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On the cover ...

Now the summer season is well and truly under way, clubs and societies throughout the UK and, indeed, around the world are staging miniature locomotive efficiency competitions. Cancellation of last year's IMLEC due to restrictions caused by foot and mouth disease resulted in members of Guildford MES staging OMLEC, an Open Competition without restriction for all comers.

Jan Rottier with his narrow gauge engine, Tom Rolt, *featured on our cover for this issue may not have been the eventual winner, but he certainly competed with one of the more unusual locomotives. Our report on last year's event begins on page 66 in this issue and serves as a reminder that the 2nd OMLEC will be held at Stoke Park on 10/11 August.*

(Photograph by Mike Chrisp)

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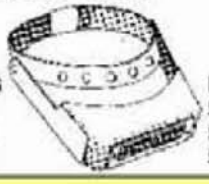

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Steaming Down the Ages [Freeman] £7.80
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Most of us played with *Meccano* as children, so a biography of Frank Hornby, the inventor of *Meccano*, is welcome. There is also a lot of background here on toy development, especially from the social viewpoint, which sometimes threatens to submerge Frank Hornby's life story, but it is here. A well written book, which does go a long way to putting Frank Hornby in his rightful place as the inventor of perhaps the most popular educational toy ever made. Effectively unillustrated. 288 pages. Hardbound.

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On the Trail of the Titfield Thunderbolt [Castens] £5.75
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5" 2-6-0 BR Class 2 Tender Loco
5" 2-6-0 Monarch Crab Tender Loco
5" 2-6-0 Macallin Mor Tender Loco
5" 2-8-2 BR Class 84000 Tank Loco
5" 2-6-2 GW 51XX Tank Loco
5" 2-8-0 Nigel Gresley Tender Loco
5" 2-8-0 R.O.D Tender Loco
5" 4-2-2 Princess of Wales Loco
5" 4-2-2 Sterling Single Loco
5" 4-4-0 Bulldog Tender Loco
5" 4-4-0 Dukedog Tender Loco
5" 4-4-0 Etna Tender Loco
5" 4-4-0 Glen Tender Loco
5" 4-4-0 Maid of Kent Tender Loco
5" 4-4-0 New York Central and HR Loco
5" 4-4-0 Robinson Tender Loco
5" 4-4-0 Washington Tender Loco
5" 4-4-2 Jersey Lily Tender Loco
5" 4-6-0 Black 5 Tender Loco
5" 4-6-0 Eastern Belle Tender Loco
5" 4-6-0 Fury Tender Loco
5" 4-6-0 Immingham Tender Loco
5" 4-6-0 King's Own Tender Loco
5" 4-6-0 Lionder Tender Loco
5" 4-6-0 Royal Engineer Tender Loco
5" 4-6-0 Springbok Tender Loco
5" 4-6-0 Torquay Manor Tender Loco
5" 4-6-2 Duncaster Tender Loco
5" Passenger Car Bogies

7.25" LOCOMOTIVES

7.25" 0-4-0 Hunslet Tank Loco
7.25" 0-4-0 Adam's B4 Tank Loco
7.25" 0-4-0 Dolgoch Tank Loco
7.25" 0-4-0 Eldir Tank Loco
7.25" 0-4-0 Hercules Tank Loco
7.25" 0-4-0 Jessie Tank Loco
7.25" 0-4-0 Locomotion Tender Loco
7.25" 0-4-0 Marie Estelle Loco
7.25" 0-4-0 Railmotor Tank Loco
7.25" 0-4-0 Romulus Tank Loco
7.25" 0-4-0 Tug Tank Loco
7.25" 0-4-2 Brigella Tank Loco
7.25" 0-4-2 Dart Tank Loco
7.25" 0-4-2 Edward Thomas Loco
7.25" 0-4-2 Tom Rolt Tank Loco
7.25" 0-6-0 Deen Goods Tender Loco
7.25" 0-6-0 Hermes Tank Loco
7.25" 0-6-0 Holmside Tank Loco
7.25" 0-6-0 Newport Tank Loco
7.25" 0-6-0 Paddington Tank Loco
7.25" 2-4-4 Maxi Lucky 7 Tank Loco
7.25" 2-6-0 GW 43XX Tender Loco
7.25" 2-6-2 Lynton & Barnstaple Loco
7.25" 4-2-2 Lorna Doone Loco
7.25" 4-4-0 Gooch Tender Loco
7.25" 4-4-0 New York Central and HR Loco
7.25" 4-4-2 Adam's Radial Tank Loco
7.25" 4-6-0 Highlander Tender Loco
7.25" 4-6-0 King George V Loco
7.25" Denver and Rio GR-C19 Loco
7.25" Passenger Car Bogies
7.25" Slate Waggons

12.25" LOCOMOTIVES

12.25" 0-4-0 Darjeeling & H'A Loco
12.25" 2-6-4 Leek & Manifold Loco

STATIONARY ENGINES

Bonderer Engine
Centaur Gas Engine
Commander Compound Launch Engine
Consort Vertical Engine
Diagonal Paddle Engine
Double Tangye Horizontal Engine
Emperor Vertical Engine
Hells Rotary Engine
Heinrich Hot Air Engine
Hercules Steam Crane
Lady Stephanie Beam Engine
Marcher Vertical Engine
Marlson Vertical Engine
Mary Beam Engine
Master Oscillating Range
Model Engineer Beam Engine
Monarch Vertical Engine
Nicholas Vertical Engine
Perseus Horizontal Engine
Popular Oscillating Range
Regent Vertical Engine
Sheldon Vertical Engine
Sovereign Vertical Engine
Steam Hammer
Tinker Horizontal Engine Pump
Triple Expansion Engine
Trojan Vertical Engine
Unicorn Horizontal Engine
Vulcan Beam Engine
Warrior 2 Vertical Engine

TRACTION ENGINES

1" SC Minnie Convertible Engine
1" SC Minnie 1 Engine
1.5" SC Allchin T.Engine
1.5" SC Marshall Portable Engine
2" SC Clayton Waggon
2" SC Lincolnshire LAD T.Engine
2" SC Shand Mason Fire Engine
2" SC Thetford Town T.Engine
2" SC Titan Tractor
3" SC Atkinson Waggon
3" SC Foden Waggon
4" SC Foden STG6 Waggon
4" SC Foden Timber Tractor

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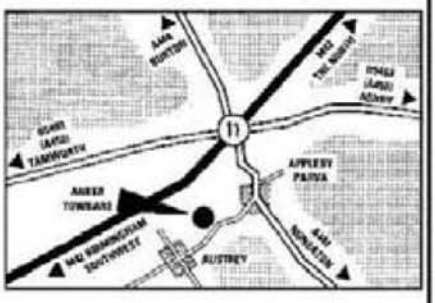

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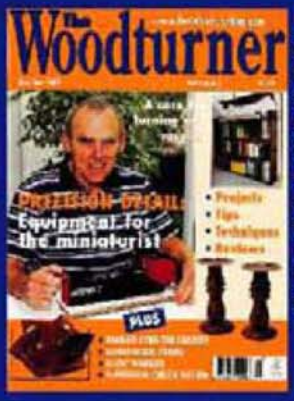

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OVM02

SMOKE RINGS
With the Editors

Alan Bourne

We have just learned from Hubert Dawson in Norfolk of Alan Bourne's death in hospital on Sunday 23 June. We regret that at present we have no further information.

It seems hardly any time since Alan provided us with an informative account of the life and work of his very good friend Gordon Read with whom he had collaborated in the preparation of several projects published in these pages.

Much of Alan's recent attention had been spent caring for his invalid wife and, as Hubert Dawson notes, he did not long survive his friend Gordon Read. Our thoughts are with Alan's family and friends at this sad time.

Amberley Exhibition on track with Lottery grant

The Heritage Lottery Fund has recently confirmed a £108,000 grant to Amberley Working Museum for the development of a new Exhibition & Restoration Hall for the museum's narrow gauge railway collection. The hall will help to house exhibits of national importance, protecting them from the elements while providing the space necessary for essential conservation work.

The considerable support of the Heritage Lottery Fund complements the work of numerous local organisations and the volunteer workforce at Amberley. The volunteers' work, not only in securing the grant but preparing the site for construction work, is instrumental in the success of the project. Construction will start in November and finish the following March.

"The support of the Heritage Lottery Fund has meant that not only is the vital preservation work of Amberley continued" said Sandy Wilson, Museum Marketing Manager, *"but that we will have suitable facilities to educate future generations in the key skills required."*

The Railway Exhibition & Restoration Hall is one of several new developments at Amberley. A 1930s Transport Cafe is currently being transported to the museum for use as an Education Centre, ground work is being undertaken for the construction of a Fire Station for vintage appliances, and a new Restaurant/Conference Centre is set to open next year.

The 36-acre museum just north of Arundel, is open to the public now and has a wide range of special events happening throughout the season. Visit the website at **wwwamberleymuseum.co.uk** or call 01798-831370 for further details.

SEQLEC 2002

Applications for entry are now welcome for the Twelfth 7¼in. gauge Locomotive Efficiency Competition which will be hosted by

WESTON PARK MINIATURE RAILWAY

at their track at Weston Park, Shifnal, Nr Telford, Shropshire on

SUNDAY 13 OCTOBER 2002

Please call Bruce Whalley on 01952-850555 for an Official Entry Form

All visitors will be very welcome, model engineers and their families particularly so

(Please note that it may be necessary to restrict the number of entries.)

Bristol Aero Collection at Kemble

Attractions for all the family including rural and traditional crafts, Bristol cars, buses and lorries, trade stands and autojumble, historic aircraft fly-in, fun fair, and more are to be found at the Stroud Vintage Transport and Engine Club's annual steam and vintage vehicle rally at Kemble airfield, near Cirencester over the weekend 3/4 August.

Perhaps more importantly for readers of *M.E.*, the Bristol Aero Collection and Museum will also be participating and have invited all owners and builders of miniature internal combustion engines to Kemble for the weekend as their guests to display and run their creations. Plenty of space is available under the trees, out in the sun, or in the BAC hangar. Tables and display panels will be available as required, and a roped-off area will be arranged for engines to be run in the open. Engine operators must make their own arrangements to cover public liability, etc.

Mike Tull (call: 01329-314970; **MikTull@aol.com**) and Brian Perkins (call: 01454-633494; **BPER311742@aol.com**) say *"If you are interested in displaying your miniature internal combustion engines, old, new, 2-stroke, 4-stroke or turbine, commercial or hand built, complete or under construction and can attend one or both days, contact one of us so that we can count heads and make the necessary arrangements with BAC."*

Remember the date and venue: 3/4 August 2002 at Kemble Airfield near Cirencester.

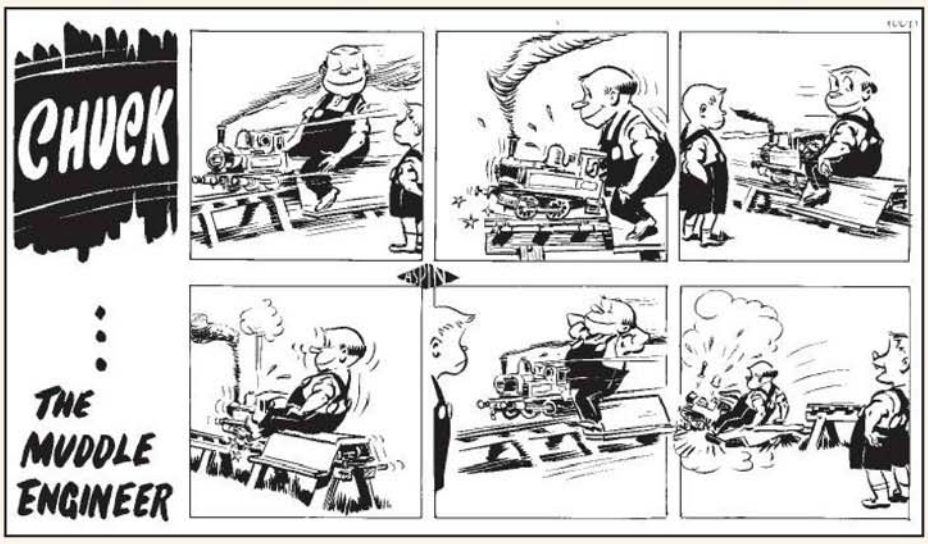
SEQLEC 2002

We are very pleased to announce that the twelfth annual efficiency competition for owners and drivers of 7¼in. gauge steam locomotives will take place on Sunday 13 October in the delightful surroundings of Weston Park. We are particularly grateful to Weston Park Miniature Railway for the opportunity to use their fine track for this event. Bruce Whalley assures us that locomotives ranging from the smallest *Tich* to the largest Beyer Garrett have successfully negotiated this splendid 1¼ mile track in glorious parkland.

In view of the challenges presented by this track both in its length and its grades, two important rule changes have been made for this particular event. The first is that competitors will be very welcome to run on Saturday in order to familiarise themselves with the railway. Secondly, since a complete circuit of the track taken at a respectable and safe speed is likely to take at least 8 minutes, we propose to replace the 25/30 minute rule with a 2/3 lap rule. That is to say, competitors must complete a minimum of two circuits of the track but may not exceed three laps. By this means we hope that each contestant will have a run of about half an hour.

Other SEQLEC rules will apply as in previous competitions. We very much hope that by holding SEQLEC 2002 at Weston Park, drivers who might not otherwise think of competing may consider the challenge worthwhile.

As always, visitors will be most welcome and arrangements are in hand to ensure that all who come to Weston Park for either Sunday or both days over the weekend 12/13 October 2002 will enjoy an excellent day/weekend out. Plenty of space adjacent to the railway is available at a very modest charge for campers and caravanners who wish to stop overnight, and local accommodation is available. Please see the panel above for details and give Bruce Whalley a call if you would care to compete. Further information will be published in due course.



POST BAG

Geoff Tomlinson

SIRS, - Geoff Tomlinson died on Sunday, 5 May at the age of 61 after a long and painful battle with cancer. Characteristically, he fought bravely and there was real optimism that the battle was being won, but sadly, this was not to be.

Geoff was born into a railway family in Royston, Barnsley. After leaving school he worked briefly on the railway and in the coal mines He trained as a full-time Fire Officer, and served the Royston and Barnsley Fire Service for many years. He retired from the Service after an injury. However, his loss to the Fire Service was a gain to the model engineering fraternity. He applied his natural engineering skills to modelling, and he excelled at it. He built up a reputation as a fine boiler maker, known to model engineers throughout the British Isles for the high quality of his workmanship. His boilers were a testimony to that — the best you could buy. There are hundreds of locomotives, big and small, running with 'Tomlinson' copper boilers, some of them over twenty years old.

Geoff had a broad interest in model engineering and was a member of several Yorkshire model engineering societies. In addition to being a member of the Leeds and Rotherham societies, he served variously as Secretary of the West Riding Small Locomotive Society, and Chairman of the Barnsley Society of Model Engineers. He was a good influence on model engineering and particularly encouraged younger members. He had the determination and the ability to get things done. He was a grafter. If a job needed doing he got on with it. He used to observe that things don't get built by sitting in front of the television.

Geoff was a person with enthusiasm and intelligent interest, and with whom one could discuss things seriously. Many people benefited from his advice on a range of model engineering activities. He was able to discuss things in depth from his personal experience, and gave a balanced view of things. You found him interested when you went round to discuss something with him, and there were many constructive conversations in his workshop.

Geoff's interests were broad, and he did not just stick to model engineering. In his earlier years he was a specialist in chrysanthemums and gladioli, and won numerous prizes at shows. He was interested in wild life, particularly wild birds. He had a large picture window in his workshop which looked over the garden and the bird tables.

Geoff had an enquiring mind which could embrace many activities. He would have a go at anything. After reaching the age of 60 he decided he would learn to fly an aeroplane! This was something which characterised his whole approach to life — an open-minded interest and a desire to do well. Everyone was delighted when, after months of concentrated flying and theoretical work on navigation and meteorological studies, he gained his PPL wings. That was typical of the way be set about things — with dedication and determination. However, it was deeply ironical that the day his licence arrived in the post was the day that his myloma was diagnosed and confirmed. Geoff was an inspiration to many, and he will be sadly missed.

Our deepest sympathies are with Geoff's wife Barbara, and his family.
Paul Mann, South Yorkshire.

Natal

SIRS, - On and off during the last ten years or so, I have been building *Natal,* a locomotive to the design by Mr. Martin Evans.

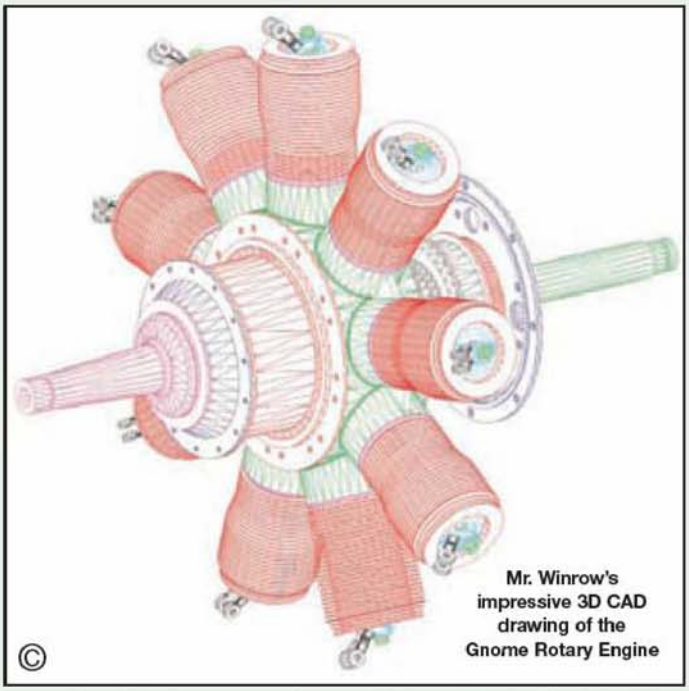
At last it is beginning to look like a locomotive, and even runs on compressed air.

I would much appreciate hearing from any reader who has built this locomotive in 3 1/2in. gauge.
D.W. Smith, Powys.

Gnome rotary engine

SIRS, - I am building a model of the Gnome rotary engine currently being described in *Model Engineer* but, due to my taste for models in the so-called larger scales, have decided to build it 2:5 full size in place of the 1:5 as drawn. This has led to some re-drawing of various parts to make them more suited to the larger size. In doing so I believe I have come across a couple of errors on the original drawings and, although not serious, they are probably worth pointing out.

The first, I believe, is that the centre line of the crank pin is offset from the centre line of the cylinder bore by 0.011in., in other words the 0.127in. dimension on item 3 Rear Ball Bearing Housing should be 0.116 inch. The other is the 0.585in. diameter minus 1 1/2deg./side on item 6 Engine Bearing Ring should be 0.575in. diameter minus 1 1/2deg./side. If any other readers can confirm the above, or consider that I have made a mistake, I would be most grateful to hear from them.



Mr. Winrow's impressive 3D CAD drawing of the Gnome Rotary Engine

I enclose a copy (above) of the engine drawn full size in 3D. This was done as part of the course work of a part time 3D CAD course taken at my local technical college. I found the work most interesting and can recommend it to anyone interested in this aspect of engineering.
Jim Winrow, North Yorkshire.

Angular measure

SIRS, - The series by Philip Amos on surveying (*M.E.* 4170, 31 May 2002) prompts me to enquire about something which has puzzled me for a while. Why did Nato, etc. abandon degrees and minutes for compass markings, and why choose 6400 mils which is neither metric nor binary?
John Walford, by e-mail.

Philip Amos replies:

In response to Mr. John Walford's query as to the reason for NATO adopting the mil system for angular measurement (6400 to the circle), my understanding of the history of this decision follows.

I cannot vouch for the veracity of the tale, but it seems to have a ring of truth about it. Others of historical bent with backgrounds in artillery, ordnance or navy circles may be better able to shed more light and accuracy on the account.

Prior to World War I, the USA manufactured very little artillery in its own factories. In the early 1900s the US Marine Corps bought some Italian guns calibrated in metres and mils, and it is my understanding that the US arsenals adopted these designs to build locally (e.g. the 105mm howitzer).

At one time, the US Navy had its Pacific fleet and Atlantic fleet with different calibrations; one was yards and degrees while the other was metres and mils. This was inconvenient for ship transfers through the Panama Canal as the ship needed to be recalibrated to match its new fleet. So standardisation was needed and metres and mils adopted. Later, the US Army and US Navy agreed to standardise on metres and mils.

When the USA entered World War I in 1917, it purchased considerable quantities of artillery from European countries, principally the UK and France. The UK weapons would have been calibrated in degrees, but I am unaware whether the French ones were calibrated in degrees (360 to the circle), grads (400 to the circle) or mils (6400 to the circle).

Now, in the field of international standardisation, the USA has always been keen to standardise, provided that the American National Standard is adopted. This is why Unified Coarse 1/2in. thread has 13TPI whereas 1/2in. BSW has 12TPI.

Mr. Knights' old photograph of the McKay Sunshine harvester at work.

The problems of the US and UK working together in World War II led to an understanding that it was imperative that equipment be sufficiently compatible for forces to be inter-operable. So NATO and ABCA (America, Britain, Canada, Australia) agreements resulted, with immense swathes of standardisation of defence material.

Because of its productive power, the USA completely swamped all other nations as a source of weaponry, so the US standards became the NATO and ABCA standards with seldom any modification except where the device originated in another country.

The *Illustrated Encyclopaedia of Artillery* by Ian V. Hogg (1987); ISBN 1-85348-096-7 is a fairly authoritative reference with a very respected author. However, this topic does not seem to be directly addressed therein, although there are some oblique mentions.

Twists and turns

SIRS, - I have been amazed by the interest shown by so many people in *Twisty*. With reference to my article describing this simple steam engine (*M.E.* 4163, 22 February 2002), my recent showing of my own engine in action at the Merstham model steam show has prompted me to write to clear up a few queries.

At least two builders of this engine have drilled holes at positions **a** and **b** (see fig 1 published with the original article) when holes are only required at **c** and **d** on the exhaust ellipse.

My reference to 'clockwise' is to rotation as viewed in the two photographs published. If anticlockwise rotation is required, the inlet and exhaust slots should be cut on the other side of their respective ellipses.

A frequently-asked question concerns whether *Twisty* could be made double-acting. The answer is that it can, by fitting a gland at the flywheel end of the cylinder together with an extra exhaust port and slot, plus a second slot on the inlet ellipse. These slots break out to the gland side. The inlet could stay at the top of the cylinder and the exhausts spaced 120deg. apart. Two separate pipes exhausting to atmosphere would be necessary.

The presence of four slots on the piston increases the possibility of steam escaping around the piston clearance and the original simplicity of the engine would be forfeit. It would be much better, I think, to make a twin-cylinder engine as suggested in my article.

Readers may be interested to learn that I am presently designing a 'garden gauge' locomotive in the style of a de Winton with a similar rotating piston configuration.

Colin Andrews, Hampshire.

Sunshine harvester

SIRS, - I have been an enthusiastic model engineer for over fifty years during which time I have built a couple of steam locomotives and workshop equipment. A few years ago, I felt like a change and commenced modelling horse-drawn vehicles and farm implements. Recent cover photographs and articles in *M.E.* featuring models of a side delivery rake, a threshing box and tractor, and the Sunshine harvester have therefore given me a great deal of pleasure.

The Leader harvester was first developed and built by McKay in the town of Sunshine, Victoria, about 13km west of Melbourne. *The Land,* our leading rural newspaper, sells copies of photographs taken over many years of countryside activities. As I happen to have one depicting the Sunshine harvester at work (above), I thought that sending a copy to Brian Young would give him pleasure.

Thank you for a most enjoyable magazine.

