

MODEL ENGINEER

Vol. 194 No. 4241

18th February - 3rd March 2005

KEW BRIDGE
STEAM MUSEUM

•
30TH
ANNIVERSARY
CELEBRATIONS

•
SUN 6TH MARCH

•
ALL WELCOME!

NARROW GAUGE IMLEC

Close run competition
at Daresbury

BUILDING A SIMPLE LATHE

Engineering for
the impecunious

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RESULTS, AWARDS & THE DUKE OF EDINBURGH TROPHY



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IN THIS ISSUE

● Vol. 194 No. 4241 18 FEBRUARY 2005 ●

SMOKE RINGS

Editorial news, views and comment.
 PAGE 189

POST BAG

Letters to the Editors.
 PAGE 190

THE 74th MODEL ENGINEER EXHIBITION RESULTS AND AWARDS

MEX 2004 Medal, Trophy and Certificate
 winners classified by their
 Competition Class.
 PAGE 192

COVER FEATURE: THE 74th MODEL ENGINEER EXHIBITION THE DUKE OF EDINBURGH CHALLENGE TROPHY

An analysis of the four competing entries
 for this prestigious award presented
 by the Chief Judge together with
 detailed notes on the judging
 procedures followed at Sandown.
 PAGE 195

LETTERS TO A GRANDSON

A by-way is followed before further
 details of the Robertson engine are
 revealed. Part LXXIII.
 PAGE 197

NARROW GAUGE IMLEC 2004

We report on a fun, but closely fought
 event, hosted this year by the
 Warrington and District Model
 Engineering Society.
 PAGE 198

FOWLER STEAM WAGON

The driver's controls, lubrication and a
 detailed list of all full size wagons
 built. Part XV.
 PAGE 202

ANNA A MANNING WARDLE LOCOMOTIVE FOR 7 1/4in. GAUGE

Further work on the boiler, regulator and
 associated parts. Part XII.
 PAGE 205

ELECTRO-PNEUMATIC CONTACTORS

Further revelations about the art of coil
 winding before going on to consider
 the actuation cylinder. Part IV.
 PAGE 209



On the cover ...

A photograph of the well detailed and
 beautifully finished back-head of Peter
 Fagg's King Arthur Class
 locomotive Sir Bors de Ganis.
 Having won a Gold Medal, the Bradbury-
 Winter Memorial Challenge Cup and the
 Charles Kennion Memorial Trophy at
 MEX2003, Peter's entry was well qualified
 to take its place on the Duke of Edinburgh
 Challenge Trophy table at this year's
 event. To find out how he fared in this
 most prestigious competition turn to page
 195 of this issue.

(Photograph by Kelvin Barber)

JOHN HARRISON'S H3 SEA CLOCK BUILDING A REPLICA

Construction continues with more
 insights into this eighteenth
 century masterpiece. Part IV.
 PAGE 212

CAMCUTTER

Completion of the cutter spindle for this
 specialised machine tool. Part VIII.
 PAGE 215

KEITH'S COLUMN: LILLIAN A NARROW GAUGE LOCOMOTIVE FOR 7 1/4in. GAUGE

Details of the expansion links, motion
 brackets and connecting rod. Part V.
 PAGE 218

BUILDING A SIMPLE LATHE

A simple but accurate lathe built from
 easily obtainable materials.
 PAGE 222

CLUB CHAT & CLUB DIARY

Recent activities and forthcoming events.
 PAGE 224

TURN TO PAGE 229 FOR GREAT OFFERS ON SUBSCRIPTIONS

INDEX to ADVERTISERS

Camden	185	Jones & Bradburn	188
Chester UK Ltd.	OBC	Leofric	180
Chronos Ltd.	228	Machine Mart	186
Classified Pages	230-234	Maxitak Ltd.	183
Compass House Tools	185	Peter Clark	183
Cotswold Heritage	180	Polly Models	180
Engineers Tool Room	187	Reeves 2000	227
G. & M. Tools	182	Screwfix	187
G.L.R.	181	Stirling-Technik	187
Greenwood Tools	183	Taunton Model Engineers	
Hemingway Kits	187	Exhibition	185
Home & Workshop Machinery	IBC	WARCO Ltd.	IFC

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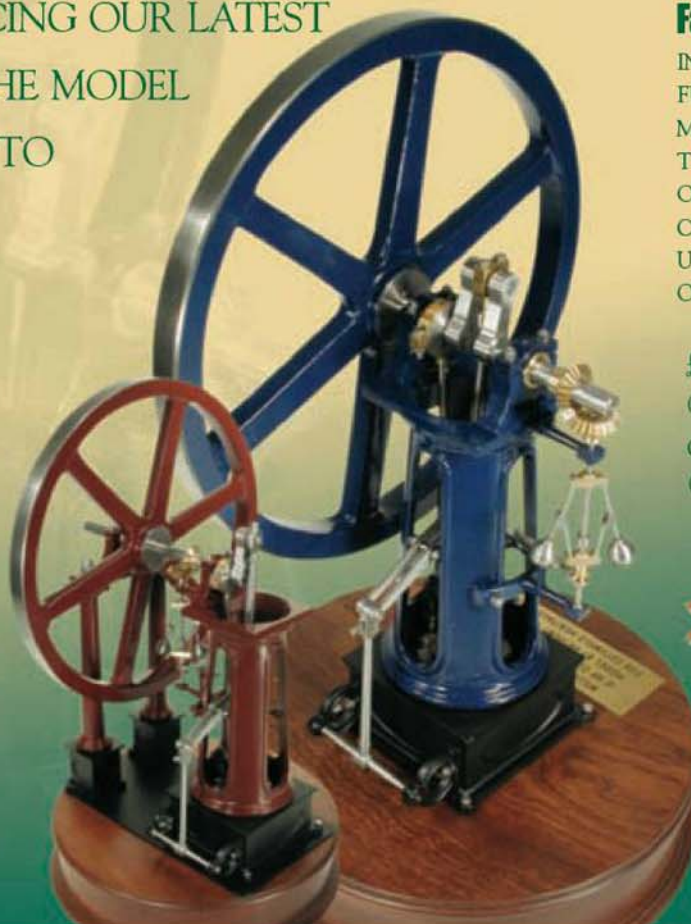
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A7	1/2 x 3/4 - 1 - 1 1/4 - 1 1/2.	23.20	

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B1	1/8 - 5/32 - 3/16 - 7/32 - 1/4 - 5/16 - 3/8.	04.92	
B2	1/4 - 5/16 - 3/8 - 7/16 - 1/2 - 9/16 - 5/8.	10.55	
B3	5/8 - 3/4 - 7/8 - 1.	17.45	
B5	3/8 - 1/2 - 5/8 - 3/4 - 7/8 - 1 EN8M	23.52	

B.M.S. HEXAGONS

C1	5/32 - 3/16 - 1/4 - 5/16 - 3/8	06.05	
C2	1/4 - 9/32 - 5/16 - 3/8 - 7/16 - 1/2 - 5/8	11.58	

B.M.S. SQUARES

D1	5/32 - 3/16 - 1/4 - 5/16 - 3/8	05.15	
D2	7/16 - 1/2 - 5/8 - 3/4	11.58	

BRASS ROUNDS

E1	1/8 - 3/16 - 1/4 - 5/16 - 3/8 - 1/2	11.65	
E2	1/16 - 3/32 - 5/32 - 7/32 - 9/32 - 7/16 - 9/16 - 5/8	17.70	

BRASS SQUARES

F1	1/8 - 3/16 - 1/4 - 5/16 - 3/8	09.90	
F2	1/4 - 5/16 - 3/8 - 7/16 - 1/2	20.20	

BRASS HEXAGONS

G1	5/32 - 3/16 - 7/32 - 1/4 - 9/31 - 5/16	08.20	
G2	1/4 - 9/32 - 5/16 - 3/8 - 7/16 - 1/2 - 5/8	23.05	

BRASS ANGLE

H1	1/4 x 1/4 x 1/16	5/16 x 5/16 x 1/18	
	3/8 x 3/8 x 1/16	1/2 x 1/2 x 1/16	09.00
H2	5/16 x 5/16 x 1/16	3/8 x 3/8 x 1/16	
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K1	3/32 - 1/8 - 5/32 - 3/16 - 7/32 - 1/4	10.92
K2	3/16 - 7/32 - 1/4 - 5/16 - 3/8 - 7/16 - 1/2	28.32

BA STAINLESS STEEL HEXAGONS 303 F/C

L1	.152" - .193" - .220" - .248" - .275" - .324"	18.18
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BA BRASS HEXAGONS

M1	.152" - .193" - .220" - .248" - .275" - .324"	09.00
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BA STEEL HEXAGONS

M2	.152" - .193" - .220" - .248" - .275" - .324"	04.30
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BRASS FLATS

N1	1/16 x 1/4 - 3/8 - 1/2 - 3/4 - 1	09.00
N3	1/8 x 1/4 - 3/8 - 1/2 - 3/4 - 1	15.50
N4	3/16 x 1/4 - 3/8 - 1/2 - 3/4 - 1	21.65
N5	1/4 x 3/8 - 1/2 - 3/4 - 1	24.65

ALUMINIUM ROUND F/C

P1	3/16 - 1/4 - 5/16 - 3/8 - 7/16 - 1/2	10.25
P2	5/8 - 3/4 - 1	17.70

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Q1	1/8 - 5/32 - 3/16 - 1/4	09.45
Q2	5/16 - 3/8 - 7/16	24.00

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S1	3/32 - 1/8 - 5/32 - 3/16 - 7/32 - 1/4 - 9/32 - 5/16 - 3/8 - 7/16 - 1/2	20.40
S2	3mm - 4mm - 5mm - 6mm - 7mm - 8mm - 9mm - 10mm - 12mm	18.00

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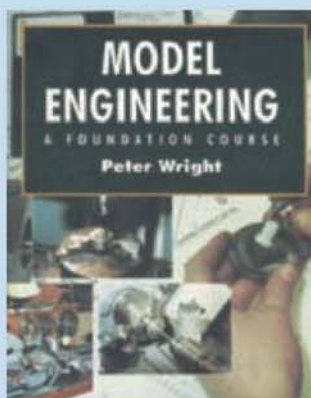


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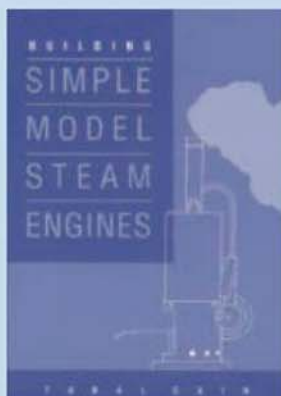
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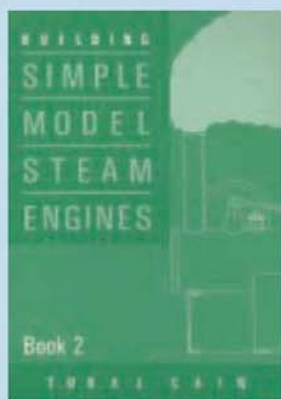
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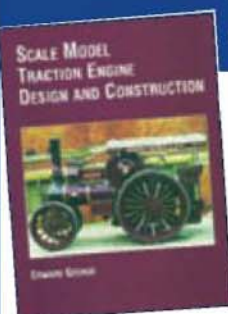
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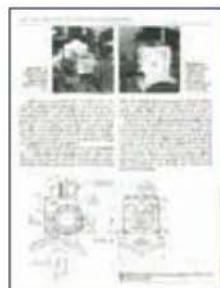


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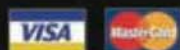
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SMOKE RINGS

With the Editors

Paradoxical gears

Following the fascinating series on paradoxical gears by our contributor Jacques Maurel we can now reveal the answer to his tie break question published in *M.E.* 4240. It seems that the idea may have been a British one and the following letter appeared in *The Engineer* for June 1923: -

I am inclosing a short description of gears that mate together, but run in the same direction. A model of brass plate has been made, and they work quite well, though their practical application is perhaps doubtful. As considerable interest and some amusement as been shown in the idea, I thought you might care to publish it. It is original as far as I know.

The analogy of the crossed belt on two pulleys to explain the action of the involute tooth, the pulleys representing the generating circles and the belt the line of action, is well known.

It occurred to the writer that if gear wheels could be designed on the same analogy, but with uncrossed belt, the wheels would both run in the same direction.

The result is shown in fig 1. It was at once apparent that step gears or helical gears would have to be used on account of interference (1); also that sliding would be considerable.

The pressure angle is 90deg., the wheels both being of the same hand. If the hand of one of the gear is changed, thus making them of opposite hand, it is as if the imaginary belt had been crossed; the wheels then become ordinary gears and run in the same direction, as shown in fig 2.

If helical gears were used in place of the step gears, apparently one tooth pinions of fairly long lead, of the same hand of helix, would mate together, turning in the same direction.

(1)Note: The problem is not interference, but is the driving path which is too low for a spur gear.

The letter is signed by F. E. Lindsay of Birmingham. It would appear that it may be yet another British idea that has been developed to fruition abroad!

M. Maurel has also pointed that a diagram comparing the true involute profile to that achieved by approximating it to an arc of a circle was omitted from part III of the series. We reproduce it here and apologise to M. Maurel and those many readers following this series for the omission.

Chronos Open Weekend

We have received a letter from Mark Smith of Chronos Engineering Supplies to say that their Open Weekend held on 26, 27 and 28 November 2004 was a huge success with over 600 visitors coming to see the company's new premises in Dunstable and their expanded range of products.

Mark wishes to thank all customers, old and new, who took the trouble to visit and adds that the popularity of the event "was far greater than we had hoped for". Plans are in hand to make the Open Weekend an annual event. The winner of the MJ189 lathe that was in the free draw was Mr. McMahon of Houghton Regis and we congratulate Mr. McMahon on his good fortune.

Chronos can be contacted at Unit 14, Dukeminster Estate, Church Street,

Dunstable LU5 4HU; tel: 01582-471900; fax: 01582-471920; email: sales@chronos.ltd.uk; website: www.chronos.ltd.uk

Peter Guy

We have been contacted by Peter Guy, of Worthing DSME, who is available for general light machining work, one-offs, small batch machining and the production of industrial models in metal and plastic. The production of one-offs is a speciality.

Happy to machine castings and parts for models and with some 40 years experience, he has built several models including *Metro*, *Sweet Pea* and two *Railmotor* locomotives, and is one

M.E. postal address

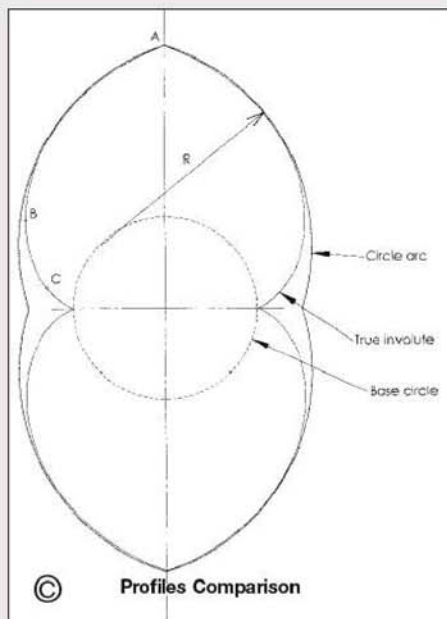
All contributors and correspondents are urged to note that letters or material for the attention of the Editors should be sent to the Orpington office which now has responsibility for its distribution.

With immediate effect the Hemel Hempstead PO Box number ceases to be operational.

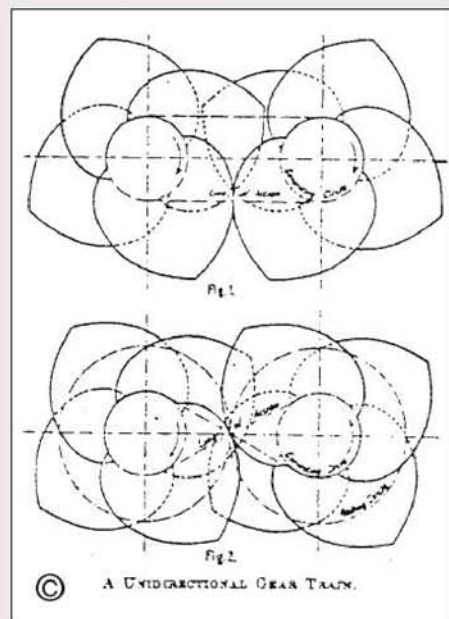
The Orpington office address appears at the top left-hand corner of the contents page of each issue.

of the Worthing DSME boiler inspectors.

Peter has recently introduced a series of classified advertisements in this magazine and may be contacted by telephone or fax on 01903-755745, mobile: 07906-193143 or e-mail: gpeter430@aol.com



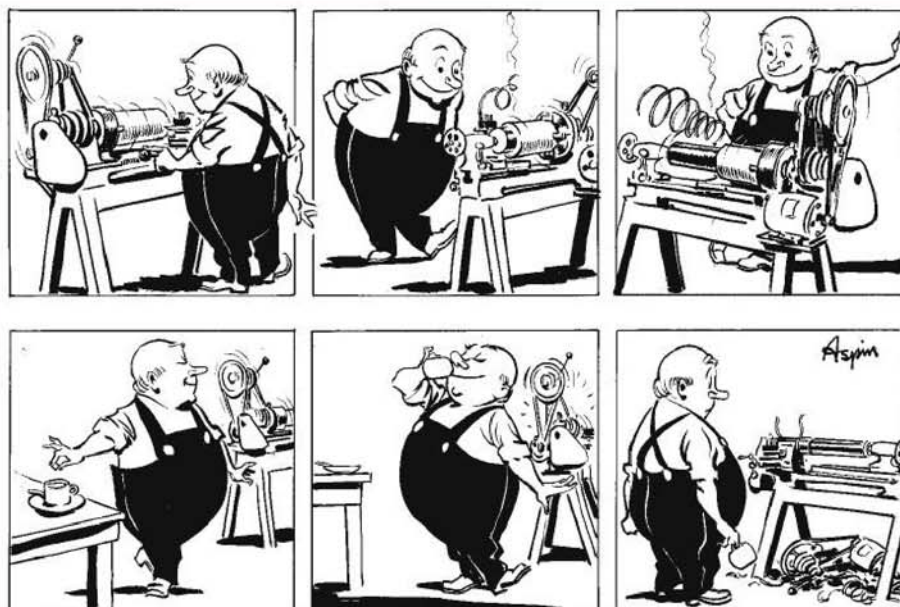
The diagram that should have appeared in part III of M. Maurel's series on paradoxical gears.



The diagram that accompanied Mr. Lindsay's letter to *The Engineer* in 1923.

CHUCK, the MUDDLE ENGINEER

by B. TERRY ASPIN



POST BAG

Old enough to know better

SIRS, - I have never before written to any publication, and I should be old enough to know better. Nevertheless, I should like to comment on *M.E.* 4237, 24 December 2004. As usual I am thoroughly enjoying its contents but I was surprised to see the subject of the front cover. I have nothing against Brian Young and recognise his expertise. I would challenge the claim that the timber choice is such that you could mistake this miniature (1/12th scale?) for the real thing, but that is not why I am writing. My concern is that I do not believe miniature furniture is model engineering. The link involving Charles Rennie Mackintosh and Bassett-Lowke is a bit too tenuous.

I hope I may be seen as better qualified than some to make this observation because for 30 years my wife's passion and business has been dolls, doll's houses and other miniatures. So, as well as my own engineering interests, I am acquainted with that scene well enough to know that it is well served with magazines that have the words doll, doll's house, or miniature in the title. I do not believe their projects need be covered in *M.E.*

You may suggest that such miniatures are a parallel interest to readers of *Model Engineer*. I might counter by listing gardening, football, and drinking beer, but I imagine you are not planning cover pictures of cauliflowers, David Beckham, or the inside of the Red Lion. Other likely interests come to mind, but I hope you are going to leave the relevant pictures to other publishers.

I recognise the difficulty in finding an interesting picture every two weeks, and anyhow you will not take this very seriously. I know also that there is no very apt definition of what constitutes model engineering in the 21st Century, but I hope you will agree that it does not include the miniaturisation of a room setting to 1:12 or any other scale.

John Davies, Sussex.

Neil Read comments:

On the contrary Mr. Davies, we do take your remarks seriously. We are not short of photographs of traditional model engineering subjects but, once in a while, like to feature something on the front cover a little out of the ordinary. We are

not brave enough to try and define what constitutes model

engineering either but would like to feel we cover as many of the branches of the hobby as we can within the usual constraints of space. What do other readers think?

With knobs on

SIRS, - I read with particular interest two letters in *M.E.* 4238, 7 January 2005 and would like to offer the following comments.

Firstly, the letter from Mr. Gascoyne. I would debate his suggestion that the knob on the top of the pillar of a scribing gauge is only to facilitate assembly. Whilst I agree that it would possibly have some effect in its initial assembly afterwards the slider is rarely removed. I believe that the knob has two functions, firstly decorative and traditional and secondly that the recess formed by the neck below the ball acts as a stowage and protection for the point of the bent end of the scribe. I do not know if I was taught this sometime in the distant past but I have always used it so.

I also remember advertisements for the Pilot Plug Gauge Co. in a weekly magazine *Practical Engineering* which I read as a lad before joining the RAF in World War Two.

With respect to the letter from Mr. Rowe regarding halogen security lights the following anecdote regarding them may amuse or help. Sometime ago we were attempting to dismantle a Le Rhone rotary engine at the Fleet Air Arm Museum at Yeovilton. We were hampered in this by two factors. Firstly the lack of the specialist tools for this engine and the fact that the oil (castor oil?) had hardened and/or oxidised and was like baked on varnish. It had to be removed with paint stripper and scrapers.

On removing the front cover and propeller boss we were confronted with a diaphragm. Most of a morning was spent with improvised pullers all to no avail. I then had an idea and before we went to lunch placed three halogen lights against the crankcase. On our return about an hour later the crankcase was nicely warm and the plate was lying loose on top. I hope that this may be of some interest,

Derek S. Moxley, Yeovil.

Fairbairn engine

SIRS, - I was delighted to see the series on the Fairbairn engine. Among some of Ronald Clark's

photographs, which I purchased at the Auction at Weeting following his death, are a few of a Fairbairn twin-cylinder, twin-column engine once in the Norwich Locomotive works. If Mr. Mount has an interest in seeing these I would be more than happy to scan and e-mail them to him - copying might not be too viable an option as they are contact prints.

On another matter, I am researching the Norwich firm of Riches and Watts, the last direct contact reference I have found is in the pages of *M.E.* 2244, 11 May 1944 where a Mr. R. Hall of 'RAF' writes regarding the model of one of their portables, used for marketing, purchased at a sale following the death of the son of Mr. Richard Robert Riches (one of the original partners). I am writing to ask if it would be possible to print/ask if Mr. Hall is still with us or if anyone knows anything regarding the whereabouts of this engine or indeed anything else about the firm. They vanished just before the turn of the 20th century, despite being considerably advanced technically compared with some of their better-known competitors. They made very efficient stationary and portable engines, including tandem compounds, as well as the singles and regular, side by side compounds. They also had well established markets in New Zealand and South America apart from the UK and Europe.

I would appreciate any help readers can offer. Some details of the firm and surviving engines can be found on my website www.phoenixbooks.org
Richard Adamek, by e-mail.

Cast frames

SIRS, - In his *Penrhos Grange* article (*M.E.* 4238, 7 January 2005), Neville Evans mentions the cast steel frames as used on the later American steam locomotives. It may be of interest to readers to elaborate on this subject a little as American locomotives have been mentioned several times recently. These frames or engine beds were cast by General Steel Castings Corporation which was partly owned by Alco and Baldwin and, I believe, Commonwealth Steel. The well known Commonwealth bogies used by British Rail on a number of passenger carriages and also on Class 47 and Class 31 diesel locomotives were made under licence in the UK by English Steel of Sheffield. If you look closely at one of these bogies you will see the General Steel Castings Corporation trade mark, a

shield with four stars above a stylised letter G, cast into it.

An excellent example of a General Steel Castings Corporation cast locomotive bed can be seen in the UK at the Buckinghamshire Railway Centre at Quainton Road station on the South African Railways Class 25NC locomotive on display there. This locomotive also has cast steel bogie frames, a one piece cast steel tender frame and Commonwealth cast steel, six wheel tender trucks (bogies).

The later American cast steel engine beds even had the main air reservoir as part of the casting between the frames. One can only marvel at the skill of the pattern makers and moulders who produced such complicated castings.

Malcolm Young, Milton Keynes.

Time

SIRS, - I believe the 'little poem' that stuck in Neil's mind (*Smoke Rings*, *M.E.* 4238, 7 January 2005) is as follows. I cannot name the author, but as far as I can recall the words are inscribed somewhere near the clock in Chester Cathedral. Mind you, with the passage of time since I hurriedly scribbled down the words, I could be wrong!

It goes like this: -

When as a child I laughed and wept,

Time crept.

When as a youth I dreamed and talked,

Time walked.

When I became a full-grown man,

Time ran.

And later as I older grew,

Time flew.

Soon I shall find while travelling on

Time gone.

Will Christ have saved my soul by then?

Amen.

Earlier this year I had a coronary artery by-pass. I really must spend more time in the workshop (and in church!) before the end of the poem catches up with me!

T. R. Hawke, Cornwall.

Mystery item

SIRS, - Many years ago, my wife purchased this item (see photograph) for me at an auction, because she knew that I was always interested with anything featuring gear wheels!

The years have passed and every now and again I look at it and wonder what on earth its function is. Engineer friends have examined the 'machine' and proffered no convincing suggestions.



The curious mystery item owned by Dr. Dickson who is most anxious to find out its exact purpose.

The device is solidly constructed on a cast-iron frame. It is designed to be mounted on a bench/table-top and has three holes, one of which is square sectioned, in the flange above the securing clamps. These must have held auxiliary pieces of mechanism. It is hand driven with no provision for being motorised; the central cylinder, which the handle rotates, looks like a commutator but is not. The bright metal parts, which include the arm which holds the central spindle for the cylinder to rotate around, are nickel-plated.

Any help fellow readers can offer in identifying this object would be greatly appreciated.

Derry Dickson, Argyll & Bute.

Needle roller bearings

SIRS, - With reference to Geoff Johnson's letter regarding the use of needle roller bearings (*M.E.* 4237, 24 December 2004), I am currently building a 7 1/4 in. gauge steam locomotive with these bearings. I have also built a large double bogie 7 1/4 in. gauge weed spray rig for the club that carries 180 litres of spray.

The bearings used on the locomotive (0-4-4-0 Mallet) are SKF HK2820 (28mm shaft, bearing 35mm O/D x 20mm wide) and these run direct on tracks precision ground on AISI 4140 steel stock (about 60 tonf/in² ultimate tensile stress) which is used for the locomotive axles. These bearings are the type with pressed outer tracks and no oil seals and they are mounted in 'cannon boxes' with a standard double lip oil seal to the outside and the box provides an oil reservoir. These bearings are designed for a maximum dynamic (rotating) load of 20,100N or about 4,500lbf load each, or about 2 tons force, as there are eight of them this equates to 16 tons force total permissible load using hardened tracks. The locomotive is expected

to weigh about 3/4 ton in running order so the bearings can carry about 21.5 times the locomotive weight, as this 3/4 ton is distributed over 8 bearings they each carry about 210 pounds force. All this above means there is a safety factor of about 21.4 in loading, reduced slightly by the somewhat softer axle bearing surfaces, and the bearings should outlast the locomotive.

