvil is made from a 1/4in. BSF or some such stainless steel

bolt, and machined as per the photos. You will note that there is included with the detail of spike and anvil, the simple jig that holds the anvils for ease and accuracy of manufacture. The diameter of the anvil determines the spacing of the rivet heads. Obviously a 1/2in. diameter anvil will set your rivet heads 1/4in. apart. The adjustable fence, which determines the distance of the rivets from the edge of the metal, slides into two holes drilled in the vertical column of the machine, which will give just over 3in. of movement. The anvil is lightly centred with the tip of a Sloccombe centre drill. The spike is made from silver-steel, the tip being slightly rounded when it is then

flame hardened. The depth of the centre drill indentation in the anvil determines the size of the rivet. For larger rivet heads the recess is made larger, and the spike has a slightly larger diameter point. It's as easy as that.

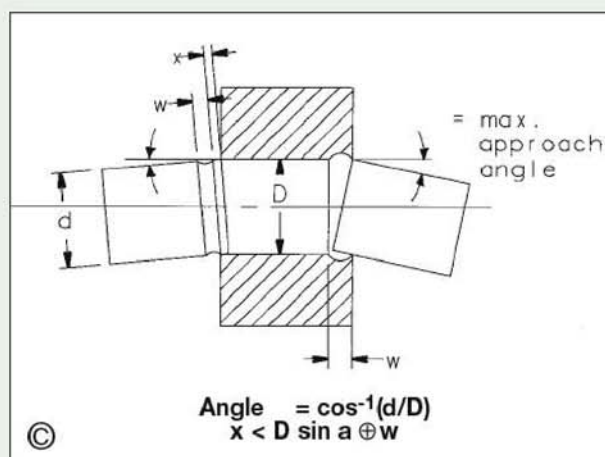
Mark has further modified the tool to spring load the plunger so that it is self returning. For smoothness of operation he also fits a brass plate behind the two adjusting screws, which can be seen protruding from the face of the machine. The screw can be adjusted to minimise sideplay in the arbor and the brass plate acts as a bearing surface to increase sensitivity and to reduce wear.

●To be continued.

SHAFT/HOLE ASSEMBLY TIP

Mike Jasper
in New Zealand explains
a neat solution to a
troublesome problem.

When attempting to fit a shaft in a component with a clearance hole, jamming will often take place. The accompanying diagram shows the problem, which occurs when the shaft enters the hole at an angle. A shallow, semi-circular groove at the entrance to the hole, or one near to the end of the shaft, prevents jamming and acts as a guide to assist further entry. The easier of the two options is to



machine a single groove on the shaft. The groove curvature should be tangential to the axis of the mating part.

This idea was developed by an Asian student at the Mechanical Engineering Department of the University of Canterbury to aid robotic assembly. It was patented but this has now expired.

The method works very well. Commercial users of this idea are requested to assess the value to their businesses and make a suitable donation to an Asian charity of their choice. The concept also works well with transition and interference fits. Just machine the diameter of length 'x' to provide clearance in the hole.



FOR YOUR BOOKSHELF

SCALE MODEL TRACTION ENGINE DESIGN AND CONSTRUCTION

The model traction engine has been an enduring favourite of model engineers almost since the hobby first came to prominence in the early years of the last century. Even so, it has never quite achieved the popularity of the railway locomotive as a choice of prototype, as a glance through various model trade catalogues will confirm. Perhaps for this reason the number of column inches in the model engineering press devoted to this class of vehicle is much less than the railway locomotive and the number of books published on the steam driven road vehicle is also proportionally less.

True, in recent years we have seen some excellent books published on full size 'road steam' practice following on from the lead set by W. J. Hughes, R. H. Clark and John Haining. Some books on building model steam road vehicles have also appeared over the years, most notably W. J. Hughes' book on building the 1 1/2 in. to the foot Allchin, that by L. C. Mason on building the 1 in. to the foot Minnie and the popular books by John Haining. However, a comprehensive work reflecting the current taste for larger scale traction engines, modern techniques and materials has been long overdue and the volume presently under review meets this need admirably.

This is certainly a beautiful book. It is large (225 x 285mm) and heavy (248 pages) printed on good quality paper with 590 illustrations (some in full colour) and includes a selection of prints by Geoffrey Wheeler. However, the name of the author may not be familiar to all potential readers. It is only when we read the enthusiastic forward penned by Mike Chrisp, Editor of *Model Engineer*, that we learn that Edward George is the real name of the well known contributor to these pages, Martin Wallis. Writing under his pseudonym, Edward George has for some years delighted readers with his *Road Steam* column in these pages. Many *Little Samson* steam tractors are being built and it is Edward's proud boast that more will soon be running around than were built by Savages themselves! Presently, and in close collaboration with Stan Nipper, he is describing the Savage *Universal Carrier*. From the notes printed on the flap of the dust jacket we learn that Edward has built a number of model steam engines of various types and is also a teacher of metalwork (or its modern equivalent) so is well placed to write a book of this nature.

The book is divided into twelve chapters. The first three of these cover the choice of model, the boiler, the hornplates and shafts. Chapters four, five and six deal with the front end of the engine, the gears and wheels. Chapters seven, eight and nine are on the back tank and its fittings, the brakes, gear selectors and steering and the cylinder. The final three chapters relate to the motion, the boiler fittings, ash pan and grate and how to complete your model. A further section deals with the important topic of smokebox cuisine and gives other useful information. A comprehensive index is included.

SCALE MODEL TRACTION ENGINE DESIGN AND CONSTRUCTION



EDWARD GEORGE

Each chapter is illustrated with many black and white photographs and, where appropriate, *Little Samson* drawings specially prepared for publication by Stan Nipper. However, this is far more than a reprint of the *Little Samson* articles. The author has expanded the text considerably to cover model road steam vehicle building in general and has drawn on his own considerable experience as well as that of other established builders of his acquaintance. The result is a valuable guide to this aspect of the model engineer's craft.

Some authors express surprise when I, as a reviewer, tell them that I actually read their books before writing my review. It is the only way I know of forming an opinion about a particular work. I can assure readers that reading this informative and well-presented book was no hardship. If you are interested in 'road steam' then try to get someone to buy it for you for Christmas. If no one will buy it for you then buy it as a present for yourself. Highly recommended!

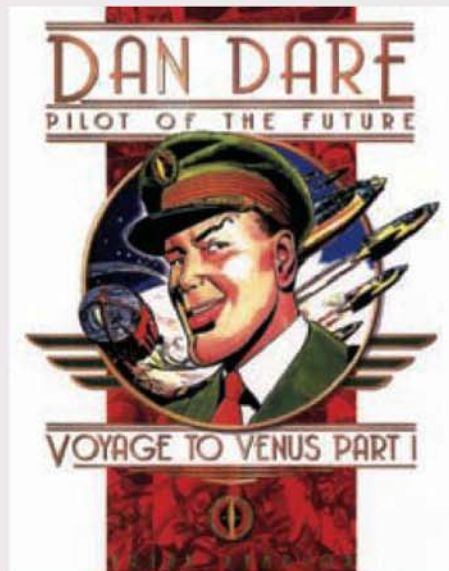
Scale Model Traction Engine Design and Construction (ISBN 0 9548393 0 7) by Edward George is published by *Little Samson Models*, 38 Wheatshaf Way, Linton, Cambridge, CB1 6XD from whom it is available for £29.95 plus £3 postage and packing (UK). Further details of this book and postage costs outside the UK can be found on the *Little Samson Models* website: www.littlesamson.co.uk

Neil Read.

DAN DARE PILOT OF THE FUTURE VOYAGE TO VENUS PART 1

Anyone who grew up in the 1950s will fondly remember such childhood pleasures as Meccano and Dinky Toys. Great for playing with as far as they went, but what could really fire playtime imagination? Cue the *Eagle* comic with its cover star Dan Dare - Pilot of the Future. Youngsters just went overboard for this bold new mix of futuristic fantasy that had adventure by the bucket-load together with elements of humour and fun. But how did it all come about?

The *Eagle* was first launched in Britain 14 April, 1950 and was edited by the Rev'd Marcus Morris who had designed it from the outset to have a high moral stance. This was in direct response to the amount of American horror comics which were, at this time, grabbing a large share of the comic market. Dan Dare himself was



closely modelled on the archetypal British war hero as he neither swore nor drank, always told the truth, and would only fire his weapon in self-defence. An acquaintance of Rev'd Morris, Frank Hampson was actually responsible for the Dan Dare strip and he used some of the technological and scientific advances of the late 1940s to add an air of authenticity to his stories. Indeed, the famous science fiction author, Arthur C. Clarke, was used as a scientific adviser in the early days. Published by the Hulton Press, those responsible for *Picture Post*, the comic proved an immediate success and went on to be published until 1969 when it was unfortunately merged with the *Lion*.

As well as his success in comic form, Dan Dare also starred in a radio show on Radio Luxembourg which was sponsored by the malted bedtime drink Horlicks. The cast of this show featured some well-known actors including Ralph Richardson, Kenneth Williams and, voicing Dan himself, Noel Johnson (the original Dick Barton, Special Agent). Together with a mountain of spin-off products like wristwatches, puzzles, ray guns, spaceships, board games and wall paper (who says *Star Wars* kicked off merchandise overload?) Dan Dare was guaranteed to enter the nation's psyche where he remains to this day, also thanks to a recent CGI animated series shown on television!

Titan's new book contains a total of 40 Dan Dare episodes covering the period April 1950 to January 1951. Each instalment is reproduced in full colour over two pages just as per original. Reading through will reintroduce many familiar characters such as Digby, Sir Hubert, Professor Peabody ("sufferin' cats, a woman!") and The Mekon, Dan's arch-Nemesis. As well as the strips, the book contains an introduction to the characters, plus the background story of Dan Dare and a useful story checklist from the *Eagle's* 1950-69 original run. Those still wanting at the end of this 96 page volume, need not panic for a second volume is planned continuing his *Voyage to Venus* story.

For all readers of 60 years plus, this book will bring back many memories. Even those who are too young to remember the original *Eagle* comic from the early 1950s, like myself, will still find it fascinating. Highly recommended. *Dan Dare Pilot of the Future - Voyage to Venus Part 1* by Frank Hampson, ISBN 1-84023-644-2, costs £12.99 and is published by *Titan Books*, 144 Southwark Street, London SE1 0UP; tel: 020-7803-1819.

Kelvin Barber.

SAVAGE'S UNIVERSAL CARRIER



A worm's-eye view of the front axle and steering assembly of John Thompson's model of the Universal Carrier. (Photos 26-27: John Thompson)



A front axle, the beam being machined from the solid. Note the pads left at the ends to receive the king pin brackets.

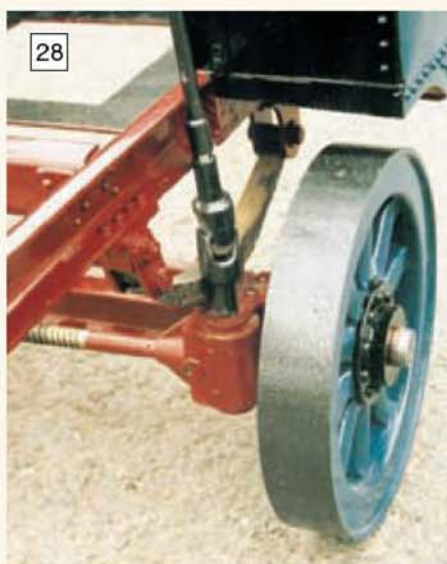
Stan Nipper and Martin Wallis describe the front axle and steering.

●Part IV continued from page 453
(M.E. 4232, 15 October 2004)

A few words describing the front axle and steering arrangement of the Savage Universal Carrier would probably be helpful. At first glance it may appear complex, but a few moments' study of the arrangement drawing and it will be quite straightforward. Photograph 26 was taken with John's wagon leaning against a wall. It is thus an underneath view and illustrates the assembly nicely.

Savages designed the front axle and steering as a self-contained unit which is bolted to the front leaf springs with U-bolts. The steering wheel is connected to the steering gear box by a shaft which has both a universal joint and a telescopic joint allowing the front axle to move about freely while the steering wheel remained fixed in the driver's hands.

A pair of bevels in the steering box transfers the vertical axis rotation of the steering wheel shaft into the horizontal rotation of the steering leadscrew which runs across the wagon behind the front axle (photo 28). Dust covers were provided for both the steering box and the leadscrew and nut. The steering box and drag link are positioned behind the axle, and the tie



The steering box attached to the right side of the front axle. (Photo: Martin Wallis)

rod which connects the two wheels is placed ahead. In the Savage catalogue the description was: "The steering is effected by a screw and nut, so arranged that all steering strains are confined to the gear itself." While there were several variations of leaf spring and front wheel the steering gear seems unchanged in all their wagons.