John Knights,
New South Wales, Australia.

Drawings and dimensions

SIRS, - I have followed the discussion on drawings and associated subjects in *Postbag* with some interest.

My own procedure is to first make a full set of drawings, then to build a model to those drawings, noting any alterations or errors on the drawings, and then to revise the drawings before issue.

However, even with this process, mistakes can get through. One cannot check one's own drawings; we tend to 'see' what *should* be there, not what *is* there.

As for putting tolerances on the drawings, this has never been model engineering practice. Each model engineer makes one piece to fit the next, in most cases there is no need for interchangeability. Even a new recruit to this wonderful hobby of ours will soon realise that a 10mm pin will not go into a 10mm hole.

As for the metric verses imperial debate. Let's face it, it's going to end up a metric world whether we like it or not. The younger model engineer, who we fervently hope will join us, will not want to mess about with imperial measurements. I would like to see all new designs in metric units for the encouragement of future model engineers.

It used to be said that the cost of replacing machines and measuring equipment would be prohibitive. But all that needs to be replaced is the feed screws on machines. The price of measuring equipment from the far east is very low and the quality is often very good. I recently saw on offer a set of six micrometers with carbide pads covering the range 25-150mm, for a similar price to a single micrometer of European manufacture.

Dare I say that it is *easier* to work in metric. Hooray for the elimination of fractions!

Anthony Mount, Devon.

Machine tool 'bible'

SIRS, - If I want to buy a car, 'fridge, camera or computer, a host of sources of relatively objective information is available in magazines dedicated to the subject.

If I want to know whether a Meddings or a Fobco drill would best suit me, where do I go?

Yes, there are model engineering societies and thousands of saloon bar 'experts', but it surprises me that someone hasn't written a book listing the more common likely second-hand buys in milling machines, drills, lathes, etc. and giving a fair run-down of their strengths and weaknesses.

As it is, new recruits could spend a lot of time and money learning by a series of mistakes which could have been avoided had there been a machine tool 'bible' to advise them in the first place.

Jim Evans, Worcestershire.
(Any takers?—Ed.)

Britannia

SIRS, - Having made good progess with a *Simplex* to Martin Evans' popular design, I propose to commence the construction of a *Britannia* locomotive in 5in. gauge.

Since this is a rather more ambitious project, I would much appreciate hearing from any reader able and prepared to offer me advice.

Tony Griffiths, West Glamorgan.
(tel: 01792-371629)

Longevity

SIRS, - Although I have looked forward to model engineering as a hobby for many years, for various reasons I have only recently been able to contemplate pursuing it in any practical way. I have, in fact, just purchased a lathe.

One pertinent factor in all this, and one upon which I am not inclined to dwell too much, is that my most recent birthday was my eightieth. You will understand therefore why my learning curve in respect of all aspects of model engineering has to be a fairly steep one. From my reading it would seem that even a skilled engineer already well-practised in his craft may take a very long time, perhaps years, to complete a large project — the construction of a working model of a steam locomotive for example. In consequence my current feeling is that my sights must be set at a much lower level.

I have no information on the average, or expected, longevity of model engineers; it may be, for instance, that dedication to the hobby has been shown to prolong life considerably beyond the normally allotted span. With your connections, of course, you may well know more of this then I do and any information you may have would be very welcome; with a favourable forecast of what my expectations might be, I could, perhaps, set my sights somewhat higher than they are at the moment. As a current subscriber, it really would be something, wouldn't it, if I were still receiving the magazine twenty years from now? Indeed ... perhaps even writing articles for it!

Derek Warren, Hampshire.


Matthew Byatt


Bill Dwyer


Brian Eatock

OPEN MODEL LOCOMOTIVE EFFICIENCY COMPETITION

Brian Digby
recalls the performances of those who participated in the first OMLEC hosted last year by members of Guildford MES to prompt would-be visitors and competitors for this year's event scheduled for the weekend 10/11 August at the GMES track in Stoke Park, Guildford.
●*Photos: Mike Chrisp*

In view of the cancellation of IMLEC 2001 due to the foot and mouth disease epidemic, members of Guildford MES decided to host a similar event open to all who wished to enter.

The direction of running was clockwise, as for normal operation, and the start and finish point for the competition was on the short straight before the facing turnout to the new locomotive/stock shed and steaming bays. Competitors were therefore faced with the adversely graded continuous curve encircling the shed and steaming bays immediately on starting, which gave quite a lot of trouble to more than a few of them.

With one exception, the minimum load comprised the driver on the dynamometer car and the observer on a short passenger car loaned by Geoff Moore for the event. The number of passengers added to make up the total load for each run is as shown in the accompanying table of results. The speeds quoted are calculated from lineside observation of lap times and are averages for sustained running over a number of laps, 1404ft. in length.

Run No. 1: Matthew Byatt with his *Speedy* set off with a load of 4 passengers, got his train up the bank at a second try, then ran his second lap at a speed of 5½mph but on the fourth time around, had difficulty climbing the bank and had to drop off his passengers before being able to complete the circuit and his run.

Run No. 2: Colin Morgan with his *Mona* was unable to participate in the competition.

Run No. 3: Bill Dwyer with his 3-cylinder 3½in. gauge A4 pacific *Silver Fox* took a load of 4 passengers. Overcoming initial difficulty on the bank by setting back a long way to get a run at it, Bill ran two successive circuits at a speed of 9½mph but retired at the end of his fourth lap due to problems with boiler feed.

Run No. 4: Brian Eatock halved his starting load of 2 passengers before climbing the bank for


Dave James


Paul Tucker


Terry Booth


Len Steel


Steve Eaton

FIRST OPEN MODEL LOCOMOTIVE EFFICIENCY COMPETITION (OMLEC) AT GUILDFORD (GMES) - STOKE PARK 11/12 AUGUST 2001

Run No.	Name	Locomotive	Gauge	Load (Adults) Start	Load (Adults) Finish	Runtime (min.)	Distance (ft.)	Work (ft.lbf.)	Coal Used (lb.)	Average Pul (lbf.)	Average Horsepower	Efficiency (%)	Final Position
26	L. Flippance	2-8-2: *George Eveniss*	5	19	3	31	22490	872100	2.125	38.777	0.852	3.638	1
10	G. Moore	LNER B1: *Impala*	5	9	2	30	22470	598005	2.187	26.613	0.604	2.424	2
8	L. Steel	Britannia: *Coeur de Lion*	5	10	10	29.33	19660	519330	2.375	26.416	0.537	1.938	3
24	G. Winsall	LNER 04/8 2-8-0	5	10.5	10.5	28.5	19710	454260	2.125	23.047	0.483	1.895	4
13	D. Neish	LBSCR 4-6-2T: *Bessborough*	5	8	4	28	15460	280350	1.625	18.134	0.303	1.529	5
12	J. Elliott	*Speedy* 0-6-0T: *Aileen*	5	6	6	30	13140	215100	1.25	16.37	0.217	1.525	6
21	J. Ellis	Glen	5	6	4	31	18230	328050	2	17.995	0.321	1.454	7
25	J. Dalton	Britannia: *William Wordsworth*	5	10	2	30	16640	342870	2.187	20.605	0.346	1.39	8
27	K. Ayling	SR Leader: *Brighton*	5	26	2	30	16860	902985	5.812	53.558	0.912	1.377	9
20	P. Tompkins	LBSCR 0-6-0 *Minx: Vauxhall*	5	6	2	26.42	14030	230055	1.687	16.397	0.264	1.209	10
23	D. Watkins	*Speedy* 0-6-0T: *Aileen*	5	5.5	5.5	30	21060	276585	2.25	13.133	0.279	1.09	11
22	B. Remnant	*Sweet Pea: Lady Margaret*	5	10	10	30	12640	328080	2.687	25.956	0.331	1.082	12
16	S. Duncan	Hunt 4-4-0: *The Percy*	5	6	2	35	12460	157335	1.687	12.627	0.136	0.827	13
28	Dwyer/Young	4-8-2 USA J Class	5	19	19	30	12630	358020	4	28.347	0.362	0.793	14
5	D. James	Britannia: *Polar Star*	5	10	6	29	12310	284790	3.312	23.135	0.298	0.762	15
18	D. Mayall	LMS 4F	3.5	3	3	30	12630	117255	1.375	9.284	0.118	0.756	16
15	R. Hillman	*Dholpur*	5	15	13	30	9280	265590	3.312	28.62	0.268	0.711	17
19	D. Ball	0-6-0T: *Pansy*	5	4	3	30	11600	150900	1.937	13.009	0.152	0.691	18
14	D. Kerry	0-6-0T: *Simplex*	5	5	5	28	11200	186195	2.437	16.625	0.202	0.677	19
11	J. Rottier	*Tom Rolt*	5	6	6	30	15410	244995	4	15.898	0.247	0.543	20
17	M. Richardson	0-6-0T: *Simplex*	5	4	3	30	14920	126810	2.437	8.499	0.128	0.461	21
4	B. Eatock	Black 5	3.5	4	2	29	7510	75922.5	1.5	10.11	0.079	0.449	22
1	M. Byatt	0-6-0T: *Speedy*	5	6	2	27	7760	90165	2	11.619	0.161	0.4	23
7	T. Booth	Britannia: *Apollo*	3.5	4	2	29	8630	85710	1.937	9.932	0.09	0.392	24
6	P. Tucker	*Princess Royal*	3.5	3	2	30	7350	52072.5	1.25	7.085	0.053	0.369	25
9	S. Eaton	Stirling Single	5	4	2	30	13680	74205	1.875	5.424	0.075	0.351	26
3	B. Dwyer	LNER A4: *Silver Fox*	3.5	6	6	13	6960	111877.5	-	16.074	0.261	-	Retired

the first time with his 3½in. gauge LMS class 5MT, dropping off his other passenger the second time round and completing four circuits.

Run No. 5: David James elected to take 8 passengers behind his Winson Britannia *Pole Star,* but dropped 4 off before mastering the climb for the first time, then kept going to complete a total of 8 laps, achieving a speed of better than 6½mph for two laps in succession.

Run No. 6: As a consequence of initial steaming problems, the run by Paul Tucker and his 3½in. gauge 4-cylindered LMS pacific *The Princess Royal,* was delayed somewhat. Impressively, with his teenage son as sole passenger, Paul ran his first lap in 3¼ minutes from the standing start but then found it prudent to reduce his load and detached both passenger and trolley. The third of his five laps was run at 6¾mph.

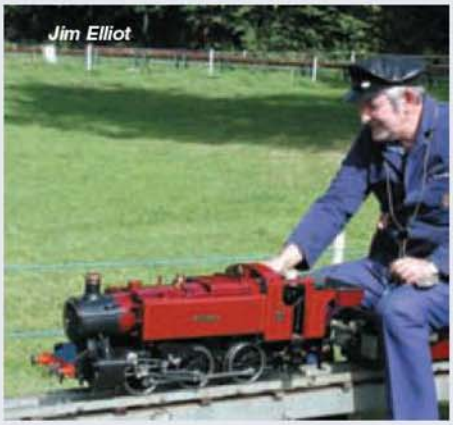
Run No. 7: Terry Booth attempted to get a run at the bank with his 3½in. gauge Britannia *Apollo* by setting back a good distance from the start, but even so had to drop off his 2 passengers before mastering the climb. After covering 2 laps at 8½mph, his fifth and final lap was again something of a struggle.

Run No. 8: 6 adults and 2 teenagers made up the passenger complement for Len Steel's run with his Britannia *Coeur de Lion.* Apart from a brief stop at the steaming bays on the first lap to pick up his firing shovel, Len's 14 lap run was made without stopping. The early experiment with hand firing reduced the boiler pressure to 40psi on the second lap. After the third circuit, Len ran 10 consecutive laps at all but 8¾mph.

Run No. 9: Steve Eaton with his Stirling single *Frederick* also sought to charge the bank by setting back at the start of his run, but even so had to detach his two passengers and their trolley before being able to accelerate quickly enough to surmount the climb. The third and fourth laps were run at 8¾mph. Then, having come to a stand when approaching the summit for the ▶


Geoff Moore


Jan Rottier


Jim Elliot

David Neish


Dave Kerry


Ray Hillman


Stuart Duncan


Mike Richardson

eighth time, Steve finished his run as he had started — in reverse!

Run No. 10: *Impala*, Geoff Moore's LNER B1 made its first appearance in public competition taking 7 adult passengers for a non-stop 29½ minute trip. After a trio of shakedown laps, this antelope got into its stride and reeled off two groups of 4 laps at better than 8¾mph. As Geoff reached the end of his fifteenth lap he decided to go round one more time so opened the regulator again; however, after clearing the summit he stopped to detach trolleys and passengers so that he was able to complete 16 circuits of the track.

Run No. 11: Jan Rottier took 4 passengers behind his *Tom Rolt* and had quite a smooth run apart from taking a breather for a couple of minutes on his fourth lap. After this he ran 4 laps at 7¼mph followed by 2 laps at 7½mph, completing 11 circuits in total.

Run No. 12: Jim Elliott with his most attractive *Speedy, Aileen* also had a load of 4 passengers and, despite overfilling his boiler, covered 5 laps at more than 7mph. He then had to pause and set back on lap 7, with another stop caused by the dynamometer car de-railing at the summit on his ninth and final circuit.

Run No. 13: David Neish entered his home-grown LBSCR *Bessborough* and took 6 passengers with his 4-6-2 tank. Stopping at the summit on his fourth lap, David parted company with 4 of his passengers and then ran non-stop to the finishing line to complete 11 circuits, reeling off 3 successive laps at more than 8¾mph in the process.

Run No. 14: The load Dave Kerry had for his *Simplex* was 3 passengers and a jerrycan of water to feed his injector. Speed varied between better than 5¾mph and just over 6¾mph for 5 laps out of a total of 8 for the run, with a break taken on the penultimate circuit.

Run No. 15: Ray Hillman brought along his colourful *Dholpur* and set off with a load of 15 passengers, only to have trouble getting up the bank; 2 passengers were dropped off later on the first lap. Five further laps were run, two at better than 7¼mph.

Run No. 16: The first of Sunday's runs was uniquely the LNER D49 *The Percy* built by Percy Wood and now owned by Stuart Duncan. A starting load of 4 passengers proved too much so 1 passenger was soon dropped off and another at the clubhouse after getting up the bank for the first time. Six further laps were run, only one at less than 8mph, and the fastest at 8½mph. The wheels stopped going round after passing the summit for the eighth time; WD40 freed the seized axle bearings enabling Stuart to complete the circuit and his run although without passengers.

Run No. 17: Mike Richardson had a load of 2 passengers for his *Simplex, Lionheart* and seemed to be set for a trouble-free trip, but light rain 15 minutes into his run made the rail slippery and brought him to a stand on the bank in lap 6. After dropping 1 passenger and setting back, Mike surmounted the grade and carried on without further hindrance to complete 10 laps, running laps 8 and 9 at better than 8mph.

Run No. 18: The only 3½in. gauge locomotive to run on Sunday was also the smallest in the competition. David Mayall with his Derby 4F took Frances, his wife as his only passenger for a ride and ran 9 laps non-stop, running very steadily throughout and averaging 4½mph for the 7 intermediate laps.

Run No. 19: With a load of 2 passengers for his *Pansy* to pull, David Ball achieved speeds of 8mph and better than 8¼mph for a couple of laps at a time, but stopped to blow up after each dash and so made 8 circuits of the track. Difficulty in re-starting on the seventh lap resulted in one passenger being asked to get off.

Run No. 20: Due to injector failure, Paul Tompkins' first attempt with his *Minx, Vauxhall* lasted only a couple of minutes. Later, with injector working, he set off with a load of 4 passengers


Dave Mayall


David Ball


Paul Tompkins


John Ellis


Brian Remnant


Denver Watkins


Glyn Winsall


John Dalton

and maintained a speed of about 9mph for 7 consecutive laps. After running more than 9¾ laps non-stop, Paul had to detach his load to complete his run of 10 laps.

Run No. 21: Sand was applied to the rails at the start for John Ellis with his *Glen* so that his start with a load of 4 passengers was good. However, slipping towards the end of his third lap caused him to make a brief stop and have 2 passengers alight. Ten further circuits were made without stopping again, speed fluctuated with a maximum of over 8¼mph for 3 individual laps.

Run No. 22: Brian Remnant chose to haul 8 passengers with his *Sweet Pea, Lady Margaret* and seemed set for a steady run but stopped in the woods for 4 minutes on his third lap. The next three laps were run at better than 7½mph followed by two laps at 8mph. A second 4 minute stop, this time at the station, came during the ninth and last lap.

Run No. 23: Three adults and one junior made up Denver Watkins' passenger load. An unusual task for the observer on this run was to top up the plastic water bottle worn as a back pack by Denver to feed the injectors on his *Speedy*. After the first 3, Denver ran 9 laps at better than 8¾mph. There was a brief stop in the penultimate lap and the total for the run was 15 laps.

Run No. 24: Glyn Winsall had 8 adults and 2 kiddies as the passenger load for the hybrid *Nigel Gresley* built by Fred, his father. Three laps to get settled and then Glyn ran 8 laps at a steady average of nearly 8½mph, with the final 3 laps a bit slower giving a total of 14 laps for the run.

Run No. 25: John Dalton took 7 adults and 2 junior passengers as the load for his Britannia *William Wordsworth*, getting up the bank on his second attempt. Speed fluctuated but laps 4 and 5 were run at a steady average of better than 7¼mph. John dropped off his passengers at the station on the tenth lap and his observer slipped the empty trolleys at the summit next time round enabling John to complete 11 circuits.

Run No. 26: Lionel Flippance, with his British Railways style Mikado *George Eveniss* had a passenger load comprising 15 adults, 2 juniors and 3 kiddies. With little variation in lap times, Lionel covered 13 laps at an average speed of 8½mph, then stopped a lap later to set down all but one of his passengers and run a further lap to make a total of 16 laps for his run.

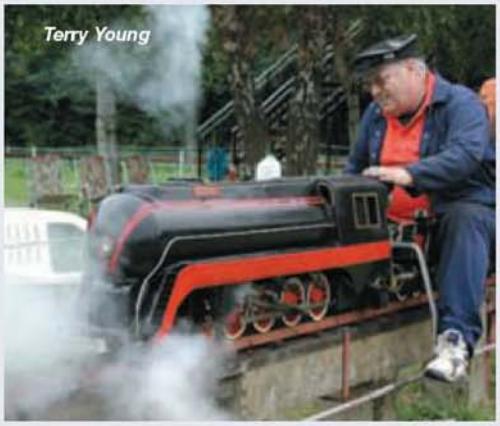
Run No. 27: A total of 24 passengers made up the load for *Brighton,* the Bulleid Leader bogie locomotive built by Kevan Ayling. Three successive laps were covered at an average speed of 7¼mph, then the safety valves started to blow so that during his eighth lap Kevan made a 3 minute stop near the top of the bank to get water into the boiler. After this 4 bottles of water were picked up in the course of the next 3 laps. Stopping at the summit on the twelfth lap, the passengers dismounted and Kevan completed his run as an empty stock train.

Run No. 28: *Annie,* Bill Dwyer's American style 3-cylindered Mountain was driven by Terry Young who sat in the middle of the locomotive's modified tender, while his seat on the dynamometer car was occupied by the observer. The passenger load for this run comprised 17 adults, 2 juniors and 1 kiddie. Terry had quite a struggle to get this heavy train up the bank for the first two circuits but then reeled off 6 laps in fine style, the middle 4 at an average speed of 8½mph, to make a total for his run of 8 laps.

The proceedings concluded with a brief presentation to winner Lionel Flippance of a trophy made by David Ball, together with a £50 token generously donated by Bruce Davey. It was generally agreed that the first OMLEC had been very successful and the gratitude of all present was expressed to Geoff Moore, Peter Breakwell, Brian Barrow, Ron Roebuck, Jim Wilson and all who had worked hard to make the weekend so enjoyable for all participants and visitors.


Lionel Flippance


Kevan Ayling


Terry Young


Brian Digby

SIMPLE SURVEYING

Philip Amos

concludes his introduction to the techniques of surveying with some 'rough-and-ready' measurements for length and a brief review of curves in railway trackwork.

●*Part III continued from page 497 (M.E. 4172, 28 June 2002)*

A rough measure of angles can be made using the hand at the end of an outstretched arm. As shown in **fig 18(a)** the knuckles subtend angles of 3, 3 and 2deg. at the eye, and with the fingers outstretched the fingertips subtend angles of 12 and 19deg. at the eye, see **fig 18(b)**.

These are generalised figures and will differ from one person to another; however it is easy to 'calibrate' one's own hand if greater precision is required.

Distances

(i) Visual Acuity

- Moving vehicles can be detected at a range of about 3km.
- Windows of a large house can be counted at a distance of about 4km.
- Movements of persons can be observed at about 800m.
- A person's head can be seen at about 500m.

These distances will vary somewhat with differences in eyesight from one person to another.

(ii) Comparison Method.

A thumb held up at arm's length can be compared to the height of a person to allow distance calculation thus:

$$d = (a \times h) / t$$

where

d = distance
a = arm's length
h = person's height
t = proportion of thumb length

See **fig 18 (c)**.

Typically:

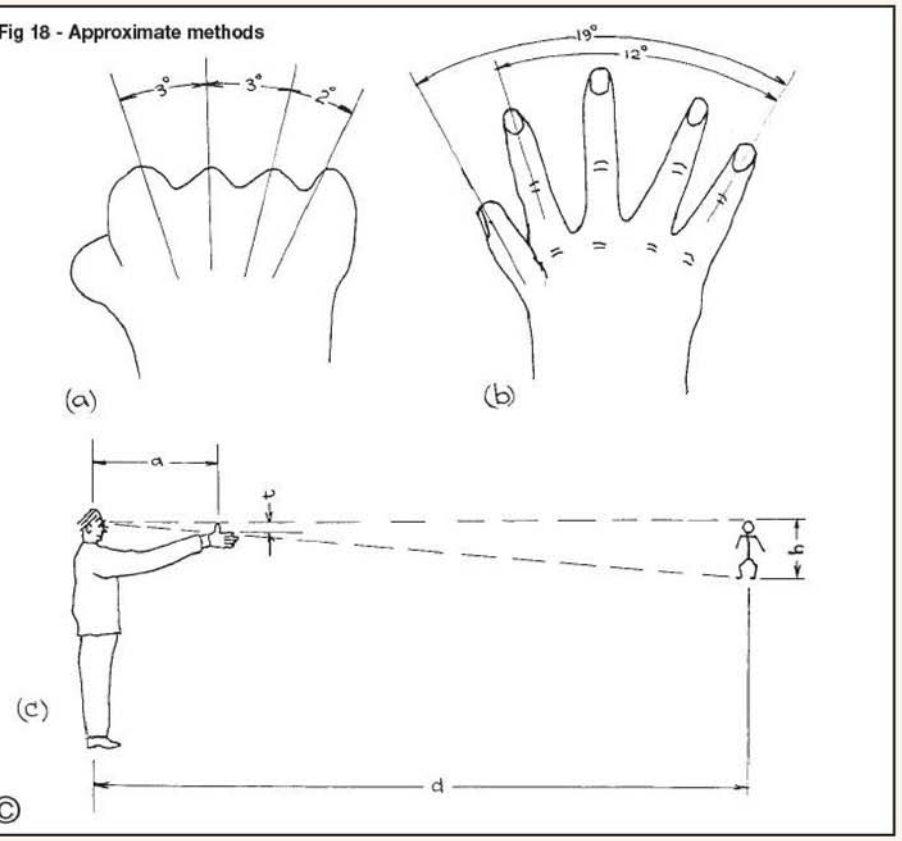
Arm's length = 650mm
Person's height = 1800mm
Thumb length overall = 60mm
Thumb length to knuckle = 30mm
Thumb nail length = 20mm

From which, if the person's height appears to equal the thumb length, the distance is about 20m; if equal to the knuckle length, about 40m; and if equal to thumb nail length, about 60m.