The spray rig has HK 1616 bearings (16mm shaft, bearing 22mm O/D x 16mm wide) these are mounted in hollow axles with a separate double lip oil seals and run on plain precision ground AISI 4140 steel stock (*à la* Keith Wilson) located in plain axle boxes. This assembly is lubricated via a 1/16 in. cross drilling inboard of the bearings linking with an end drilling of the same size. The axle is sealed in the axle box by an O-ring in a groove. This arrangement allows oil to be pumped right through the axle assembly from one box oil plug to the other. There is no other means of securing the axles from rotation than the O-rings (which are tight) - they do not appear to be moving apart from normal articulation within a tapered seating in the boxes. These bearings have a maximum dynamic loading of 10,500N or about 2,360lbf - call it 1 ton force. There are eight bearings, so 8 tons plus of load capacity and the estimated all up weight of the rig is about 600 pounds. Therefore, this gives a safety factor of about 30, again reduced slightly because of the softer bearing surface.

In all the above I have ignored the probable fact that the figures quoted for dynamic loadings already make an allowance for a safety factor - probably at least of '6' as the static loadings are much, much higher. If such a further safety factor is included we would probably end up with factors for the above projects of well over 100 and these bearings are going to outlast us!

I hope the above is of some assistance to Geoff, there was much consulting with retired engineers among the club members before this was done, being a 'belt and braces' man I wanted to make sure.
Peter King, New Zealand.

Conquest of chatter

SIRS, - Like Harry Barrett, (*M.E.* 4238, 7 January 2005) I have been having chattering problems with my Chester Conquest mini-lathe. This was possibly due to me getting a parting tool jammed under the work a while back. It was at the stage where a 15mm steel bar could not be faced when only 10mm from the chuck. I phoned Chester for some advice and was told to try and tighten up the castellated nuts on the end of the spindle to take up the play.

This did not make any difference and the reason for this was found out later. I asked about the feasibility of fitting taper roller bearings but was told that they were slightly larger than the originals at 17.25mm compared to 16mm and that fitting angular contact bearings would be easier as they are the same size. The gentleman from Chester (I did not get his name) also gave me the confidence to tackle the job myself.

In stripping down the headstock, the biggest problem I found was removing the woodruff key from the spindle. This was eventually removed by gripping the key in a vice and levering it out. I fitted the two new 7206 bearings, sourced from RS Components, and after reassembling the headstock could not tighten up the castellated nuts enough to take up the play in the bearings. Even though I did not have the proper C-spanner and was using slip joint pliers something was obviously wrong and I had to strip it down again. The distance between the inner faces of the bearings on my lathe is 60mm give or take a bit. The spindle gear and spacers which keep the gear centred between the two bearings added up to 62mm. No wonder that my initial attempts to take up the play were unsuccessful. The

spacers are made from plastic so I decided to sand off about 1.5mm from each, which would allow the axial tension required by the bearings. After reassembly, it was a joy to be able to cut metal without chattering. Things were going so well that I attempted a parting operation again. Another jammed tool and more play on the spindle. This time, a quick tightening up of the C-nuts and I was working again.

I do not know if the lathe alignment is seriously affected by replacing the bearings but for me, it is much more important to be able to cut without the dreaded chatter. If my skills ever reach the stage where accurate alignment is important, I will look at it then and maybe even mount the lathe on a solid surface. Do I hear shouts from the more experienced that my lathe will be wrecked first?

I do not know whether the taper roller bearings or angular contact bearings are superior in a lathe headstock but did notice that Myford use a plain bearing. A search for angular contact bearings on the internet found a reference to the fact that a Hardinge HLV which is described as a super-precision toolroom lathe is fitted with them. The reason I picked Chester was that they had some with them at Harrogate last year and I was able to take it home with me. This machine is my first experience of metal turning. One of the reasons I decided on the mini lathe was the wealth of information available on the internet www.mini-lathe.com has a series of photos supplied by SEIG which show the tear down and reassembly of the head stock. There is no text though.

Anyone who has a mini lathe should consider making a cam operated tailstock lock. I consider this to be one of the most useful mini lathe modifications and with my limited experience if I can make one then anyone can do it. The one I made is described at www.gadgetbuilder.com which also has a useful section on alignment checking.

Archie McNee, Falkirk.

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THE 74TH MODEL ENGINEER EXHIBITION RESULTS AND AWARDS

THE DUKE OF EDINBURGH CHALLENGE TROPHY

Peter Fagg

*Sir Bors de Ganis 5in. gauge Southern Railway
4-6-0 Locomotive*

CLASS A1: HOT AIR ENGINES

Very Highly Commended:

Norman Barber

The Heinrici Hot Air Engine

CLASS A2: GENERAL ENGINEERING MODELS

Gold Medal and the Tom Nevins Memorial Trophy:

Philip Pugh

Greenwich Gem Type Steam Fire Engine

Silver Medal:

Philip Pugh

*Shand Mason Oswestry Town Manual
Fire Pump*

Commended:

Norman Barber

A Freelance Horizontal Steam Engine

CLASS A3: INTERNAL COMBUSTION ENGINES

Gold Medal and the Edgar Westbury Trophy:

Rolf Depping

DKW ULD 250 Two-stroke Racing Engine

CLASS A4: MECHANICALLY PROPELLED ROAD VEHICLES

Gold Medal and the Aveling-Barford Trophy:

Harold White

Savory/Garrett Ploughing Engine

Gold Medal and the Bill Hughes Cup:

Stephen Harbach

Burrell Showman's Engine The Griffin

Silver Medal:

Richard Hodges

Fowler Road Locomotive King Carnival II

Bronze Medal:

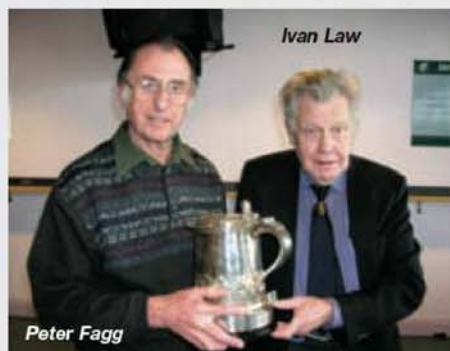
Alan Walker

Burrell Scenic Showmans Engine Lord Curzon

Bronze Medal:

Eric Williams

Royal Chester Allchin Traction Engine



Ivan Law

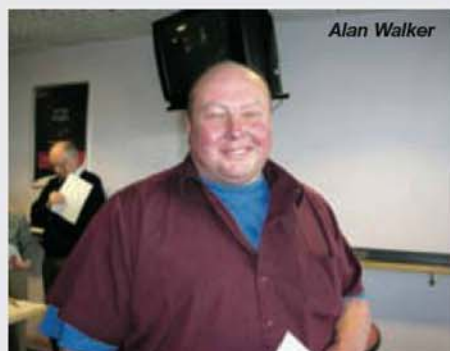
Peter Fagg



Philip Pugh



Rolf Depping



Alan Walker



Harold White



Stephen Harbach



Peter Glenister



Anthony Graham



Esa Kaariaho

Very Highly Commended:

Brian Baker Foster 5in. scale Single Cylinder Rope Hauling Engine

Highly Commended:

Kenneth Sims Minnie

CLASS A5: TOOLS AND WORKSHOP APPLIANCES

Silver Medal and the Bowyer Lowe Challenge Cup:

Peter Rawlinson Continuous Wire Eroder – CNC Controlled

Bronze Medal:

Peter Glenister Stent Tool and Cutter Grinder

Very Highly Commended:

Peter Clark Integrated Lathe Tooling

Highly Commended:

Derrick Cross Improvements to 90 x 325mm Bench Lathe

Highly Commended:

Alan Wragg Vertical Polishing/Honing Machine

CLASS A6: HOROLOGICAL, SCIENTIFIC

AND OPTICAL APPARATUS

Silver Medal:

Anthony Graham Skeleton Clock

Bronze Medal:

Henery Penberthy Large Balance Wheel Electric Clock

Commended:

John Chantler 'Anti War' Clock

CLASS A7: GENERAL ENGINEERING EXHIBITS

Silver Medal:

Esa Kaariaho Mark VII (Vickers Mark VI) 8in Howitzer

Highly Commended:

Barry Glover Franklin G2 Power-Assisted Reverser

Commended:

Barry Glover Westinghouse A6ET Brake Valve and Pedestal

CLASS B1: WORKING STEAM LOCOMOTIVES

(1in. SCALE and OVER)

Gold Medal and the J. N. Maskelyne Memorial Trophy:

John Heslop 5in Gauge Rebuilt Royal Scot Class Loco

Gold Medal and the Charles Kennion Memorial Trophy:

Chris Vine LNER B1 Bongo

Silver Medal:

Michael Perry Duchess of Hamilton 5in. gauge Pacific

Silver Medal and the Crebbin Memorial Cup:

Alan Jensen 5in. gauge GWR 4-6-0 Denbigh Manor 7830

Silver Medal:

Les Walters Ramsbury Manor No. 7829

Bronze Medal:

Charles Davison 5in. gauge Springbok

CLASS B2: WORKING STEAM LOCOMOTIVES

(UNDER 1in. SCALE)

Bronze Medal:

Christopher Barnacle Alice Class Hunslet Quarry Locomotive ex-works 1891



John Heslop



Chris Vine



Michael Perry



Alan Jensen



Les Walters



Brian Simpson



Brian Young



Leslie Jones



Stephen Atkinson



Arthur Bodily



David Horton



Paul Winter

CLASS B3: LOCOMOTIVES OF ANY SCALE

Bronze Medal:

Charles Davison 5in gauge *Simplex*

CLASS B12: TRAMWAY VEHICLES

Silver Medal:

Terry Russell 1936 London Tramcar

CLASS G1: TRAMWAY VEHICLES

Gold Medal and the John Thompson Trophy:

Brian Simpson Bavarian Waggon

Silver Medal:

Brian Young Mellor's Stripper

Silver Medal:

Leslie Jones Robinson & Napton Lifeboat Carriage

CLASS J1:

ANY TYPE OF MODEL MADE BY AN UNDER 14 YEAR OLD

Commended:

Curtis Church A Freelance Cannon of Circa 1800

CLASS K1: NON-WORKING CARS

Silver Medal:

Stephen Atkinson MG TC of 1946

Silver Medal:

Ian Scott 1937 Leyland Gearless Fire Engine

CLASS K7: FUNCTIONAL MODEL CARS

Gold Medal and the Bradbury-Winter Memorial Challenge Cup:

Arthur Bodily 1936, 747cc Twin Cam Austin Racer

Very Highly Commended:

David Lee

'Big Jim' Euclid-Hitachi Dump Truck

Highly Commended:

John Nell

Caterpillar 789B Mining Truck

Highly Commended:

Leonard Cooper

1964 Routemaster Double Deck Bus

Commended:

Leonard Cooper

Morris Minor Fire Engine

CLASS L1: SCALE FLYING MODELS IN ANY SCALE FOR RADIO CONTROL

Bronze Medal:

David Horton

Cosmic Wind Miss Milly Jane

Bronze Medal:

David Horton

Cosmic Wind Miss Julia Louise

Very Highly Commended:

Colin Agate

Miles Falcon

CLASS L2: SCALE FLYING MODELS IN ANY SCALE FOR FREEFLIGHT OR CONTROL LINE

Bronze Medal:

Paul Winter

Strega

Bronze Medal:

Peter Morris

Dornier 335 Pfeil 1945

BEST CLUB STAND

The Society of Ornamental Turners



Peter Morris



The Society of Ornamental Turners



Master of Ceremonies Mike Chrisp chats to Cherry Hill.



David Brown's Leander Class frigate HMS Danae was displayed with several alternative modules illustrating variations in ships within the class.



Also by David Brown was this superb model of the Hunt Class mine hunter HMS Chiddingfold.

THE DUKE OF EDINBURGH CHALLENGE TROPHY

AT THE 74th MODEL ENGINEER EXHIBITION

Ivan Law

our Chief Judge, describes the superb entries that contested this prestigious award.

Judging the Duke of Edinburgh Challenge Trophy is always a pleasant but daunting task. Pleasant because the standard of the models on display is of the highest order and daunting because there can only be one winner. Only models that have been awarded a Gold or Silver Medal, or one of the major trophies in any previous M.E. Exhibition are eligible for entry into this prestigious event. The fact that a model is accepted into the competition is an achievement in itself and one that should give pride to any model engineer whose model is on display. It is, however, a 'first past the post' competition with no recognition for coming second. This is a method of judging that I do not favour and, although there does not appear to be an alternative in the case of this particular trophy, this system of judging does not apply to any other sections in the overall competition.

One hundred years

The Model Engineer Exhibition is now almost 100 years-old and much has been learned about judging in that time. The system I inherited when I was appointed Chief Judge (that seems a long time ago) still contained an element of the 'first past the post system' and this was resulting in some inconsistencies and anomalies. A model that was awarded 'first prize' in one year's exhibition may not have been of sufficiently high standard to obtain a place in the first three the following year. Conversely, in a year when the general standard is high the models awarded second prize, third prize or even getting no recognition at all (if, as is usual in this type of assessment, there is only three categories) could be up to or even well above the standard that merits a major award. There is no consistency in this system of judging as the

standards vary depending on the models entered into the competition.

At the M. E. Exhibition the method of judging that has evolved is that the models are not judged against each other but to a standard. We have three medal standards, Gold, Silver, and Bronze. It does not matter how many or how few models there are in a section. If a model is up to one of those standards it will receive the appropriate award. It is therefore possible for all the entries in a section to be awarded a Gold Medal, provided of course they are all up to Gold Medal standard.

Experience

The judges must be consistent and fully aware of the standards and this comes with experience. When introducing a new judge into the panel I always try to get them to work with, preferably, two experienced colleagues as this helps to maintain the standards at a constant level. Judges rarely work alone, a minimum of two, or preferably three, specialised judges per section seems to have worked well. Although they initially mark as individuals, it is surprising how close those marks are when they get together to confer before making the final decision on each and every model.

As already mentioned, in addition to the medals, a model may be awarded one of the cups or trophies. Such an award automatically allows that model entry into the Duke of Edinburgh Competition should its builder so desire. There are about 25 of these trophies covering most of the 40 sections in the competition. These cups can, on occasions, lead to some confusion, particularly with the general public. It can happen, and often does, that some models that have been awarded a trophy are not quite up to the same high standard as those that have no such recognition. In fact there may be no Gold Medal awarded in a particular section and yet a trophy may be awarded to an exhibit that has a Silver Medal, or on some rare occasions, a Bronze. When this happens the poor old judge comes in for some criticism.

There is, of course, a reason for this apparent anomaly. Most of the cups have been donated

either by individuals, or by some organisation, often as a memorial trophy. In either case the donor sometimes specifies conditions relating to the type of model that is eligible to receive the award. For instance, there is a cup available in the locomotive section that specifies that the prototype of the model must have been in service before pre-grouping i.e. before 1923. Another award is only available to models built to the designs of LBSC. There is one cup that can only be awarded to an entrant who is under the age of 25 on the date of entry and that entry must be a piece of workshop equipment! That cup is rarely awarded. The judges have a free hand with most of the awards and always endeavour to ensure that the most deserving entrant receives the recognition due.

Stringent

With such stringent conditions governing the terms of entry into this competition it is not surprising that the number of entrants each year are relatively few in number. The average received being approximately four, although there have been occasions when there have been as many as eight models on display. One of the by-products of this event is that not only the judges but the also the general public have the opportunity of inspecting an outstanding model for a second time. As mentioned earlier, there is only the one award, and so the judges have no means of showing their appreciation to the other contestants, however the fact that a model is on the Duke of Edinburgh stand must be considered an honour in itself.

There were four entries in this year's competition. They were two model boats, one a Hunt Class mine sweeper and the other a Leander Class frigate. The third model was an I/C engine, a scale, working BMW racing motorcycle engine and the final entry was a 5in. gauge Southern Railway, King Arthur Class locomotive. All the entries had been meticulously examined by judges in a previous Model Engineer Exhibition. Therefore, the judges did not have to assess each individual model again because their standard was known. The problem is how to compare



The well-detailed model of the 1938 twin-cylinder, supercharged BMW RS 500 engine by Rolf Depping.



Peter Fagg's beautifully made 5in. gauge Southern Railway King Arthur Class locomotive Sir Bors de Ganis.

them to each other. This is usually an almost impossible task as the models represent widely differing disciplines. Just how does one compare a superb model warship with a Gold Medal locomotive? This is a problem the judges are confronted with every year, and usually involves deep and long discussions. One facet that invariably has an influence on the final decision is the number of disciplines involved in the model's construction. Often, after the final decision has been announced, I invariably go back to the display stand and wonder if our deliberations have been correct! However, I believe we are usually correct and I know that the disappointed contestants have the reassurance that their model was under consideration for the highest award that any model can achieve.

Model ships

The two model ships that were entered were both built by the same person, Mr. David Brown of Liskeard in Cornwall. David is no newcomer to the Model Engineer Exhibition having won Gold Medals in the past for his work on model warships. He informed me that most of his collection are on permanent display in the Plymouth Naval Base Museum and that the two models entered into the competition were destined to go there after the exhibition had ended.

Both of the models on display were constructed to his usual scale of 1:96. This resulted in the length of the Leander Class frigate, HMS *Danae*, being about 47 inches. The smaller Hunt Class mine hunter, HMS *Chiddingfold* measuring about 24 inches. When making models of large prototypes the question of detail becomes paramount, what small details should be attempted and what should be omitted. If small details are made over scale then this spoils the overall effect of the model. If, on the other hand, some details are omitted then the finished model looks bare and the overall effect is marred. Mr. Brown has obviously given much thought to the problem and his models look just right. If any small impractical details are omitted then this is not apparent. The depth of detail incorporated in his small replicas illustrates the craftsmanship and artistry that David Brown possesses. One interesting feature of the Frigate is that, in the case along side the model, are a number of modules. This allows the model to be assembled to represent other ships of the same class. For instance, one equipped with special armoury or ships employing sonar or decoy systems. In all there were six variations, which added interest to the display. Both models were

built on the 'plank on frame' principle and are completely scratch built from basic raw materials, mainly by hand and the use of his Myford ML7 lathe. Mr. Brown deserves our congratulations for his work and our thanks for allowing us the privilege of seeing the models for a second time. I am sure those members of the general public who attend the museum in Plymouth will appreciate them.

I/C engine

There are just one or two model engineers whose work is unique and instantly recognisable. Mrs. Cherry Hill for instance - her models could not be mistakenly attributed to anyone else. A new member is joining this illustrious group, Mr. Rolf Depping of Germany. Mr. Depping has become a regular exhibitor at the Model Engineer Exhibition and also a collector of Gold Medals! He specialises in I/C engines, and his work possesses that certain indefinable quality that bares his hallmark. His entry into this year's competition was a horizontally opposed, twin-cylinder motorcycle engine, a 1938 BMW RS 500 supercharged racing engine built to a scale of 1:2.75. I believe the prototype engine was that which powered the machine ridden to victory by Georg Meier in the 1939 Isle of Man T.T. and this was one of the last supercharged engines to run in the race before the supercharger was banned.

Mr. Depping had to prepare his own drawings from information he gathered over a period of time. No castings were made as all the components were machined from the solid. There are certain advantages to this method of construction. An irregular shaped item can remain part of a regular shaped block until all the machining operations are completed and then finally removed from the block. It was not possible this year to examine the complicated interior of the model but the authenticity of these components had been discussed when the model received its Gold Medal last year. The model was an example of very fine workmanship, the finish was of the highest standard as is usual with all this gentleman's work. I am looking forward to seeing more of Mr. Depping's work in the future.

Locomotive

The fourth model in the competition was a 5in. gauge locomotive and tender *Sir Bors de Ganis* built by Mr. Peter Fagg from Storrington, this is a Southern Railway, N15 King Arthur Class locomotive. These engines were derived from a A. W. Urie design of 1918 and used on the

LSWR. The original locomotives had their problems so when R. E. L. Maunsell became the Chief Mechanical Engineer of the Southern Railway he had them modified and they became the King Arthurs. *Sir Bors de Ganis* was the first of a batch of 30 engines fitted with eight-wheeled tenders to be built by the North British Locomotive Company. The prototype of the model No. 763 entered service in 1925 and was finally withdrawn in 1960. In order to construct the model Mr. Fagg had first to produce a set of drawings. He was helped here by a few works drawings he had managed to acquire together with a collection of photographs. For other information visits to the Bluebell Railway were made where he was allowed access to one of their engines. His aim was to build a model as near scale as possible but, at the same time, it had to be a locomotive capable of heavy work on the track. Mr. Fagg made all his own patterns and had the cylinders and valve liners cast in Meehanite. The rings for both the pistons and valves were obtained from a piston ring company but to Mr. Fagg's specification. Other than these items, and the pressure gauge, Mr. Fagg designed and constructed everything else himself.

The boiler is made from copper and based on Martin Evans design for Springbok and has two home-made injectors. The cross-head vacuum pump on the prototype is reproduced on the model but serves as a boiler feed pump. I think it can be said, without doubt, that Peter has achieved his original ambition. It is an outstanding scale model and after careful inspection, I am sure it will perform up to expectations on the track.

There is no predetermined or fixed panel of judges for deciding the Duke of Edinburgh Competition. I usually wait until all the models are on show and gathered together and then form a panel in which the discipline involved in each model can be represented and discussed by a judge who specialises in those disciplines. This ensures that each of the models entered has a spokesman who can illustrate to the other judges the finer points that may not have been fully appreciated by them. After each judge has expressed his opinion a general discussion takes place and the result is not finally decided until, preferably, the decision of all the judges is unanimous. I am pleased to say that this is normally the case but there have been times when, after a prolonged debate, the award has been announced by a majority vote. Such is the nature of the competition and the integrity of all the judges concerned. The award this year went in favour of Mr. Fagg for his excellent model of *Sir Bors de Ganis*. 

LETTERS TO A GRANDSON

M.J.H. Ellis

follows a 'by-way' before returning to the intricacies of the Robertson engine and discussing reasons for its commercial failure.

●Part LXXIII continued from page 103 (M.E. 4239, 21 January 2005)

Dear Adrian, I told you in my last letter that I would continue on the subject of the Robertson engine. But all my life I have found it difficult to resist the temptation of by-ways and, for a little while, I am going to do it again. I meant that literally as well as figuratively. Although, more often than not, following sign-posts bearing such beguiling inscriptions as 'Ready Token', 'Great Snoring', or 'Yelling' (all of these are real English place names) only brought me to a place no better than the one I had just left.

There was, however, one occasion when my curiosity was handsomely repaid, and that was when, on the road back to Manchester, I followed the road to Ironbridge. Little did I know that it was the cradle of the Industrial Revolution in Britain. I was dumb-struck by the sight of the great cast-iron bridge, dating from 1779 and rode my motorbike, the Matchless twin, across it. The town, together with its open-air industrial museum, is now so well known that it would not surprise me if even your father has heard of it.

The site is so important that I shall have to tell you more about it in a later letter; but for the present, I have other things in mind. The digression that I intend to make is by way of summing up what I have already said at length about the injector. It takes the form of a balance between the energy which goes in, and that which comes out.

The Giffard injector is an extremely efficient device since the only energy which it wastes is the tiny amount of heat which escapes from the injector and its pipe-work into its surroundings. It is so small that we can ignore it.

The energy which goes in is the heat-energy contained in:-

- 1: The steam, and
- 2: The feed-water.

The energy which goes out is made up of:-

- 1: The pressure energy, and
- 2: The heat energy, of the water fed into the boiler.

Any kinetic energy which it possesses may be ignored, since it will ultimately degenerate by turbulence into heat energy after it enters the boiler. Whatever goes on inside the injector is irrelevant to the present consideration, just as in Statics the internal forces within a body have no effect on its equilibrium.

Let me just remind you that when we were considering the action of the injector it was assumed that the boiler operated at 85 pounds per square inch (psi) gauge pressure, equivalent to 100psi absolute. One pound of saturated steam at this pressure has 1181.9 British Thermal Units (BTU) worth of energy compared with the same

weight of water at its freezing point, 32 deg. Fahrenheit. In the injector this pound of steam is capable of forcing into the boiler 9 pounds of cold water. Let it be assumed that this feed-water is at a temperature of 60 deg. Fahrenheit. Then, relative to the datum temperature of 32 deg. F, the feed water contains:-

$$\begin{aligned} & (60 - 32) \times 9 \text{ BTU of heat energy,} \\ & = 28 \times 9, \\ & = 252 \text{ BTU.} \end{aligned}$$

$$\begin{aligned} \text{The total energy input is } 1181.9 + 252 \\ = 1433.9, \text{ or call it } 1434 \text{ BTU.} \end{aligned}$$

9 pounds of feed water plus 1 pound of condensed steam make 10 pounds of water for the injector to force into the boiler. The jet leaves the combining cone and enters the delivery cone at less than atmospheric pressure; we do not know exactly what pressure, so assume that the injector works against 100 pounds per square inch. A cubic foot of water weighs 62.5 pounds, so the volume of 10 pounds of water is:-

$$\begin{aligned} & 10 / 62.5 \text{ ft.}^3 \\ & = (10/62.5) \times 12^3 \text{ in.}^3 \\ & = 0.16 \times 1728 \\ & = 276.5 \text{ in.}^3 \end{aligned}$$

$$\begin{aligned} \text{This is equivalent to a column of water one} \\ \text{inch square and} \\ 276.5/12 \\ = 25.04 \text{ ft. long} \end{aligned}$$

There is no need for the utmost accuracy, so we can call this 25 feet, and the work done in forcing the column of water into the boiler is:-

$$\begin{aligned} & 100 \times 25 \text{ foot-pounds} \\ & = 2500 \text{ ft-lb} \end{aligned}$$

Since 1BTU is the equivalent of 778 foot-pounds, 2300 ft-lb. is equivalent to:-

$$\begin{aligned} & 2300/778 \\ & = 2.96, \text{ or say } 3 \text{ BTU} \end{aligned}$$

So this gives the short answer to my original conundrum. As the pound of steam may be assumed to have entered the cycle at 60 deg. F, as water, it gained only:-

$$\begin{aligned} & 1181.9 - (60-32) \\ & = 1181.9 - 28 \\ & = 1155.9, \text{ or call it } 1154 \text{ BTU as it was turned} \\ & \text{into steam in the boiler.} \end{aligned}$$

Of this 1154 BTU, only 3 went towards forcing water into the boiler, and the remaining 1151 BTU simply went round and round, leaving the boiler in steam, and coming back to it in hot water. Having endured this much mathematics, let us see how hot the water would be, and then call it a day.

1151 BTU goes to heat 10 pounds of water from a temperature of 60 deg. F, each pound receives 115.1BTU, which raises its temperature by say 115 deg. F and so its final temperature becomes:-

$$115 + 60 = 175 \text{ deg. F.}$$

I think that most people who think about it would be surprised to learn that only:-

$$(3/1154) \times 100$$

= 0.26% of the energy in the steam actually forced water into the boiler, although, of course, very little of the balance was actually wasted. No wonder that locomotive engineers preferred the injector to a feed-water pump.

After that interlude, we can at last return to contemplate the Robertson engine. I have great respect for Mr Robertson because of his inventiveness and also his tenacity of purpose. I hope you can recall the prayer of Sir Francis Drake, which I quoted to you many moons ago: *"It is not the beginning, but the continuance of the same until it be thoroughly finishes, which bringeth the true glory"*. Dr. Diesel's first engine did not generate enough power to keep itself running, and see what that developed into. I can think of lots of inventions, which, once they had been proved to work, were developed almost beyond recognition. The telephone and television are good examples.