Front axle

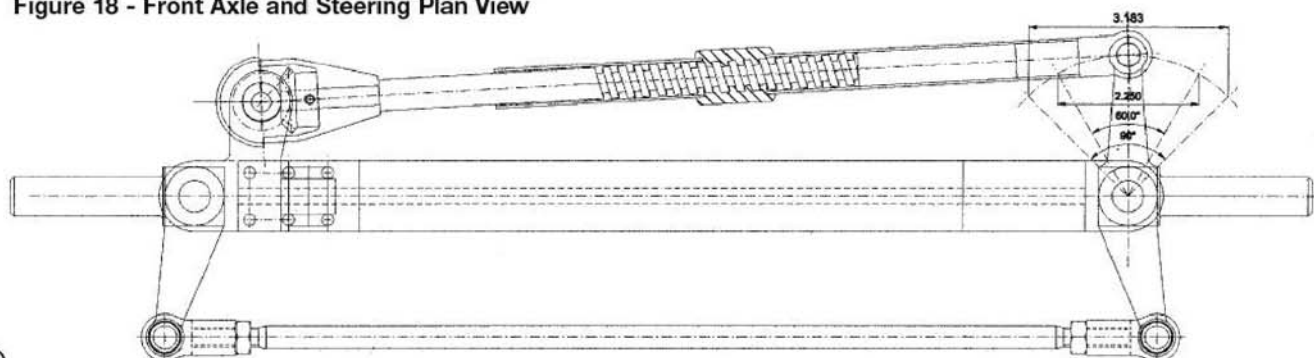
On the prototype, the front axle was a hot rolled steel I-beam, a size which, once scaled down, will certainly not be available to the model engineer. There are two alternatives, first to cut the front axle from the solid, and secondly to fabricate it.

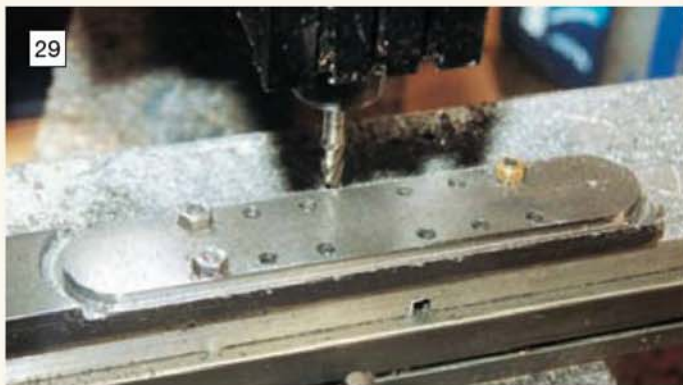
To cut the axle from the solid, ideally a piece of steel bar of 1.125 x 1.5in section is needed but 30 x 40mm may be easier to obtain. 30 x 40mm translates to 1.181 x 1.574in. which is entirely satisfactory dimensionally. An alternative, which avoids quite a bit of machining, is to join two pieces of channel back to back. Happily the channel for the chassis will suit so two 13.5in. lengths of it will do fine. After joining, the welds must be dressed back and filler used as required to get a smooth finish. Using two pieces of channel will mean the central piece of the 'I' will be too thick for scale but, as the stub axles will hide it, this is acceptable.

It is important that the top and bottom faces of the front axle are parallel and ideally they should be machined. Any misalignment of the two faces will be passed to the top and bottom kingpin brackets and the kingpin will not assemble as it should. With alignment in mind, some builders may prefer to drill and ream the king pin holes with the brackets in place on the front axle.

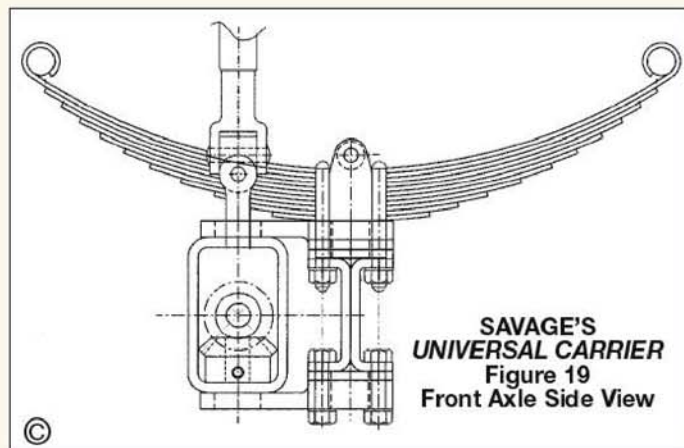
The inside faces of the front axle need to be flat as the fastenings for the king pin brackets fit against them. Sharp-eyed readers will notice in photo 26 that John has angled these faces for the

SAVAGE'S UNIVERSAL CARRIER
Figure 18 - Front Axle and Steering Plan View





29
The left-hand kingpin brackets being machined as a pair on a CNC milling machine. (Photos 29-34: Stan Nipper)



majority of the front axle, which is prototypical for rolled 'I' section, but has left the end portions parallel for the fixings to register on.

King pin brackets

All the surviving wagon pictures illustrate the steering on the right hand side and in consequence this end of the axle is fitted with kingpin brackets

with an extra lug to hold the steering box. Cast iron is not strong enough for the kingpin brackets, as not only do they take the weight of the vehicle but also any shocks and knocks from uneven road surfaces.

Some thought was given to supplying malleable iron castings for the king pin brackets, but with the high cost of the material and the relative ease with

which the components may be cut from stock bar sections, patterns were not made.

Machining the brackets from 1/2in. thick bar or plate should not take too long. The 1/2in. and 5/8in. holes should be reamed and builders may, as mentioned, drill and ream the holes with the brackets *in situ* on the front axle. Alternatively, they may be completed first and with the king



30
The right hand kingpin brackets have lugs to receive the steering gearbox.



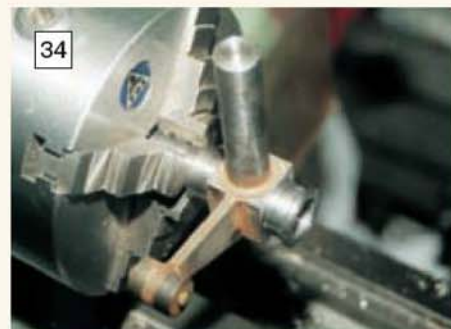
31
The completed right hand bracket and the remains of the stock from which it was cut.



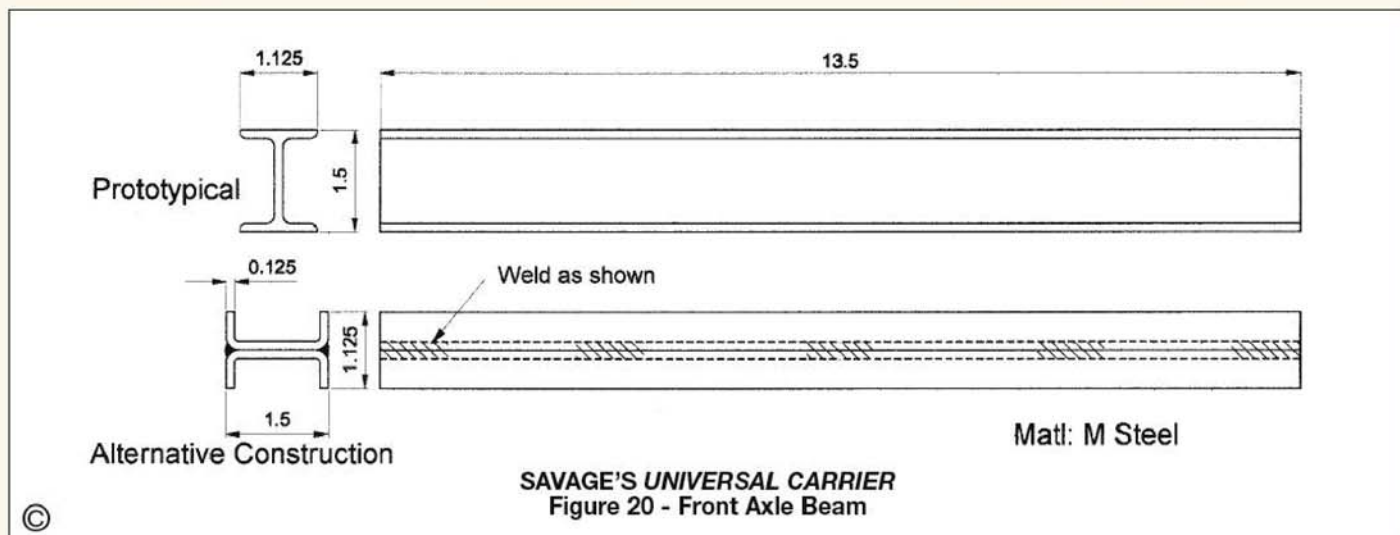
32
Stub axles being fabricated in steel. The colour is from the pickle bath.



33
Reaming the kingpin hole in the stub axles after silver-soldering.



34
A good finish is required on the top flange which takes the weight of the wagon.





The pair of fabricated stub axles for Stan Nipper's wagon. Parts were located with 3mm dia. pins prior to silver-soldering. (Photo: Stan Nipper)



John used the spheroidal graphite iron castings available, using a tipped tool to get under the skin. (Photos 36-38: John Thompson)



Shown here, the king pin hole has been bored and the boss machined.

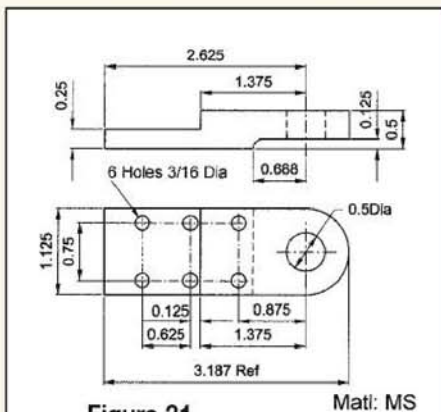


Figure 21
Left Hand Upper



This right-hand cast stub axle now only needs the track rod hole to be drilled and reamed.

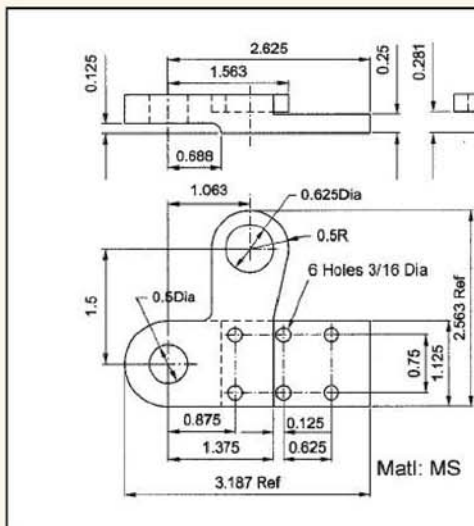


Figure 22
Right Hand Upper

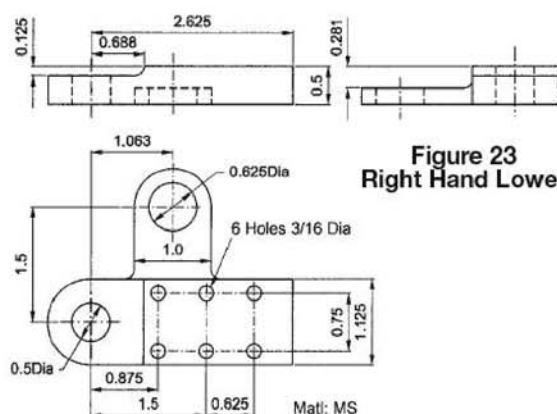


Figure 23
Right Hand Lower

SAVAGE'S UNIVERSAL CARRIER Figures 21-24 King Pin Brackets

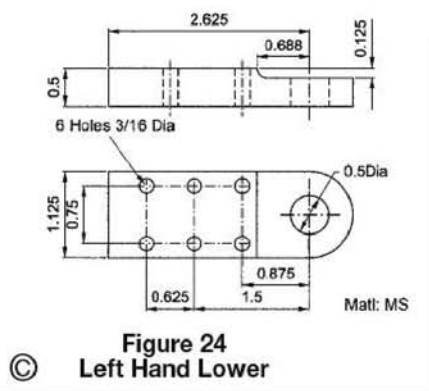


Figure 24
Left Hand Lower

pin and gear box (or a piece of $\frac{5}{8}$ in. dia. ground bar) in their respective holes, the assembly may be offered up to the front axle and the six securing bolts spotted through.

Each bracket is fixed to the front axle by six fixings, the bottom pair by bolts and nuts, and the top one by a pair of nuts and the U-bolts which go over the springs. The U-bolts and fixings might, by choice, be made from high tensile steel.

The king pins should be a close fit in the brackets. A decent grade of steel such as EN8 is suitable, or alternatively if a hardened pin is desired, silver-steel hardened and tempered will be fine. To prevent the pin turning in the brackets Savages added a small key but some builders may prefer the quicker option of a small taper pin. The top of each kingpin is drilled for an oil reservoir and a $\frac{1}{16}$ in. hole delivers the oil to the bearings. As per the prototype, a spiral oil groove is detailed. These may be applied with a file or screw cut in the lathe.

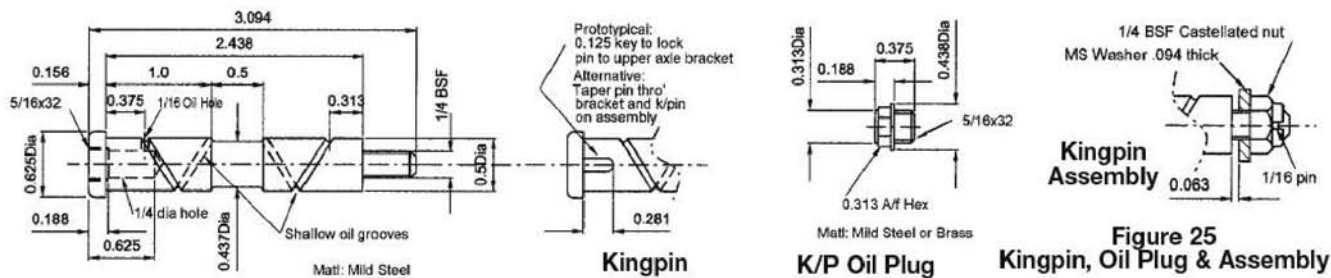
When making the kingpins, make sure that when the $\frac{1}{4}$ in. BSF nut is pulled up tight, it is only the bottom bracket which is gripped. The upper and lower brackets should not be pulled together as this will cause binding on the stub axle. A castellated nut and $\frac{1}{16}$ in. split pin will complete the job.

