

MODEL ENGINEER

Vol. 192 No. 4212

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- Faceplate
- Fixed and travelling steadies
- Cabinet stand and splash back

Reviewed in Model Engineer Workshop by Raymond McMahon, Winner of the Best in Show and Gold Medal awards.

"an excellent machine and surely represents great value for money"

Reviewed in Model Engineer by Anthony Mount, Technical Author.

"a good, sound machine which is accurate and easy to use. It runs quietly and does not take up an excessive amount of workshop space"

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BURRELLS

SOME NOTES ON A COMPANY AND ITS PRODUCTS

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On the cover ...

Kentish Lad, a 1:3 scale model of a 7nhp
 Foster agricultural and general purpose,
 single-cylinder traction engine,
 was photographed at the second recent
 Model Engineering and Hobbies
 Exhibition organised by Bristol S.M.E.E.
 Completed in 2003 after some 2,600 hours
 work spread over 5 years, Kentish Lad
 was built to published drawings and with
 commercially available castings
 by Bob Danton who is seen here about to
 enjoy a leisurely run around the
 Thornbury Leisure Centre car park.
 Apart from the boiler and some minor
 fittings, Kentish Lad is all Bob's work,
 weighs in at 9.5cwt ready for the road
 and is now a regular sight
 at steam rallies and exhibitions.
 Turn to page 16 of this issue
 for our report on the Bristol exhibition.
 (Photograph by Neil Read)

'HOPKINS' HOT AIR ENGINES

The Mk I engine is completed and our
 attention turns to the Mk. II unit. Part IV.
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KEITH'S COLUMN: SAINT CHRISTOPHER

A GWR LOCOMOTIVE for 7 1/4in. gauge
 Making the 'fiddly bits' including the
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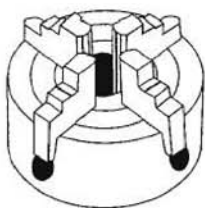
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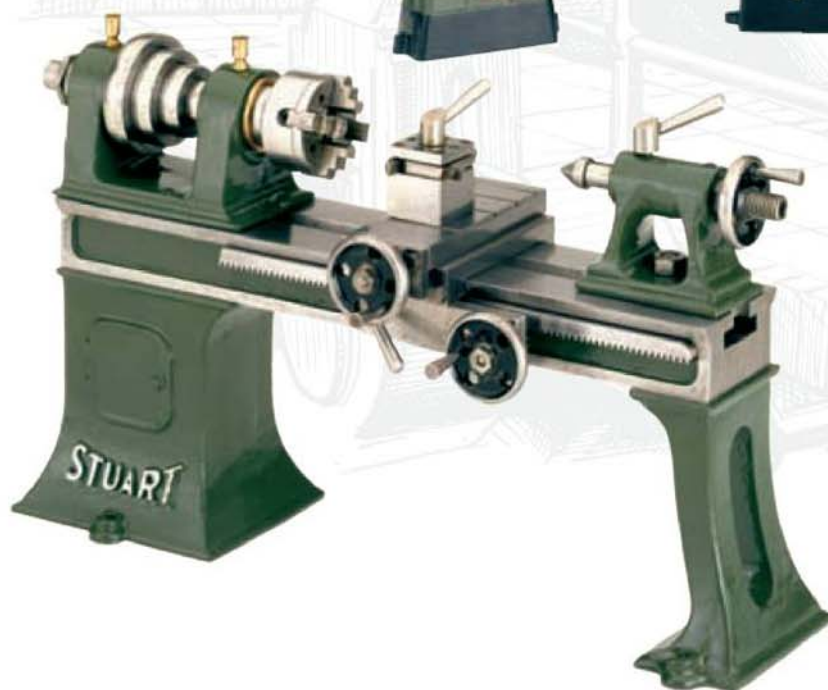
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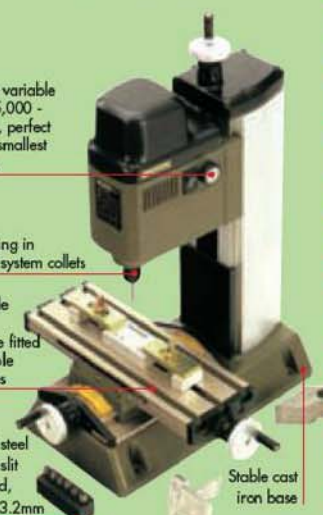
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based on industrial practice, but there is some useful stuff here for the model engineer, and the whole book is interesting. 72 pages, well illustrated with drawings and photographs. Paperback.



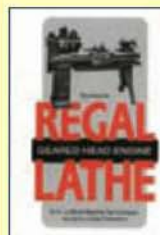
The History of J & H. McLaren of Leeds

• Pease •

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Good history of this Leeds firm, mainly known for their traction engines but who, unlike their near neighbours Fowlers, embraced the oil engine, and went from strength to strength as a result. The author has produced a well researched and interesting history, of which

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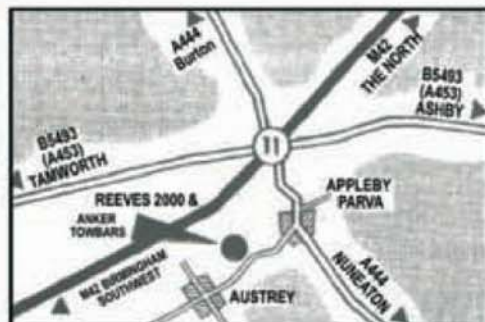


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SMOKE RINGS

With the Editors

Stolen locomotive

Regrettably we must begin the New Year with unhappy news concerning the theft of a locomotive from a private workshop. Walter Ellis wrote to us to say that his 3 1/2in. gauge *Heilan' Lassie* was stolen at the end of November from the garage in which his workshop is situated. He explains that his garage is underground and opens straight onto the road outside. The garage doors were secured with a padlock which appears to have been cut with bolt croppers. Inside were three locomotives, all of which were of his own building.

Accompanying the *Heilan' Lassie* were *Firefly* to the Martin Evans design and L&BR *Exe* to the Les Warnett design. Walter's *Heilan' Lassie* was built during 1962-7 to LBSC's 'Words and Music' and was housed in two boxes. The boiler is identified with the code BR4 9DW marked on the backhead. A portable compressor was also stolen. "Needless to say" adds Walter "the other two locomotives have been moved elsewhere."

At the age of 75 years, it is far from easy to come to terms with the loss overnight of the result of five years effort and Walter is understandably very upset about the theft. A life member of Tonbridge MES which he joined in 1964 and has since served as a Committee Member from about 1970, we are sure that Walter has the support of his friends in the Society.

The missing locomotive is shown in the photograph (top right). Any reader able to assist in the recovery of Walter's *Heilan' Lassie* is asked to contact Bromley Police (tel: 020-8853-1212) where we understand PC650 P. Y. Stone is dealing with the matter. Please quote Crime Number: Bromley 3329427/03E.

Generous offer

Edward Thornley (tel: 01909-484703) wrote recently to say that he has in his shed gathering dust, three bars of material: 1 x 3 1/2in. and 1 x 21in lengths of 1in. dia. brass, and 1 x 19 3/8in. length of 3/4in. dia. copper. "If any readers in the Workshop area are interested, the three pieces are available free for collection, complete with dust."

Hot air engines

We were pleased to hear recently from Arc Euro Trade that four hot air engines will be available from them in either kit form or fully assembled and working. Elsewhere in this issue (see page 48), readers will find reference to the London Model Engineering Exhibition 2004 at Wembley. We understand that preview versions of these four hot air engines will be available for examination on the Arc Euro Trade stand where orders may be placed for delivery in early March.

Arc Euro Trade have taken the precaution of seeking Roy Darlington's approval of a sample of each of the four engines. Roy has observed that engine HAE02 would be a good starting point for anyone wishing to build their first hot air engine. He has also noted that the models are well presented and make up into good working engines. HAE03 is a good looking model but the design of its cooling fins is such that it may not run for as long as the others.

We illustrate these four engines which are identified with their product codes as HAE01,



Mr. Ellis' *Heilan' Lassie* which has been stolen.

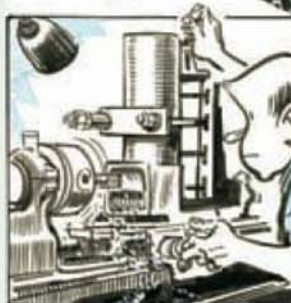
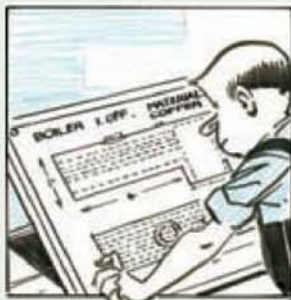
HAE02, HAE03 and HAE04 with the suffix A for the kit form and B for the assembled and tested engine. Prices will range from about £75-£85 for the kits and about £150-£170 for the finished

engines. Prices include carriage and VAT to most UK mainland destinations. They will be available for inspection at Wembley 23-25 January where orders may be placed. Arc Euro Trade are at 10 Archdale Street, Syston, Leicester LE7 1NA; tel: 0116-269-5693.



CHUCK the MUDDLE ENGINEER

by B. TERRY ASPIN



POST BAG

Keyway cutting

SIRS, - Being an indifferent craftsman I can but admire Keith Julier's article on broaching (*M.E.* 4208, 14 November 2003) from a distance knowing that I have neither the skill nor the equipment to follow his guidance. However, his article started me thinking about whether there could be a cheap and cheerful way of cutting keyways by more primitive means.

Basing my thoughts on the workpiece details with which Mr. Julier chose to illustrate his article, i.e. 1/2in. dia. shaft, 3/8in. thick ring (mild steel in my case) with a 1/8in. wide x 1/16in. deep keyway, I have come up with something which although probably not at all novel may be of interest to other readers.

The schematic shown above will give an indication of how my gadget looks. In essence, the device is a 1/2in. dia. body carrying a 1/8in. square silver-steel slotting tool capable of being progressively lifted for successive passes through the work until full keyway depth is reached.

The tool is driven through using the vice as a press with a suitable spacer behind the work to receive the follow through. The hole under the cutting edge and the extended slot is to provide somewhere for the chip to go. I have found that the ring clamp, which holds things together, should be tightened before the grub screw at the cutting end is advanced. This provides a positive resistance giving a feel for the adjustment since only a very small increment per pass is advisable.

The photograph shows a specimen made using the tool.

Further consideration of Keith Julier's article prompts me to wonder if his Fig. 5, which shows the broaching tool, is correctly drawn. I believe that most of the height dimensions shown are double what they should be.

Keith's nomination of high speed steel for the broach is fine, but to people like me, it isn't a material we are used to thinking about except in the form of small tools for purchase. While I doubt if many of us, especially the run of the mill garden shed/corner of the garage brigade, would have a need to work HSS, how about someone knowledgeable out there producing a short article on the subject with answers to such questions as: is the occasional odd piece of HSS in a convenient size available from the trade? If so, in



what metallurgical condition is it likely to be? What tools are required to work it? How is it heat treated? Keith's reference to 65 Rockwell C may be alright for someone with access to industrial equipment, but is likely to be out of reach for most of us.

David Upton, Surrey.

Best or cheapest?

SIRS, - Anthony Mount's articles describing his mods. to his Warco lathe are very interesting. However, I must disagree with his description of the work as 'fine tuning'. In my opinion 'rebuild' would be a more correct term!

I wonder how many of us would find the time and, in my case, the necessary skills to carry out the work. I have never enjoyed making or modifying tools, preferring to get on with the project in hand, although the need for jigs and fixtures and suchlike will always occur.

When I purchased my lathe and other items years ago, it was of British make and my wife - bless her - persuaded me to buy the best.

The cost, relative to my then finances was as high as it would be in today's markets, but I have never regretted the choice. I would still say start saving, and perhaps send the wife out to work!

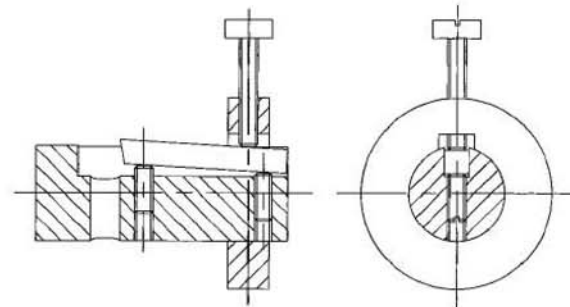
More seriously, there is much talk today of Britain's dwindling manufacturing industry. Is not our continual search for cheaper items partly responsible? This is a very complex economic problem to which I have no answer.

I think I'll go and turn an axle or two!

G. E. Hobbs, Berkshire.

Brace of Saints

SIRS, - On seeing the photograph of the firedoors for Mr. Underwood's Saint, (*Post Bag M.E.* 4206, 17 October 2003) I was reminded of something the late Fred Cottam told me a long time ago about GWR firedoors. Namely that the small ribbed hole at the top of the doors formed on the joint line when closed was not there for a bit of top air, as I thought, but was somewhere to insert the coal pick to force them



Mr. Upton's keyway cutting tool and left, a result from its use.

apart if they jammed.

Top air was catered for by hollow fire doors with air admitted at the bottom on the footplate side and out at the top through apertures on the firebox side. I fitted this to my Saint and she steamed alright. What it would have been like without, I don't know as I never experimented.

Seeing a photograph of Fred's superb *Saint Sebastian* in the same issue reminded me that the GWR profile beading on the splashers was machined with a form tool that I made to do the job for my own *Saint Benedict* and which I lent to Fred. It's nice to think that I had a very small part in the building of that lovely locomotive.

Bert Mead, North London.

Tram identified

SIRS, - The *Post Bag* enquiry published in *M.E.* 4205, 3 October 2003 was passed to me for comment.

The model tram shown is indeed one of many built by the late Mr. Richard Elliott who was President of the Tramway and Light Railway Society. It is hard to be 100% sure from the photo, but it is probably his London Transport HR/2 class No. 1898 which he built in the 1930s. Mr. Elliott and the TLRS exhibited at the Model Engineer Exhibition on many occasions. The model seems to be on display on its own, i.e. not on a layout, so your 'guess' that this is in the 1950s is probably correct; I would say the early 50s.

Richard Elliott worked at the tramway Central Repair Depot at Charlton, London and later as the Road Transport Technical Advisor at the Museum of British Transport at Clapham. He died in 1995.

John Prentice by e-mail

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Gyroscopes

SIRS, - Further to the letter from Bill Steer (*M.E.* 4207, 31 October 2003), Louis Brennan lost further funding from the War and India Offices for the development of the 20 ton load capacity prototype monorail vehicle as they saw that since every wagon in a train needed

a stabilising unit, an extensive skilled maintenance force would be necessary to maintain operation. The only problem that seemed to persist to the end appears to have been some leakage in the air control valve of the pneumatic system which forced the gyrostats to precess thus generating the restoring force for stabilisation.

The demonstrations, including extensive running at the White City Exhibition, were very successful.

Modern technology would no doubt provide a more reliable maintenance record but two main problems remain. Does the low capital cost of the track bed compensate for the added complexity of the vehicle? And how do you recover a failed vehicle? Brennan quoted 20 minutes before stabilisation was lost in the event of power failure.

I would suggest that the only future might lie in a tram system when a twin unit would cope with the load and a fairly short run would allow a failed vehicle to be readily diverted to avoid disrupting services.

Incidentally, the last of Louis Brennan's models is held in store at the London Science Museum.

Roger Pryer, Surrey.

Successes and failures

SIRS, - I have been model engineering in a modest way for some 30 years, being entirely self taught and never having had the benefit of club membership to extend my knowledge. A number of Stuart engines, including two No. 9s have been completed but I would not wish anyone to see them as my shortcomings are obvious, but they all work to my personal standard which is that they turn very smoothly by blowing!

With my Super 7B I have used small section high speed steel tool bits in Armstrong holders, as well as larger square section HSS direct in the tool post. As all my learning has been from the gospel according to Sparey, I have always tried to grind my tools according to their purpose and the metal concerned. Generally speaking I have been satisfied with the speed of removal



Two views of the 'pliers' which Mr. Twist seeks to identify.

and the finish, although much of my machining has doubtless been at an uneconomic rate.

Because of the advertisements I have bought some indexable tools from an impeccable supplier, attracted by not having to spend time machining with HSS with its attendant mess and the ability to use on virtually all metals. After some months I am moving back to the ancient system because I seem to produce better work that way.

By now there must be much experience of this new technology and I would be interested to know what the general experience is. Am I somehow getting it wrong with indexable tools or have others had similar experience to me?

Dennis Randall, Oxfordshire.

Mike Chrisp comments:

I assume from the fact that Mr. Randall is comparing indexable tooling with high speed steel for his lathe that the former is of sintered carbide formulation. High speed steel and other cutting tool materials are also available in indexable form.

The basic constituents of tungsten carbide tooling are particles of the extremely hard tungsten carbide blended and bonded with particles of cobalt. Innumerable grades of this material are available with different proportions of these constituents. Titanium carbide tooling is also available, as is tungsten/titanium carbide. The insert geometry also varies considerably in many respects which are sometimes obvious but may be extremely subtle.

Sintered carbides were developed and are used for production engineering applications where rapid material removal rates are required on equipment which is sufficiently rugged and driven with adequate power to utilise the characteristics of these materials. The other principal application of sintered carbide tooling is to work materials which are difficult to machine with HSS tooling. It should also perhaps be noted that production HSS tooling is available in a wide variety of grades and types.

Generally speaking, model engineers have neither the equipment

nor the available power to take advantage of sintered carbide tooling. Its use for difficult materials such as hard cast iron is an obvious exception. Some years ago Sandvik Coromant published an excellent book detailing all that any of us needs to know about using sintered carbides. Readers may wish to check their local library for a copy, or to contact Sandvik Coromant at Manor Way, Halesowen, West Midlands B62 8QZ; tel: 0121-504-5400. The book is called *Modern Metal Cutting - A Practical Handbook* (ISBN 91 97 22 99 - 0 - 3).

Another problem experienced by model engineers seeking to use sintered carbide concerns the availability of quality tooling. Many who experience difficulties are using imported grades of uncertain pedigree and indeterminate characteristics. Mr. Randall refers to an 'impeccable' supplier, so this cannot be the source of his problems. Techniques for the proper use of sintered carbides are quite different to those suitable for high speed steel. I am sure his decision to revert to tried and trusted HSS tooling is the right one for him. I am equally sure we shall be regaled with a variety of opinions following publication of his letter and this response!

Surging motion

SIRS, - May I please offer a few words about Ron Isted's excellent article concerning the LB&SCR 'E1' and 'E1X' 0-6-2 tank locomotives published in *M.E.* 4206, 17 October 2003.

In the third column on page 439 Ron mentions the unpleasant surging motion imparted to the train by these locos, and also mentions the GW outside cylinder 4-6-0s together with others. In my experience the GW 56xx class 0-6-2 tank engines were definite culprits regarding this effect, and travel between Cadoxton and Penarth in the first carriage when hauled by one of these locomotives, was to experience what a rat must feel like when shaken by a dog!

The phenomenon lasted almost to the end of steam but was eventually cured by Sam Ell at Swindon after

the 'Britannia' class locomotive No. 70014 *Iron Duke* started shaking up the first class passengers on the 'Golden Arrow'.

In his book *British Railways Standard Steam Locomotives*, E. S. Cox gives a good description of the problem and cure; it is basically caused by trying to reduce the vertical hammer blow on the rails by balancing the revolving and reciprocation masses of the locomotive's machinery. When this has been brought to acceptable levels there still remains a longitudinal component which produces the fore-and-aft motion. Balancing effectively smothered this motion provided there is no 'magnifier' in the couplings along the train to pick up and produce resonance to amplify them once again to a perceptible shaking.

The real culprit was found to be in the drawbar spring at the rear drawbar. This spring eliminated a dead portion in the range of drawbar extension when under load, however with certain designs and under certain conditions this was not being achieved and the coupling became solid thus transmitting the fore-and-aft motion to the train.

Ron mentioned the GW 2-cylinder 4-6-0s, however I cannot recall this effect with them while running, but very definitely you could feel each entry of steam into the cylinders when starting from a stand. The effect was like that of a rowing boat where, while the stroke is under power the boat surges ahead but slows until the next stroke; very definitely a surging effect.

Ron queries why the BR 92000 class was not afflicted in this way, but in his book Cox states that all BR Standard locomotives had the same fault. I cannot answer Ron's statement about the 92s, but can only observe that, compared to passenger engines,

they did very little passenger work and it may be that there were very few interested people around at the time to record it.

Pete Rich, Monmouthshire.

Pliers — or what?

SIRS, - The enclosed 'pliers' (see photos left) were given to me recently and I just cannot imagine to what use they could be put.

From the handle grips I think they may be of French origin (not that that helps much), however somebody might recognise them and perhaps be able to explain their purpose.

Pat Twist, Hampshire.

Pat Collins Fair

SIRS, - I was interested to read the reference to the Pat Collins Group on page 570 in part 2 of the feature on the history of the Burrell concern in *M.E.* 4208, 14 November 2003.

Could I enquire through the pages of this magazine, if there is, or has ever been written, a history of the Pat Collins group? I would certainly like to read it, if so.

My interest follows from my early days, when the Pat Collins Fair (or Wakes) arrived in my then local town. Usually regularly every six months in the Spring and Autumn, as I recall. Interestingly, it was always well advertised on the billboards and many other (illegal) spots. How colourful and significant these posters were. I expect genuine examples would be very valuable today as collector's items, if still around.

My memories of those glorious showman's engines remain vivid, even after all these years. As I remember them, one in particular was always parked in the same place on the fairground and powered the adjacent dodgems.

They always towered above me, I must have been quite small in those days, their driving wheels seemed so large and the driver appeared to be located so high above ground level, as the flat dynamo drive belt flapped up and down and the engine rocked continuously on its wheels. I suppose No.1 (3865) must have been one of those engines.

D. N. Wellings, Somerset.

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A little piece of fun put together by one of the members of the South West Meccano Club. Coins were supplied to make it operate.



A freelance horological lathe constructed by Howard Harvey of Newport Model Engineering Society.

BRISTOL EXHIBITION 2003

Neil Read

tours the second Bristol SMEE Model Engineering and Hobbies Exhibition held at Thornbury.

By cruel quirk of fate I was unable to attend the Bristol Exhibition last year and so had entered the dates for this year's exhibition in my diary early and *underlined* them to make sure that nothing prevented a visit this year. This turned out to be a wise move on my part as the trip proved to be both enjoyable and interesting.

Readers may well ask "Why get all excited over another exhibition when there are so many already?" Well, that is true but the organising members, drawn from the Bristol Society of Model and Experimental Engineers, have done their homework. They realised that there was niche market for just such an event in the south west of Britain where model exhibitions are conspicuous by their absence. Here was a large potential market just waiting to be filled. During a chance conversation with some other visitors I learned that they had travelled over 140 miles from their homes in Cornwall to get to Thornbury. To travel on to London, the Midlands or Harrogate to attend one of the other established shows would be a trifle daunting, I imagine, to say the least.

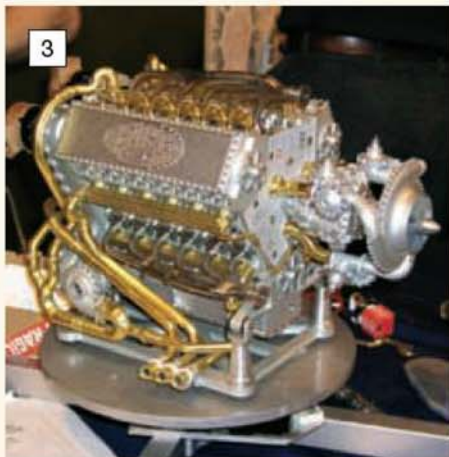
So, the exhibition has a place in the model engineering firmament but what of the venue? Well, the Thornbury Leisure Centre is located on the outskirts of the small town of Thornbury, a few miles north west of Bristol, with easy access from the M5. Even if you have a propensity for getting lost, the usual yellow and black special event markers would get you there just as they did for my wife and I. The leisure complex is a pleasant modern building with ample free parking. A short walk brings you to the two halls used for the exhibition. These are reasonably well lit and ventilated and were laid out with generous aisles. Food and drink are available on site and, perhaps just as important, a spacious viewing area upstairs provided comfortable seats to ease weary legs. In other words, the venue is a good one and almost ideal for an exhibition of this type.

As might be expected, many of the exhibits were by members of the host society, but these were augmented with a great many private entries. The event also enjoys the support of a good number of other model-making societies and clubs from the surrounding area and has a strong trade presence. Essentially a non-competitive exhibition, one award is however made to the club stand judged to be the Best in the Show. This year it went to the IC Engine Builders Group, worthy successors to the Stirling Engine Society, last year's winners.

Having set the scene, let us take a look at some of the models (who just said "...not before time!"?) The South West Meccano Club had a busy stand with many memory provoking exhibits for those whose youth was spent playing with this wonderful, educational toy. One piece of fun was a pair of musicians mounted on a stage; they played a tune when a two pence piece was inserted into a slot. There was no excuse for not giving it a try as the exhibitors had kindly laid on a supply of suitable coins (photo 1).

I was drawn to the Newport MES stand by the sight of the handsome clock maker's lathe built by member Howard Harvey (photo 2). This was said to be of freelance design but appeared to follow the general style of the well-known Webster-Whitcomb pattern of horological lathe. Mr. Harvey had chosen not to nickel plate the machine, the usual finish for this class of machine tool, but had finished it by what appeared to be a chemical blacking process — a sensible finish for a workshop machine.

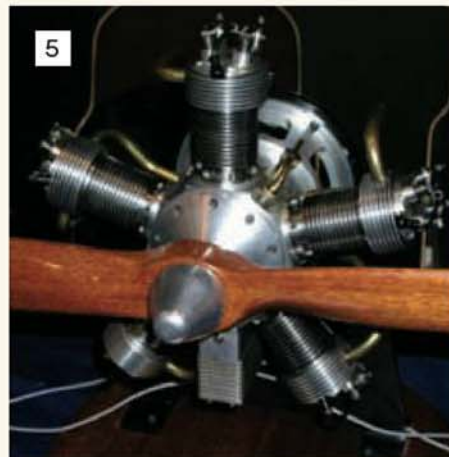
As might be expected of an award winning stand, that of the Internal Combustion Engine Group was laden with fascinating exhibits. The growing detail on Clen Tomlinson's *Deltic* engine just makes me gasp (photo 3) despite seeing it evolve over recent years. Having read with awe the account of Brian Perkins' work on his 1:4 scale Bristol *Hydra* engine (the ongoing series commenced in *M.E.* 4203, 5 September 2003) I



Clen Tomlinson's Deltic continues to take shape as the detail fittings are added.



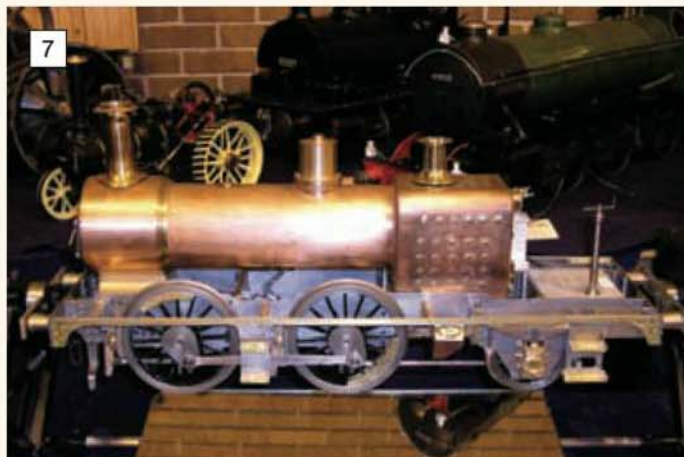
How many parts go to make a Bristol Hydra aero engine?



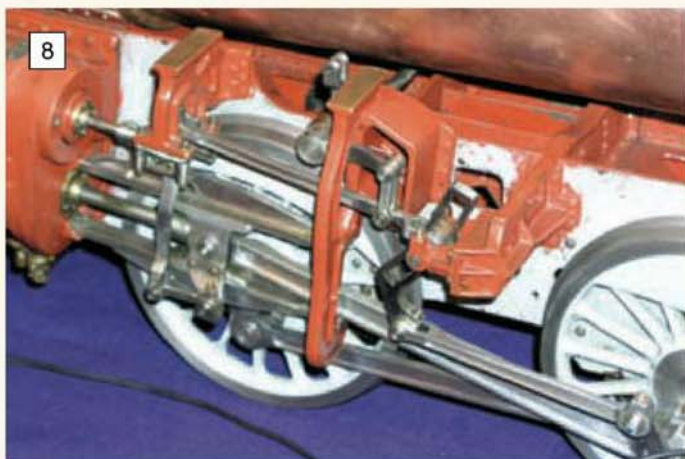
An attractive little engine — Roy Hankins' Kinner 5-cylinder radial.



6
The demonstration of rose engine turning by Michael Bain of the Society of Ornamental Turners was fascinating to watch.