It is conceivable that Robertson's idea could have been developed into a thoroughly practicable engine, but I think that the dice were rather loaded against it. There were four-stroke sleeve-valve engines, which made the grade, notably the Bristol radial aero-engines. There was a car, I cannot be sure, but it may have been the Willys-Knight, which had sleeve-valves and Barr and Stroud made proprietary sleeve valve engines for fitting into motorcycles and supplied a number of companies. My impression is that such success as sleeve-valve designs enjoyed was because they avoided the weakness of early poppet valves, due to the fact that the steels then available for making the valves were not up to the job. When better steels were developed, poppet valves forged ahead, and the sleeve-valve fell by the wayside. Simple cylindrical sleeves, such as were used in the four-stroke engines, were trouble enough, and it seems to me that Robertson's stepped sleeve was a 'step' too far. I believe that lubrication of even the simpler four-stroke sleeves was a problem. I do not think that this can be fancy on my part because, in the course of the discussion which followed the presentation of Robertson's paper, Mr. Jas. Watt asked: *"How does the author lubricate the long sleeve?"* The answer was: *"The top portion of the sleeve is lubricated under pressure, the lower part relying on splash and on the overflow from the oil release valve."*

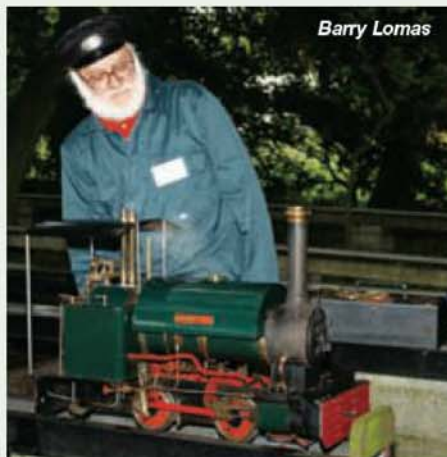
The great advantages of the common or garden two-stroke engine are its simplicity, cheapness and ease of manufacture. A wag once referred to it as *"The lowest form of mechanical life"*. The Robertson engine had to sacrifice these advantages, and it seems to me that the stepped cylinders and sleeves would have been troublesome to manufacture, at least without specialised machinery. True, it had virtues as well, but I think that they were bought at too high a price. Besides all this, the economic situation at the time was depressed, and even well-established firms would have had a hard time keeping their heads above water. Poor James Robertson. He tried hard, yet failed in the end. He has my sympathy.

Your affectionate Grandpa.

●To be continued.



Brian Remnant



Barry Lomas



Joe Holdsworth

Don Broadley describes the The Northern Association of Model Engineers' Narrow Gauge Efficiency Trials for 3 1/2in. and 5in. locomotives hosted by Warrington and District MES.

The seventh Northern Association Narrow Gauge IMLEC was held over 5/6 June 2004 at the Warrington and District MES track at Daresbury, Cheshire, a great setting for this popular event. The formula is for narrow gauge locomotives pulling slate wagons, simulating Welsh slate mining quarry working and was thought up by Joe Holdsworth of Wrexham and my predecessor as Chairman of the Northern Association Bill Tabiner. It is a fun event, I have to say taken more seriously by some than others, and has simple rules the chief practical issue on the track being a speed limit of 5mph.

Warrington MES have done an excellent job of rebuilding their track, having had half of the site being sold off some years ago. Set in trees it is a challenging track ideal for this event. The weather was perfect except for overnight rain the night before making early runs more difficult. The WDMES dynamometer car was used throughout and in order to limit the length of train the larger engines used a large beam load, this can be seen in the photographs where it was used and was made specially for this event. The organisation was excellent, a total of 17 locomotives taking part starting with last year's winner.

Run 1 - Brian Remnant

Being the first to run on a completely strange track Brian could have been forgiven for being more than a little nervous. If he was he kept it

carefully hidden. Brian raised steam on his Sweet Pea *Lady Margaret* without a hitch, selected the maximum load and made a quiet but confident start on a track wet from some early morning rain. The initial climb was impressive with the engine giving a nice even beat as the boiler pressure remained rock steady. After that it was mainly a matter of keeping to the 5mph speed limit - a particular problem on the long downhill section where the couplings were slack for long periods. There was never any doubt that Brian would achieve the desired 30 minute run and this he did with both engine and driver in good shape. A most impressive performance that set a high standard for those who followed finally achieving third place.

Run 2 - Barry Lomas

With Mr. Remnant having most generously dried out the track, Barry got his Sweet Pea away to a good and well controlled start with his well-chosen load. An enjoyable run was spent with the laps being ticked off steadily and uneventfully until Barry completed his allotted half hour, finishing in 14th place.

Run 3 - Joe Holdsworth

Joe Holdsworth brought *Holy Rose*, his Hunslet from Wrexham. Starting out with a fair-sized load, there was a little bit of wheel-slip as he pulled away from the station, but once under way there were no problems. On the penultimate lap Joe decided he needed more coal which left him with

a lot of fire at the finish. This no doubt pulled down his efficiency and left him in 11th place.

Run 4 - Dave Roberts

By the time Dave's turn came with his *No. 10 Beyer Peacock*, we had accumulated a few more wagons, and Dave requested 'the lot' as his load, around 1034lbs, plus driver and observer. A confident start with no slipping despite the uphill gradient, the run proceeded without incident. Except that Dave couldn't see the driver's speed readout on the dynamometer car because his coal supply was in the way, so the observer had to give a running commentary on the speed! Things went well and Dave finished in the lead, which he held until mid-afternoon on the Sunday when he was pushed down to second!

Run 5 - Nigel Thompson

Nigel and *Betty*, his 3 1/2in. gauge Conway, seemed determined to enjoy themselves, treat the whole event as a fun day and do the fastest overall time - in which aim he succeeded, albeit at the expense of efficiency, finishing in last place. At the end of an uneventful and enjoyable run, he asked if his observer knew any other words than "five miles an hour"!

Run 6 - Phil Buck

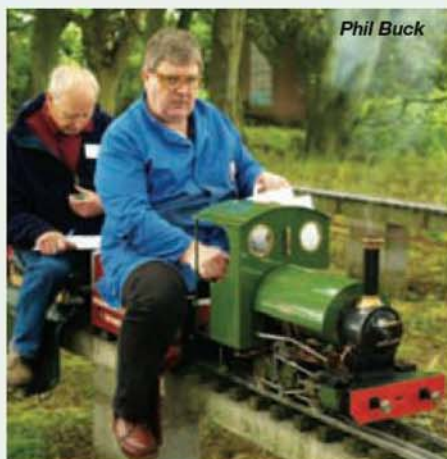
Phil selected quite a large load for his 0-6-0 Metre Maid *Betty*, but got away well with just a little wheel slipping. Once running Phil kept the locomotive pulling just below the speed limit on



Dave Roberts



Nigel Thompson



Phil Buck

all the uphill sections, and soon got used to controlling his speed on the downhill leg. A continuous run with no stops, this was Phil's first attempt at the competition so his well-driven and enjoyable run did him credit. Well done, and a final placing of ninth on the board.

Run 7 - David Dick

It was obvious right from the smooth start of the run that David Dick of Urmston had plenty of experience as a driver - having got his well-chosen load started without any slipping. David proceeded to manage the boiler performance of his Sweet Pea *Millclose* very well throughout his run producing a well-controlled, smooth and trouble-free ride that earned him sixth place overall.

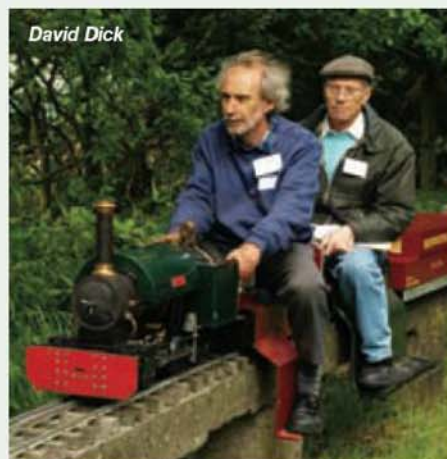
Run 8 - F. A. J. Collin

A regular to NG IMLEC, F. A. J. took a relatively light load of four slate wagons for his little 0-4-0

engine *Alva*, got away well and had a good run. Water was a problem - the water bottles were too big to go into the small fillers of his tanks, but fortunately he had brought his own bottle with him, so the observer had to throw it to a trackside attendant for refilling, then collect it next time round! Fortunately one bottle's worth of water lasted a couple of laps! *Alva* had a good turn of speed for a little engine, so the observer was constantly shouting "Slow down, approaching 5mph" - Faj responded every time to avoid breaking the limit, and also responded verbally in language best not repeated here! Fifteenth overall, in company with the other diminutive engines, but ahead of NAME Secretary Mr. Thompson!

Run 9 - Jan Rottier

With the event running ahead of schedule, and the WDMES lads wanting to get another run in to give some comfort space on the Sunday, Jan obligingly agreed to fire up his 0-4-2T Barclay *Tony Rolt* and do the extra run. He had a good run, uneventful until near the end when he dropped his shovel overboard along with a load of his measured coal! The resulting delay led to Jan being left with just 3 minutes to get past the clock and start another lap, albeit now short on water. Jan drove the engine dead on 5mph all the way back to the start, to pass the clock with just 10 seconds to spare and get another lap under his wheels. The observer grabbed a good supply of water on the way past, whilst one of the assembled multitude had picked



David Dick

up what coal he could find and re-filled Jan's coal container. Achieving 7th place, Jan would probably have finished higher without his little mishap with the coal.

Run 10 - Harry Grundy

Harry took just the 300lb 'heavy load' for his run, quite a load for his diminutive GER 0-4-0ST *Gemma*. Some slipping on starting, but an uneventful run thereafter, except, according to the Observer, for the amount of fire and ash that *Gemma* spat out in protest at the effort that was being asked of her. Made worse by the fact that Harry was shorter than the Observer and could duck better, so the Observer copped for most of it! Harry quickly became used to the vagaries of the track and lapped confidently, but unfortunately ran out of steam on the last lap just 60ft. short of the finish. A good effort by a small locomotive, the driver on his first visit to an efficiency competition. ▶



F. A. J. Collin



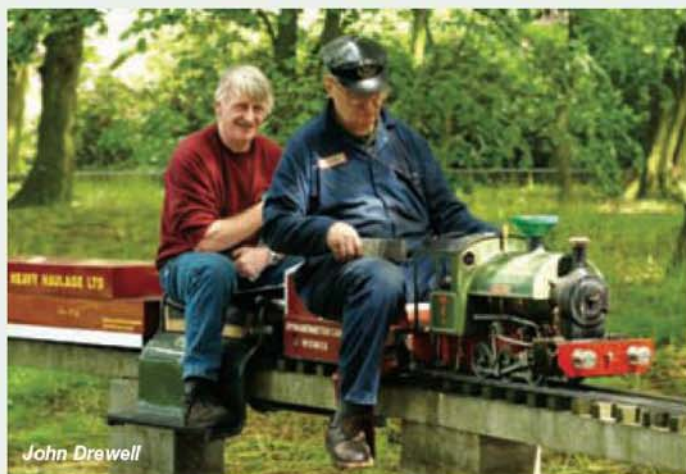
Jan Rottier



Harry Grundy



David Sidebotham



Run 11 - David Sidebotham

David entered his Sweet Pea locomotive *Daph*, but left the driving to Brian Collier. He had selected a relatively light load for a Sweet Pea, and might have been better placed had he opted for a bit more behind, which the locomotive could have managed with ease. Nevertheless, Brian managed a good run with ease, sticking just below the 5mph limit for the greater part of the run. Eighth place was his reward.

Run 12 - John Drewell

John made a reasonable start with his Metre Maid *Walter* and chosen load and went well on the 'long drag' uphill from the starting position

to the pond. However, he had to watch his speed on the downhill section where the load tends to push the engine along and gain speed. Coming around the bottom bend on his first lap John ground to a halt on the 1/100 incline, having run short of water. It didn't take long to rectify matters though. John then proceeded to reel off the laps confidently as he became more accustomed to the track. The Observer was heard to comment "*I hope John enjoyed that as much as I did!*" A well-earned fourth place.

Run 13 - Tegwyn Davies

Representing Wrexham MES, Tegwyn got Hunslet *Ceri* off to a good start, but then came to

a short (10 second or so) halt on the first lap due to his water pump having slightly over-filled the boiler. With that little hiccup resolved, Tegwyn continued on his way without any further problems. A good run that earned him tenth place.

Run 14 - Jim Moyle

Entered by Jim, but driven by his son Nigel, No. 9 Beyer Peacock is the sister engine to Dave Robert's No. 10, both built together. As Dave Roberts did, Nigel took every available truck and even with this load made an excellent start once the regulator had been cracked. The first lap went well, nicely below the speed limit, until that bottom bend (again!) caught Nigel a bit short of



COMPETITOR	LOCOMOTIVE NAME	LOCOMOTIVE TYPE	SOCIETY	RUN No.	TIME mins
James Moyle	No. 9	Beyer Peacock	Urmston	14	30.00
Dave Roberts	No. 10	Beyer Peacock	Urmston	4	33.00
Brian Remnant	Lady Margaret	Sweet Pea	Romney	1	32.00
John Drewell	Walter	Metre Maid	West Riding	12	32.00
Roy Allen	Jennifer	Polly IV	Warrington	17	31.90
David Dick	Milliclose	Sweet Pea	Urmston	7	34.00
Jan Rottier	Tom Rolt	Barclay 0-4-2T	Uckfield	9	32.30
David Sidebotham	Daph	Sweet Pea	Buxton	11	30.00
Phil Buck	Betty	Sweet Pea	North Staffs.	6	35.00
Tegwyn Davies	Ceri	Hunslet	Wrexham	13	30.00
J. Holdsworth	Holy Rose	Hunslet	Wrexham	3	35.10
Glynn Davies		Sweet Pea	Oswestry	15	32.00
John Brady	Brown Owl	3.5" Conway	York (Leeds)	16	30.00
Barry Lomas	Sweet Pea	Sweet Pea	North Staffs.	2	31.00
F A J Collin	Alva		Rochdale	8	28.53
Nigel Thompson	Betty	3.5" Conway	Erewash	5	29.60
Harry Grundy	Gemma	GER 0-4-0ST	Fylde	10	



John Brady



Roy Allen

steam for the 1/100 climb. A short stop for a blow-up cured things, then it soon became obvious that Nigel had the got the measure of the track and lapped without any problems. Nigel is an excellent driver, and demonstrated this by taking first place from Dave Roberts.

Run 15 - Glynn Davies

After struggling to start with a little too much load, Glynn had some trucks taken off the Oswestry Club Sweat Pea train and some sand put on the rails. This did the trick, and the spirited start showered the observer in hot sparks - much to the discomfort of his not very well covered scalp, and the amusement of the onlookers as his clipboard was put to good use! After a short stop for a blow-up on the first time around the bottom bend and its 1/100 gradient, Glynn soon got the measure of the track and proceeded to lap at a steady pace, albeit one with no risk of incurring any speeding tickets! An enjoyable ride that saw Glynn gaining 12th place.

Run 16 - John Brady

John was due to run on the Saturday but having crossed the Pennines, past the Customs Post and Border Guards, discovered a problem with his original 5in. gauge entry that prevented him from running it. Not easily discouraged, he returned on Sunday with his 3 1/2in. gauge Conway Brown Owl. He chose to start with a fairly large load for a small engine, but could not get started on the incline and had to drop some of the heavier

trucks. Then he was away in fine style with just one stop for a blow-up during the rest of his run - yes, that bottom bend and the 1/100 incline again! A fine and competent performance from a small engine that gave John 13th place, the highest of the 3 1/2in. gauge contingent.

Run 17 - Roy Allen

Warrington's Roy Allen ran last, and in the interest of impartiality I was roped in to act as his Observer. Although now sold as a kit, Roy's Polly IV Jenifer was built 13 years ago from castings and a fine job he has made of it. The start was a little hesitant but he got away well enough only to decide to drop load at the end of the first lap.



Presentation

There was no lack of local support, with even the ladies abandoning their catering duties to give rousing cheers for Roy's first few laps! Roy finished his run with considerable relief - since he had run out of steam about 50 yards short of the line during the 2003 event at Rochdale, his main aim was to finish. Getting a very creditable 5th place as well was the icing on the cake!

Results

Thanks and congratulations to all those who entered this splendid event. Results are a matter of record in Table 1, being updated after each run was completed, expertly done by computer guru Barry Harrison, even a computer crash failed to halt the flow of information. Note how close the top three finishers were! For the presentations each competitor received an excellent certificate with a photograph of their endeavour, again the handiwork of WDMES Chairman Barry Harrison, his digital camera and his laptop run from a generator since they have no mains electricity on site. To the winner Jim Moyle and driver Nigel was a superb trophy of a slate wagon and a year's subscription to *Model Engineer*, the latter also awarded to the first three places, thanks to Highbury Leisure Publishing Ltd.

Congratulations and thanks to Warrington MES for putting on such a superb event and for all the hard work that running such events entails. Special thanks to the ladies for the catering which was really first-class. The event returns to Wrexham where it started in 2005, hope to see you all there.



AVERAGE SPEED mph	WORK DONE lbs.ft.	AVERAGE DBHP	COAL USED lbs	COAL CONS. lbs/hr	SP. COAL CONSUM lbs/dbhp/hr	THERMAL EFF. %
4.51	19808	0.020	1.47	2.938	2.447	1.263
4.10	19721	0.018	1.48	2.699	2.484	1.244
4.23	19397	0.018	1.51	2.827	2.565	1.204
4.24	18135	0.017	1.98	1.781	3.611	0.856
4.24	13081	0.012	1.72	3.233	4.336	0.713
4.55	15418	0.014	2.71	4.784	5.802	0.532
4.20	10925	0.010	1.98	2.609	5.994	0.515
4.52	9925	0.010	2.01	4.016	6.676	0.463
3.31	12354	0.011	2.55	4.379	6.824	0.453
3.87	15675	0.016	3.48	6.953	7.319	0.422
4.41	14787	0.013	3.47	5.929	7.741	0.399
3.12	6604	0.006	1.77	3.325	8.862	0.349
3.28	6446	0.007	1.95	3.891	9.959	0.310
2.50	6913	0.007	3.21	6.215	15.328	0.202
3.39	2022	0.002	0.97	2.037	15.811	0.195
4.57	4006	0.004	1.98	4.022	16.347	0.189

FOWLER STEAM WAGON

Tony Webster

describes the driver controls and lubrication before giving a list of all the wagons of this pattern built by John Fowler & Co.

●Part XV continued from page 97

(M.E. 4239, 21 January 2005)

The steering column outer casing, which is part of the steering box, should have two pairs of holes at $\frac{1}{2}$ in. centres and tapped 4BA. The lower ones are at the rear and the upper ones at the front. The top pair holds a pivot bracket for the cylinder drain cock levers, the top of the base plate for which is bent forward and slotted for the damper control lever.

This lever links to a rod, which passes through the floor to the damper door. Where these two link together is a short arm which moves on a pivot pin secured to the lower pair of tapped holes. The other end of this pin has two bell-cranks which convert the vertical motion of the drain levers into fore and aft motion of the rod which is pivoted to the H.P. cylinder lower drain cock. The left-hand lever and rod control a cross shaft and rod to the L.P. cylinder. The cross shaft turns in pivots, which could be like long headed 4BA bolts with a hole through the head. However, the nut under the floor is difficult to get at as it is over the front mudguard. Another type of pivot could be devised which uses a screw from the top.

The control rods are $\frac{3}{32}$ in. dia. with left/right dog-leg bends at the ends and hooked into the bell-cranks etc. The tops of the vertical rods are bent and threaded 7BA and screwed into tapped holes in the control levers. This makes for a neater job and the thread stops the control rod



The virtually completed chassis showing the engine, drive arrangements, water tank and driving controls.

valves, should be screwed into their holes in the cylinder castings and the spindles assembled and aligned. Make sure that they are open by passing a wire through the steam way. File a flat on the two mating spindle ends and fit a connector with two Allen grub screws. The connector could be the brass part of a 'chocolate block' electrical connector. The bottom end of the bottom cock is bent out, flattened a little and drilled and tapped 8BA for a pivot screw to the control rod. The cocks should be open when the steering column levers are up. Concentric shafts transmit the movement of the gearchange lever and handbrake lever to arms between the chassis members. Both of these levers are on the driver's right hand, just inside the channel which supports the roof. The handbrake lever is pinned to a $\frac{3}{8}$ in. dia. shaft, the inner end having an arm (also pinned) which, via a rod, pulls the end of the multiplying lever, the middle of which pulls an arm on the brake cross tube. This arm and its mate on the other end, are silver-soldered onto the cross tube.

Returning to the handbrake lever, its shaft turns in brass bushes, which are $\frac{1}{2}$ in. lengths of $\frac{7}{16}$ in. outer dia. tube, which have been pushed into the ends of $\frac{1}{2}$ in. outer dia. x 20 swg steel tube. The gearchange lever is silver-soldered onto the outer end and an arm secured to the inner end by a very short cap head screw. This screw must not penetrate the tubular shaft and bind on the inner shaft of the handbrake. Arrange the position of this screw to allow for removal at a later date.

The handbrake and gearchange concentric shafts pass through a clearance hole in the chassis and rotate in bearings which are screwed

from unhooking. Try to keep the pairs of rods parallel to each other and the column, etc.