(iii) Sound

At 0deg. C, light travels virtually instantaneously in dry air while sound travels at about 332m/second. Thus, if a firearm is discharged and the 'flash-to-bang' interval is measured, the distance from the observer to the weapon is 332m for each second elapsed time. For any great accuracy, corrections are needed to account for temperature variations and any wind blowing towards or away from the observer, but the basic relationship is often a useful approximation.

Fig 18 - Approximate methods



Railway curves

General

The minimum radius of curvature of track is related to the maximum distance between fixed axles of the rolling stock or locomotives. Adams **(Ref. 1)** suggests:

$$R = 9W \times G$$

where

R = minimum radius (ft.)
W = maximum rigid wheelbase (ft.)
G = gauge (ft.)

So, for standard gauge (4ft. 8 1/2in.) coal waggons having a wheelbase of 8ft. 6in., the minimum curve radius is 360ft. (approx 5 1/2 chains.)

Such minimum curves need to be traversed at very low speed to avoid the overturning effects of centrifugal forces (see below).

Superelevation

To offset the overturning effect, full scale practice is to raise the outer rail relative to the inner rail on a curve. This is referred to variously as superelevation, cant or banking — see **fig 19 (a)**. The amount of superelevation depends on the gauge of the track, the sharpness of the curve and the intended maximum train speed.

A number of formulae are given below from the references shown. For standard gauge they yield similar figures as shown in the example.

(i) $e = (g V^2) / 15 r$ (Ross: **Ref 1**)

(ii) $e = (0.06 V^2) / R$ (Hamnett: **Ref 2**)

(iii) $E = (G v^2) / 32.16 r$ (Hawson: **Ref 3**)

(iv) $e = 0.00066 D V^2$ (Hawson: **Ref 3**)

where

e = superelevation (in.)
E = superelevation (ft.)
g = gauge (in.)
G = gauge (ft.)
v = speed (ft./sec.)
V = speed (miles/hour)
r = radius (ft.)
R = radius (chains)
D = degree of curve (see **Table 1** below from **Ref. 4)** and note that superelevation should not exceed 6in. for standard gauge.

'Degree of Curve' is an American term and is the number of degrees of central angle subtended by a chord of 100ft. length measured on the track centre line.

Note that for high speed track, curves are not usually sharper than 6 or 8 degrees. In mountains,

Table 1

Degree of Curve	Radius to Track Centre Line (ft.)	Degree of Curve	Radius to Track Centre Line (ft.)
1	5730	12	478.3
2	2865	13	441.7
3	1910	14	410.3
4	1433	15	383.1
5	1146	16	359.3
6	955.3	17	338.3
7	819.0	18	319.6
8	716.8	19	302.9
9	637.3	20	287.9
10	573.7	21	274.4
11	521.7	22	262.0

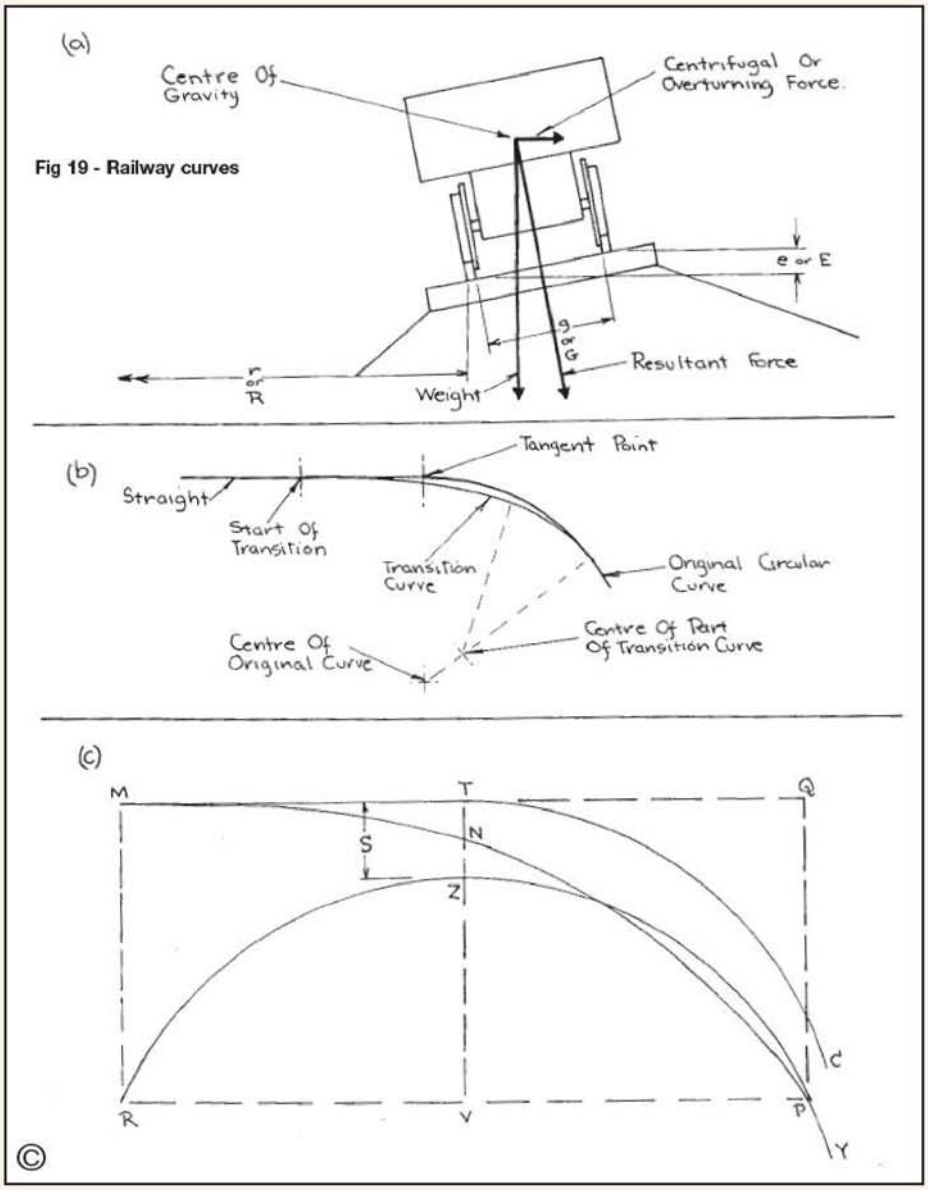


Fig 19 - Railway curves

mainline curves may sometimes be as sharp as 18 degrees. Most locomotives are designed to traverse curves as sharp as 16-18deg. but may pass even sharper curves if driven very slowly and carefully.

Example:

Standard gauge 4ft. 8½in. = 4.708ft.
= 56.5in.
Speed 60mph = 88ft./sec.
Curve 8deg. = 716.81ft.
= 10.86 chains

from (i) $e = (56.5 \times 60^2) / (15 \times 716.8)$
= 18.92in.

from (ii) $e = (0.06 \times 60^2) / 10.86$
= 19.88in.

from (iii) $E = (4.708 \times 88^2) / (32.16 \times 716.8)$
= 1.58ft.
= 18.97in.

from (iv) $e = 0.00066 \times 8 \times 60^2$
= 19.01in.

Clearly the required superelevation is about three times the suggested maximum which infers that for this speed the curvature must in fact be softened to about 33 chains or 2150ft. radius, say about a 3deg. curve.

Suppose these formulae are applied to a scaled-down system, e.g. 7¼in. gauge. This is about 1:8 standard gauge, so scaled down speed would be about 7½mph (11ft./sec.) Superelevation should not exceed 6/8 or ¾ inch. In this case an 8deg. curve radius would be:

= 716.8 /8 = 89.6ft. (1.36 chains)

When these figures are used in the various formulae, three of them yield comparable values (about 0.3in.) but (ii) differs considerably. This seems to be because formula (ii) does not explicitly include a term for gauge which may be implicit in the factor 0.06 for standard gauge.

Transition Curves

In full scale practice it is found impractical to move directly from zero superelevation on the straight at the tangent, to a curve having significant superelevation and so a transition curve is used to join the straight section to the circular section. In British practice this transition curve is a cubic parabola ($y = x^3$) and it is applied as follows.

Figure 19(b) shows the general concept wherein it will be seen that the transition curve starts to diverge from the straight before the tangent point of the straight to circular curve. The actual layout can be approached as follows — see **fig 19(c)**.

The original circular curve TC is tangential to the straight at T. This curve is shifted by an amount S to ZY (the shift is TZ) The transition curve MNP bisects TZ at point N. The total length of the transition (along the tangent) is MQ and MT = TQ. The offset QP at the end of the transition is eight times the offset TN (because $y = x^3$). This latter is half the shift S so QP = 4S. If we draw the chord RP then VZ + TZ = QP = 4S, so VZ is 3S.

The minimum length of the transition recommended for any curve is the greatest value for 'L' from the formulae:

$L = 0.65\ E\ Vm$ (a)
or $L = 0.65\ D\ Vm$ (b)
or $L = 25\ E$ (c)

where

L = length (ft.)
E = superelevation (in.)
Vm = maximum intended speed (mph)
D = deficiency of superelevation (in.) a concept which is not addressed in this discussion.

The actual length of the transition should preferably be 1½ x L.

The seminal paper on this topic was by W. H. Shortt in 1908 (**Ref. 5**). His rules were:

$L = V^3 / r$ (d)
and $S = L^2 / 24R$ (e)

where

L = transition length (ft.)
V = speed (ft./sec.)
r = curve radius (ft.)
S = curve shift (ft.)
R = curve radius (chains.)

For example, using standard gauge track, 60mph and 2150ft. curve radius with 6in. superelevation:

From (a) we obtain
$L = 0.65 \times 6 \times 60$
= 234ft.

or from (c)
$L = 25 \times 6$
= 150ft.

or from (d)
$L = 88^3 / 2150$
= 317ft.

The superelevation is usually increased uniformly from the straight to its maximum at the end of the transition.

In the case of our 7¼in. gauge example, the transition length would be from (d)

$L = 11^3 / 89.6$
= 14.85ft.

Conclusion

Having regard to the accuracy of track laying of scale track, the amount of superelevation of 5/16in. obtained in the above calculations makes it doubtful whether it is necessary or even desirable to attempt such refinement. If it is not attempted then of course the need for a transition curve also disappears.

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1: *Engineers Handbook*: H. Adams (1908).
2: *British Railway Track Design - Construction & Maintenance*: Editor R. A. Hamnett (1956).
3: *Railway Engineering and Maintenance Encyclopaedia*: Editor E. T. Hawson (1942).
4: *Mechanical Engineers Handbook*: L. S. Marks (4th Edition 1941).
5: *New Method for the Improvement of Existing Railway Curves*: W. H. Shortt - *Proceedings of the Institution of Civil Engineers* (Vol. CLXXVI 1908-9 Part II.)

A FERRIS WHEEL CLOCK

Richard Stephen
deals with the wheels and pinions and describes the construction of the Ferris wheel itself.

●*Part V*

continued from page 502
(M.E. 4172, 28 June 2002)

Close scrutiny of the wheels and pinions assembled in the Author's clock reveals the very fine finish obtained on all the individual parts.

The materials required for the wheels and pinions for this clock, and their details are shown in **tables 1 and 2** and in **fig 15**.

Cutting the wheels should present few problems. It is worth cutting at least two spares of each of the wheels; it is as easy to cut four wheels at a time as it is to cut one. I have learned to my cost that it is quite easy to ruin a wheel when crossing out; having a spare to hand at such a time is very handy. Even if you do not use the spares, it is as well to store them away; you may be glad of them at a later date. The dimensions of the centre wheel pinions are also given in fig 15.

It is not necessary to use steel for these pinions, brass bar is quite adequate. The centre wheel pinions can be cut satisfactorily with a wheel cutter. For both centre wheel pinions the hole for the arbor is 2.5mm diameter. A tip when cutting the smaller pinion wheels is to make a trial blank from brass rod. Cut two trial teeth, remove the blank, and check using a powerful glass that the tooth cut is truly radial. If not, adjust the position of the cutter and repeat until the tooth cut is truly radial.

Replace the brass blank with the steel blank and cut the pinion but don't cut the teeth in a single pass. The initial cut should remove about 90% of the material and the final cut the remaining 10%. You will find that free-cutting mild steel cuts much more easily than any other type, and the finish is much better. Use the slowest feed speed and plenty of water-based cutting lubricant.

If you cut the pinions on a lathe, drill the 1.6mm hole for the arbor before you remove them from the chuck.

Case hardening the pinions

Before hardening the pinions, true up and smooth the ends. The safest way to do this is to use the side of a carborundum cutting disc in a Dremel mini-drill. Hold the pinion in a collet in the lathe and grind the faces true. Now make a mandrel from a 60mm length of 3mm dia. steel rod. Using a file, taper the end so that it fits tightly into the hole in the pinion. Grip the mandrel in the chuck of a hand drill or a battery powered cordless electric drill — *don't use a mains powered drill.* Check that the pinion rotates truly. Heat the pinion with a blowtorch while rotating it at the same time.

When it is hot (not red — read the instructions!) dip it into the case hardening powder and return it to the flame. Repeat this process until you have built up a good covering on the pinion. Now heat the pinion up to red heat and maintain it at temperature for at least a minute, rotating it in the flame all the time to ensure even heating. Quench the *still rotating* pinion in cold water. Quenching the pinion while rotating will prevent any distortion from occurring.

With the wheels cut and the pinions hardened, the teeth on both the pinions and wheels should be polished. Polishing the teeth significantly reduces the engaging friction in the train.

Making the polishing hob

To make a hob you will need a 70mm length of 25mm square boxwood or any other close grained hardwood. Grip the block of wood in a 4-jaw chuck in the lathe and turn a cylinder approximately 20mm in diameter. Drill a 6mm hole through the cylinder and cut it into two pieces, each about 30mm long. This gives enough material to make two hobs, one for brass wheels and one for hardened steel pinions. Make the mandrel shown in **fig 14** and attach one of the hob blanks.

Screw-cutting wood using conventional methods is a problem because, being rather brittle, the wood tends to break up. I cut all my wheels on the lathe using a milling spindle fixed to a vertical slide. The easiest way to cut a clean thread on the hob is to use the milling spindle and the cutter you used to cut the wheel you need to polish.

Fix the vertical slide so that the axis of the milling spindle is parallel to the bed of the lathe. Using the spindle, cut a thread in the hob blank with the same pitch as that of the wheel you want to polish. For this clock you will need 4 hobs, two each for the 0.30 and 0.40 module wheels and pinions. The suitable pitches for the hob threads are 1mm (0.30 module) and 1.25mm (0.40 module).

Polishing the teeth

Grip the hob on the mandrel in a collet or 3-jaw chuck and charge the hob with a polishing compound. If the wheel being polished is made of brass, the polishing compound should be a non-embedding abrasive. Suitable non-embedding abrasives include any of the domestic metal polishes, e.g. Brasso.

For hardened pinions, 1200 grade carborundum powder is the most suitable. When using carborundum powder, care must be taken to ensure that the carborundum remains on the hob and does not scatter all over the lathe to do untold subsequent damage! To overcome this difficulty mix a small quantity of the carborundum powder in a jar with some thick cutting fluid, e.g. Dormer Supacut, which has the consistency of thin honey and is about as sticky! The mixture sticks very well to the hob, as well as anything else! The lathe bed and compound slide should be protected with paper

Table 1 - Wheels & Pinions: Materials

Ferris Wheels:	1.2mm brass sheet (CZ180) or 1.5mm brass sheet (CZ120)
Centre Pinion:	12mm brass rod (CZ121)
Centre Wheel:	1.2mm brass sheet (CZ120)
Intermediate Wheel:	1.2mm brass sheet (CZ120)
Pinions:	6mm mild steel rod (EN1A)

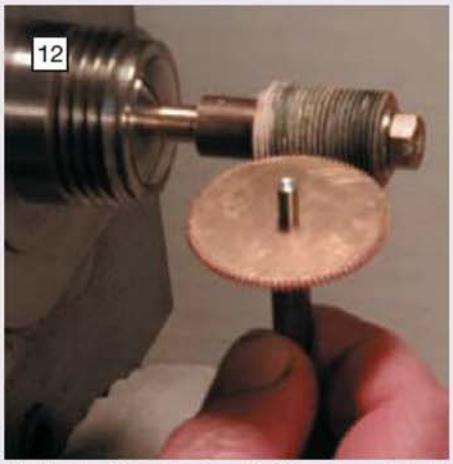
The drawing of the Brass Foot on page 501 (*M.E.* 4172, 28 June 2002) should have called for one foot with a 3.5mm groove, not 3mm as indicated. We regret any inconvenience this may have caused.

Table 2 - Wheels & Pinions: Details

Description	Number of teeth	Module	PCD (mm)	Full dia. (mm)
Drive Wheels (2 off)	100	0.40	40.0	41.10
Centre Pinion (2 off)	25	0.40	10.0	11.10
Centre Wheel	144	0.30	43.2	44.03
Intermediate Pinion	12	0.30	3.6	4.08
Intermediate Wheel	120	0.30	36.0	36.83
Escape Pinion	12	0.30	3.6	4.08

kitchen towels to ensure that the abrasive does not go where it is not welcome!

The wheel, free to rotate on a *hand held* arbor is engaged in the thread, as shown in **photo 12**, with the plane of the wheel aligned with the axis of the rotating hob. To avoid any possibility of distorting the wheel, polish the teeth before you cross it out. As the hob rotates, it forces the wheel to rotate as well, polishing one flank of each tooth in the process. The wheel is turned over to polish the other flank.



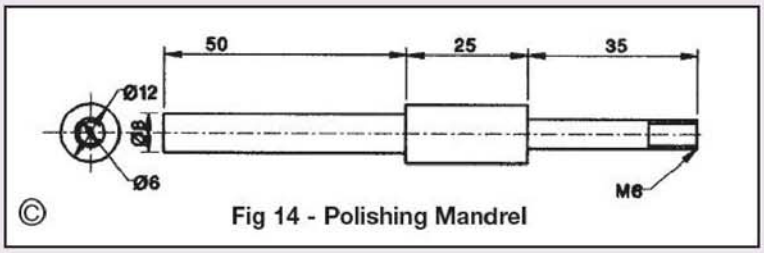
The teeth of the wheels and pinions are polished by rotation against a boxwood hob loaded with a suitable abrasive. For this operation, the wheels and pinions are supported on a hand held arbor.

Crossing out the wheels

Once you have finished polishing the teeth of the wheels you should cross out all the wheels. The dimensions for the crossings for all the wheels are shown in **fig 15**. The spokes are all shown as being slightly tapered which is a personal preference of mine. How you decide to finish the spokes is your choice.

I leave all the internal corners rounded with a radius of 1mm just as they are after crossing out on the CNC milling machine. With the crossing out completed, the wheels should be finished off on 1200 grade wet and dry paper in a bath of water to which has been added a squirt of washing up liquid. This prevents the abrasive paper from clogging and improves the final finish. The wheels will be brought to a final high polish once the clock is completed.

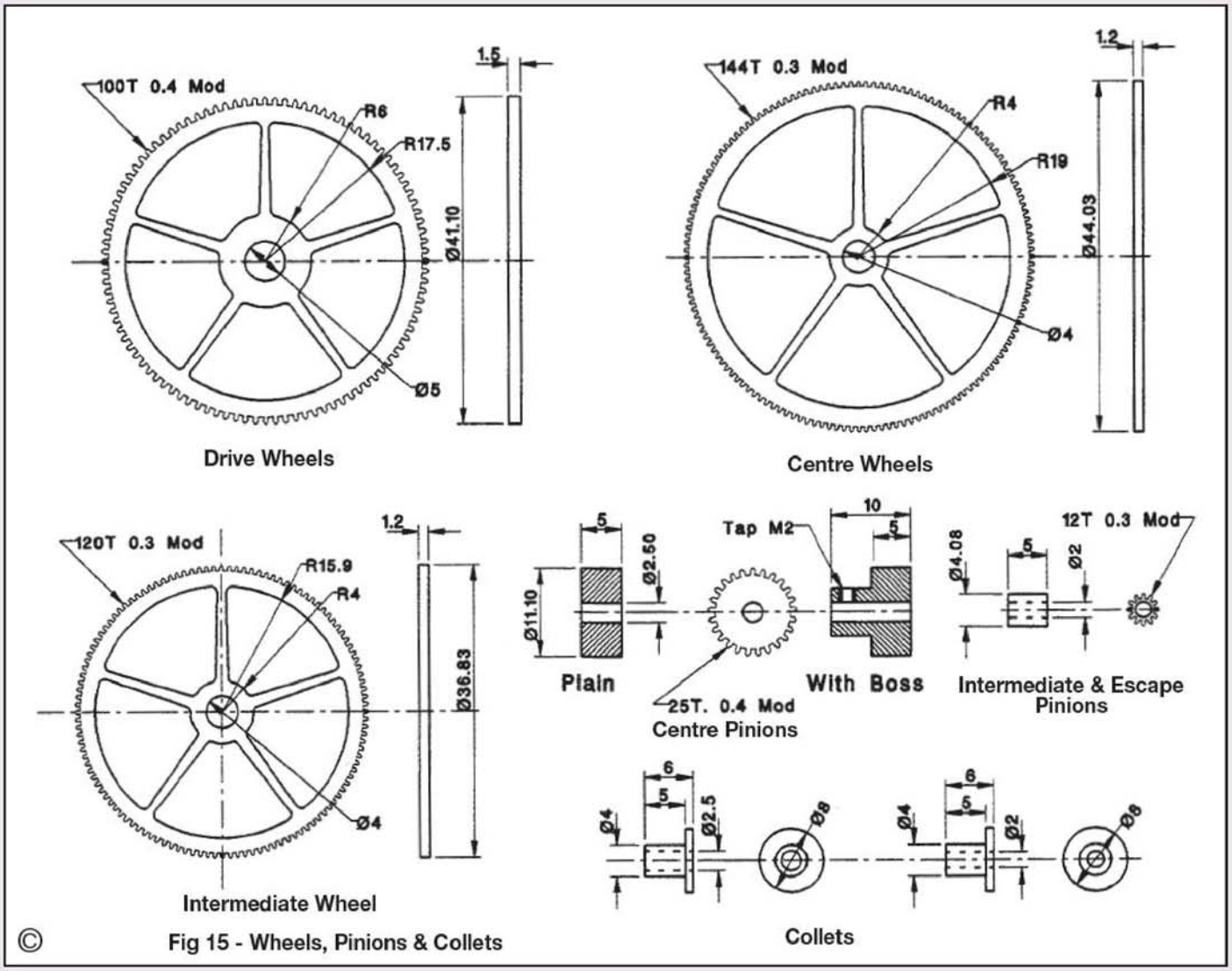
The dimensions of the collets for the wheels are also shown in fig 15. These look best made in steel and polished. Fix the wheels to their collets using Loctite Screwlock. This will adequately secure the wheels to the collets and enable you to test the clock, but still allows them to be removed relatively easily for final polishing. Once the clock is finished the wheels can be permanently secured to the collets using Loctite High Strength Retainer.



© Fig 14 - Polishing Mandrel

Ferris wheel

The details of the Ferris or ball wheel are shown in **fig 16**. The wheel is made from 1.2mm CZ108 brass sheet rather than CZ120 (engraving brass). The reason for using CZ108 is that it is significantly stiffer than engraving brass, thus allowing the wheel to be a little more ▶



© Fig 15 - Wheels, Pinions & Collets

delicate. As a result, CZ108 is rather more difficult to cut than engraving brass. If you prefer an easy life and don't want to use CZ108, preferring instead to use engraving brass, I suggest you use 1.5mm thick material.