Stub axles

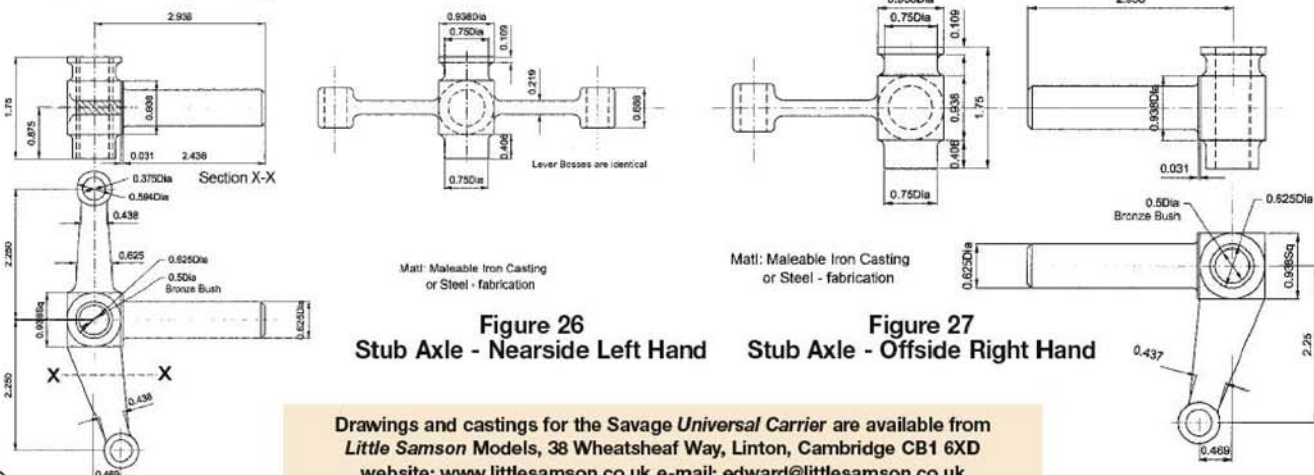
The stub axles may either be fabricated from steel or machined from malleable iron castings. I believe the illustrations are self-explanatory. Despite the colour of photo 32, Stan's stub axles are in steel, the copper colouration is from the pickle bath.

The top to bottom dimension of each stub axle should be made to correspond to the gap between the king pin brackets. If the stub axles are steel fabrications it is important to make some thin bronze thrust washers to separate the two steel surfaces, and while the bar is in the chuck it probably wise to part off a spare pair as well. Remember the 0.938in. diameter, which gives the larger surface area, is uppermost, so be careful not to machine it on the wrong side of the casting.

Where the 0.625in. diameter stub axle for the front wheel meets the 0.938in. square block, a small radius is detailed on the drawing. This is important for if left sharp a 'stress raiser' results and in due course a small crack may be induced



SAVAGE'S UNIVERSAL CARRIER
Figures 25-27 - Kingpin and Stub Axles



Drawings and castings for the Savage Universal Carrier are available from
Little Samson Models, 38 Wheatsheaf Way, Linton, Cambridge CB1 6XD
website: www.littlesamson.co.uk e-mail: edward@littlesamson.co.uk

which could grow and eventual failure may occur. A minimum radius of $\frac{1}{16}$ in. is recommended, easily checked by laying a $\frac{1}{8}$ in. dia. drill in the corner and holding it up to the light.

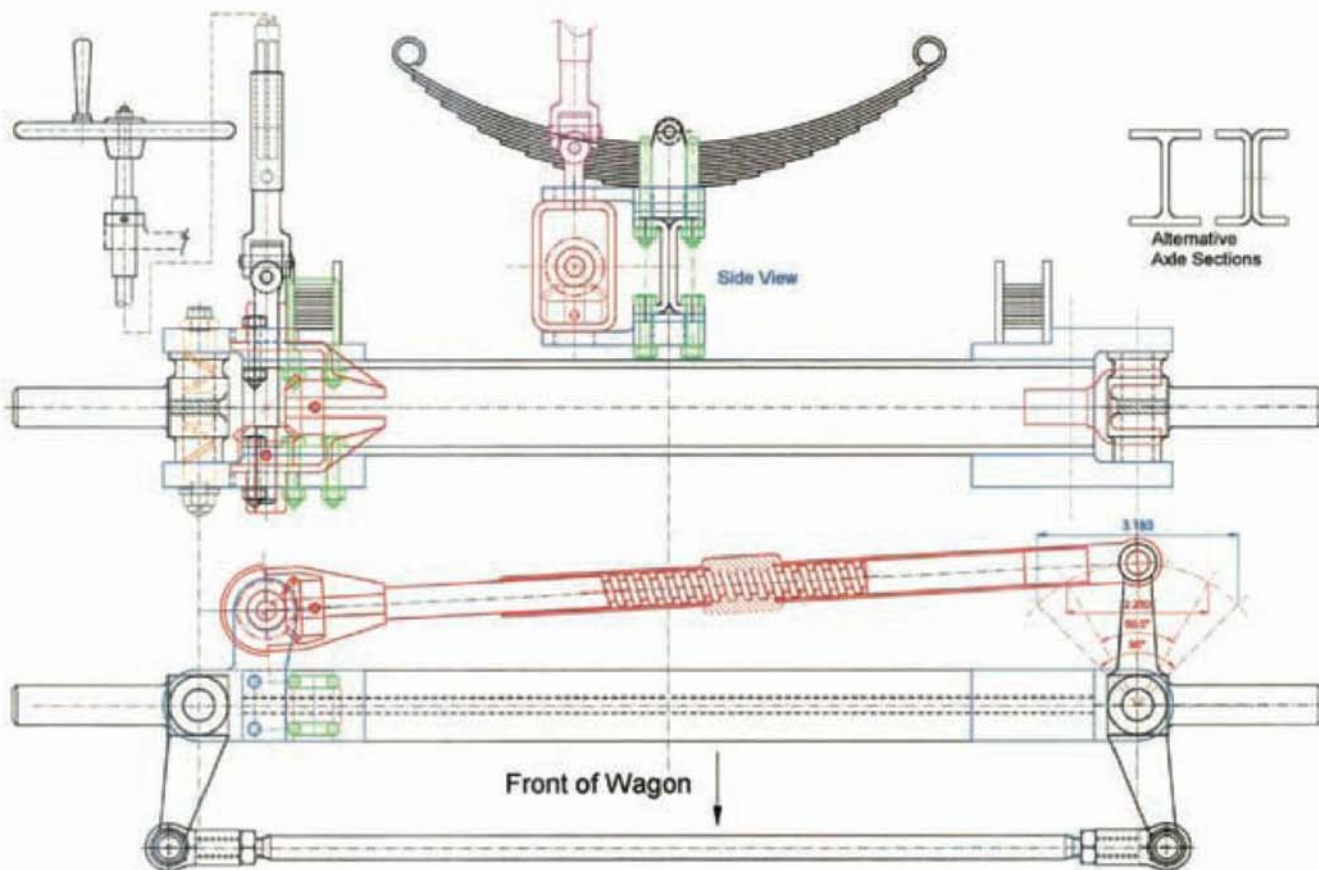
To drill the holes for the drag link and track

rod ends, the stub axles may be fixed to the milling machine table with a bolt through the king pin drilling. The faced off end will then register on the table and the holes may be drilled in the knowledge that they will be parallel to the

kingpin drilling.

The steering box, drag link and track rod complete the steering assembly and these will be described next time.

●To be continued.



SAVAGE'S UNIVERSAL CARRIER - Figures 28 - Steering and Front Axle Layout



'Her Ladyship' in finery normally reserved for less public outings, won first prize at a Yorkshire show when she rode in on the M.Y. Coventry Tricycle ...



... while our intrepid Author, as a novice riding the M.Y. Otto di-cycle into the grass ring was only Highly Commended for his efforts!

M.Y. OTTO DI-CYCLE

Malcolm Young concludes his account with some experiences, a parting tale and grateful acknowledgements.

●Part III continued from page 441
(M.E. 4232, 15 October 2004)

Will it work? This is a short simple question to which I do not have a straight answer and at this point have to confess to economy with the truth in the opening sentence of this series (M.E. 4230, 17 September 2004). Perhaps I was trying to avoid admitting the fact that I constructed a few of the simplest cycles of all, some uni-cycles. Having made one, I set about learning to ride it which, on the wrong side of 60, perhaps was not a wise move. No, I did not master it, but after six months practice and many bumps and bruises, I could cover about 200 yards. At that point, I decided discretion was the better part of valour and retired to admire those who have become proficient in the art. This may seem a strange confession, however, without the uni-cycle experience, I don't think I would have considered the di-cycle a manageable machine. While in no way suggesting that di-cycling requires the dexterity of uni-cycling, maintaining balance at 90deg. to that which becomes second nature to the conventional cyclist, requires some practice. No doubt, the learning curve is much shallower with the advancing years of the student. To date, my experiences are as follows:

In order to mount the saddle, a set routine is required. First the machine is moved to a position where the cranks are near enough to horizontal. The rider then backs up to the saddle and places the respective foot on the leading pedal. At this

point, the seat tends to push under the rider, then the wheels are grasped at chest height. In one smooth movement, the saddle is mounted by standing on the forward pedal while the hands lift the body weight and hold the wheels stationary.

Balancing while stationary, with the hands on the wheels, is quite easy.

Maintaining balance while holding the handles is somewhat more difficult but, with the pedals at mid-stroke, there is no real problem. Tipping back onto the tail-wheel is a little unnerving at first. Unbalancing in the forward direction, while quite safe, as the rider simply steps off, is the most frustrating as the 'mount-up' sequence has to be repeated.

The real 'hairy' nature of the beast is revealed when forward movement is attempted. As the pedals approach the top and bottom positions, the rider no longer has the same degree of control and has to literally 'float' on the saddle until the cranks attain a more favourable angle.

Forward movement then adds to the equation such variables as undulations and gradients, not to mention the change in dynamics when a brake is applied to control direction.

I will not elaborate, other than to say I believe it does work; how well it works depends on the skill of the rider.

Parting tale

I shall reluctantly comment on the outcome of the first 'official' appearance of M.Y. Otto. A large annual Classic Car event is held in the grounds of a north Yorkshire stately home and features a Period Costume event. The previous year (2002), I plucked up enough courage to enter, and rode into the ring on M.Y. Macmillan bicycle dressed in my 'Brunel' outfit. I was chuffed to be awarded second prize.

With this experience under my belt, I persuaded

Ruby to don her Victorian outfit, usually reserved for much less prominent locations, and we entered — so I thought — as a couple. As a novice, riding the Otto into the grass covered ring was a real effort. 'Her Ladyship' rode in sedately on M.Y. Coventry Tricycle.

The result, her ladyship won first prize, I was highly commended but got nowt. For the real icing on the cake, my benefactor Mr. Piper, wearing straw-hat, spats and smoking a cigarette in a holder, drove his 1920s Humber car into the ring and was awarded third prize.

Acknowledgements

I am reluctant to take all the blame for re-inventing this Victorian cycle variation.

My contacts, mentioned earlier, were instrumental in setting the (big) wheels in motion.

Mr. J. Piper really set the project rolling when he presented me with the Otto breakfast cup. It was kept moving by Colin, the classic transport enthusiast, and given the final push start by meeting up with Maurice Bartell, President of Bygone Bikes, and Tony Staples, a M.E. reader, at the Ripon Racecourse Show.

My brother Geoffrey and son Richard are also worthy of mention, as they did allow me a small area within my workshop in which to construct the project.

Where would I be without the help of my pal Kevin and his scrap heap?

When suitable parts are not forthcoming from the scrap pile, one or other of my two cycle dealer contacts invariably come up trumps: lifelong cyclist Norman Fay, owner of F. W. Holdsworth in South Shields, and Peter, of Peter Darkes Cycles, Sunderland.

As always, 'Her Ladyship' allowed me to pursue the construction, provided it was in my own time.





The dividing attachment in use on the lathe. It utilises the mandrel handle previously described.



The modified handle spacer shown with its locating key and a change wheel.



The set-up used to silver braze the handle to the handle sleeve or spacer

SETTING UP THE CLARKE CL300M LATHE THE SIMPLEST DIVIDING ATTACHMENT IN THE WORLD

Neil Wyatt

explains his approach to dividing in the lathe.

●Part VIII continued from page 456
(M.E. 4232, 15 October 2004)

Sooner or later every model engineer discovers the need to carry out an operation involving evenly spaced features around a workpiece. This may be as simple as the holes in a cylinder cover, or as critical as cutting the teeth of a gearwheel. Some of these operations can simply be carried out with the work mounted in the lathe and 'indexing' the rotation of the mandrel. In such cases the machining operation is carried out by some other means — a drilling or milling spindle fixed to the tool post, or even a file guided by a simple rest.

The real 'simplest dividing head' is to use the gearwheel at the back of the mandrel, together with a simple detent. This can be just a screw in a bracket or a spring catch made from piano wire, though there are more elegant solutions. On the CL300M this wheel has 45 teeth, allowing division by all the factors of 45, i.e. 45, 15, 9, 5, 3, 1. This is a fairly limited series. The factors of 60 are more numerous and handy (60, 30, 20, 15, 12, 10, 6, 5, 4, 3, 2 and 1) so the usual solution is to somehow fit a 60-tooth (or some other) change wheel to the mandrel.