The drain cocks, complete with their relief

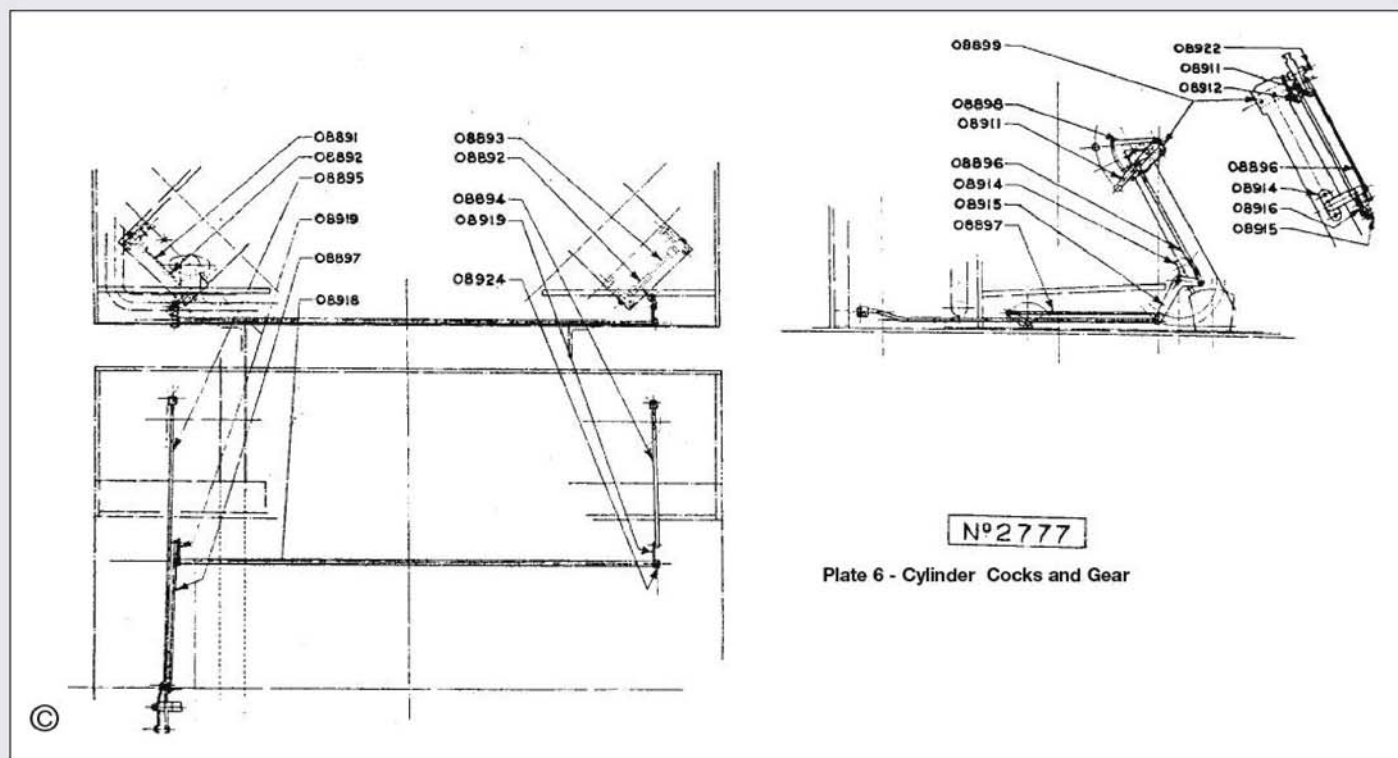


Plate 6 - Cylinder Cocks and Gear

FOWLER STEAM WAGONS						FOWLER STEAM WAGONS					
Works No.	Date built	Registration No.	Type	Customer	Notes	Works No.	Date built	Registration No.	Type	Customer	Notes
16252	20/10/24	UM 57		J. Riddell, Glasgow	Returned /25, demonstration wagon, LL 3/29	16824	23/04/26	NP 3911	GE	Acton Corporation.	??/35 Mechanical Cleansing Service
16266	26/01/25		H3WT		Sydney show	16825	??/??/28	UA 4470	GE	Demonstrator	18/06/29 Mechanical Cleansing Service S.I. LL 03/38
16295	10/03/25	NW 9610	5TET	Leeds Corporation (Highways Dept.) No. 8	LL 6/32	16826	04/04/28	UI 7289	GE	Demonstrator	29/03/29 Hackney B.C. No.1. Sold for scrap /48
16296	26/11/24		No body	Sydney (Jones Bros.)	Returned and scrapped /27	16827	13/11/28		GE	Wolverhampton Corporation (Streets Dept.)	Thos. Nash, Wolverhampton (for sale ??/34)
16297	05/03/25		H3WT	Rennart & Lenz, Johannesburg		16879	30/11/27	SH 2924	3WT	J & G Campbell, Oxtou, Berwick	LL 09/30
16298	29/12/24	MB7318		John Ellis, Sale, Cheshire	Returned 08/26. Parts used for 16993.	16880	04/11/27		8T	Ministry of Public Works, Bogota	
16459	14/12/25		3WT		Australia, chassis	16881	28/09/27		3WT	Johannesburg Municipality	
16460	04/05/25	UM 742	HET	C. Sizer, Hunslet, Leeds	Returned 9/25, demonstration wagon.	16882	??/??/27	UA 2689	3WT	Smithfield Show	Sold 07/03/28 R. K. Smith-Wouldham, Kent. LL 06/29
16461			3WT		Highland Show 1926, LL 12/30, demonstration wagon. UA 8922 from 07/29	16883	13/10/27		ET	Ministry of Public Works - Bogota	
16462	31/03/25	NW 9611	5TET	Leeds Corporation (Highways Dept. No. 9)	LL 12/32	16884	13/10/27		ET	Ministry of Public Works - Bogota	
16463	31/03/25	NW 9612	5TET	Leeds Corporation (Highways Dept. No.10)	LL 12/32	16885	04/11/27		ET	Ministry of Public Works - Bogota	
16464	20/06/25		H3WT		Bath & West and R.A.S.E. Shows, Reid Bros. (Demonstrator)	16886	20/12/27		3WT		South Africa
16465					South Africa Ltd. Not sold but dismantled to make up No. 17742	16887	20/12/27				South Africa (chassis only) Used for 17744
16466	05/06/25		H3WT		Dublin & Belfast Shows. Sold 03/26 to C.R. Barlow, Capetown (Demonstrator)	16888					
16467	23/04/25	SH 2090	H3WT	J & G Campbell, Oxtou, Berwick	Returned 12/27 and scrapped	16889	09/01/28	UA 1790	ET	Leeds Corporation Farley, Leeds	LL 12/35 A. Waterman, Used for 17745
16468	??/11/25		H3WT		Demonstrator. Sold 31/08/25 to Geo. C Siddons, Loxley, Sheffield Returned 08/29	16890					
16469	30/04/25		H3WT	Gronow Bros., Bishopston, Swansea.		16891	11/06/28	UT 3166	3WT	Breedon & Cloud Hill Lime Works, No. 10	
16470	25/08/25		GE	Dublin Corporation		16892	29/02/28	UC 7652		Rickett, Cockrell & Co. Ltd., No. 42	Sold to Mechanical Cleansing Service for spares.
16498	??/??/25				Demonstrator (Buenos Aires) R.A.S.E. Show/Biceler R.D.C. Highland & Glasgow Shows, Hamman Bros., Conon Bridge, Ross. For sale /30 Charles Homes & Co. Grangemouth LL 9/32	16893	29/02/28	UC 7653	ET	Rickett, Cockrell & Co. Ltd., No. 43	Sold to Mechanical Cleansing Service for spares.
16499	30/6/26	UD 218				16894	19/06/28		ET	Ministry of Public Works, Bogota	
16500	04/07/25	RF 1091	H3WT	Northamptonshire C.C.	Sold to Craddock Bros. Kettering	16895	21/04/28	TX 5232	3WT	F.W. Lougher & Co., Bridgend	04/31 J. Coupland & Sons, Gloucester
16501	27/07/25	YB 3493	H3WT	Wm. Nutter, Wedmore, Somerset.	Returned 11/26., scrapped /27	16896	30/4/28	UA 3751	3WT	Rhys J. Rhees & Co., Treforest	LL 12/31
16502	17/08/25		H.3WT	Fenwick Farmers' Co-operative Society Ltd., Fenwick, Ayrshire.	Returned and scrapped /27	16897	27/06/28		3WT	J.Fowler Tarspraying Co., Johannesburg	
16503	14/11/25		H.3WT	Austral Engineering Supply Co. Ltd	Sold 10/26 as NY9774 to Rhys J.Rhees & Co. Treforest. Returned 3/28 and scrapped. Not sold, but dismantled and used to make up No. 17743	16898	24/09/28	YX 7844	3WT	Stepney B.C.	
16504					Smithfield Show/ F.W.Lougher & Co.-Bridgend. Returned and scrapped /27	16899	25/09/28	YX 7842	3WT	Stepney B.C.	
16505	01/01/26	NY 9922	H3WT			16900	25/09/28	YX 7843	3WT	Stepney B.C.	
16506	18/01/26		H3WT	Johannesburg Municipality		16901	12/10/28				Johannesburg (chassis only)
16507	31/12/25			C. R. Barlow, Capetown, S.A.	Demonstrator	16902	08/11/28				
16508	10/11/25	NR 7571	H3WT	Breedon & Cloud Hill Lime Works, Isley, Walton, Leics.	Returned and scrapped 04/28	17532	17/01/27	YE 2566	3WT	Triple Tipping Transport (Concrete Aggregates Ltd.)	Resold to W. J. Lawender, Ashford, Middlesex ??/29. 07/31 to A.Pennan Campbell for scrap
16509	16/11/25	M0 6429	HST	Newbury R.D.C. to Berkshire C.C.	/30 Mechanical Tarspraying & Grouting Co.Ltd., Reading (by 11/30)	16993			3WT		Returned and scrapped ??/27
16560	03/02/26		HET	Ministry of Public Works, Bogota		17742	26/01/28		ET	Ministry of Public Works, Bogota	
16561	03/02/26		HET	Ministry of Public Works, Bogota		17743	26/01/28		ET	Ministry of Public Works, Bogota	
16562	12/02/26		HET	Ministry of Public Works, Bogota		17744	26/01/28		ET	Ministry of Public Works, Bogota	
16563	12/02/26		HET	Ministry of Public Works, Bogota		17745	26/01/28		ET	Ministry of Public Works, Bogota	
16564	27/04/26	NT8239		J. Jones & Co., Whitchurch, Salop.	Mrs. M. A. Williams, Whitchurch (by 04/26). Returned 9/26	17832	14/07/28			J.Harries, Pontardulais	
16565	30/12/26			John Harries, Pontardulais	Returned /28 and scrapped. (chassis only)	17833	28/02/29	IA 7886	3WT	Mechanical Tarspraying & Grouting Co., Ireland	
16566	28/09/27		3WT	Johannesburg Municipality		17834	08/04/34	UL 3968	3WT	Mechanical Tarspraying & Grouting Co. Ltd.	
16567	13/05/27	WU7376	3WT	Pately Bridge R.D.C.	South Africa (chassis only) West Riding C.C. No.17. LL 12/32. E. Sheard, Wakefield for scrap.	17835	26/08/29	WE 6249	3WT		R.A.S.E. Show
16568	20/10/26	YD7540	3WT	W. Mutter, Wedmore, Somerset.	LL ??/31	17836	21/09/29			Across Ltd., London	For demonstration abroad.
16569	30/10/26	AG1147		Fenwick Farmers Co-op. Soc. Ltd	By 02/30 J. Brown & Sons. Belfast	17837	21/09/29			Across Ltd., London	For demonstration abroad.
16570	02/11/26			Bulawayo Municipality	(chassis only) Became 17532	17838	11/09/28	YX 7845	GE	Stepney B.C. No.1	LL 12/32
16571						17839	26/09/28	YX 7846	GE	Stepney B.C. No.2	New boiler JF18425 LL 12/32
16572	22/03/27	TX2684	3WT	F. W. Lougher & Co., Bridgend	Returned to Fowlers and scrapped ??/30	17840	31/12/28		GE	Barrow-in-furness Corporation	
16573	08/04/27	UD 882	3WT	Nettlebed Potteries, Brick & Tile Works, Nettlebed, Oxtou.	47 sold to J.Hardwick & Sons, West Ewell. Scrapped 1948	17841	14/06/29	HA 8690	GE	Demonstrator	Mechanical Cleansing Service. S.3 LL 3/46
16574	30/04/27	TY3003	ET	The Northumberland Whinstone Co. Ltd	Fitted with new boiler JF 19186 LL ??/33	17842	11/04/29	CU 6159	GE	Mechanical Cleansing Service. S.2 LL 10/39. F.W.Lane, Tulse Hill	
16575	28/02/27	GD 5619	GE	Glasgow Corporation Tramways		17843	03/06/29	GE 5836	GE	Glasgow Corporation (Cleansing Dept.)	
16576	13/06/26	KU 8905	GE	Bradford Corporation, No. 6.		17909	31/08/29	JA 462	GE	Stockport Corporation	
16577	03/03/27	MI 2279	GE	Wembley U.D.C.	05/08/31 Mechanical Cleansing Service, Brixton. LL 12/35	17910	??/??/29		3WT	Demonstrator	Scrapped 3/31
16710	12/03/28				Bombay	17911	21/09/29		GE	Across Ltd., London	
16816	08/06/27	YH 4731	GE	Camberwell B.C. Mechanical Cleansing Service	12/34 F.W. Lane, Tulse Hill, London	17912	??/??/29		GE	Demonstrator	27/01/30 Wandsworth Corporation, No. 24, ??/35
16817	06/04/27	TW 8745	GE	Leyton Corporation, No.1	New boiler in ??/31. JF 19475-50 group.	17913	28/02/30	GF 153	GE	Lewisham B.C.	LL 12/37
16818	24/08/27	MP 207	GE	Ealing Corporation	LL ??/36	17914	31/12/39	GC 9214	GE	Battersea B.C.	??/36 Mechanical Cleansing Service
16819	12/10/27	TR4502	GE	Demonstrator.	Sold to Southampton Corporation.	17915	28/03/30	MT 3162	GE	Ealing Corporation	LL 12/37
16820	01/11/27	VG 140	GE	Norwich Corporation	LL 12/37	17916	26/04/30		GE	Glasgow Corporation	
16821	10/11/27	WH 483	GE	Bolton Corporation No.2	New Boiler JF 19174. LL 12/41	17917	07/04/30	UB 2220	GE	Mechanical Cleansing Service S.4	LL 12/??
16822	11/04/28	K0 8958	GE	Erith U.D.C., Kent		17918	29/10/30	RH 2171	GE	Kingston-upon-Hull Corporation	LL 12/40
16823	30/04/28		GE	Chesterfield Corporation		17919		UB 2920	GE	Demonstrator	16/05/30 Mechanical Cleansing Service S.5. LL 9/43
						17920	04/09/30	GH 7891	GE	Mechanical Cleansing Service S.6	LL 12/37
						17921		WK 3926	GE		Health Exhibition-London, 1930
						17922	29/12/30	UB 4962	GE	Leeds Corporation No.1	02/02/31 Newcastle-upon-Tyne Corporation No. 22
						17923	05/12/31	UB 8660	GE	Leeds Corporation No.2	Scrapped /38
						17924	07/10/31	GT 1390	GE		Issued as JF197
						17925	08/05/31	GO 9693	GE		??/42 Robinson & Birdsall, Leeds, /68 T.Varley, Gilsburn (now carries 19708)
						18216			GE	Mechanical Cleansing Service	LL 07/40
						19007	24/03/31		GE	Mechanical Cleansing Service S.7	LL 01/39
						20156	04/04/34		GE	Sewage and Canalisation Service of Warsaw	

D.A.G. Brown and Mark Smithers continue the work on the boiler for this stylish locomotive followed by a description of the regulator and associated parts.

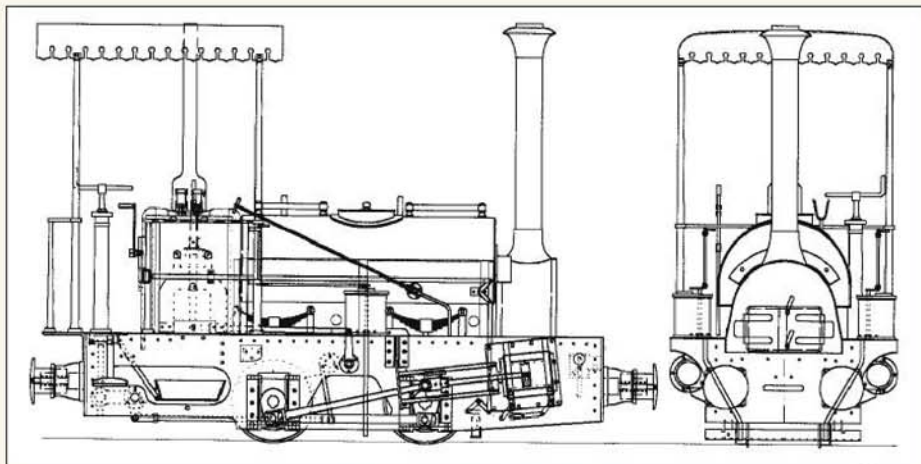
● *Part XII continued from page 90*
(M.E. 4239, 21 January 2005)

We continue discussion of the Boiler construction, hopefully with the idea that it is a precision piece of work, making use of ready-made formers and templates. I suppose it is possible to transfer manually all the hole dimensions to the copper plates, but that seems very laborious when CAD has done it for us. If you look back at the last part of the serial, you will see that all the holes have been placed on the cutting patterns; all I had to do to achieve this was to speak nicely to the CAD programme and get it to copy all the bits required from the drawing which appeared on the double spread, rotating them, changing their layers, colours and thicknesses to obey my rules of recognition. I just had to edit things like the size of the Throatplate cut-out to fulfil our needs, but the days of laborious slogging are past.

Before putting the flanged plates to one side, you should note the two Brass Door Pads, which belong to the Backhead. Drill and tap as indicated all the holes in these, using the coordinates given, including the half-hole in the middle of the bottom edge. These pads will then be ready to snuggle around two of the rivets during the silver-soldering process, and in turn will allow the Firehole Door to be hung either way round - just like your domestic refrigerator, only a bit warmer!

If you have made use of the prepared materials to cut out the boiler-plates, you will have two rectangular pieces of copper, for the inside and outside Firebox Wrappers.

Dealing first with the larger component, this requires rolling after annealing and here again it is quite simple to make a sighting mark on the plate, to line up with the outside diameter of the bending rolls. Do not even contemplate taking out the large hole before rolling. If you were to do so, you would find it virtually impossible to make a neat job through the bending rolls, the area near the hole taking the bend in preference to the rest of the section. So, by all means drill a string of holes or slots so as to minimise the metal removal after rolling. It is appropriate to drill all the other holes in both wrapper sheets before forming them. It would be prudent to make use of a spare piece of MDF as a gauge, to ensure not only that the rolling is done to the correct radius, but also that the two vertical tails of copper are of equal length. Upon rolling, the large elliptical hole shape becomes a circle, which needs finishing truly cylindrically all round, ready for fitting the Dome Bush.



ANNA A MANNING WARDLE LOCOMOTIVE FOR 7¹/₄in. GAUGE

The two sliding supports should be positioned and prepared to be held lightly with a couple of small rivets, ready for silver-soldering. It is in order to interpret the dimensions of these sliding supports liberally; furthermore they can be made from copper, brass or bronze, whatever metal is to hand. They will be only supports, not part of the boiler pressure system.

Turning our attention to the Inner Firebox Wrapper, this is quite straightforward although it is not possible to roll the small radii. So, it becomes a beating job over a wooden former. You can make use of the steel firebox former to mark out the correct shapes on several pieces of MDF, not forgetting to add ³/₁₆in. around three of the edges. Saw and finish these to the correct profile and clamp (or stick) them together as a 7in. thick lump. Now position, say, four steel pegs in the crown surface of the MDF block, with the same precision as you would be doing in metal. These pegs are now used to locate their corresponding holes in the copper sheet, as it is clamped to the top surface to allow the

sides to be beaten down around the ⁷/₈in. radii. Making use of the crown section of the copper in this way should ensure that the shape works out symmetrically. Annealed copper does yield to this form of rough treatment without too much trouble.

Foundation Ring

I have drawn the Foundation Ring as ¹/₄in. thick copper, but it is quite in order to reduce it to ³/₁₆in., and to make use of scraps of plate that you will undoubtedly have stockpiled. It is important to maintain the top of the ring in its correct position, i.e. so that the distance between it and the bottom row of stays is as drawn. Two ¹/₂in. sections may be fitted within the constraints of the Backhead and Throatplate flanges, not forgetting to notch the pieces so as to continue out to the full 9¹/₈in. width of the Firebox Outer Wrapper. The sides of the Foundation Ring are reduced to ⁷/₁₆in. wide and may be fitted to the outsides of the Inner Firebox Wrapper. I favour keeping them in place with two or three small copper rivets. In another worthwhile detail, each Ring section is fitted with two pegs, say ³/₁₆in. dia., which locate the ashpan. They need to protrude ¹/₈in. or so below the plate edges. Setting the pegs in ¹/₈in. from the edge of the ring and drilling their holes blind will ensure that they do not intrude into the pressure regime of the boiler.

Bushes

I have already mentioned a number of holes for bushes. The rule is: wherever possible they must be tapped ³/₈in. x 32tpi, which makes for ease of manufacture of boiler fittings. The bushes are drawn on the following centre-spread, indicating some departures from the standard, as follows: two stay-hole bushes near the top of the Outer Wrapper must be tapped ⁷/₁₆in. x 40tpi to allow removal of the stay while the regulator assembly is positioned; four bushes tapped ¹/₂in. x 32tpi are for



The Anna chassis enjoying a day out at the 2004 Model Engineer Exhibition held at Sandown Park.

water feed into the main Barrel. Bushes should be tapped only part way through, until after silver-soldering.

A bush is required for the Main Steam Pipe at the Smokebox End and a corresponding piece on the Backhead, called the Lower Backhead Bush. These go right into the steam space and can be made from stock material. Castings are available for the Dome Bush, Upper Backhead Bush and Throatplate Bush. Dimensions of these are all important, for the following reasons. When a hole is made in a pressure surface, it is necessary to compensate for the missing bit by replacing it with an equivalent amount of material going through the pressure surface. It is acceptable in this context to consider compensating material up to 2 1/2 thicknesses on each side of the metal. Let us look at the example of the dome bush, as a good illustration. The green-hatched section is a 3 1/2 in. dia. hole cut through the 3/16 in. shell in the top of the Firebox Wrapper. The material removed up to the centre-line of the hole is: -

$$0.1875 \times 1.750 = 0.328 \text{ in}^2$$

The red bush sticks through the hole by 0.534 inch. Of this amount we can use: -

$$2 1/2 \times 0.1875 = 0.469 \text{ in.}$$

of the material, which has a thickness of 1/4 in. to compensate for the hole (area = 0.117 in.²). On the outside of the hole the metal widens out to 1/2 in., so the compensation allowance becomes: -

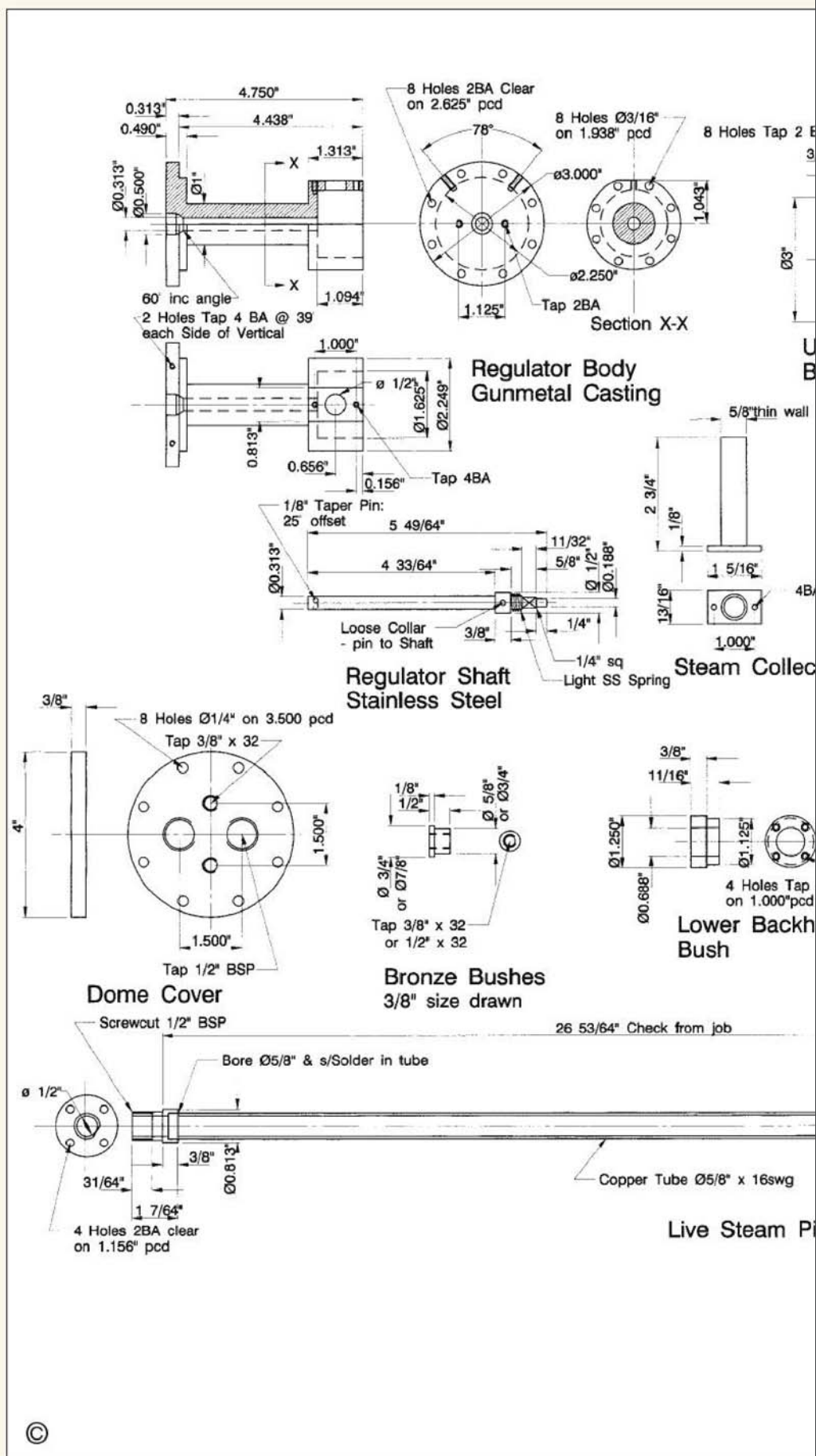
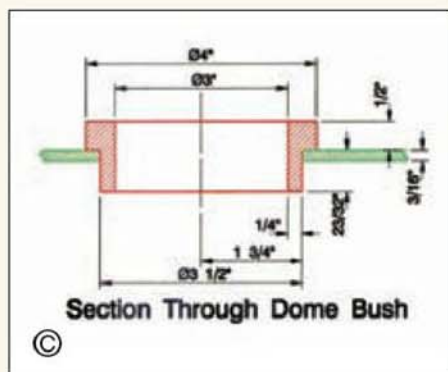
$$0.500 \times 0.469 = 0.235 \text{ in}^2$$

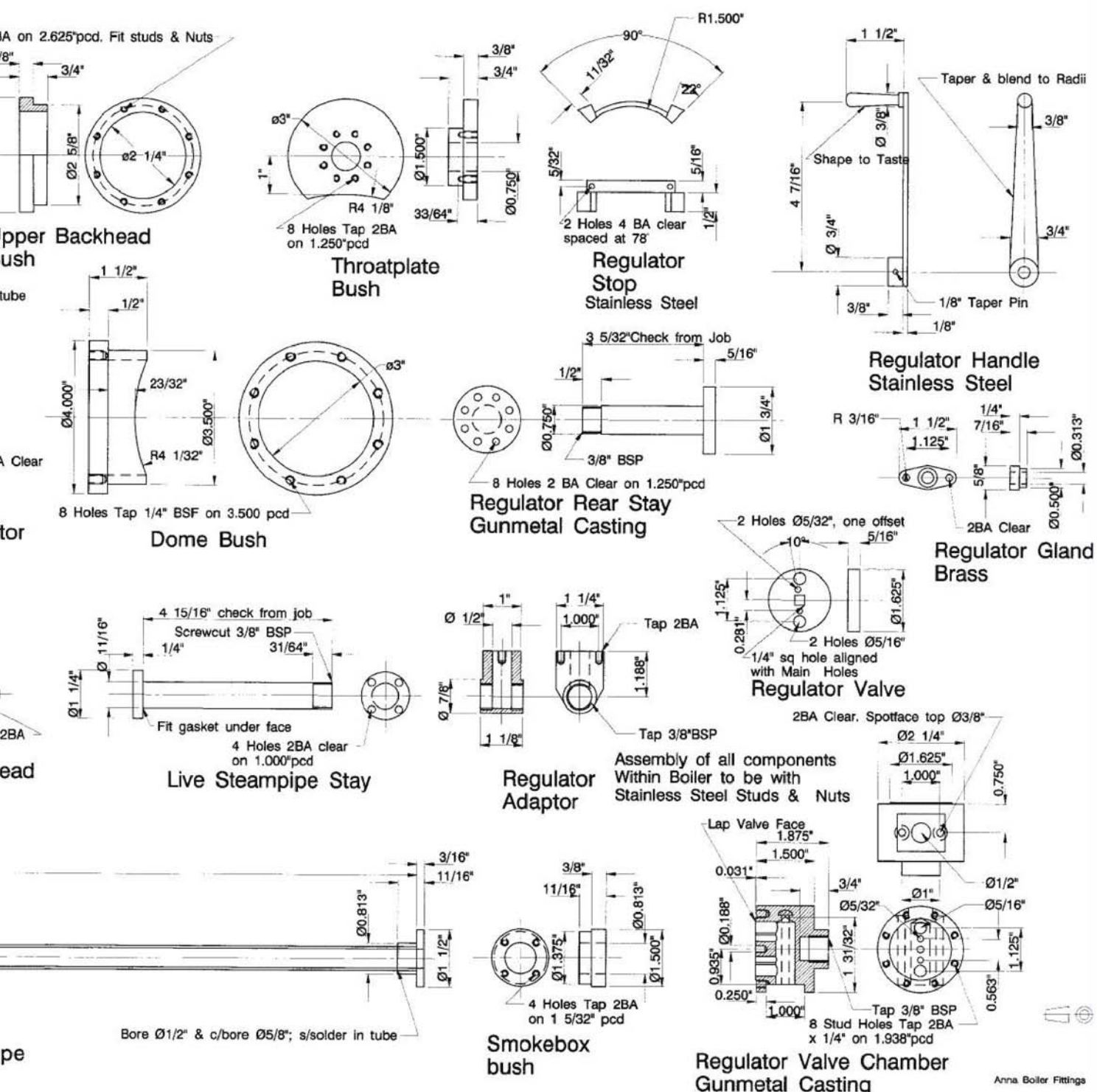
As it passes through the hole, the bush has an area of: -

$$0.1875 \times 0.25 = 0.047 \text{ in}^2$$

Adding these three figures together, the sum is 0.398 in.², which is slightly greater than the area of material removed in the first place. If you now extend this analysis to the section of the Dome Bush at 90deg. to the centre-line of the boiler you will find that, as the thick top flange moves slightly farther away from the boiler, the compensation material becomes slightly less, but we still fulfil the criterion for compensation area. One shot, which we still have up the barrel is the mechanical strength of a gunmetal bush, which is actually much higher than that of the parent silver-solder in the joint. That factor gives us confidence in the integrity of the design.

I trust that the above notes go some way to explain why it is vital that bushes actually penetrate the vessel shell and that they are securely silver-soldered into place, so that strength is imparted to the vessel shell. Long gone are the days of sticking a bush onto the outside of a boiler shell. It just does not stand up to scrutiny! I suppose it all reflects on my industrial





Anna Boiler Fittings

Drawings, castings and laser cut components for this locomotive are available from the designers.

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or Mark Smithers tel: 01609-773734, email: marks_northall.yorks@tiscali.co.uk

experience, in which some good friends were actually pressure vessel specialists. Their lives were full of exotic materials, finite element analysis and other esoteric subjects which enabled the chemical industry to push ahead. In the area of industrial boilers, for instance, it was sometimes fruitful to challenge a design with the question: "Just what pressure could we squeeze out of the equipment without violating the the pressure vessel codes?" In industrial design use is always made of the nearest size of commercially available material, so there may sometimes be a small margin available for the taking. Do not let that remark go to your head however in a search for increased boiler pressure. The current design is for safety valves to lift at 90 pounds per square inch on the gauge.

The arching of the underside of the dome bush echoes the shape of the top of the Firebox Wrapper. That bit does not need machining, but the rest should be finished with care, machining all over, the final operation being to drill the eight blind holes on 3.500in. pitch circle diameter ready for tapping $\frac{1}{4}$ in. BSF. For this operation mark the position of a low (or high) point of the flange height on its top surface and hold the flange in chuck jaws set on a rotary table. Arrange a depth stop on the vertical travel of the machine spindle so that the drill will not quite break past the $\frac{1}{2}$ in. thick flange. When positioning the holes for drilling do not forget to position them off-centre i.e. at $22\frac{1}{2}$ deg. to the axis of symmetry. Similar remarks apply to the other bushes in the set. You will notice that the Throatplate Bush has a large area of 'spare' metal outside the tapped holes. This is deliberate and provides a compliment to that in the Upper Backhead Bush, both members taking the stress on the end walls of the firebox space.

The Dome Cover is drawn as a $\frac{3}{8}$ in. thick bronze flange, drilled for the fixing screws for the two safety valves and for two standard steam connections. Should such a bronze disc prove difficult to find at the right price, then just make use of a circle of $\frac{3}{16}$ in. copper sheet (from the Throatplate?) and fit four bushes in the same

positions as already indicated. Such a thin flange must then be backed up with a 4in. dia. loose steel blank of $\frac{1}{4}$ in. or 6 mm. thickness, the latter piece imparting strength to the copper to resist bulging. It should fit easily over the flange heads as indicated on the sketch.