The Ferris wheel must be accurately made. All the ball slots must be identical and spaced exactly 22.5deg. apart around the circumference of the wheel. If the slots are not all identical and eqi-spaced, the balls will not drop out of the wheel at the same angular positions. When they drop off the wheel, the balls have to fall exactly between two electrical contacts, closing a circuit and switching on the drive that raises the balls. I cut my wheel on the Wabeco CNC mill which, although it took about a full day to completely cut out the three sections, made an excellent job of it.

Exactly how you will tackle the wheel depends on the equipment available. The parts could be made entirely by hand, which will require some very careful marking out and fitting. The job will be considerably easier if a milling machine with a good rotary table is available.

Making the Ferris wheel

A piece of 1.2mm CZ108 (or 1.5mm CZ120) brass sheet 450 x 150mm is required for the Ferris wheel. Start by roughing out three discs to 170mm diameter. Cut a disc of 12mm plywood or MDF board about 180mm in diameter and fix this onto the rotary table. Take all three roughly cut discs and screw them securely to the wooden disc. Ensure that the discs are centred and positioning the fixing holes in the areas of waste material. Do not stint the number of screws you use to secure the discs.

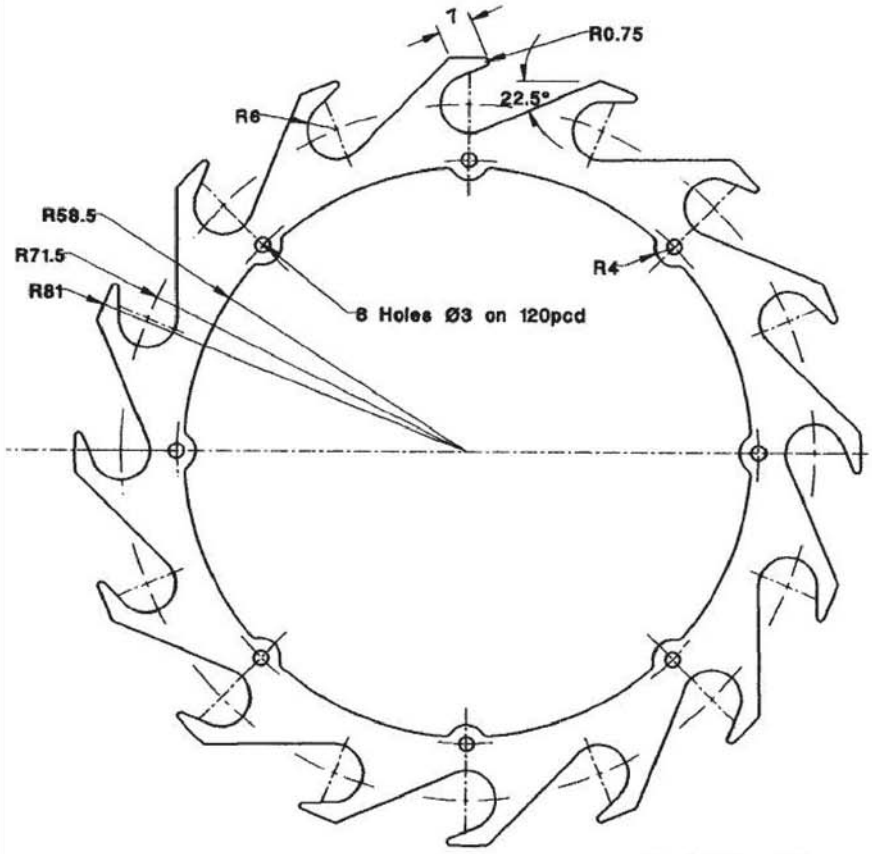
Begin by cutting a 12mm hole in the centre of the three discs. If you can accurately locate the centre of rotation of the rotary table, you could use a drill to make the hole. Alternatively, and possibly more accurately, mill the hole using a slot drill. It will not matter at all if the hole is not exactly 12mm diameter, all you will have to do is make the arbor to fit the resultant hole you have made. Now set the rotary table at 0 degrees. As accurately as you can, position the axis of rotation of the milling machine spindle at the centre of rotation of the rotary table. For convenience we will refer to this position as having the co-ordinates (X = 0, Y = 0).

The next task is to drill eight 3mm dia. holes spaced 45deg. apart on the circumference of a circle having a radius of 60mm. The first hole is to be drilled at the co-ordinates (X = 0, Y = +60).

Next drill sixteen 12mm dia. holes spaced 22.5deg. apart on the circumference of a circle having a radius of 71.5mm. The first hole should be at the co-ordinates (X = 0, Y = 71.5).

Drilling large diameter holes in thin material is sometimes difficult. My technique is to use a series of drills of increasing diameter and finish the hole using a boring head. The discs can now be machined to their final diameter. This is best done taking light cuts against the side teeth of a milling cutter, preferably a sharp end mill.

Machine the track way for the balls next. Refer to the drawing of the ball cage in fig 16. Careful study of the drawing will reveal that the track way of the slot immediately to the right of the uppermost slot (in the 12 o'clock position) is parallel to the X-axis of the milling machine table. Using a sharp slot drill, machine the track ways starting with the first hole to the right of the topmost hole. Once the slot drill is positioned to cut one edge of the track way, cut this edge of all the slots, rotating the table 22.5deg. for each. Reposition the slot drill to cut the other edge. The sharp corners can be removed later using a fine file.



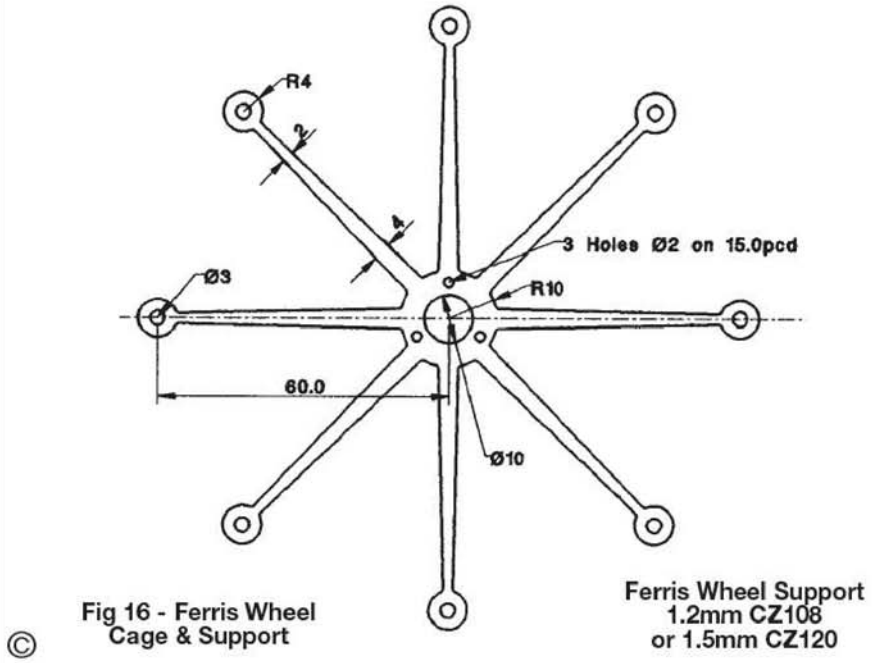


Fig 16 - Ferris Wheel Cage & Support

You will now have three identical copies of the Ferris wheel cage, one of which will be used to make the spokes of the wheel. Remove the three discs from the table. Before you separate them mark each one so that when you have finished making the wheel they can be assembled in the same relative positions as when they were machined. By this means, you should have no problems aligning the wheel on final assembly.

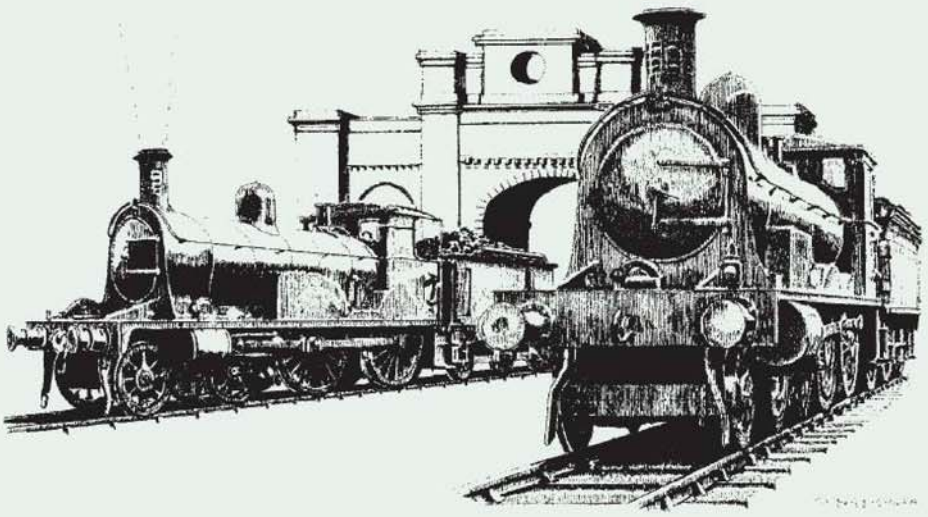
If you have no access to a CNC milling machine, the spokes of the Ferris wheel are probably best cut out using a piercing saw Finish them with a fine file and wet and dry paper. A piercing saw is also probably the easiest way to cut out the sides of the cage. Again, finish off with a fine file and wet and dry paper.

● *To be continued.*

Neville Evans

discusses David Jones' characteristic louvred chimney and its production in miniature form before dealing with the smokebox, superheaters and the steam circuit.

●*Part XV III continued from page 510 (M.E. 4172, 28 June 2002)*



THE HIGHLAND RAILWAY JONES 'BIG GOODS' & LOCH 4-4-0

LOCOMOTIVES IN 5in. GAUGE

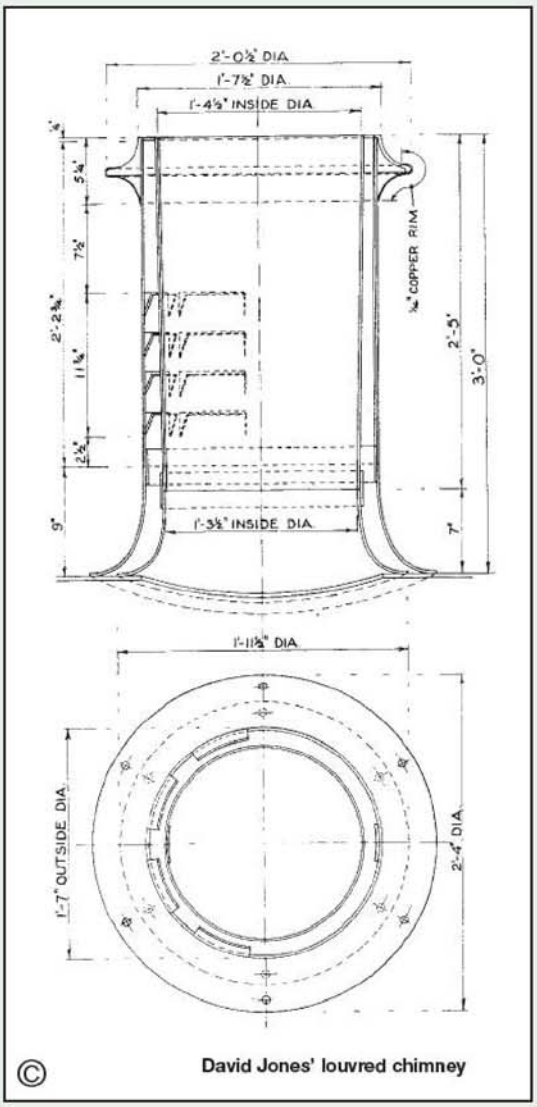
And so to the front end of the 'Big Goods'. Although it is very similar to the 'Loch', it nevertheless is slightly different in many ways. To avoid confusion I have detailed them separately, together with a synopsis of a very good article written by Tony Allcock in October 1979, describing how to make the louvred chimney from the castings supplied. As I mentioned recently, this loco was awarded a Silver Medal in the M.E. Exhibition of that year.

The Jones locomotive developed from the Barclay and Stroudley locomotives, into a simple, rugged and characteristic design which included outside cylinders and, not least, the individual appearance of its chimney, a design which I believe to be unique to the Highland Railway and David Jones, who used variations of it for all his major locomotive building. In fact it is not one chimney but two, the outer one containing four ranks of four louvres which allowed air to circulate between it and the inner chimney. As the louvres were only in the forward section of the chimney, the air could escape only through an annular orifice at the top.

Why Jones developed this pattern of chimney does not seem to have been recorded, but several reasons have been suggested. The Highland ran through the kind of terrain where at times there was high risk of heather and forest fires. The effect of the upward movement of the air exhausting through the orifice would carry the sparks higher than normal and would therefore allow them to cool before falling to earth. There appears to have been a slight reduction in compensation paid for fires during Jones' time with the Highland Railway, which may possibly be attributed to the introduction of the chimney.

Secondly, it has been suggested that the effect of the louvres would be to lift the drifting exhaust steam and so not obstruct the driver's view. In the long periods of downhill running which the Highland main line demanded, this may have been a factor. However, the speeds were never high, goods trains were limited to 25mph and even express passenger trains to 45mph, so the effect surely cannot have been very marked.

A third view is that during those long stretches of downhill running with closed regulator, the draught through the chimney orifice would encourage better steaming of the boiler. Whatever the reasons or the results, Jones used the louvred chimney throughout his time with the Highland Railway. His successors abandoned it and so far as I know, no other locomotive engineer used it in similar form on any other railway, with the possible exception of Mr. Clayton, who was Maunsell's chief draughtsman on the Southern Railway. He had a problem with the 'King Arthur' class, due to poor smoke lifting over the big round topped boiler. As an experiment he tried louvres in the chimney of the *Red Knight* — which was always looked upon as the greatest of all the N15s. The louvres obviously didn't help, and the answer came with the fitting of the large smoke deflectors, which disfigured these super locos and all the other big Southern engines for evermore.



 David Jones' louvred chimney

The Urie N15s, incidentally, whether they carried the Maunsell modifications, and were called 'King Arthurs', or without, seemed to be just as good as, or better than the Maunsell engines. What made the difference to the sluggish N15s was a slight change in the draughting, what we now call 'fine tuning'. Read all about it in *LSWR Locomotives* by E. D. L. Bradley. An example of the louvred chimney may of course be seen on the 'Big Goods' 4-6-0 in the Glasgow Museum of Transport.

Characteristic though it is, and some might say attractive, the chimney posed a few problems for construction in 5in. gauge. Although I do not expect to be able to prove the existence of any operational advantage in such a small version, I decided to keep as close to the original concept in construction as possible. The full-size chimneys had the louvres cast in. I decided to follow suit and to machine the resultant castings to obtain a finer finish than simple foundry processes would allow.

First, a split pattern was made to allow the segments containing the louvres to be 'drawn' from the sand. With this, to my delight the foundry produced some excellent gunmetal castings, marred only by some too obvious joint lines which fortunately were easily removed when machining to size. I had included a cast top to the chimney, but as several ▶

Jones locos sported copper rings to their chimneys, (yes, even on the Highland Railway with its periodic recourse to severe economic restraint) on mine, the cast top has been machined away and replaced by a copper cap. An alternative here is to copper plate the whole chimney and to paint up to the copper top with smokebox paint.

The inner chimney posed few problems, its bore being tapered and its outer diameter a push fit in the parallel bore of the outer chimney. The main problem comes in machining the louvres themselves, although I do not claim the remotest originality for the techniques used. The casting was first held by its extension boss, so that the outer surfaces above and below the louvres ran fairly true; it was bored to 1 1/2in. dia. after which the boss was removed. Most of the remaining work was done on a 1 1/2in. dia. mandrel.

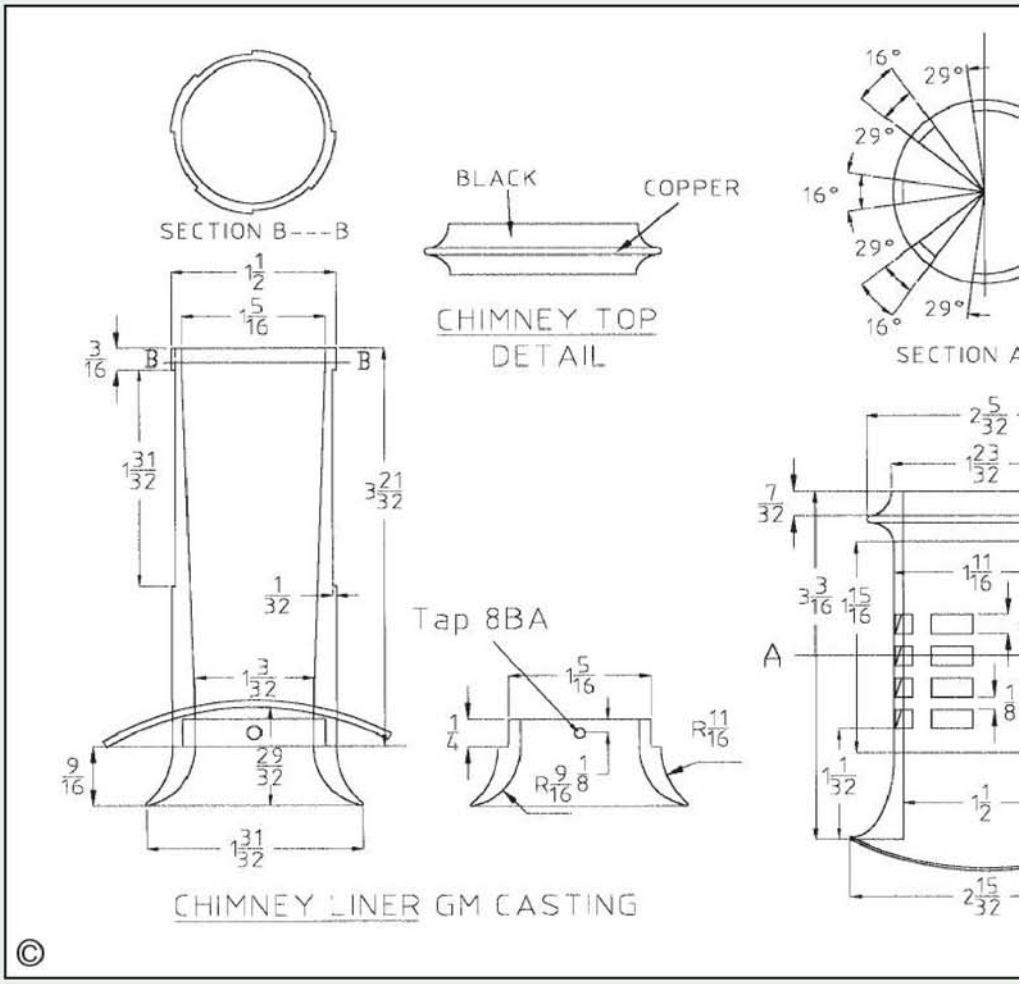
The initial task, with the casting mounted on the mandrel, was to machine the outer surface, and then to shape as much as possible of the base. All that was the easy bit. A special tool, in this case a 60deg. thread form ground with severe side clearance, was mounted in the tool post and angled to 21 degrees. A check was then made that the point would touch each louvre upper edge when the top slide was advanced 0.280in. for each row. When all was set fair, at a top-slide setting of zero, the lathe was rotated by hand at a depth of 0.65in. for each of the four louvres in the row, so cutting over half the sloping surface of each vent. The process was repeated by moving the top slide 0.280in. for each successive row, and advancing 0.65in. each time, cutting as far as possible into the corners. When all was checked, the process was repeated with fine cuts to a total finished depth of 0.090 inch.

Next, the chimney was reversed on the mandrel and with the top slide carefully reset, the remaining portions of each sloping vent were cut, again, well into the corners. To cut the corners on the top edges, a tool with a narrow chisel point was used, the first job being to check that all the uncut ends of the vents were in line, and that by rotating the chuck the same amount each time, all four ranks would be of similar widths.

Again, with chimney reversed on the mandrel, the process was repeated, advancing the top-slide and cross-slide recorded amounts each time, so completing the two ends and the angled faces of all 16 vents. The only remaining job was to take a cleaning cut from the upper edges and so produce a finish which needed no further attention. The main problems were in setting the tool for the two halves of each face so that there was no join line, and to keep one's wits alive in manipulating top-slide and cross-slide screws to clear chips away from the corners.

The final process with this stage of construction while the chimney was held on a stub mandrel, was to bore the centre section so that the upper edges of all louvres broke through into the bore. This was no problem and the resulting slits were quite uniform.

Tony Alcock then outlined briefly the ingenious set up described by Sir Ron East (*M.E.* 3353, 20 September 1968) to facilitate the machining of the base or skirt of the chimney on a milling machine. It uses Woodruffe cutters of differing diameters working on top of the flange and fed so that the chimney can be rotated by hand. In rotating, the fly-cut base — the bit



that actually sits on the smokebox top — is pressed against a guide, so that the cutter follows the contours exactly. In fact, as there is still some filing to be done, I think it just as well to skip the last bit and do it all with a file. There isn't a lot to take off anyway, as the casting is pretty accurate and once the base has been flycut to suit the smokebox you're practically there.

One further point. If you are going to look up the original text, don't be misled into thinking that either loco carried a tapered chimney. I enclose an original drawing of the Jones chimney which clearly specifies NO TAPER.

'Big Goods' smokebox

Apart from the slightly greater size of the 'Goods' smokebox, the chief difference between the two boxes is that the front and rear plates of the 'Loch' are castings, whereas the 'Goods' plates are either cut from 1/4in. brass plate or built up from plate and possibly thick-walled brass tube. That being so, I don't propose to go through it all again. I would, however, like to mention that on the 'Loch' box as detailed last month, one has to take note that the 2 31/32in. length of the wrapper as shown, only applies to the bottom bit, where it screws behind the frame. The rest of it is 1/8in. longer, in order to stretch to the rear of the smokebox. The 'Big Goods' wrapper has a flat back and should present no problems.

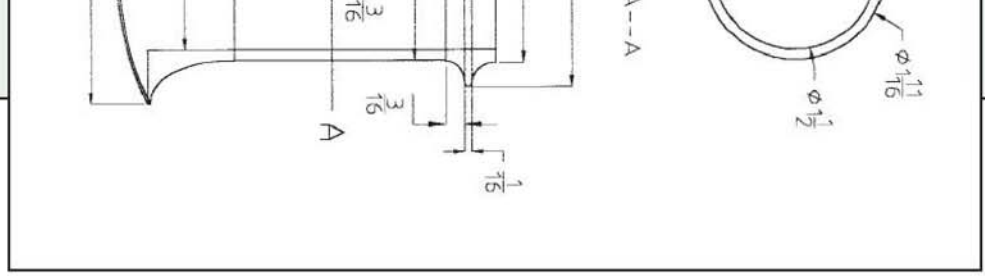
Superheaters and steam circuit

I have been progressing the 'Loch' as far and as fast as possible, and while assembling the superheaters, I fell to wondering as to whether it wouldn't be better simply to make the steam pipe/superheater/wet header in one piece as opposed to two. The reason I made it in two parts was to facilitate assembly of the pipe into the regulator. If the steam pipe is separate, with its own flange, it's much easier to poke the end of the steam pipe into the regulator, the snag being that it now becomes necessary to use two gaskets, or a gasket and an O-ring. If the whole lot is soldered up in one piece, using only one thick flange carrying both superheaters, it is possible to wangle it all in and to assemble the regulator onto the steam pipe through the dome orifice. I have noted it on the 'Big Goods' drawing and you can now decide for yourself.