An obvious way of doing this is to fit a suitable spindle to an expanding collet, along the lines of my mandrel handle. While contemplating this I had a 'Eureka!' moment. Why have separate devices? If a gear can be attached to the handle, you have the added advantage of being able to turn the mandrel with greater ease. On the assumption that you have made the handle previously described, a simple way of doing this is to modify the $\frac{1}{2}$ in. dia. sleeve. Turn a

12mm section using a gear as a gauge to get a firm fit, rather than aiming for an exact dimension. Drill a blind $\frac{1}{8}$ in. hole in one side of the sleeve and glue a short length of $\frac{1}{8}$ in. rod in place with cyanoacrylate adhesive to act as a locating key for the gear wheels. You should find that the natural 'give' in the gears allows them to be slid on and off without difficulty, with no play or danger of them coming adrift in use.

There is the danger that the sleeve could slip relative to the mandrel. To eliminate this I silver-brazed the sleeve to the handle lever. My method was probably a bit hit and miss; I assembled the entire handle, and clamped across the sleeve and the handle (see photo). I then dismantled everything but the sleeve and lever, and set to with the blowtorch. To my surprise, only a stroke or two with a small file was required to true up the square hole in the handle so the spindle would fit. An alternative would have been to make a round hole in the handle, use a short brass spigot to hold the two parts true, then drill the spigot out after silver-brazing. It would then be simple to file the hole square.



The addition of a suitable change wheel to the mandrel handle turns it into a simple dividing attachment.

Mounting plate

The other component required is the detent assembly. As this accessory will only ever be used with the lathe switched off, it is quite safe to remove the gearbox cover to fit it. Once the cover is removed, its mounting bolt holes are ideal candidates for fixing the detent mechanism to the tumbler gear mount. The 80-tooth wheel offers the possibility of 16 divisions, 32 if a half-spacing detent is used. In this digital age these are important numbers, so it is best to make the detent mounting plate large enough to accept even this largest change wheel. I have carried out much fiddling with calipers and pieces of cardboard to get the right size and shape. You have the benefit of a drawing of my mounting plate.

The shape of the plate is easier to deduce from the drawings than it is to describe. I used a precious chunk of $\frac{3}{8}$ in. Dural — lovely to machine, but hacksawing it saw me dissolving in sweat. Thankfully I found that it could even be sawn with an electric jigsaw — a relief to discover on what turned out to be the hottest day in history! You could use $\frac{1}{4}$ in. mild steel, but be prepared to take a long time with the machining.

I cleaned up and sized the edges of the plates using a fly cutter, holding the plate horizontally in the tool post. It is surprising what can be machined in this way and it gives a very rigid set-up.

To set out the three holes, remove the tumbler gear mounting plate, and clamp the backplate to it. Spot through the holes in the mount and scribe around the bull wheel clearance hole. Drill clear for the mounting bolts and $\frac{1}{2}$ in. to clear the mounting plate fixing screw. To machine the semi-circular cut-out, I set the fly-cutter to the correct radius and then clamped the mounting plate to the tool post. A spacer should be placed between the plate and the tool post. Setting the work at the correct angle is facilitated by aligning the



The fly-cutter used to machine the semi-circle in the mounting plate.



Machining the semi-circle in the Dural mounting plate with the work mounted in the top slide.



The detent in use. This type of detent can be used to index half a tooth.

fly-cutter so it is alternately at the top and side of its circle. When the gap between the tip of the cutter and the scribed semi-circle is consistent, the work is then aligned. Withdraw the cross-slide and the work can now be fed into the cutter. The single bolt I used to clamp the plate to the tool post may look precarious but I took gentle cuts of 0.016in. at a time without any movement.

The detent mounting block is made from a section of 5/8 x 7/8 in. mild steel, but you could change this to suit whatever is in your scrap box. Square the ends off in the 4-jaw chuck. The mounting holes need to match up with two holes in the mounting plate. The lower of these can be extended into a slot, to allow the block to be accurately aligned with the index gear. The 3/8 in. hole is best drilled and reamed with the block in the 4-jaw chuck, but take care as one end of the block

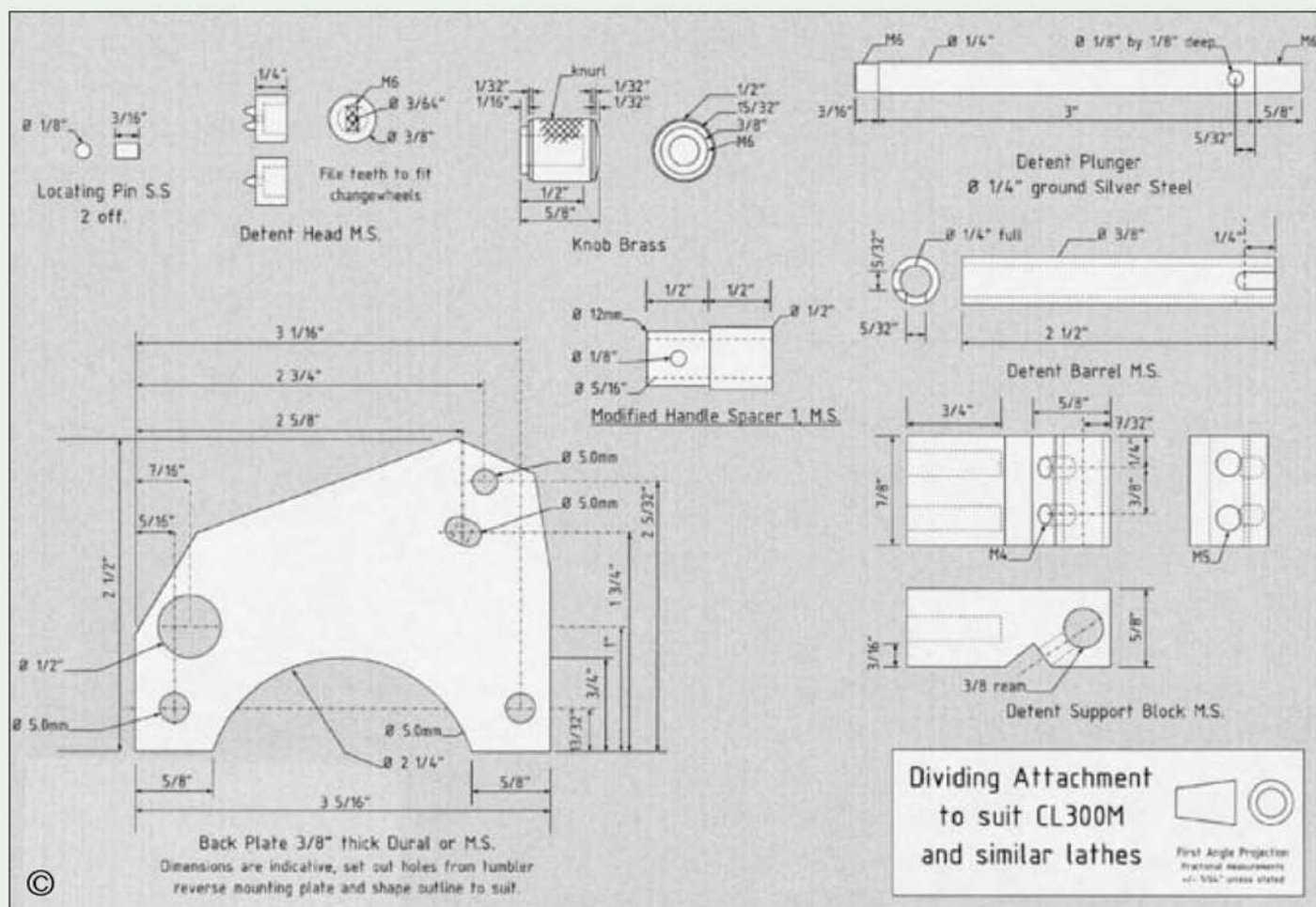
will be unsupported. The cut-out for the two M4 locking screws is milled with the block in the vertical slide. If you do not have the facilities to do this, you can just put the screws through the side of the block, though they will have less metal to grip.

Detent

The detent itself is a simple sprung plunger, inside a $\frac{3}{8}$ in. dia. barrel, to allow easy adjustment for different sized gears. Ideally centre, drill undersize, and ream the barrel $\frac{1}{4}$ in. bore. If you have no reamer, or are nervous about reaming such a deep hole, drill 6mm, then open out with a $\frac{1}{4}$ in. drill in good condition. If you lock the barrel in the mounting block, the latter can be held in the tool post and the barrel will be at centre height, facilitating the easy milling out of the two guide slots.

The plunger is built up around a piece of silver-steel to avoid the need for turning a long, accurate 1/4in. dia. shank. There are two options for the detent. The easiest is a 'simple' wedge, filed to fit the tooth form, the other is an 'inside/outside' detent as used by Harold Hall for his dividing head (*Model Engineers' Workshop* 88, February/March 2003). This doubles the number of divisions on each wheel. It is made on the end of a short piece of 3/8in. mild steel screwed and glued to the end of the plunger. Mild steel or brass is adequate — it will be meshing with nylon gears.

Thread the top end of the plunger 2BA or 5mm for a knurled brass knob, and cross-drill it about $\frac{3}{16}$ in. deep for a short piece of $\frac{1}{8}$ in. dia. rod. Place a drop of cyanoacrylate adhesive in the hole, and force in a short stub of silver-steel using





The assembled detent assembly. The design is such that an 80-tooth gear can be used.



The detent barrel carries two slots to allow the detent to index through 90 degrees.



Using the dividing attachment to graduate an index dial for a boring head.

a vice or pliers *after* assembling the plunger and a suitable spring.

Use

In use, unplug the lathe and remove the gear cover. Insert the mandrel handle, fitted with a suitable gear. Fix the mounting plate in position and align the mounting block so the barrel aligns diametrically with the mandrel. Adjust the barrel so that the detent can be withdrawn sufficiently to turn the gear without removing the stop from the slot. This allows the detent to be slightly lifted, without

Divisions available with different change wheels

Wheel											
80	160*	80	32*	40	20	16	10	8	5	4	2
65	130*	65	26*	13	5						
60	120*	60	30	20	15	12	10	6	5	4	3
57	114*	57	38*	19	3						
55	110*	55	22*	11	5						
50	100*	50	25	10	5	2					
45	90*	45	18*	15	9	5	3				
40	40	20	10	8	5	4	2				
35	70*	35	14*	7	5						
20	20	10	5	4	2						

Divisions marked thus * can only be obtained by using half tooth steps.

against any significant turning forces. A simple method to allow the mandrel to be locked in any position would be to fit a block holding an M6 screw onto the top of the tumbler gear mount. A suitably shaped brass pad inside the mount, sprung away from the mandrel, could be locked against the mandrel when required. I must admit, I have not got as far as performing this modification; if you get there before me, please send a description of your solution to the Editor!



The finished index dial fitted to the home made boring head.

accidentally turning it, to index a few teeth around the gear. The stop can be switched from one slot to the other to accommodate moves of half a tooth. Finally, the stop can be completely withdrawn to allow the free movement of the mandrel using the handle. *Please do not attempt to operate the lathe under power with the handle or detent attached;* to do so would be to invite injury.

The photographs show a micrometer dial with 40 divisions, made for a boring head using this device with an 80T wheel. I was very pleased with the result, which appears very even and accurate. Its next job will be re-graduating the home-made index wheel fitted to my leadscrew.

Mandrel lock

One of the disadvantages of this sort of arrangement is that the detent arrangement is not really suitable for locking the mandrel



The machine must be isolated and the change wheel guard removed to use this device.

Editorial note

A number of dividing attachments of the type described in the foregoing article have been featured in these pages over the years. However none have been specifically for the CL300M lathe and, with the growth in popularity of these machines, we felt this article had a right and proper place in these pages. We hope it will be of particular interest to the beginner who may be faced with an indexing problem and unsure how to proceed.

However, inexperienced readers should note that for indexing devices to be effective, it is vital that the selected change wheel is mounted truly concentric to the lathe mandrel axis. Any run out of the change wheel with respect to the mandrel will cause indexing errors which may not be apparent until the work piece is placed into service.

It is therefore very important that every care is taken to ensure that the change wheel runs true. It may seem that this aim would be automatically accomplished by mounting the change wheel off the bore of the mandrel as described above. However, experience suggests that the through bores of mandrels are not always concentric to their outer diameter. Since the through bore is normally only there to permit the chucking of long bars there is no reason why it should be. True, the Morse taper in the business end must run true to the outer diameter of the mandrel but the rest of the mandrel bore is just there to provide clearance.

Readers are therefore urged to check the bore of the rear end of their lathe mandrel with a dial test indicator before proceeding. If some error is present then mount the mandrel handle and, again with a dti, check the run out of the handle

sleeve or spacer. Remove and refit the handle several times to check if any error repeats. If there is a repeatable error it may be possible to correct it by making a new sleeve with a bore which is deliberately made eccentric to the outer diameter. Then, by always fitting the mandrel handle in the same position in the lathe mandrel, the two errors can be made to cancel out and a true running index wheel will result.

Such practices may seem to have little to do with precision engineering but do, in fact, have industrial precedents. If every machine had to be perfect before good work could be done then there could have been no progress. It is really a case of knowing your machine and allowing for its foibles. Such data as the run out of the bore of your lathe mandrel is important and should be written down in your workshop note book for future reference.

A RULE STAND

Peter Spenlove-Spenlove describes a simple project of use and interest to the novice.