7
This fine 5in. gauge GWR 0-4-2 1400 tank loco was displayed on a special stand and was built by Roger Davis of Bristol SMEE.



8
The neat valve gear of the part-finished 5in. gauge LMS 2-6-0 Horwich Crab by Terry Phelps.



9
Coming along nicely. This 2in. to the foot Durham & North Yorkshire traction engine is the work of Brian Hacker of Bristol SMEE.

was even more impressed to see the various cylinder and cylinder head components for the engine laid out on a display board (photo 4). We look forward to reading further progress reports on this unusual engine. Slightly less complex but no less photogenic was the Kinner five-cylinder radial engine by Ron Hankins (photo 5).

I was delighted to see that representatives of the Society of Ornamental Turners were present to demonstrate some of the secrets of this intriguing art. To pull a couple of machines out of their resting places and re-erect them at the show for the benefit of visitors is dedication indeed and I am sure many paused fascinated to see the

various attachments and cutting tools as they were brought into use. I particularly liked the rose cutting demonstration by Michael Bain, which he carried out on a converted Grayson lathe using a very finely made, home-built slide-rest of the traditional ornamental turning pattern (photo 6).

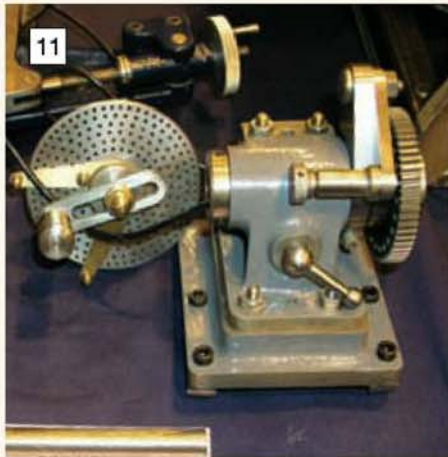
The organising society, the Bristol Society of Model & Experimental Engineers, had put together a most impressive stand with a wide range of member's work. A few part-built models caught my eye. The 5in. gauge GWR 0-4-2 1400 tank engine by Roger Davis was nicely presented so that visitors could admire the detail (photo 7). The well executed valve gear on the 5in. gauge

LMS 2-6-0 Horwich Crab by Terry Phelps looked most impressive (photo 8) to someone untutored in locomotive matters like myself while the sturdy 2in. to the foot Durham & North Yorkshire traction engine by Brian Hacker is making good progress and will no doubt be a good performer when complete (photo 9).

Also by Bristol SMEE member Terry Phelps was a splendid model of a 1929 Morgan Aero Sports three-wheeler showing all the grace of the original car (photo 10). It is interesting to note that the distinctive front suspension fitted to this vehicle is identical, in principle, to that used on the current Morgan 4/4. H. F. S. Morgan devised this



10
Also by Terry Phelps was this lovely model of a 1929 Morgan Aero Sports three-wheeler.



11
A nice example of a George Thomas versatile dividing head by Geoff Sheppard.



12
An unusual but very neat tool and cutter grinder by David Caseley.



Part of a large 1:16 scale model of an industrial estate by R. W. Beach of the Guild of Model Wheelwrights.



A very elegant and well executed model was this 1:8 scale swivel galloper cannon also on the Guild of Model Wheelwrights stand.



This wooden representation of the Geneva index mechanism was part of an extensive collection of such devices by Edward Addis.



Seen on the Stoford Miniature Locomotive Society stand was this 7 1/4 in. gauge 4-4-2 Adams radial tank engine by member Dave Cox.

arrangement and fitted it to his first vehicle in 1909 so, whatever else you may think of the Morgan enthusiast; you can hardly accuse him of being someone who worships change for its own sake!

Among the workshop tooling items was a rather nice versatile dividing head of the George Thomas pattern built by one of the event organisers and former editor of *Model Engineers' Workshop*, Geoff Sheppard (photo 11). I am glad to see he now gets some time off to pursue his workshop activities. The tool and cutter grinder by David Caseley appeared to be well made and finished and was

unusual in that it did not seem to follow any of the usual designs used by model engineers (photo 12).

The Guild of Model Wheelwrights always attracts an enthusiastic group of onlookers of both sexes. The 1:16 scale industrial estate by R. W. Beach bristled with detail (photo 13) and repaid careful study. It is one of those exhibits that calls for several return visits. One invariably sees something new each time you returned to it. I also admired the 1:8 scale swivel, galloper cannon, the builder of which was, regrettably, not listed in the catalogue (photo 14).

It is not often that an individual is able to equip a stand with just his own work, but such was the case with Mr. Edward Addis. Mr. Addis makes working wooden models of mechanical mechanisms and a fascinating group of artifacts they are too. Simply too many to list, one example will have to suffice. Photograph 15 shows Mr. Addis' representation of the Geneva index mechanism, an arrangement familiar to many engineers as it is much favoured by the builders of multi-spindle automatic lathes to index the spindle carriage.



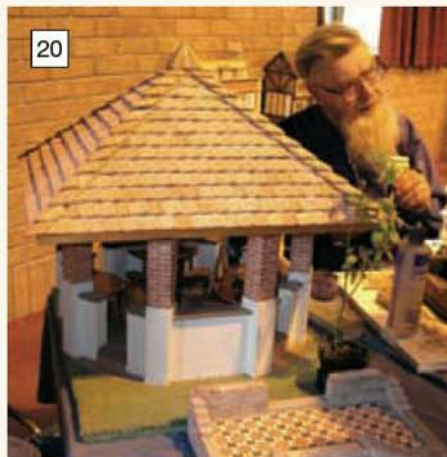
The inimitable Roy Darlington, doyen of hot air engines, with his Stirling engine powered 'Moon Buggy' on the Stirling Engine Society stand.



Keith Taylor-Nobbs' model of Lion on the Old locomotive Committee stand was a former medal winner at the Model Engineer Exhibition.



This overtype steam wagon is available in kit form from ModelWorks International Ltd.



An attractive model building shown on the Grandad's Toys stand.



A neat universal dividing head exhibited privately by Ivan Law.

Stoford Miniature Locomotive Society has only eighteen members but, judging by their stand, all must be active model engineers. Centre stand was the impressive 7 $\frac{1}{4}$ in. gauge Adams radial tank by member Dave Cox (photo 16).

A visit to an exhibition of this type would not be complete without pausing at the Stirling Engine Society stand for a chat with the irrepressible Roy Darlington (photo 17) and colleagues. Seen in the photo with Roy is his Stirling engine powered 'Moon Buggy'. He tells me that his next project is a Stirling powered rocket to get the thing to the Moon! I think he was joking, but with Roy you can never be too sure!

The Old Locomotive Committee (OLCO) stand had a number of exhibits based on the 1838 locomotive *Lion*, star of the well-known film *The Titfield Thunderbolt*. Keith Taylor-Nobbs' model of this venerable old locomotive (photo 18) won a Silver Medal and the J. N. Maskelyne Trophy for fidelity to prototype at the 1986 Model Engineer Exhibition.

A number of our friends in the trade actively supported the exhibition. Regrettably space constraints must restrict us to two examples. Modelworks International Ltd. (tel: 01327-300270) displayed many of their large scale engineered kits, among which was their overtype steam wagon *The Pride of Penryn* shown in part built form (photo 19). For those whose current projects involve architectural structures Grandad's Toys (tel: 01536-722822) was on hand with their range of miniature bricks and tiles (photo 20).

As already mentioned, in addition to the club

and trade stands there were models and items of tooling on display from private individuals. Ivan Law, our Chief Judge at the Model Engineer Exhibition at Sandown was visiting the show and



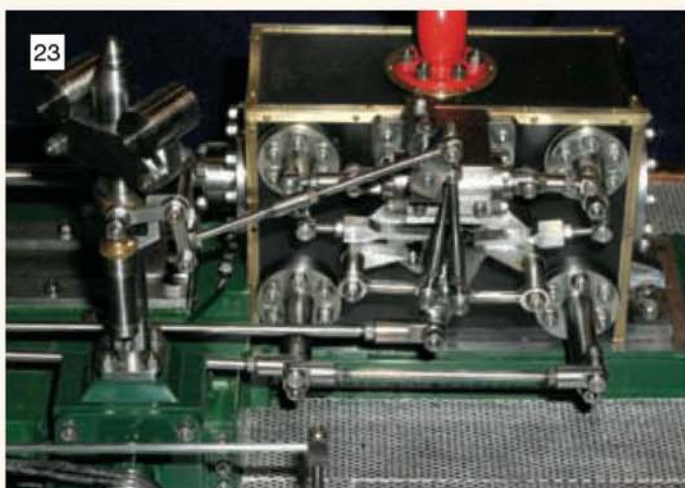
Martin Gregory's Quorn tool and cutter grinder was the subject of much favourable comment.

had entered his universal dividing head with provision for differential indexing and spiral milling (photo 21). Martin Gregory's Quorn tool and cutter grinder was also well made and had been extensively and ingeniously modified to better adapt it to his work (photo 22). The cross-compound mill engine with condenser by John Smith was a spectacular exhibit and was beautifully made and finished (photo 23). With its finely riveted tender, John Hawley's part built 'Big Boy' American locomotive provided a splendid opportunity for rivet-counters to test their skills (photo 24).

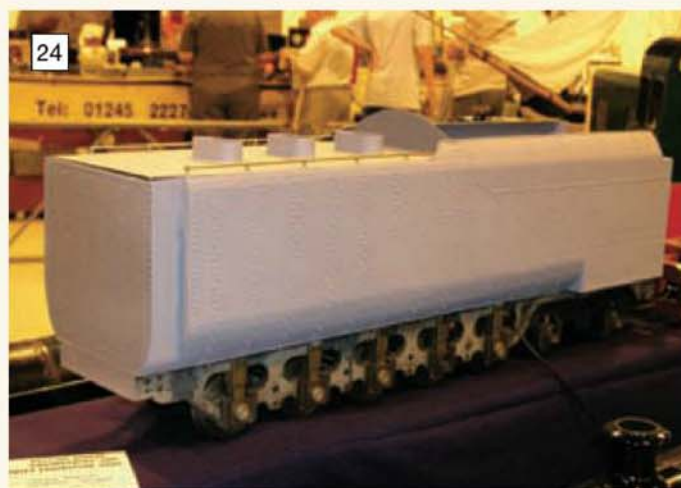
In conclusion I must pay homage to the band of heroes on the Bristol SMEE workshop stand who undertook to build a small horizontal mill engine during the course of the exhibition. They did not finish it but appeared to be enjoying the experience immensely. Perhaps that was the best advertisement for model engineering at the event — after all if it isn't fun why do it?

The members of Bristol SMEE deserve our admiration for the work put into this event which, just like IMLEC 2003 (also organised by Bristol SMEE) which preceded it, ran like clockwork. To organise two such large events to take place within a few weeks of each other takes some doing. Our thanks and congratulations to all concerned.

I believe that there are plans to run this exhibition next year and I for one will be watching out for any advance publicity. Perhaps I should place a 'three-line whip' (to use a Parliamentary expression) on any diary entry for next year.

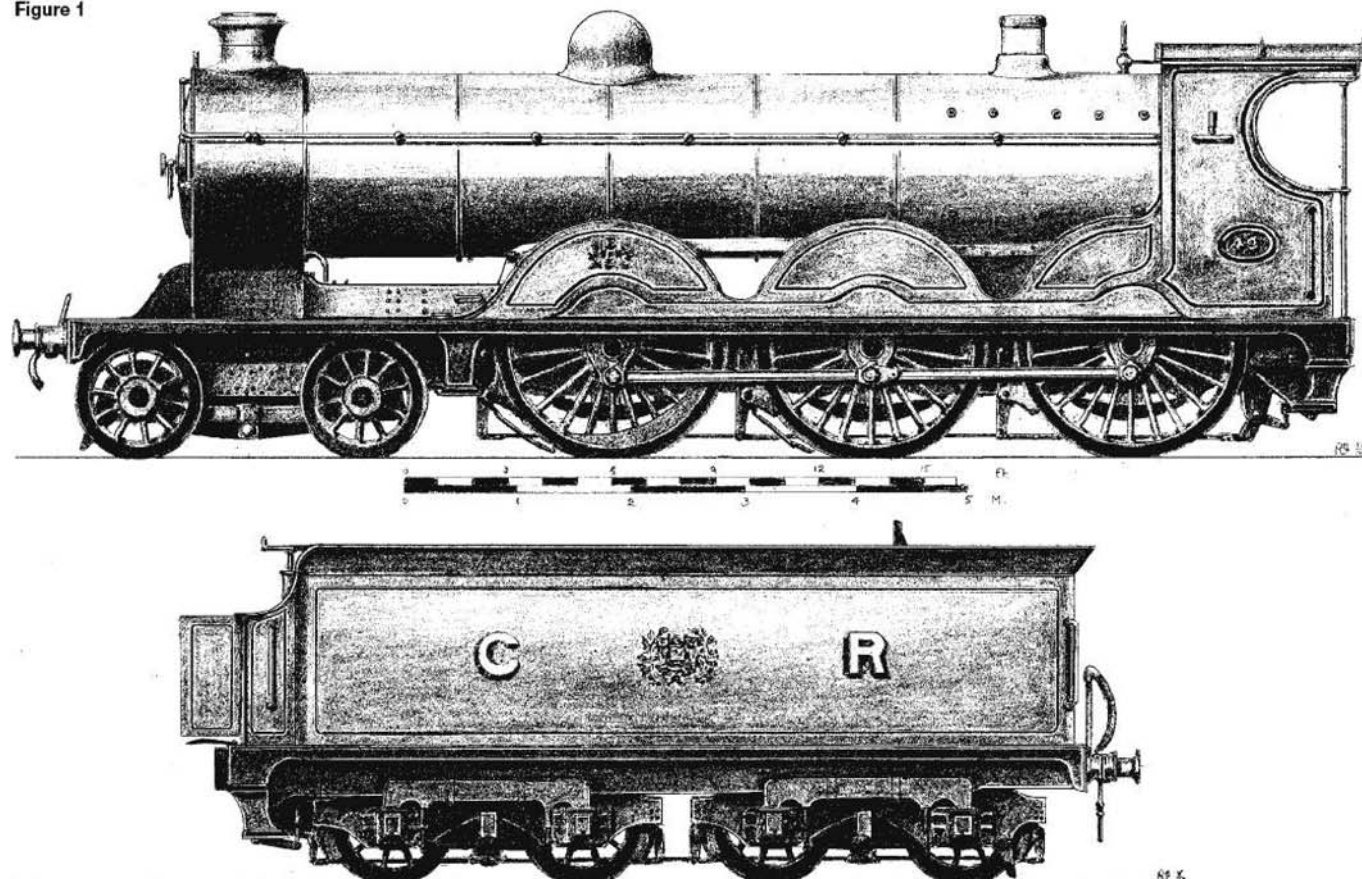


A close-up of the complex valve gear on the compound mill engine exhibited by John Smith.



The well detailed rivet work on the tender of John Hawley's 'Big Boy' American locomotive.

Figure 1



EDWARDIAN ELEGANCE

Ron Isted
describes the Caledonian Railway
and 4-6-0s Nos. 49 and 50.

●Part VI continued from page 441
(M.E. 4206, 17 October 2003)

Had it been captured on film, the look of complete disbelief mixed with contempt and deep personal anguish on the face of my Scottish railway enthusiast friend might have won him an Oscar. In fact, it was merely his natural reaction to my pronunciation of the 'a' in Caley as in 'ale' instead of 'apple'. So, fellow sassenachs, take warning! The Caledonian Railway really was a national institution and a great source of pride to the Scots, a fact of which the company was well aware and acted accordingly. If you don't believe me, what other commercial concern can you think of, which would have the sheer gall to purloin not only the Royal Arms of its own country for use on its (completely unauthorised) armorial device, but even that of England for use on its common seal? Even the autocratic Great Western made do with the Arms of London and Bristol.

The Caledonian certainly did things in style and with a panache difficult to imagine nowadays; it also provided a superb train service between some very elegant stations, using superior rolling stock and worked by a fleet of handsome locomotives, clad in one of the most striking colour schemes ever devised. At the beginning of the 20th century, the company was way ahead in the league tables of average speeds, at 59mph its fastest booking far in

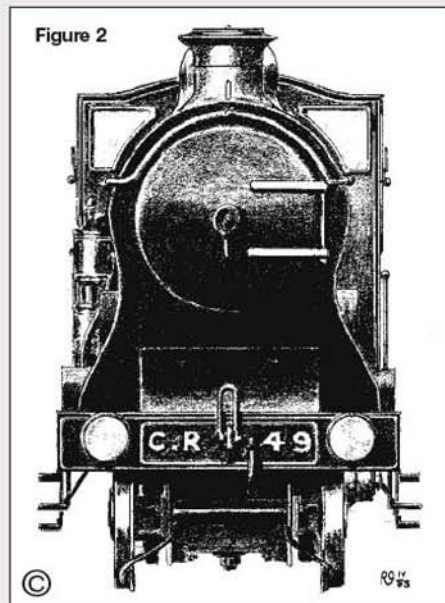
advance of anything the English lines could offer at the time. The man responsible for such high standards of locomotive performance was John Farquason McIntosh, who had been appointed Locomotive Superintendent at St. Rollox in February 1895 on a six month trial, at the rather paltry salary of £700 per annum. Compare this with the £2,400 that Dugald Drummond was earning when that formidable gentleman had resigned from the same railway five years earlier.

Fortunately, the Caledonian board of directors soon realised John McIntosh's true value and within five years, his salary had more than doubled to £1,500.

In his early years, he had qualified as both fireman and driver, before rapid promotion first to inspector and then locomotive foreman, but in 1877, at the age of 35, he suffered the misfortune of losing his right hand in an accident. Despite this personal tragedy, he continued to pursue his career and just nine years later, he was in charge of the Caley's top shed, Polmadie. Besides displaying great personal courage, John McIntosh was a thoroughly practical running man and knew only too well, from his own experience, that the worst nightmare for any footplate crew is the engine that is shy for steam. So, in contrast to those of many of his contemporaries, none of his designs can by any stretch of the imagination be labelled 'under-boilered' or 'over-cylindere'd'. whichever you like to call it. In the space of nine years, the maximum boiler dimensions on the Caledonian Railway increased from 4ft. 6in. diameter x 10ft. minimum tube length, providing just under 1200sq. ft. of heating surface on the Lambie 4-4-0s, to 5ft. diameter x 17ft. 3in. tube length, with almost double the heating surface, on the subjects of this article. During the same period, the grate area went up from 19 to 26 square feet.

That said, John McIntosh did in fact inherit from his two predecessors a first class fleet of locomotives, the basic design of which was capable of extensive development and enlargement, very different from the situation at Crewe on the

Figure 2



Caledonian's West Coast route partner, the London & North Western Railway, where George Whale was faced with a desperate situation, as was Henry Ivatt at Doncaster on the rival East Coast route. At St. Rollox, however, Dugald Drummond and John Lambie had managed to keep one jump ahead of Caledonian traffic requirements and McIntosh more than maintained the tradition by producing locomotives that inspired an almost ferocious pride in the crews who drove and fired them.

The development of his Dunalairstair from a very neat, but typical, late-Victorian 4-4-0 of the 1890s, into the powerful, superheated piston-valve 139 class of 1910 has been well documented and much has been written about the famous 903 Cardean class 4-6-0s of 1906, but comparatively little has appeared in print about their predecessors of three years earlier, Nos. 49 and 50, (figs 1 and 2). They were John McIntosh's first true express passenger design of this wheel arrangement and must surely rank as one of the most noble looking locomotives ever to take the rails. For me, there is an indefinable something about these two that even the Cardeans don't have and it is difficult to put a finger on just what it is.

Although there were major internal differences between No. 49 and No. 903, the only easily visible external variations were the greater space between the rear bogie wheels and drivers on Cardean, due to placing the driving wheels 4in. further back (although the total wheelbase remained the same), and the siting of the reach rod higher up the side of the boiler, so that on Cardean it was visible throughout its length, rather than being concealed behind the coupled wheel splashes as on Nos. 49 and 50. This detail may be the clue to my personal preference, since on these two earlier engines, the line of the boiler was virtually unbroken throughout its length, creating an even more massive appearance, although in fact, the maximum diameter of Cardean's boiler was slightly larger.

The 'Caledonian Giants', as railway journalist Charles Rous-Marten christened them, were built specifically to avoid the use of a 'pusher' up Beattock bank with the heaviest expresses, which were becoming uncomfortably close to the 400 ton mark. The first of the twins, No. 49, emerged from St. Rollox works in March 1903, followed a month later by No. 50, both built to order No. Y69 at an official cost of exactly £3,000 each, one of those suspiciously convenient round figures which, as will be apparent later, cropped up rather frequently whenever the Caley did a spot of number-crunching. Both engines ran trials in works grey before going back to St. Rollox to receive the full treatment: four coats of red lead, two coats of Prussian blue, followed by three coats of varnish, with much rubbing down, filling and of course, generous drying time, between each coat. The proud letters C R on the massive tenders were half as big again

Figure 3
As built 1903.
Boiler tubes
not shown.

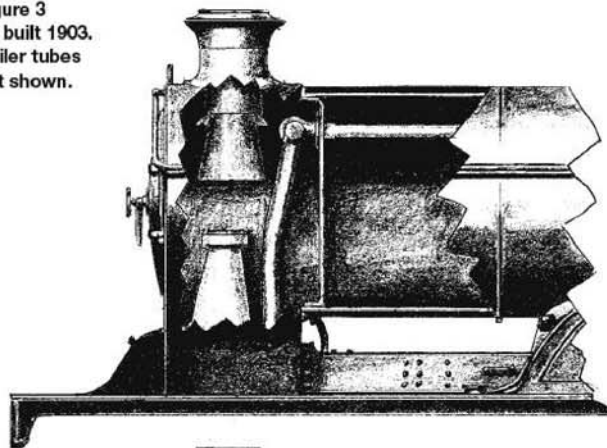
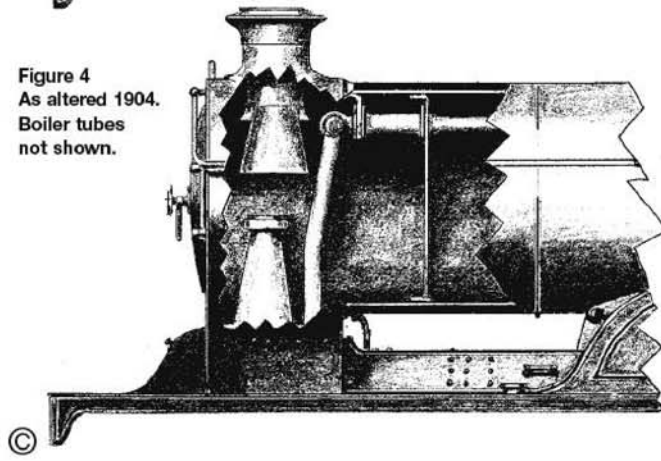


Figure 4
As altered 1904.
Boiler tubes
not shown.



as the then current standard size, with the Caledonian armorial device (complete with Royal Arms) between them, but uniquely on Nos. 49 and 50, it was surrounded by an ornate design of gilt thistles and leaves, hand-painted by James Jeffrey, the foreman painter at St. Rollox works.

These days, it is difficult to imagine the sheer splendour of these two superb creations of the art of the Edwardian locomotive designer, which, from June 1903, worked alternate weeks on the famous up 'Corridor', the 2.00pm from Glasgow, and the 10.45pm up sleeping car express. By August, No. 49 and driver Ranochar had the 'Corridor' to themselves, while driver Todd and No. 50 had moved to Carlisle, in order to work another heavy sleeper in the early morning to Glasgow, returning with the 10.00am, better known in later years as 'The Royal Scot'. The length over buffers of Nos. 49 and 50, and the later Cardean class, including their bogie tenders, was 65ft. 6in., the greatest overall length of any Caledonian locomotive, and for the first three years, this caused major problems with engine turning: at Carlisle, for example, the engine and tender suffered the indignity of being parted from each other and turned separately, although at Glasgow, dignity was maintained by a canter round the Cathcart circle line.

Now, if you thought that the Great Western Railway of the 1920s had perfected the art of milking the last drop of sometimes questionable publicity from its technical developments, I can assure you that the Caledonian, a quarter of a century earlier, was at least the equal of the English company. Soon after Nos. 49 and 50 had been decked out in all their finery, the Caley board of directors commissioned a large portrait in oils of the second of John McIntosh's masterpieces, No. 50, which by then had been named *Sir James Thompson* after the railway's

general manager, the first Scottish railwayman to be honoured with a knighthood, in itself a tribute to the company's high reputation. I just hope that the worthy gentleman himself also had his portrait painted, as it must be rather humiliating to be upstaged by a railway engine.

Thirty years ago, the painting of *Sir James* (the engine), was in the Glasgow Museum of Transport, but seven weeks and nine telephone calls after my initial enquiry to check the current situation, the museum is still unable to confirm whether the painting is still in its possession. This is unfortunate, as it would be an excellent reference for the standard colour scheme of the Caley's passenger locomotives at the beginning of the 20th century, except, of course, for the size of the lettering and collection of Scottish flora on the tender already mentioned. Publicity material on sale included postcard reproductions of the painting in colour, black and white photographs and handouts laying claim to "the heaviest and most powerful passenger locomotive in the kingdom". Does this sound

vaguely familiar?

And St. Rollox was treading on even thinner ice than Swindon by basing its "most powerful" claim on theoretical tractive effort. Quite apart from being only a paper figure, the Caledonian's publicity machine, according to Charles Rous-Marten, was in any case guilty of misquoting a crucial dimension. The formula for calculating the nominal tractive effort of a simple expansion two-cylinder locomotive is given by

$$T = (d^2 L P) \pi D$$

where

T = tractive effort,

d = cylinder diameter in inches,

L = piston stroke in inches,

P = 85% boiler pressure and

D = diameter of driving wheels in inches.

Substituting the published dimensions for Caley's Nos. 49 and 50, i.e. d = 21, L = 26, P = 170 and D = 78, we arrive at a figure of 24,990lb., which indeed made these engines, on paper, the most powerful passenger locomotives in the British Isles. But, writing in *The Engineer* on 5 January 1906, Rous-Marten stated categorically that the cylinder diameter had *always* been 20in. and that they had *never* been bored out to the officially quoted figure of 21in., "Mr. M'Intosh (sic.) prudently waiting first to see whether a smaller bore would be as effective as he needed."

Now I know that in a previous article, I accused poor old Rous-Marten of sometimes being economical with the truth, but in this case, there is corroborative evidence in the form of a surviving General Arrangement diagram dated July 1904, which, although entitled "21in. x 26in. x 6ft. 6in. Six-coupled Bogie Passenger Engine", has the dimensions 20 x 26in. specified over the drawing of the cylinder block. If we accept this, combined with Rous-Marten's statement, which

he claimed came straight from the horse's mouth i.e. John McIntosh himself, then the tractive effort is reduced to 22,667lb., or about 400lb. less than G. J. Churchward's third GWR 4-6-0 which sallied forth from Swindon the very same month that Caledonian No. 49 rolled out of St. Rollox. What is certain, is that Churchward's famous remark about the LNWR on the lines of "one of our (engines) could pull two of their b***** things backwards" most certainly did not apply to the Scottish partner in the West Coast route.

When it comes to weight, there is even more confusion, as the figures quoted in the railway press of the day for Nos. 49 and 50 as originally built, varied between 72 and 74 tons. One technical journal, presumably quoting Caledonian 'official' sources, listed each individual weight on bogie, driving axle and the two coupled axles as being precisely 18 tons! Figures like this, I have to say, make my nostrils twitch, sensing the odour of a small furry animal of the genus *rattus rattus*.

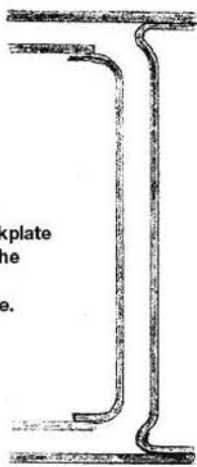
One item which contributed its own small quota of a few pounds to the weight on the rear coupled axle was an extra seat in the cab 'for an observer'. Whether it was provided to ease the lot of Caledonian locomotive inspectors (unlikely), or as a sprat to catch the mackerel of more publicity from people like Charles Rous-Marten (much more likely) is not clear, but guess who received a personal invitation from J. F. McIntosh requesting the pleasure of his company to sample the work of the two 'Caledonian Colossi' as Rous-Marten now called them. I'm sorry about the amount of Latin creeping into this article, but it does give it a certain class!

Mr. Rous-Marten, needless to say, promptly betook himself to Carlisle, where a pair of LNWR 2-4-0s delivered the express from London three minutes late; incidentally, the combined weight of these two locomotives belonging to the Premier Line was approximately equal to that of Caledonian Railway No. 49, which replaced them for the run to Glasgow. It is also worth noting that south of Crewe, the North Western was still using pairs of 'Lady of the Lake' 2-2-2s on its principal expresses, the original design of which dated back to 1868. No wonder George Whale had some catching up to do.