Another point which comes to mind is that, rather to my surprise, it is possible to insert both superheaters down one flue, if the Paul Gammon type of welded end is used. There is nothing new about Paul's design, except that he has used MIG welding techniques to streamline the joint A whole vista of new possibilities emerges, using perhaps one flue underneath the wet header and an increased number of small tubes. Watch this space, we'll look into the sums and the practicalities, and let you know.

Lamentations

While perusing said drawings, I immediately noticed an error in the labelling of the wet header. The groove in the back is not of course, for an O-ring, but to accept the spigot of the steam pipe. There is an O-ring groove, but it's in the steam pipe itself as shown. I've corrected the main drawing. Two more errors, which I put down to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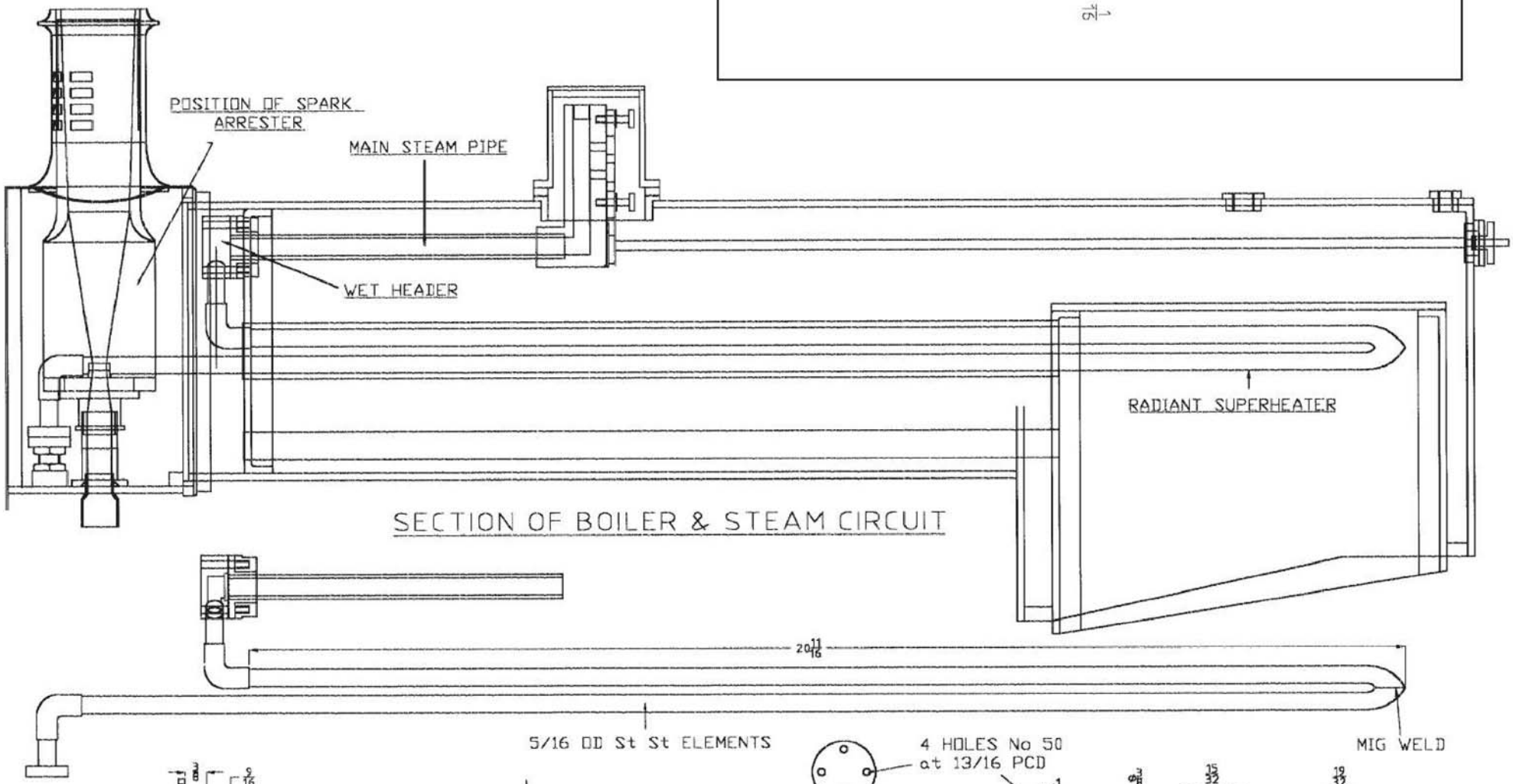
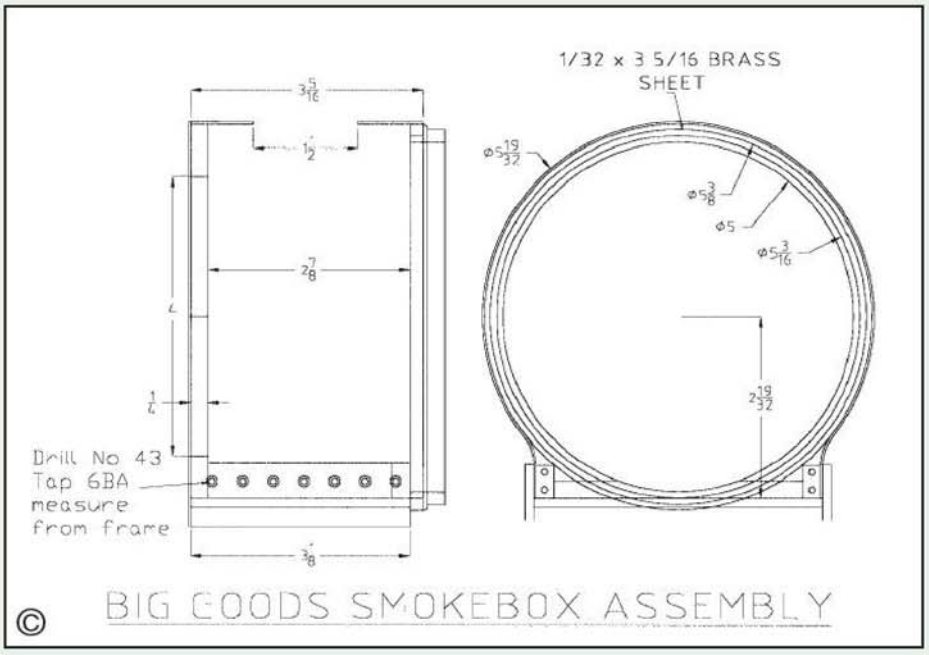
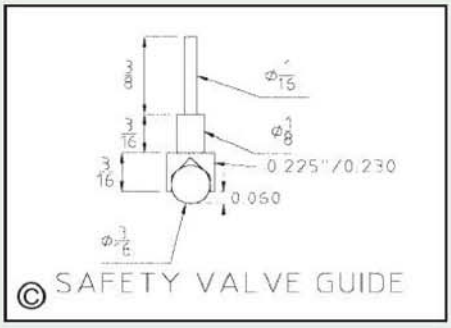

POSITION OF SPARK ARRESTER
MAIN STEAM PIPE
WET HEADER
RADIANT SUPERHEATER
SECTION OF BOILER & STEAM CIRCUIT
20 11/16
5/16 OD St St ELEMENTS
MIG WELD
4 HOLES No 50 at 13/16 PCD
MEASURE FROM JOB
5/16x22 SWG COPPER TUBE
SUPERHEATER ASSEMBLY
WET HEADER
ONE PIECE WET HEADER





'computeritis', are that the note which appears on the 'Big Goods' smokebox drawing reminding builders that if they are using metric (i.e. 3mm) frame sides, then they have to adjust the distance apart of the frame cutouts in the smokebox wing plate from 4 1/8in. to 4.139in. has disappeared from the 'Loch' drawing. I'm sure it was there when I last looked. The other one is that the hole in the bottom of the 'Loch' horizontal stay to accommodate the blast pipe should be 1/2in. dia., as on the 'Big Goods' drawing.

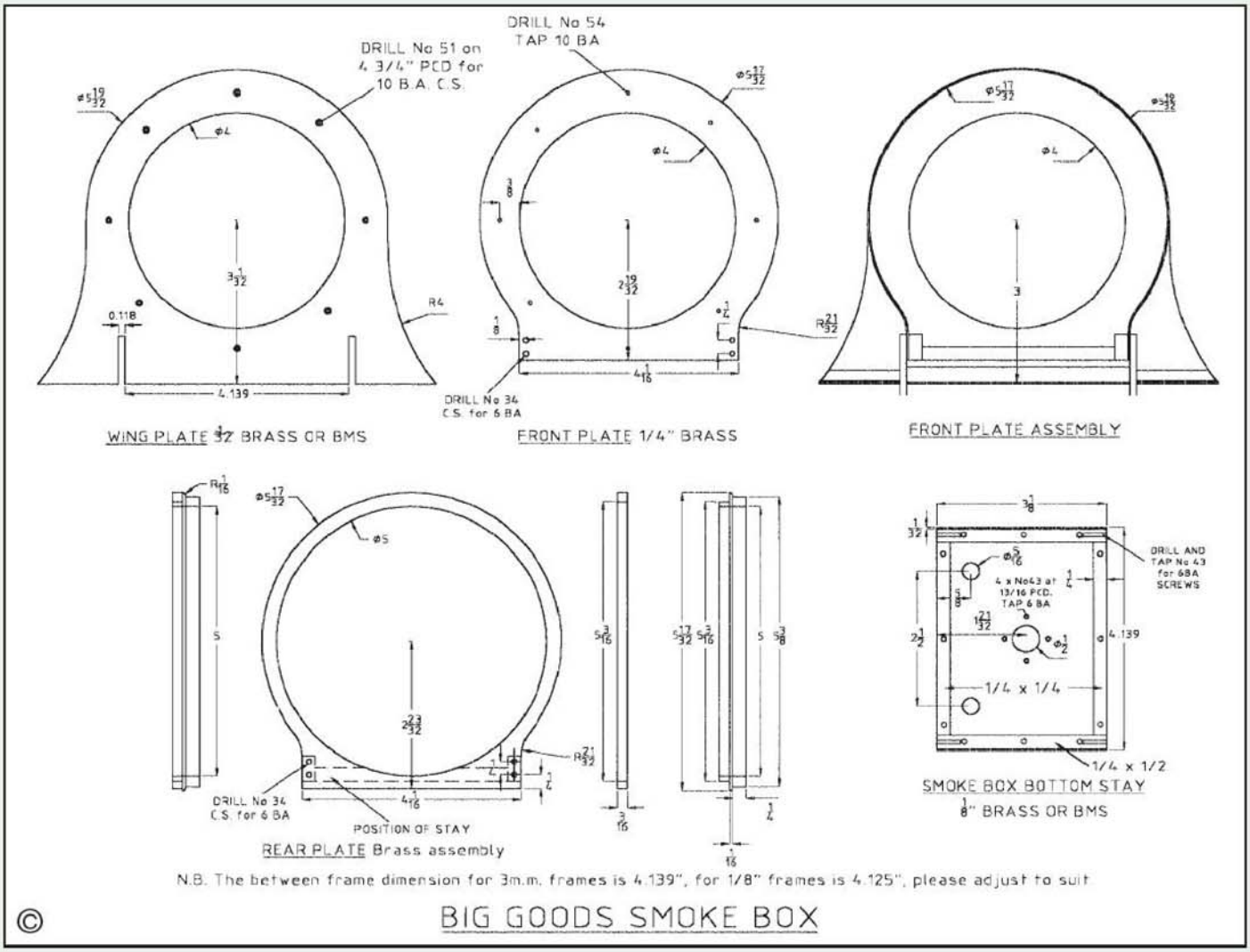
I was talking to Gordon Smith, he of the super safety valves, just now, and he asked if I could correct a misconception, in that I didn't emphasise the fact that in his design, the diameter of the ball shroud (I've labelled it 'guide') is critical, because of gas flow between the shroud and the valve body. The diameter should be held, not at 7/32in. (0.219) but between 0.225 and 0.230 inch. The other important thing is that the 3/16in. ball, should protrude 0.060in. from its housing. For the benefit of newcomers, the easy way to ensure accuracy is first to measure the complete length of the guide using your new digital calipers, then reset to zero, and set the ball 0.060in. out. Please note the amended drawings.

Our Editor received a very informative letter from Michael Breeze the other day, in which he recommends the use of naval gunmetal to BS 1400 G1 or phosphor bronze to BS 1400 PB1 for boiler work. Neither of these alloys contains more than a trace of lead and is therefore very suitable for brazing or hard soldering. He warns us to beware of leaded bronzes of the BS 1400 LB series from 1 to 5. Sounds like good advice to me.

Supplier

Drawings, castings, laser cut frames, etc. are available from **Practical Scale, 46 Pentyla, Port Talbot, West Glamorgan SA12 8AA; tel/fax: 01639-883741.** Please send a stamped, self-addressed envelope for list.

●*To be continued.*



ROAD STEAM

SAVAGE'S *LITTLE SAMSON*
in 3in, 4in. (and other) Scales

Martin Wallis

completes the work on the cylinder by dealing with the external profile, valve face, ports and passages.

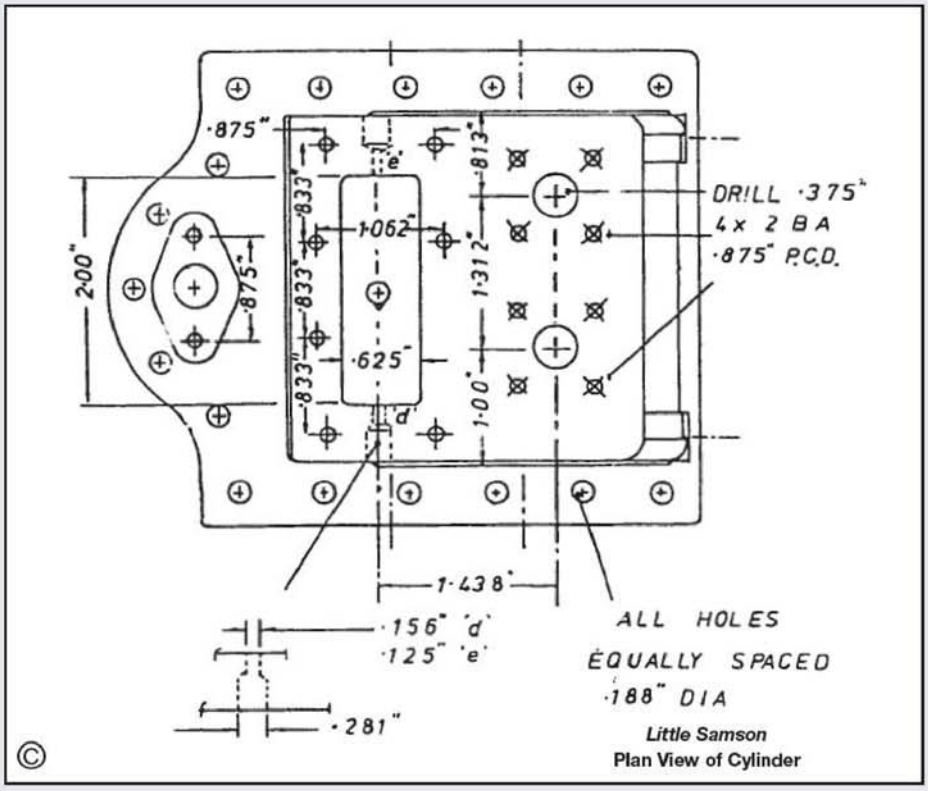
●*Part XXVII continued from page 514 (M.E. 4172, 28 June 2001)*

I would recommend machining many of the 'as cast' surfaces to remove the draught angle and to tidy them up. The remaining tasks then are the valve ports, the numerous drillings for all the studs and nuts that hold the cylinder assembly together, and the drain cock and valve spindle holes. The following notes complete the description of machining of the cylinder.

Tidying up

There are some finishing touches which are worthwhile before embarking on the ports and the multitude of drillings to be done. The external curved face of the cylinder should be cleaned up as illustrated in **photos 1** and **2** to remove the inevitable draught angle left from the casting process and provide a good surface against which the thin sheet metal cylinder lagging will fit. The greater portion of this curved face should be machined back so that the cylinder lagging is only in contact with the cylinder around its edges. However small, this air gap will at least guard against direct conduction and provide some insulation which will keep the cylinder warmer. It will also minimise paint discolouration due to the heat.

It would also be as well to machine the top and side faces of the saddle, and a machining allowance has been made for this. The front and back edges of the saddle are pretty straightforward, as is the flat edge under the cylinder side of the block. However, the double ogee curves under the valve chest will present much more of a challenge. The internal curves are easily produced using a fly-cutter, but the external curve may need to be the 'series of little flats' method finished by filing to the correct radius.

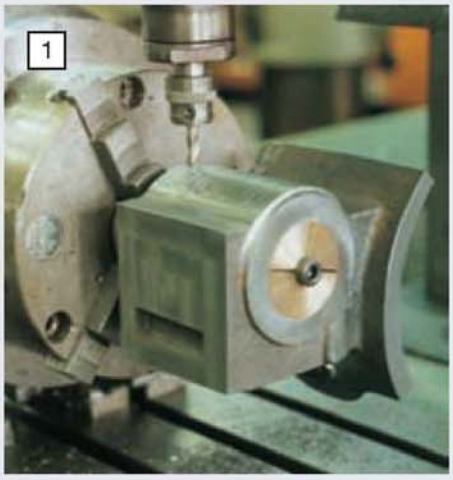


Little Samson
Plan View of Cylinder

The top faces of the saddle, where the nuts bed down, will benefit from a little attention too. **Photographs 8** and **9** show Stan part way through this operation, working to scribed lines and dot punching.

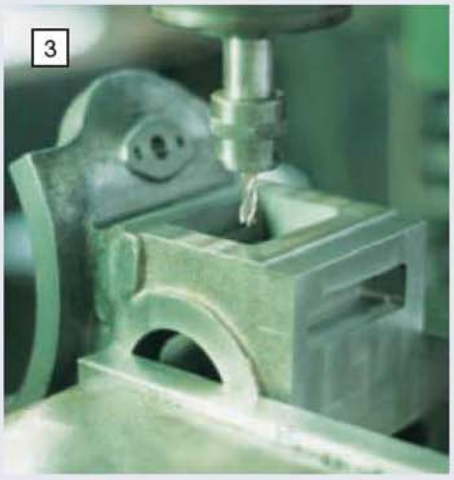
Valve face

We machined the valve face to prove the casting some time ago; it is now time to complete the job. One of the drawings included this month shows the required dimensions which, as for the other cylinder drawings, is in 3in. scale. The slide valve is located vertically in a machined register dimensioned at 1.25in. tall. The overall width of the valve face is 1.375in. beyond which, to left and right, the valve chest is machined back to provide clearance. In full gear, the slide valve should travel across the whole of the 1.375in. face. If no clearance is provided, the valve face will wear concave in time because at the extremities ▶

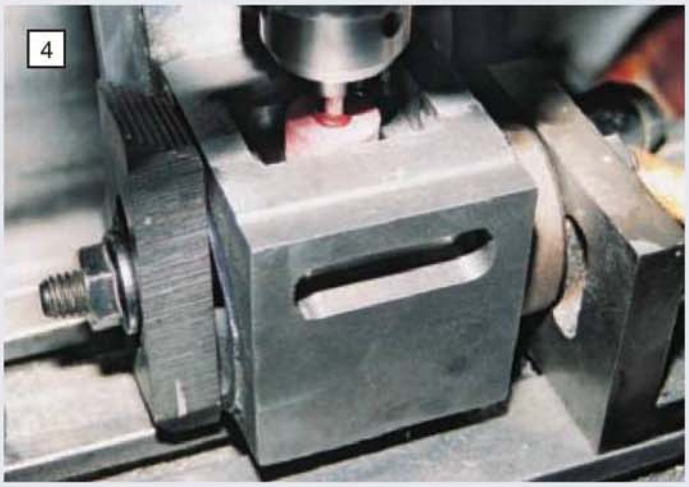


The cylinder is clamped to a rotary table to allow the external cylinder profile to be cleaned up by milling so that the cladding will fit neatly over it. (Photo: B. Camps)

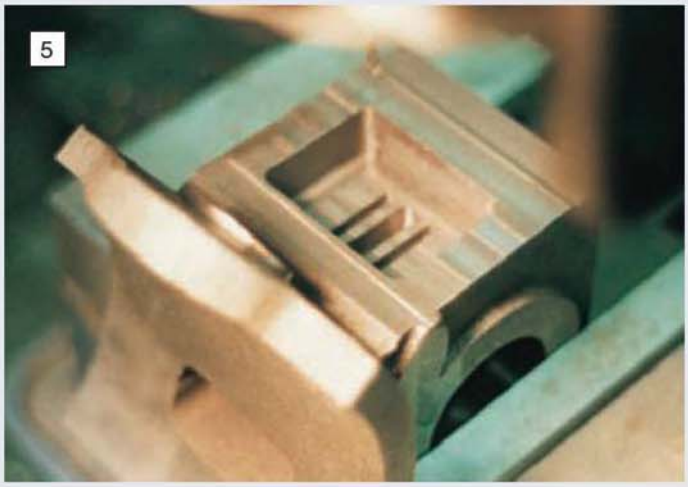
Profiling the 1in. scale cylinder as described in the text to generate a faceted cylindrical surface which can be finished by hand. Note the neatness of the saddle. (Photo: J. Milne-Fowler)



Machining the valve face of a 3in. cylinder. The cutter is held in a small chuck which improves both clearance and visibility during use. (Photo: B. Camps)



A small grinding wheel purchased locally served to complete Stan's 3in. scale cylinder valve face. (Photo: S. Nipper)



The completed ports on David's 3in. scale cylinder valve face. (Photo: B. Camps)

of its travel, where the valve comes momentarily to rest before starting its return movement, the wear will be much less than in mid-travel where the valve is moving the most vigorously. In bad cases where clearances are not properly provided and the wear is heavy, a ridge may develop at each end of the valve face.

A relatively small diameter cutter will be required to machine the recess and to machine the valve face. A mirror finish is not necessary; a well sharpened cutter and a slow feed will do the job. Don't worry if a few machining marks remain, the valve face will be fine as long as it is smooth and flat. Any little blemishes there might be will serve a useful purpose by retaining oil.

If you prefer, the valve face may be finished by a lick over with a small grinding wheel to improve its smoothness. Stan found a little stone in Halfords which was just right for the job (**photo 4**). If you choose this method, be aware that the 'corners' of such wheels are rarely 'sharp', in which case it won't work right into the top and bottom corners as defined by the 1.25in. dimension. The slide valve would then rest on the little strips of metal left top and bottom and not seat successfully across its whole face.

Valve ports

Small cutters will also be needed to get inside the valve chest to mill out the exhaust and steam ports. These cutters will need to be of the long series variety, or a normal cutter will have to be extended by being fitted into a sleeve. A suitable extension sleeve is easy to make and the cutter may simply be Loctited in place.

Machining the ports is easy enough — the two frustrations will be seeing what is going on and swarf removal! A vacuum cleaner with the inlet nozzle fitted with a piece of small diameter plastic tubing is a handy solution to this latter problem; if the end of the plastic tube gets too close to the cutter and caught up, it will certainly get chewed up, but the work and cutter should survive unharmed. If your machine has table stops, use them once you have established the port lengths. Secure stops are much more reliable than watching the feedscrew dials.

Some builders may prefer to remove the bulk of the waste by careful chain drilling. If this is the case don't rely on the drill starting in the correct position all by itself but use a centre drill first. A drill should find its own centre on a flat machined surface, and the chance of it wandering is small, but locating its position by the use of a centre drill is worth the extra trouble. Those whose machines are fitted with a digital read out will benefit from their investment when cutting ports. I have cut several sets of ports both with and without the use of a digital read out and can certainly say that if you have the cash available they are an investment which is well worth making.