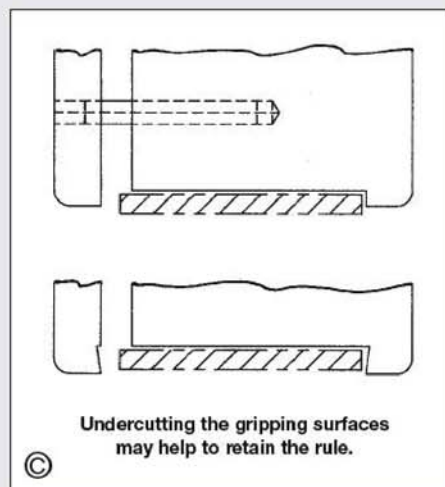
Having installed your first lathe and collected a few basic tools, you may well send off for a set of castings and materials ready to start your first model. The articles in *Model Engineer* tell you to mark out the raw materials before cutting metal, but how?

These days there are many second hand and new imported aids on the market to facilitate accurate marking out. Many amateurs will have access to a vernier height gauge, a surface plate and other such useful tools. However, it was not always so. To start with most amateurs only had a 6in. rule with 1/64 or 1/100in. graduations. We then saved up and bought or made a simple surface gauge. Our surface plate was often an off-cut of plate glass fitted into a suitable wooden frame. The point of the surface gauge was set to the rule, the latter being supported on a block of steel or an angle plate to keep it vertical. For convenience many workers used a little block which clamped the rule in an upright position. Such rule stands were available commercially, but most made one for themselves. Practically every youngster who was apprenticed to a fitting shop or toolroom made tools for use at work. It was good basic training and if a mistake was made, no harm was done. You just started again.

As an apprentice I was not initially allowed to use machine tools, but I was given access to files,

chisels, hacksaws and a rather battered bench vice. With these I was able to make the rule stand shown. It is very useful and yet is easy to make. Mine is about 2in. high and takes a standard 3/4in. wide rule. For a 12in. rule a taller block might be better and for a 1/2in. wide rule 1 1/2in. would be high enough. Size is not important as long as the block is stable in use. Mine is triangular in section but a rectangular one would be just as good; maybe better as it would have more mass. Try to obtain a piece of material 1in. thick or slightly more. As the device is used on a surface plate it is important that the base is at 90deg. to the surface that supports the rule and this is really the only important parameter.

To make mine I first soldered the side plate

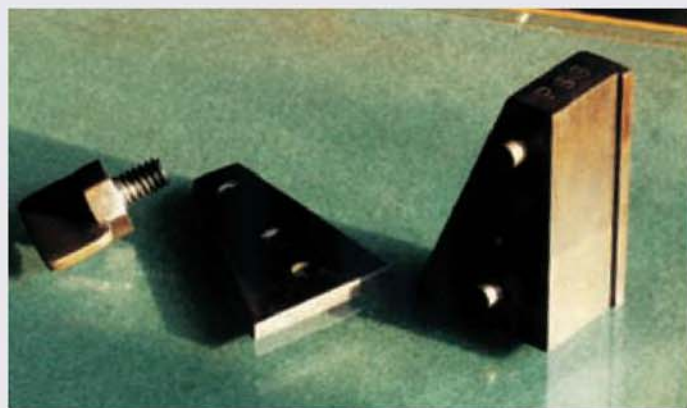


©

onto the main block and then hacksawed and filed the block to shape. Two dowel holes were drilled reaming size (highlighted in white paint) and a 1/4in. BSW hole drilled and tapped. This hole was opened out with a letter G drill in the plate only. The two dowel holes were reamed so that the dowels were tight in the block but a sliding fit in the side plate. The two parts were then separated and the recess for the rule cut with a hammer and chisel and finished with files to approximately 0.05in. deep. To achieve a sharp inside corner a scraper was used to clean up the mess left by the files. Nowadays most model engineers will mill out the recess using their lathe or milling machine. If you do mill the recess you may care to undercut the gripping edges of the recess but this is by no means essential. Mine are cut square and grip the rule well enough. The screw was a standard one with a 'wing' brazed on.

My stand looks brown in the photos but is made of mild steel. The brown finish was achieved by using a chemical 'blacking' process. It is wearing a bit thin now.

When equipping the rule stand with a rule, select one with engraved, not etched, graduations. You can feel the surface gauge point enter an engraved graduation but this is not possible with cheap etched or printed rules. The rule shown is a Chesterman No. 310D purchased in the 1940s and still in regular use. It is 'one sided' only and now very rounded with wear.



These photographs of the Author's rule stand reveal its general construction. The finish (now wearing thin) was achieved using a chemical blacking process. The dowels are highlighted in white for photographic purposes. The surface gauge is a Starrett Universal No. 57A of 1916 vintage. The rule stand and surface gauge are shown on a piece of 3/8in. plate glass in use as a marking out table.





A H.K. Porter plate of 1914, which was recovered from a lumber company's 2-6-0 locomotive.



Post WWII Porters omitted the date. This example was from an export narrow gauge 0-8-0.



The stylish, early brass plate used by the Vulcan Iron Works.

NORTH AMERICAN STEAM LOCOMOTIVE BUILDER'S PLATES

Eric Ellis

continues with a look at industrial builders and equipment plates.

●Part VII continued from page 449
(M.E. 4232, 15 October 2004)

Many steam locomotives were the antithesis of the huge articulated locos or Northern's thundering along main lines and of course they had to be built somewhere. So we come to the companies that did just that. Three seems a reasonable number to look at, particularly as these three built tank engines which came to the UK during World War II, most of which went on to Europe after D-Day.

H. K. Porter of Pittsburgh, Pennsylvania was founded in 1866 as Smith & Porter and built their first engine that year. By the early '70s, they had completed 100, had a fire at the plant, and changed to Porter, Bell and Company. Bell died and the name changed to H. K. Porter & Co., then the H. K. Porter Company.

Exports and a new plant followed at the turn of the century. Porter died in 1921, the new owner turning

away from a shrinking steam railroad market as the decade passed. The firm was bankrupt in 1940 and built its last steam locomotive in 1951.

Porter built thousands of small locomotives, the 0-4-0 and 0-6-0s of the genre, both tender and tank, standard and narrow gauge, though they did manage up to 2-8-2s on occasions.

Their first builder's plates may have been rectangular with rounded ends, but the shield shape (photos 1 and 2), are much more familiar. That in photo 1 was a lumber company 2-6-0 while that in photo 2 was a narrow gauge export 0-8-0. There were several sizes, in brass or cast iron, and strangely not greatly different in dimensions. Lettering layout varied over the years; note that the one in photo 2, a post WWII plate, has no date included. All

had three bolt fixings. The build number on this plate does not necessarily mean that over 8,000 locomotives were turned out at the Pittsburgh plant, though it was a certainly a large number.

Davenport's market was the same as Porters. Beginning in 1901 as the successor to an established company producing stationary engines and boilers in Davenport, Iowa, the company expanded, began exporting, and they too built larger locomotives, and small diesel/gas (petrol) powered ones. In 1933, a change of ownership also brought about a change of name to Davenport Bessler Corporation. The last steam locomotives were turned out in 1953, making a total of about 2,300. Their plant closed in 1956.

Davenport plates were originally oval, in brass, with three very pleasant fonts of Davenport Locomotive Works (two lines) following the shape of the curved top, with Builders, and DAVENPORT, IOWA (two further straight lines under), finishing with the final line which was the build number. Later, and in complete contrast, a very plain cast iron rectangle was used, as photo 4 shows. This was from a US Army 0-6-0T that ended up in France.



The uninspiring later Davenport plate. This example is from a US Army 0-6-0T used in France.



The later circular cast iron plate used by the Vulcan Iron Works.



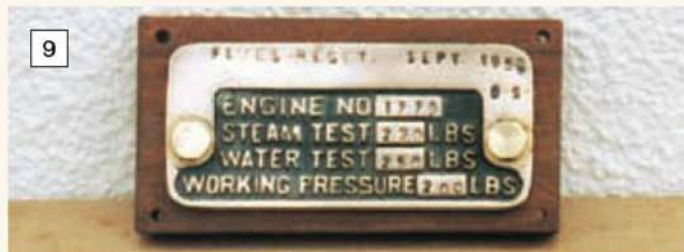
An example of the US Army plate that makers were obliged to fit to army contracts.



A typical equipment plate advising customers of the type and make of thermic-syphon fitted.



An Elesco, The Superheater Co. plate taken from a Southern Pacific 4-8-8-2 locomotive announcing the use of the former's superheaters and throttle.



An example of a boiler plate stamped with the engine number, steam test pressure, water test pressure and working pressure among other data.

Our third builder was Vulcan Iron Works of Wilkes Barre, Pennsylvania. Starting as a foundry in 1849, they began locomotive building in the late 1880s, finishing in 1949. Their market was again similar to Porter, but a surprise order for 88 standard gauge 2-10-0s for Turkey with skyline casings (like Southern Pacifics) came towards the end. Vulcan's early plates were a rather stylish brass rectangle as in photo 3, followed by a circular cast iron pattern (photo 5). Photograph 5 is of a plate from a US Army 0-6-0T that went to France, which leads me very nicely to the next plate.

The three builders had an obligation to fit US Army plates to the smokeboxes of the 0-6-0Ts exported during the war. An example is seen in photo 6. Corps of Engineers information, plus builder references, are included. There were several slightly different variations of the lettering on these plates, which were made of cast iron. This particular locomotive ended up in France too.

As a general rule, North American builders tended, perhaps more than UK builders, to buy in parts and equipment to fit to the engines they produced rather than make the items at their own plants. There are many examples of this practice. Names like Nathan, Sellers, Westinghouse, Worthington, Franklin, Waugh and so on spring to mind. Some had visible reminders of the fact displayed on the locomotives so fitted, and two examples are included in photos 7 and 8. Elesco, The Superheater Company (photo 8) often had their plates adjacent to the builder's plate on the smokebox. This one is from a Southern Pacific



Another boiler plate but with less cryptic information than the previous example.

4-8-8-2 'cab forward' and states that the throttle (regulator valve) was also supplied, along with various patent numbers. Cast in brass, with two fixing holes, the plate in photo 7 needs no explanation, assuming that everyone knows what a thermic-syphon is. This leads me to wonder how many successful such items have been fitted to model steam locomotives. There was another version of the plate that had the shape of a syphon (from the side) cast in. This was not as common as Superheater's, and introduced some years later. It was in brass, with three fixing holes and seen fixed to a Nickel Plate Road 0-8-0 switcher (shunter).

The final items shown here (photos 9 and 10) are not builder's plates as such but an example of what might be found on a boiler, usually on the backhead (doorplate). They are identification plates giving the engine number, and safe maximum working pressure. Interesting, because a separate boiler number does not appear, which

raises questions about interchangeability at overhauls, and what does *Flues Reset* mean? Who is B.S. and what authority did he have? Why were the flues not reset before 1950? Is it a replacement plate? One can make assumptions about all of this (B.S. is maybe Boiler Surveyor). Perhaps Southern Pacific did not interchange boilers between engines, and so on, but it shows how curiosity can be aroused by old plates like this and how model engineers might enhance their own locomotives by fitting such plates — which is where we started in the first place!

The plate in photo 9 was from a Southern Pacific 2-6-0 four-cylinder Vaclain compound, built by Baldwin in 1902 and later converted to a two-cylinder simple. That in photo 10 was from a Texas & New Orleans 4-6-2 of 1912 which was renumbered — hence the obliteration of its original number and stamping of the new.

Acknowledgements

My thanks go to several people who have helped with photographs and information for this article including V. Edwards and Alan Miller. Sources were many including *A Short History of American Locomotive Builders in the Steam Era* by John H. White.

This is an excellent book which can be recommended to anyone interested in North American steam locomotives.

Undoubtedly there are gaps and errors in these articles; I would be pleased to hear from anyone who could expand or correct my knowledge.

●To be continued.

WHEN COTTON WAS KING

Dave Roberts

provides an authoritative if brief glimpse at the rise and fall of an important British industry.

With the recent closure of Bolton's last cotton spinning mill, Lancashire's once-huge cotton industry has virtually disappeared. Cotton cloth manufacture in Lancashire superseded the older woollen industry, the raw cotton at first being imported from India. Spinning and weaving were cottage industries, whole families being employed. Spinning by hand on a cottage wheel was a very slow and tedious process, much of this work being carried out by unmarried women, called 'spinsters'. About three or four spinsters were needed to supply one handloom weaver, and after Kay's invention of the flying shuttle had increased the loom's output, five or six were needed.

The shortage of spun thread for the loom was a bottleneck in the production of cloth, and attention was given to mechanisation of the spinning operation by several workers. Hargreaves built his 8-spindle 'jenny' in the 1750s. Arkwright's so-called 'water frame' was patented in 1769, power to drive the machines being provided by a water wheel in the manner of the ancient corn mills, so Arkwright's factories became known as 'mills'. Arkwright was very successful commercially, in addition to his own mills many were built under licence.

Samuel Crompton married together the jenny and the water frame to produce the 'mule' in 1779. His first mule, with 48 spindles, produced yarn of excellent quality, despite the machine's crudeness. The mule became the mainstay of the British cotton spinning industry for over 150 years. Crompton did not take out a patent for his invention but used it to spin thread for sale, with the result that others copied and improved his

machine and Crompton was left with nothing.

The mule received numerous improvements over the years, especially by Richard Roberts (formerly a partner in Sharp, Roberts of Manchester). Roberts made the mule self-acting, or automatic in today's language. (Roberts, it seems, was a better engineer than businessman and, like Crompton, died broke) The mule became a most complex and ingenious machine. The spindles, mounted in a travelling carriage, draw out and spin the thread on the outward stroke, and wind the spun thread onto the spindles on the return stroke.

