

MODEL ENGINEER

Vol. 195 No. 4254

19 August -1 September 2005

**BRISTOL MODEL
ENGINEERING
AND HOBBIES
EXHIBITION**

•
19-21 August

•
**THORNBURY
LEISURE
CENTRE**

STRANGE NUMBERS



MODEL SUB

LOCOMOTIVE TRIALS





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- 8" 4 JAW CHUCK
- 10" FACE PLATE
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- STAND, COOLANT TRAY, REAR SPLASH BACK



BV-20 Lathe

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- COVERED LEADSCREW
- SET OVER TAILSTOCK FACILITY
- INDIVIDUAL ACCURACY TEST REPORT
- SAFE ELECTRICAL INTERLOCKS TO CHUCK GUARD AND GEAR TRAIN COVER

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- DISTANCE BETWEEN CENTRES 14"
- SWING OVER CROSS SLIDE 5"
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- SPINDLE SPEEDS (6) 140/1710 RPM
- HEADSTOCK TAPER 3MT
- TAILSTOCK TAPER 2MT
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 and highly decorative patterns.
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On the cover ...

Ballan Baker at the start of his winning
 run at this year's IMLEC 2005 hosted by
 Northampton SME at Delapre Park. His
 K1/1 Mogul, MacCailin Mor, made the
 penultimate run to take the title, the
 Martin Evans Trophy, and awards from
 Model Engineer and Newton-Tesla. The
 model is based on a Don Young design,
 with modifications by Ballan. Runner up
 was Steve Eaton with his Britannia, and
 Alan Bibby took the award for the best
 3 1/2 in. locomotive with his Hunslet.

(Photograph by Neil Read)

SAVAGE'S UNIVERSAL CARRIER

The authors describe a locomotive type
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An unusual and fascinating model of an
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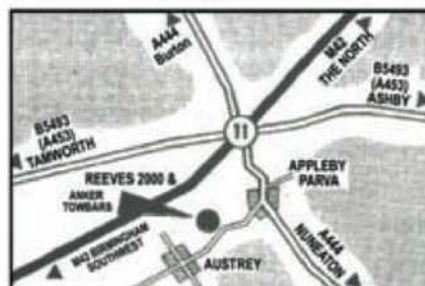


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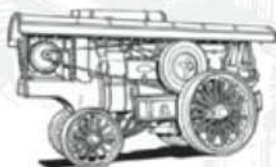
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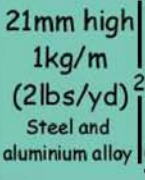


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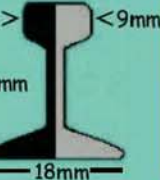


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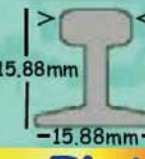


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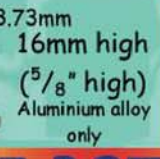


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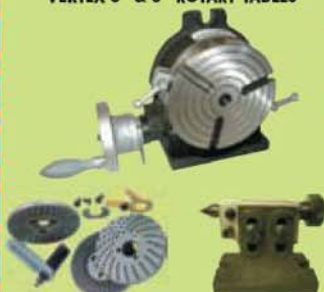


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SMOKE RINGS

With the Editors



Sorted: Des Adeley thoroughly enjoying the first highly successful outing for Ayesha

2.5 x 30 = joy

The National 2½in. Gauge Association recently celebrated its 30th anniversary rally at the delightful Rugby track. A clear indication of the recent progress of 2½ was the fact that no less than 60 members signed in, 19 locomotives were registered, of which more than a dozen took to the rails.

Watching these perform immaculately, with hardly a hint of the tricky firing of small fireboxes, is truly impressive. Small wonder more and more model engineers are joining this excellent organization, with its extensive range of plans, castings, and building guides.

The Rugby event was also a milestone as the first outing for the first steaming of its 'new' model, LBSC's *Ayesha*. Is no exaggeration to say that the development of model engineering over the past 70 years owes an awful lot to this locomotive. Curly and this little engine transformed passenger hauling small locomotives from the exclusive province of the well-heeled gent who paid for the work to be done, to people like us with our home workshops.

Ayesha did a lap of the Rugby track, but a problem with the displacement lubricator brought a halt to the proceedings. However, at a later date and after fitting a different type of lubricator (LBSC mechanical) the locomotive performed perfectly.

This *Ayesha* is one of several being built by the Association to prove the design, before drawings are finalised and castings made available. An article on the project will appear shortly in *Model Engineer*.