A 1/8in. slot drill is unlikely to cut a 1/8in. slot, particularly if it is in an extension holder. At 0.118in., a 3mm cutter is just enough undersize to allow for a bit of 'oversizing'. The slot may be tickled out to size with tiny cuts on the edge. My preference is to start with the exhaust port and then work outwards. Port widths are easily checked with the (undamaged) shank of a twist drill, which is usually pretty close to the nominal drill diameter; you can always check it with a micrometrer anyway. A completed set of ports is shown in **photo 5**.

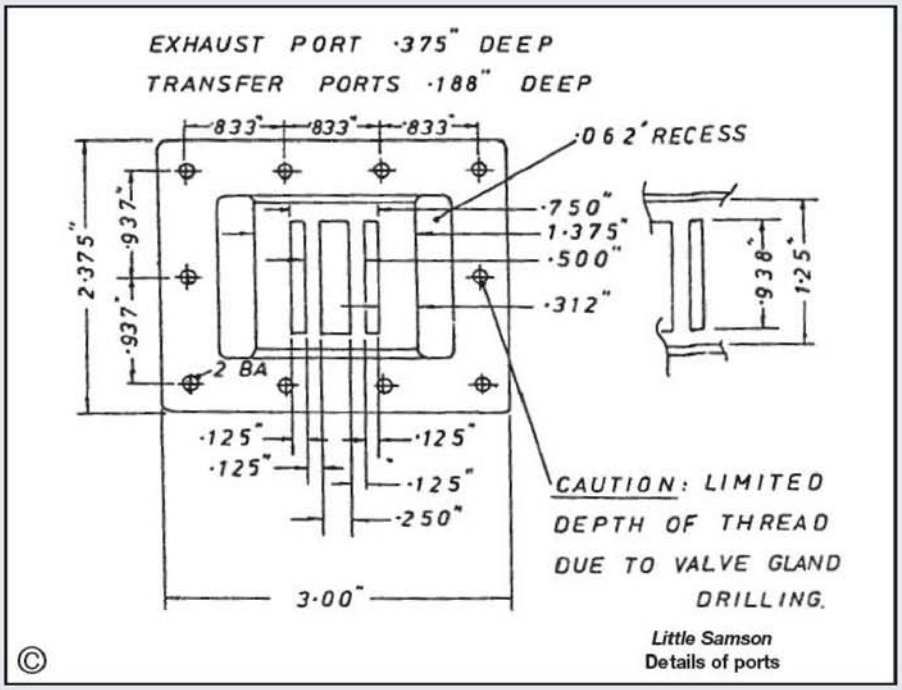
Special cutter

In the smaller scales, as with Jonathan Milne-Fowler's 1in. engine being built in Australia, the ports are so small that the sort of activity just described is not a very practical proposition — a 40 thou. slot drill is very fragile! In Jonathan's own words:

"The layout of the Little Samson *cylinder block does not lend itself to the adoption of a bolted-on valve chest as frequently found in miniature locomotive designs, and the prospect of milling steam and exhaust ports at the bottom of a pit in this scale did not fill me with enthusiasm.*

"The strategy I adopted was to mill out the cavity for the steam chest, and extend the excavation right through the front end of the block so a little ganged cutter could be used to cut the three ports at a single pass as described by the old master LBSC. A filling piece was then fitted, pinned in place with a 1/16in. bronze rod screwed into tapped holes, and the whole lot secured with low melting point silver-solder."

This is illustrated in **photo 6**.



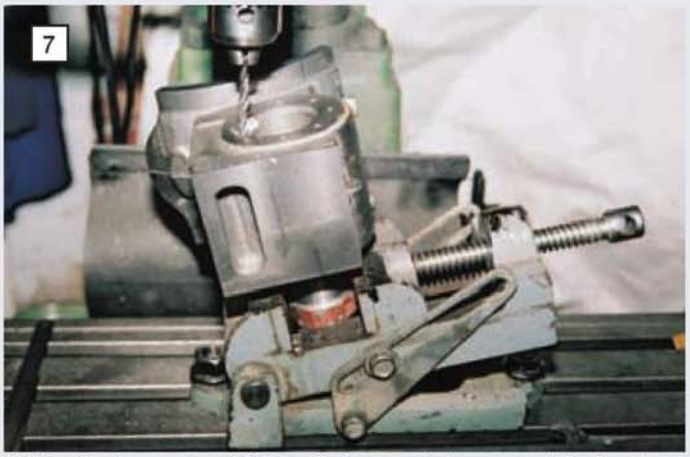
Little Samson Details of ports

Drilling the steam ways

Before the steam ways are drilled, the recesses in the ends of the cylinder need to be machined. While the width of the recesses is dimensioned at 0.437in., the size is of little consequence as long as sufficient metal is left between the recesses for the stud that secures the cylinder cover. Builders may prefer to drill this hole first, which should be jig drilled from the completed cover.

Four steam ways need to be drilled from each end of the cylinder to meet the corresponding steam port cut in the valve face. In 3in. scale, the drillings are 3/16in. diameter. The sectional

Jonathan's special home-made ganged cutter in use to machine the ports of the cast iron cylinder which has since been discarded in favour of a fabricated bronze cylinder. (Photo: J. Milne-Fowler)

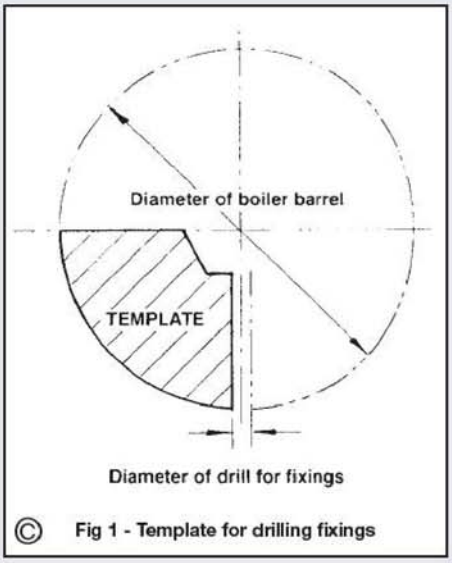


Drilling the steam ways with the cylinder mounted on a mandrel gripped firmly in a tilting machine vice. The set-up is amply strong for this operation. (Photo: S. Nipper)

drawing was included in last time's *Road Steam* but no matter, the principle is shown in **photo 7** and the angle is 10 degrees. The cylinder may be held either on an adjustable angle plate on in a tilting machine vice as illustrated.

It is as well to drill the hole a little small at first, say 1/8in., to see what happens. I like to start the holes with a tiny (1/8in. - BS1) centre drill for the first drilling. The length (depth?) of the hole may be estimated from the drawings, and if it hasn't broken through into the port don't drill the hole any deeper. The risk is that the hole may already have passed underneath the steam port and could then break into the exhaust steam port. If you believe the drill has gone to the depth needed to break into the steam port, and has missed, dismount the cylinder and carefully deepen the steam port until contact is made. Once the hole(s) have been successfully drilled 1/8in., they may then be opened out to 3/16in., starting the twist drill with a 3/16in. (BS2) centre drill.

An exhaust drilling has next to be drilled from underneath the cylinder to meet the exhaust port. Here too, I suggest you drill the hole undersize to check where it breaks through in the exhaust port. If it is not quite where you expected it to be, you can move the hole over a little by starting with a slot drill equal in size to the next drill to be used. The hole is finally drilled tapping size for either 1/4in. BSP or 1/2in. x 32TPI. A final 1/2in. hole is drilled to connect the hole just drilled either with the oval flange at the chimney end of the cylinder for direct discharge into the chimney base, or at the crankshaft end if a feed water heater is to be fitted.



© Fig 1 - Template for drilling fixings

Drilling the holes for the saddle studs

A template is required to drill the holes in the saddle for the studs and nuts that will hold the cylinder to the barrel. This will confirm the angle needed to get the drilling radial to the curved underside of the saddle. A template is shown leaning against the vice in **photo 9** and drawn out in **fig 1**.

Jonathan drilled the saddle holes on his 1in. scale cylinder by re-mounting the cylinder on the mandrel we saw a few weeks ago to machine the saddle itself. The dividing head was mounted along the axis of the table and the drill was set above the axis of the dividing head. Provided the cross-slide was left undisturbed, all the holes drilled have no choice but to be radial. Note that the cylinder is held by two methods, the small clamps on the mandrel and a modified toolmaker's clamp. This allows one of the clamps to be removed if it fouls a drilling position, while the cylinder is still safely secured by the others.

This set-up was then adapted to drill the holes in the boiler barrel, a special steady having been made to support the boiler. A long series drill was used to reach past the cylinder, care being taken to grip the boiler just tightly enough to hold it without causing distortion.

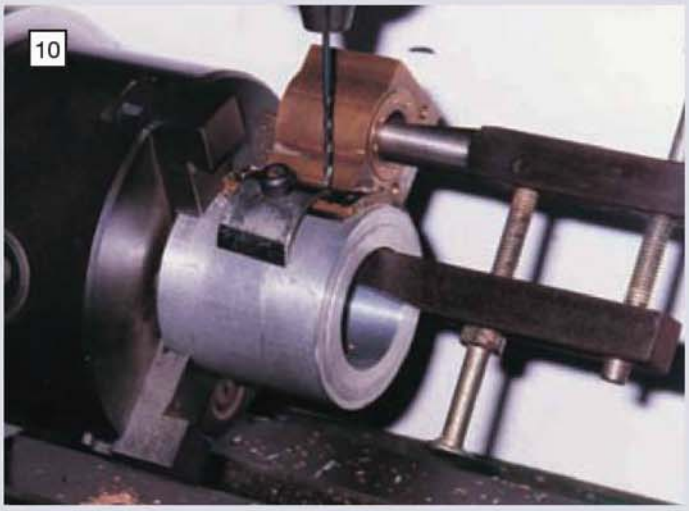
Lots of holes

A great number of tapped holes, some four dozen in all, are needed for the studs that secure the two cylinder covers, the cylinder top, the valve chest cover and the exhaust flange. These are best jig drilled from the covers themselves. The different covers are straightforward machining exercises which I am sure require no explanation from me.

Two more holes are required for the cylinder drains, the first drilled and tapped to suit the drain cocks, and a smaller drilling then extends further into the block to communicate with the bottom of the cylinder bore where the condensate is collected. ▶

This particular view reveals the quality of the honed cylinder bore and the two recesses for the steam ways with the cover stud hole between. (Photo: S. Nipper)

Stan's set-up for drilling the stud holes in the underside of the saddle involves the use of an adjustable angle vice. Note the drilling template resting against the vice. (Photo: S. Nipper)



Jonathan mounted his 1in. scale cylinder on a substantial aluminium alloy mandrel to drill the saddle holes. Note the clamps in use. (Photo: J. Milne-Fowler)

The holes were spotted through to the boiler with the aid of a specially constructed steady. A long series drill was used but an extended drill would have served this purpose as well. (Photo: J. Milne-Fowler)

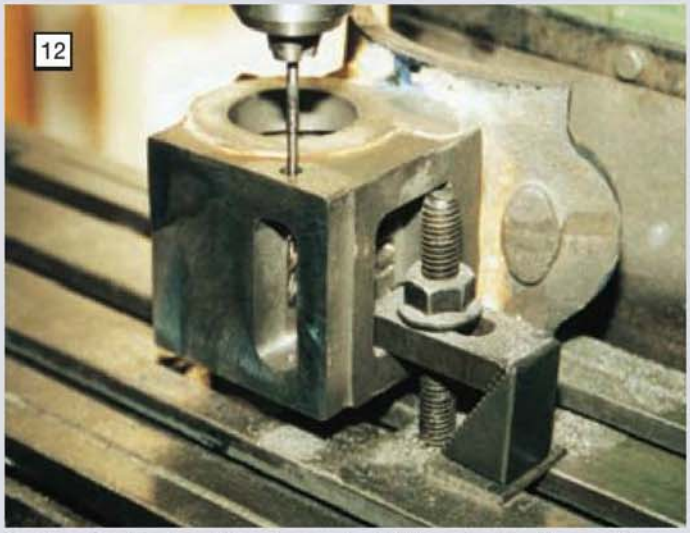
Regulator and valve spindle glands

The holes for the regulator rod and glands may be drilled at this stage. Two drillings are needed for the regulator, one at the front and one at the back of the regulator chest. They could be independently marked out and drilled from each end but I would much prefer to start at one end and continue onwards with a long series drill.

Start at the crankshaft end of the block and, using a centre drill, pick up the dot punch mark and start the hole. For the 3in. scale engine, use a 1/8in. drill to complete the first part of the hole, then exchange it for a long series 1/8in. drill and drill through other end of the regulator chest. Guided by the previously drilled 1/8in. hole and starting on a machined face, the drill should start well enough. The first portion of the hole may then be opened out to 0.156in. and counterbored to 0.281in. for the gland. The cylinder will then need to be turned over for the gland counterbore at the other end.

I realise that some builders will choose to fit an O-ring rather than graphited packing, but that is up to individual constructors to choose. Jonathan felt, quite correctly in my view, that in 1in. scale such a tiny regulator valve at the bottom of such a narrow chest was certainly not his idea of fun, and opted for a small piston valve in a hole lapped to provide a steam tight sliding fit. The overall height of the 1in. scale cylinder had to be raised by an overscale 40 thou. in order to fit the revised regulator.

I would not drill the valve rod hole at this stage but would wait until the trunk guide has been finish machined and the guide for the valve rod fitted. The trunk guide assembly may then be fitted to the cylinder and a piece of silver-steel, turned to a point, then slipped into the guide so the exact position for the valve rod may be established on the cylinder. Any small discrepancy that might have crept in will then be accounted for and perfect alignment is assured.

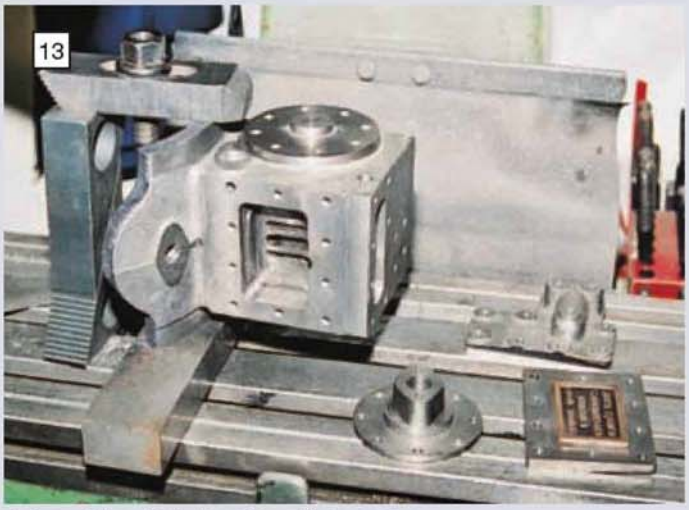


Another situation for which a long series drill is required is when spotting the regulator rod hole from one side of the cylinder to the other. The drill should pick up cleanly on the machined surface of the valve cavity.

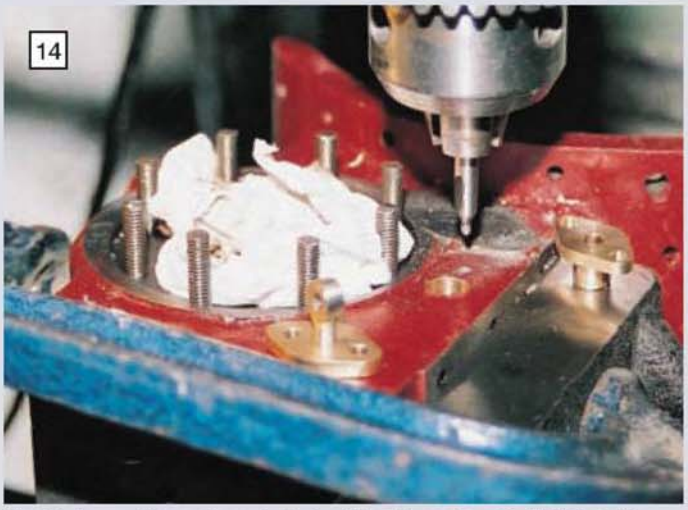
Supplier

A *Little Samson* catalogue listing drawings, copies of works drawings, materials and castings in 3in. and 4in. scale is available for £2.50 post paid (UK) from ***Little Samson* Models, 38 Wheatsheaf Way, Linton, Cambridge CB1 6XD.** Visit **http://homepages.tesco.net/~little.samson**

●*To be continued.*



A view of the cylinder together with the covers. (Photos 12 -14: S. Nipper)



The final operation on the cylinder is drilling the valve spindle hole by jig drilling from the valve rod guide after the trunk guide has been assembled.

BRAY'S BENCH

Stan Bray

completes his decorative model with its variety of uses in the home, office or workshop.

●*Part II continued from page 499*

M.E. 4172, 28 June 2002

Made with care and presented as a token of affection ... or retained for use as a pen holder for the office desk.

MONTY THE MORTAR

Having dealt with the barrel and frames for this little bit of fun while taking a break between more serious workshop projects, we can now complete its construction with the remaining components, starting with the spacers and pivot.

Spacers and pivot

The spacers and pivot can be made of any metal you happen to have to hand; some builders may prefer to use brass, while others who prefer to do things the hard way could use stainless steel.

The pivot is easy to make because all that is necessary is to part off a piece of metal to length. If you prefer, it could be parted off over long and faced down to size.

The four spacers are simple turning exercises and are essentially the same, except that that bottom two are tapped 6BA at the ends.

The lower spacers are held in place with the carrying bars and although those shown were made individually, using a file and filing rest, it would be better to make a proper form tool and thus ensure that all are identical.

Clamp bars

Two clamping bars were made from a length of 1/2in. dia. brass rod drilled 5/16in. in the lathe and machined to an outside diameter of 7/16 inch. This was cut in half and also cut lengthways to size, before silver-soldering to 1/4 x 1/16in. brass strip. The drawings show two round holes for fixing, but on the actual model these were filed to 1/8in. square and the clamping bars dropped over the wedge blocks that were screwed in position.

Anyone preferring to take the easy option can simply bolt the clamping bars in place and forget the wedge blocks altogether.

For the benefit of those wanting to wedge the bars on, which is the way the prototype worked, the wedge blocks were made from a length of 1/8in. square brass. This was threaded and then a 1/16in. slot milled in it. The ends of the blocks were fluxed and set upside down on a sheet of thin brass which had been previously tinned. The whole assembly was gently heated until the solder ran (**photo 5**) and then each block was cleaned up individually.

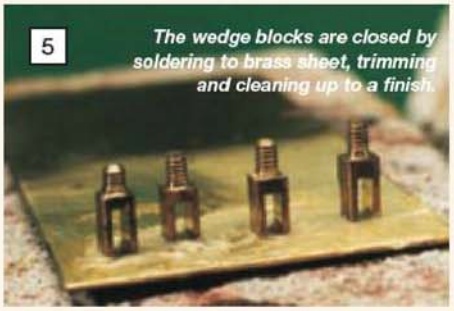
The wedges were drilled and filed from brass strip and when pushed home, hold the barrel quite securely in position while allowing it to pivot if required. The wedges should be provided with a slow taper of about 3deg. included angle so that they lock in position.

Barrel support plate

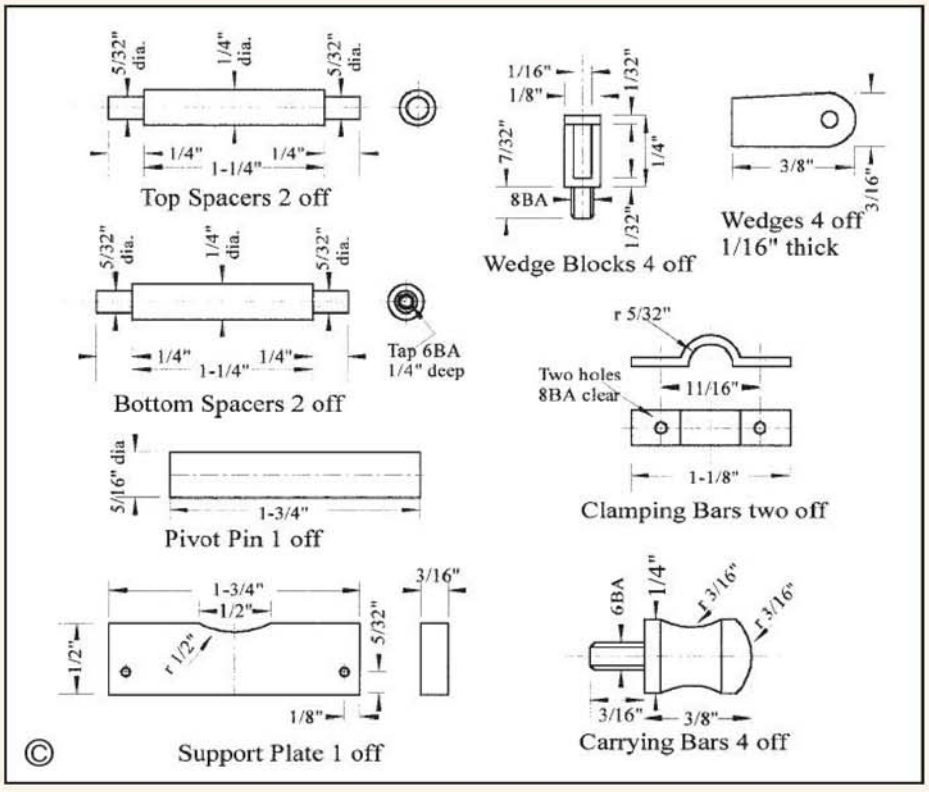
Only one part remains to be made, and that is the barrel support plate. A small recess is milled or filed in it, into which the barrel can rest, and two 1/16in. dia. holes are drilled as shown. These are transferred to the end of the frame and lengths of 1/16in. dia. rod pushed through to hold the plate in position. After final assembly they can be secured with a retaining compound if desired, but if they are a good fit this shouldn't be necessary.

Finishing

To polish the model, the time honoured method would be to use a polishing mop. It is not something that everyone will have in the workshop. A very good substitute is to use Scotchbrite hand pads that can be bought from DIY stores in various grades distinguished by their colours. Brown is the most abrasive and white the least. For the purpose of obtaining a final high quality finish, the grey pads are possibly the best, with brown being used for the removal of deeper scratches. It is doubtful if the finish of the model can be improved after it has been worked over with the finer grade but, even so, some people might feel inclined to use metal polish to finish off.



Well that is it. A real 'quickie' that, as it happens, is also an attractive model which can be useful if you wish.



KEITH'S COLUMN

SAINT CHRISTOPHER
A GWR LOCOMOTIVE for 7 1/4in. gauge

Keith Wilson
notes that the topic of making and fitting boiler cladding has not been much aired in these pages, and sets out to advise builders accordingly.