For a time, weaving remained a hand-loom operation; the last quarter of the 18th century was a period of prosperity for weavers, but by the 1820s the new power looms had reduced cloth prices. Handloom weavers were driven to poverty, made worse by the slump following the Napoleonic wars. Angry mobs wrecked power looms in some places. The industrial era had arrived.



Gibson Mill, near Hebden Bridge, Yorkshire. Built in 1800 and powered by Hebden Water, this early style mule spinning mill was converted to steam operation about 1860 but closed at the end of the 19th century owing to competition from the later modern mills. Gibson Mill is now in the care of the National Trust.

Early mills

The water-powered mills were necessarily built beside rivers, preferably where there was a good fall. A favourable stretch of river might have several mills on its banks and were often in remote valleys, inconvenient for transport and workers. Some of these mills can still be seen today but most have been demolished. They were built of stone, large rectangular buildings of three to five stories, commonly with a wheel pit at one end, or sometimes underneath. Many early mills were built to rent, the owners letting floors to smaller manufacturers on a room-with-power basis.

The concept of having 'free' power seems to us like a good system in these days of favouring 'sustainable power', but the water mills suffered from summer droughts and winter freeze-ups. Mill owners were quick to adopt steam power as soon as the rotative steam engine became a practical proposition, sometimes to supplement the water wheels. A ready supply of cheap coal became a requirement, so new mills were often built alongside canals.

Most of the mills were built during the boom periods of the 19th century, but there were also periods of depression with widespread unemployment. Particularly bad was the 'Cotton Famine' resulting from the American Civil War in the 1860s.

A common arrangement for spinning mills was to have the preparation machinery (carding, roving, etc.) on the ground floor, the upper floors being mule spinning rooms. The mules were usually arranged for each machine to span the whole width of the mill. Over the years, the buildings became wider and the mules became longer, incorporating more spindles. Later mules might be 150ft. long with 1,200 spindles or more.

Self acting mules were arranged in pairs, the travelling carriages and headstocks facing each other. A skilled man, the spinner, operated both machines, usually with two assistants or 'piecers' who, in the early days, would usually be children.

In the 20th century, ring spinning began to supersede the mules. These compact machines spin continuously onto the spindles, and can be tended by less skilled people. Although a British invention, ring spinning was developed and perfected in the United States, but mules seem to have been favoured for the finest quality yarns.

Buildings

Many of the mills were of fireproof construction having floors of brick arches, or sometimes stone flags, between iron joists, all supported by rows of iron columns. To provide the large open rooms needed to accommodate the mules, stairway towers were built onto the outside of the building, often incorporating a water tank and capped by an ornate turret or dome.

On earlier mills, the engine house would be inside the main mill building. Later, the engine house and associated boiler house were usually outside the mill. Where there was no canal or river nearby, it was usual to have a reservoir or 'lodge' to provide cooling water for the engine's condensers.

The mill buildings gradually became larger as the 19th century progressed, the plain austerity of the early stone mills giving way to larger brick structures. By Edwardian times, huge Accrington brick buildings, often with terracotta detailing, perhaps in the Italianate style, were built. Their owners must have thought that 'King Cotton' would live for ever.

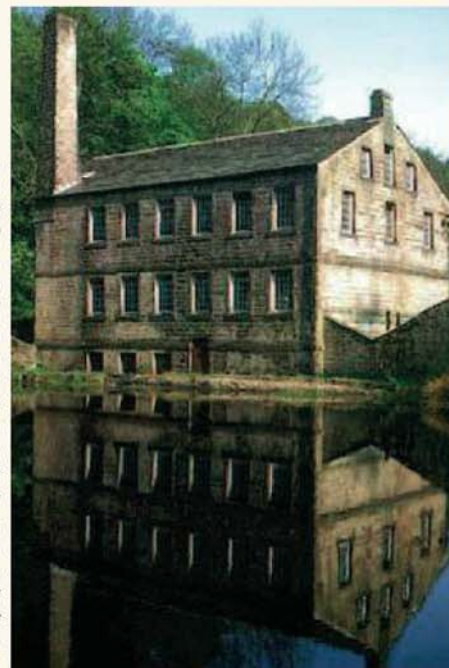
Specialisation

Although some mills incorporated both spinning and weaving facilities, most specialised in either spinning yarn, weaving cloth or bleaching and dyeing operations. Owing to the weight and vibration of power looms and the need for good light, weaving sheds were usually single storey buildings with saw-tooth 'north light' glazed roofs.

There was also a tendency for specialisation in the different cotton towns. In Bolton, Rochdale and Oldham spinning predominated, whereas further north Blackburn, Accrington and Burnley were more weaving orientated. Of the cotton towns, Oldham produced much the greatest quantity of yarn, partly owing to its concentration on the coarser counts of thread, whereas Bolton specialised in the finer counts.

The 'count' refers to the fineness of the thread, and is the number of hanks that can be spun from one pound of raw cotton, each hank representing 840 yards. A pound of cotton can be spun out an amazingly long way. Crompton was spinning 80s count on his early mule, and by the 1850s, 350s was available from Bolton's mills. A pound of 200s thread would be about 95 miles in length.

Right: Swan Lane No. 3 Mill, Bolton was completed in 1915 and is a mule spinning mill in the late style. The tall engine house in the foreground accommodated a vertical marine-type engine, while the earlier Nos. 1 and 2 mills (out of view to the right) each had a large cross-compound engine, all supplied with superheated steam from ten Lancashire boilers. This huge complex had a total spinning capacity of 330,000 spindles.



Steam power

From the late 18th, and much of the 19th century, steam power was supplied by beam engines, some of the later engines being double, that is, two cylinders and beams side by side. Some engines had their power enhanced by a second cylinder fitted to an existing beam, turning the engine into a compound. This conversion was a speciality of Wm. McNaught of Glasgow, later of Manchester, and not a Rochdale firm of the same name, as is sometimes stated.

Power transmission throughout the mill was by geared shafting. The engine drove lineshafts on the ground floor and via bevel gears and a vertical shaft to lineshafts on the upper floors. The introduction of high speed lineshafts for power distribution in factories is largely due to William Fairbairn, whose name deserves wider recognition in the annals of engineering history.

In the latter part of the 19th century other types of engine came into use, including vertical triple-expansion engines, and the horizontal cross-compound type. With these engines a new system of power transmission was introduced. A large flywheel between the cranks carries grooves for ropes, groups of ropes directly driving lineshafts on the different floors. With this system the mill has to be built with a rope race the full height of the building.

An engine powering a large mill might be of 2,500hp with steam provided by four Lancashire boilers (another Fairbairn development) and consuming perhaps 300 tons of coal a week. Lineshafts were subject to high torque loads. A long 3in. diameter shaft under load could have a twist of two full turns where the drive was at one end. Where the site permitted, it was preferred to install the engine in the centre of the mill. With the introduction of municipal electricity supplies, some later mills were powered by electric motors. Kearsley Mill, near Farnworth (1906) had its own turbo-generating station.

Decline

Although British cotton manufacture reached its peak in 1913, its share of the world's production had been falling since the 1880s. Increasingly, the countries which had been Britain's customers became producers, especially India. Textile firms have been criticised for not modernising their

machinery but whether it would have made any difference in the long term seems to the writer to be unlikely.

After a brief boom following the First World War the industry went into decline after 1926, with mills closing after the Second World War.

By the 1980s very little spinning and weaving remained, though some mills are still involved in clothing manufacture. Some of the mills found new industries to occupy them, but many others have been demolished, housing estates or supermarkets now occupying the sites.

The writer believes that readers would enjoy M. Williams' book *Cotton Mills in Greater Manchester*, and H. Catling's *The Spinning Mule*, which describe in detail how the machines work.

The author also thanks Neil Carney for his help in the preparation of this article. 



UK News

October looms as I begin work on this column; the evenings are drawing in and we will all, no doubt, be retreating to our workshops to work on those 'winter projects'. It would be nice to have news of these for possible reporting in this column, particularly from those who are not members of clubs for various reasons but who have much to contribute to our hobby.

One club with plenty of work to do is Ascot Locomotive Society which now has planning approval for their new track at the racecourse site. The process has taken three years due to the complication of "green belt land, wild life heritage, bats, nesting birds, great crested newts, badger setts and many mature trees." As Derek Alford reports "it is now our task to rebuild the miniature railway and create an exciting journey over undulating terrain." I am sure all our readers will wish the group well in this major venture. Now with assurance for their future security, the club is looking to encourage some younger members

to join them from our readership.

Life has been made difficult for Bedford MES due to "a couple of boiler failures", one

involving the club locomotive *Loch Trig*. This happened when other members with locomotives were on holiday, but sterling efforts by those available saved the day. The locomotive failure was due to a massive build up of scale in the firebox leading to the formation of a bulge and eventually a leak. We are pleased to report that the boiler has now been repaired by Michael Maskell and his team and the locomotive is awaiting reassembly. An additional project is the installation of warning lights at the entrance to the raised track where it crosses the ground level railway. Due to members leaving the area, the club is inviting applications from members to join the 'Sunday Gang'. The terms of employment are described as "3 hours per week, no money, tea breaks and fag breaks as required, and occasional work breaks." Sounds to me a bit like being a *Club News* Editor! The editor reports an incident when a car drove onto the site, turned round and stopped. The group watching took no more notice until the car door

slammed and the car rapidly left the site. Investigation showed that the driver had filled a wheelie bin with rubbish and departed. The matter was eventually sorted out, the culprit (not from the club) identified and an apology received. This reminds me of a recent incident involving another person's rubbish which happened as I was approaching a sharp right-hand bend in the local village, a 'skip' lorry came round the corner fast and a desk top computer flew off the skip and bounced into the front of my car! When the insurance company asked what had happened I replied "I was hit by a flying computer." There was then a long pause followed by "Pardon?" from the other end of the phone! Other strange insurance tales are welcome.

Bournemouth DSME held a successful benefit day in aid of the local air ambulance service recently. Work is continuing on the provision of a head shunt inside the track. This is to "provide relief for drivers who may be having trouble and need to come off the line temporarily". Martin Cuff reports running with the club *Maid of Kent* locomotive when the water pump bypass fractured at the valve shooting a spray of water into the ashpans and damping the fire. This made "running and firing a tad tricky when continuous

running". Haven't I read somewhere that injecting steam into the fire makes locomotives more efficient?

The open day at Bradford MES is reported as having been a success although fewer visitors than last year attended. There were trains on both tracks with plenty of passengers to ensure they earned their keep. A fine display of boats in the centre of the track generated lots of interest and a good deal of support for having a boating pond on site. During the event Chris Eddison's locomotive made its debut and was christened *Rombald* by President Chris Brear who applied the champagne in suitable fashion. Member John Hawkes recounts a tale which will be familiar to all our readers. He was soldering some small parts and had completed the first three successfully but the fourth 'leapt' from his pliers onto the floor. After a fruitless search which involved getting into the deep dark recesses under his machines he found lots of swarf but no part. He made and soldered a new one and while clearing up spotted the missing item "tucked neatly into the top of an open tool box under the bench." John swears that he "distinctly heard the part fall on the floor and roll away." His question is "how did it leap 9in. into the air and 9in. sideways into the top of the tool box?" Answers on a postcard please!

Assistant Editor Kelvin Barber attended the Leighton Buzzard Narrow Gauge Railway's annual Vintage Vehicle Rally. Taking along his 1966 Ford Anglia 123E Super for a day out in the July sunshine, he also enjoyed a trip on the railway behind *Beauesert*, a 4-wheel diesel-hydraulic locomotive originally supplied to The National Coal Board in 1979 and later used as a shunter on the Channel Tunnel construction project. Alternate steam rides were provided throughout the day by P. C. Allen, a 0-4-0WT locomotive built in 1912 and imported from Spain to England in 1963.

At Stonehenge Works, the end of the line, a sand quarry display was

put on to entertain passengers. The accompanying photograph shows a Ruston & Bucyrus 10RB face shovel which spent some time loading wagons with sand. These were then towed away to the tipping dock by a Ruston narrow gauge locomotive. The display proved fascinating and 'hats off' to the operator who made quite a complex operation look remarkably easy. These old cable-operated machines certainly take more effort to use when compared to today's hydraulic versions.

Interestingly, this LBNGR display was awarded a Highly Commended Certificate in the 2003 Heritage Railway Association awards for Heritage Interpretation.



A Ruston & Bucyrus 10RB busy loading wagons at Stonehenge Works on the Leighton Buzzard Narrow Gauge Railway.

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.

Peter Davis
Percy Napper
Trevor Summerfield
Mike Wogan

North Norfolk MEC
West Huntspill MES
North Norfolk MEC
Brandon DSME

On the track, members have been trying out running anti-clockwise which gives improved visibility on approaching the station. The trials were successful and this direction has now been adopted on a permanent basis. The annual 'Pop-Pop' boat competition was won this year by Ken Shipley with a time of 12 seconds for the course. As Ken had won the trophy last year he forfeited the cup to second placed man Graham Done who clocked a time of 18.2 seconds. Colin Brear has decided to contact Ross Braun, the Ferrari F1 team technical director for advice on improving his time.