The regulator

In faithfully following the outside shape of the Manning Wardle boiler it has been necessary to mount the Regulator Lever high up on the backhead. Short of leading the main steam pipe under the lagging, outside the boiler shell, a way had to found of getting the steam into the conventional position in line with the top of the smokebox.

The solution is to be found in the accompanying sketch of the Regulator Assembly colours helping to discriminate between the various parts. CAD has, of course, been used to advantage to prove that the dimensions hang together correctly. The top string of parts makes use of three gunmetal castings, which should save quite a bit of wastage of material. Let us start with the Regulator Body. The most important aspects of this item are the $\frac{47}{16}$ in. length from the back of the main flange to the right hand end and the concentricity of the $\frac{21}{4}$ in. bore with the hole for the Shaft. Start by holding the casting by the large flange and rough out the shape as far as possible, finishing the bore and drilling the $\frac{5}{16}$ in. dia. hole right through. The next set-up forms the small flat $\frac{13}{16}$ in. wide on the top of the short barrel section. While set up for this operation, drill the $\frac{1}{2}$ in. hole and the 4BA holes for the Steam Collector.

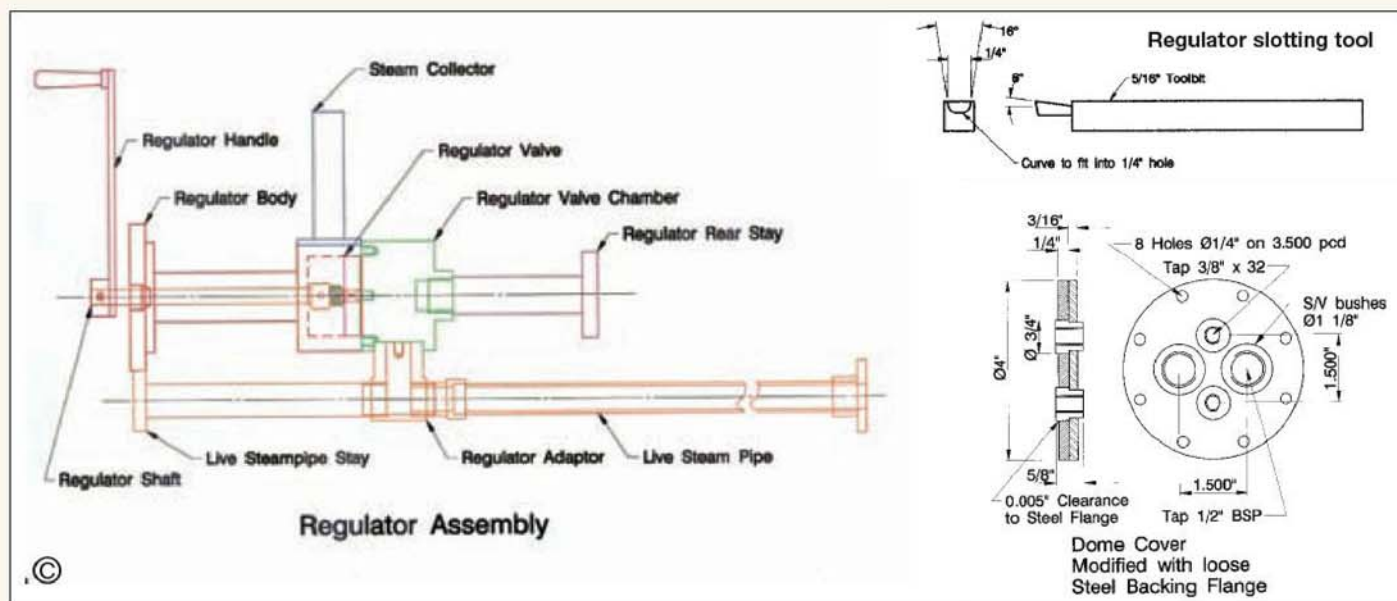
The flat will act as a reference surface which can be clocked true when the eight holes in the end flanges are drilled on their own pitch circles. With the part held in a chuck, running true on the rotary table, determine with a clock gauge that the above flat is true to the x-axis. Move out from the centre axis an amount equal to the pitch radius of the holes, rotate the table $22\frac{1}{2}$ deg. and place the holes at 45deg. intervals. With the indexing set-up on its side, the flat can again be used with a clock gauge to rotate it horizontal.

Having rotated 39deg. first one way and then the other, position and drill the two 4BA blind holes to support the Regulator Stop.

The Regulator Valve Chamber must be machined all over, eventually bolting to the previous part by eight stainless steel or phosphor bronze studs. Before tackling the valve face, mill the 1in. wide slot and drill vertical holes to drawing, not forgetting to spot face the upper ends of the two 2BA holes to taste! A $\frac{1}{32}$ in. rebate around the valve face defines the area which will eventually be lapped, but before this is done, position the five holes with great precision. The Regulator Valve, a slice of bronze, has the complementary array of holes, the middle one being broached square and one of the small port holes being offset by 10 degrees. If you prefer to plant the holes along a machine axis, rather than using a rotary table, then the offset for that hole is 0.049in. in the x-direction and 0.004in. down in the y-direction. Slotting the square is best done while holding the disc true in the 4-jaw and racking a slotting tool held at centre height in the tool post, making use of the chuck jaws to position the job in 90 deg. steps for each of the sides of the square. If you stick rigidly to the dimensions and angles given in these drawings, then you will find that the regulator opens 'on the first valve' for the first half of the lever's travel, and then the main valve takes over. Just try out my Hunslet some time and you will see what I mean. It works very well.

Little needs to be said about the Regulator Handle and Stop, nor the rest of the components on the sheet. When you see an indication "Check from job", leave plenty of allowance to be machined off after a trial assembly. It should be obvious why there is a removable stay across the firebox wrapper walls. It is to allow the Regulator Adaptor to be positioned prior to screwing in the Live Steampipe Stay and the Live Steampipe. You eventually need to seal the joints with thread sealant, but make sure that the Adaptor marries up with the Valve Chamber, with a thin joint between these last two and all stud holes in their correct positions.

● To be continued.



Colin Beckwith

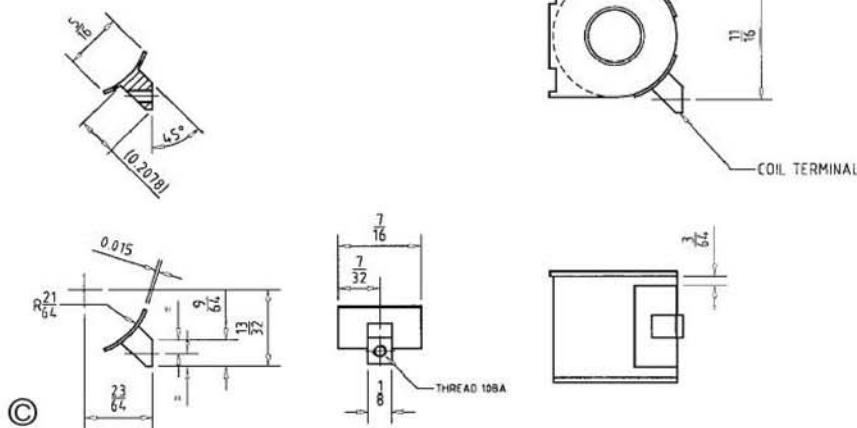
continues his description of coil winding before moving on to the operating cylinder.

●Part IV continued from page 93
(M. E. 4239, 21 January 2005)

The first layer of the coil is then wound onto the bobbin slowly. Extreme care must be taken to preserve the neatness of the turns as they are applied. It is essential that there are no gaps left between successive turns, as this will make it difficult to get all the turns on. Once the neatness is lost, the whole coil turns into what is termed a 'mush' winding. This may be okay for automatically wound coils, but not for this application, where minimum size is a priority. When one layer has been wound on the bobbin, the wire is packed carefully against the end washer, which further ensures the absence of gaps. The next layer of wire is then wound over the previous one until the starting point is again reached. The close packing of the wire on the previous layer will be appreciated here. If this is done correctly the next layer will not sink into the one below. When the second layer is complete, the wire is packed again as at the other end. Polyester tape is then applied over these first two layers. Two more layers are then wound over this, and then more tape is applied. This is then repeated until the prescribed number of turns are on the coil. Doing this ensures reliable inter-turn insulation and keeps the winding stable by limiting its outward spread.

As stated above, it is this spreading that can 'overload' the end washers of the bobbin. 'Mush' winding inherently causes greater pressure on these end washers and the bobbins must be strengthened accordingly. The chosen method of manufacture is therefore not compatible with 'mush' winding. Completely moulded bobbins would be required for this, which would be difficult to produce. Stronger, built up bobbins would work, but this would be at the expense of winding space. The coil is then given a final layer

Figure 6
SOLENOID VALVE COIL AND TERMINAL



ELECTRO-PNEUMATIC CONTACTORS

of polyester tape to finish. The leads are then held clear and protected ready for the fitting of the terminals. At this stage it may be convenient to undertake electrical testing. The test is to ensure that the coil is not short circuited or, indeed, open circuit. A simple check of the coils resistance can be undertaken to achieve this. The preferred tool is a digital or analogue Ohmmeter. The reading given will indicate the state of the coil. A low resistance indicating short circuited turns whilst off-scale readings will indicate an open circuit coil. Unfortunately, either situation will necessitate reworking of the coil. My experience of the resistance measured against the calculated figure, is that it can be very close. This is, of course, related to the 'quality' of the wound coil.

Coil Terminals

The other reason for ensuring a circular, finished coil profile is because of the chosen terminal configuration. The terminals are brass fabrications and are tapped 10BA for the exterior

wiring connections. The terminal is shown in fig 6. Two such terminals are required for each coil. They are shaped to match the wound coil surface so the quality of the surface is of prime importance. Assuming that they mount correctly the terminal faces should end up level and in line with each other. The leads of the wound coil are cut to length, with a re-connection allowance added on. The enamel insulation is then removed carefully with a suitable blade with a scraping motion. The leads are then tinned and soldered to the brass terminals. The exposed leads left are protected with polyester tape. It is now possible to secure the terminals to the coil surface, varnish or lacquer can be used for this. Using this eases the process of dismantling the terminals should repair be necessary. The whole coil assembly is then wrapped with thin cotton strips and secured with several layers of varnish. The coil is tested for continuity and resistance as described at the earlier stage of construction. With an insulated bobbin, the possibility of earth faults are very unlikely to be manifested at this stage. The comparison to design and measured resistance values being of much more significance here. I have usually connected the coil to a supply at this stage just to prove that it is actually an electromagnet. It can be left connected if desired in order to check the temperature rise. The coil should reach thermal equilibrium before it burns out! Of course the structure of the solenoid valve will act as a heat sink when the coil is mounted. The thermal characteristics of the energised coil are calculated on this basis, so the coil is likely to get a bit hotter when not in its assembly.

The winding of the coils for electrical equipment seems to be a protracted operation, but care taken with them will ensure trouble free operation for years. This is on a component which is of absolute importance to the reliability of the vehicle whilst in service.

Air connections and control terminals

Why did I design my own? Well, the electrical equipment is designed to fit in small spaces with a high density of similar units. With air connections, the types available are functionally suitable, but far too large. The operating cylinders of the electrical equipment are only about 1/2in. diameter so airflow is not a great issue. Therefore I have standardised on pipes of 1/16in. bore. I have never seen proprietary unions, etc. for this pipe size, which was a difficulty. My only alternative was to design and manufacture my own fittings, which has been quite successful. These can be seen on the pictures. The beauty of doing this is that I have a relatively free reign with the layout of my contactors. If I had no recourse but to use proprietary items the contactors would have needed around twenty

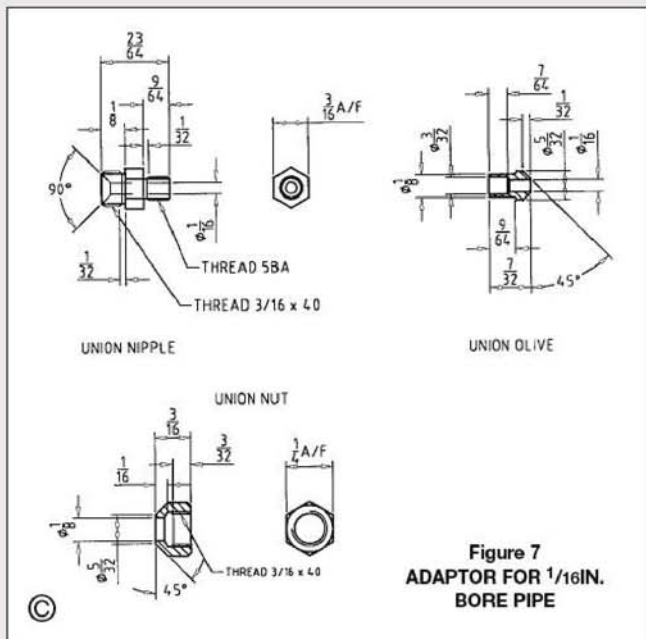


Figure 7
ADAPTOR FOR 1/16IN.
BORE PIPE



undue wear and tear on the Morse tapers, which can be accommodated by moving the saddle away from the headstock. The drill chuck and tap are then supported by hand while the remaining portion of thread is completed.

The $\frac{5}{64}$ in. hole between the two 10BA tapped holes is an air displacement port for the piston. When the piston moves, the air sitting above the piston needs to go somewhere. If this hole was not included then the piston would go nowhere fast instead of upward fast, so to speak. The arc chute bracket bolts on over this hole, so a further hole is needed in this bracket. The arc chute being quite heavy could put a lot of shear on the bracket fasteners, so a hollow spigot fits into this displacement hole to take this load.

The last operation is to create the chamfers on the corners of the cylinder block. These are completely cosmetic although I would not be without them. They are machined in the main which generates the chamfers albeit with steps at their lower end. These steps are then carefully removed with a file to complete the look of the finished cylinder.

This provides the piston running surface as well as the sealing face that fits into the recess in the

cylinder cover. It is inserted into the main cylinder block with a force fit and is meant to be removable when worn out. The liner has an abutment, which pushes hard up against the bottom face of the cylinder. This allows the part to be fitted to the cylinder with minimum setting up and simplifies the seal design.

The part is made from bright mild steel, which is turned to the correct profile and is shown in fig 10. The material is chucked in the 3-jaw chuck and the nominal $19/32$ in. dia. is produced. I say nominal because it has to be slightly oversize for the force fit as discussed earlier. The diameter actually being about 0.001in. oversize or 0.59475 maximum diameter. I always like to create a small lead for a force fit so I put a chamfer on the end of the part. The work is then drilled out in order to produce the $1/2$ in. dia. bore, which is done without removing the work from the chuck. This ensures that the bore is truly concentric with the outer diameter. A drill slightly below $1/2$ in. is used before the final finishing with a boring bar. The use of a boring bar enables the surface finish to be optimised. This being especially so if the tip of the tool is given a small radius. The boring bar being quite thin makes the generation of a good surface finish an easier task. A very light final cut is made with a fine feed in both forward and reverse directions. It is much more important to have a parallel bore than a perfectly smooth one, so hand finishing is out of the question. Any improvement could only be achieved with machine honing. The outer diameter of the spigot feature is then turned down to $21/32$ in. being careful to provide enough length for the facing operation. The work is then removed from the chuck and turned around to face the seating for the cylinder cover joint, the flange generated being $3/64$ in. thick.

●*To be continued.*

Figure 10
DETAILS OF OPERATING CYLINDER



The upper and lower balance arbors, inserted bearing bushes and centralising wire.



The balance arbor wire, sprung anchor on the back plate



The pulleys, poising weights, upper and lower balance arbors and balance arc spring.

Don Unwin

describes further details of this triumph of eighteenth century clock making.

●Part IV continued from page 78
(M.E. 4239, 21 January 2004)

The balance wheels are fixed to flanges on tubular arbors. Through the central bores of these arbors are the centralising wires and inserted bushes at either end that ran on anti-friction arcs. These arbors, the wires with their end anchors and the bushes are shown in **photo 51**. The lower arbor in the picture is shown before assembly and the upper one assembled.

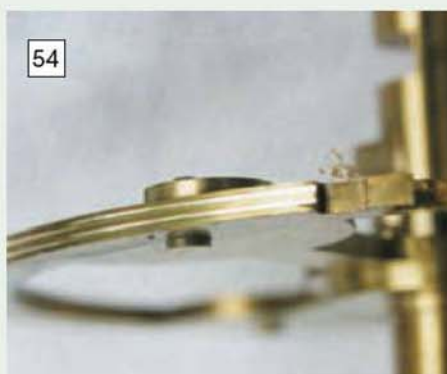
One end of the centralising wire is held by a rigid anchor fitted on the centre plate whilst the other end is held by a similar shaped but springy anchor on the back plate (**photo 52**). A grub screw in the arbor locking on the large bush fixed to the centre of the wire holds the balance wheels in the correct locations. This screw hole can be seen next to the flange on the top left arbor shown in **photo 53** whilst the holes near the ends lock the bushes in place.

Once again the holes in the plates were bored to fit the balance arbors and the escape wheel shaft ran on similar, temporary plain bearings in the plates. Also illustrated in **photo 53** are the two pulleys, fixed to the arbor flanges, that carry the wires connecting the upper and lower balance wheels, then at the top is the spring that restrains positions of the anti-friction arcs described later. To prevent the wires rubbing at the point of cross over the

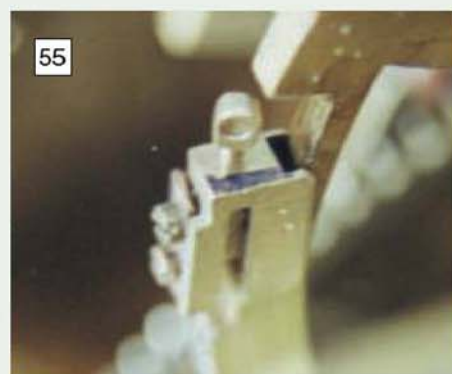
pulleys have two grooves in the circumference to locate and keep the wires separated (**photo 54**). The wires are anchored to the pulley rim at one end by a plain hook and at the other by a hook with a little adjusting or jack screw.

Photograph 55 is a close-up of an end hook with screw. These hooks are joined to the wires

by small clamps secured by two 12BA screws, whilst the little jack screws permit the wires to be adjusted to the correct tension and keep the two balances in phase. When the pulley assemblies were completed the small poising weights fitted to them required setting, again on the level bars (**photo 56**).



Pulley rim showing the two grooves to keep the wires separated.



The balance pulley rim showing the wire anchor with its adjusting screw.



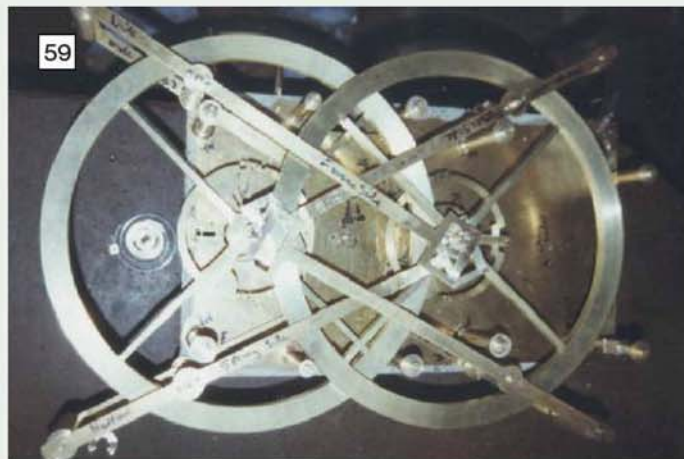
Setting the poise weights of the lower pulley and arbor using the level bars. The latter are supported on trestles.



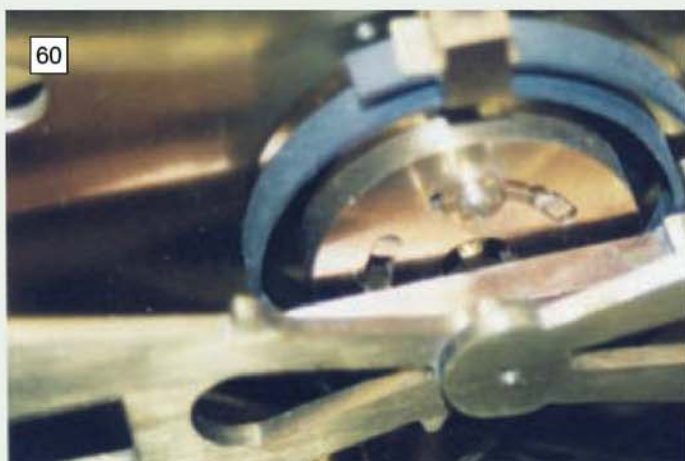
The balance arbor anti-friction arcs shown both in component form and assembled. The annotation is an aid to assembly!



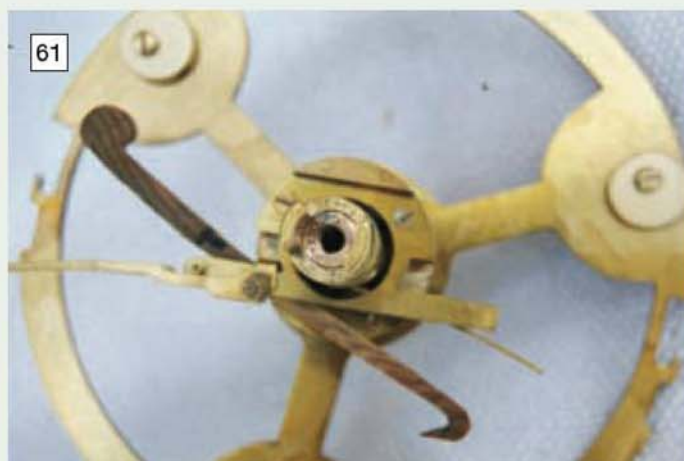
58
Machining the radial curve on the lower balance arbor anti-friction arc on the milling machine.



59
The balances assembled on the centre plate. The back plate has been removed for clarity.



60
A close-up view of the spiral balance spring mounted in the clock. It can be seen detached in photo 59.



61
The upper balance arbor. Note that the pulley and pallet are both adjustable for position.

At this stage the anti-friction arcs supporting the balance arbors were made, seen still covered with my identifying hieroglyphics in **photo 57**. Cutting the outline shapes was a simple task but the radii at the ends upon which the arbors ran needed care. They had to be both truly radial and of the correct radius. To machine the curve the arm was clamped on the rotary table, supported and guided on the arc end and moved under the cutter by a tangent screw, shown in **photo 58** machining the lower balance arc. A similar set up was used to machine the upper balance arbor anti-friction arc curve whilst a view of the balance wheels and arcs in position but with the

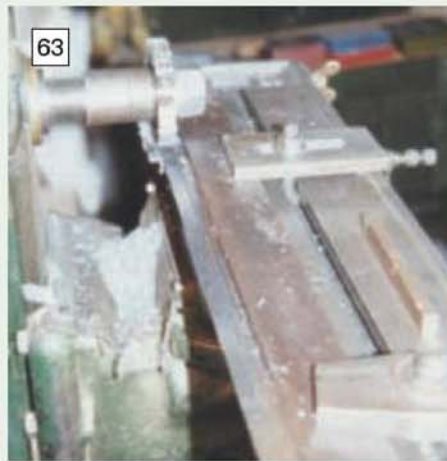
back plate removed is shown in **photo 59**. The arc pivots run in loosely fitting plain holes in the plates, some of the few plain bearings Harrison used. However, as the angle of movement is very small and the fit loose they roll in the hole rather than slide. It is just possible to discern the wires connecting the upper and lower pulleys crossing between the balance wheel pulleys. Lying on the bench to the left of the plate in the centre is the balance spring with its mounting flange, more clearly shown in **photo 60**. The completed balance arbors with the pallet assemblies fitted are seen in **photos 61** and **62**. In **photo 61** can be seen the collar carrying the

upper pallet allowing radial and angular adjustment whilst the lower pallet carrier in **photo 62** has only angular adjustment. The ring and arm fixed to the pulley is now unused, presumably the remains of an earlier discarded isochronism correction mechanism. It appears on an early Harrison sketch.

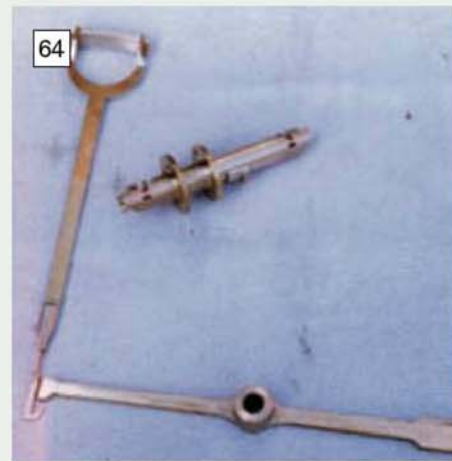
Rough calculations indicated that the balance spring would need to be about 1.7mm thick but, as it needed to have a thickened end portion, it had to be machined from a piece of thicker cast steel gauge plate. The first operation, machining it to thickness, is seen in **photo 63**. After this it was cut to the correct width from the plate using



62
The lower balance arbor with the pallet adjustable for angle only plus the saddle cam.



63
Machining the balance spring to thickness from gauge plate.



64
The isochronism correcting link, shoe and arm. Also the lower balance and saddle cam.



The isochronism correcting mechanism assembled in position on the clock.

a slitting saw, the fixing screw holes drilled, then rolled into a spiral and finally hardened. To prevent distortion it was clamped between two plates and, after heating to red heat, quenched in oil. It has been shown finished in photo 60.

I mentioned the interesting mechanism for isochronism correcting earlier when describing the roller bearings. These bearings carry the isochronism correcting arbor in the centre and back plates. This assembly includes the arm, link, channel sectioned curved stirrup, the saddle piece as Harrison called the 'bump' on the lower balance arbor and the associated spring barrel. With the exception of the separate spring barrel the components are illustrated in **photo 64**. The whole assembly with spring barrel is shown in situ in **photo 65** whilst the back plate view, **photo 66**, shows the fine adjustment for the spring barrel with the two pawls at half pitch engaging the ratchet wheel, another of Harrison's clever innovations. **Photograph 67** features machining the openings in the arm. One cannot help feeling that by the time Harrison fitted this mechanism he was clutching at straws. There is evidence that he had tried and abandoned other arrangements before settling on the one now fitted. In fact on the whole clock there are a number of unexplained fittings and redundant holes, all of which I have reproduced as they are part of the history of the clock.

Harrison's great invention, the bimetallic strip, was part of the temperature compensating mechanism. Two pins at the free end of the



A three-quarter back view showing the isochronism correcting adjusting lever.

Incidentally, I do all my own engraving as well, using my engraving machine, also home-made, described some years ago in *Model Engineer* and *Model Engineers' Workshop*.

● *To be continued.*



Milling the openings in the isochronism correcting adjusting lever on the milling machine.



The temperature compensating arm. All the engraving was carried out in the author's home workshop.



Dividing the curved vernier scale on the temperature compensating arm.

bimetallic strip embraced the balance spring and moved up and down as the strip bent as the temperature varied so changing the effective length of the spring. The strips are of brass and steel rivetted at intervals along their length, as a method of bonding of the two materials had not been invented at that time. It was supported in a frame with adjustments for angle and length as seen in **photo 68**. Notice the verniers on the angular and length adjustment scales. Dividing these was an interesting task as 10 divisions on the vernier has to be equal to 9 divisions on the main scale. Mounted on the rotary table with my home-made dividing gadget mounted on the miller over arm is the angular vernier scale (**photo 69**). As the linear vernier scale is on a sloping surface it was held in a vice mounted on two angle plates and the divisions determined by a change wheel and sector on the traverse screw (**photo 70**).



Dividing the linear vernier scale on the temperature compensating arm.