According to Rous-Marten, because of the lateness (which today's computerised figures would classify as punctual) and with a load of 390 tons, they stopped at Beattock for a banking engine, which is strange, in view of the official reason given in the first place for building these mammoth 4-6-0s. Final arrival in Glasgow was two minutes early. Rous-Marten later made good use of his observer's seat to sample other runs with trains of similar weight, when Beattock was indeed attacked without assistance and he duly reported the results of his experiences to *The Engineer* in his best Churchillian style: "such a performance with so vast a load on such a gradient has never been equalled in my experience." Eat your heart out, Winston, you were forestalled by nearly 40 years.

Into this plethora (a Greek word for a change) of adulation, a gentleman from Glasgow, writing under the initials J. D., threw an outside spanner, if you will excuse the mixed metaphor, with a sensational letter published in *The Engineer* on

Figure 5
Rearward
projecting
firebox backplate
flanges of the
so-called
'Crewe' type.



10 April 1903, suggesting that "Mr. MacIntosh's (sic.) fine engine would be greatly improved ... if the boiler barrel were shortened by about four feet ... the utter inutility of the last three feet or so of a very long boiler has been demonstrated over and over again ... its suppression in this case would save at least two tons in deadweight and £150 in the price." (!) I imagine that a goodly number of wee drams were consumed at hostelryes in the St. Rollox area of Glasgow that evening, but as was proved by subsequent events, J. D. — any relation to former Caledonian Locomotive Superintendent D. Drummond I wonder? — knew exactly what he was talking about.

Before we pursue this intriguing little saga, it is perhaps salutary to digress for a moment in order to remind ourselves of the timetable of events so far:

March 1903, Caley No. 49 emerges from St. Rollox works;

3 April, Charles Rous-Marten publishes his first article in *The Engineer*, entitled *A Caledonian Locomotive Giant*, complete with photograph;

6 April, J. D. pens his critical epistle to the same magazine;

10 April, J. D.'s letter published.

So, with all our computers, scanners and other automated speeding-up devices, how far have we really progressed? If you really want the answer to that one, I suggest you check out the deadline and publication dates of this magazine. Having unburdened myself of that, I will return to the main line.

After several further complimentary articles in the railway press during 1903, many of which carried contradictory dimensional details, but no reply to J. D.'s original letter, the next important event took place early in 1904, when both engines suddenly disappeared back to St. Rollox works. The reason for this peremptory exit from the Caledonian stage was for 'boiler modifications', or to be more specific, the reduction of the tube length from 17ft. 3in. to 15ft. 8in. by recessing the front tube plate a further 1ft. 7in. into the barrel! (figs 3 and 4). While this was rather less than the 4ft. suggested by J. D., he, of course, was unaware that the tube plate was recessed 9in. to start with. His estimate of a reduction of 2 tons in overall weight by losing 4ft. off the tubes, makes an interesting comparison with the 3 tons quoted by St. Rollox for the loss of 1ft. 7in. Of this nice round figure, exactly half was removed from the adhesion weight and half from the bogie, would you believe?

Just how the Caledonian authorities calculated

the 3 tons is an interesting question: 257 x 1ft. 7in. lengths of 1³/₄in. copper tube plus 13 lengths of 2¹/₂in. ditto do not weigh anything like that amount and an addition to the modified boiler, consisting of a substantial piece of double-flanged tube, was installed between the re-positioned front tube plate and a new piece of angle fitted in the tube plate's original position, in order to support the main steam pipe, which was retained unaltered, (fig 4). And, strange to say, the heating surface figures shown on the 'before and after' General Arrangement diagrams, according to the St. Rollox drawing office, are identical, in spite of lopping more than 1¹/₂ft. off 270 tubes! In case you wondered, the lettering on the revised G.A., as well as various details such as the coupled wheel springs, are in a totally different hand to that of the original.

One or two unusual design features of these two boilers may be of interest. Although made in three rings on the usual telescopic principle, the middle, rather than the more normal front section, was the smallest, with a diameter of 4ft. 10¹/₁₆in., while front and rear were both 5ft. More obvious was the firebox backplate, the flanges of which projected towards the rear (fig 5) in what has been described as 'Crewe fashion'. I have not yet unearthed any Webb designs incorporating this feature, although the Bowen-Cooke Claughton class 4-6-0s of 1913 certainly had it, so perhaps someone at St. Rollox originated the idea? Whoever dreamt it up, it was not perpetuated on the later Cardean class, which also followed convention by having the smallest ring of the boiler at the front.

But the most surprising (at least to me!) feature on Caledonian Nos. 49 and 50, which did reappear on the later 4-6-0s, was the position of the blast-nozzle, set 1³/₁₆in. in front of the chimney centre line. Now, how many times have we been exhorted by master designers of small locomotives like LBSC, Martin Evans, Don Young *et al* (more Latin), to take great care in ensuring that the blast-pipe/nozzle assembly is both exactly vertical and dead in line with the centre of the chimney? Yet here in full size, we find an experienced and thoroughly practical designer deliberately off-setting the nozzle forwards, and although its diameter was reduced by 1/8in. during the 1904 modifications, its position remained unaltered.

What is more, off-set blast-pipes seem to have been a Caley speciality, as they were used on the 55 class 4-6-0s of 1902 (1/2in. ahead), and on the 600 class 0-8-0s of 1901 (3/16in. ahead). The only possible reason that I can see for the off-set, is that the shape of the main blast-pipe is asymmetrical (still more Latin). In other words, the front is at a greater angle to the vertical than the rear (figs 3 and 4), which presumably deflects the exhaust backwards as it leaves the nozzle, although the top appears to be horizontal on both G.As. Any elucidation would be welcome, along with details of other locomotives so fitted, either on the Caledonian or elsewhere. The whole thing reminds me of the extraordinary 'ash-hopper' on some of Webb's designs on the North Western, which in theory should have completely destroyed the smokebox vacuum, but, like the bumblebee, which flies because it is ignorant of aerodynamic theory, the famous Precedents just got on with the job of running the railway.

●To be continued.

A BEREAVEMENT ASSISTANCE SCHEME

John E. Snowden

in Australia, has some advice which should ease the burden on those who have to dispose of our effects following our inevitable demise.

The letter from John Colville of Northern Ireland published in these pages a year or so ago, seeks a solution to the disposal of workshop equipment left by a deceased model engineer. He sought means to ensure that the widow or dependents were not disadvantaged by unscrupulous dealers, or those he failed to mention, some of the deceased's so-called 'friends' seeing an opportunity that they could use to their advantage.

I became aware of this problem over thirteen years ago and proposed the adoption of a bereavement assistance scheme to my club, H&DMES, now the Hornsby Model Engineers Co-operative Ltd. The proposal was approved by the members and adopted immediately. Realising that other clubs would increasingly meet this problem I submitted an article to *Australian Model Engineering* magazine which was published in the Jan/Feb 1991 issue. The article was printed unedited and fully sets out all details together with a copy of the forms we use.

For those readers of this magazine who have no access to the Australian publication, the scheme works as follows. At a discreet time after the death of a member, a photocopy of the original form (right), which had been completed by the member, together with the 'acknowledgment' block (below), is sent to the widow or 'nominated person' offering the club's assistance. In most instances our help has been requested even before it was officially offered, and on some occasions when the member had not participated in the scheme when offered to him earlier.

Our club has been requested to render this assistance to widows and families of non-members who have been desperately endeavouring to satisfactorily dispose of their husband's or other relative's equipment. I have been involved in eight cases to date, all of which have been resolved to the satisfaction of all. The boards of management of clubs/societies etc. must realise that notwithstanding the work involved, there is a distinct benefit to the club, as well as the widow, particularly as members have the first opportunity to purchase items.

Having been involved in eight cases where this scheme has been implemented, I have found that with each succeeding case it has been more difficult to locate buyers who are prepared to pay satisfactory prices for items of equipment. Membership of our club fluctuates and during the eight years of my chairmanship has ranged between 170 and 210. Presently, the majority of our members are well advanced in years and already have comprehensively equipped workshops with a declining need to purchase more gear. We are very fortunate in having locally a friendly and honest dealer, (an ex 'pommy'!), who in all cases has offered more for each item than the value we had nominated. He is not invited to become

involved until all other sale avenues have been exhausted. Although our scheme states that "a panel of three suitably qualified members ... will jointly confer" with the widow and act as required, on occasions it has not been possible to find three members prepared to perform this task

so only two were used. The club authorities should address this problem when drafting their own procedures.

While making no claim that this scheme is foolproof, every effort has been made to eliminate the possibility of any malpractice. 

Name of Club/Society Bereavement Assistance Scheme

I, _____ of _____
(Please print full name) (Residential address)

request the Directors of the (name of Club/Society), in the event of my death or incapacitation, to render assistance and/or advice to my Wife or Nominated Person (NP) in respect of my workshop equipment, materials, models, technical books/magazines _____
to take such further action as agreed by my Wife or NP.

I understand that in regard to this request, all the following points will apply:

- 1: An approach to my Wife or NP by members of the Club/Society will only be made following her/his request for assistance.
- 2: The Board of Directors of the Club/Society will nominate a Panel of three suitably qualified members who will jointly confer with my Wife or NP, value equipment, materials, models, etc., and take such further action as requested.
- 3: The Board may replace any member of the Panel at their discretion, and my Wife or NP may request the Board to make such replacement.
- 4: Participation in this Scheme cannot in any way affect my Last Will and Testament, nor does it give the Club/Society any authority whatsoever over my estate or to act in any way contrary to the wishes of my Wife or NP.
- 5: Confidentiality between my Wife or NP, the three Panel members and the Club/Society's Board of Directors will be observed at all times.
- 6: Where a request is made to dispose of any property, such property must first be valued by the three Panel members acting jointly, my Wife or NP then informed of the valuation(s) and her/his written request obtained (on a form to be supplied by the Club/Society) to have the property sold, or firm buyers identified at no less price than the values specified. When sold, the full amount realised is to be paid to my Wife or NP.
- 7: Details of the Offer of Sale of any property is to be announced at the earliest monthly meeting of the Club/Society and where two or more members offer to purchase an item, it is to be sold to the highest bidder. Failing sale at the meeting, the next offering is to be at the discretion of the Panel of three advisers, but any reduction in price is only to be accepted with the approval of my Wife or NP. Offers to dealers will *only* be made as a last resort.
- 8: No Commission or Charge for the Service outlined herein will be made by the Club/Society or any of its members.
- 9: I can withdraw from this Scheme at any time by notifying the Secretary of the Club/Society in writing.
- 10: Participation in this Scheme by my Wife or NP is to be on the strict understanding that she/he and all my beneficiaries indemnify the (Name of Club/Society) and all its members against any legal action or claim because of any act, statement, omission or other thing whatsoever done by the Club/Society, its Board of Directors or any of its members acting in good faith.

My Wife's/Nominated Person's full name is: _____
(please strike out as appropriate) (please use block letters)

If a Nominated Person please state relationship (if any): _____

Detail any Special Requests or Instructions (using and signing a separate sheet, if necessary):

Signed: _____ Witness: _____
(Print name): _____ (Print Name): _____
(To be a Club/Society member)

Acknowledgement

To: _____

Postcode: _____

This is a photocopy of a document which is self-explanatory. Should you require the assistance described, please notify the Secretary of our Club/Society or any of its members.

Date: _____ Signed: _____

For and on behalf of the Board of Directors
of the (Name of Club/Society)
Society Co-operative Limited.

Contact address:
(Postal address of Club/Society)

Colin Pape

returns to these pages with his version of a dividing attachment for the Myford Super 7 lathe.

●Part I

This article describes a relatively easy to make indexing attachment for the headstock of a Myford S7 type lathe. I would like to say straight away that this attachment is based on a design described in a book entitled *Dividing and Graduating* by the late George Thomas.

Many readers will be aware of the articles which Mr. Thomas wrote for *Model Engineer* about 25 years ago, and the many excellent devices that he designed. In this case, the device was the Versatile Dividing Head and Mr. Thomas adapted his design to allow it to work directly on the headstock of the lathe. To do this he modified a design for a headstock indexing attachment from an earlier contributor to *Model Engineer*, Jack Radford, who had written a number of articles for *Model Engineer* in the late 60s. His indexing attachment was described in *M.E.* 3336, 18 January 1968.

There is probably a whole generation of readers who have never seen the work of either of these two gentlemen. This may well be perfectly normal but in my view is a great pity. I started to read *Model Engineer* in 1990. One day, about a year later, I bought a bundle of old *Model Engineer* magazines at a second-hand counter. The bundle contained all the issues for 1978. When I read through these old issues I struck gold. I discovered George Thomas. I have subsequently made several tools based on the designs of Mr. Thomas and they all work very well indeed. In two cases, this one and a spherical turning attachment, Mr. Thomas adapted designs originally made by Jack Radford. So it was through him that I discovered Jack Radford. With this article I will maybe encourage some others to go looking for examples of their work.

Having said all that, I must say that I, like many readers, do not always make things exactly as prescribed in the drawings or photographs that we have available. We may have ideas of our own in some areas, which we consider better for one reason or another, or we may have a different view of the utility and the end use of the device or, more prosaically, we may not happen to have the specified material. So I have made a number of changes to the detail design of this device but none to the basic idea. I will explain the more important changes as I come to them.

Concept

The basic idea of the Head Indexing Device (HID) is very simple. The bull wheel gear in the Myford Super 7 headstock has 60 teeth. The top of the bull wheel gear is exposed when the headstock cover is opened. A worm drive is dropped down onto this gear; this worm has a shaft equipped with a handle to turn it and a plate with holes in it that serve as stop positions for the handle. One complete revolution of the handle causes the bull wheel to advance by one tooth and the work piece turns through $1/60$ of a turn (6 degrees). The device is shown attached to a Myford Super 7B in photo 1.



The attachment in use to cut the degree divisions on a Universal Pillar Tool table.



Setting the best angle for the attachment to engage the bull gear.

INDEXING ATTACHMENT FOR THE MYFORD LATHE

Design

The basic design is due to Jack Radford. I have never actually seen the Radford design, only the version already modified by George Thomas. There are numerous small differences, particularly to reduce the number of parts and to simplify installation and set-up. Probably none of the dimensions are the same since I dimensioned mine as I went along. All the parts will be shown in the drawings accompanying the articles. No castings or special parts are required.

Attachment to the lathe

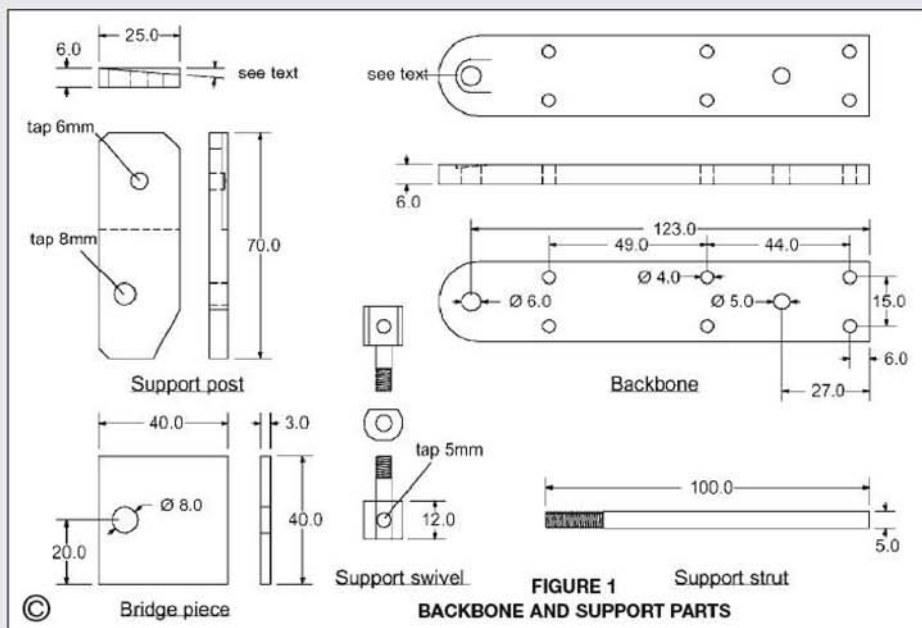
I have made quite a significant change to Mr. Radford's attachment system. I think this design permits easier installation and allows the set up

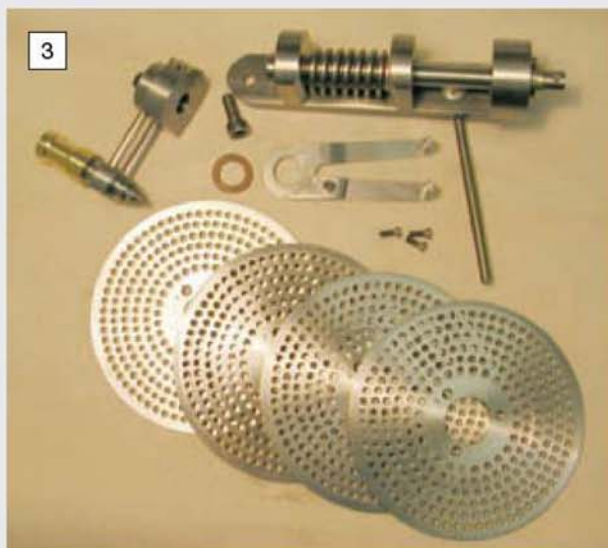
of the device to be simple and flexible.

I have only drilled one 5mm dimple in the lathe, and this is in the headstock casting. It is to locate the foot of the support strut and is not visible when the cover is down.

My lathe was built to continental regulations and is equipped with a safety interlock on the chuck. Part of this safety feature is a plate that holds the switch. A single bolt attaches this plate to the headstock. For all I know, all recent Super 7s may have the hole for this plate even if the safety interlock is not fitted.

In my case the attachment bolt is a $5/16$ in. BSF. The original bolt does not go completely through the casting although the hole does and is tapped all the way through. I do not have any of these bolts.





The parts for the indexing device shown prior to fitting.

Component parts

All but two of the components of the device are shown in **photo 3**. The support post and bridge piece had already been fitted to the lathe when this photograph was taken. The parts are shown as three sub-assemblies plus the set of four indexing discs.

Attachment pieces

The main attachment point for the device is a single straight piece of steel called the support post. This post is fixed to the headstock casting by using a screw which passes through the plate that holds the safety switch

for the chuck cover.

The inside of the headstock casting is not flat. The casting has a relatively thin shell and a thick edge. In the place where we need to put the support post the thick edge forms two sides of a square and the support post cannot be directly attached. I cut a 40 x 40mm square of 3mm steel plate and used this as a bridge across the thin part of the casting. The support post attaches to the exposed face of this square and when the 8mm bolt is tightened, the whole assembly is completely rigid.

These two pieces are permanently fixed to the lathe. They are not in the way and are invisible when the headstock cover is closed.

Drive assembly

This assembly consists of the backbone, the worm shaft, the shaft bearings and the index hub. These parts are mounted together and need never be taken apart except for occasional cleaning and lubrication.

Backbone

The backbone is a piece of 25 x 6mm flat steel which supports the two shaft bearing housings and the index head housing. A single screw through the end of this backbone attaches the

entire device to the lathe. The housings are attached to the backbone with 4mm socket head screws. The backbone and support pieces are shown in **figure 1**.

Worm

The specification of the worm is taken from Mr. Thomas' book and I suppose, originated with Mr Radford. It is given below:

Length: 1.5in.

Diameter: 0.855in.

Diametral Pitch: 16 DP

Hand: Left hand

Pressure Angle: 20deg.

Pitch: 0.19707in.

Depth: 0.142in.

Helix angle: 4.89deg.

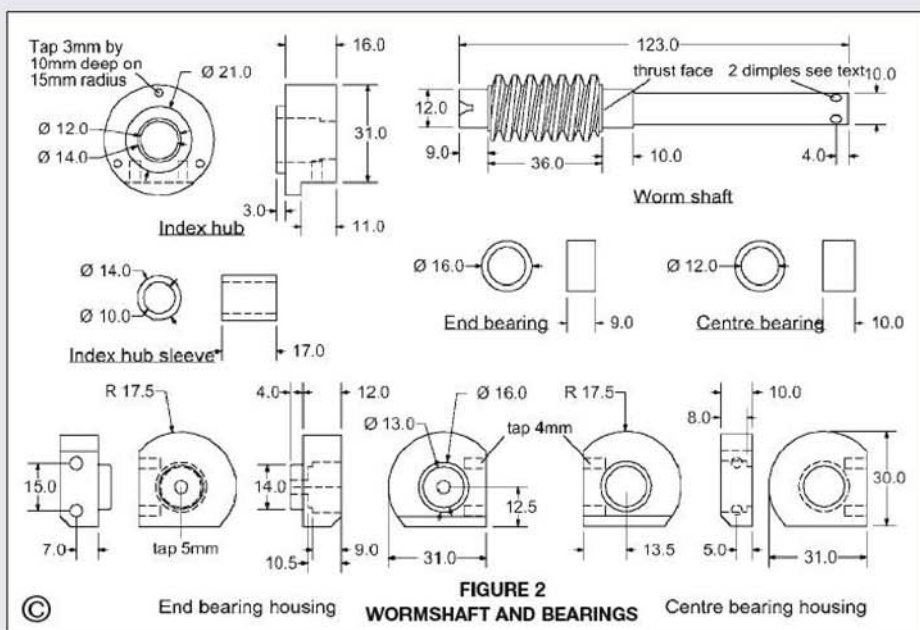
Tool: 40deg. included

Tip width: 0.041in.

I work mostly with metric fixings. Happily it turns out that an 8mm metric bolt will pass through the threaded hole with negligible play so I used a long 8mm bolt to secure both the safety switch plate and the support post for the HID. **Photograph 2** shows this device in its embryo form being fitted to the lathe. The dimensions were being developed as the work progressed! This was the original backbone that turned out to be not quite straight.

The drawing of the post shows that some corners have been removed. For the two at the top this is to remove a safety hazard but in the case of the lower front corner it is to ensure that there is no interference with the handle of the backgear latch. Once the support post has been fitted and adjusted to the best position for the user, the bolt is tightened and the post stays permanently in the lathe without interfering in any way with any operation.

In the first version of the backbone, seen in the photograph, I had made space for a dowel to define the angle between the backbone and the post. I was planning to make the support post part of the removable assembly but this was not a good idea and was abandoned. It was much more convenient to leave the post and the bridge piece permanently in the headstock. This also allows the possibility to swing the whole device up and out of the way and to block it in the up position.



A left-hand thread is specified in the Radford/Thomas design but Mr. Thomas gives no explanation in his book as to why this is so. I have not seen the original Jack Radford articles so I don't know if he explained his choice. I wondered a bit about why a left-hand thread was specified. I don't often cut left-hand threads and I did not want any unnecessary complications in my first attempt at cutting a worm.

I could think of at least two good reasons why a left-hand thread is better than a right hand one and I am most likely still missing something very obvious to more experienced people. The first concerns the fact that it is probably more natural to turn the handle of the worm shaft in a clockwise direction rather than anti-clockwise. The result of this is that the lathe chuck moves backwards but this is a good thing because it allows maximum visibility of the result of the last operation on the workpiece.

The second reason concerns the possible wear that exists already on the teeth of the bull wheel. When the lathe is put in backgear mode the bull wheel is driven by another spur gear, which is underneath. There is often a heavy load on these gears in backgear mode. Because the chuck spends most of its time turning in the forward direction the wear will be mostly on one side of each tooth. Looking at the top of the bull wheel from the front of the machine, the wear which may have occurred will be mostly on the back of each tooth. With a left-hand worm the drive from the indexing attachment will be on the front side of the tooth — the good side.

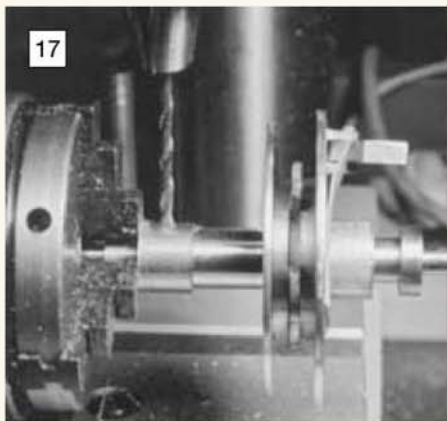
Index hub

This piece looks like a bearing but its real job is to ensure that the index plates are concentric with the worm shaft. In addition, the design allows for the precise location of the indexing plates and the indexing fingers, and for the quick and easy changing of these components.

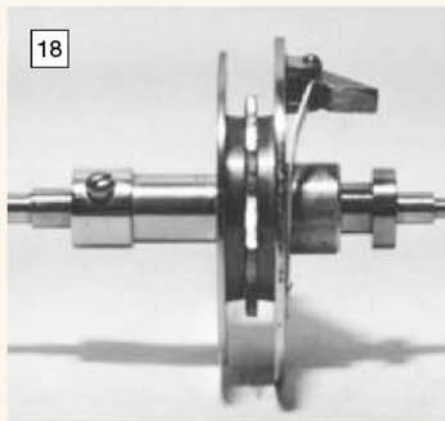
End bearing housing

This piece includes the anti-backlash device. The boss on the outer end is drilled and tapped to take a 5mm set screw. This screw presses a 4mm steel ball into the centre hole left in the end of the worm shaft. The wormshaft, the bearings and the index hub are all shown in **figure 2**.

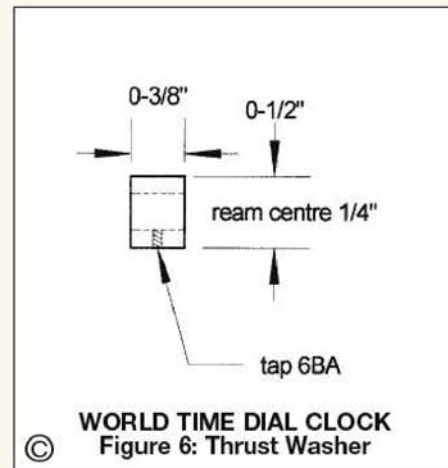
●To be continued.



Using the thrust washer as a jig to drill the arbor.



The washer is held in place by means of a 6BA screw and thread locking compound.



WORLD TIME DIAL CLOCK

Ian Beilby

continues work on his intriguing clock with descriptions of the thrust washer and other components.

●Part III continued from page 684
(M.E. 4210, 12 December 2003)

The thrust washer is fitted on the great arbor and keeps the click of the pulley in contact with the crossings of the great wheel. On many thirty-hour clocks the arbor was simply cross-drilled and a large steel pin driven through the arbor to keep the pulley in place. The washer is dimensioned in fig 6.

After reaming $\frac{1}{4}$ in. dia. and parting off, the washer should be cross-drilled with a 6BA tapping drill (2.35mm or No. 42). The pulley and washer are assembled on the arbor with the click of the pulley facing the wheel seating. The pulley is held right up against the wheel seating and the washer used as a jig to drill the arbor (photo 17). The arbor is

then tapped 6BA and the cross-drilled hole in the washer opened up to 6BA clearance (2.85mm or No. 33). On the completed arbor the washer will be held in place with a 6BA screw secured with Threadlock (photo 18). The components can then be dismantled at a later date without too much difficulty.

Wheel arbors

Since the pinions for the clock will be made as separate heads and fixed to the arbors with Loctite, we will require three arbors machined from either $\frac{3}{32}$ in. pivot steel, or silver-steel (fig 7). If silver-steel is used, the pivots will need to be hardened. The arbor pivots must be concentric and should be machined using the collet chuck or set up in the 4-jaw chuck (photo 19).

After the first pivot has been turned it should be finished with the pivot file followed by the burnisher. The arbor may then be laid across the plates to determine the position of the second pivot. The arbor can be marked using the screw head-slotting file (photos 20 and 21).

There should be a small amount of end shake

between the shoulders of the arbor and the plates. As before a smooth, parallel, highly polished finish is required on all pivots if the train is to run freely. The finished arbors are shown in photo 22.

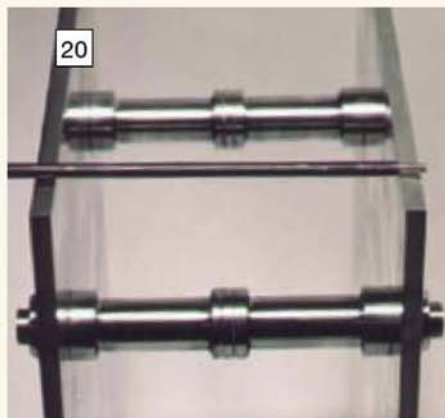
Wheel and pallet collets

Three collets are required for the wheels, and one collet for the pallets. Figure 8 gives the dimensions of the wheel and pallet collets. The wheel collets differ in that a wheel seating is necessary.