●*Part XXVIII continued from page 518 (M.E. 4172, 28 June 2002)*

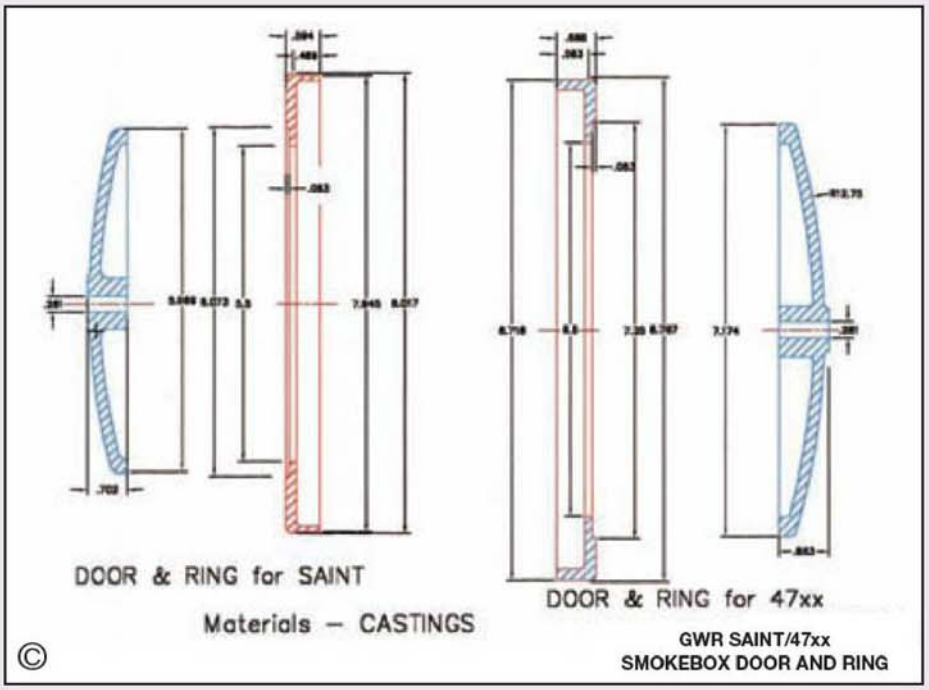
Detailed drawings of the cladding/cleating/cleading plates aren't much use, for being 90% curves there is nowhere to measure to or from; cladding has to be made and fitted to an individual boiler. However, a reasonable scale drawing of the plan view is useful as a guide.

Some formed plates are needed, one pair for the throatplate and one pair for the backhead. These should be about 1/2in. larger all round than the main boiler former plates. I allow 1/4in. for lagging plus plates, if these plates be of 18swg. then all is well. In case you think you have caught me out here, recollect that the boiler plates are 5/32in. thick, hence there is some 5/16in. to look out for.

The plates need to be in pairs or halves, else you won't get the assemblies on or off. To get the formers done, I have found it simplest to get one plate flame-cut. If this plate is about 1in. thick and cut un-symmetrically so that one side suits the backhead and t'other suits the throatplate then, if both edges are rounded off all round (except at the bottom) this one plate will do for all the cladding formers. Don't make these exactly to size yet but leave about 1/2in. overlap to make things easier later.

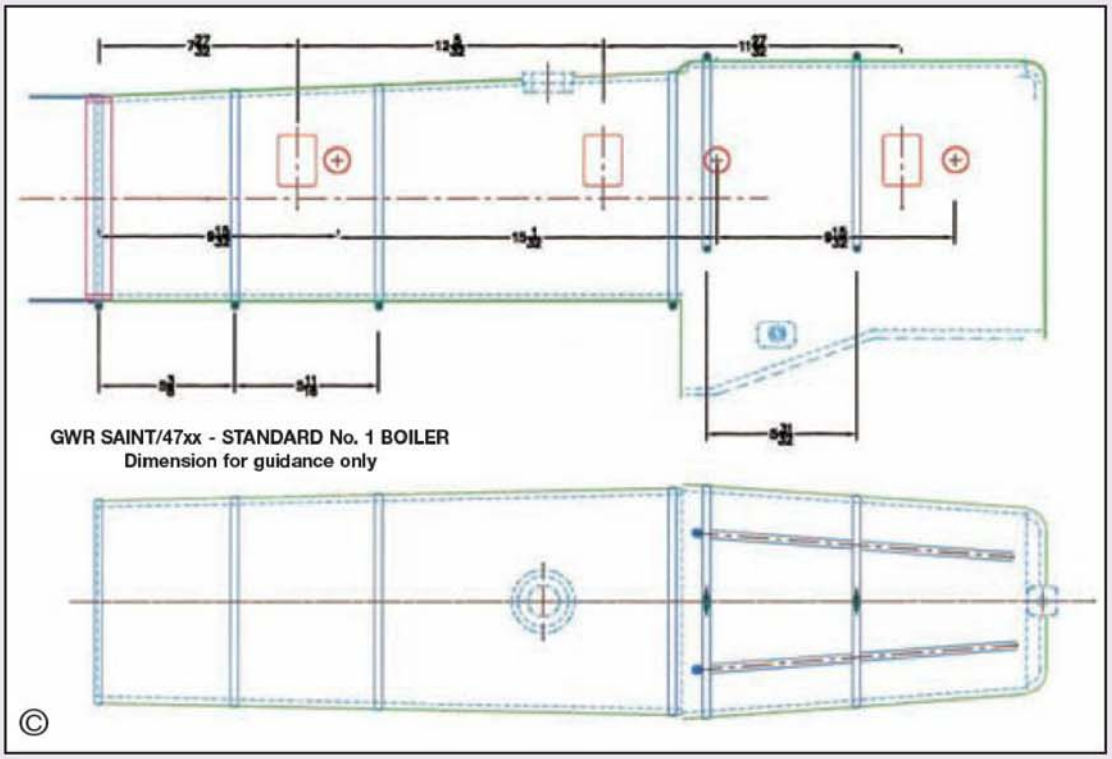
The throatplate bits are attached to the barrel by means of a strip of 3/8 x 3/16in. brass rolled to suit the barrel at that point. This is silver-brazed to the throatplate half and then, during assembly of the firebox cladding, the two throatplate sections are fixed to the barrel by a cladding band. Later, the cladding itself will hold it in place.

Above: the cladding is an assembly of many separate pieces. Below: assembly is facilitated by the use of a 'gantry'. Right: interlocking lugs retain the backhead cladding.



The backhead portions of the cladding must be matched to the bushes on the backhead (as if that wasn't obvious) and are finally held in place by the four studs for the firedoor assembly. It is not obvious how the two portions of this backhead section are kept in close alignment, but a glance at the 'inside' photograph doth reveal all: the lugs are permanently attached alternately to each part, the result being an interlocking system that keeps the edges right.

You will see that the firebox cladding, which should be done first, is in three parts — two sides and a central top portion. My photograph shews extremely rare top view of a 47xx, demonstrating this. The two side parts are tricky to make as they usually refuse to stay bent, annealed or not, and teaching them manners is a right old job. I made up a sort of double signal gantry which mounts on a big assembly resembling the frames. The boiler sits in this and is levelled up to be in the right position relative to the frames. The gantries bolt onto this jig, one each end of the firebox, and once the end plate parts of the cladding are attached to the boiler, some adjusting screws force the approximately-bent cladding plates into position. A few seconds work with the torch and some silver-braze will then persuade



them to stay put. It may be unconventional, but the deuce with that, it works! Note that there is a sort of inner frame of 3/16 x 3/8in. brass bar to support the top portion.

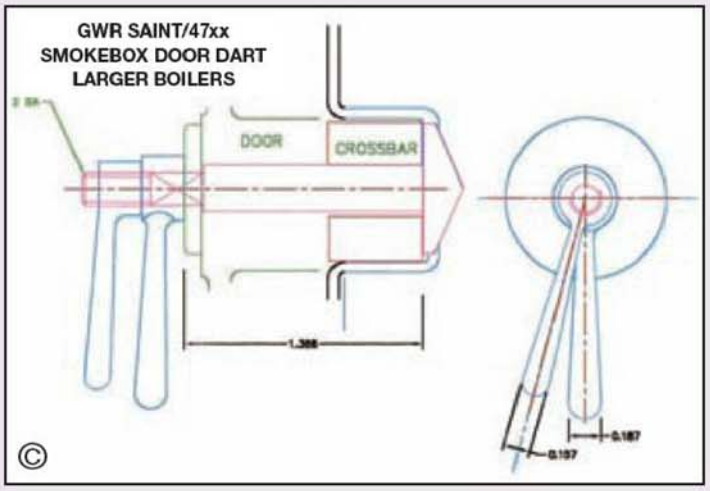
The use of brass for the cladding system may well be questioned, but it's better in the long run. For steel in this position, rust rears its head, even through paintwork underneath, for hereabouts things are quite moist. One might think that the heat would cause the place to dry out, but it doesn't seem to. It is a bit of a puzzle in this respect that rust does not seem to affect safety-valve springs in the same way, why this should be so I know not.

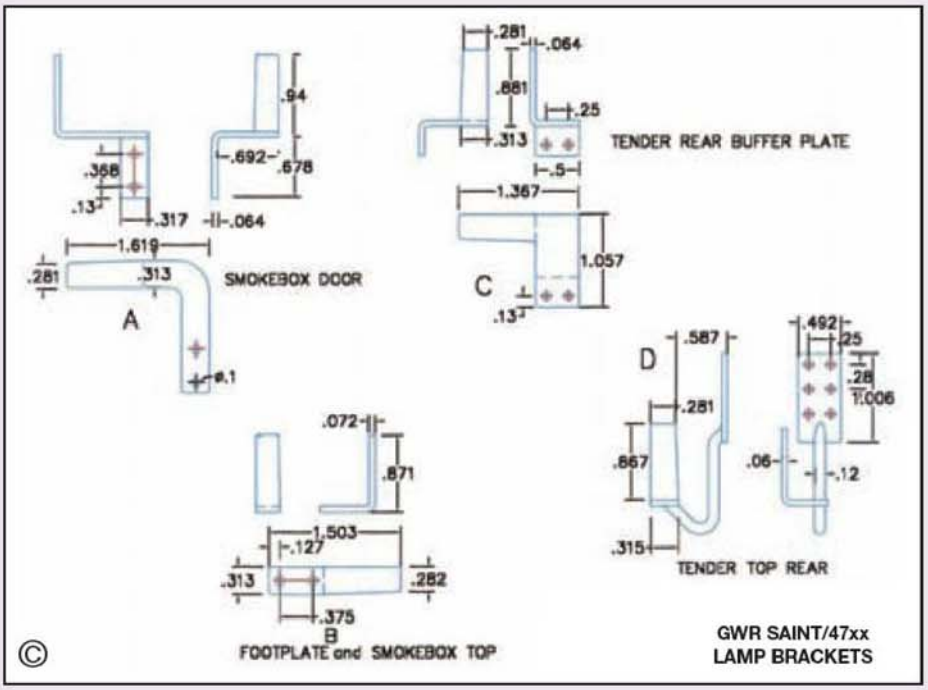
The shape of the top portion on the firebox is called, if my memory is right, a regular (hemi-symmetrical?) trapezoid (not that the name matters!) but its location and fixing are tricky. It took me such a long time to find out what was the Swindon way, for you won't find it on any drawing that I know of, bar one, and that is extremely rare. I eventually got the information by taking a picture of the top of *Caerphilly Castle* when it was in the London Science Museum, by leaning over one of the gallery walls. It was during this visit, which I had arranged in advance, that I noticed one of the staff pointedly hanging round keeping a watchful eye on what I was up to. It wasn't until he fetched a big step-ladder for me that I learned he was there to shoo other people away!

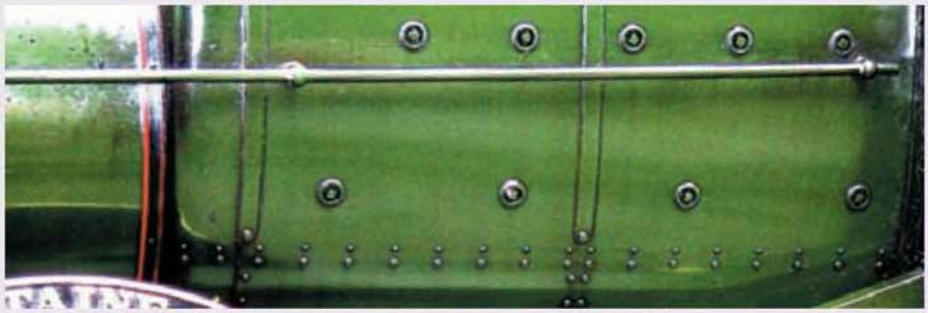
Later, the boss of the transport section appeared and we had quite a chat, with me sitting on the top of *Locomotion No.1's* tender with me in stockinged feet only, I hasten to add, for no way would I have defiled such an exhibit with shoes on. He could not be seen from very far away, and I was eventually spotted by a fairly distant attendant up on a balcony. *"Warreryoudoinupthere!"* came a fairly indignant but understandable shout. *"Talking to Mr X"* I replied, pointing down at him. *"Beg pardon zurr!"* was the further shout. Understandably!

As a matter of fact, if you visit this museum (and probably all the other 'public' ones) and make yourself known, preferably in advance, shew that you are a: responsible and b: genuinely interested, then you can have virtually complete access to any exhibit. But avoid school holidays, of course!

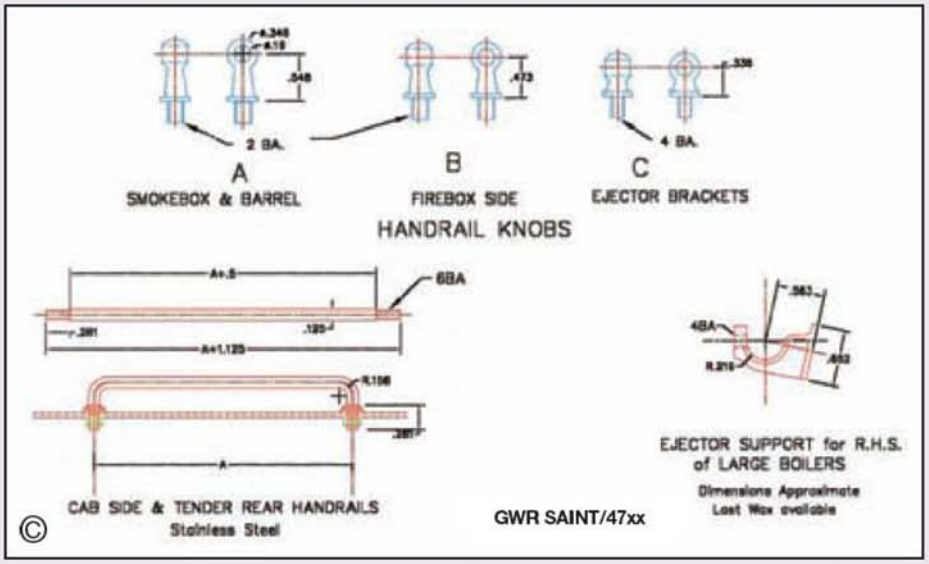
This happened in the early 1970s; in the early '80s I had similar access to *Mallard* in the York Railway Museum. I took about 300 pictures, for it was Laurie Lawrence's idea that a series on a 5in. A4 would be a good idea. However, someone else (Don Young) produced a very similar design, so we dropped the idea. Laurie then thought up an ''orrible think', result *Ariel*, the Merchant Navy design. To this day I am not sure whether I won or lost on the deal; perhaps I was too dumb to realise the difficulties! ▶







Careful attention to detail greatly improves the appearance of a fine model.



The cladding ties (lagging bands) are formed from 5/16 x 20g. brass strip. Strictly speaking, for a tender engine the joints in these strips should be beneath the barrel but on top of the firebox, for tank engines they should be on the top of the barrel. Some 7BA brass nuts and a piece of brass studding hold the joint closed. The originals had pieces of steel angle welded to the bands at the joint, with the long bolt/studding through these, sometimes very long at 12in. or so, but it's not that hard for us to bend up the ends of the band and use that. However, to improve their appearance, small brass angles should be used for the two pairs over the firebox.

I have given roughly dimensioned locations for these bands as a guide only. They were scaled from the Saint drawings, so will be about right. The No. 7 boiler (47xx) is the same length (or just about) so band spacing will be the same. However, the drawings shew another cladding band behind the safety valve, so that the valve is about midway between the two, the safety valve being further forward, however (to gain a bit of height clearance), this matches out nicely.

I have indicated the horizontal locations of the left-hand handrail supports for Saints, but the 47 boiler is a bit different. Although the kettles are about the same length, the 47 smokebox is far longer, and the handrail supports are differently spaced; likewise the ejector brackets. So, for 47, reading from left to right, the brackets are at 2, 12 1/4, 22 5/8, 32 3/4in. from the front edge of the barrel, while the handrail supports are at 12 1/4, 25 11/16, 35 5/8in. from the same datum.

However, vertical positions must be considered. Due to the fact that these are above the boiler centre-line, it follows that the long ones used on the smokebox and forward position are at an angle, so the actual holes for these supports will be lower for these holes. I have allowed for this angularity in the smokebox developments shewn in the last episode. This doesn't apply so much to the rearmost supports, for a: they are much shorter and b: they are much less steeply inclined.

The Saint handrails are 12in. above centre-line, scaling to 1.53in., but the larger boiler of the 47 gives only 6in. scaling to 0.769in. It is a good idea to note the approximate positions on the inside of the cladding and to soft-solder some pads at these positions. Pads are shewn in red, rectangular for the right-hand side (ejector brackets) and round for handrail supports; 1/8in. thick will do nicely, say 2 x 1in. for rectangular and 1 1/2in. dia. for the round — only a suggestion.

The joint between the smokebox and the barrel is tricky, for not only has the joint to be firm but also air-tight. In full-size, the box was riveted to the boiler but we can't really do this, for though 'tis a dark and murky job to work inside a full-size smokebox, it is certain that we cannot get into our own smokeboxes. So the double row of rivets at the rear end of the box are used to hold a rolled-up strip of brass that sticks out behind the actual box. This should be a good fit on the boiler, and if desired four bolts can be used to fix it. Horrors! A bolt into the barrel? The bolt is actually a countersunk set-screw, sunk into the rolled-up strip with a brass nut on the inside. It is clearly hidden by the cladding when this is complete. If these be roughly at 45deg. to the axis of the boiler (this will be clearer when you come to do it) all will be well, and the joint is made dead air-tight by the use of car exhaust/silencer repair goo: 'Gun Gum'. This can be applied both inside and outside the joint, and when it dries will caulk up the joint well.

The strips along the top of the firebox are bolted down at intervals. However, at about 1/32in. diameter, scale bolts would be confoundedly small. Taps of this size are rather on the costly side, and how!, and bolts aren't cheap. However, 8BA roundhead brass screws look quite well when painted. You'll discover, unlikely as it may seem, that this built-up system of cladding plates is not as awkward as it may at first beseem; the individual parts are not far off rectangular which makes cutting them a lot easier.

The cladding round the barrel is fairly rectangular too. In our sizes, it is a good idea to leave a fairly wide gap at the bottom of the barrel for the purpose of inspecting the joint. About 1 1/2in. is okay, and there is an overlap on the top of the barrel. If one of the two halves overlaps the other by about 3/8in. it is easy to support and locate it with two or three roundhead rivets, soft-soldered into the upper plate and resting in clearance holes in the lower one. This immensely aids assembly, I assure you that on-and-off with these plates is very much the order of the day, the final 'on' being after painting.

Lagging

It is a moot point as to just how valuable lagging is for our sizes. In full-size, lagging was often about 4in. thick, an exception being the 47xx where the Swindon drawing scales to about 2 1/2 inch. Now, for a given rate of heat conductivity, the effectiveness of the lagging depends on the thickness thereof and the two temperatures involved. Temperatures, or at least the 'inside' temperature, are related to the pressure in the boiler, so are not scaled in a linear sense. However, lagging thickness is scaled to some extent, (I allow for 1/4in. on my boilers) and the overall thermal efficiency of the lagging is therefore much less for us. The situation obviously gets worse as the scale of the locomotive reduces.

So, to get the same insulation effect, the only variable is the thermal conductivity. I have very little information on such matters, but clearly the matter of costs must arise. For example, those really rich enough might go in for the ceramic insulation tiles as used on space vehicles, but although these would undoubtedly save much heat the actual advantage might well be minimal. A good insulator is the cardboard from breakfast cereal packets. I have not tried it myself but articles in 'ours' have recommended it. It is certainly cheap enough and fairly easy to apply, several thicknesses being the order of the day.

An old blanket will work well, and I suppose large amounts of Gun Gum might well be applied, a bit messy perchance but worth a trial. Finishing of the neat curves on the cladding at the front of the firebox may be assisted by the use of Isopon or similar car repair plastic. It works.

I cannot recall off-hand any great description(s) of the actual making and fitting of cladding appearing before, so I can only hope that I have not got too far out. It seems to be a matter for which only general guidance can be given. The accompanying pictures are the best that I have at time of writing.

● *To be continued.*

CLUB CHAT
With Stan Bray

Bob Symes enjoys a drive at the Grand Opening of the brand new Woking Miniature Railway track on 25 May 2002.

UK News

Negotiations have been completed for the renewal of the **Peterborough SME** lease on their site at the Sue Ryder Home in the city. Despite every effort being made to secure a longer tenure, unfortunately the new lease only guarantees another two years of occupation. This has nothing to do with the management of the home at Peterborough but is a situation which applies to all the properties owned by the Sue Ryder charity. Although only a short lease is permitted, there is every reason to believe that the society will have security of tenure for many years to come. A recent visitor to the track was a member of the **Atlantic MES** in Nova Scotia who was on a visit to the city; it has been agreed that the two societies will exchange news letters in the future.

Members of **Taunton ME** have now finalised the arrangements for their exhibition to be called the *Model Engineering 'Models in Motion' Exhibition* and to be held at Heathfield Community School, Monkton Heathfield, Taunton, Somerset on 14/15 September when it will be open on both days from 10am to 5pm. We are promised a full range of items to interest the model engineer, no matter what his or her preferences might be, and to augment an ample supply of refreshments, there will also be a number of trade stands. Further information is available on the club web site at **www.tauntonme.org.uk** or from Mr. G. Willis on 01823-698765 or 0771-205609.

Car parking is becoming a problem for members of **Erewash Valley MES**, particularly on open days and when other societies are invited to visit. Attempts to purchase adjacent land have so far proved fruitless. The situation worsens as progress is made on the ground level track. The construction of a cutting for this track proved to be a mammoth task but is now nearly complete. It may eventually be necessary to organise vehicle parking inside the track, although this is considered to be an unsatisfactory solution.

The name Stirling is associated with many aspects of model engineering; there are models of Stirling locomotives, particularly the well known singles, and of course there is considerable interest in Stirling cycle hot air engines. At **Guildford MES** yet another interest is embraced by the famous name. The club has just donated a pallet truck, for which they had no practical use to the **Stirling Project Group.** Older readers will be familiar with the Stirling bombers, which operated during World War II. In all, 2400 were built, to be scrapped at the end of the war together with the drawings from which they were made. They were, of course, only part of enormous numbers of aircraft and other equipment destroyed with the cessation of hostilities. Many British and American aircraft were simply taken out to sea and dumped in deep water channels. Members of the Stirling Project Group are building a replica Stirling bomber from scratch. The Chairman of the group is Brian Harris DFC, a member of the model engineering society; as it happens, he will also be talking to the society about the aircraft at the beginning of October. Anyone who would like further information about the group, which is a charitable trust, or perhaps would like to offer assistance, should contact Project Manager, Guiseppi Lombardy at 9 Taylors Lane, Swavesey, Cambridgeshire CB4 5ON. In the meantime good old steam is not forgotten and their own locomotive efficiency trial (GIMLEC) is planned for 15 September.

The popularity of the annual **Fylde SME** exhibition continues to increase and this year the event, which was held at the Marine Hall, was so good that other exhibiting societies and traders are already seeking to be included next year. A couple of members who had moved from the district some years ago, took the opportunity to pay a visit and both were invited to join the club coach trip to the exhibition at Harrogate. Neither knew the other had gone to the Marine Hall and the surprise of both can be imagined when they were reunited on the coach. Members of the club have been invited to visit the premises of the **Northern Mill Engine Society**, an invitation which will no doubt be eagerly accepted by any that have an interest in stationary engines. Some years back, the society donated the proceeds of a public running day to the Northern Mill Engine Society which at that stage had just been obliged to vacate their premises and were endeavouring to make a new start. Cash was tight and the donation was doubtless very welcome.