Drilling the 200mm long, 8mm dia. hole through the spindle using a long series drill, plenty of coolant and patience.



Setting up to screw cut the 16mm x 24tpi thread specified for the spindle nose. Note the use of the fixed steady.

CAMCUTTER

A.J. Aldridge
completes the cutter spindle, its
accessories and fittings.

●Part VIII continued from page 86
(M.E. 4239, 21 January 2005)

When machining 817M40 it works something like bronze and stainless steel and seems to prefer deeper cuts than skimming 0.025 or 0.05 millimetres. It is stronger than ordinary steels by at least a factor of two but it does cost more. One can see that I was quite profligate to cut down from a 40mm bar to the 17mm diameter. For the penny pinchers, and aren't we all these days, plain steel may be used with a full, butt welded ring for the collar. 817M40 does not weld nicely. The actual turning and screw cutting is much the same as for the housing along with the checks on concentricity. Make the locking ring for a gauge is screw cutting in sequence.

The real awkward job is the machining through of the 8 mm centre drilling (photo 39). I acquired a long series drill but have never drilled anything this long before so all of this was to be a brand

new experience. It is obvious before even starting that the danger is that the drill will run off centre and therefore long-hole drilling requires some definite thought and then some disciplined practice.

First thought is that a new drill is imperative as the manufacturer is much better at sharpening than I shall ever be, even though I have a Quorn. That way I know the drill tip is on centre. Next, the drilling needs to be taken slowly using correct drilling speeds but feeding relatively slowly and allowing the drill to cut its own way and not be forced, as I am wont to do. Frequent removal of the drill for swarf clearance is an absolute necessity at every few millimeters especially after the first 40 - 50mm of the hole has been drilled. Lots of cutting fluid must be helpful. The tailstock must be accurately aligned to the lathe axis but we should have adjusted for that already.

That then is the theory, now for the practice. It takes about 30 minutes to drill right through following the plan and surprise, surprise the actual results are very satisfying. The drawings are littered with tolerances, which many model engi-

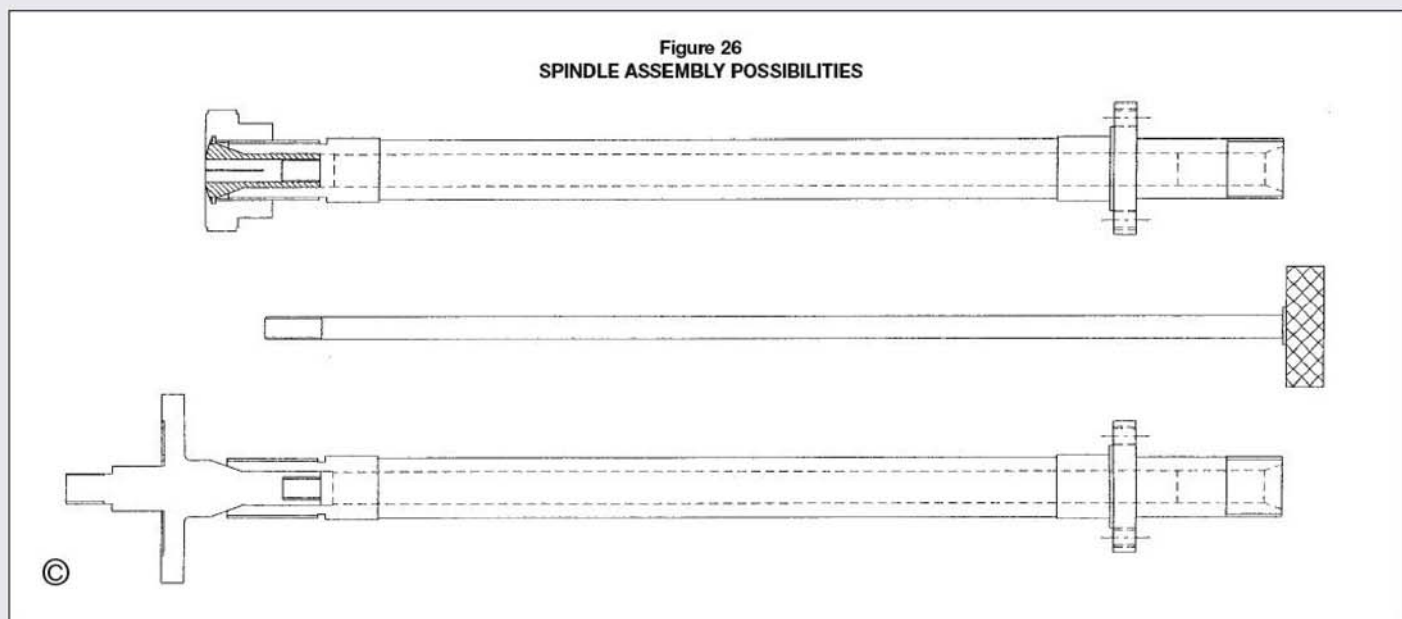
neers find superfluous or habitually work to a 'thou' up or down. The make up of the spindle is no different from that of the headstock where there are several parts that have to mate together and have to have some clearance to ensure running but 0.001in. up and down will not achieve this in the long run as it is quite possible that a lesser part will determine the fit and not the important part.

It is possible, for instance, for the shaft-locking ring to actually carry the shaft and not the bearing if tolerances are ignored and it will be hard to detect what is amiss.

On the fig 24 (part VII, M.E. 4239, 21 January 2005) there are some notes on putting the spindle together, which should offer the guidance necessary to get a free running shaft and housing.

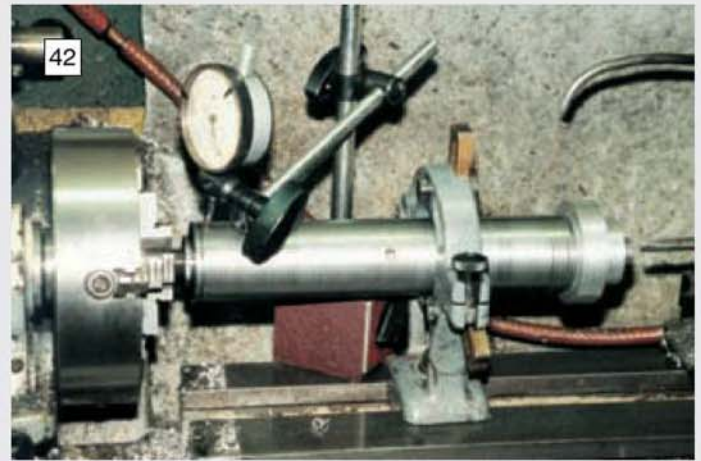
It was found that the housing closing ring would undo itself once oil had been fed into the housing, which I can only think is all about tight clearances and the drag of the oil. It would not appear to be possible but it is only the addition of oil that causes the cap to release. To overcome this a small screw is needed to keep it in place. It also means that the housing is not oil tight and will leak at a very small rate when the shaft is turning.

Figure 26
SPINDLE ASSEMBLY POSSIBILITIES





41
Machining the poly-V groove pulley from a billet of aluminium alloy using a special tool ground to the correct geometry.



42
Setting up the entire spindle in the lathe to bore the tooling location tapers off the spindles own bearings.

Presumably surface tension or capillary action stops the oil leaking when standing still. Remember to top up the oil at each session. A small hole threaded M6 is provided halfway along the spindle for this purpose but there is no way of knowing how full the housing is.

One will note that I have not bothered with sealing in any way other than tight clearances. I feel justified in this approach as the Camcutter is not a production machine and it probably will only get an outing once or twice a year. The leaking oil film is to my mind a good seal in its own right, if a little wasteful.

Finishing the spindle

Figure 27 gives the extra parts needed to complete the spindle. The draw bar is nothing fancy but the arbor and the collet need extremely careful work to maintain the concentricity we have so far achieved. The cutter collet tries to duplicate what

is used on the Clarkson milling cutter style of engagement as I see it. The cutter bears on the centre that drops into the centre hole and will find its own position when the cutter is loaded. Only one size of collet is required, a 6 mm bore, as for the type of work intended for Camcutter there is no need for anything bigger that I can see. The collet has to be made directly after the turning out of the mating bore in the shaft so that a good line fit is achieved. 817M40 is the chosen material as it is slightly harder than mild steel but that is optional and one might think that it would be better to have a soft and replaceable collet than damage the shaft bore. Cutting the collet thread to M6 x 20tpi was done by using an old milling cutter and fluting it to make a tap. Slitting collets is a *bette noire* for me but it is so superior to using a hacksaw.

Grinding arbors

The grinding arbors need to be carefully made. I

made mine from a welded on disc and shaft machined between centres although the length is not too great. The angle is set with the cross slide still set to the last cut on the shaft.

Pulleys

One of the problems with poly-V belting is that it is intolerant of misalignment and will jump grooves to find the right running position or run off altogether therefore end play is not something that is allowable.

I found this out the hard way with a plain bearing motor of ancient vintage on another machine, which had some 4mm play that only showed when up to speed and power on. It took a long time to work out what was happening.

Many types of machine now use poly-V belts and pulleys. They allow the designer to get much smaller sizes of pulley but give at the same time better power capacity and also allow greater

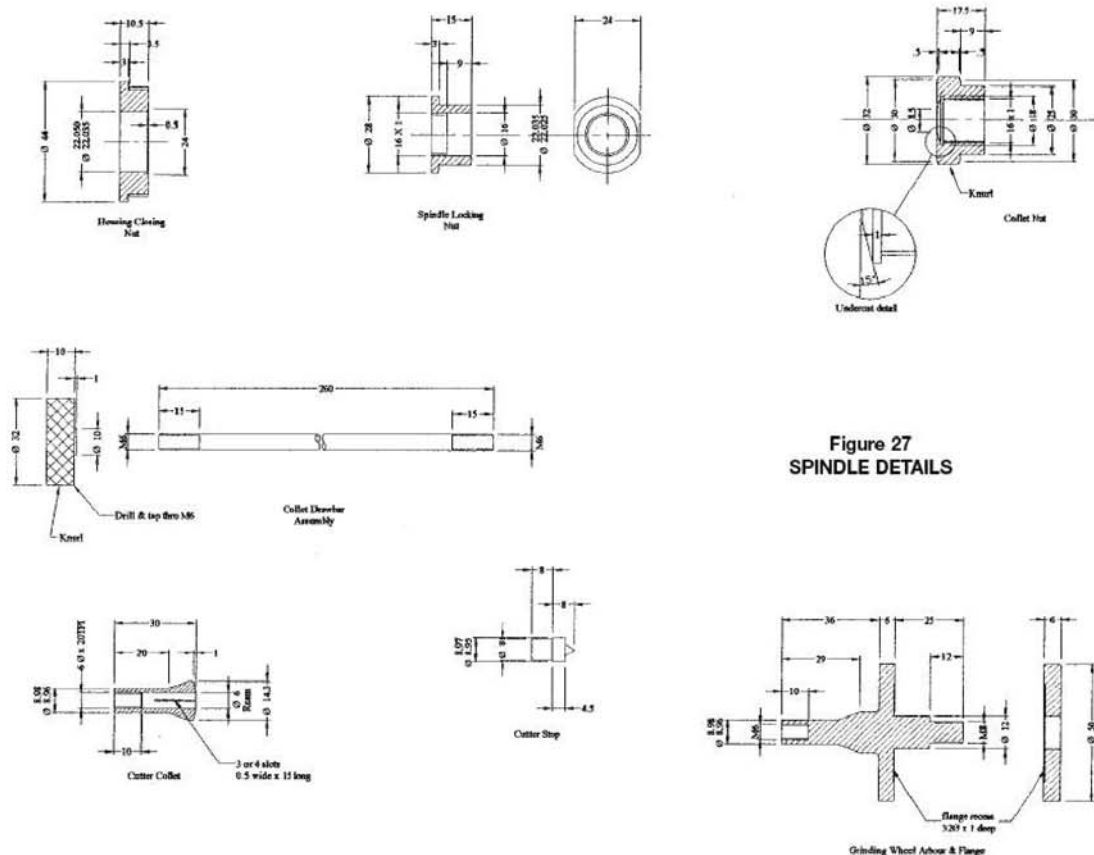


Figure 27
SPINDLE DETAILS



Another view of the tooling taper boring procedure. The method used was that described by Prof. Chaddock in his series on the Quorn.



The finished spindle assembly. A 6mm dia. milling cutter is shown mounted in the milling end of the spindle.

reductions or step ups than conventional belts. On the whole, space required is much reduced, they look better, and they are not expensive. On the debit side the pulleys are said to be difficult to machine properly which I do not think the case but then I have made many and it is almost second nature now that I have special tools to do the job. The Camcutter is both a miller and a grinder so it has to have two different, if not more, very different ratios in the driveline. I have chosen to have the grinder run with a step up from the motor of 2.5:1 and the mill to drive at 1.5:1 down. I never looked at a standard belt but am pretty sure the pulley on the spindle would be close to the diameter of the smallest grinding wheel I would use and this would interfere with the work. I would also think that the angular lie of the motor would be too wide to accommodate the swing mounting plate with standard belt drive.

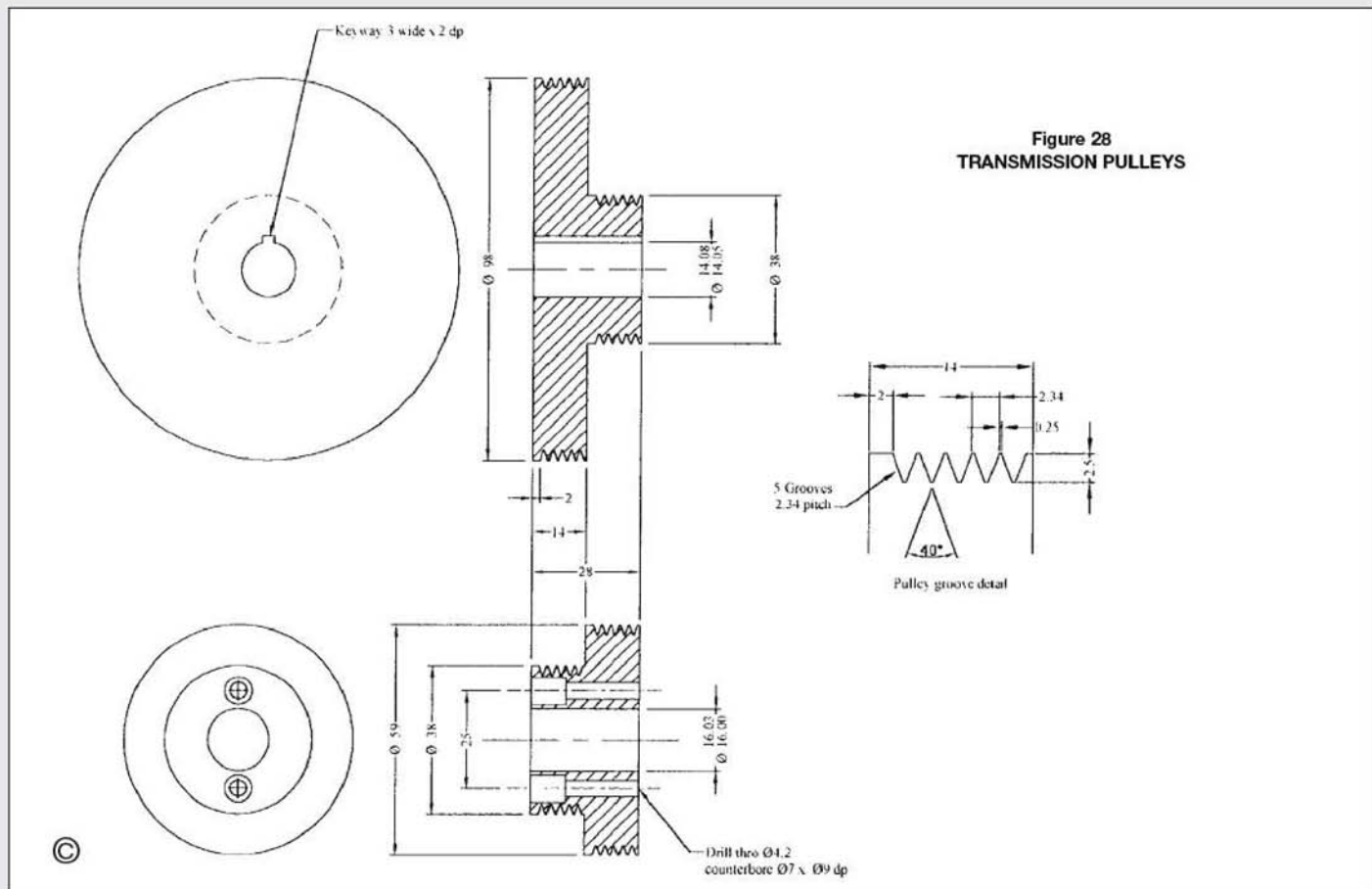
The dimensioning comes straight from the manufacturers pamphlet and looks terrible with three places of decimals but there is some latitude - 2.335mm becomes 2.34mm which we can measure and will not throw any real error over five grooves. The 40deg. angle needs a gauge to be made which is just another little exercise that will repay itself in time, as do so many other jigs and fixtures made for one job but are used over and over again on other work.

Gauging the 2.34mm steps is done by a vernier held against the chuck face and some arithmetic. I actually have now a cutting tool, made from silver steel, that cuts out all measuring. The diameters of the aluminium alloy pulleys are turned and then we switch to the special tools and one will note that getting into the corner needs a really special tool but it is the only one you will need. Photo 41 shows

this tool at work set over and working on the smaller of the two pulleys. Photos 42 and 43 show the complete spindle back in the lathe held by its shaft and arranged in the steady so the complete assembly is riding on the lathe centre line. This operation came straight from the Quorn series and it is the type of procedure that is eminently simple and highly effective but not one that I would have guessed at let alone used, had it not been for Professor Chaddock. Again, check out the alignment front and back with the dial indicator and machine the spindle pulley grooves. This was also the stage when in the collet 40deg. included angle was machined.

One should also now appreciate why it was necessary to machine the body or housing to fine limits in the first operations. Photo 44 shows the completed spindle assembly.

●To be continued.



Keith Wilson

describes the expansion links,
motion bracket and
connecting rods.

●Part V continued from page 100
(M.E. 4239, 21 January 2005)

That reliable means of communication 'the grape vine' has produced some news that I find a teeny bit disturbing. It seems that there are some readers (including some of the local club which honours me as a member) are shy of asking my advice on miniature locomotive matters – or just scared! Please don't be. The worst that could happen is for me to say "get stuffed" or equivalent, and it is a fairly proud boast to state that 'none have yet gone away empty' when requesting aid. I always enjoy photographs, and will respect any requests for anonymity if sending them to the magazine for publication. Also, I get quite a kick from seeing a photo of an engine built to my design that is built better than I could do it myself.

Expansion links

These links are fairly hefty compared to the more usual sizes in 'our' sizes, but have to be done and need to be as accurate as we can get them. The following is the procedure that I have used for these selfsame links. Begin with four blocks of mild steel, 1 1/2 x 3/8 x 7 1/2 in. long. I do not recommend normal rule and centre-punch methods of marking out, for great accuracy is vital. The 'blank' drawing shows precision locations for the holes, all of which are important. Set the first blank up on the milling machine table under a vertical attachment. Or, of course, on the vertical slide on a lathe. With a centre-drill (I suggest 1/4 in. diameter) it is quite easy to locate all the holes to an accuracy of 0.001 inch. Beat that with scribe and rule if you can!

Transfer the blank to the vertical drilling machine; drill right through with 1/4 in. drill. De-burr the holes (the easy way is to use a bigger drill at slow speed, holding the blank in the hands) and clamp the blank to the next one firmly. Two clamps top-to-bottom, two bigger clamps sideways recommended. Drill through all holes, gently. On getting the first hole through, push in a piece of 1/4 in. dia. steel to aid location – clamps can slip! – and this is the last thing we want. In my case, I had a couple of 1/4 in. rivets handy – a good fit were they too. I used the other rivet through the second hole to be drilled. The best hole to do first is

one of the end holes; the second is the one at the other end. After that it's not so important in what order you drill. Do the other two blanks in the same way. Open out the 1/2 in. holes to reaming size, ream them, de-burr.

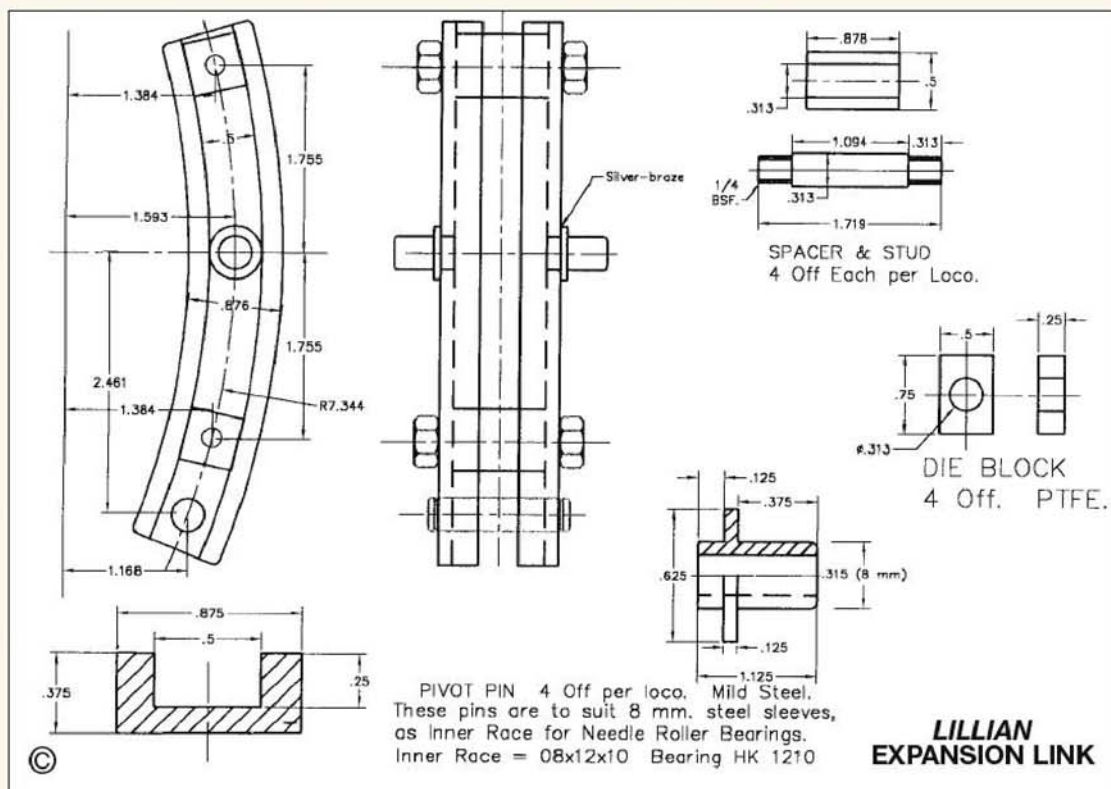
The next item is a fairly hefty rotary milling table. If not, then the expansion-link milling-device designed by Martin Evans will meet the case nicely. I made one several years ago (circa 1981) 50% bigger than his design, but with 10 1/4 in. gauge Stephenson expansion links to cater for I thought it prudent! Setting up is a matter for jig methods – as will be seen (photograph) I used a 12 in. rotary table with a welded-up jig from 2 x 1/2 in. mild steel. Two studs 1/2 in. BSF were firmly installed, located from one of the blanks. In the case shown, they were extra long and locked by nuts underneath the jig. It was necessary to just touch-up the outside of the thread in the lathe; after which the blanks fitted firmly, and needed tapping down into place with a hammer and levering up afterwards. Held firmly down with a couple of nuts, milling the most important part of the link – the inside – was easy. Suggestion – use a 3/8 in. slot-drill to rough out the link, then take a few light cuts equally spaced each side of nominal until a piece of 1/2 in. dia. silver steel just fits the slot. A digital read-out system is a very great help on jobs like this, but is not vital.

Another drawing shows the angles through which the table needs to be turned – if you use a

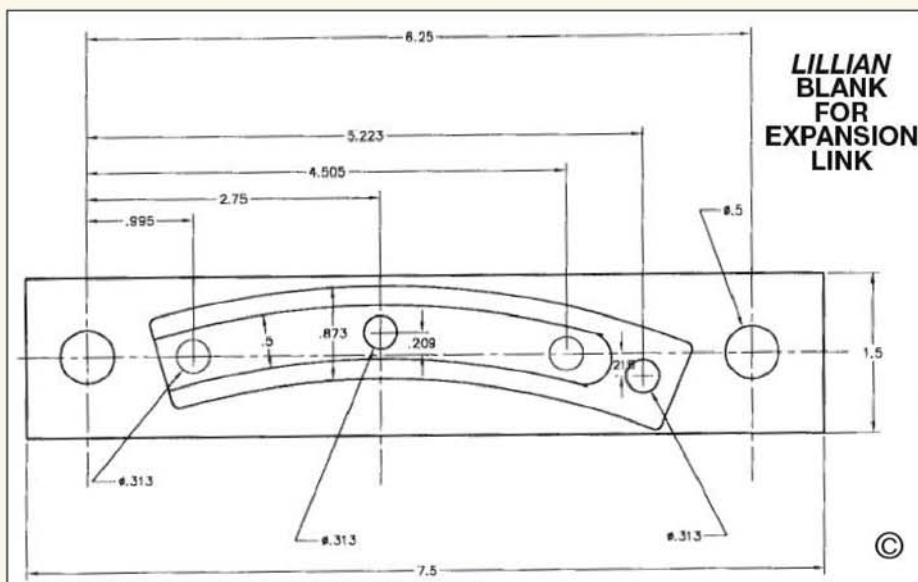
table. If you make a note of the 'zero' angle – i.e. the neutral centreline – then a couple of simple calculations will show exactly 'where to turn'.

Odd-leg calipers will locate a suitable cutting line from the inside part of the link, use of a bandsaw will take care of roughing-out the outside, followed by using the previous jig to trim to size – if you'd rather use files or finisher then use elbow grease as well – personally I prefer letting the machine do the work – it's not only easier but a neater finish and more accurate. If you have long enough studs in the jig, then clean up the outsides in pairs; it is easier and you end up with a pretty close match. Last operation is to cut off the ends where the 1/2 in. holes are, followed by trimming.

It is reasonably clear that the various holes in each link pair must match up exactly, especially lining up relative to the curved slot inside. So line these up with two pieces of 1/2 in. dia. silver steel about 7/16 in. long, one near each end of the link slot; but of course clear of the holes. A 1/4 in. bolt through the centre hole will clamp the lot together; the other holes can then be opened out to 19/64 in. and reamed 5/16 inch. Push a piece of 5/16 in. silver steel through each, remove centre bolt and open this out to 23/64 in., ream 3/8 inch. To get the assembled line-up correct, the two spacers must match exactly. It is no great task to get them matched lengthwise, to within 0.001 inch. The ties need not be so accurate, but preferably not too far out.