When making the wheel collets, in order to maintain concentricity it is important that the wheel seating is machined and the collet reamed $\frac{3}{32}$ in. diameter at the same setting. The $\frac{3}{8} \times \frac{3}{16}$ in. dimension is turned first and the work parted off. The work is reversed in the chuck to machine the wheel seating. As mentioned when machining the great arbor, it is better to turn the wheel seating slightly oversize and to broach the hole in the wheel to fit the seating, thereby ensuring a positive fit. The wheels are fixed to their collets with three equi-spaced 10BA screws, and the wheel must locate positively on its seating.



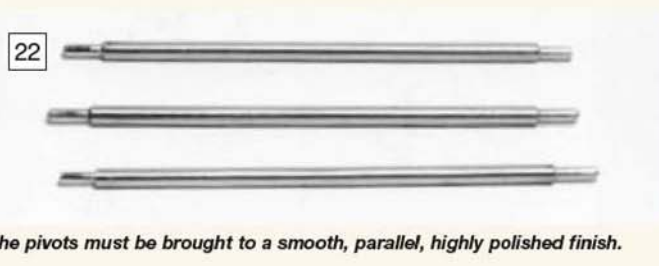
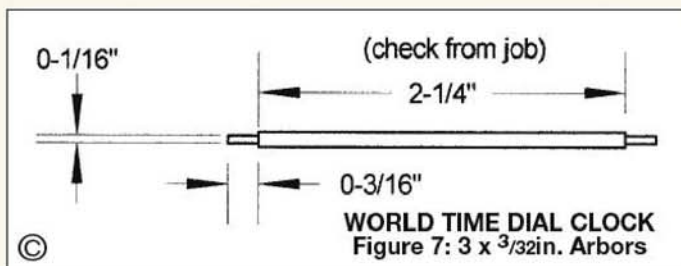
To ensure concentricity, the arbor pivots must be turned using a collet or 4-jaw chuck.



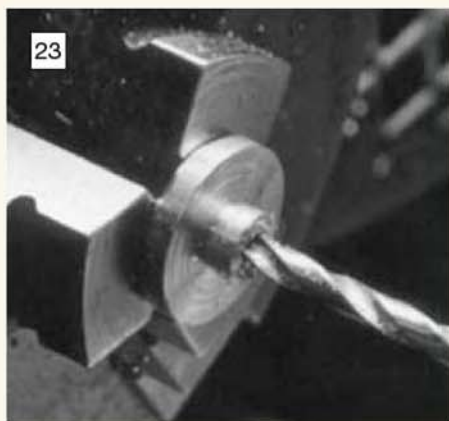
The arbor is laid across the plates to determine its correct length.



The position of the second pivot is marked using a screw head slotting file.



The pivots must be brought to a smooth, parallel, highly polished finish.



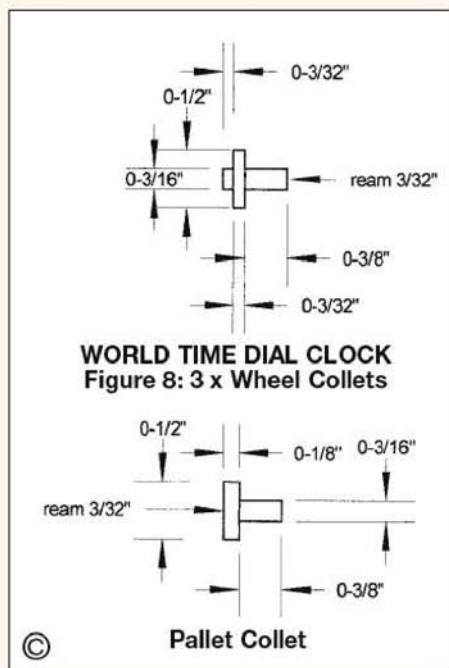
It is important to machine the wheel seat and drill and ream the bore without disturbing the work.



A group of collets; note the undercut face to ensure the wheels seat truly in position.



Adjustable crutch collet and outer sleeve.



The shoulder should be slightly undercut; the wheel centre must fit up against the maximum diameter of the collet. When the seating has been machined, the collet should be reamed $\frac{3}{32}$ in. (photo 23).

The pallet collet is machined in the same way, but there is no seating. When the pallets and

crutch are made, they are reamed $\frac{3}{32}$ in. and are fixed to their respective collets with two 10BA screws. A group of collets is shown in photo 24.

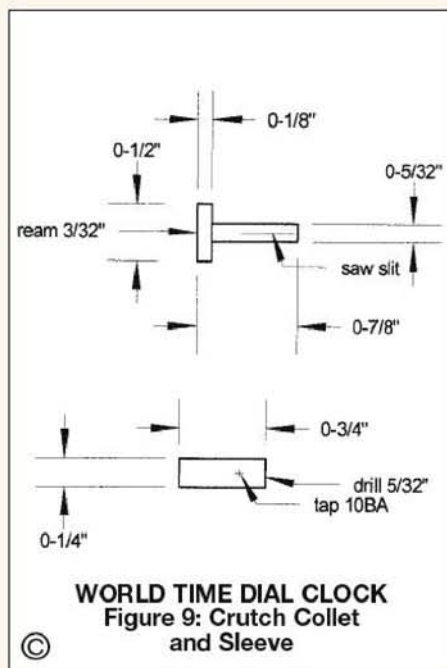
Adjustable crutch collet and outer sleeve

The crutch collet is machined in the same way as the other collets; it is only the dimensions which differ. The collet sleeve should also be slit horizontally for $\frac{1}{2}$ in. length using a fine piercing saw blade (fig 9 and photo 25). The outer sleeve is drilled $\frac{5}{32}$ in. and cross-drilled 1.45mm or No. 54 and tapped 10BA at one end. In use, this outer sleeve is positioned on the collet sleeve and a 10BA steel screw is used to pinch the inner sleeve and tighten the collet on the pallet arbor when the clock is put in beat.

We have yet to machine the actual pallet arbor, but until the back cock has been made and fitted in place, we have no accurate plate-to-plate dimension.

When the wheels are ready for fixing to their collets, three equi-spaced 10BA holes are drilled in the wheels. The wheels can then be used as a jig to drill the collets. The holes in the collet are then tapped 10BA, and the holes in the wheel opened up to 10BA clearance (1.8mm or No. 50). Round head brass screws should be used.

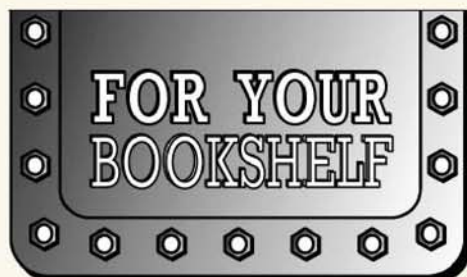
With the wheel arbors and collets made, constructors who are cutting their own wheels should make a start on the wheels and pinions which will be required to depth the train, the next job. The escape wheel should be cut with a



No. 6 recoil cutter.

Constructors who are purchasing the wheels and pinions ready cut should have them to hand. In the next part we will depth the train, drill the pivot holes and make the pallets and the eccentric bush.

●To be continued.



HORNBY

The Official Illustrated History

by Ian Harrison

with Pat Hammond

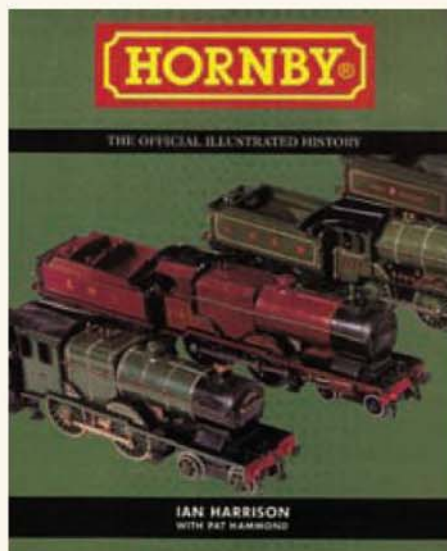
Published by Harper Collins

ISBN 0-00-715173-X; Price: £20.

I suspect that for many readers an interest in railway locomotives and railways was fostered, if not actually begun, by ownership of a model

train set. From just after World War One to the present day one name has been synonymous with good quality model trains: Hornby. This book is subtitled *The Official Illustrated History* and is a thoroughly researched and interesting source of reference on what must be one of the most addictive forms of toy ever devised.

Model engineers can sometimes be a little scathing of those who buy their locomotives, rolling stock and track 'off the shelf'. LBSC was always quick to differentiate between his small locomotives and the 'model locomotive', an expression he tended to associate with crudely constructed toys. However, 'toy trains' quickly evolved to become true representations of the prototypes that inspired them and, by the use of modern production techniques and materials, have become truly remarkable works of engineering in their own right.



This book commences with an introduction outlining the reasons for Frank Hornby entering the toy train market and the subsequent history of the Hornby brand name. This is followed by four detailed chapters, which look at the most significant developments to take place during specified periods. Chapter one deals with the years 1901 to 1937 and the prominence of Gauge 0 during that period. Products reviewed range from the simple clockwork trains of the time to the beautifully detailed, electrically driven LMS *Princess Elizabeth*.

Chapter two covers the period 1938 to 1964 and the dominance of the Dublo (00) system. Just as Gauge 1 reached its zenith with the introduction of *Princess Elizabeth*, so the Dublo system reached its peak during these years with the introduction of *Bristol Castle* and super-detailed rolling stock. Unfortunately the superb detail and quality of the product did not stave off the reality of the market place and Meccano, owners of the Hornby name, passed into the hands of the Lines Brothers. Lines Bros. were owners of Meccano's greatest competitor Rovex Scale Models Ltd. who made Tri-ang Railways.

Chapter three relates the history of the company for the period 1964 to 1980 during which the name changed from Tri-ang Hornby to Hornby Railways. The difficulties of amalgamating two incompatible and until recently, competing systems are analysed. Also the effect Rovex, who were basically toy makers, had on the product is noted. However, during this period many new designs were introduced to satisfy the more traditional style of customer.

The final chapter deals with the period 1981 to 2002. The name changes again to Hornby and the products become more detailed and backward looking; perhaps a realisation that many of the customers for Hornby products are now adults. The book concludes with a useful appendix, index and bibliography.

The work is illustrated throughout with high quality, coloured photographs and reproductions of period catalogue material. For anyone brought up with a Hornby Dublo train set, or is still growing up with one, it is a delightful and informative work.

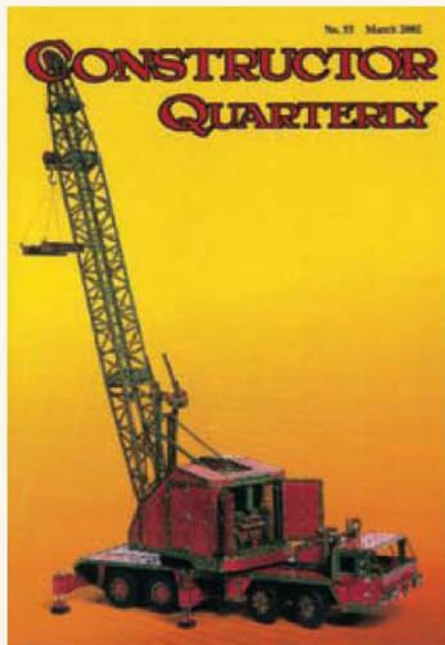
Hornby – The Official Illustrated History (ISBN 0-00-715173-X) by Ian Harrison with Pat Hammond is available in hardback for £20. It has 192 pages and is published by Harper Collins Publishers; tel: 020-8741-7070; fax: 020-8307-4555. *Neil Read.*

CONSTRUCTOR QUARTERLY

Edited by Robin Johnson
Annual Subscription £48.

Meccano! The very mention of the name provides fond reminiscences for those budding future engineers, model and full-size, who spent many happy hours during their childhood building models with this innovative construction toy. The brain-child of Frank Hornby, the toy was first manufactured in 1901 and was later produced in a purpose-built factory in Binns Road, Liverpool.

Binns Road was to become synonymous with Meccano products and would later become world-famous as the producer of Hornby Trains and Dinky Toys.



Meccano Magazine was also launched to give advice on its use and to also encourage purchase of the sets, and this fine publication was, for a time, run by Model and Allied Publications Ltd., who also used to publish *Model Engineer*. Indeed, your reviewer can remember sending off to MAP for a sample copy of the relaunched title after seeing an advertisement in a hobby magazine. The writer must also confess to still having two Meccano sets stashed away in the loft; a classic green and red coloured set from the 1960s (inherited from his brother!) and a later one bought in the 1970s when the parts were changed to blue and yellow.

Regular readers will remember a recent two-part feature in which Mike Dennis built a wonderful Meccano model of the Volks *Pioneer* Tram, the prototype of which ran on the sea front at Brighton at the turn of century. Still, Meccano products have featured within these pages many times over the years so we feel more than justified in bringing readers' attention to *Constructor Quarterly* which is quoted as being "The Meccanoman's Favourite Magazine".

Editor, Robin Johnson sent three sample issues to us, and I must say I was mightily impressed by what I saw. Printed on high quality paper with colour throughout, the approximately 56 page issues contain features on the most amazing Meccano models you are ever likely to see. How about 7ft. 6in. long *Titanic* or a 1:13 scale Ransomes & Rapier W1400 Walking Dragline Excavator? Or perhaps a 1:10 scale 232 U1 Steam Locomotive at 2.5 metres long or a Galleon 3ft long x 3ft. tall? These, and many other models, are fully described and, together with some non-model features (i.e. *Engineering and the French* and "Sleuthing Duke Street") make for a fascinating reading package.

With only four issues per annum at a rather hefty £48 subscription fee, dedicated Meccano fans will probably be the only takers. However, if you do take your Meccano seriously, then I can wholeheartedly recommend this quality publication. Further details on subscribing are available from the Editor: **Robin Johnson** at 17 Ryegate Road, Crosspool, Sheffield S10 5FA; tel: 0114-2605017. *Kelvin Barber.*

FROM DEVON TO DORSET
Story of the Lyme Regis Branch
by Martin Smith
and George Reeve,
Published by Irwell Press
ISBN 1-903266-37-8; Price £9.95

Builders of Kelvin Moonie's 5in. gauge 4-4-2 London & South Western Railways radial tank locomotive would do well to obtain a copy of this new book. It provides valuable reference material, especially if the builder is intending to include additional detail in their model to that already provided on the basic drawings. Its 60 pages include some 70 black and white photographs and reproductions of the 1920s Ordnance Survey and other maps of the route from Axminster to Lyme Regis.

Following the south west boundaries of Dorset and Devon, and neither completed nor opened to traffic until 1903, the Lyme Regis to Axminster branch (of just 5 'crow' miles) was one of the last branch lines to be constructed. It continued to operate until its closure in November 1965.

As a current builder of the radial tank I have found this publication invaluable in providing details of the fixtures and fittings. I regularly visit the Bluebell Railway in Sussex but obtaining high level, detailed pictures of the only preserved engine in existence is not permitted as the railway does not allow even *bona fide* builders of models to climb up on the engines to obtain their reference photographs.

This book would also be of value to the smaller scale modeller keen on building a working layout of the line between Axminster and Lyme Regis. Numerous detailed line-side photographs of the station buildings, the Cannington Viaduct and signalling equipment are accompanied by comprehensive information on the gradients, track details and timetables, etc.

The book was launched 29 August 2003 at the museum in Lyme Regis. I was particularly fortunate to learn about the launch from Dave Cox, a member of the Stoford Miniature Locomotive Society. Dave Cox exhibited his two fine, unpainted Adams radial tanks, one in 3 1/2in. gauge, and the other in 7 1/4in. gauge, at the recent Bristol Model Engineering Exhibition.

Racing to Lyme Regis on 29 August, I was able to make the launch time and after parking my car I was able to get my copy signed by one of the authors. I also showed him pictures of my own Adams locomotive which is still in the construction stage after 7 years work.

Printed in A4 portrait format (vertical), the front page shows No. 30582, passing under a bridge. The back page shows Cannington Viaduct photographed at ground level in 1903. Written by Martin Smith and George Reeve, this book is published by Irwell Press Ltd. of Clophill, Bedfordshire MK45 4 BE; ISBN 1-903266-37-8; price £9.95.

I consider this volume to be a valuable contribution to my existing collection of other railway reference books. It sits nicely on my bedside cabinet without intruding on the space reserved for the early morning cup of tea! Woe betide the lady of the house who places a cup and saucer on this book. *Harry Paviour.*

Neville Evans

discusses the tender brake gear before moving on to a progress report on *Penrhos Grange*.

●Part XXXIII continued from page 688 (M.E. 4210, 12 December 2003)

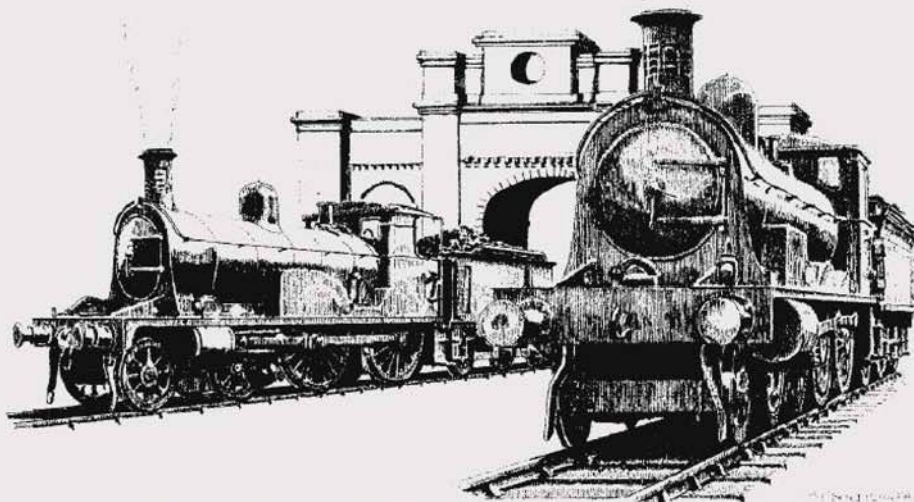
The tender brake gear posed a few problems. The operating mechanics are actually of a rather interesting design. The brake blocks are operated by rods in tension and these rods are connected by means of several compensating levers. The two sides operate independently, and the only adjustment is by means of a pair of turn buckles on the front rods. A pull on those rods should operate all three brake blocks on that side evenly. In fact it took me some time to work out exactly what did happen (sometimes I can be a bit thick!)

I have annotated the length of the rods with the letter 'C', which as many readers will know means 'circa', around or approximately, because I think that each different tender will have slightly differing lengths for the rods which are best measured on the job. The second problem lies in the big, heavy and very expensive capstan that someone saw fit to place on the right-hand side of the tender in order to operate the brakes. Why the wheel is made to turn horizontally and therefore has to operate through a bevel or some-such, I cannot fathom. Just about everybody else operates the tender brake by means of a vertical screw which simply has a bit of round rod stuck through it and bent at right angles to form a handle of sorts. Perhaps they found a source of ex-WD surplus Clyde *Puffer* steering wheels which one of the directors of the Highland Railway happened to have in his garage.

Apart from the aforementioned wheel, the design of which incidentally I haven't yet succeeded in finalising, (there are no bevels small enough on the market so we may have to make our own, or use a crank arrangement using a geometric lock to hold the brakes on) the brake gear is perfectly straightforward. The brake blocks are available from Practical Scale as iron castings. The brake hangers are simple fabrications.

Penrhos Grange

The Dragon has been busy with her new digital camera on Mike's latest magic offering. This is,



THE HIGHLAND RAILWAY JONES 'BIG GOODS' & LOCH 4-4-0 LOCOMOTIVES IN 5in. GAUGE

of course, the earlier Great Western cross-head. All I can say is that even Dave Noble was impressed and that takes a bit of doing. Investment castings in stainless steel will be available by the time you read this and the 2-cylinder GWR engines are forging ahead now that the two wee 'Teuchters' are about finished. Simon has finalised his valve gear redesign for the benefit of those among us who are starting from scratch on this locomotive.

The rethink includes shortening the eccentric throw to 0.280in. which means that a new eccentric is called for. I am taking the opportunity to include the eccentric sheave drawing in this issue, as well as a brief description of the machining thereof, as there is no point in assembling the driving wheels on their axle without putting the sheaves on first. This sentence has been entered for the 'understatement of the month' prize of a half pound of facial egg.

The cylinders are to be a new pattern as well. I have decided to do both the basic 2-cylinder designs, that is the *Grange* and the *Manor*, which have 19.625in. bore centres with enlarged steam chests and the slightly smaller cylinders that were fitted to the rest of the locomotives, that is the 'Halls', the heavy freight engines, the 'Moguls' as well as the larger outside cylinder tank engines.

These have 17.625in. bore centres and look rather different to the previous type. These smaller castings will also fit the 'Modified Halls' and the 'Counties'. I can't expand upon this statement at the moment, as negotiations are still in progress. Suffice it to say that I'm fully in accord with Doug Hewson's comments about cutting down on build time of model locomotives by whatever means are available, as well as improving the performance and appearance of the modern model.

There will be new smokebox saddle patterns of appropriate size to fit all the outside cylinder locomotives. These castings will include the exhaust and live steam passageways, where applicable, probably as bosses and provision for drilled holes of appropriate size. Those engines which use outside steam pipes will be catered for by the use of removable bosses on top of the steam chests and I hope that this set up will be almost indistinguishable from the authentic half saddle and cylinder of the full size engine, at a quarter of the price.

The new cylinders lean heavily on Keith Wilson's designs in 7¹/₄in. gauge, which strikes me as an intelligent thing to do. I can remember an apparent aside from him many years ago, when K. N. Harris was advising people to use



Mike's brass pattern for the lost wax stainless steel early type GWR crosshead castings.



huge steam pipes 1/2in diameter (how do you bend them?) Keith remarked that his 'King' in 5in. gauge could pull a huge load at high speed up a steep incline and that the main steam pipe was 1/4in. outside diameter. Did I hear a little voice say "Nuff sed!"?

As I write, 'Mike the patterns' is engaged upon lost wax patterns for the GWR tender axleboxes and spring hanger assemblies in furtherance of this policy of superior castings, that will, with a minimum amount of labour, produce a superior article. Which is what I hope we are all striving towards.

Eccentric sheaves

These devices stem from the very successful design that I used for the 'Highlanders'. The two sheaves are pinned together as before and are held onto the driving axle by means of a pair of grub screws. I suggest that the sheaves be machined from mild steel and case hardened around the wearing surface. This, combined with a cast iron strap, should produce an extremely hard wearing eccentric. The machining of these particular artefacts is quite straightforward. Make certain that marking out is carried out in a meticulous manner (No. 7830?) and that particular attention is paid to ensuring that the sheave working face diameters are held to close limits: of this, more later.

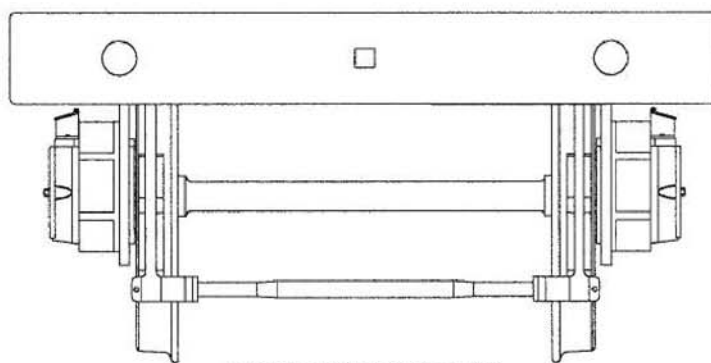
The alternative which I am waiting to try out is to use 'Ivor the Engine's' ball bearing or roller system. I shall include a drawing of this set up for your inspection in the next gripping instalment. It works really well on Ivor's two GWR locomotives. The 'Manor' in particular has run faultlessly for many years of really hard work. I have, however, introduced a modification in that the sheaves are now secured with Loctite and pinned to the axle.

Plain bearing sheaves

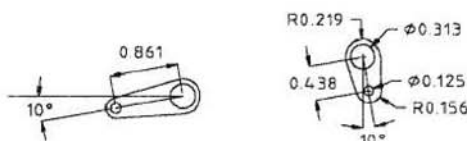
The sheaves are turned from a length of 2in. diameter mild steel. Grip this in the 4-jaw independent chuck, face off, and turn down to 1.75in. diameter. Part off about 3 1/2in. of the turned bar, sufficient for four sheaves. Reverse this piece in the chuck, and set to run true with a dial test indicator (dti). Face off and centre lightly, preferably with a 1/8in. diameter Slocumbe centre drill. Remove from the chuck and scribe an accurate diameter across the face, using a centre square. Scribe a 0.280in. radius circle with dividers, see fig 1.

I always check the radius to which the dividers are set by lightly scribing a circle on a piece of scrap metal and measuring the diameter using electronic calipers and a magnifying glass. I say diameter rather than radius, because that way, you automatically get twice the accuracy. Centre pop where the scribed circle meets the centre line. We now mount the piece in the chuck, centring the offset spot, first against a centre held in the tailstock, and then accurately, using a needle as a wobbler against the dti. Make certain that the accurately faced back of the piece is hard up against the body of the chuck. Centre deeply, drill 5/8in. and bore 3/4in. to a tight fit on the axle.

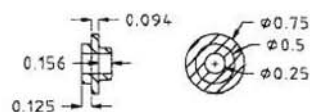
Reset the 4-jaw chuck and set the outside of the job to run true against the dti. Face off lightly and turn down to 1.625in. diameter for 1/4 inch.



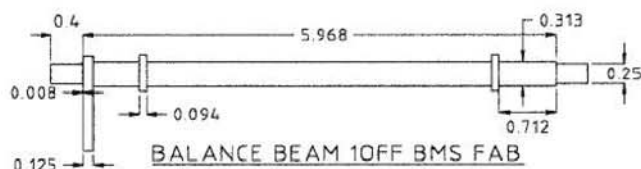
TENDER BRAKES REAR



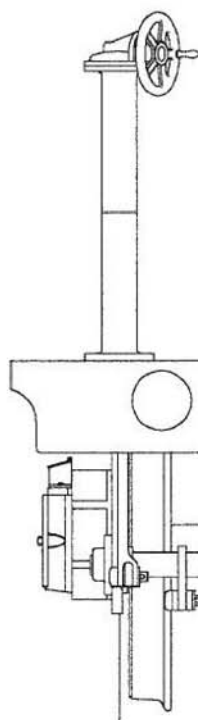
BALANCE BEAM LEVERS



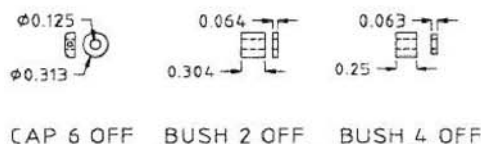
BALANCE BEAM BUSHES 2OFF GM.



BALANCE BEAM 1OFF BMS FAB

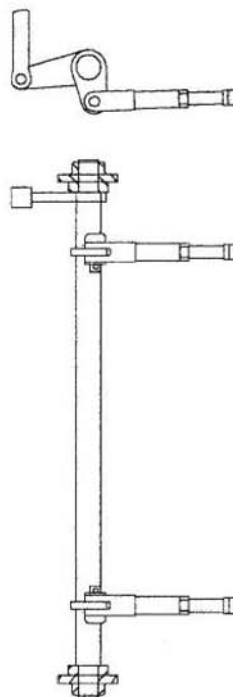


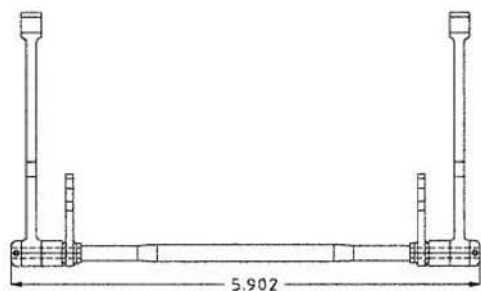
TENDER BRAKE GEAR FRONT



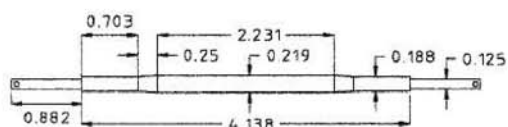
CAP 6 OFF BUSH 2 OFF BUSH 4 OFF

BEAM BUSHES BMS

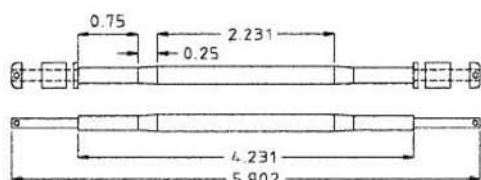




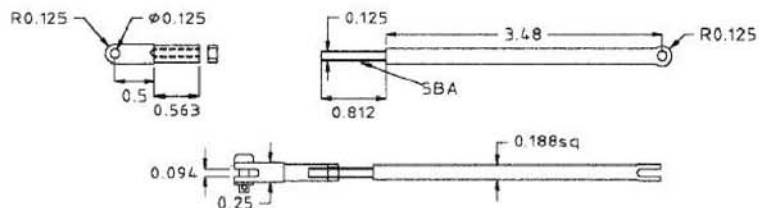
FRONT BEAM G.A.