West Riding SLS is still waiting to hear the result of a bid for a lottery grant towards the cost of building new passenger vehicles, but it is expected to be late in the year, or even early next year before the result is available. A few societies have been successful in their bids for grants, so there is a chance of success. The whole business does however seem to depend on how well the case can be explained rather than how much the cash is needed. At the AGM, the society's Treasurer reported a slight decrease in membership; a situation which appears to be against the national trend which seems to indicate that club membership is generally on the increase. The annual awards were made during the meeting, with David Wilson receiving the *Morley Head Trophy* for his continuing services as treasurer and John Drewell the *Running Trophy*.

The local authority have now granted planning consent for members of **Norwich DSME** to build a new place for the storage of heavy equipment required for the operation of their ground level railway. A brick-built structure with cavity walls and pitched steel roof, it will include a sandwich of insulation material. The doors through which rolling stock will be taken will be in the form of steel roller shutters, and the main entrance will be a heavy door with high security locks, all of which, it is hoped, will make it burglar and vandal proof. No doubt it will not be long before the local ne'er-do-wells test it out. It is intended to bring society equipment, at present stored at a number of locations, into the one building, thereby making it all much more readily available. Immediately above the storage area will be a floor which converts the upper part into a small meeting room in which those not attracted by the operation of a miniature railway can while away their time in good company, discussing other aspects of the hobby.

With visitors from a number of local societies in attendance, **Bradford MES** reports a successful open day on 23 June. All who wished to do so had an opportunity to spend plenty of time on one or other of their tracks and to get to know the society which we are told claims to serve the best pie and peas in the country. Unfortunately, the event clashed with a boating regatta at Keighley to which the stalwarts of the boating section were already committed. The problem was resolved by these members dashing to Keighley in the morning to take part in the regatta and returning in the afternoon in time to mount a superb display for their own society. It has been a busy time all round for the boaters who, a few weeks previously, had travelled to an event organised by the **York Model Boat Club** where, in addition to using the boats on the pond, they also presented a static display.

As a change from the more usual type of programme arranged at the monthly meetings, **Wigan DMES** devoted their May event to a discussion by members of the various methods they used for dividing. The meeting was originally to have been addressed by Norman Lowe on the subject; on the announcement of his untimely death members decided to proceed, but instead of a talk it became a general discussion. In the event the evening was both interesting and enlightening, with a very wide range of devices both on show and being explained.

Signalling has been occupying the attention of the **Wortley Top Forge Model Engineers** and, as a result of the efforts of member Chris Farrar, the track now has a magnificent system of semaphores. These will be in full operation during the open day to be held on 8 September, an event that will include a barbecue. The latest issue of the club magazine *Absolute Block* contains a potted history of the forge itself, a heritage site, revealing that there is documentary evidence that can date it back to 1621, although it is known that it was in existence long before that. Most of the original buildings, as well as some of the original machinery remain, and guided tours are arranged on a regular basis. ▶

Members of the model engineering society can join in these without charge. Visitors to the open day who might wish to see the whole of the site will have to pay a small fee.

In early June Christopher Awdry, President of the **Tallyllyn RPS**, opened a children's playground at Abergynolwyn Station on land purchased two years ago from Snowdonia National Park. The playground has a railway theme with a wooden track made of miniature railway sleepers, with signals and level crossing gates plus a timber built station. The area also includes picnic facilities so that families can use it as a rest area while the children let off steam. The largest project recently undertaken must be the redevelopment of the Wharf Station area, work which included the rebuilding of the station building, happily in such a way that it is still recognisable as the original.

World News

New Zealand

Members of **Hutt Valley MES** enjoyed an interesting evening when David Grant-Taylor gave a talk on the extraction of geothermal energy and explained the advantages of its use as well as the risks that might be involved. Although an expert on geothermal energy, David is far better known to members as the person who organises the weeding and general tidying up of the club grounds, using human energy alone. Having been inadvertently left out when everyone went home, the bell at the club railway's beach station was stolen some time ago; it has now been replaced with one specially cast for the club.

A couple of changes to the membership of the **Maidstone MES** committee were approved at the AGM. Alan Kemp stepped down from the post of President to be replaced by George Harvey, and Brian Shears was replaced as Treasurer by Barry O'Callaghan. In recognition of his long service to the club and his vision and drive towards the construction of the ground level track, Barry was made an honorary life member. It has been a busy period for members who have been laying a concrete area to be used for barbecues, the local Round Table Group generously chipped in to cover the cost while the club supplied the labour for a project aimed at increasing social activity among members and their families.

Left to Right: Jim Vass, Dick Billington, Ron Stanbridge and Ken Cottle certainly have something to be pleased about - the Grand Opening of their Fancott Miniature Railway on 25 June 2002.

Australia

A considerable number of visitors attended the Kindred Society weekend of the **Steam Locomotive Society of Victoria** with 82 people signing the visitors book and 21 locomotives in operation on the track at various times during Saturday. On Sunday, a bad weather forecast appeared to put would-be visitors off with just 26 arriving. When the large distances that many visitors had to travel are considered, this is hardly surprising. It is particularly pleasing to report that an all-out effort by a section of the membership had enabled a dual gauge garden gauge railway layout to be completed. This proved to be a popular additional attraction with 15 visiting models operating on it at various times. There was also a small exhibition of models and other model engineering artefacts, and a number of stationary engines operating on steam provided by a vertical boiler. Just to make sure that no-one went hungry, there was a barbecue

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.

JULY

To 3 September STEAM – Museum of the Great Western Railway. *All Aboard the Holiday Express.* **Information: 01793-466646.**

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

27 **Erewash Valley MES.** *10th Anniversary Day.* Contact Jim Matthews: 01332-705259.

27 **Hornsby ME.** *Family Day.* Contact Ted Gray: 9484-7583.

27 **Leyland SME.** *LEYLEC.* Contact Alan Wilson: 01942-715072.

27 **STEAM – Museum of the Great Western Railway.** *Meet the Railway Workers.* Information: 01793-466646.

27/28 **Luscombe Valley Railway.** *Grand Charity Weekend.* Contact Richard Knott: 01202-709833.

27/28 **Oxford (City of) SME.** *Dreaming Spires Rally.* Contact Chris Kelland: 01235-770836.

27/28 **Guild of Model Wheelwrights** at Wroughton Nostalgia Show, Wroughton Airfield, Swindon. Contact Biddy Hepper: 01492-623274.

28 **Aldergrove Model Engineers.** *Summer Meet.* Contact Alex & Bram DeRuiter (604) 856-9420.

28 **Chichester DSME.** *Steam on Sunday.* Contact Brian Bird: 01243-542266.

28 **Colchester SMEE.** *Visit to Chelmsford Society.* Contact L. G. Hammond: 01376-511686.

28 **Elmdon MES.** *Running* at Museum of Transport, Wythall. Contact Chris Giles: 0121-458-1291.

28 **G. W. Soc.** (Didcot Rly. Centre). *Steamday.* Contact Jeanette Howse: 01235-817200.

28 **MELSA.** *Sunday in the Park.* Contact Graham Chadbone: 07-4121-4341.

28 **Plymouth MSLS.** *Running Day at Plym Valley Railway.* Contact John Brooker: 01752-671722.

28 **Ryedale SME.** *Passenger Day.* Contact Michael Burch: 01439-788033.

28 **Surrey SME.** *Members' Steam-Up.* Contact John Cook: 020-8397-3932.

28 **Sutton MEC.** *Barbecue & Family Day.* Contact Mike Dean: 0208-657-5401.

28 **Wigan DMES.** *Open Day.* Contact John Chamberlain: 01744-882255.

28 **Woking MRS.** *Open Day.* Contact Ronald Dewar: 01932-343331.

28-3 August Talyllyn Railway. *Victorian Week.* Enquiries: 01654-710472.

29 **Canterbury DMES.** *Meeting.* Contact Granville Askham: 01227-463295.

30 **Chelmsford SME.** *Brian Bourn: Ramblings of an Old Traction Engine Driver.* Contact D. Blake: 01376-324205.

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

30 **Wigan DMES.** *John Gore: Building a Robot for Techno Games.* Contact John Chamberlain: 01744-882255.

31 **G. W. Soc.** (Didcot Rly. Centre). *Steam & Railcar Day.* Contact Jeanette Howse: 01235-817200.

31 **Nottingham SMEE.** *Lark in the Park.* Contact Gerry Chester: 0115-9259096.

AUGUST

1 **Leyland SME.** *Paul Pavier: Silk Screen Printing.* Contact Alan Wilson: 01942-715072.

1 **South Lakeland MES.** *Meeting.* Contact Adrian Dixon: 01229-869915.

1 **Sutton MEC.** *Bits & Pieces.* Contact Mike Dean: 0208-657-5401.

2 **Vale of Aylesbury MES.** *Track Night.* Contact Clive Ellam: 01296-623433.

2 **Lincoln DMES.** *Meeting.* Contact Paul Thompson: 01522-888228.

2 **Maidstone MES.** *Evening Run & Barbecue.* Contact Martin Parham: 01622-630298.

2 **Portsmouth MES.** *Family Fun Night.* Contact Bob Aldred: 023-92-523366.

2 **Rochdale SMEE.** *Meeting.* Contact Mike Foster: 01706-360849.

2 **Romford MEC.** *Competition Night.* Contact Colin Hunt: 01708-709302.

3 **Amnerfield Miniature Railway.** *Diesel & Electric Open Day.* Contact David Jerome: 0118-9700274.

3 **Gas Turbine Builders' Ass'n.** *Fly In* at Church Fenton, Yorkshire. Contact: Tom Wilkinson: 01508-570977.

3 **G. W. Soc.** (Didcot Rly. Centre). *Steamday.* Contact Jeanette Howse: 01235-817200.

3 **West Wiltshire SME.** *Steam-Up at the Great Bulkington Railway.* Contact R. Nev. Boulton: 01380-828101.

3 **York City & DSME.** *Summer Meeting.* Contact Ken Bateman: 01904-421445.

4 **Ascot LS.** *10th Anniversary Celebration Steam-Up.* Contact Tony Alderman: 01932-854393.

4 **Gas Turbine Builders' Ass'n.** *Fly In* at RAF Honington, Suffolk. Contact: Tom Wilkinson: 01508-570977.

4 **G. W. Soc.** (Didcot Rly. Centre). *Steam & Railcar Day.* Contact Jeanette Howse: 01235-817200.

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

4 **Hull DSME.** *Dove House Running Day.* Contact Brian Rylance: 01482-647032.

4 **Lincoln DMES.** *Running Day.* Contact Paul Thompson: 01522-888228.

4 **Malden DSME.** *Open Day.* Contact John Mottram: 01483-473786.

4 **Melton Mowbray DMES.** *Track Running Day.* Contact Phil Tansley: 0116-2673646.

4 **Ottawa Valley Live Steamers.** *Steaming Day.* Contact John Bryant: 761-1109.

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

4 **Peterborough SME.** *Visit by Erewash Valley MES.* Contact Tony Meek: 01778-345142.

4 **Reading SME.** *Running.* Contact Graham Bustin: 01189-615450.

4 **Rugby MES.** *Members' Running Day.* Contact David Eadon: 01788-576956.

4 **South Durham SME.** *Running Day.* Contact B. Owens: 01325-721503.

4 **Surrey SME.** *Maxitrak Owners Day.* Contact John Cook: 020-8397-3932.

4 **Sutton Coldfield MES.** *2½in. Gauge Rally.* Contact Roger Timings: 0121-308-5875.

4 **Guild of Model Wheelwrights** at Walsall Leather Museum, Walsall. Contact Biddy Hepper: 01492-623274.

and the ladies kept up a regular supply of refreshments. There is no doubt that the meeting is highly popular with members from other societies, and plans are already in hand for next year when the Kindred Society weekend may take a different form. A proposal under consideration is that the event is made a single day meeting with an extra evening barbecue and a night run replacing the second day. This may prove more convenient for visitors, while still allowing plenty of time for people to run on the tracks.

Following a mention in a local newspaper, **Hornsby MEC** had a considerable increase in the number of passengers on the following public running day. Fortunately, there was also a good turnout of members to help keep things moving, and the additional revenue raised was most welcome to meet the spiralling cost of maintaining the railway to the standard they require. This is reflected in the number of major tasks carried out recently, and facilitated by having a contractor build a new workshop, allowing many tasks to be completed in comparative comfort. One of the jobs being done in there is the construction of new 6m long track sections using a specially designed jig. It is interesting to note that the club is using plastic sleepers as mixed reports are arriving concerned with their suitability. It seems that some societies have been able to purchase plastic which is quite satisfactory, while in other cases there have been problems with instability and in one instance the sleepers even caught fire. Much obviously depends on the supplier of the material, and if the correct type is supplied the sleepers should be far superior to wooden ones.

The **Model Engineers and Live Steamers Ass'n. of Maryborough** AGM attracted a good turnout and it was reported that the past year had been an excellent one for the society. The meeting was chaired by Mel Neilson, conductor of the Maryborough Excelsior Band, and if this sounds a strange arrangement, it should be explained that the band and the model engineering society have very close associations, with the band playing in an adjacent bandstand during the public running sessions. The association between the two is reminiscent of the old days of engineering and mining in Britain when most major works had their own brass or silver band which was used on every possible occasion. During the AGM, Bob Lisle was presented with a gift by George Bishop who took over the position of President. Bob had decided it was time to stand down after 8 years as President following 8 years as Vice President. Members were able to enjoy a buffet dinner at the Royal Hotel on the evening following the meeting, this sounds to be an ideal way to complete a successful year.

The editor of *The Narrow Gauge*, newsletter of **Adelaide Miniature Steam Railway Society** has decided on a new format and, commencing with the most recent copy received, a model locomotive is to be featured together with a profile of its owner. The model chosen for the first issue is a Fyansford Garrett built by Keith Bradford in which he describes how he went to Victoria on five separate occasions to measure and photograph the original before making drawings, including detailed drawings of each individual part. Scaled to $1\frac{1}{2}$ in. to the foot, the finished model of the 4-8-4+4-8-4 is 6ft. 8in. long and absolutely lovely.

South Africa

Members of **Durban SME are** being asked to attend a special meeting to decide whether or not the society should acquire some adjoining land in order to expand the facilities. Expansion invariably involves additional hard work and it is essential that there is a commitment to carry out the work before finalising plans to obtain the land. The club premises have now been fitted with an alarm system in an attempt to curb the activities of burglars. Although the property stolen at the last breaking will be covered by insurance, the society has to pay a substantial amount towards the cost and if burglaries continue, it will only be a matter of time before premiums are increased out of all proportion.

In Memoriam

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

Frank Johnson	*Guildford MES*
Geoff Tomlinson	*West Riding SLS*

4 **Woking MRS.** *Open Day.* Contact Ronald Dewar: 01932-343331.
5 **Bedford MES.** *Traction Engine Drivers on the Locos.* Contact Ted Jolliffe: 01234-327791.
5 **Lancaster and Morecambe MES.** *Bring & Buy Sale.* Contact Harry Carr: 01524-411956.
5 **Peterborough SME.** *Bits & Pieces.* Contact Tony Meek: 01778-345142.
6 **Basingstoke DMES.** *Meeting.* Contact Ian Shanks: 01420-561741.
6 **Romney Marsh MES.** *Track Meeting.* Contact John Wimble: 01797-362295.
6 **South Durham SME.** *Meeting.* Contact B. Owens: 01325-721503.
6 **Stamford MES.** *Discussion & Quiz.* Contact David Ash: 01780-751211.
6 **Taunton ME.** *Meeting.* Contact Don Martin: 01460-63162.
7 **Bradford MES.** *Steam-Up.* Contact Gordon Eddison: 01943-864217.
7 **Chingford DMEC.** *Kelvin Loco Evening.* Contact Martin Masterson: 0208-989-5552.
7 **G. W. Soc.** (Didcot Rly. Centre). *Steamday.* Contact Jeanette Howse: 01235-817200.
7 **Hull DSME.** *Auction.* Contact Brian Rylance: 01482-647032.
7 **Hutt Valley MES.** *David Grant-Taylor: Fuel Cells.* Contact Gavin McCabe: 567-4487.
7 **West Wiltshire SME.** *Steam-Up.* Contact R. Nev. Boulton: 01380-828101.
8 **High Wycombe MEC.** *Meeting.* Contact David Savage: 01494-527402.
8 **N. W. Leicester SME.** *Visit to Garryson Ltd.* Contact John Elliott: 01455-847040.
9 **Bloemfontein SME.** *NLSM.* Contact F. W. Bishop: 4476556.
9-11 **British Columbia SME.** *Train Festival Meet.* Contact Sean Laurence: (604) 931-1547.
10 **Cardiff MES.** *Steam-Up & Family Day.* Contact Trevor Jenkins: 029-20755568.
10 **G. W. Soc.** (Didcot Rly. Centre). *Steamday.* Contact Jeanette Howse: 01235-817200.
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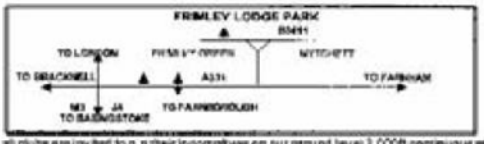

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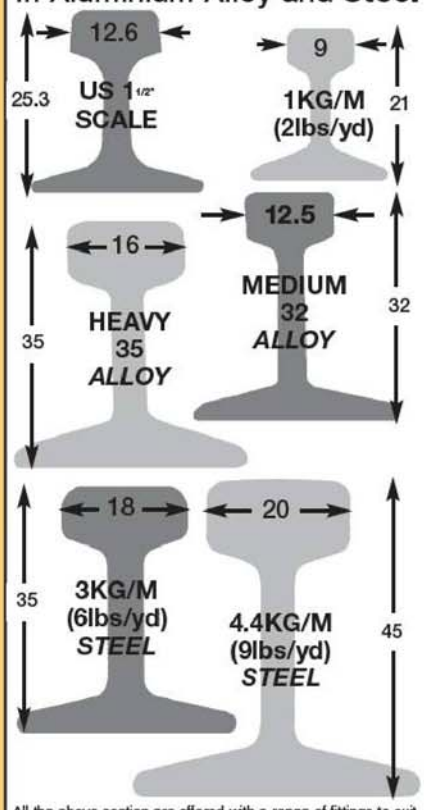

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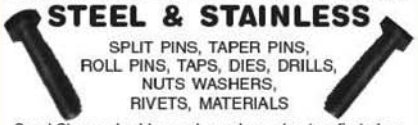

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- Range of threads (inch) 16-40tpi (metric) 0.4-1.25mm
- Motor: 250w
- Net weight: 25kg
- Distance between centers: 200mm
- Tailstock Taper: MT1
- Cross-slide travel: 70mm

Lathe £295
Mill & Lathe £395

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Conquest Lathe

- Swing over bed: 180mm
- Spindle bore: 19mm
- Tailstock travel: 60mm
- Speed range variable 100-2500 rpm
- Range of threads: (inch) 12-52tpi (metric) 0.25-1.5mm
- Motor: ¾hp
- Net weight: 38kg
- Distance between centers: 300mm
- Tailstock Taper: MT2
- Cross-slide travel: 70mm
- Dimensions: (LxWxH) 770x295x360
- Face Plate

NOW INCLUDES TEST CERTIFICATE **£395**

Price Include VAT & Delivery UK

920 Lathe Deluxe

- Swing over bed: 229mm
- Swing over cross slide: 133mm
- Distance between centers: 500mm
- Spindle bore: 19mm
- Taper in spindle bore: MT3
- Motor: ¾hp
- 6 Speed: 100-1800rpm
- Net weight: 100kg

STANDARD EQUIPMENT:
- 4" 3-jaw chuck with 2 sets of jaws
- 7" 4-jaw chuck with reversible jaws
- Steady rest • Follow rest
- MT2 Dead centre
- MT3 Dead centre
- 4-way tool post
- Face plate
- Tool Box & Tool Kit
- Tray & Splash guard

£850

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Model B-Super

- Swing over bed: 420mm
- Distance between centers: 500mm
- Mill drill spindle taper: 19mm
- Tailstock barrel travel: 80mm
- 7 speeds: 60-1300rpm
- Swing over cross slide: 160mm
- Spindle taper: MT3
- Draw bar M12
- Cross slide travel: 180mm
- Motor: ¾hp
- Net weight: 155kg

STANDARD EQUIPMENT
- 4" 3-Jaw chuck
- 2 dead centers
- 1/2 drill chuck
- Change gears
- MT3 chuck arbor

£725

Price Include VAT & Delivery UK

Comet Lathe

- Swing over bed: 250mm
- Swing over cross slide: 133mm
- Distance between centers: 550mm
- Spindle bore: 19mm
- Taper in spindle bore: MT3
- Motor: ¾hp
- 6 Speed: 125-2000rpm
- Net weight: 130kg

Mill Attachment
- Spindle taper: MT3
- Head travel: 215mm
- Speed variable
- Range: 0-3,000rpm
- Motor: ¾hp
- Net weight: 45kg

£1155

Price Include VAT & Delivery UK

Centurion

- Swing over bed: 420mm
- Distance between centers: 520mm
- Mill drill spindle taper: MT3
- Tailstock barrel travel: 80mm
- 7 speeds: 160-1360rpm
- Swing over saddle: 160mm
- Spindle taper: MT3
- Draw bar: M12
- Cross slide travel: 200mm
- Motor: 2 x ¾hp
- Net weight: 230kg

STANDARD EQUIPMENT
- 4" 3-Jaw chuck
- 2 dead centers
- 1/2 drill chuck
- Change gears
- MT3 chuck arbor

£1395

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Craftsman Precision Belt Drive

- Swing over bed: 300mm • Swing over gap: 450mm • Swing over saddle: 170mm
- Distance between centres: 570mm • Spindle bore: 36mm • Spindle bore taper: MT5
- Cross slide travel: 150mm • Compound travel: 89mm • Tailstock barrel taper: MT3
- Tailstock barrel travel: 92mm • Range of speeds: 50-1250rpm • Motor: 1 1/2 hp
- Net weight 398kg

STANDARD EQUIPMENT:
- 6" 3-jaw chuck with 2 sets of jaws
- 8" 4-jaw chuck
- Steady rest • Follow rest
- Stand • Face plate
- Splash guard • Threading dial
- 4-way tubular tool post
- 3MT dead centers
- T-Slotted cross slide

£1725

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Cub 620/630

- Swing over bed: 300mm • Swing over gap: 430mm • Swing over saddle: 174mm
- Distance between centres: 500/750 • Spindle bore: 38mm • Spindle nose: D1-5
- Spindle nose taper: MT5 • Cross slide travel: 160mm • Compound travel: 75mm
- Tailstock barrel taper: MT3 • Tailstock barrel travel: 70mm • Range of speeds: 9 60-2000rpm
- Number of inch threads: 33 • Range of inch threads: 4-72 TPI • Motor: 1 1/2hp 240v or 2hp 415v
- Approx shipping weight: 380kg • Number of metric threads: 27
- Range of metric threads: 0.25-9.0mm • Motor: 1 1/2hp 240v or 2hp 415v

STANDARD EQUIPMENT:
- Hardened and ground gears in headstock
- Bridge-type stand • Foot brake • Worklight
- Induction hardened bedways • Face plate
- Emergency stop • 4-way turret tool post
- 6" 3-jaw chuck with 2 sets of jaws
- 8" 4-jaw chuck
- Steady rest / follow rest • 2 dead centers
- Coolant system with back splash guard
- Threading dial • Direct reading dial cross slide
- Removable chip tray

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