Bure Valley Railway in Norfolk reports that after extensive trials with heavy trains, their newest locomotive, a 2-6-4T tank based on a Leek & Manifold Railway design, has been fully passed off by HM Railway Inspectorate. Further information on the railway can be found on www.bvrw.co.uk

At the risk of mixing two topics which generate much passion on occasions, namely religion and railways, I liked the following from the *Cambridge MES* newsletter. "One of our early members, the Rev'd Wilbert Awdry, when asked why so many Church of England clergy were rail enthusiasts, replied

that both the Railways and the Church of England had their heyday in the nineteenth century, both inherited large buildings which were costly to maintain, both were the butt of constant criticism and both were convinced that they provided the best means of getting man to his ultimate destination." How things have changed! On a more serious note, various improvements have been made to the signalling with a new shunting signal and telephone on the high level steaming bay. The club recently held a members' friends and family day, and it has been suggested that this becomes a regular event.

Crawley ME had what can only be described as a "slow" public running day on 4 July with only 11 tickets sold during the day. This may have had something to do with the Wimbledon Finals, Euro Football final and the F1 British Grand Prix being on the same day. Oh — and it was raining! The opportunity was taken to clean the track with detergent because it had become very slippery in the wet. The following evening a running session was held for the local **Crawley MRC**. The

rain continued for the start of this but eased after an hour or so. Locomotives lined up included "Simplicity, Warship, Hunslet, Simplex, Rail Motor, Sub Nigel and Pansy". The 20 visitors and 10 club members enjoyed a good spread in the club house and everyone departed at about 9:30pm having had an enjoyable evening. A committee has been formed to work between members of the 'Friends of Goff's Park' and the council to try to arrest the continuing decay in the state of the park. Editor Jack Darby is representing the club interests on this committee.

Peter Gardner, Chief Engineer at **Ascot LC** has been busy with repairs to one of the coaches after a bearing seizure. This resulted in a complete rebuild of the bogies but as Peter comments "hopefully we will get another 14 years service from them." Peter has also been busy (mainly on rainy days) with the prototype brake van which is making progress. Other work by members includes making a new point and installing some new low level fencing. Signs of the moles'

return have been noticed so members "will now have to find the mole-scarers to change the batteries." The railway recently ran in support of the Friends of the Park and the opportunity was taken to experiment with longer trains.

Several of the **Fylde SME** 'Wednesday Gang' deserted the track on the first Wednesday in July for a trip to the **Eddisford Bridge** track of the **Ribble Valley Live Steamers**. Several locomotives were taken which reportedly ran for long periods without problem, and the weather was kind which helped considerably. The society has purchased a new *Charlatan* battery electric locomotive to supplement the existing locomotive. The new locomotive proved its worth at the gala day "when its presence on the track was much needed." Several members have expended considerable effort on painting the concrete floor in the club hut.

Stan Compton of Hereford SME reports on a trip to the Science Museum hangars at Wroughton (near Swindon, so you can visit the **GWR Steam Museum** on the same trip) where two hangars are open to the public on certain days. The hangars house a wide variety items ranging from early bicycles to a D.

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.

NOVEMBER

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| <p>12 Hereford SME. Colin Bowben: <i>The Royal Yacht Britannia</i>. Contact Richard Donovan: 01432-760881.</p> <p>12 Malden DSME. Slide Show. Contact John Mottram: 01483-473786.</p> <p>12-14 Meridienne Exhibitions. <i>The International Model Boat Show</i> at The Warwickshire Exhibition Centre, Fosse Way, near Leamington Spa. 10.30am-5pm daily. Adults £6.50, Senior Citizens £5.50, Children £4.50, Family (2+3): £17.50. Ample free car parking. Enquiries: 01926-614101.</p> <p>13 Brighton Toy & Model Museum. Music Night. Enquiries 01273-749494.</p> <p>13 Glasgow & S.W. Rly Ass'n. Hamish Stevenson: <i>British Industrial Locomotives</i>. Contact Bruce Steven: 0141-810-3871.</p> <p>13 Reading SME. Club Running. Contact Graham Bustin: 0118-9615450.</p> <p>13 Sutton Coldfield MES. Bonfire Party. Contact Neal Harrison: 0121-378-3992.</p> <p>14 Hornsby ME. Running Day. Contact Ted Gray: 9484-7583.</p> <p>14 St Albans DMES. Puffing Field Morning. Contact Roy Verden: 01923-220590.</p> <p>14 Sutton MEC. Track Day, Bonfire and Night Run. Contact Mike Dean: 0208-657-5401.</p> <p>15 Lancaster & Morecambe MES. Discussion of the Year's Activities. Contact Harry Carr: 01524-411956.</p> <p>15 Model Steam Road Vehicle Soc. Ian Pope: <i>Forest of Dean Railways</i>. Contact Geoff Miles: 01869-247602.</p> <p>15 Peterborough SME. J. Truluck: <i>Hovercraft</i>. Contact Tony Meek: 01778-345142.</p> <p>15 Salisbury DMES. Major Reid: <i>Artillery Pieces</i>. Contact Pete Parrish: 01980-610346.</p> <p>16 Cardiff MES. Steam-Up and Family Day. Contact Trevor Jenkins: 029-2075-5568.</p> <p>16 Chesterfield MES. Mike Eggington: <i>Cuban Steam</i>. Contact Mike Rhodes: 01623-648676.</p> <p>16 South Durham SME. Afternoon Steam-Up. Contact B. Owens: 01325-721503.</p> <p>16 Taunton ME. Mark Davis: <i>Auction</i>. Contact Don Martin: 01460-63162.</p> <p>16 West Wiltshire SME. Adam Harris & Co.: <i>H. Clarkson & Son of York</i>. Contact R. Nev. Boulton: 01380-828101.</p> <p>17 Birmingham SME. Peter Flavell: <i>Lady of the Lake & John Moxham: Talk</i>. Contact John Walker: 01789-266065.</p> <p>17 Bournemouth DSME. Jack & Anne Bath: <i>Ladies' Night</i>. Contact Dave Fynn: 01202-474599.</p> <p>17 Bristol SME. Clive Chambers: <i>Wuppertal Suspension Railway</i>. Contact Trevor Chambers: 0145-441-5085.</p> <p>17 Chingford DMEC. Club Auction. Contact Martin Masterson: 0208-989-5552.</p> | <p>17 Guildford MES. Bits & Pieces. Contact Dave Longhurst: 01428-605424.</p> <p>17 Leeds SME. Jumble Sale. Contact Colin Abrey: 01132-649630.</p> <p>17 MELSA. Meeting. Contact Graham Chadbone: 07-4121-4341.</p> <p>18 Cardiff MES. Cyril Chandler: <i>Film Night</i>. Contact Trevor Jenkins: 029-2075-5568.</p> <p>18 East Somerset SME. Ken Bluff: <i>The Napier Lion Aero Engine</i>. Contact Roger Davis: 01749-677195.</p> <p>18 Isle of Wight MES. AGM. Contact Ken Stratton: 01983-531384.</p> <p>18 Rugby MES. Alan Whenman: <i>Restoration of 92 Squadron</i>. Contact David Eadon: 01788-576956.</p> <p>19 Brighton & Hove SMLE. AGM. Contact Mick Funnell: 01323-892042.</p> <p>19 Canvey R&MEC. On the Table 4. Contact Brian Baker: 01702-512752.</p> <p>19 Historical MRS (East Midlands Area). John Cook: <i>Great Central Railway</i>. Contact Mark Shipman: 0194-983-6311.</p> <p>19 North London SME. Alan Dobins: <i>London's Historic Railway Stations</i>. Contact David Harris: 01707-326518.</p> <p>19 Rochdale SME. Auction Night. Contact Mike Foster: 01706-360849.</p> <p>19 Romford MEC. Photo Talk. Contact Colin Hunt: 01708-709302.</p> <p>19 Worcester DME. Charles Jones: <i>Holiday Talk</i>. Contact M. Lane: 01905-425972.</p> <p>20 Chesterfield MES. Running Day. Contact Mike Rhodes: 01623-648676.</p> <p>20 Historical MRS (Scottish Area). Iain Quinn: <i>Clyde Steamers</i>. Contact Richard Crockett: 01896-750730.</p> <p>20 SM&EE. Rummage Sale. Contact David Boote: 01202-745862.</p> <p>20 Steam LS of Victoria. Club Running. Contact Graham Plaskett: (03) 9750-5022.</p> <p>20 York City & DSME. Dave Ventress: <i>A Life on the Railway</i>. Contact Pat Martindale: 01262-676291.</p> <p>21 Frimley & Ascot LC. Club Running. Contact Bob Dowman: 01252-835042.</p> <p>21 York City & DSME. Running Day. Contact Pat Martindale: 01262-676291.</p> <p>22 Bedford MES. Our Winter Projects. Contact Ted Jolliffe: 01234-327791.</p> <p>22 Hornsby ME. Meeting & Social. Contact Ted Gray: 9484-7583.</p> <p>23 Basingstoke DMES. Meeting Night. Contact Guy Harding: 01256-844861.</p> <p>23 Historical MRS (E. Lancashire/N. Manchester Area). David Williamson: <i>North Eastern Wagons</i>. Contact John Sykes: 01706-823989.</p> <p>24 Harrow & Wembley SME. Brian Tilbury: <i>REMAP</i>. Contact Dr. Roger Greenwood: 020-8427-2755.</p> <p>24 Historical MRS (Bedford Area). Meeting. Contact John Chamney: 01442-851214.</p> <p>24 Hull DSME. Chairman's Evening. Contact Tony Finn: 01482-898434.</p> <p>25 Brighton & Hove SMLE. Workshop Evening — confirm by contacting Mick Funnell (01323-892042) or Gerry Collins (01273-553228).</p> |
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H. Comet airliner and a Ford Edsel car. More information can be found on the web-site at www.sciencemuseum.org.uk/wroughton or by telephone from 01793-846200. The anonymous contributor to *Whistle Stop* (the newsletter) who writes under the pseudonym *Blowing Off* comments that "Many fascinating photographs have been printed in *Whistle Stop* over the years, but none perhaps so revealing as that of our esteemed Chairman and his wife caught on camera halfway up a volcano in New Zealand wearing shorts and sporting some very natty headgear! We hope that that most revered publication, *Model Engineer*, will not feel obliged to publish this photograph." Rest assured that I won't, but is his concern out of consideration for our readers or to spare the blushes of the chairman and his lady wife? The same contributor also suggest that the club could raise extra revenue by producing and selling a calendar featuring "a selection of bare modellers legs draped provocatively around locomotive boilers." Now that would be worth publishing but perhaps some of our readers may have their own opinions on this? The club attended the Much Marcle Steam Rally this year with the portable track and some exhibits in the model tent. The club locomotive steamed for both days of the show and performed well on the steep and sometimes slippery track. An unusual item seen at the event was a straw burning traction engine from Argentina with a huge fire door but no tender. Covered access to the front of the firebox enabled straw to

be raked off the firebox tube plate when it got blocked. The engine awaits restoration.

Four members of Isle of Wight MES visited Bob Symes' open day at his Surrey home in June. The event was run in parallel with the Gauge 1 Association annual get together with Bob. The day coincided with Bob's 80th birthday so we would like to add our congratulations to him on this milestone. Motive power was provided by Bob's 10 1/4in. gauge *Super Simplex* and GWR railcar. The gauge 1 layout was very busy with many excellent engines running passenger and goods trains throughout the day. Members also attended the 'Pryde in Ryde' event with their ground level track and the *Thomas* event at Havenstreet in July. At the latter event the club *Thomas* was needed as a banker on the portable track when the *Super Simplex* ran out of steam. An interesting collection of items appeared on the table at a recent Bits & Pieces Evening. Contributors included John Helps who brought along the frames and buffer beams of his quarter scale saddle tank model *Edward Thomas*. Gil Hughes showed off his well advanced project of a small Baldwin locomotive, cased, mounted on a plinth and designed to be coin-operated. Dick Clifton had his G-scale working chassis and a careful mock-up of the finished tank engine. Stuart Mackemson displayed a 3 1/2in. *Tich* of very dubious pedigree which came to light while he was investigating the contents of abandoned cupboards.



Billy Greer of the Model Engineers Society (Northern Ireland) enjoys a run on the club track at Cultra.

Mike Rose attended with two of his locomotive models, together with an amusing and informative visual aid to distinguish between the confusing array of scale and gauge on the garden rail scene. Peter Brown had his own micrometer boring head and attachments made from castings. Reg Wrenn explained his work holding technique using expanding wooden mandrels when turning steam domes, and his sand drum method for producing the seating radius to mate to the boiler. Norman Godfrey concluded the evening with his locomotive *Ajax* to show and explain the extensive work which had been done at the Pumphouse to bring it into first-class condition.

Members of King's Lynn DSME have been busy this year. Tasks being carried out include more stabilising blocks being laid under the track to correct/modify the remaining places where cambers need attention. More alignments and ballasting require attention, and a couple of remedial bits of work for which materials are available, remain to be completed. *Open Day* notices have been made, displayed and fixed to the fence near the platform. Colour prints of

the notices have been distributed locally and in town. The turntable has been modified and fitted with detachable operating arms to cure a problem when bringing steam locomotives from the steaming bays — the side plates have been trimmed to allow more clearance on the rail ends and one top is now hinged, with the operating arms stored beneath when not in use. The new Diesel bay is also in and ready to be concreted in place — locomotives can be stored on this line out of the way of the kettles! (Diesel speak for steam engines!) The undergrowth has been cleared away from the steaming bays. A mobile engine preparation trolley has been made for use with the portable track which will facilitate changes of locomotives with a reduction in lost operating time.

Model Engineers Society (NI) report a busy and enjoyable period earlier in the year including the celebration of their 60th anniversary at the Cultra track site.

The Chairman and Secretary of North Norfolk MEC have been invited to promote their club on North Norfolk Radio. They report that the 320ft. track is now fully operational.