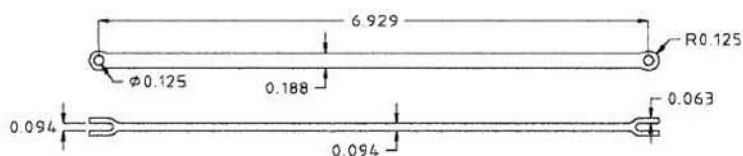
FRONT BEAM 2 OFF BMS



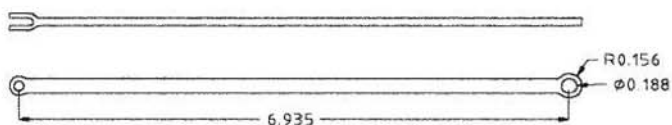
REAR BEAM 1 OFF BMS



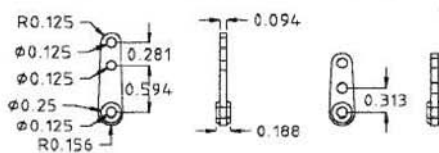
FRONT TIE ROD 20FF BMS



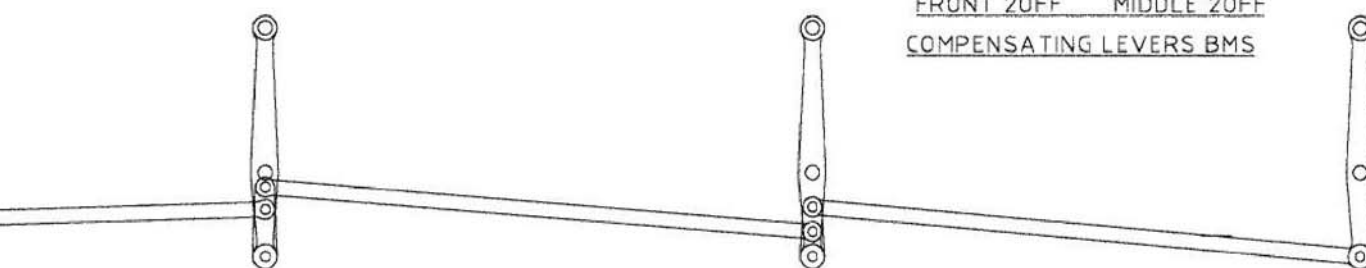
MIDDLE TIE ROD 20FF BMS



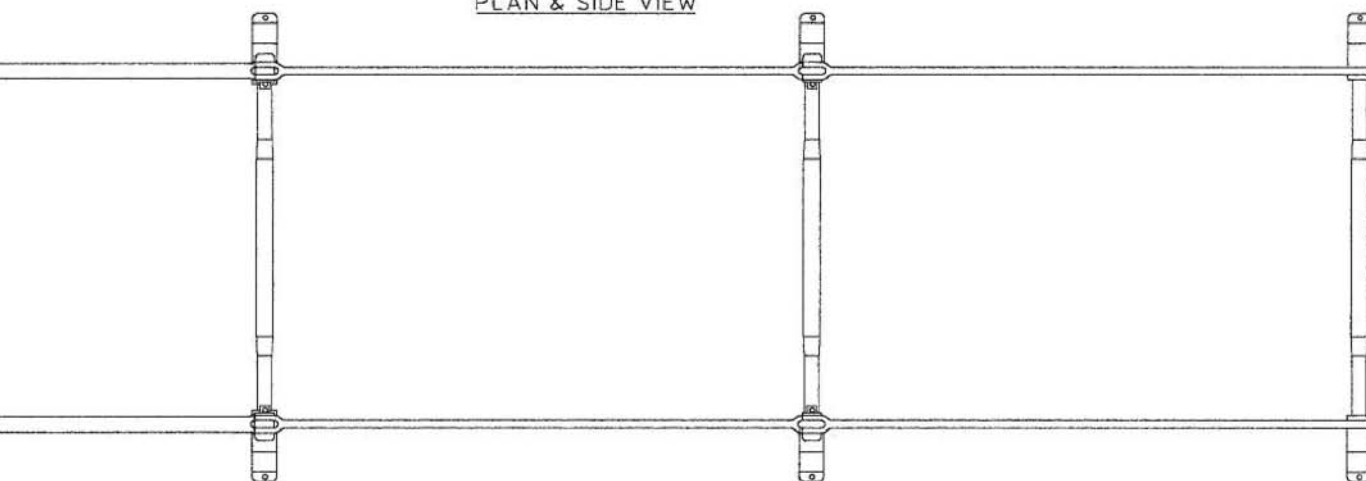
REAR TIE ROD 20FF BMS



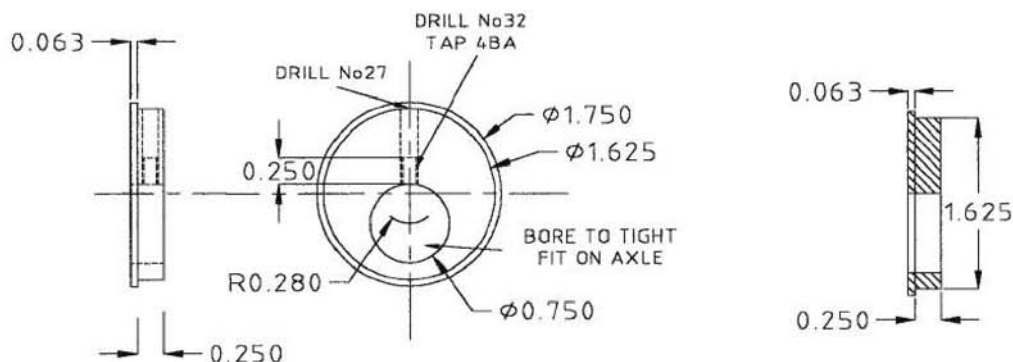
FRONT 20FF MIDDLE 20FF
COMPENSATING LEVERS BMS



PLAN & SIDE VIEW



TENDER BRAKE GEAR



6868 "PENRHOS GRANGE" PLAIN ECCENTRIC SHEAVES

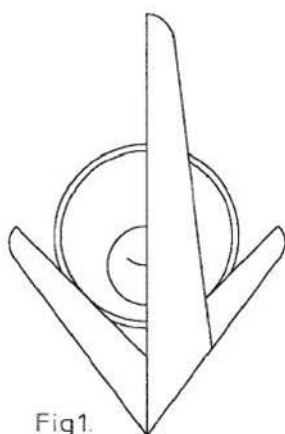


Fig1.

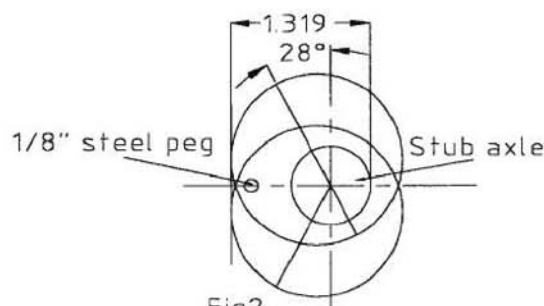


Fig2.

Setting the angle of advance

How to use a centre square to mark out an eccentric

Part off just over $\frac{5}{16}$ in. and ditto repeat three more times. Face off the back of the sheaves to give a total thickness of $\frac{5}{16}$ inch. The next job is to drill down No. 32 on the major diameter and open out to No. 27, leaving $\frac{1}{4}$ in. at the bottom of the hole to be tapped 4BA for a grub screw. I've used 4 rather than 5BA because you have a thicker Allen key, so you can do it up more securely before the key bends.

The sheaves must now be set at 124deg. to give the all important 28deg. angle of advance. From the diagram it can be seen that the widest faces of the sheaves must be set exactly at 1.319in. from

the back of the axle. *Provided that the diameters of all the sheaves are held to exactly 1.625in. this will set the angle of advance to 124 degrees.*

An alternative method would be to draw an accurate diameter line on the widest part of the eccentric, and to align that line with lines drawn at 124deg. on a sheet of paper. Make certain that the stub axle is centred over the meeting point of the two lines. Slip the pair of sheaves over a short piece of $\frac{3}{4}$ in. axle material, lock up one sheave with a grub screw and set the other to the required distance. I use electronic calipers and a piece of ground bar. Clamp up, and drill through

both sheaves, as in fig 2. I find it easier to drill the top sheave separately before drilling through the bottom. Turn up a $\frac{1}{8}$ in. pin to press fit. Make sure that the two rims are on the outside when you perform this operation.

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 details.

●To be continued.

EASY WORK SETTING IN A 4-JAW CHUCK

Neville Evans' accompanying description of machining the eccentrics for *Penrhos Grange* prompts the following note which could be helpful to readers who may not have had a 'formal' workshop training.

Not everyone finds it easy to set work in a 4-jaw independent chuck - but it is, really, provided you remember the Golden Rule. Only ever adjust the pair of jaws in line with the indicator. It is only by doing so that you can see what you're doing.

The photograph alongside was taken of a set-up similar to that described by Neville. First note that the jaws are aligned with the dial gauge, secondly note that a convenient spare centre with a sharp point is set into the centre-pop mark in the workpiece with its tail end supported on the



tailstock centre. Note also that the dial gauge is as close to the workpiece as possible.

All that is now necessary is to adjust the two jaws to halve the error along the vertical axis. Next bring the other pairs of jaws vertical and halve the error along this axis, slackening one jaw and tightening the other as necessary. Return to the first pair of jaws and repeat. In my experience, it only takes about three rounds to get the work set to within a thou. or so.

If you need to get a diameter true then set the dti to run on it and proceed as above. If you are working to the tool tip rather than a dti, then only adjust the jaws (usually along the horizontal axis this time) which are in line with the tool - it really is a quick and easy process.

Mike Chrisp.

PETE'S PAGE

Peter Spenlove-Spenlove

describes how to go about making a set of gauge blocks.

●Part II continued from page 699
(M.E.4210, 12 December 2003)

The following notes may be of interest to readers who would like to make some 'Joey's' and have evening class access to a surface grinder.

In our works tool room, we had access to offcuts of alloy steel which could be hardened, and powerful milling machines to quickly size a chunk leaving a little stock for heat treatment and grinding. At home we may have some gauge plate or silver-steel which can be hardened and lightly tempered to pale yellow to remove some of the quenching stresses.

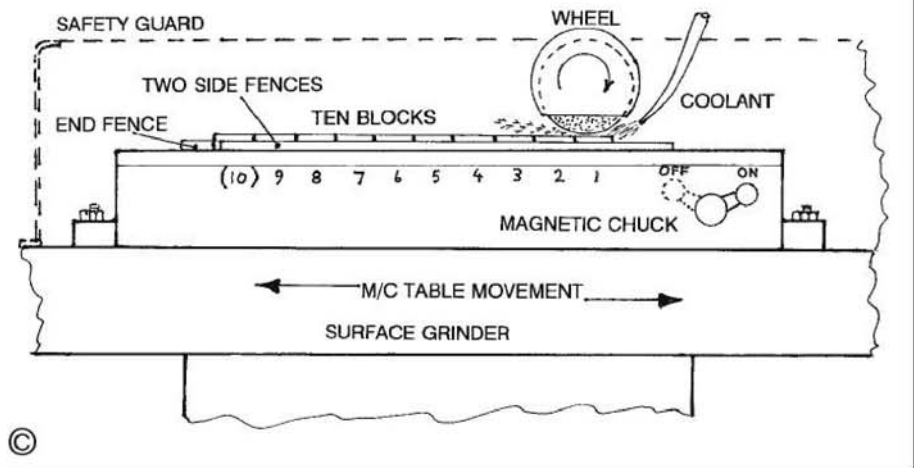
It is more likely that mild steel will have to do. If you can, get the pieces case hardened in a salt bath for sufficient time to give them a deep case, aiming for at least 0.01 inch. When they are returned there should be no scale, so there is no need to make an allowance for it when milling each piece. We had access to a non-distorting type of steel which does not warp or crack as much as mild steel during heat treatment. We used to leave 0.002-0.005in. on each face for grinding. The amount left would depend on the machining marks. A blunt cutter could leave tear marks that could often be quite deep.

Unless you are used to the surface grinder at your night school, I strongly recommend you discuss the job with the tutor in charge. He will know the capabilities of the machine and will help with any safety issues you need to observe. Our surface grinders were fitted with magnetic chucks clamped onto their reciprocating tables. Some magnetic chucks will not grip small parts safely and special adapting pole pieces may have to be used. You may well have to fix up some form of fence to stop the parts flying away at the first touch of the grinding wheel.

With a flood of coolant covering the work, it is all too easy to try and work too fast by taking heavy cuts. Remember that a piece being ground for the first time will have a face in contact with the magnetic chuck which is not completely flat. The magnetic grip will be weak. When you have ground the top face and turned the part over the grip will be much better. Always test the grip of the chuck on the work by turning and pushing the part. Always make sure the grinding wheel is off and stationary before doing this. If the part moves easily a fence is needed. Only experience will reveal whether the magnetic grip is safe.

Always dress the wheel and make sure it is clean and sharp. A blunt or partly glazed wheel is bound to lead to trouble. The local heat will expand the gauge block and cause the wheel to dig in even more and ping — the 'Joey' has shot away! If you can find it again you will see on it a groove and a burn mark on the face. If you are watching a grinder in use, always stand behind the line of sparks and away from the line of the grinding wheel. Most grinding machine

Figure 1 - Grinding a set of ten gauge blocks



GAUGE BLOCKS

operators have, through haste, had work fly away. It is all part of growing up and being British! In severe cases the wheel can burst and then your pay bonus flies away too. You therefore learn to take great care in setting up the work and making sure that all the guards are in place and secure. The use of eye protection is compulsory for those working with grinding machines nowadays and goggles and a face mask are sensible wear.

If you have problems getting enough adhesion to grind the first face of your block, grip it in a machine vice. Once the first face is ground you may find there is sufficient adhesion to grind the other faces off the magnetic chuck. This may be particularly true if your block was case hardened in a pack system and is covered with scale. You may have access to charts or a textbook giving suitable table speeds and lateral feed per table stroke for grinding your parts. I would advise you to ignore them. It is probable that the data was compiled for perfect operating conditions and for those who desire optimum throughput rates.

Slips for use with a sine bar

In order to decide which size of gauge block you need to go with a sine bar, first decide what angle you most frequently use. Some people may need to machine a steam cylinder with an inclined valve face or bore. It has to be marked out and set up on the machine tool. The drawings will give the angle and trig. tables will give you the sine of that angle. For a 5in. sine bar (a common length) multiply the value of the sine given in the table by 5 to give the height of the slip stack in inches. This will give you the length to which your gauge blocks should be ground. I say blocks because it is difficult to grind single tall parts. They tend to topple over even when securely fenced. If you need a thickness of 0.728in., try making a 0.108in. + 0.120in. + 0.200in. + 0.300in. and, while making the 0.108in., make one 0.100 inch. Next you may make a 0.050in. piece and a set of 0.110 to 0.150in. advancing by steps of 0.010 inch. The choice is a personal one and depends up on your particular needs.

When a block has been finished to your satisfaction, use an etching pen to mark the true size. It is difficult to make a piece to a pre-chosen size. To add to a set, use pieces cut from a set of feeler gauges but make sure they are flat and not damaged. The more pieces used to make up a

stack then the more errors will be introduced which could either accumulate or cancel one another to a greater or lesser degree. In my experience, the errors tend to become additive with thin feeler pieces. The sine bar end roller is just rested on the block and will not compress pieces that are burred or slightly bowed.

If you have an entire evening to use the surface grinder, there is a quick way to prepare a whole series of blocks. First the milled and hardened blocks must be ground on one face to a good finish. Next, put them all finished face down on the magnetic chuck (fig 1). Grind them all to the thickest dimension required. Remove one without disturbing the others or switching the magnetism off — stop the grinding wheel before attempting this. Restart the wheel and coolant and grind the remainder down to the next smaller size required and remove one more. Carry on in this way until the last one is done. A good surface grinder will have an accurate feed dial index and so will produce accurately graduated blocks of a standard acceptable to most home workers.

Before grinding a batch of blocks in the manner described, you must be certain the magnetic chuck face is clean and freshly trued up. In a tool room we would test the chuck all over by fixing a dial test indicator to the wheel head with the plunger tip on the chuck. Set the table (not the wheel) in motion and note any errors in the chuck as it moves to and fro and from side to side. For accurate work we invariably had to clean up the chuck by taking a 'lick' (perhaps 0.0005in.) off the face. You cannot take a chuck off a machine and put it back and expect it to be perfectly true. Magnetic chucks are made with very thick top faces to permit them to be regularly trued up and still have a reasonable life expectancy. It is usual to leave a magnetic chuck permanently fixed to one surface grinder all of its working life. Another machine would deal with vice or table mounted fixture work using the tables T-slots as you would on a milling machine.

Incidentally, the list of gauge block sizes listed last time in the table published in Part I, is not the only combination. Makers of sets of blocks issue them in dozens of variations with up to 100 pieces in steel, hard chromed steel and carbide. Most are rectangular but one firm makes square gauge blocks, with a hole through the middle for easy stacking.



BURRELLS SOME NOTES ON A COMPANY AND ITS PRODUCTS

Martin Wallace

describes the steam tractors, steam rollers and steam wagons made by this famous company.

● *Part III continued from page 571*
(M.E. 4208, 14 November 2003)

In this last part of the current short series concerning the celebrated works of Charles Burrell & Sons Ltd. of Thetford, Norfolk we will consider their steam tractors, steam rollers and steam wagons. All the engines in this review are rated 4nhp (nhp = nominal horse power), a figure which relates to the cylinder(s) diameter of the engine. Burrells cast cylinders in 4, 5, 6, 7, 8, 10nhp sizes which covered most but not all ratings as they made a handful of 3nhp engines and a few exceeding 10nhp.

The nominal horse power rating also applied to their boilers. I assume a 4nhp boiler was of dimensions best suited to a cylinder of the same rating given good coal and normal circumstances. Anomalies are not infrequent; for example a 6nhp cylinder might be fitted to a 7nhp boiler. Since engines were priced by nhp it is possible that with a 6nhp cylinder and a 7nhp boiler a customer might be getting rather more for his money than would have been usual. While traction engines and road locomotives were categorised by nhp, rollers were classed by weight.

Nominal and brake horse power

It might be prudent for those new to *Road Steam* to explain the term 'nominal horse power'. On a single cylinder engine the nhp is derived from the cylinder bore alone and, as I understand it, is simply the square of the diameter divided by ten. Remarkably the formula $nhp = (D^2/10)$ takes into account neither the stroke of the crank, the piston speed (rpm), nor the pressure at which the steam is applied. Thus the nominal horse power of an engine with a 9in. bore is 81/10 or 8nhp. In real

terms it is hardly a quantitative figure but is useful as a term of comparison of engine output.

The term bhp or 'brake horse power' is the power available to do useful work at the flywheel and is reckoned to be 4 or 5 times the nhp. An 8nhp engine thus produces some 35 to 40bhp, and considerably more if required to do so for short periods.

The formula for a compound engine is a little more complex but still relies on the cylinder diameters only.

First steam tractor

Burrell's first steam tractor was probably made just before the turn of the century and a drawing survives of their experimental 4nhp 'Special Light Traction Engine' which was unusual in that it had a vertical boiler. It had Ackerman steering and, rarely used by Burrells, trunk guides in the compound motion. Feed water was contained in a tank at the front over the cylinders, and the coal

at the rear of the engine adjacent to the driver.

The engine was never sold and it is believed to have been used to transport goods to and from the station. The engine does not survive but two excellent representations of it have been built, one by Eddie Lancaster (**photo 1**) and the other by Don Grey. Both have been illustrated before in *Road Steam Out and About Christmas specials*.

Gold Medal Tractor

The 4nhp 'Gold Medal' 5 ton tractor will be well-known to readers I am sure. Burrells won the Gold Medal in the RAC trials of 1907. The notion of a 5 ton tractor however, goes back to 1903 when a relaxation of legislative restrictions was introduced for light engines. Such machines could then travel at 5mph rather than 4mph, and could be one-man operated.

The first 5 ton tractor to be built was Works No. 2808 and was fitted with direct geared steerage which avoided the use of steering chains. A model of the third tractor built, Works No. 2831, which was sold to Smart & Son of Blandford 14 July 1906, is illustrated in **photo 2**. Since Burrell records list new parts being despatched to convert most of them to the more usual chain steering, it must be assumed that this type of steering was less than successful. The picture shows a splendid pair of 'Meteor' road locomotive headlamps exactly as fitted in the works photograph of the prototype engine when new.

Most Gold Medal engines had an 8¹/₂in. stroke with 4¹/₂in. high pressure and 7¹/₂in. low pressure cylinders. No less than 203 compound 5 ton tractors were built between 1906 and 1927 and probably more engines were built to this specification than any other. The first 18 had a working pressure of 180psi but the remainder have 200psi boilers. The grate contributed 3sq.ft. to the 65sq.ft. total heating. The engines were able to haul 12 ton loads up a 1 in 18 gradient.



Eddie Lancaster's fine 6in. scale 'special light traction engine' complete with wood block back wheels.



A 4in. model Burrell Gold Medal tractor with direct gear drive steerage. This fine model is the work of John Anyon. Note the pair of 'Meteor' road locomotive headlamps fitted as per the works photograph of the prototype.



The lack of painting and lining draws the eye towards engineering details. Note the flywheel brake and the cylinder exhaust from underneath the LP valve chest. She is Works No. 3355 built January 1912.



No single cylinder Gold Medal tractors have survived in the UK, this one was a visitor and has now safely returned home.

All were double geared. The 3-speed engines had gear ratios of 24.4, 13.6 and 7.6 to one. They were very successful little engines.

Frost damage

The cylinder of a Gold Medal tractor recently and regrettably suffered irreparable frost damage requiring a new one to be cast. No small undertaking, this was a great credit to all concerned. The patterns, together with a casting from them, are in the splendid Burrell Museum in Thetford making a visit worth while to see them alone. A telephone call to the museum before you set out is worthwhile, as they are not open every day, especially in the winter.

A single-cylinder Gold Medal tractor was made and I understand two have survived in New Zealand. Happily one of them came to the UK recently and attended several rallies. Shown in photo 4, it is a super little engine. The single cylinder version weighed less than 5 tons but in working order, the compound engine was notably overweight, particularly if fitted with a third speed and a canopy.

In preservation a great number of the surviving Gold Medal tractors have been converted to showman's specification. Burrells list only 11 tractors built with dynamos and extra long canopies but, of course, many were converted during their working life, so some engine owners may be forgiven.

Rollers

A steam roller is as fine a piece of engineering as any engine and it is a pity that so few models of steam rollers have been made. Sadly, a great many surviving rollers have been converted either to tractors or to full showman's specification. The temptation for roller owners has all too often been too great, particularly as we shall see when Burrell rollers shared so many parts with their tractor brothers. Burrell rollers were invariably unsprung, single geared to the back axle, and did not have differentials. Conversions are not too hard to spot at rallies.

My understanding is that there are 5 classes of Burrell rollers. In weight order, first were the 6 and 8 ton rollers which used the steam tractors' cylinders and motion, then the 'A', 'B' and 'C' rollers which used the cylinders from the 5, 6 and 7nhp range of engines respectively.

The roller wheels were usually made from cast iron which could be steel plated at the request of the customer. When worn, the steel plate might then be replaced returning the wheel to as-new specification. On earlier engines the rim was cast around the spoke ends but in due course bolts were substituted so the rim could be replaced as and when necessary.

A point not often appreciated is that the back rolls are not of uniform diameter across the rim but reduce by about 1in. towards the middle of the engine. This was to account for the road

camber which was then more noticeable than it is today. Road engines had a similar conical wheel circumference to match the road profile. Just how the Burrell craftsmen managed to roll the 'T' rings in this manner is, as far as I know, not recorded. I guess it might have been easy enough to roll the inside back 'T' ring to a smaller diameter than the outer one, but just how they got the two outside diameters to taper so they mated up correctly is a mystery.

The roller illustrated in photo 5 is Works No. 4025 and was completed in April 1926. Listed as 8 tons but in working order she was nearer 8.5 tons, and likely to be 9 tons with the scarifier fitted. She was sold to F. Sharpe of Blandford in Dorset. The motion was rated at 4nhp with the same cylinder and 200psi boiler as the Gold Medal tractor. The back rolls were 5ft. diameter by 16in. wide. Most were fitted with a Price two-tyne scarifier.

The first 8 ton roller was built in 1907 and the last in 1929. However, while 203 tractors were manufactured only 22 rollers were made. All the rollers made prior to 1914 were exported. The numbers were boosted a little by a few road engines being converted by Burrells or others to rollers, rollers generally enjoying a longer working life than road engines as their weight was a virtue and speed was not of the essence. One example was Works No. 3622, (photo 6), the donor engine being a Gold Medal tractor



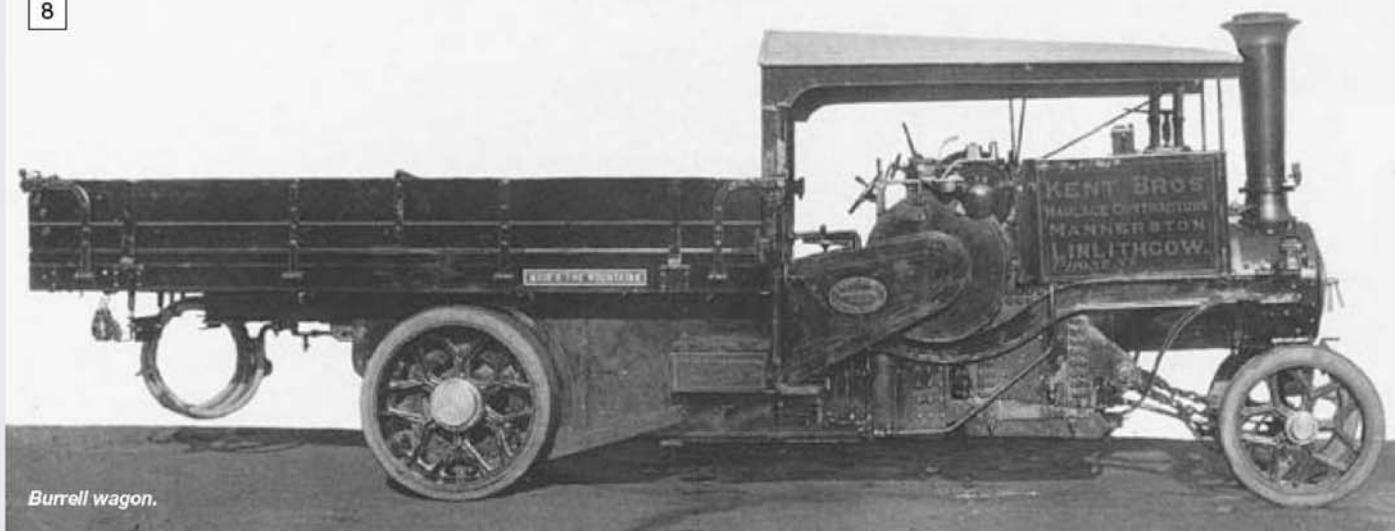
The Burrell roller Pride of Dorset photographed during a visit to her birthplace, St Nicholas Works.



Works No. 3622 was completed in October 1914 and was built as a Gold Medal tractor, being subsequently converted by Burrells to a roller. While 203 tractors were manufactured only 22 rollers were ever made.



One of the last rollers to be built by Burrells. She is Works No. 4061 and was completed in Jan 1927, only three more rollers were to be made: Nos. 4062, 4067 and 4069, all of 4nhp 8 ton specification.



Burrell wagon.

and the result being a three-speed and fully-sprung steam roller complete with belly tank, differential and winding drum. Very few Burrell rollers survive and it is hoped no more are lost through conversion to tractors.

Steam wagons

All the Burrell wagons made were overtypes with the exception of the first wagon they built which was a solitary undertype. Some 20 drawings survive dated either 1900 or 1901 of this undertype wagon or 'Lurry'. I am not sure what to make of 'lurry' (it is clearly spelt thus on the drawings) and wonder if some parties in the Burrell drawing office were in some way related to parties in the Savage drawing office at Lynn. Savage spelling could be equally bizarre on occasion.

Since no works number was allocated to the undertype, is not certain if it was ever made. Allegedly it was allotted the same employment given to the experimental 'Light Steam Tractor' to convey goods from the Burrell works to the railway station and vice versa. One wonders how many not altogether satisfactory prototypes Burrells had plying the road to the station. The drawings detail an undertype compound engine, a vertical boiler, and Ackerman steering. It was double geared to the back axle. I hope in due course an enterprising model engineer will adopt the wagon as a project, surely a deserving cause and one of great challenge and interest.