We expect this to prove to be one of the most popular locomotives in the coming years. It will be available in three versions: original Curly, Ivatt, and Marsh. It is quick to build, inexpensive, and a good model for beginners, being really no more difficult than a simple tank locomotive. And it is easy to transport, a bonus for many of us.

Already proving popular with builders is the New Zealand Railways Kb locomotive, a super 4-8-4 three foot six inch gauge. Another new one on the stocks is a narrow gauge Leek and Manifold 2-6-4, with the first 10 casting patterns now made.

Exciting times for 2½in. gauge.

Cheddar steam

As reported in these pages, Cheddar Models is now part of Stuart Models, bringing together much of the original Stuart range. Meanwhile, the boiler making business remains in the Somerset town. With 25 years of professional experience, Cheddar Valley Steam now concentrates on making boilers all of which come fully tested with a certificate of conformity. They are on 07789 681977, or at cheddarvalleysteam@hotmail.co.uk

Classes in South Wales

Starting in September, Gorseinon College, has two courses of interest to readers in the area. 'Welding for Beginners' meets on Wednesday evenings from seven until nine, and takes members through how to weld safely, using a variety of gas and arc welding equipment. Workshop conditions are controlled and

supervised. The course is for hobbyists or those who would like to be assessed for a BTEC award at level 1.

The Model Engineer's Club meets at the same times on Thursday evenings, under the auspices of the City and County of Swansea. This enthusiastic and friendly group can make full use of the engineering workshop facilities, with assistance available when needed.

Call 01792 893054/890754.

From the ashes

Following a fire at premises next door, Phoenix Paints stock suffered smoke damage. It aims to get back in production before September.

Call 01245 494050.

New owner

Red Wing Motor Co reports it has sold 550 of its 1:4 scale engines. It has a new 1:3 air-cooled engine, and is now under new ownership, and can be contacted at: P. O. Box 581, Lead Hill, Ar. 72644, USA. Email: rich@redwingmotor.com

Blurring the lines

There has always been a pretty clear demarcation between 'model railways' and 'model engineering'. Its now a bit blurred with the latest offering from Hornby: a live steam *Flying Scotsman* in 00 gauge, fired by electricity.

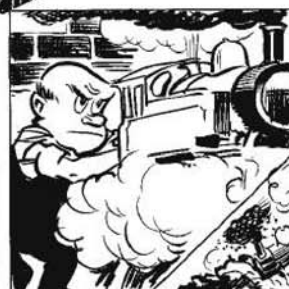
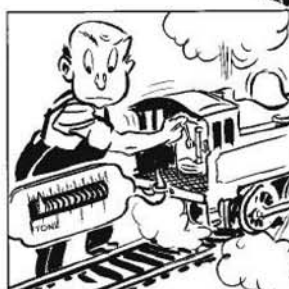
The system has been developed by Richard Hallam, starting as long ago as 1963, the year *Flying Scotsman* left mainline service. A regular boiler was not an option at this size, so Richard hit on the idea of using a mini immersion heater, powered from the track. However, the motion etc is of familiar design, and there is even a steam whistle. The A3 set sells for £525, and joins A4s in various guises, whose prices start at £325. www.hornby.com



Live steam in 00 gauge: how it is organised in *Flying Scotsman*.

CHUCK, the MUDDLE ENGINEER

by B. TERRY ASPIN



Replica firearms

SIRS, - Further to your piece in *Smoke Rings* about the Violent Crime Reduction Bill and its relevance to model engineers. The bill prohibits manufacture, sale or import of imitation firearms although it will be possible for people already in possession of imitations to keep them.

To appreciate the implications it is necessary to look at the legal definition of both firearms and imitation firearms.

A firearm is a lethal barrelled weapon.

An imitation firearm is something having the appearance of a firearm.

There are no size limits so a firearm can be anything from the smallest handgun to an artillery piece. An imitation would extend this to cover anything from a full size replica to the smallest scale model. Thus it will no longer be legal to make any form of model firearm.

The Bill fails to clarify what happens at the time of death of the lawful owner i.e. can his or her family inherit or must the item be surrendered for destruction or given to a museum.

Writing to MPs and the Home Office about this ill-conceived legislation will be more effective if positive improvements or suggestions are made. At present the making of model guns is a legal grey area and, as the activity will be prohibited unless a satisfactory solution can be found, now would be a good time to formulate an acceptable standard for model firearms.