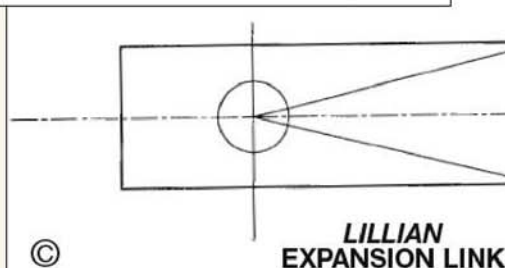


**LILLIAN
EXPANSION LINK**

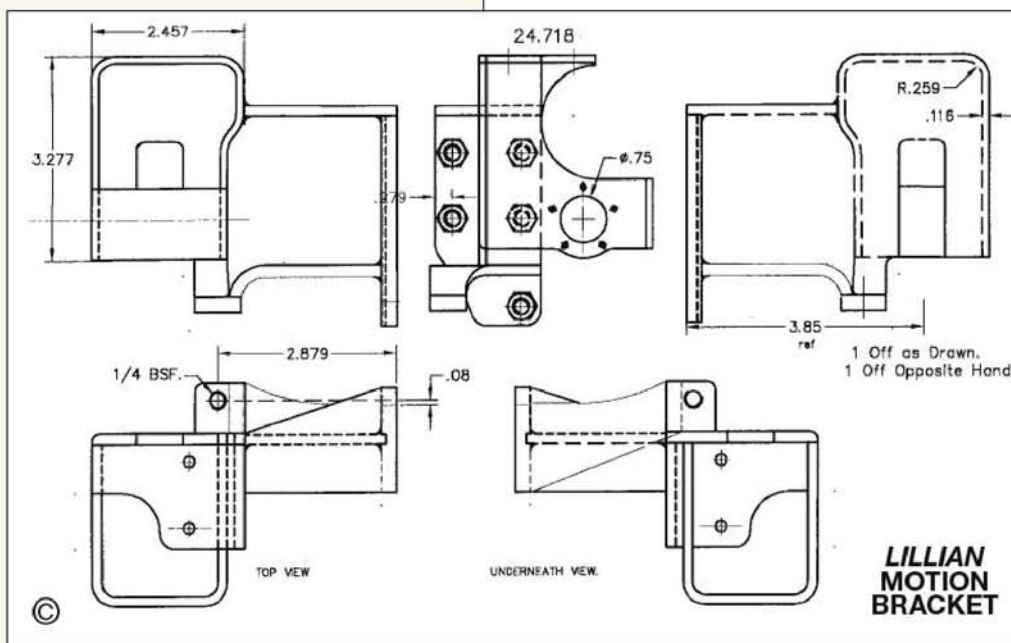


**LILLIAN
BLANK
FOR
EXPANSION
LINK**

The main pivots should be carefully lined up, hence the reamed hole. If a piece of silver steel be used as a guide during the silver-brazing operation (done with link assembled) it will greatly aid accuracy. Admittedly the silver steel is then a write-off, 'tis a small price to pay. The outside of these pins will have inner races bonded onto them (IR 8 x 12 x 12.5) which in turn suits bearing HK 1212. These will be mounted in a pair of housing caps. They could



**LILLIAN
EXPANSION LINK**



**LILLIAN
MOTION
BRACKET**

well be made of steel, but brass was chosen to look posher. Likewise, I chose five bolts instead of the adequate three to hold these caps onto the motion bracket frameworks. There is nothing like being plain awkward at times!

I mention that although locomotives like Kings, Duchesses, A4s and Merchant Navies might well look much more impressive, one of the things you can do with these 'smaller fry' (Narrow Gauge) is to decorate them with bright colours and lots of polished brass etc. Also, due mainly to their simplicity and size, they are somewhat easier to drive and handle.

Now there is no way that narrow gauge types can completely displace 'mainline' locomotives in impressiveness of performance. I have in mind the tunnel at Stoneleigh where I always

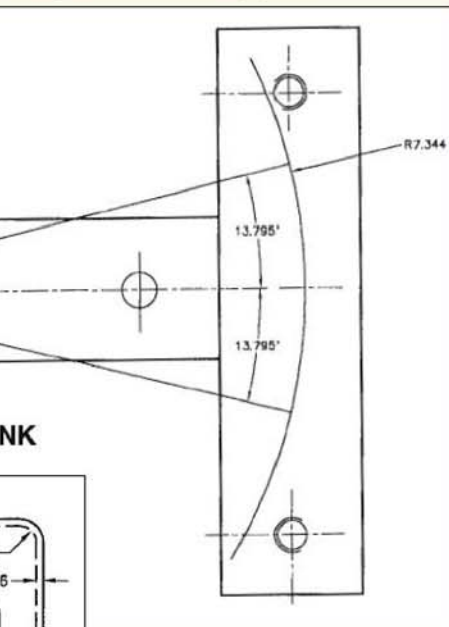
give a bit of flat-out performance just for the sake of the sound. You are not likely to get a Swindon 'bark' from a narrow gauge puffer, with a long chimney, but of course being very much larger can beat 'em on power output as well as being easier to drive.

I have recently (at time of writing) made four sets of links (eight bits) by this method, and discovered that four pieces of silver steel all went through their respective holes at one setting. Something like accuracy – not mine directly, but the method's.

(Loco) motion bracket

Most engines have these items, ours is no exception. It is perhaps not the easiest item to make nor perchance the easiest way, but it works; after all the prime consideration. I believe that the

originals were largely castings, but some castings are easier than others. An item that can be cast 'full size' is somewhat different to (from?) the smaller but otherwise identical casting in our size. This little matter proved a thorn in the 5in. Merchant Navy design inside cylinder but was overcome and the locomotive has proved very popular, some 50 plus being started and several completed – it seems they go well.

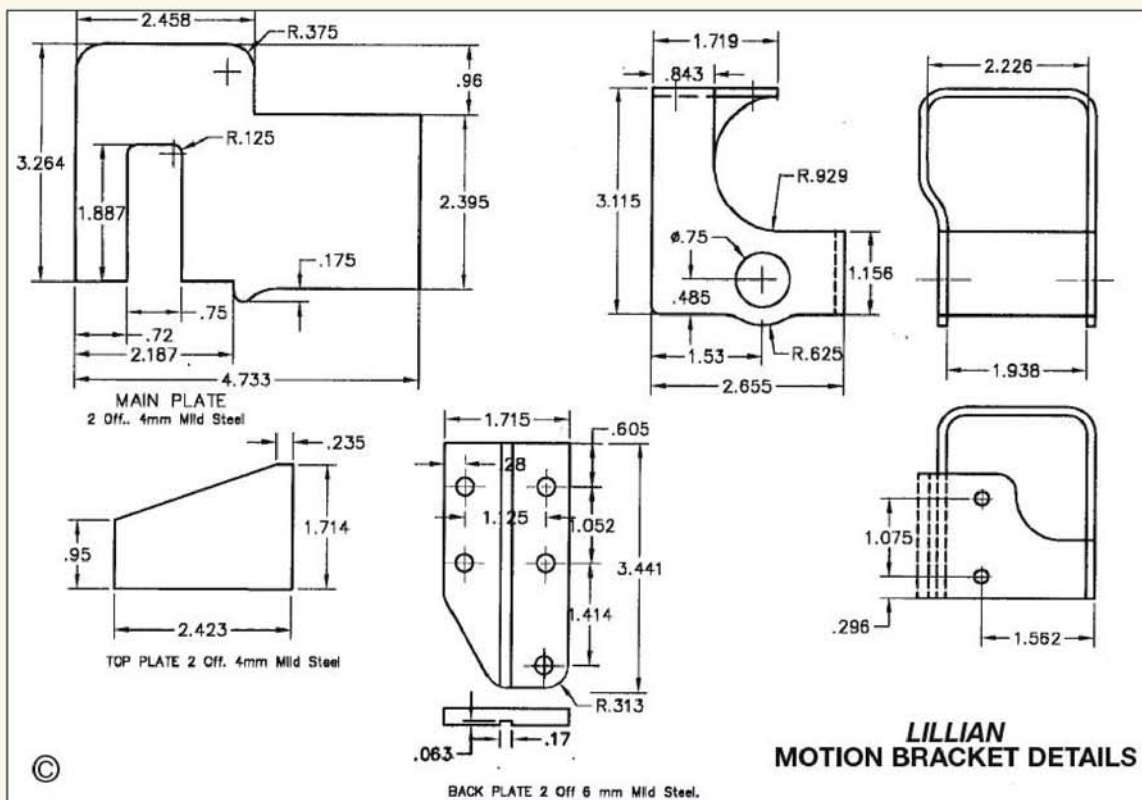


The method shown (fabrication) looks very tricky but makes up well. The largest item is the main frame, this looks most odd in the flat, but it is accurate. I had four cut out by abrasive water-jet, a nice clean job and saved me lots of elbow grease. It (they) has/have to be persuaded into shape, note carefully that they are handed by bending. I found an odd chunk of mild steel that could be chewed into shape for a bending mold, chewed it to shape and used it. To persuade the blank to take up its appointed shape, begin by putting two 2BA tapped holes where they will match up with the two holes in the top of the bracket. If these be used to bolt the blank to the block (socket-head cap screws

recommended) the application of heat on the bend zone will aid matters muchly, plus a fat hammer. With the good old oxy-acetylene torch, this heated zone can be kept very local. The outer ends are deliberately shown too long, and they will need trimming. When they become flush, they can be arc-welded.

A little bit of trimming (linisher, angle-grinder) and the main work is done. The 3/4in. dia. holes can be reamed, and if not dead in line, use a piece of 3/4in., steel bar to persuade them that you know best.

To line up and arc-weld the rest of the bracket is straightforward. If you have all the parts pre-cut (laser or jet) then get the holes in the backplate lined up well with the 3/4in. holes as these will be easier to match up on the main frames.



half the volume had to be reduced to swarf, but the final result looks quite well. There is an advantage in using flame-profiled black mild steel. You can safely machine it with minimum distortion; this cannot be said of bright drawn mild steel, unless of course it has been stress-relieved. So unless you get stress-relieved or 'normalised' bright, stick to the black even although it takes a little more machining. Begin by reducing the parts sideways, aiming at leaving the block a bit over thick. It will be easiest to take one cut completely across the face but only just enough to clean it up, and then

The bearing housings or caps are plain lathe jobs. Please yourself on the number of mounting holes, if these are located using a rotary table then it makes little difference how many you use, it is a matter of $360/n$ degrees between each pair of holes, n being the number of holes. Best not to use fewer than three, for two would be weak in the plane perpendicular to their mutual axis. Do not worry as yet about overmuch side clearance for the expansion links in their housings, for it is not likely that every part of the valve gear will match up exactly. Adjustments will certainly be needed.

Connecting rods

Absolutely essential, but rather big chunks to machine. It might well be that these can be made available in the form of malleable cast iron. As far as I know, this is ordinary cast iron that has

been 'stewed' at a dull red heat for about a week; this renders it very soft, certainly not brittle.

If available, this will need absolute minimal machining; cleaning up with files/carborundum paper etc. should suffice. Drilling and reaming the holes is quite easy and should need no further explanation.

To chew them out of solid needs (for preference) a fairly hefty milling machine. It is so much easier to have a traverse that is greater than the length of the rod, in this case a preferable minimum of about 21 in., although by sliding the job along after cutting halfway along this job could be done on a smaller machine – it will just take longer. (I recall milling the 10 1/4 in. frames; to clean up the ends required opening of a workshop window).

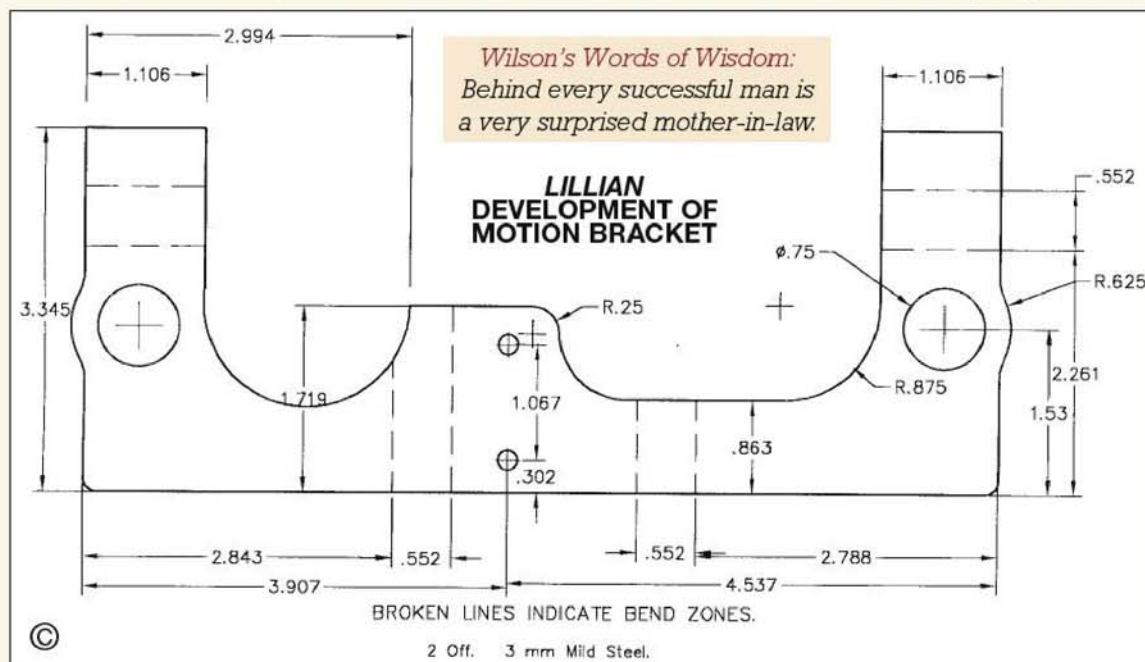
In my case, I started with some flame-profiled chunks of 35mm thick steel. Much more than

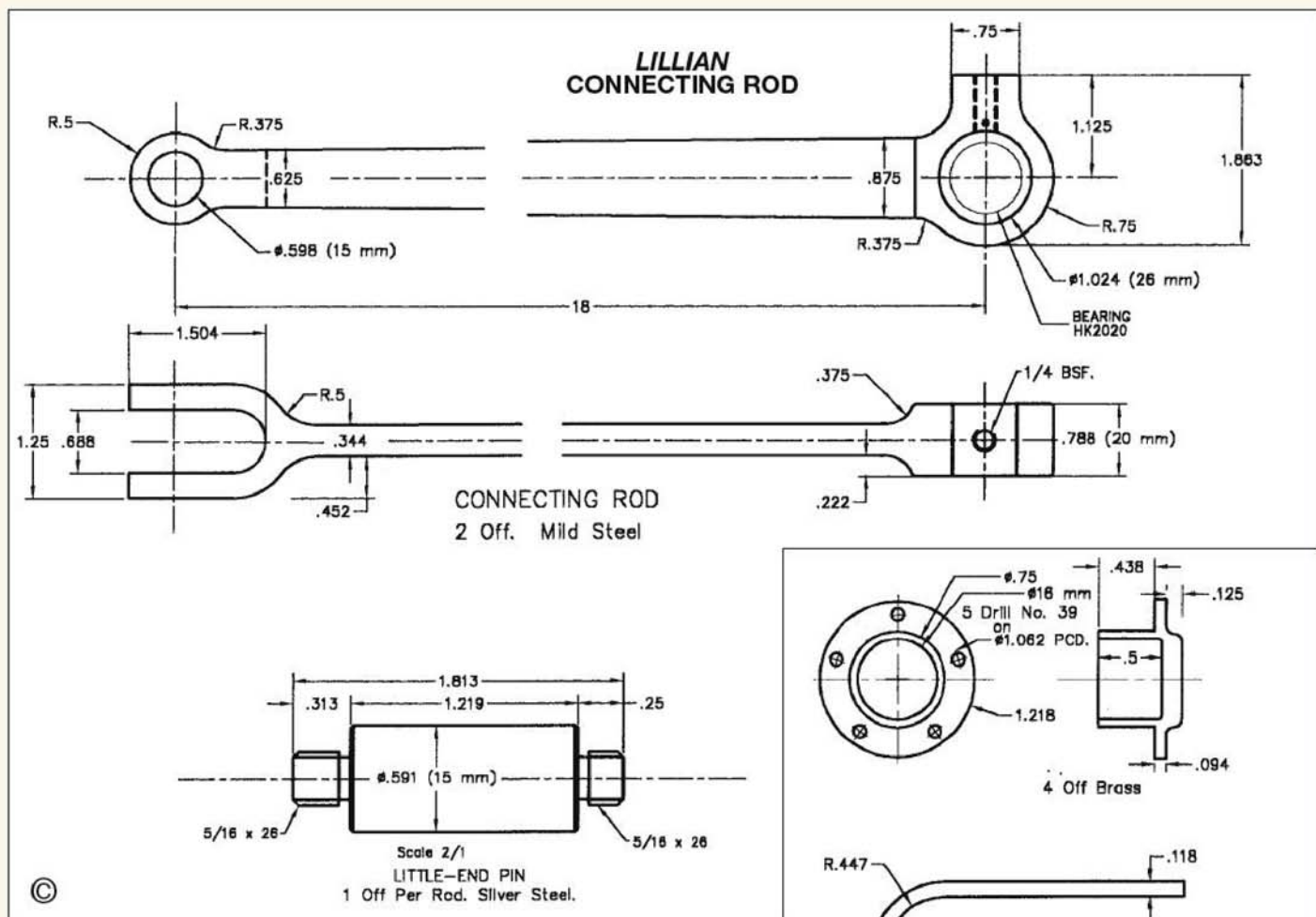
the other side can be reduced to leave the block cleaned up and parallel. There will be plenty to spare as 35mm is a tiny bit over 1 3/8 inches.

To machine the fork at the little end, the simplest way is to use a slot drill. I used a 1/2 in. slot drill to get the main part of the fork, followed by sideways enlargement to get the full width. It is important, but not too easy to achieve, that the slot be dead central, for even a slight bit 'out' sticks out like a sore thumb. I 'cheated' on this matter, by cutting the slot first, trimming the outsides of the rod afterwards (1.25 in.) to leave the slot dead central.

The next operation is to drill and ream the holes. However, it will be easier for the time being to leave the small end at 0.5 in. diameter and the big end at 1 inch. This greatly aids the setting-up for the tapered portion of the rods; opening out later is no problem.

Two machine vices, preferably identical, are a great boon. Mine are matched exactly in height, but not otherwise, although similar. Mounted about the right distance apart, they can hold the embryo rod horizontal by the ends. If the blank rests on a couple of identical blocks (parallels) it will be just right for milling. There is no need to purchase posh parallels. If you visit a scrap metal merchant, the odds are that you will discover a suitable piece of bright drawn mild steel. Two separate pieces should be viewed carefully because they might be from different batches, in which case





they could have a difference between them of over 0.005in. or so.

All right, I did find this out the hard way. But if cut off the same piece, preferably adjacent, the chances are that they will match within 0.001in. or even better. As a guide, my two were cut from a block of 3 x 1 1/2 inches. One end of each was carefully painted so that they were less likely to be used for any other purpose.

To locate the taper so that the uppermost part of the taper is horizontal for machining purposes, put a 1/2in. dia. bar in the small end hole and a 3/4in. dia. one in the big end. Now you see why I recommended the hole sizes given above. If these two bars rest at exactly equal heights above the milling table, the future tapered top will be exactly right for milling. A photograph shows this set-up.

This takes care of the tapered section; but there are more tricks to follow. Curly used to machine the round ends of connecting and coupling rods etc. by putting a suitable sized bar of steel in the lathe toolpost and feeding it up to an end-mill in the chuck, rotating the rod(s) by

hand. Feeding the cross-slide in obviously reduces the diameter of the boss. However, trying to use this method with rods this size is a horse of another kettle of fish, but if you try it **watch your fingers** and count them afterwards!

The safest way is as shown in the photograph, mounting the rod on a central spigot and clamping the rod firmly. Juggling with handles etc. can take care of all curved portions and the oil box. Note that if you are using needle roller bearings (strongly recommended) the oil hole should be 'vented' to the inside of the rod (the side nearest the engine) so that oil may flow onto the crankshaft and thus reach the bearing. A 1/16in. hole will suffice, but there is no real problem with a 3/32in. one. The same applies to the bearings in the coupling rods (except the flexible joint). But more of these items later, for their hole spacings are quite critical and

must match the axlebox centres exactly.

After opening out the holes to finished diameter, final cleaning up is a matter of filing or finishing; remember to remove sharp edges and burrs. Avoid rust by a quick overall spray of WD-40, one of the finest outcomes of space exploration.

●To be continued.



Connecting Rod machining.



Rounding off ends.



The complete Expansion Link.

BUILDING A SIMPLE LATHE

Jon Milne-Fowler

of Australia describes how he built a simple lathe for low cost.

In *M.E.* 3760, 6 September 1985, and in alternate issues over the following three months, a short series of articles by Don Gordon explained the methods he used to construct from available materials a simple treadle powered lathe suitable for a variety of model engineering applications.

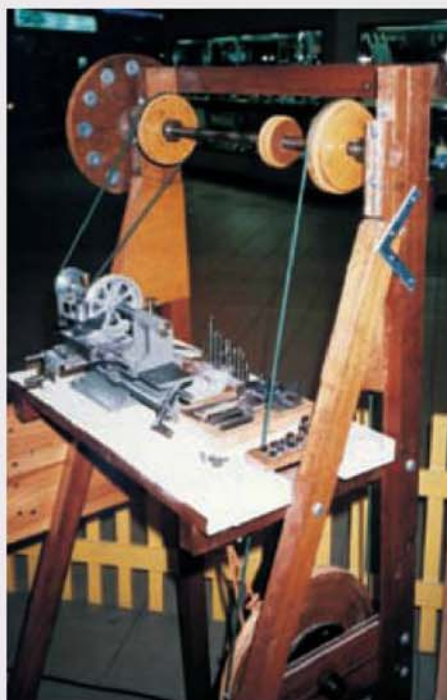
Over the years I have assisted at several model engineering displays, at which I operate my Unimat SL as well as tending to the running of some small model steam engines, and talking to interested members of the public who came to look, or to seek information. On several occasions people commented on the cost of setting a model engineering facility at home and I drew their attention to several books which describe how it is possible to build a lathe and other equipment for a small outlay in materials. I was also able to tell them that one of our club members had built a lathe to the design of L. C. Mason, over a period of about eighteen months, utilising the machining facilities at one of our technical training centres. I would also draw their attention to the series of articles by Don Gordon. However, in this age of electronic gadgetry and the universal application of electrical power to drive everything from toothbrushes to irrigation water pumps, doubts have often been expressed about the practicality of using treadle power to operate a metal turning lathe.

I came to the conclusion that doubts of this nature must be laid to rest by practical demonstration and made a start along the lines described so well by Don Gordon, but following the philosophy and construction sequence rather than the design and construction features. I should add that, as a further excuse for embarking on this project, I had decided that such a piece of equipment would be good to have at our beach cottage, where I propose laying a 3 1/2 in. gauge ground level railway - but that is a digression.

Treadle drive unit

My treadle drive unit generally follows the description in the construction series, but the following, small details may prove an inspiration to somebody wondering how to solve their particular problem. Firstly, the treadle wheel itself was cut from an old piece of 7/8 in. thick plywood, which had served various purposes over the past forty years, and the centre spindle and bearing were previously the agitator unit of a Hoover twin tub washing machine. Pulleys and a flywheel were also jigsawed from this same piece of plywood.

The treadle wheel is 12 in. dia. and the flywheel 10 in. diameter. In order to improve the inertial characteristics of these two items I cast a number of lead plugs, which were then pressed into holes bored with a carpenter's brace. The treadle wheel has approximately one pound of these weights, at 10 in. pitch circle



The completed lathe with its accessories on display to the public at an exhibition.

diameter, distributed so as to partially balance the weight of the treadle as well as increasing the dynamic mass. The flywheel is 10 in. dia. and has approximately four pounds of lead plugs set in it at 8 in. pitch circle diameter. At the time when I was building this part of the project I was unable to locate any suitable ball bearings for the overhead shaft, so settled for plain bronze bushes set in wooden 'pillow blocks'. At some future date I might change these, but so far they have been quite satisfactory. The shaft itself came from a local scrap metal dealer, who was selling it as bright shafting. I have since discovered that it is actually a grade of silver steel suitable for tool



The upper portion of the treadle drive unit. The lead loaded flywheel can be seen to the left.

making! I can assure readers that there is no more of this material available from that source.

In order to allow for some experimentation, I made pulleys of various sizes from about 2 1/2 in. to 5 in effective diameter, and cut the grooves with a form tool to give an included angle of about 33 deg. to suit 5 mm. dia. 'Polycord' plastic belting. The pulleys were cemented with Araldite to turned and bored steel bushes made to suit the shafting, and are fixed in place with the usual grub screws.

Lathe

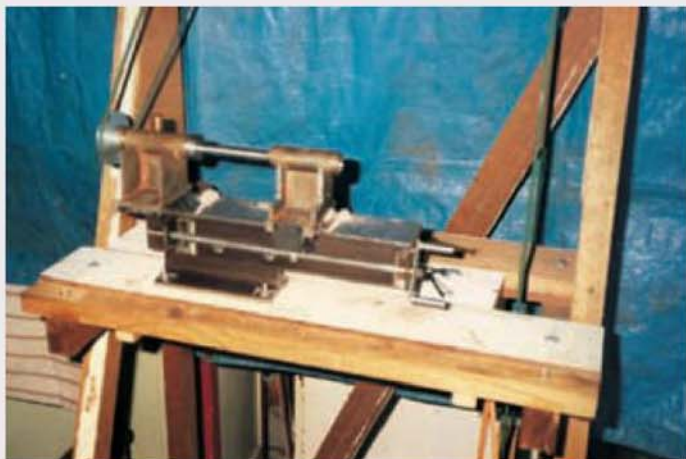
When it came to materials for the lathe itself, I was unable to obtain a piece of T-iron, but was able to purchase from the scrap dealer a short off cut of 'RSJ' or I-beam nominally 2 1/2 x 5 in. and splitting this length ways produced two pieces of T-bar of suitable size to start making small lathe beds. I have only used one piece - the other will be offered as an incentive to somebody else who shows sufficient interest in starting a similar project. I resorted to the shaper at the 'tech' to start truing up this piece of material and took initial cuts on the top face with a fly cutter in my milling machine. However, the essential work of obtaining a satisfactorily true flat face was performed with file and hand scraper using a piece of plate glass for a surface plate and engineer's blue to identify the high spots. Material for the saddle was also trued up using hand finishing methods, and the dovetail slides were produced by essentially the same procedures described by Don Gordon.

For mounting the lathe bed on its bench I decided on a single long foot at the headstock end, rather than a short foot each end of the bed. This was purely a matter of personal preference but this method of construction does also help prevent the risk of bed distortion.

The original descriptive series suggests the use of 1/4 in. BSW screw rod for the feed screws on the cross slide and the compound slide, and also for the leadscrew. I retained the 1/4 in. BSW standard for the cross and top slide feed screws but decided on 3/8 in. BSW for the long leadscrew as I felt that the smaller diameter was a little too flimsy for the length of the bed. An alternative choice was 5/16 in. BSW or 5/16 in. BSF. I rejected 5/16 in. BSW because the pitch (18 tpi) would be inconvenient if, at a later stage, it is decided to add a screw cutting gear chain, whereas 3/8 in. BSW, having a pitch of 16 tpi, is likely to be more convenient. A further reason for opting for 3/8 in. BSW was that it is readily available as screw rod from hardware shops which cater for the home handyman. For 5/16 in. BSF it would be necessary to ferret out an engineering supply house, and these are few and far between in this part of the world.

I decided not to incorporate a split nut on the leadscrew, and have used a standard commercial nut which is captured by a close fitting 'fork' in the saddle apron. This is prevented from rotating by a metal strap soft-soldered to the nut and secured to the apron with a cheese head screw.

The swivel base of my compound slide is pivoted near to the slide centre line and furnished with two curved slots to accommodate a pair of hexagon head securing screws of 4 BA



Boring the tailstock bushings from the headstock. A special one piece mandrel/ boring bar was used for this operation.



A front elevation of the completed machine shown with a work piece held to the faceplate by a draw bar.

size. This is a miniaturised version of the swivel base fitted to many commercially produced lathes of much larger size. Although providing two curved slots is without doubt more difficult than the arrangement shown by Don Gordon, I prefer to have the swivel point as close as practical to the tool post - another example of personal preference.