Five ton overtypes

After the undertype no further Burrell wagons were built for ten years, the next wagon did not follow until 1911. A conventional otype wagon, Works No. 3276, it was exhibited at the Royal Norfolk show that year. Four such otype wagons were built. A notable feature was that these wagons had two countershafts, making them effectively four-shaft engines. The crankshaft was fitted with the usual pinions driving the larger gears on the second shaft. The second shaft had the usual differential for splitting the drive to the two chains, but these drove a second countershaft just in front of the back wheels. The transmission between the second countershaft and the back wheels was by means of gears which were placed in a protective casing.



Roy Butcher's superb 4in. scale Burrell wagon. Note the artillery style wheels.

Sensibly perhaps, after the first four wagons, Burrells abandoned the second countershaft and the drive was taken directly from the first countershaft by chains (double drive) to the back wheels. The back axle was 'dead' with the wheels rotating upon it. Subsequent designs simplified the drive still further by putting the differential on the back axle to bring the design broadly in line with the famous and highly successful Foden wagon.

These 5 ton wagons were equipped with two injectors and, if fitted, a feed pump of vertical design in which an eccentric pushed down on the piston and a spring returned it, arranged to allow the mechanism to be disconnected when not required. A variety of wheels were available for fitting during production; these included the spoked traction engine type wheel, a pressed steel plate alternative, and wooden artillery wheels.

Cylinder sizes

The cylinder used on the earlier 5 ton Burrell wagon were HP: 4 1/2 in., LP: 7 1/2 in. with an 8 1/2 in. stroke. these were the same as the Gold Medal tractor, but were later changed to HP: 4 1/8 in. and LP: 7 in. with a 7 1/2 in. stroke. No reason seems to have been given. My assumption is that the wagon's motion would probably be running at noticeably higher revs than the tractor thus producing more power, more than was really needed or maybe than the boiler could happily remain in control of at the higher rpm. I imagine the smaller swept volume combined with higher rpm made all the power the wagon needed.

None survive

As far as is known, and by now it must be pretty certain, no complete Burrell wagons have made it into preservation although parts of two wagons survive, one in Derbyshire and one in Sussex (No. 4008). However, I recall listening to a lengthy conversation next to the 'Gold Medal' cylinder patterns, mentioned earlier, between a number of experienced and well-known engine men. The nub of the conversation was why not cast another cylinder and make a full size Burrell wagon? The cylinder was agreed to be too large, correct it seems for later wagons, and the total cost of such a project was mentioned more than once. However, the bores *could* be sleeved or the cores modified or it *could* be made with the cylinder as it is was on the earlier wagons.

In the meanwhile it is left to model engineers to fly the Burrell wagon flag, an example on wooden wheels is shown in photo 9. The same builder is presently building a similar Burrell wagon in 6 in. scale. I am aware of at least one other model Burrell wagon that is out on the rally circuit but regrettably have no pictures.

Burrells completed their steam wagon portfolio with the 6 ton wagon, the first of which was completed in December 1924. The boiler had a 3 1/2 sq. ft. grate and the pressure was increased to 220 psi. The 4 1/8 in. (HP) and 7 in. (LP) by 7 1/2 in. stroke cylinder was retained, the motion being balanced for speeds up to 400 rpm. All had boiler feed pumps, expanding brakes on the back axle, and flywheel brakes for good measure. Thirteen such wagons were built, the last one being completed in 1928.

The fast disappearing market for road steam engines affected Burrells badly and they hoped to rescue themselves by becoming part of the Agricultural and General Engineers (AGE) combine. Unfortunately this was not a happy relationship and the Burrell works closed on 4 June 1928. No. 4081 was the last engine built at Thetford, the last handful of Burrell engines were made on their behalf by the Garretts works in Leiston, Suffolk. Happily the paint shop, part of the original Burrell works has survived and is today the Burrell Museum which, as I have already said, is well worth a visit.

Finally, I must express my thanks to Ron Dawe for kindly checking these notes.



'HOPKINS' HOT AIR ENGINES

James G. Rizzo

in Malta, completes work on the Mk. 1 engine with details of suitable burners and cooling arrangements before embarking on construction of the Mk. 2 engine.

●Part IV continued from page 679
(M.E. 4210, 12 December 2003)

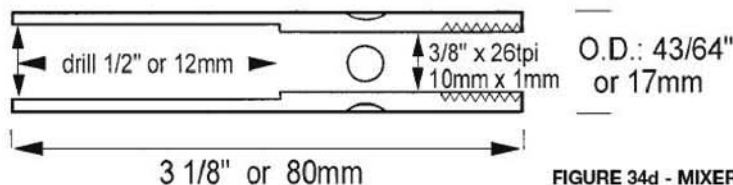
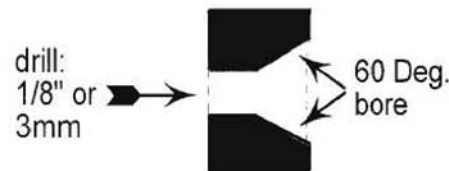
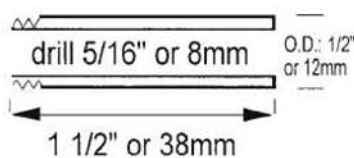
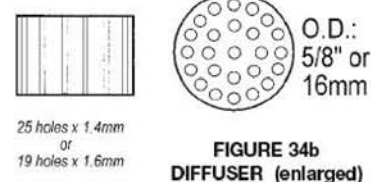
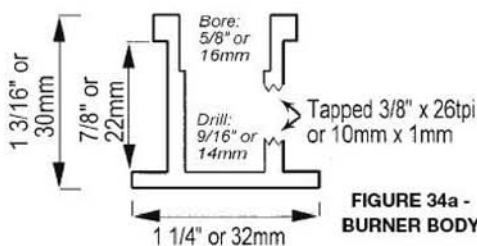
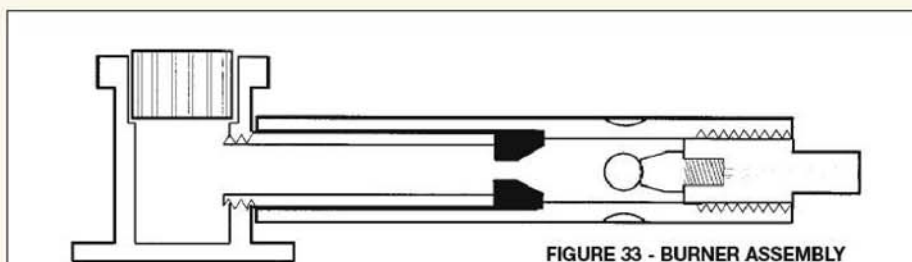
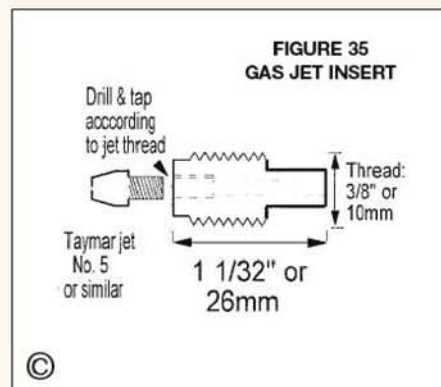
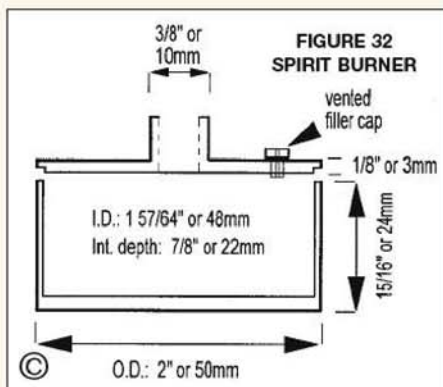
The burner may be fuelled using either spirit or gas. A spirit burner with sufficient heating power may be constructed from a brass tank with filler cap and spout to take a cotton wick. The filler cap should be drilled $\frac{1}{16}$ in. (1.5mm) to prevent build-up of gas (fig 32). A gas burner requires more elaborate construction but is more effective, particularly if the engine is run for long periods, for example during exhibitions. This type of burner is a gas jet burner (fig 33) which requires a ceramic flame diffuser and a mixer tube/gas jet with a shut valve in the connection to the gas cylinder. It is made up of three separate parts, the burner body with extension, the mixer tube and the jet insert. The shape of the burner allows ready fixing to the base by means of two screws.

The burner body, (fig 34a), is machined from a $\frac{1}{16}$ in. (30mm) length of $1\frac{1}{4}$ in. (32mm) brass bar. A $\frac{7}{8}$ in. (22mm) length is reduced to $\frac{3}{4}$ in. (19-20mm) with the remaining $\frac{3}{16}$ in. flared out to $\frac{15}{16}$ in. (24mm). The bar is then drilled $\frac{9}{16}$ in. (14mm) to a depth of $\frac{17}{64}$ in. (28mm). The top $\frac{3}{8}$ in. (10mm) is then bored $\frac{5}{8}$ in. (16mm). The burner body is cross-drilled at a point $\frac{43}{64}$ in. (17mm) from the top and tapped $\frac{3}{8}$ in x 26tpi (10 x 1mm). A ceramic diffuser (fig 34b) such as is used in gas heaters is cut round to fit into the top burner body. If ceramic is not available, a brass diffuser may be machined and drilled with 25 x 1.4mm holes or 19 x 1.6mm holes.

An extension tube (fig 34c) is machined to fit into the side of the burner body which in turn takes the mixer tube complete with the gas jet insert connected to the gas cylinder. The extension is machined from a $1\frac{1}{2}$ in. (38mm) length of $\frac{1}{2}$ in. (12mm) brass bar. The front part is reduced and threaded $\frac{3}{8}$ in. (10mm) for a length of $\frac{3}{16}$ in. (5mm) and then drilled through $\frac{5}{16}$ in. (8mm).

The mixer tube (fig 34d) is slightly more complicated to machine as it involves precision fitting onto the burner body extension and a number of operations are necessary for its completion. The tube is machined from a $\frac{31}{8}$ in. (80mm) length of $\frac{43}{64}$ in. (17mm) brass. A $\frac{137}{64}$ in. (40mm) length is drilled $\frac{1}{2}$ in. (12mm), the same diameter as the above extension piece to give a tight sliding fit. The workpiece is reversed and drilled through $\frac{11}{32}$ in. (8.7mm). This end is then threaded $\frac{3}{8}$ in. x 26tpi (10 x 1mm) to a length of about $\frac{1}{2}$ in. (12mm). At a distance of 1in. (25mm) from this end the tube is cross-drilled by four equidistant holes $\frac{7}{32}$ in. (5.5mm) diameter.

Although machining work on the mixer tube is completed with the above operations, there remains the fitting of a venturi device (fig 34e). This is machined from $\frac{1}{2}$ in. brass, $\frac{3}{8}$ in. (9.5mm) long, drilled through $\frac{1}{8}$ in. (3mm). While in the chuck the workpiece is drilled $\frac{7}{32}$ in. (7mm) to a



depth of $\frac{3}{16}$ in. (4.5-4.75mm) at an angle of 60 degrees. This device is inserted from the front end of the mixer tube with a smear of Loctite 601 (or similar) and pushed right in until it rests against the stepped bore.

A gas jet insert (fig 35) completes the assembly of the burner. This insert performs a dual function, placing the jet in the appropriate position relative to the air vents and receiving gas from the cylinder. The jet insert is connected to the gas cylinder by one of two methods, either a $\frac{1}{8}$ in. (3mm) soft copper tube soldered to the insert and

to an adapter which screws to the gas cylinder shut valve, or by means of special pressure rubber tubing suitable for such a purpose. The sealing of any tubing, whether copper or suitable rubber/plastic, should be checked very carefully.

The jet insert is machined from a 1in. (25mm) length of $\frac{7}{16}$ in. (12mm) brass bar. The front $\frac{1}{8}$ in. (3mm) is reduced to just under $\frac{3}{8}$ in. — say $\frac{23}{64}$ in. or 9mm — the middle $\frac{1}{2}$ in. (12mm) section is threaded $\frac{3}{8}$ in. x 26tpi (10 x 1mm), and the remaining $\frac{7}{16}$ in. (11mm) is reduced either to fit the rubber tubing or to receive by soldering

the 1/8in. (3mm) soft copper tube. The next operation is to drill through 1/8in (3mm) and tap the front end to take the gas jet (Taymar No. 5 or any other suitable jet). It is suggested that PTFE tape is wound round the threaded part before insertion into the mixer tube.

A safety cover for the burner in the shape of a furnace is a requirement for exhibitions nowadays. This may be constructed from a 3in. (75mm) length of 2 1/2in. (63-65mm) pipe such as is used for automotive exhaust pipes or silencers, with two lugs brazed at the top and drilled for securing to the engine base. A 1 3/16in. (20mm) O/D bright mild steel pipe with a suitable bend connected to the furnace will remove some of the heat generated by the burner from the engine base.

Cooling

The inlet and outlet pipes from the cylinder block are connected to a water tank placed in such a position as to provide cooling by convection, hot water exiting from the top pipe and cooler water entering the cylinder block through the lower pipe. The ideal water tank should be long and narrow with cooling fins, however a point is always reached at which the water in the tank becomes quite hot with the result that the difference in temperature between the hot end and the cold end of the displacer cylinder lessens considerably and the engine slows down until it stops.

Starting and running the Hopkins Mk. I engine

The Hopkins Mk. I is an easy starter requiring only a few seconds of heating before a flick of the flywheel sets the engine off. The water pump is primed after the engine has been running for about a minute. There should be an immediate reduction of engine rpm as the pump starts to operate.

Hopkins Mk. II

The Hopkins Mk. II (see photo 2, *M.E.* 4206, 17 October 2003) is 10 15/32in. (266mm) high, 6 45/64in. (170mm) long and has an overall width of 4 33/64in. (115mm). The Mk. II engine has a totally different drive mechanism, indeed an unusual and unexpectedly quite efficient one.

The patent specification and the accompanying narrative made it quite difficult to understand how the mechanism operated, however as each component was part assembled and as the mechanism evolved the patentees' intentions became clearer. Basically, the Mk. II is a parallel cylinder engine with the phase difference controlled by the crank disc and pin at the end of the crankshaft (see fig 4, *M.E.* 4206, 17 October 2003). The drive mechanism is placed slightly behind from the displacer rod guide (fig 36) with an almost upward parallel motion of the displacer con-rod with the displacer rod.

The cylinder block (fig 37) is machined from 2 23/64in. (60mm) O/D solid aluminium alloy bar bored through 1 11/32in. (34mm) and partially enlarged to 1 27/32in. (47mm) to take the reel type fitting (photo 14).

The cylinder block is drilled to take the inlet and exit water pipes for cooling; these are located at the back of the block when the engine is fully assembled. The inlet pipe centre is 2in. (50mm) from the top and the exit pipe centre is 3/8in. (10mm) from the top (photo 15). One way to

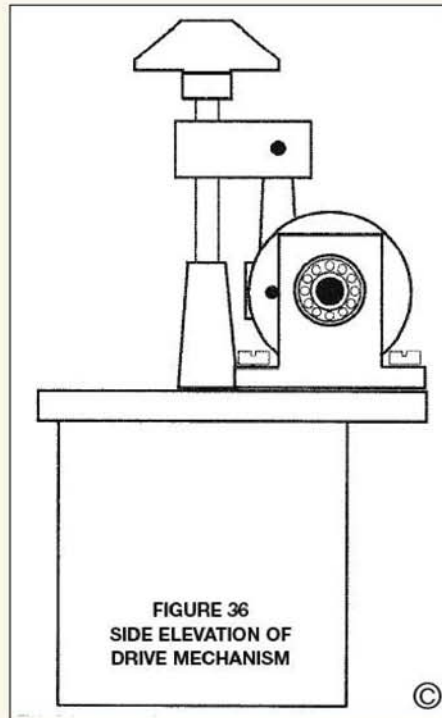


FIGURE 36
SIDE ELEVATION OF
DRIVE MECHANISM

secure the cylinder block to the engine plate is by fitting four studs in the base of the cylinder block which will be inserted into the plate in the final stages of assembly. An alternative method is to secure the cylinder block by bolting from beneath. This is done during the final stages.

The Mk. II power cylinder (fig 38) is machined from solid drawn bright mild steel tube, O/D 1 11/32in. (34mm), I/D 1 3/16in. (30mm),

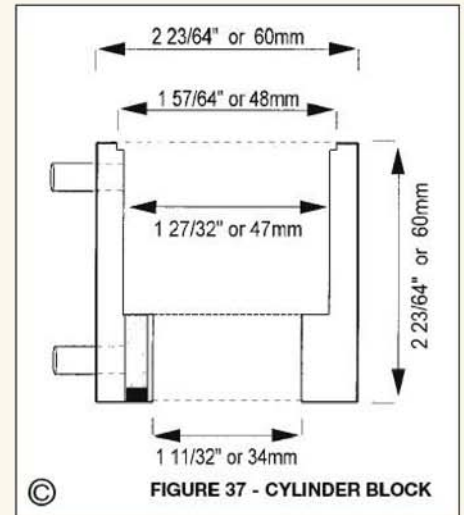


FIGURE 37 - CYLINDER BLOCK

with an overall length of 2 13/32in. (61mm). The bore is honed and lapped to a mirror finish. The bottom end is sealed with a tight fitting aluminium alloy plug giving an internal depth of 2 13/64in. (56mm). The total length of the plug is 1 1/64in. (1mm), giving an overall length to the power cylinder of 2 41/64in. (67mm). The bottom of the plug is drilled and tapped 0BA (6mm) to secure it to the lower cylinder plate. The power cylinder is cross-drilled at a height of 2 13/64in. (56mm) from the top to take the pressure transfer pipe to the displacer cylinder. Ideally, this pressure transfer pipe should have an O/D of 5/16in. and an I/D of 1/4in., however, it is more likely that brass tube of 8mm O/D and 6-6.5mm I/D will be available.

The power piston is machined from cast iron to



Mk. II Cylinder block bored out for the 'reel'.



Mk. II cylinder block assembly.

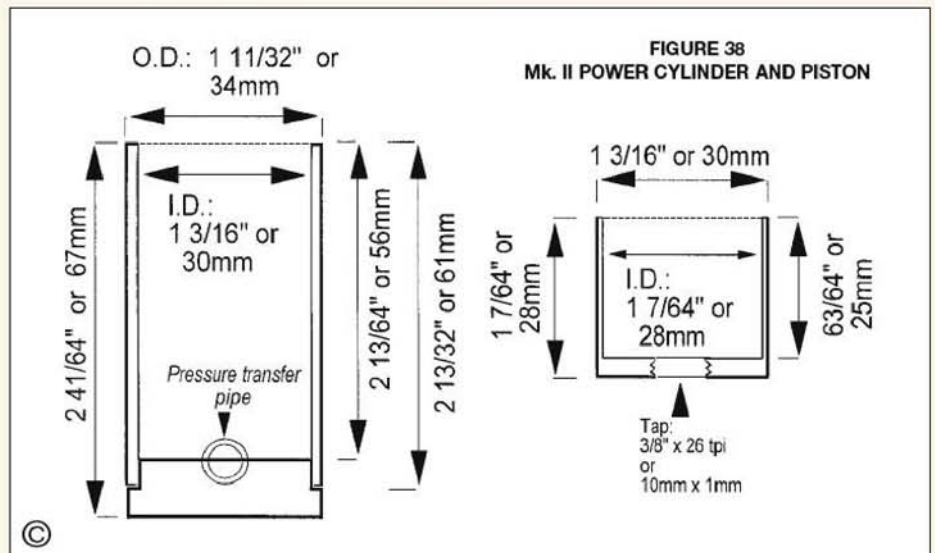
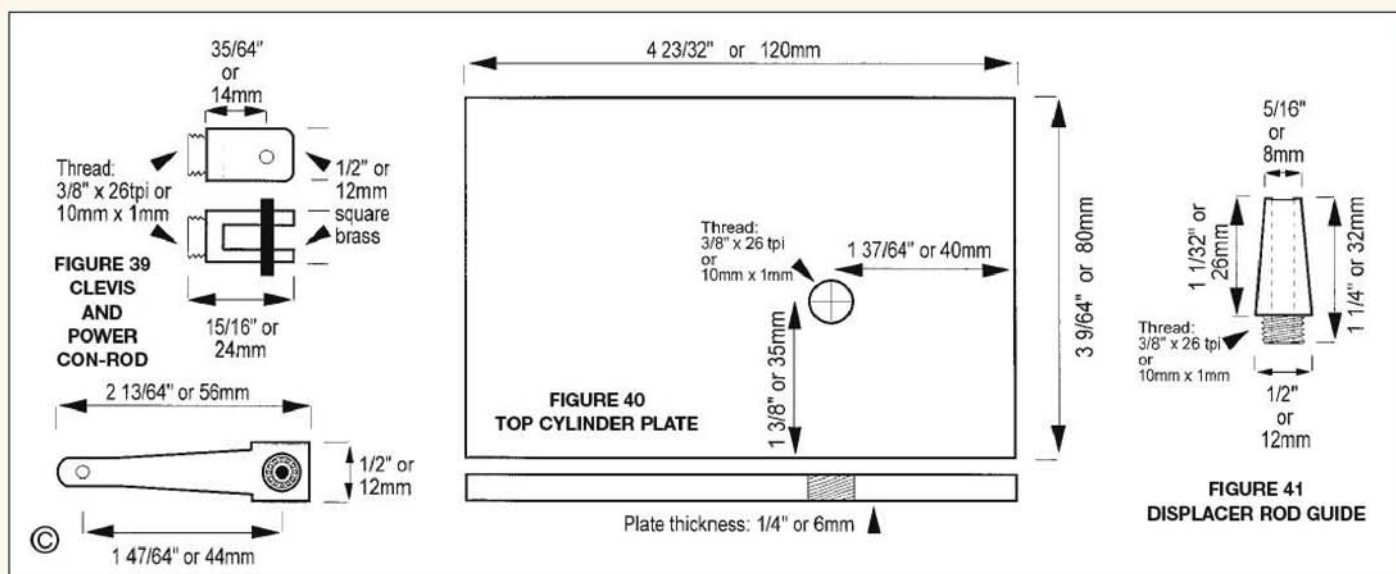


FIGURE 38
MK. II POWER CYLINDER AND PISTON



fit the honed bore of the power cylinder ($\frac{13}{16}$ in. or 30mm). The piston is $\frac{17}{64}$ in. (28mm) long, bored to a depth of $\frac{63}{64}$ in. (25mm) leaving a $\frac{1}{8}$ in. (3mm) crown and an internal diameter of $\frac{17}{64}$ in. (28mm). The crown is then drilled and tapped $\frac{3}{8}$ in. x 26tpi (10 x 1mm).

The power piston clevis (fig 39) is machined from a $\frac{15}{16}$ in. (24mm) length of $\frac{1}{2}$ in. square brass, reduced and threaded one end $\frac{3}{8}$ in. x 26tpi (10 x 1mm), the other end being slot-drilled $\frac{1}{4}$ in. (6mm) to a depth of $\frac{1}{2}$ in. (13mm) and

cross-drilled $\frac{1}{8}$ in. (3mm) at a distance of $\frac{9}{16}$ in. (14mm) from the base of the crown.

The power con-rod is machined from a $2 \frac{13}{64}$ in. (56mm) length of $\frac{1}{4}$ in. brass flat, shaped as indicated in fig 39, marked and drilled $1 \frac{47}{64}$ in. (44mm) between centres. The big end is drilled $\frac{3}{8}$ in. (10mm) to accommodate a suitable ball bearing; the small end is drilled $\frac{1}{8}$ in. (3mm).

The top cylinder plate (fig 40) is cut from $\frac{1}{4}$ in. (6mm) aluminium alloy plate to finish $4 \frac{23}{32}$ in. (120mm) long by $3 \frac{9}{64}$ in. (80mm) wide.

The plate is marked and drilled at a point $1 \frac{37}{64}$ in. (40mm) from the right-hand edge and $1 \frac{3}{8}$ in. (35mm) from the bottom edge. The hole is tapped $\frac{3}{8}$ in. x 26tpi (10 x 1mm).

The displacer rod guide (fig 41) is machined from a $1 \frac{1}{4}$ in. (32mm) length of $\frac{1}{2}$ in. (12mm) brass rod. One end is reduced and threaded $\frac{3}{8}$ in. x 26tpi (10 x 1mm) for a length of $\frac{1}{4}$ in. (6mm). The guide is then drilled through and reamed $\frac{3}{16}$ in. or 5mm. The guide is tapered to conform with the patent drawing.

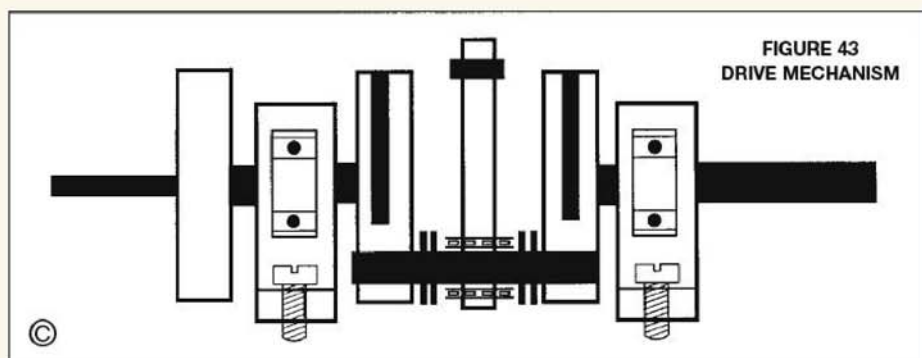
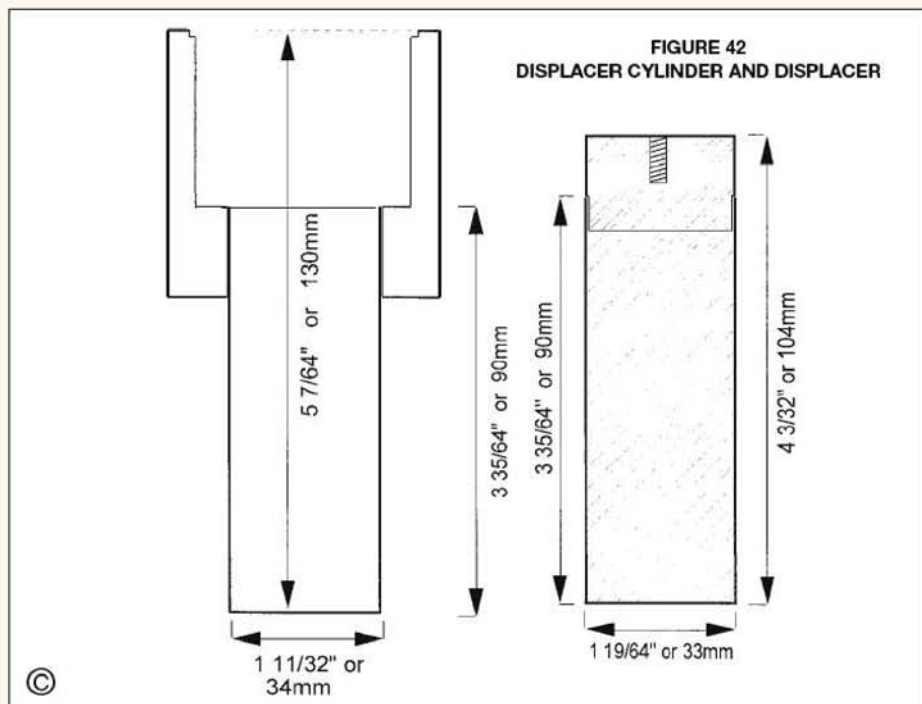
The displacer cylinder (fig 42) is made up of a similar pressed stainless steel canister as used in the Hopkins Mk. I, giving a total length of $5 \frac{7}{64}$ in. (130mm), made up of part of the cylinder block — $1 \frac{37}{64}$ in. (40mm), and the canister $3 \frac{35}{64}$ in. (90mm).

The displacer is similar to that used in the Hopkins Mk. I engine, i.e. $1 \frac{19}{64}$ in. (33mm) O/D. The total length is $4 \frac{3}{32}$ in. (104mm actual), made up of a stainless steel cylinder $3 \frac{35}{64}$ in. (90mm), and a plug $\frac{35}{64}$ in. (14mm actual) long. The plug is machined from aluminium alloy bar $\frac{55}{64}$ in. (22mm actual) long hollowed out to reduce weight. A total of $\frac{5}{16}$ in. (8mm) of the plug is inserted with a smear of epoxy resin adhesive, then centre-drilled, drilled and tapped 4BA or 4mm. The displacer rod is cut from silver-steel rod $3 \frac{7}{32}$ in. (82mm) long with one end reduced and threaded 4BA or 4mm.

At this stage it is appropriate to part assemble the above components so that the position and securing of the cylinder block beneath the top cylinder plate can be carried out. The displacer rod guide is screwed in place, finger tight. The displacer rod is screwed into the displacer. A couple of turns of electrical insulating tape are then wound around the top and bottom of the displacer. This part assembly is inserted into the displacer rod guide and the cylinder block (without the cylinder) is slid over the displacer and held against the underside of the top cylinder plate. The circumference of the cylinder block is marked and the top plate drilled to provide for 4BA (4mm) securing bolts. The above operation is repeated and the cylinder block is marked, drilled and tapped 4BA (4mm) and then secured to the top cylinder plate.