At present an imitation firearm must not be readily convertible to a firearm, the courts have accepted a standard of four hours work by someone with no specialist knowledge and using tools found in a domestic environment for acts of property maintenance, to cover this. A good case could be made that small arms of 15mm or smaller bore and modelled at 1:3 scale and larger firearms modelled at 1:5 scale or smaller, would pose no threat to public safety but would allow model engineers to continue with minimal inconvenience.

At these scales the mechanical strength would be so reduced and the mechanism so fragile that the threat would be minimal and with models of old cannon, for example a suitable approved design of barrel obstruction could be formulated.

Name and address supplied.

4.5in. guns

SIRS, - Yes, there was a 4.5in gun. As a schoolboy during the war I remember reading that the Army had two new weapons, a 4.5in and a 5.5in gun, but of course, being wartime, no other information was revealed. The 4.5in Mk 1 and 1* were intended as conversions of the old 'sixty-pounder' but it was found that there were too few older weapons left to make this worth while, so the Mk. 2 was designed to fit the carriage of the then new 5.5in gun. The latter had a bore length of 30 calibres; the smaller gun was 41 calibres long but, although it had a longer range than its larger partner, this was thought to be poor compensation for its much smaller (55lb) shell.

Anticipating shortages of higher-grade steels the 5.5in was originally given a 100lb shell. When the supply position eased a thinner-walled shell of stronger steel could be provided. This weighed 80lb, increasing the range. The lighter shell also allowed the use of a 'super' charge, with a further increase in range.

As they were starting with the proverbial 'clean sheet of paper' the designers of the 5.5, in a natural desire to be really up-to-date, seem to have been a little too clever at first. The gun was originally fitted with a complicated semi-automatic firing lock which had worked perfectly in the Navy, but it could not cope with the dirt and grit of land service so it had to be replaced with an older but simpler lock. Likewise, the balancing presses (the conspicuous 'horns' which are so characteristic of this weapon) were originally hydro-pneumatic, but the complicated design caused much grief so they were replaced by simple springs.

David Wooderson, Kent.

Banning of gun plan adverts

SIRS, - Oh dear! What direction is *Model Engineer* taking now? We have a batch of letters (M.E. 4247, 13 May 2005) from readers objecting to censorship of information on the potential manufacture of firearms by model engineers. So S. Walkley, B. Perkins and B. Hares object to the principle of banning information from a land with a different gun culture on making a replica Gatling gun model, which can be made to fire lethal 0.22 bullets and Brocock air cartridges.

S. C. Walkley finds it disheartening to be denied historical information about firearms because of the importance of 19th century developments in the mass manufacture of firearms. I accept that these warfare-driven developments made significant advances in engineering manufacturing in general. The arms industry was fundamental in establishing the low cost mass manufacture of interchangeable engineering components which could be assembled by semi-skilled labour.

Unfortunately, I fail to see how obtaining information for making a single non-functional model will give any insights into the extensive tooling, specialist machines and methods used in the original production processes. I am afraid that considering a replica of an efficient functional object an 'art form' is outside the boundary of my creative imagination.

B. Perkins considers that censoring the advert was a destruction of private initiative and denial of access to the results of historical research. I am afraid I do not share his belief that historical information about model aero engines is in the same category as that about a potentially lethal model firearm. Surely he contradicts himself when he considers that real guns are more dangerous than replicas which may also fire lethal projectiles. He also ignores the potential dangers of such a model getting into the hands of the criminal fraternity.

I do not understand how legitimate de-activation of historical firearms or the restrictions of the 1968 Firearms Act can result in the break up of firearms collections. Legitimate and valuable historical firearms still seem to regularly turn up on the Antiques Road Show. Of course I regret that law-abiding citizens have to suffer inconvenience to allow for an extreme minority but surely that is a reality of living in a complex modern society, democratic institutions have to try and govern for the protection of the overwhelming majority.

It seems a cheap populist jibe to me for B. Hares and B. Perkins to pass off legal and health and safety regulations as interference by the nanny state. The reality is that moves to establish or tighten up statutory regulations are invariably retrospective to some previous fatality or accident.

The legal control of firearms forms an essential part of public protection policy in the UK.

Removing illegal real guns from circulation amongst the criminal fraternity is a separate police enforcement activity.

It should be abundantly clear to any person with a public awareness that making a model which bears a passing resemblance to a firearm incurs a significant risk in the current climate. I recall that there was a construction series in this magazine for a replica handgun during the editorship of Ted Jolliffe. I don't think that that series sits too easily today considering the frequent advice by the police about the problems of replica guns and the risk of being innocently shot by them if seen carrying one. Do we really need more legal information in this area, as S. C. Walkley proposes, which is presented to enable us to construct models which will just fall within the regulations?