At this stage I have not split the headstock bearings. I believe that with the light duty the machine is liable to be subjected to, and having achieved a close fit between the lathe mandrel and the bearing bushes, together with the provision of adequate lubrication, it should be many years before any adjustment becomes necessary. For the purpose of ensuring continuous lubrication, in addition to the headstock bearing housing acting as an oil reservoir, a wick-type brass oil cup is mounted over the central portion with the wick wiping the mandrel.

For the design of the nose end of the lathe mandrel I decided against the more common screwed end and instead adopted a plain spigot 17mm. dia. with three set screws of M4 standard, spotted through from a Unimat lever-scroll type self-centring 3-jaw chuck. Both the mandrel nose and the tailstock sliding poppet are bored at their business ends with a $1/2$ in. to the foot tapered socket equivalent in size to a Brown & Sharp No. 4 end mill taper. Both are also drilled right through $3/16$ in. dia. to accept a draw bar or whatever. The only reason for not drilling through $1/4$ in. dia. was that I did not possess a long series $1/4$ in. drill, but the local hardware store does carry long series $3/16$ in. drills.

Basic equipment

While setup for taper boring the mandrel nose and tailstock poppet I made an assortment of taper shank mandrels as well as the usual set of male and female centres. One of these mandrels has been bored an accurate $1/4$ in. dia. and fitted with a $1/8$ in. dia. grub screw so that it may be used as an end mill holder or as a drill holder for $1/4$ in. dia. shank end mills or drills. A couple of 'spares' with parallel plain portions $13/32$ in. and $9/16$ in. diameter will undoubtedly find useful employment in due-course.

A small casting of unknown original source or purpose proved ideal for a catch plate and a $1/2$ in. capacity carrier or lathe-dog complete the essential equipment for turning between centres.

The faceplate was originally a test piece produced when I made a dividing attachment for my Atlas 6in. lathe. With a diameter of $3 1/2$ in. it



The lower portion of the treadle drive unit. All materials used are simple and inexpensive.

seemed about right, but as it was only $3/8$ in. thick a separate boss was turned up and fitted to the disc. As I have found the usual arrangement of radial slots is not ideal, particularly on a small



The lathe shown removed from its treadle base and displayed on its packing case, which is used for safe storage and transportation purposes.

lathe, I arranged a total of six slots in this faceplate only two being positioned radially, and the other four as two pairs of parallel slots. The slots are $9/32$ in. wide and allow approximately $3/4$ in. movement of $3/16$ in. dia. or M5 fixing bolts. A long draw bar and a small angle plate provide for alternative means of holding work on the faceplate.

Additional accessories

For the initial testing of the lathe and final truing-up of the cross-slide I used a tool holder and clamp similar to that described by Don Gordon. However, as I dislike the use of loose packing for setting tool heights, I have now furnished the compound slide with a substantial tool post 20mm. diameter. I have also made up three height adjustable tool holding blocks similar to those described by L. C. Mason, but modified in respect to the arrangement for clamping them to the tool post. Instead of splitting the blocks and fitting them with a clamping stud, they have been provided with split cotters, which securely hold the blocks on the tool post. Only a small amount of effort needs to be applied to the clamping nuts and there is no distortion of the blocks, which have been case hardened. Two of the blocks comprise a handed pair for holding either small inserted cutter tools or solid high speed steel tool bits up to $5/16$ in. square. The third block is bored to hold $5/16$ in. diameter boring bars, or boring bars of smaller diameter held in split sleeves.

An independent, 4-jaw chuck, nominally 3in. dia. and of the Whitworth pattern, is in the process of being fabricated and, together with a selection of special spanners, turning tools and shouldered bolts for faceplate use will complete the initial complement of equipment for this small lathe. To facilitate safe movement and storage a strongly made, fitted packing case houses the lathe and its accessories. Planned improvements to the basic machine include a lever operated sensitive feed fitting for the tailstock, and graduated thimbles for the feed screws.

I found this project very rewarding in that I have gained confidence in my ability to use basic hand tools to achieve close tolerance fits. I also have the satisfaction of being able to say with confidence that anybody who really wants to can make a lathe or, for that matter, any other machine tool without having to be a tradesman. The essential ingredients are imagination and a determination to see the project through. A little encouragement can also go a long way and this will be found in the various model engineering societies.



CLUB CHAT

With Malcolm Stride

Before I start the proper business of this column can I remind readers that the address for *Club Chat* information has changed due to Mike Crisp's recent retirement. Having persuaded you all to use the Hemel Hempstead address over the past year, this has now ceased to function. Therefore, all information for this column should be sent to the Orpington office address which can be found on the Contents Page of the magazine. Can you also please allow at least seven clear weeks for those items which are time sensitive. Having said all that I would like to thank all those who continue to send information into this column and to also say how nice it was to meet some of you at the Sandown Model Engineer Exhibition.

UK News

The AGM of the **Aberdeen MES** was attended by more than half the of membership (20) with the existing committee being re-elected. The society is looking for new members and anyone interested can contact secretary Charles Milne at 'Turlundie', Urydale, Inverurie AB51 3XW or tel. 01467-6121881. They are also looking for a reasonably priced meeting room, so no doubt Charles would be pleased to hear from anyone in the area who knows of such a facility.

Geoff Challinor, Chairman of the **Anson Engine Museum** (Anson Road, Poynton, Cheshire) has received the 'Commitment to Industry' prize at the Cheshire Awards for Tourism Skills in November last year. I am sure all readers will join us in extending our congratulations to Geoff on this honour. Further details of the museum which is devoted to the 'restoration and preservation of the internal combustion engine' can be found on their website www.enginemuseum.org I am sure many of our readers will be interested in this venue.

At recent meetings of the **Bedford MES** "all sorts of goodies were on display". These included, among other things, an unusual rotary steam engine designed and made by member Peter Rossi and a demonstration and explanation of the working of a modern black powder gun by David Elvin.

The revamped raised level station

at **Birmingham SME** has been finished complete with patterned wooden valance and glass etched with the BSME logo in the windows. A club banner for use at exhibitions is being made by "the group of wives who come to the club regularly and who like making things".

Bournemouth & District SME are continuing to make progress with various improvements to their track with the siding having all its support posts cemented in with the rail to be put on top.

The annual auction at **Bradford MES** was described as "a bit slow to start with items going for 10p but things soon warmed up". A Myford lathe described as "being in need of some TLC" went for £25 so someone had a good bargain! Member Eric Dean was a Technical Author for part of his career and provided the following "Imagine - A fitter on a freezing winter's morning under an earthmover. He's just checked the maintenance manual and it said 'remove nut A' - Yes I wrote that! He finally found 'nut A' embedded under a mass of gunge. His spanner slipped and rounded the rusty nut's flats and cracked his front tooth. On with a big mole wrench. That just removed more metal off the flats. Cold chisel, chip away, knuckles bleeding. Finally the nut is in bits on the frosty ground. Well he's removed 'nut A'. I didn't tell him how to do it. He knew. I knew as well, but you don't put that in a maintenance manual!". My initial thought was "Is it any wonder we don't read the instructions until we are in trouble?" On a more serious note, how many of us when building a locomotive or other working model really think about future

maintenance at the time? The society reports that three new locomotives have been run recently which must be good news for the 'motive power depot'.

Following the success of the 3 1/2 in. gauge rally held last year, **Bristol SMEE** are to hold another on Sunday 8 May this year. The society entertained 'The Beavers' (miniature Scouts according to one of their leaders) in October and the youngsters enjoyed so many rides that "soon the railway was working flat out" with Beavers, friends and adults all rushing from train to train.

Canterbury & District MES have a talk by Mr. G. Harris entitled 'A Russian Journey - St.Petersburgh to Moscow' on 28 February. The talk will take place at The barn, Kingston, Nr. Canterbury at 7.30pm.

Colchester SMEE have 'The Story of the Edison Cylinder Phonograph' by Keith Catchpole as the subject of their talk to be held on 11 March. Further details from Les Hammond on 01376-511686.

We have been asked by Pete Jarman of **Northampton SME** to publicise the change of date for IMLEC 2005 back to the 2/3 July. The date has been changed to avoid clashing with the now confirmed British Grand Prix at nearby Silverstone. Two websites have been set up for the event, one at www.imlec2005.com the other at www.imlec2005.co.uk

Hereford SME report a very successful 7 1/4" Gauge Society AGM weekend in spite of the weather which looked to be very damp judging by the photos. The society '00' layout was also now "been operated for the first time before an audience".

The first Gala Weekend at North

Wilts MES was a success with "quite a good selection of steam/electric locos" and the dates for the event this year are 18/19 June. The society have gained some new members but this has been balanced by those not renewing their membership.

Saffron Walden & District SME report that "A new locomotive was delivered to Audley End Estate Railway on 10 November. It is a scale model of a Great Western Saint 4-6-0, built by Neil Simkin". The newsletter also reports "that the Chairman has now obtained an insulated container for a donation to a beer fund of £50. It requires some small repairs none of which will be beyond the expertise of any member". We will no doubt hear more of this in the future.

The **Society of Model & Experimental Engineers** is making progress with the re-arrangements at the rear of its Wanless Road premises in South London. The pictures of members' 'Work on the table' for October included a plateful of 'Cakes for Teatime' by Susan Parker. We hope those attending enjoyed them!

Chris Dobbs, Secretary of **Stafford & District MES** reports that the "long running rebuild of the triple gauged raised track is almost completed" although at the time of writing the steaming bays are still to be finished. The society has a talk by Brian Simpson 'Model Wheelwright & Wagon Builder' on 22 February. Contact Chris on 01889-270533 for more information on this and other talks in the programme.

I have just received the superbly produced *Bulletin* from **The Society of Ornamental Turners** which, among other things, contains details for a horizontal cutting frame for the lathe which will allow the cutting of all sorts of patterns. Other items mentioned are a "dodecahedron in a single cage turned from a solid sterling silver casting". Stuart King has made a version of the first ever known lathe using details from a sketch by Leonardo da Vinci. This lathe is the first to use continuous revolution with a flywheel and treadle driven crankshaft. Stuart comments that "the end result is a surprisingly powerful machine".

I have received details from Brian Thompson of the **Southern Federation of Model Engineering Societies** that the sixth edition of the directory and the 2005 directory supplement are now available and will be on sale at rallies and



Some of the beautiful items exhibited by the Society of Ornamental Turners at the recent Model Engineer Exhibition at Sandown.

exhibitions throughout the year. They are also available by mail order from Brian at 35 Rivershill, Watton at Stone, Herts SG14 3SD. Mail order prices are £3.50 for the Directory and £4 for the supplement, both inclusive of postage and packing.

Strathaven Model Society held its annual open weekend over the 9/10 October with excellent Autumnal weather. There were 14 visiting locomotives on the Saturday and 16 on the Sunday with owners travelling from both Yorkshire and Lancashire to support the event. Music, as usual, was provided by Raymond McMahon's model of a Showmans Organ, and new member Archie Canne presented his 5 cylinder rotary aero engine as a static display model. It is reported that "wallets were firmly locked by wives as Phillip Newman and Graham Burhouse of Tayside Locomotive Builders ran one of a batch of four newly finished Talyllyn 0-4-2 Tom Rolt narrow gauge locos". Further work is continuing at the park with new toilet facilities and loading ramp as winter projects. The Monday club is now up and running along with the usual Tuesday night meeting. Further information about the



Neil Simpkin's fine Great Western Railway 'Saint' 4-6-0 photographed at Saffron Walden.

society can be obtained from Secretary Martin Simpson (01698-821032) or Roy Kavanagh (01563-850976).

Sussex Railway Modellers have sent us details of the Brighton Modelworld Exhibition which opens on the date of publication of this issue. The exhibition includes a wide variety of exhibits and trade/club stands and is open from 18-20 of this month. More details on the website at www.brightonmodelworld.com

Taunton Model Engineers had

a successful stand at the Bristol Model Exhibition and are busy working on their new site in spite of the attentions of vandals who, in two separate incidents, demolished newly built walls to the carriage shed. The society have engaged a security firm to carry out daily checks on the site. In spite of all this the roof is now installed on the shed and the main structure of the building has been approved by the local Inspector. Another milestone achieved was the first run (in light

steam) of Andy Webb's *Speedy* on the new track. Other items making good progress are the platforms, turntable pit and retaining walls and steps in the station area. Progress also continues with the manufacture of riding trucks and trackwork. The site activities are reported as "generating much local, and friendly, interest". The society are holding their 2005 Exhibition at Monkton Heathfield School on 2/3 April.

The September 2004 Open day at Tyneside SMEE was attended by several drivers and locomotives. The first locomotive on track was Eddie Gibbons' 3 1/2in. gauge 4-6-2 *Sir Nigel Gresley* in blue livery followed by Billy Johnson with his 3 1/2in. gauge 0-4-0ST *Mary* in its red livery. They were followed by Dave and Ian Cormack, visitors from West Cumbria club with their 4-6-2 *Moray Firth* in British Rail green. After lunch Eric Lonsdale steamed his 5in. gauge LNER *Pioneer*, which steamed very well for a 70 year-old! Eddie Gibbons came back on with *Sir Nigel Gresley* and Ian Spencer ran through until closing time with his Bl. The day was also graced with Martin Young's 6in. scale Burrell Showman's Engine *Simplicity* which "ticked over all day".

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.

FEBRUARY

- 18-20 **Brighton ModelWorld** at the Brighton Centre. 10am-5.30pm; Adult: £7, Child/Senior Citizen: £4, Family: £18. Contact Tim Steven: 01444-254057.
- 18 **Canvey R&MEC**. Auction. Contact Brian Baker: 01702-512752.
- 18 **Ickenham DSME**. Slides & Videos/Workshop Practice. Contact David Sexton: 01895-630125.
- 18 **North London SME**. An Evening with George Case & Tony Dunbar. Contact David Harris: 01707-326518.
- 18 **MELSA**. AGM. Contact Graham Chadbone: 07-4121-4341.
- 18 **Rochdale SMEE**. Auction Night. Contact Mike Foster: 01706-360849.
- 18 **Romford MEC**. Piers of the Realm. Contact Colin Hunt: 01708-709302.
- 19 **Chesterfield MES**. Public Running Day. Contact Mike Rhodes: 01623-648676.
- 19 **York City & DSME**. Richard Gibbon: Steam Surprise. Contact Pat Martindale: 01262-676291.
- 20 **Frimley & Ascot LC**. Club Running. Contact Bob Dowman: 01252-835042.
- 21 **Leicester SME**. Mike Sherwood: Kites. Contact Raymond Wallis: 0116-285-8824.
- 21 **Model Steam Road Vehicle Soc.** Roy McClellan: Experiences of Full Size Engine Owning. Contact Geoff Miles: 01869-247602.
- 21 **Peterborough SME**. Presentation by Metalsmith Ltd. of Kettering. Contact Tony Meek: 01778-345142.
- 22 **Furness MRC**. Club Quiz Night. Contact Bob Watson: 01229-831937 or Bob Reeves: 01229-838088.
- 22 **Stafford DMES**. Brian Simpson: Model Wheelwright & Wagon Builder. Contact Chris Dobbs: 01889-270533.
- 23 **Birmingham SME**. Cup Competition 2005. Contact John Walker: 01789-266065.
- 24 **Cardiff MES**. Patrick Hassell: History of the Vari-pitch Propeller. Contact Trevor Jenkins: 029-2075-5568.
- 24 **Sutton MEC**. Non-Steam Night. Contact Mike Dean: 0208-657-5401.
- 24 **Worthing DSME**. AGM. Contact Bob Phillips: 01903-243018.
- 25 **Brighton & Hove SMLE**. Gerry Collins: Basic Silver-Soldering and Brazing. Contact Mick Funnell: 01323-892042.
- 25 **Colchester SMEE**. Club Auction. Contact L. G. Hammond: 01376-511686.
- 25 **Hereford SME**. Keith Ball: Red Marley Hill Climb & Classic Motorcycles. Contact Richard Donovan: 01432-760881.
- 25 **Kinver & West Midlands SME**. Ron Hopkins: How to Butcher Wood. Contact John Campbell: 01384-891244.

- 26/27 **Auckland SME**. Panmure Basin Festival. Contact Gary Farquhar: 576-7025.
- 26 **Hornsby ME**. Family Day & Boiler Inspection. Contact Ted Gray: 9484-7583.
- 26 **SM&EE**. AGM. Contact David Boote: 01202-745862.
- 27 **Grange Community Ass'n 23rd Annual Modellers' Exhibition** at Grange Leisure Centre, Bepton Road, Midhurst, West Sussex GU29 9HD 10am-5pm. Adults: £3.50, Seniors: £2.50, Children: £1.50, Family (2+2): £8.50. Enquiries: 01730-816841.
- 27 **MELSA**. Sunday in the Park. Contact Graham Chadbone: 07-4121-4341.
- 27 **York City & DSME**. Running Day. Contact Pat Martindale: 01262-676291.
- 28 **Bedford MES**. Favourite Videos. Contact Ted Jolliffe: 01234-327791.
- 28 **Canterbury DMES (UK)**. G. Harris: A Russian Journey - St. Petersburg to Moscow. Contact Granville Askham: 01227-463295.
- 28 **Hornsby ME**. Meeting. Contact Ted Gray: 9484-7583.

MARCH

- 1 **North Cornwall MES**. Meeting, visitors welcome. Contact Ray Reed: 01237-424254.
- 1 **Oxford (City of) SME**. Bob Goss from Locitite. Contact Chris Kelland: 01235-770836.
- 1 **South Durham SME**. Meeting. Contact B. Owens: 01325-721503.
- 1 **Taunton ME**. AGM. Contact Don Martin: 01460-63162.
- 1 **West Wiltshire SME**. Martin Bane: The latest developments in Steam Power. Contact R. Nev. Boulton: 01380-828101.
- 2 **Birmingham SME**. Gardening Talk. Contact John Walker: 01789-266065.
- 2 **Bradford MES**. AGM. Contact John Mills: 01943-467844.
- 2 **Guildford MES**. Frank Periman: Talk. Contact Dave Longhurst: 01428-605424.
- 2 **Hull DSME**. Chris Parsons: K1 - The Tasmanian Devil? Contact Tony Finn: 01482-898434.
- 2 **Leeds SMEE**. Trophy Night. Contact Colin Abrey: 01132-649630.
- 2 **Tyneside SMEE**. Members' Slides. Contact Ian Spencer: 0191-2843438.
- 3 **Bradford MES**. Brian Wrigglesworth: B.R. Steam in its Final Years. Contact John Mills: 01943-467844.
- 3 **Cardiff MES**. Club Chat. Contact Trevor Jenkins: 029-2075-5568.
- 3 **Leyland SME**. Project Night. Contact Mark Entwistle: 01772-422411.
- 3 **South Lakeland MES**. Meeting. Contact Adrian Dixon: 01229-869915.
- 3 **Sutton MEC**. Bits & Pieces. Contact Mike Dean: 0208-657-5401.

and took an occasional turn round the car park”.

Alec Buttress, Secretary of **Wortley Top Forge Model Engineers** has notified us of his new address at 3 Grange Road, Royston, Barnsley, South Yorkshire S71 4LD; tel. 01226-728423.

World News

Canada

The **British Columbia SME** report that their “year was very good overall. “We finished with just under the 30,000 riders we had hoped for, but that is far from disappointing”. The Thanksgiving dinner was also reported as “another smashing success due in no small part to the tireless work of Catherine McDonnell, Janet Klakowich, Jean Sansom, Alison Sansom and Rosmarie Postlethwaite”. Chairman Ken Klakowich also reports that he was not one of “the two turkeys well done” prepared by the ladies.

At the December meeting of the **Toronto SME** the birthdays of both John Chappell and Charles Duerdoth were acknowledged - both now 90 plus. Can we add our congratulations to John and Charles. Bert deKat showed and talked about the Quick Change Tool he had made based on a Hardinge type that locks the tool in position with a locking bolt arrangement. A set screw sets the tool height and the tool-post is able to hold two tools.

Bill Huxhold showed and talked about his recently completed Miniature Vertical/Horizontal Mill. Bill had started one some 37 years ago but had recently finished and



The busy Steaming Bays at the Strathaven Model Society's Open Weekend last October. The excellent weather drew a total of 14 visiting locomotives.

sold it, so had the need for another one - this one started in June this year and now completed and in use!

Cast Iron has been used in the major components as appropriate. The column was hollowed out to reduce weight as was the knee. Bill demonstrated the conversion from vertical to horizontal set-up and its variable speed capabilities. The gearbox drive from the motor is a very compact and clever design which provides for selecting both direct drive or a 5.5 to 1 reduction. Cutting the Acme threads of the lead screws was a time-consuming job - taking approx 0.001 in. per cut for some 70 passes!

Mike Salisbury showed a Parting

Off Tool from Greenwood Tools in the UK. The tool allows you to plunge cut with ease and will part off any material without regrinding its shape.

Richard Trounce brought down his recently acquired part finished chassis for a 7 1/4 in. gauge *Dart* by Martin Evans. Richard also has the boiler and has now put roller bearings in the axle boxes. He explained briefly the setting of the inside Stephenson Valve Gear for this locomotive. Gerry Reed showed some slides of this year's Picnic at Bob Allin's in Orono. Don Carr is now successfully making small rivets (1/32 in. dia.) and with the tooling he has developed,

explained the process for this and the fact that lining up of the individual components is essential for success. Don also explained how to make small springs in the vice based on a process he remembered from John Crook. He made a small crank that has a shank slightly smaller than the spring finished bore as the wire tends to spring open somewhat after release. Putting some amount of tension on the wire as it is wound helps keep the spring diameter consistent.

New Zealand

Members of the **Auckland SME** had an interesting ‘Bits and Pieces’ evening in August with a variety of items on show and being discussed. These included some of Bill Parker's collection of old hand oilcans including traditional engineman's types. Other items included Hugh Martin's cylinders for his Reeves GWR 2-6-2T, Brian Cotton's small proprietary horizontal hot air engine, Greville Wills' rear tool post for his Raglan Littlejohn lathe and Graeme Murray's microscope that he obtained by exchange from a friend. The ‘Beginner's Evening’ in September was also well attended with various problems being addressed.

We have received formal notification that the **Canterbury SMEE** is hosting the New Zealand International Model Convention in Christchurch New Zealand from 5-9 January 2006. The event will be known as CANMOD 2006. More detailed information is available on the society website www.csmee.org.nz

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.

Mick Collins
John (Jack) Heyes
Les Hollingsworth
Norman Shaw
Mike Wogan

SM&EE
Tyneside SMEE
Pinewood Miniature Railway Society
Bedford MES
Brandon & District MES

- 4 **Aylesbury (Vale of) MES.** Dr. Arthur Tarrant: *The History of Trams.* Contact Andy Rapley: 01296-420750.
- 4 **Canvey R&MEC.** Keith Catchpole: *Humour on the Footplate.* Contact Brian Baker: 01702-512752.
- 4 **Ickenham DSME.** John Shawe: *Building Steam Locomotives 2.* Contact David Sexton: 01895-630125.
- 4 **Maidstone MES (UK).** AGM. Contact Martin Parham: 01622-630298.
- 4 **North London SME.** *On the Table: Work in Progress.* Contact David Harris: 01707-326518.
- 4 **Rochdale SMEE.** Doug Hewson: *Building a Standard 4 Tank Engine.* Contact Mike Foster: 01706-360849.
- 4 **Romford MEC.** *Competition Night.* Contact Colin Hunt: 01708-709302.
- 5 **SM&EE.** Bob Alderman: *Building a full size locomotive from scratch.* Contact David Boote: 01202-745862.
- 5 **York City & DSME.** Paul Butler: *Year in 75.* Contact Pat Martindale: 01262-676291.
- 6 **Frimley & Ascot LC.** *Public Running.* Contact Bob Dowman: 01252-835042.
- 6 **Kew Bridge Steam Museum.** *Kew Bridge Steam Museum celebrates 30th Anniversary.* Information: 020-8568-4757.
- 6 **Reading SME.** *Public Running.* Contact Brian Joslyn: 01491-873393.
- 6 **South Durham SME.** *Running Day.* Contact B. Owens: 01325-721503.
- 7 **Leicester SME.** Norman Smedley: *Sentinel Centenary.* Contact Raymond Wallis: 0116-285-8824.
- 7 **Peterborough SME.** *Bits & Pieces.* Contact Tony Meek: 01778-345142.
- 8 **Dockland & E. London MES.** *Hon Sec's Annual Prize Quiz.* Contact P. M. Jonas: 01708-228510.
- 8 **Northampton SME.** *Auction of Models, Materials & Tools.* Contact Pete Jarman: 01234-708501 (eve).
- 8 **Saffron Walden DSME.** AGM. Contact Jack Setterfield: 01843-596822.
- 9 **Birmingham SME.** *Non-Steam Models.* Contact John Walker: 01789-266065.
- 9 **Harrow & Wembley SME.** *Photo Competition.* Contact Dr. Roger Greenwood: 020-8427-2755.

- 9 **Norwich DSME.** Don Unwin: *Building Replica Timepieces.* Contact Paul Reed: 01603-462925.
- 9 **St. Albans DMES.** D. Metcalf: *Model Boat Kits & Centrifugal Castings.* Contact Roy Verden: 01923-220590.
- 10 **Cardiff MES.** *Bring & Buy.* Contact Trevor Jenkins: 029-2075-5568.
- 10 **Sutton MEC.** *Natter Night.* Contact Mike Dean: 0208-657-5401.
- 10 **Worthing DSME.** *Other Men's Hobbies.* Contact Bob Phillips: 01903-243018.
- 11 **Brighton & Hove SMLE.** Bob Youldon: *My Way of Boiler Making.* Contact Mick Funnell: 01323-892042.
- 11 **Colchester SMEE.** Keith Catchpole: *The Story of the Edison Cylinder Phonograph.* Contact L. G. Hammond: 01376-511686.
- 11 **Hereford SME.** Richard Donovan: *Australian Steam.* Contact Richard Donovan: 01432-760881.
- 11 **Ickenham DSME.** *Club & General Interest Night.* Contact David Sexton: 01895-630125.
- 11 **Kinver & West Midlands SME.** *Bits & Pieces.* Contact John Campbell: 01384-891244.
- 12 **Birmingham SME.** *Dinner Dance.* Contact John Walker: 01789-266065.
- 12 **Cardiff MES.** *Steam-Up and Family Day.* Contact Trevor Jenkins: 029-2075-5568.
- 12 **Erewash Valley MES.** *Annual Dinner.* Contact Jim Matthews: 01332-705259.
- 12 **Glasgow & S.W. Rly Ass'n.** Max Fowler: *25 Years of Railway Photography.* Contact Bruce Steven: 0141-810-3871.
- 12/13 **The 2nd Model Engineering & Hobbies Exhibition at Michael Herbert Hall,** South Street, Wilton, Salisbury. 10am-5 pm. Contact Peter Parrish: 01980-610346.
- 13 **Bedford MES.** *Boiler Test Day.* Contact Ted Jolliffe: 01234-327791.
- 13 **Gas Turbine Builders' Ass'n.** AGM. Contact Tom Wilkinson: 01508-570977.
- 13 **Hornsby ME.** *Running Day.* Contact Ted Gray: 9484-7583.
- 13 **Leeds SMEE.** *Running Day.* Contact Colin Abrey: 01132-649630.
- 13 **St. Albans DMES.** *Club Running.* Contact Roy Verden: 01923-220590.
- 13 **Sutton MEC.** *Track Day.* Contact Mike Dean: 0208-657-5401.

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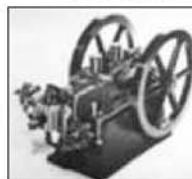
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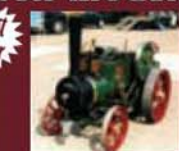
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