The drive mechanism (fig 43) is the next component for construction and assembly. This mechanism is actually a collection of parts — the crankshaft, crankshaft brackets, crank webs and crank and the displacer con-rod.

●To be continued.





Keith Wilson

starts work on the tender toolbox and lamps — 'fiddly bits' which greatly enhance the appearance of a finished locomotive.

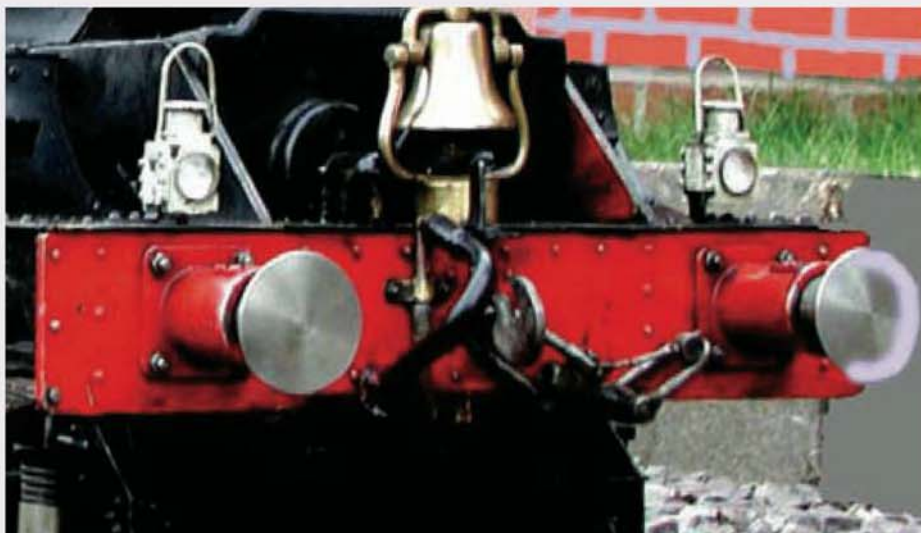
●Part XLVII continued from page 698 (M.E. 4210, 12 December 2003)

There is not a great deal left to describe for these designs, so possibly lots of little bits will come to mind. Anyone who notices an omission please let me know. I will bow my head, etc. First off though, somewhere to put your tool(s). Naughty Keith! However, tender toolboxes add greatly to the 'looks' of a tender, and are very useful for a few handy spares. For example, gauge glasses do 'go', but very rarely, so a spare one or two stashed away could be a Godsend, although you would have to let the boiler cool off first. A few O-rings ($1/4 \times 3/8$ in. for example) plus some spanners, two spare blastpipe nozzles (if you have used an adjustable nozzle) and no doubt some other items will come to mind, as well as ashes, bits of coal and the like.

The main boxes, minus lids, are almost identical for 3,500 and 4,000 gallon tenders, so I have just shown the 4,000 gallon beastie. The only difference is the cut-away portion of the lid; the reason for this is quite interesting. Due to the fact that the 4,000 gallon is somewhat higher than the 3,500 gallon tender, as the toolbox lid is opened it fouls the loading gauge. This may not seem important at first, but bethink you, a heavy lid hitting the solid wall of a tunnel at 90mph. could be — er — disconcerting, to say the least.

SAINT CHRISTOPHER

A GWR LOCOMOTIVE for 7 $1/4$ in. gauge



Details can make all the difference to the appearance of a locomotive; is this a model or prototype?

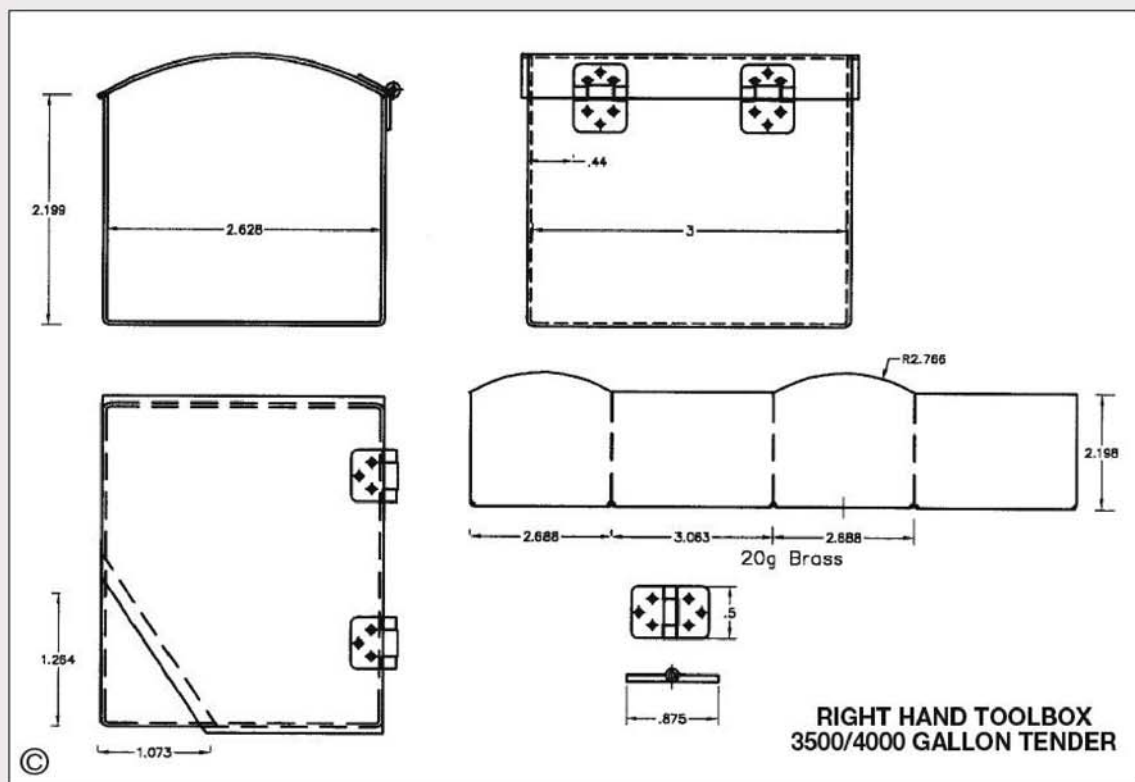
A similar argument applies to the fire-iron storage spaces. When there was only one such, as on all the smaller tenders, fire irons could be turned end-for-end without going outside the aforementioned loading gauge. With No. 1 and longer boilers (No. 7 for 47s, No. 8 for Castles,

No. 12 for Kings) clearly fire irons (hardly to be called pokers!) are somewhat longer and well outside the loading gauge. I'd rather not be there under such conditions!

So, for the larger locomotives, a fire iron storage space or compartment was added on the

left side of the engine, taking up part of the rear splasher and running up to the nameplate splasher. An opening was provided in the cab front for access. An interesting point arises here. Many years ago I was clambering over *Caerphilly Castle* in the London Science Museum for photographic purposes (with full co-operation from the curators thereof) and I had a good look at the fire iron hole. It had been obviously added a few years later than the original, for it was arc-welded to the running boards across the joint between the two sections of running board. Precisely what was done later on new engines I wot not, but for us it is easiest to make longer sections of board.

So, for 3,500 gallon tenders, full size lids; for 4,000 gallon tenders, one lid to each hand.



Wilson's Words of Wisdom:

If a fact does not fit with a cherished theory, this in no wise affects the truth of that fact.

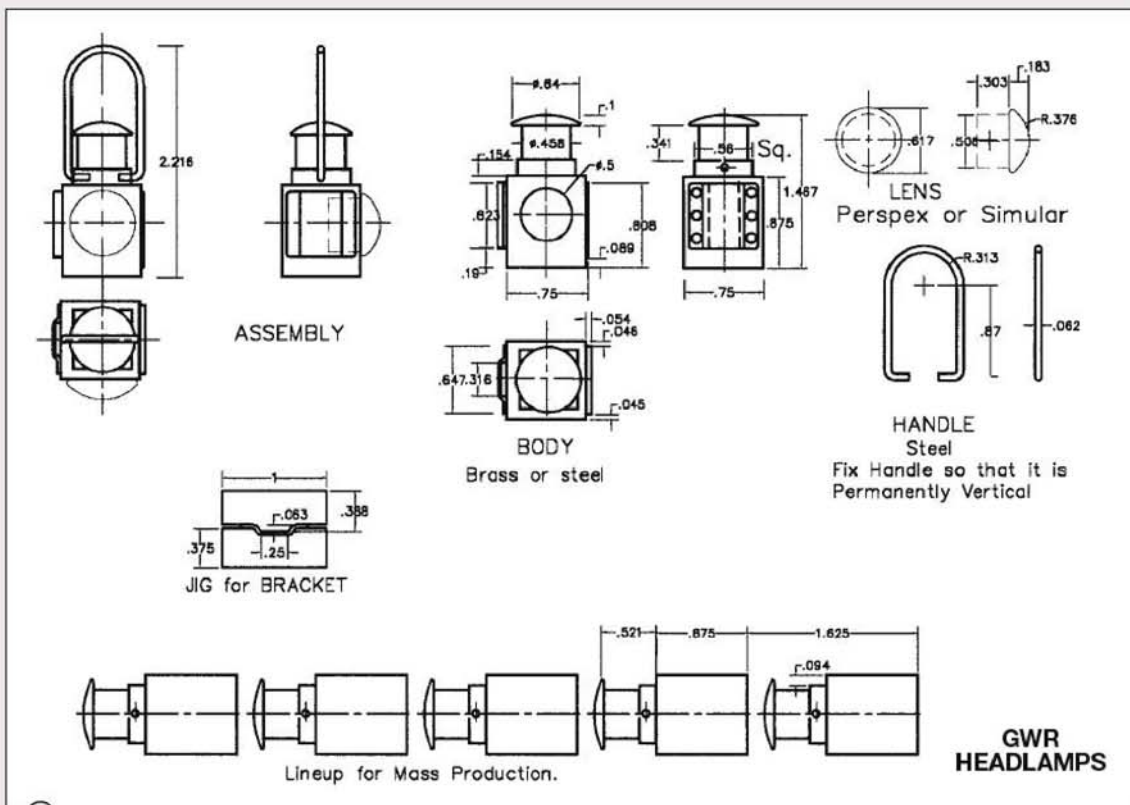
Note that the missing triangular portions are 'rain-proofed' by larger triangular sections fixed to the appropriate corners.

To make the boxes, I found the easiest way is to make the sides of the boxes first, bending them up and carefully silver-brazing the joint. Rest this on the base (made a bit larger than required) and silver-braze the sides to the base. This would be rather tricky to do from the inside, but if you tack it down at each corner from the outside, the heavy weight that you obviously used to hold it steady can be removed and the job finished from the inside. This will tend to leave a neat little fillet on the inside. When quenched in your acid pickle bath, the extra portions of the base can be finished or filed off to leave neat rounded corners. Tip: an ordinary dry household brick resting frogside down makes a useful flat surface for silver-brazing operations.

It is possible to purchase little brass hinges from any good ironmonger/toolshops but as I recall they are folded up from about 24g brass, possibly less, and they are mainly suitable for dolls' house and similar applications. To make 'scale' hinges is not too difficult; they will be much stronger and look just that much nicer to discerning, knowledgeable eyes such as yours.

Oddly enough, to get the lids to shut properly and remain so is not one of the lighter matters. Sheer cussedness seems to be their byword, as will you discover for yourself.

The boxes can be fixed to the tender tops by plumbers' solder and a couple of round-head brass screws tapped into the top and sealed in. Note that the toolboxes on the 4,000 gallon job will overhang the coal space and need extra supports. However, it might not be too amiss to mount them longitudinally instead of crossways; this also leaves more access for firing.



Lamp irons

Now we come to non-useful but nice-looking bits. Although it may be theoretically possible to build oil-lamps which will work, I am not aware that this has been accomplished with much success because the laws of combustion get in the way. I suspect that the cooling rate is too high to permit continuous burning. However, by means of a little subterfuge it is quite easy to produce lamps that look as if they are in fact giving out light.

Although all necessary headlamp codes (apart from Royal trains, and I believe some railway's breakdown trains) may be signaled by only two 'white' lights, a red light is required for the rear end of the locomotive when running light (no pun intended!). While in full size a coloured filter is used to make a normal 'white' headlamp show red,

this is not really practical for our sizes, so we need at least three lamps. But again, on rare occasions it can happen that we need a 'Royal' train. It happened in 1984 at the Echills Wood track on the Royal Agricultural Society site and in 1981 in California, on the local Live Steamers' track.

The lamp irons are cut out and bent up from 16 gauge steel. The rather frail looking one for the top rear of the tender is in fact stronger than it appears.

Lay on the Florence Nightingales!

No disrespect for an historically Great Lady, but she was nicknamed the Lady with the Lamp, so this heading seemed appropriate. I suggest mass production, in that we start with a bar of 3/4in. square material; please yourself whether brass or steel. A bar about 8 1/4in. long will be sufficient for five lamps.

It so happens that at the time of writing I am making a batch of ten lamps, so can write from immediate experience and include a piccy or two.

There is no point in marking out at this stage, for better methods are to hand. Using a 1/2in. slot drill zero your register (digital readout for preference, feed screw micrometer dial if not) with the cutter just touching one already squared off end. Feed in exactly 1.375in. and take a cut across 0.094in. deep. Feed in another 1.625in., take another cut. Do this three times more then reset with the bar turned round through 90deg., and repeat the process. Do



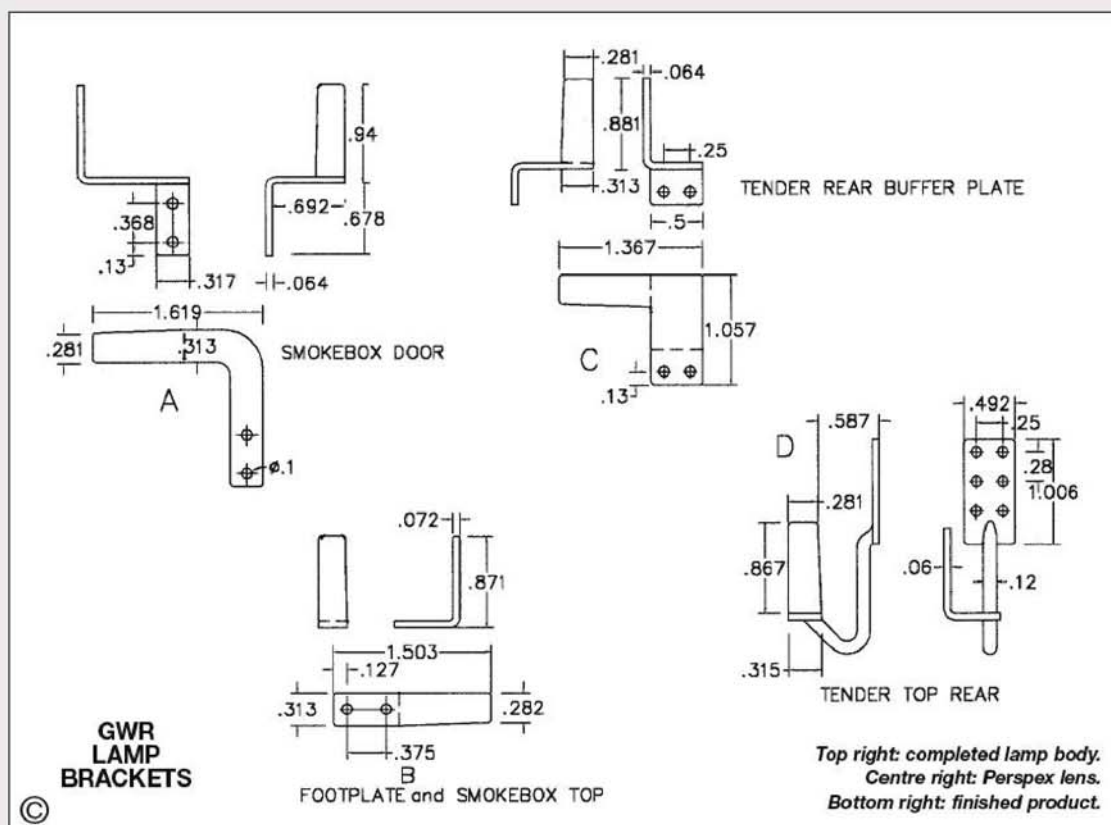
Initial stages in machining a batch of five lamp bodies.



Side mounting brackets are best formed up using a simple bending fixture.



Ten little lamps all in a row...



Top right: completed lamp body.
Centre right: Perspex lens.
Bottom right: finished product.

this twice more, and you will end up with a peculiar-looking bar of brass (or steel). To save any non-mathematical readers (few, I trust), the consecutive steps are 1.375, 3.000, 4.625, 6.250 and 7.875 inches.

Working on one face only, take the cuts that reveal the dummy door. A similar system of stages of 1.625in. will be found useful. Next mark out the main holes, 1/2in. diameter, and drill them 1/2in. deep. Tip: to get well-located holes, take care with marking out, use a centre-punch, and then a small drill as a pilot, opening out (possibly in stages) to 1/2in. diameter. This is a better way of locating a hole accurately than the 'official' way of drawing a 1/2in. diameter circle and giving four centre-pops, juggling around with more centre-pops to persuade the drill to go where you want it. A little thought or closer observation will indicate that a centre-pop will provide very little guidance when the chisel-point of the drill is three or four times as wide as the pop, whereas plenty of guidance comes from a smaller drill chisel-point comparable in size to the pop. If really great accuracy is required, then of course it is hard to beat jig-boring using a centre-drill for starters.

The small holes for the handles come next, followed by separating the individual lamps. The last stage is to trim off the base and deal with the round portions at the top.

Plain lathe work

For the lenses, get a 16mm. diameter bar of Perspex or similar transparent material (e.g. Polycarbonate) turn down a portion to 1/2in. diameter for about 5/16in. or so and part off. When you have sufficient lenses, round off and polish the bulls-eye at the front. A medium cut file will usually deal with the spherical part which can be polished using fine emery paper and then metal polish applied with a kitchen towel. It is not important to polish the back face of the lens, just paint four of the backs white and one red.

Painting the front of the lens red or white is hopeless, it looks just like what it is, painted — and

badly at that. However, painting the back of the lens gives a far more realistic appearance.

The handles are plain wire-bending jobs, but the mounting brackets are tricky and need a little jig. It is not practicable to properly rivet these brackets to the main bodies, but if they are silver-brazed in place, the rivets can be inserted into blind holes with a touch of Loctite 601; that will take care of them.

I have mentioned this before, but 'tis still a mystery. Why is it that directly I return home after posting the drawings off to *Model Engineer*, I notice, even without looking, that a silly little mistake has got through? The diameter of the wire handle for these lamps was drawn way back, in Imperial dimensions, as 1/16in., converting this to decimals the computer rounded off figures the wrong way somehow and marked up 0.057in. instead of 0.064 inch.

Now I do not claim that these lamps are dead to scale, but they are pretty close, and I reckon that any improvement could well be very little. The 'law of diminishing returns' comes to mind. As the big photograph shews (modest blush) they do not look so ill. The full-size handles, for example, are flattened at the lower end and riveted to the body. Some lamps are double-sided in the sense that they could be used for both forward and backward running; however I think that they might have been used only on guard's vans (Toads) on the sides thereof. I have also seen lamps with a mounting bracket on each side, but I wot not why.

Possibly the two-way ones were also twin-bracket ones, this making them available for either side of the guard's van. This reminds me of something that happened to me about 45 years ago. I was on the Up Relief platform at Hayes and Harlington Station, awaiting the train to Southall. Behold, a freight train emerged for the siding on the far side of the road bridge, but when it had passed I noted no Toad nor red lights, so I rushed into the porters' room and mentioned it — fairly loudly. One porter came to the door, saw that I was right, and raised Cain.

It turned out that the guard had already alerted the signalmen and had the train stopped, so I could not claim to have saved the railway, but of course any railwayman's first duty is the safety of the line. Although not employed by the railway, I consider that to be my motto also — and still do.

If you do much public running, a worthwhile idea is to fix these lamps permanently; such attractive items have a habit of growing legs and quietly walking away. However, a 1/16in. hole drilled through the bracket, lamp iron, and into the body can be useful, if a steel rivet is bonded in it works wonders as far as the dreaded wanderlust is concerned. Little fingers can be remarkably sticky! Another way to 'amputate its legs' is to use a 1/4in. BSF bolt inserted through a hole in the footplate and tapped into the bottom of the lamp through a 3/16in. spacer.

If you are operating your locomotive in before 1934 condition — I think that's the correct date — then the body of each lamp should be bright red. After this date white is the correct colour.

On the left-hand side of the engine, just behind the steam pipe to the cylinders is/are a couple of 'spare' lamp irons for lamps not actually in use. It looks good to have a spare lamp there — same precautions of course. The lamps face inwards.

In theory, if a locomotive is reversing at night, even for a short time, the red light should be on the front and a white one on the tender. However, it is against reason to imagine that this was always done.

●To be continued.

RAPID PROTOTYPING

Brian Hutchings

introduces a versatile industrial technique able to produce complex components beyond alternative economical manufacture.

The title of this article refers to the almost 'Alice in Wonderland' method of producing functional models and tooling very quickly, which has been in industrial use for a number of years. The technique uses Computer Aided Design (CAD) to produce a three dimensional drawing of a component and then to give substance to it by building up a solid representation using a computer guided laser. Four basic methods are in use, as follows:

- 1: Stereolithography,
- 2: Selective laser sintering,
- 3: Laminated object manufacture,
- 4: Fused deposition modelling.

Although there are these four basic methods, the mechanics are all very similar. I have used a teacup as an example to illustrate this article, as it is a familiar object requiring no engineering knowledge but is sufficiently complex in its form to present problems if it were to be machined.

Whichever method is used, the first requirement is to produce the computer drawing (sketch 1). This is then 'cut' by the computer into thin slices, in practice, very much thinner than those drawn (sketch 2). This is the point at which the four methods diverge.

Stereolithography

Stereolithography uses a liquid photopolymer to produce the object, which is built up layer by layer on a moving platform, lowered at each pass by an amount equal to the thickness of each slice.

The computer controlled laser is guided over each slice, switching on and off as appropriate, to solidify the photopolymer as the laser shines on it (sketches 3 and 4).

When completed, the cup can be broken free from the platform and lifted out of the liquid. The solidified material is in the form of a moderately hard plastic.

Selective laser sintering

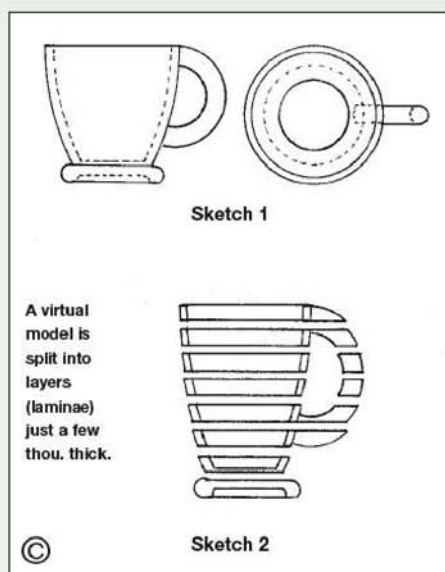
Selective laser sintering is very similar to stereolithography except that a powder is fused together in layers to create the object. This method uses a powder spreader to deposit a thin layer of fine powder at each pass (sketches 5 and 6).

In the sketches, the powder spreader is labelled 'sand spreader' as this method can also be used to produce a sand mould without a pattern though in this case, the 'object' would be a model of the space around and inside the casting. It takes some doing to think 'negatively' in three dimensions.

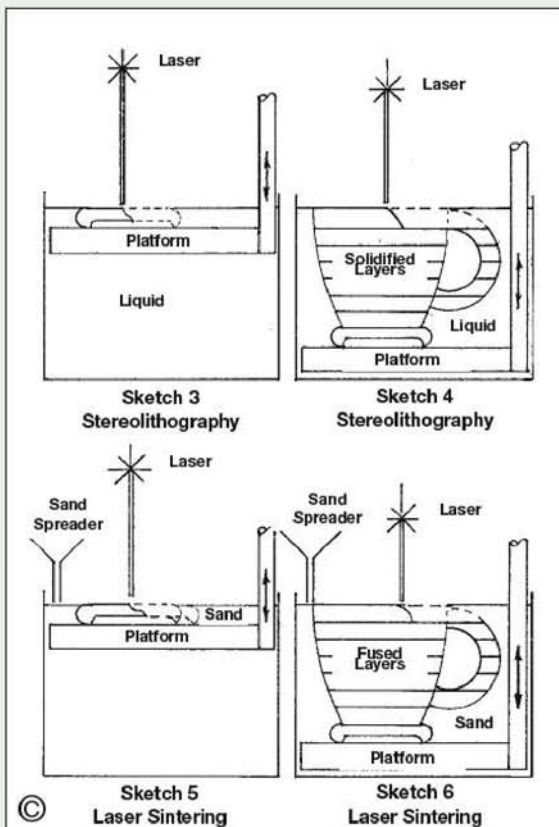
Various powdered (i.e. sintered) materials can be used in this method and the item can be impregnated or infiltrated with metal or resin to produce a stronger item. Mould tools can be made by this method and will last long enough for a limited production run.



Solid model of a patient's skull obtained using the output from body scanning equipment.



A virtual model is split into layers (laminae) just a few thou. thick.



Laminated object manufacture

With laminated object manufacture, the layers are built up by pulling self-adhesive paper or thin plastics across the platform. The laser is set just strong enough to cut through one layer, the platform then moves down, another layer of material is pulled across, and so on until the object is complete. This can then be painted or impregnated as required.

This method is suitable for quite large items due to the cheapness of the material and the comparatively high speed of the process.

Fused deposition modelling

Fused deposition modelling is a very different technique from the others in that it does not use a laser. Instead, a continuous thread of plastic or wax is squeezed through a heated nozzle, adhering to the layer below and cooling almost immediately. As with the other methods the process is under computer control. With this method it is possible to change colours part way through, if required.

Applications

Using these methods it is possible for a manufacturer to produce functional models of a proposed design. For example, two halves of a plastic telephone handset can be made, complete with working snap-together clips, without the need for costly tooling which may need to be modified or even remade if the actual product is not quite to the designer's liking.

On a more serious note, it is possible take the output from a hospital body scanner and produce a replica of, say, the inside of a patient's skull. In this way, the size and location of a tumour can be pinpointed with absolute accuracy, rather than having the surgeon try to analyse each computerised 'slice' to determine this.

Now, I am way ahead of you with regards to the possibilities for model engineering, but unless you are a lottery winner it would be too expensive, with typical plant costs of £500,000. Even going to a specialist company is not cheap as it can take hours, or even days, to produce the finished item, including the programming time. Having said that, the techniques are improving all the time, with a consequent reduction in costs.

It may be possible to produce your own computer drawings, which would also reduce the cost. If the object is relatively simple then the cost may not be too high.

Some might say that these methods are 'unfair' but, we no longer believe that models must be made on treadle lathes, with holes drilled by ratchet and brace to qualify as being of amateur construction, so who knows?

With grateful thanks to Hahn and Kolb (GB) Ltd. of Rugby (tel: 01788-577288) for their kind permission to use material from an OES brochure (motto: making light work) in writing this article. Needless to say, I have no connection with this company save that I recently visited their Rugby showroom.





These 2in. scale Burrell showmans' engines by Ron Dawe and Alan Walker certainly made a magnificent display.



Dave Leaver's 1903 de Dion Bouton in 1:4 scale is radio controlled and is powered by an engine which appears to be similar to a Westbury Whippet.

MODELS AT KNOWL HILL

Malcolm Stride

found much to admire and enjoy in and around the Model Tent.

I suppose the main thing that people will remember about the Knowl Hill Rally this year will be the heat. In sharp contrast to the rain and mud of recent years, the 2003 event was held when temperature records were being broken. The weekend had temperatures in the mid 30deg.

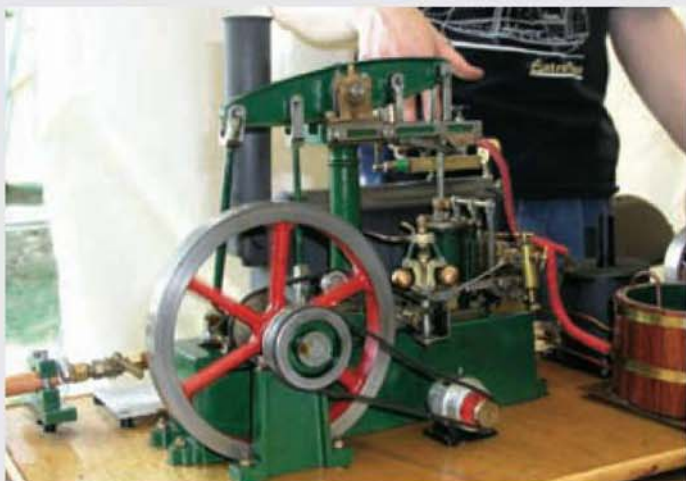
Celsius, which for England is extremely hot. The attendance at the rally was down this year, probably due to the heat with many preferring the coast.