- 25 Leyland SME. Quiz Night. Contact Mark Entwistle: 01772-422411.
- 25 Sutton MEC. Natter Night. Contact Mike Dean: 0208-657-5401.
- 25 Worthing DSME. Christmas Social. Contact Bob Phillips: 01903-243018.
- 26 Chichester DSME. Club Auction. Contact Brian Bird: 01243-536468.
- 26 Hereford SME. John Arrowsmith & Nigel Linwood: Sinsheim Exhibition 2003/4. Contact Richard Donovan: 01432-760881.
- 26 Historical MRS (Essex Area). Dave Carson: The Peter Davis Slide Collection. Contact Jem Harrison, 27 Colne Place, Basildon, Essex SS16 5UZ.
- 26 North London SME. Workshop Evening. Contact David Harris: 01707-326518.
- 27/28 Canvey R&MEC. Model Railway Exhibition at the Cliffs Pavilion. Contact Brian Baker: 01702-512752.
- 27 Historical MRS (Bristol Area). Gordon Gravett: Extracts from a Modeller's Notebook. Contact Gerry Nichols: 0117-973-1862.
- 27 Hornsey ME. Family Day & Boiler Inspection. Contact Ted Gray: 9484-7583.
- 27 Oxford (City of) SME. AGM. Contact Chris Kelland: 01235-770836.
- 27/28 South Lakeland MES. Ulverston Dickensian Festival (Portable Track). Contact Adrian Dixon: 01229-869915.
- 28 MELSA. Sunday in the Park. Contact Graham Chadbone: 07-4121-4341.
- 28 Otago MES. Public Running. Contact John Clover, 221 Ravensbourne Road, Ravenbourne 9002, New Zealand.
- 28 Steam LS of Victoria. Working Bee & Barbecue Lunch. Contact Graham Plaskett: (03) 9750-5022.

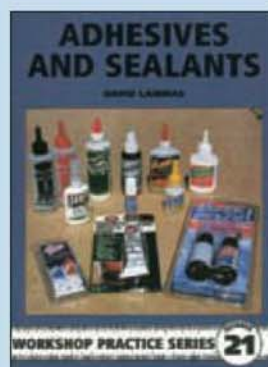
DECEMBER

- 1 Birmingham SME. Tony Sear: President's Evening. Contact John Walker: 01789-266065.
- 1 Bristol SMEE. Mike Keighley: Standing Stones. Contact Trevor Chambers: 0145-441-5085.
- 1 Chingford DMEC. Bits & Pieces. Contact Martin Masterson: 0208-989-5552.
- 1 Guildford MES. White Elephant Sale. Contact Dave Longhurst: 01428-605424.
- 1 Leeds SMEE. Christmas Dinner. Contact Colin Abrey: 01132-849630.
- 2 South Lakeland MES. AGM. Contact Adrian Dixon: 01229-869915.
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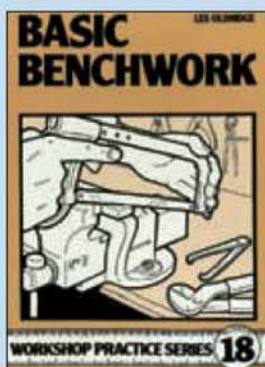


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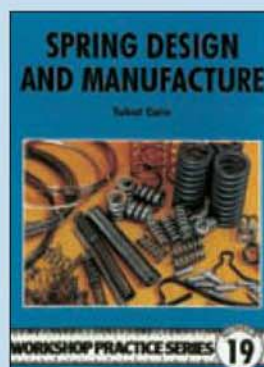
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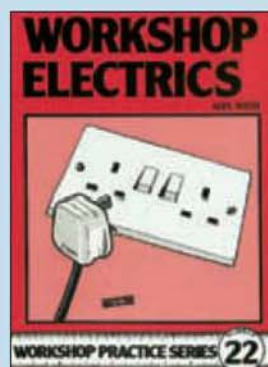
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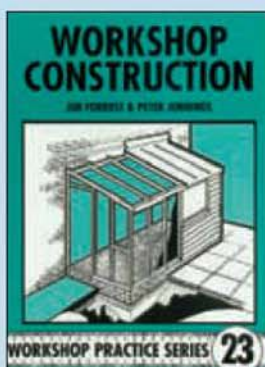
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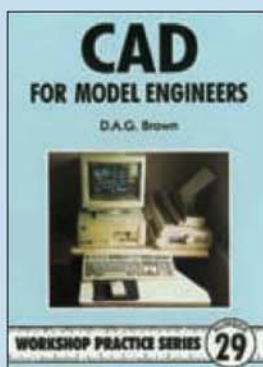
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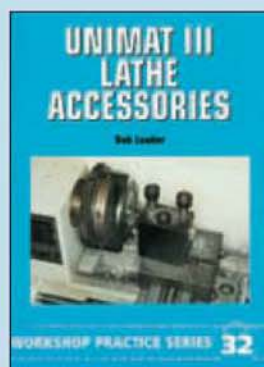
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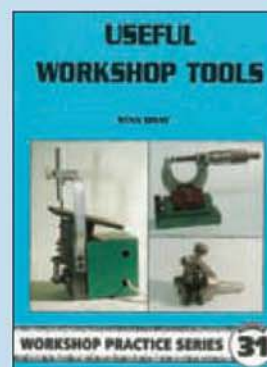
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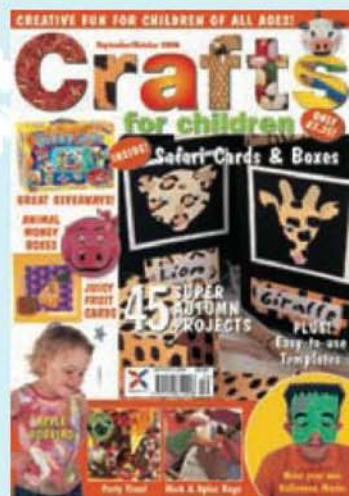
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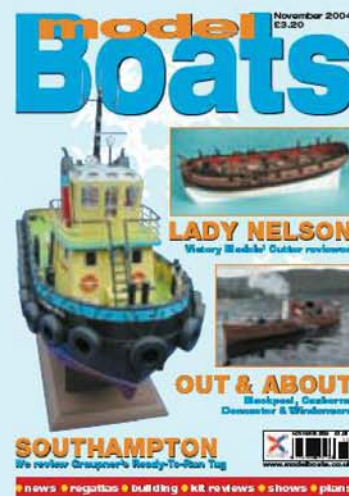
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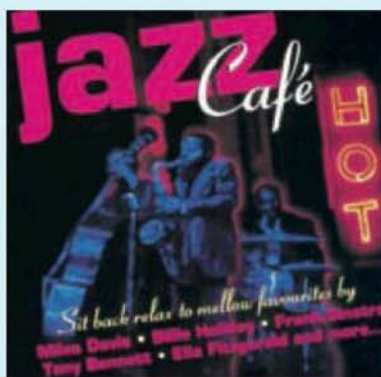
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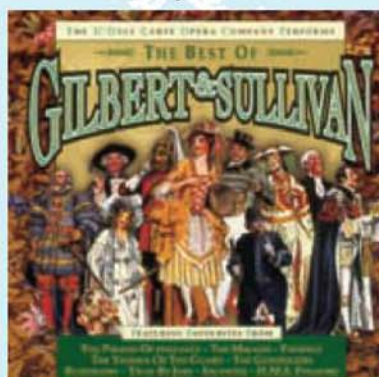
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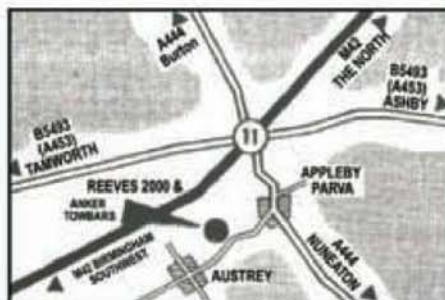


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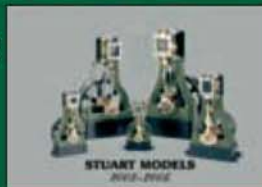
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 ELLIOT 600 OMIMILL 1/4" 3 Morse taper quill universal head, 28" x 7 1/2" powered table.....£950
 HARRISON Vertical 30 INT swivel head & clutch, 30" x 8" table / powered.....£1650
 HARRISON Horizontal, 31" x 8" powered table.....still good value £625
 HARRISON H/V 30 INT swivel head & clutch, 30" x 8" table powered.....£1650
 HOBBIYMAT milling heads.....Various
 MARLOW VERTICAL TURRET TYPE MILL, 3 MT, 28 x 7" A favorite mill for its height under the head £950
 SIP RF30, vertical milling/drilling machine complete with accessories.....Still only and New £799
 TOM SENIOR 'E' Type vertical milling machine 25" x 4 1/2", specifically designed for the production of small components, for tool room, research and development work. This excellent little machine which others have tried to copy and failed miserably is now very rare and with a selection of three in stock in almost immaculate condition is amazing for the potential buyer and will probably never be repeated.....£3200 - £3450
 Tom Senior M1 horizontal, 25" x 6" powered table, 1" arbor.....£575
 Tom Senior M1 V/H, 25" x 6", 2 MT, 1" arbor.....Selection £1200 - £1950
 Tom Senior ELL MAJOR, 2 MT quill feed head, powered 37" x 8 1/2" table in.....£2,750
 VICEROY AEW vertical mill, 30 INT swivel head, powered table 34" x 8",.....choice £1250 - £1625

DRILLS
 ASQUITH 14-54 001 MK2, SMT radial drill.....£3950
 BOXFORD 2MT pedestal drill.....£295
 FOBCO 1/2" bench, tilting table.....£325
 FOBCO 1/2" pedestal drill tilting table.....£345
 MEDDINGS 2MT pedestal drill.....£245
 MEDDINGS 2MT pedestal drill.....£275
 POLLARD CORONA pedestal 1 1/2" / 1MT.....From £100
 SIP HOP 600B 1/2" 2MT bench drill, table operated by rack, speeds; (16) 162 - 3000 rpm.....New £175
 STARTRITE Mercury 1/2" 4 speed bench drill.....£225

GRINDING / BUFFING
 ABWOOD tool and cutter grinder.....£425
 CLARKSON MK. 1 Tool and cutter grinder complete with universal head and centres.....£550

EAGLE 4W wet surface grinder + magnetic chuck.....£725
 HERBERT drill grinder + followers.....as is £245
 MILFORD 12" Pedestal Grinder.....£325
 VICEROY Grinder, pedestal model.....£145
 VICEROY Buffers, pedestal models.....each £250

MISCELLANEOUS / FABRICATION MACHINERY ETC.
 BOXFORD LITTLE GIANT toolpost grinder.....£345
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 RJH 4" bench belt sander in original condition.....£225
 BOXFORD 4 1/2" steady in.....£45 / £85
 BOXFORD vertical slide / 5" late model complete with T. slotted table.....£445
 RECORD 4" drilling vice.....NEW £15
 HUNTON BOLSTER No.2 base + rings.....£245
 ROTATING CENTRES 2MT & 3MT for tube work.....NEW £40
 MECA dividing head + tailstock, gears, banjo.....very nice £425
 BARBER COLMAN CO. bench centres.....£45
 MYFORD 4" & BOXFORD 5" back-plates.....special £19
 HPC TWO STAGE twin large compressor.....£675
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 RJH horizontal 4" finisher complete with built in dust extractor.....£325
 RJH vertical 4" finisher complete with built in dust extractor.....£625
 ABWOOD SWIVEL/TILT 4" vice in all round good condition.....very nice machine £750
 MYFORD RODNEY milling head to suit Myford ML10 lathe.....£245
 MYFORD capstan attachment (large bed mount type).....£525
 HOFFMAN dividing head complete with tailstock.....£550
 ARCHER tapping heads.....£425
 HARE MODEL 51 complete with hydraulic index-able table.....From £70
 MYFORD notch broaching fixture + notch broach.....£425
 MARFORD vertical slides just in.....£140 / £245
 BCA 12" horizontal / vertical rotary table.....£425
 BLACKSMITH tool and various leathers, anvil tools, tongs and accessories.....Various
 COPE and DRAGS / blacksmith frames.....wood £20 / metal £30
 FLAMEFAST DS 220 brazing hearth / forge.....SPECIAL £295
 ABWOOD SWIVEL/TILT 6" vice in all round good condition.....£375
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 Swivel base on own.....£49
 CROMPTON PARKINSON 3/4 HP, resilient mount, Boxford / Myford Super 7 Type motor.....New £140
 RJH BT 125 Fretsaw, variable speed.....£345
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 VERDICT CLOCKS, Long/Short Metric and Imperial models.....New £40
 FLAMEFAST LD300 soldering iron stove.....£75
 GRANITE 18" x 12" Surface Plate.....£140
 SIP 7" bandsaw, horizontal & coolant.....New £750
 DUPLEX D27A & D29 toolpost grinders.....EACH £345
 BOXFORD (imperial only) thread dial indicator.....£65
 BURNERD, D14 lever collet chuck + collets.....£400
 BURNERD, LO lever collet chuck + collets.....£400
 VERTEX Dividing head.....New £245
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 LOCKWOOD QUAD HEADED 3 MT DIE HOLDER.....quality equipment New £40
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 STARTRITE 14-S-5 woodworking band saw.....£775
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 TRANSWAVE 1.5HP Converter (including delivery charge from factory).....New £445
 TRANSWAVE MT & RT rotary converters.....From £445
 CROMPTON PARKINSON 3/4 HP, resilient mount, Boxford / Myford Super 7 Type motor.....New £140
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