I attended the rally on the Saturday to gather material for this report on the model tent which has been a feature since it was started by the late Alwyn (Ollie) Greenhalgh in 1972. Since then it has got better and better.

This year's display included some exceptional exhibits and, as always on these occasions there

were so many, it would be impossible to include photographs of them all in the space available in these pages. If your model is not featured please do not take that as any comment on its quality—I have included here photographs of some of the exhibits which caught my eye while browsing in and around the model tent.

As usual members of the local Reading Society of Model Engineers provided the train rides outside on two tracks while model boat demonstrations on the pond were under the control of the Mid



A well made beam engine and boiler was shown on the Welwyn stand.



This nicely detailed steam drifter graced the Mid Thames MBC stand.



Paul Ransley's 5in. gauge RHDR locomotive Bug.



A 6in. Mk. 7 field gun c1917 by Ian Best.



Dave Horsley pulls away with Alan Thatcher's colourful American O-4-0 Jupiter.

Thames Model Boat Club based nearby at Beale Park not far from Reading. Both clubs also had static displays in the tent.

On entering the tent, the first model that confronted me was the *Grey Goose* warship being built by M. Harding from Ware. This will be a large and impressive model, and it will be interesting to see progress in future. Adjacent to Mr. Harding's ship was a large display of stationary engines of all types and sizes presented by Welwyn Garden City SME. This display covered several tables with quite a number of engines running. It included a good collection from the Spinks family. Two models stood out, one a nice beam engine steam plant complete with boiler and ancillaries, and a 'Nodding Donkey' oil pump. Another was the twin horizontal mill engine which was one of a group by Mr. Miller-Mead.

The Reading SME stand was immediately opposite the Welwyn stand. On it was to be found Peter Martin's part built *Juliet* with Baker valve gear. It is worth mentioning that Peter is not an engineer and started his model well into retirement, having done nothing similar before; he is making an excellent job of it. Also on the Reading stand were a Black Five in LMS livery exhibited by Harold Eadie and a vintage single-cylinder water-cooled two-stroke I/C engine owned by John Tierney. Other part-built models included a fine 5in. gauge *Duchess of Hamilton* locomotive chassis and Gary Williams' Durham and North Yorkshire traction engine.

Next to be seen on my tour were the two magnificent 2in. scale Burrell Showmans engines by Ron Dawe and Alan Walker. These

were both exhibited with the cranes in use lifting in one case a 'gorgeous glittering whale' and in the other a 'scenic golden dragon'. The detail on these two models was incredible and together they made a fine exhibit.

There was something even larger on a table further round: the 5in. gauge model of *The Bug*, a Romney, Hythe and Dymchurch Railway locomotive. There was a definite and noticeable bend in the table under this model which was exhibited by Paul Ransley from Leeds in Kent.

Adjacent to *The Bug* was something completely different, a collection of fast steam power boats exhibited by Phil Abbott. These dated from the 1940s onwards and included some built by Alan Rayman of the Blackheath Model Power Boat Club. I remember these from my days in the Southend MPBC in the 1960s, when members of the club were regular visitors to the London club's straight running regattas.

The next thing that caught my eye was a working Armstrong hydraulic crane built and exhibited by Mr. D. Goddard. The prototype was originally located and used in a goods yard and was connected to the hydraulic ring main in London which originally powered Tower Bridge and such things as lifts and cranes. This most interesting and unusual model operates on oil pressure at 30 bar. With the hydraulic rams clearly visible as they operate under the base, the model is fascinating to watch in action.

Another change for the next exhibit which was the part built Savage galloping horses fairground ride. This will be steam driven but at this event builder, Mr. W. Summerhayes showed a set of gallopers accompanied by some of the vast number of carvings he has produced so far. The detail in these has to be seen to be believed and when one sees the quantity involved one begins to realise the true definition of the word 'patience'.

Further along was the 6in. Mark 7 field gun being built by Ian Best from Alresford. This large scale model is already very impressive and will be more so when finished. It contrasted nicely with Phil Hodgson's 68pdr carronade circa 1805 complete with all tools and some cannon balls. This weapon was of a type used on HMS *Victory* and was very well displayed. Next to Ian's exhibit was 'Tredegar Town', a 00-gauge railway built by Ian Rawlins. A very busy layout representing a Welsh branch line terminus, it featured a wealth



A cheerful Les Dawson enjoys a run with his Atkinson wagon.

of detail (including cats and rabbits) which repaid close inspection.

The Mid Thames MBC were in their usual place with a good display of model boats of all types. Some were operating on the pond outside to provide added interest. I have included a photograph of a nicely detailed steam drifter, including plate work on the hull. This had returned from a trip on the pond and so was not as clean as some other exhibits!

Another exhibit in this area, was unusual in that it was a radio controlled scale 1903 De Dion Bouton car powered by a 10cc water cooled petrol engine which appeared similar to the *Whippet* to Edgar Westbury's design, although I could not confirm this.

Outside there was much activity near the pond with the Reading SME tracks in operation providing rides for the visitors and close by, Les Dawson from Reading was enjoying himself driving his newly finished Atkinson Wagon around the area. The pond was quiet during my visit, probably because of the temperature and a certain amount of weed and debris floating around to catch the unwary.

As we have come to expect, the Knowl Hill Model Tent contained a varied selection of exhibits of which the foregoing indicates but a selection. There were many more excellent examples of the model engineer's craft on display and congratulations are due to all those who took part. As usual on these occasions, nothing would happen without the work done by the organisers, so thanks are due to John Billard for his efforts in this area and also, for the advice and assistance he provided to your scribe on a very hot day.



A steam plant by the late Olly Greenhalgh was displayed by Peter Jennings.



Beautiful carved horses for his gallopers by Ernie Summerhayes.

CLUB CHAT

With Malcolm Stride

This being the first *Club Chat* of the new year, I would like to take the opportunity of wishing all readers and contributors a very happy and prosperous new year and success with your many model engineering projects whatever they may be. Hopefully, more of you will make one of your new year resolutions to send information for this column; it all helps to 'spread the word'.

UK News

Turning now to the main business, the **National 2 1/2in. Gauge Association** held their Midlands area rally at the **N. W. Leicestershire MES** track in Whitwick. NLMES members had to weld some extra 2 1/2in. gauge steaming bays in place to augment the original single 2 1/2in. gauge bay. The four locomotives which ran were Steve Eaton's *Toby* and *Dick Turpin*, Les Skinner's US 'Austerity' and Andrew Dick's *Josie*. Five other engines were "sunbathing in the steaming bays"; these were Brian Butler's 'Black Five', Les Skinner's *Annie Boddie*, George Hollingshead's *Fayette*, Dennis Eade's *Southern Maid* and finally, Derrick Crossland's prize-winning *Nigel Minor* in full GNR livery and mounted on a display track. The association also welcomed twelve new members in the latest edition of *Coupling Rod*, obviously indicating an increasing interest in this gauge. The association is also intending to provide drawings and castings for a New Zealand Class Ab locomotive under their royalty arrangement with the New Zealand Christchurch SMEE.



Robert Manley took his *Sin. Ajax* to second place in the recent Reading SME Efficiency Competition.

The news sheet also provides the information that Alan Headech (formerly 'Turn of the Century Wheels') has moved to 4 Levens Way, Silverdale, Carnforth, Lancashire LA5 0TG; tel: 01424-702230. Alan is still able to supply his range of 2 1/2in. gauge wheel castings.

Members of **Erewash Valley MES** recently hosted a visit by a group of over 20 Beaver Scouts and leaders from Toton. The group also included assorted brothers, sisters, mums, and dads. The group had a very enjoyable day competing with each other to see who could do the most laps and only stopped when at 7.30pm, their leader 'Bumble' decreed that it was time for home. The new multi-gauge point was put to good use during this visit. Work is continuing on the ground level track, with civil engineering and plate laying taking place. At the recent September meeting a discussion concerning the future of the society was held; this was followed by two slide shows: a collection of railway slides by Geoff Haddon followed by John Stone's slides illustrating the restoration of his classic car.

Chairman Richard Donovan of **Hereford SME** reports an interesting excursion walking Hadrian's Wall and finishing at the Newcastle end where he and his wife enjoyed seeing some of the city's industrial heritage, including

Turbinia which, as many readers will know, was the first practical turbine driven ship and started a revolution (no pun intended) in ship design. Activity planned at the Broomy Hill track site includes making a start in layouts for gauges '00', '0' and '1'. Members have also built a new 7 1/4in. gauge club locomotive to an Australian 'Baldwin' design. It was named *Elizabeth Hilda* in honour of our present Queen and Hilda a little-known cousin of King Offa, King of Mercia 757-796AD who was responsible for the dyke named after him. Apparently *Hilda* "was frequently to be seen with her blonde hair streaming out behind her and her short saffron skirts clinging to her thighs rallying the men of the court round her to wage war on other tribes." The source of this information chose anonymity! I have to say that history lessons were never that interesting when I was at school! The original club locomotive was named *King Offa* so members decided to retain a connection between the two. The new locomotive is now earning its keep during public running sessions. The club is hosting the 7 1/4in. gauge Society AGM later this year on 24-26 September. At a recent 'Soup & Rolls' night members were introduced to a 'Beetle Drive' with a difference! Instead of drawing beetles according to throws of a dice, members had to throw a '6' to get a

boiler to start, then other numbers to get the remaining parts of the locomotive. This was all accompanied by much "whistle blowing and merriment." The club also set up a "Ghost Train in a dank and dingy tunnel" for a special charity day at the local Malvern College. The set up involved spending the whole day in the dark with the young ladies from the college. Apparently the girls had spent some time making realistic body parts, decapitated heads and other items for the occasion. The event was a great success and raised a lot of money for the charities, carrying 400 terrified passengers during the three hour running period.

A new fence has been erected for **Isle of Wight MES** by a development company currently building houses adjacent to their site. The good thing about this was the co-operation of the builders in ensuring that clearances to the track were maintained. The company concerned, Foreman Homes should be congratulated on their helpful attitude which seems to be less common these days. W. Ellington-Boot's *Autumn Observations* include a warning to members to look out for the cat when they lock up. A very friendly black cat from a local farm, likes to sleep on top of the book cupboards. The secretary is reported to be getting fed up with having to

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.

JANUARY 2004

- 9 Colchester SMEE. Colin Hartshorne: REMAP, Technical Equipment for Disabled People. Contact L. G. Hammond: 01376-511686.
- 9 Hereford SME. Bits & Pieces. Contact Richard Donovan: 01432-760881.
- 9 Kinver & West Midlands SME. John Hurley: More Memories of Stafford Road. Contact John Campbell: 01384-891244.
- 9 Toronto SME. Meeting. Contact Art Gordon: (905) 820-1988.
- 10 Reading SME. Club Running. Contact Graham Bustin: 0118-9615450.
- 11 Cheshire Live Steamers. Annual Dinner. Contact Tricia Sturgeon: 01606-48586.
- 11 Hornsby ME. Running Day. Contact Ted Gray: 9484-7583.
- 11 Sutton MEC. Track Day. Contact Mike Dean: 0208-657-5401.
- 12 Bedford MES. Ian Heys: The View from the Hot Seat - Video presentation. Contact Ted Jolliffe: 01234-327791.
- 12 Erewash Valley MES. Evening Meeting. Contact Jim Matthews: 01332-705259.
- 12 Frimley & Ascot LC. Bruce Nathan: Reading to Redhill Railway. Contact Bob Dowman: 01252-835042.
- 12 Melton Mowbray DMES. Auction. Contact Phil Tansley: 0116-2673646.
- 13 Crawley ME. AGM. Goffs Park Light Railway. Contact Allan Sinclair: 01293-888203.

- 13 Dockland & E. London MES. John Slocombe: Canadian Railways video. Contact P. M. Jonas: 01708-228510.
- 13 Stamford MES. AGM. Contact David Ash: 01780-751211.
- 13 Surrey SME. Bits & Pieces. Contact John Cook: 020-8397-3932.
- 13 Sutton Coldfield MES. Meeting. Contact Neal Harrison: 0121-378-3992.
- 13 King's Lynn DSME. David Dew: An Alternative to the Norton Gearbox. Contact Mike Coote: 01533-673728.
- 14 Norwich DSME. Meeting. Contact Paul Reed: 01603-462925.
- 14 St. Albans DMES. Frank Banfield: Film Evening. Contact Roy Verden: 01923-220590.
- 15 Isle of Wight MES. Bits & Pieces. Contact Ken Stratton: 01983-531384.
- 15 East Somerset SMEE. Tony Moon: Custom Cameras, Wells. Contact Roger Davis: 01749-677195.
- 15 Sutton MEC. Toy Steam-Up Night. Contact Mike Dean: 0208-657-5401.
- 16 Centurion SME. Meeting. Contact Rudy Du Preez: 012-9986780.
- 16 Colchester SMEE. Keith Catchpole: A History of the Longmoor Military Railway. Contact L. G. Hammond: 01376-511686.
- 16 North London SME. Members' Favourite Video Clips. Contact David Harris: 01707-326518.



Mike Sinclair with his 3 1/2 in. 'Royal Scot' and Malcolm Stride with his 5 in. Rail Motor took third and first places in the Reading SME Efficiency Competition.

get up at midnight to let the cat out! Some readers will no doubt be aware that member Norman Godfrey took his steam launch to the 7 1/4 in. gauge AGM and provided steam boat rides on the adjacent Basingstoke Canal. The combined 20th anniversary and Don Young Rally will be a one-day event on Sunday 25 April, 2004. All Don Young designs will be welcome and we will provide more information as we receive it. Members recently enjoyed a day out on *S.S. Shieldhall* preserved steam ship including a trip up the Solent during Cowes Week. Unlike more modern steam ships, *Shieldhall* has reciprocating engines.

'The Professor of Engineering' from the 'University of Life's Experience' writing in the *Melton Mowbray DMES* newsletter, mentions that the first production combine harvesters were manufactured in Ballarat in Australia. They were improved with a header comb between 1911-1914. The original designer was Hugh Victor Mackay who was aged only 17 at the time. The writer also ponders the correct spelling for the related topic of 'threshing', or should it be 'thrashing'. Both of the two options have been used. Perhaps one of our knowledgeable readers has a definitive answer? The annual club dinner was also voted a great success. An unusual talk is scheduled for the club

Ladies' Night in April, entitled "Amusing Tales of a Worm Farmer."

In common with many other clubs, North London SME has had to review the safety of members running locomotives in the hot dry weather which we have enjoyed in the UK during this last summer. A rule has already been put in place concerning spark arrestors, but problems have also been experienced from fires caused by hot cinders falling from locomotive ash pans. In future, locomotives with ineffective (or no) ashpans will be prevented from running until the problem is cured. In September the 'last spike' was put into the new loop on the ground level track. This loop circumnavigates the boating pond and has been completed in less than 12 months by a team led by Keith Bartlam and comprising John Amos, Jack Edwards, Derek Franklin, David Harris, John Sandwell and Dave Snelgrove. Congratulations are due to all concerned including Jack's six year-old grand-daughter Emma, who assisted with the driving of the last spike. Once the loop was completed an initial run was carried out on the new track with Emma acting as guard. The new H0-gauge layout 'Young Street Yard' was sufficiently advanced for members to take it to the Tring DMRC exhibition where the train ferry and working lift bridge

attracted a great deal of interest. The layout will also be at the London Festival of Model Railways at Alexandra Palace in March. Members enjoyed an excellent talk by Bill Davies about his 39-year career on the railways. Many anecdotes from the period were recounted including one about the driver who opened his lunch box one day to find no knife and fork. Cursing distaff inefficiency he refused to eat anything and took the whole lot back home. The next day his box was much larger and contained every knife and fork from the house. His comment: "see how she likes to be without a knife and fork". His lady wife, however had the good sense to pop next door to borrow the necessary eating irons and was none the worse for the action. This event obviously took place in pre-feminist days!

Members of Reading SME have also had problems with fires caused by dropping ash. At their recent efficiency competition David Horsley, driving Gerald Payne's *Ajax* managed to set a succession of fires and the resulting conflagrations removed most of the grass in the cutting. Gerald ran later on and set several more fires himself. I am also embarrassed to report that a certain Malcolm Stride won the competition with Mike Sinclair gaining top 3 1/2 in. gauge in third place with his

Royal Scot. The grand finale was second place man Robert Manley doing several laps pulling three trucks with 11 passengers as a demonstration. There were some very amazed members of the public watching this effort. The club are also recovering from the recent well attended SEQLEC competition which will be reported in this journal in the future. Maintenance work has included lengthening of the station passing loop and installing a new point. The club also had a very successful visit to the Colchester SMEE track and were made very welcome with members enjoying some good runs, including some double heading. At the recent AGM, the club gained a new secretary in the form of the aforementioned Gerald Payne. Gerald can be contacted at 45 Wamford Road, Tilehurst, Reading, Berkshire RG30 4LD; tel: 0118-9426239; e-mail GeraldGAP@aol.com

Members of St. Albans DMES were recently addressed by John Beesely who spoke about the restoration of his full size Hunslet 0-6-0 steam locomotive. This included replacing the firebox and John showed examples of the serious weaknesses that can occur with a steel boiler. John hopes to have his locomotive back in steam this year. Chairman, Michael Dyer, commented that those listening "who possess a model steel boiler must have been

- 16 Rochdale SMEE. Video Night. Contact Mike Foster: 01706-360849.
- 16 Romney Marsh MES. Video Evening. Contact John Wimble: 01797-362295.
- 16 Worcester DME. Norman Ellis: Saudi Arabia, a History. Contact M. Lane: 01905-425972.
- 17 Historical MRS (Scottish Area). Alan Mackie: Prototype Signalling & Track Layout. Contact Richard Crockett: 01896-750730.
- 17-19 Maidstone MES. Maidstone Open Day & Festival. Contact Bob Begnie: 528-9114.
- 18 Frimley & Ascot LC. Club Run. Contact Bob Dowman: 01252-835042.
- 18 N. W. Leicester SME. Running Sunday. Contact John Elliott: 01455-847040.
- 19 Bedford MES. Committee Meeting. Contact Ted Jolliffe: 01234-327791.
- 20 West Wiltshire SME. John Budgen: Restoration of Church Organs. Contact R. Nev. Boulton: 01380-828101.
- 21 Guildford MES. Bits & Pieces. Contact Dave Longhurst: 01428-605424.
- 21 Leeds SMEE. General Knowledge Quiz. Contact Colin Abrey: 01132-649630.
- 21 Bournemouth DSME. Brian Ball: Making a Suit of Armour. Contact Mike Baker: 01202-383653.
- 21 Bristol SMEE. David Harding: Video Evening. Contact Trevor Chambers: 01454-415085.
- 21 Hornsby ME. Board Meeting. Contact Ted Gray: 9484-7583.
- 22 Sutton MEC. Gauge 1 Round Up. Contact Mike Dean: 0208-657-5401.
- 22 Worthing DSME. John Narborough: 100 Years of Electricity in the Home. Contact Bob Phillips: 01903-700642.
- 23-25 Meridienne Exhibitions. The London Model Engineering Exhibition at the Wembley Exhibition Centre. 10.30am-6pm (Fri/Sat) 10.30am-5pm (Sun). Adults £8.50, Senior Citizens £7.50, Children £5.50, Family (2+3) £22.50. Enquiries: 01926-614101.
- 24 Historical MRS (Bristol Area). Gerry Nichols: Clifton Down Station. Contact Gerry Nichols: 0117-973-1862.

- 24 Hornsby ME. Family Day, Boiler Inspection. Contact Ted Gray: 9484-7583.
- 26 Bedford MES. Video Evening. Contact Ted Jolliffe: 01234-327791.
- 26 Hornsby ME. Meeting. Contact Ted Gray: 9484-7583.
- 27 Historical MRS (East Lancashire/North Manchester Group). Denis Bates: Modelling Irish Railways. Contact John Sykes: 01706-823989.
- 27 Stafford DMES. Mike Street: The History of Beaudesert, Cannock Forest & the Staffordshire New Forest. Contact Chris Dobbs: 01889-270533.
- 27 Surrey SME. Video Night. Contact John Cook: 020-8397-3932.
- 27 Sutton Coldfield MES. Fred Goff: The Kingsbury Water Model Boat Club. Contact Neal Harrison: 0121-378-3992.
- 27 Taunton ME. Committee Meeting. Contact Don Martin: 01460-63162.
- 28 Birmingham SME. Late Night Running. Contact John Walker: 01789-266065.
- 28 Bournemouth DSME. Annual Dinner. Contact Mike Baker: 01202-383653.
- 28 Historical MRS (Bedford Area). David Baker: Archive Films. Contact John Chamney: 01442-851214.
- 28 West Riding SLS. Project Evening. Contact David Batty: 01924-363908.
- 29 Erewash Valley MES. Committee Meeting. Contact Jim Matthews: 01332-705259.
- 29 Sutton MEC. Natter Night. Contact Mike Dean: 0208-657-5401.
- 30 Hereford SME. AGM. Contact Richard Donovan: 01432-760881.
- 30 Historical MRS (Essex Area). Roger Hobson: 'Barstable Street' Computer Building a Layout. Contact Jim Harrison, 27 Colne Place, Basildon, Essex SS16 5UZ.
- 30 Wigan DMES. 'Free & Easy'. Contact John Chamberlain: 01744-882255.
- 31 Stafford DMES. Running Day. Contact Chris Dobbs: 01889-270533.

FEBRUARY

- 1 Ottawa Valley Live Steamers. Meeting. Contact John Bryant: 761-1109.
- 1 Stafford DMES. Running Day. Contact Chris Dobbs: 01889-270533.

rather worried!" The talk was described as a memorable evening. As with several others, the club is proposing a small increase in subscriptions to cover extra insurance costs. Member Roger Stephen describes the making of 'cast' house signs with a tasteful motif and the house name in bold relief. Roger prepared his example using a master made from scrap chipboard etc. and then made a plaster mould from this. Car repair type resin and glass mat was used to produce the finished article. His has now been on the house wall for ten years, so the method obviously works.

Ivan Smith and his wife Barbara from the Stockholes Farm MRS recounted the tale of settling down to watch an updated TV movie version of *Murder on the Orient Express*. The magic was destroyed when the luxury train pulled out of Istanbul station headed by a C147 with the EWS logo on the side! They are intending to reorganise more and longer sittings at the railway to cope with all the locomotives and stock they now have. This has started by rebuilding the ramp into the steaming bay. One of the extra locomotives is an LMS 4-6-0

Rebuilt Royal Scot *Girl Guide*. This is owned by Brian Lee who is basing the locomotive at Stockholes because the facilities at his own club are not really suitable for a large 7¹/₄in. gauge engine. A birthday party held at the track earlier in the year had a 'Harry Potter' theme complete with platform 9³/₄ with access through a brick wall in the form of a painted sheet. The visitors had dressed as various characters from the film. Ivan also described visits to the Watercress line and the Great Dorset Steam Fair.

World News

New Zealand

Otago MES has carried out a survey of its engineering group members to decide on the pattern of public running and how to sort out manpower for the events. This generated a good response which has been taken into account for future sessions. Other club members will also be invited to make responses. The Editor includes a poem illustrating the 'benefits' of using computer spelling checkers. The title is *The Typist's Knight Mayor* which is all spelt correctly and illustrates the point. 'Semaforum' owned up to

the fact that during the preparation for a recent trip to the pond, he was forced to read the instructions for his digital camera in order to get it to work! This was of course after he had failed to get it to work without. Down at the pond side several members were busy running various boats. Eric Ledgerwood was running his Harbour Defence Launch and also had his part completed ANZAC Frigate. This plank on frame model is being built from original drawings sourced by one of his son's friends. Les Bennett was operating his Otago Harbour Board's Pilot Boat which was six months in the build. John Gerston operated his American ice breaker *North Wind*. Various items were on show at a recent 'Bits on the Table' meeting, but one of the more unusual models was Gordon Rusbach's tethered racing car. Gordon has produced top and bottom body castings and fitted the front and rear axle assemblies. He is building his own 3¹/₂cc i.c. engine to power it. Other models mentioned were Bob Bell's 5in. gauge *Virginia* built by Charlie Crossan, Tom Smellie's 'Royal Scot' and Des Burrow with a *Butch*,

one of five being built by a group of club members. Members took the portable track to the Portobello Plant Fair this year and, in addition to a boost to the club funds, a "pleasant and satisfying day was had by all."

South Africa

Centurion SME is considering putting a roof over their steaming bays. Options under discussion are a rectangular layout similar to the station roof, or a roundhouse type of roof. Both will have a concrete or paved floor. The roundhouse is the current favoured option and drawings are being prepared for consideration by members. The September public running day was marked by grey skies, steady rain and no passengers, although entertainment was provided by George Collet who brought along his three-cylinder vertical engine for his logging locomotive. This was run on air and was described as "really impressive". It was George's 80th birthday on 11 November so may we send our congratulations to George on this momentous occasion and wish him many more.



THE LONDON MODEL ENGINEERING EXHIBITION 2004

Hall 2 of London's Wembley Exhibition Centre will be the place to see nearly 800 superlative scale models of all types between 23-25 January 2004. One of the largest UK events of its kind, this event attracts modellers from all over the British Isles and Europe, some even travel from as far afield as USA and Canada.

Having grown over the past three years, this exhibition will give visitors an opportunity to see a packed hall displaying a vast range of modelling interests including steam locomotives, cars, boats and other transport and industrial archaeology models. Hundreds of superb quality models will be featured, ranging from small scale railway locomotives to large steam road vehicles,

boats, clocks and many examples of other interests. Live steam model railways, hot air engines and stationary engines will all be seen in action. Enthusiastic support for this event will permit the organisers once more to present a fine display of models in an exhibition which emphasises the enjoyment enthusiasts can obtain from a range of satisfying hobbies.

Accompanying the models, over ninety specialist companies will be on hand, selling all types of materials for model building as well as kits and even finished models. Visitors will see an excellent range of models and will have the chance to choose and buy from some of the UK'S leading suppliers.

The exhibition is open 10.30am - 6.00pm Friday and Saturday 23/24, and 10.30am - 5.00pm Sunday 25 January. A licensed bar and refreshments are available. Wembley is an international venue and, well sign-posted from miles around, is easy to find. Car parking is free and admission is £8.50 for adults and £7.50 for senior citizens. A courtesy coach offers a frequent service from Wembley Park Station (Metropolitan and Jubilee Lines)

The London Model Engineering Exhibition is organised by Meridienne Exhibitions Ltd. The Fosse, Fosse Way, Leamington Spa, Warwickshire CV31 1XN; tel: 01926-614101; fax: 01926-614293; e-mail: info@meridienne.co.uk



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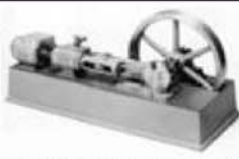


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- Hardened & Ground Bedways • Accuracy Report

DB10G Lathe

£999



- Centre Height: 125mm • Distance Between Centres: 550mm • Thread Cutting Gearbox • Complete with 3 & 4 Jaw Chucks, Fixed & Travelling Steadies & Face Plate • Vee Bedway • Accuracy Report

Model B Super

£670



- Maximum Swing: 420mm
- Distance Between Centres: 520mm
- Cast Iron Construction
- Metric or Imperial
- All Tapers MT3
- Supplied with 3-Jaw Chuck, Drill Chuck & Arbor and more!

£1100

Centurion



- Distance Between Centres: 520mm
- Centre Height: 210mm • Spindle Bore: 28mm
- Powered Crossfeed • Separate Motor for Lathe/Mill
- Complete with 5" 3-Jaw Chuck, Lathe Tools, Change Gear and more!

Conquest Lathe

£395



- Centre Height: 90mm
- Distance Between Centres: 325mm
- Large MT3 Spindle Taper
- Spindle Bore: 19mm
- Now C/W Quick Change Toolpost
- Variable Speed Range 100-2500rpm
- Metric or Imperial Leadscrews

626 Turret Mill

£1340



- Table Size: 156 x 745mm
- 1.5HP Motor
- MT3 or R8 Spindle
- Metric or Imperial graduations

Champion Mill/Drill

£585



- 1/2HP Motor
- Table Size: 150 x 630mm
- Complete with Drill Chuck & Arbor
- Ground Cast Iron Column
- MT3 Spindle

Craftsman Lathe

£1550



- Centre Height: 150mm
- Distance Between Centres: 570mm
- Swing in Gap: 450mm
- Powered Crossfeed • Spindle Bore: 36mm
- Complete with 3 & 4 Jaw Chucks, Fixed & Travelling Steadies, Face Plate, Machine Stand, Accuracy Report & much more!