All the correspondents give me the impression that they believe that they and other model engineers inhabit a perfect world where all are trustworthy and sensible people in respect of every aspect of firearms.

Are they in favour of the open publication of details for manufacturing germ warfare gases and nuclear weapons? Unlike B. Hares, I am afraid that I do not consider controlling specific lethal information on firearms to be in the same category as all potentially dangerous information. I would prefer to avoid the potential encouragement of any odd rogue model engineer than face any hint of association with a magazine which facilitated a firearms incident. I accept B. Hares assertion that the determined will source their nefarious information somewhere but I do not consider that is an excuse for making public specific lethal information through newsagents. This is enough of a quasi-political diversion for me, lets return to the normal apolitical diversity of Model Engineer please.

David L. Francis, Somerset.

Steam cars

SIRS, - I have observed the correspondence concerning monotube boilers and would be interested to know what the patents refer to as I have been involved with Doble steam cars over a long time. My father owned two Doble cars and he knew Abner Doble very well. I restored one car in which the boiler was a monotube contra flow type with a working pressure of 100 atmospheres (1500psi) and weighed

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2 tons. I give an illustrated talk now and again which causes quite a stir and covers the technical and financial side and much else.
P. H. Lewis Norfolk.

Gauge glass fittings

SIRS, - Referring to *M.E.* 4226, 29 April 2005 - *Penrhos Grange* water gauge. I am reminded of an instance where the fusible plugs melted on a full-size Great Western locomotive some time in the early 1950s. The cause of this failure was attributed to incorrect fitting of the rubber gauge glass ring which allowed the ring to creep under the bottom end of the gauge glass thus obstructing the water way and leading to incorrect water level indications.

Back to *Penrhos Grange*, The top fitting to the water gauge has a bevelled base which will keep the O-ring pressed against the wall of this Top fitting which appears (I trust) to be satisfactory. However, the lower fitting is a plain square seating with the gauge glass seating directly upon the O-ring. I see nothing to prevent the O-ring from distorting inwards and obstructing the water way thus giving an incorrect reading of water level.

Whilst it requires a larger water gauge I feel this component should be constructed with the glass seated upon the metal and the O-ring on the outside of the glass.
E. P. Moxham, Hampshire.

Magneto couplings

SIRS, - I was much amused by the juxtaposition of Brian Perkins' description of his final success with his model VW engine and Peter Spenlove-Spenlove's photograph of his BTH magneto.

My Lagonda Rapier was originally fitted with just such a magneto (type GA4). The water pump, dynamo and magneto were all driven in the same direction and at the same speed as the crankshaft, through an intermediate gear. The vernier coupling is between the dynamo and the magneto.

Further use was made of the same sort of vernier drive on each camshaft. As Peter says, $19 \times 20 = 380$, so there were 380 possible combinations for those who wished to experiment with say, a little more valve overlap.

So good was the design of this engine, that the upper timing sprocket has a purpose made cradle specially placed for when the head is removed, such that when the top sprocket is in this cradle, the chain

is not dislodged from the teeth of the lower sprocket. Further, the three holes for the drive bolts are NOT equally spaced on their pitch circle. The sprocket will only go back to where it came from. So it is possible to remove the head, inspect the bores etc. and provided that nothing much more is disturbed, replace the head without disturbing the valve timing at all. It was a really lovely engine to work with.
James Buxton, Shropshire.

Stirling engines - cooling

SIRS, - In fairness to Mike Thurgood (*How Hot Air Engines Work*, *M.E.* 4243, 18 March 2005), Keith Roper's letter (*Post Bag*, *M.E.* 4247, 13 May 2005) cannot be allowed to go unchallenged. To do so would undermine the credibility of *Model Engineer* as a technical journal.

The assertion that cooling is necessary for the proper functioning of a Stirling cycle engine is absolutely correct. To deny this fact betrays a lack of appreciation of one of the fundamentals of thermodynamics, namely the Second Law. The need for cooling is not, as Mr. Roper suggests, the result of thermal conduction along the walls of the displacement cylinder. In an idealised engine, it would be quite in order to specify that these walls be made out of a perfect insulator. Such an engine would still require a 'cold reservoir' in order to operate in a sustainable way. To imagine that the expanding gas could somehow produce sufficient cooling to sustain the engine is at odds with every thermodynamics text since Carnot.

It is also quite fallacious to suggest that if an engine were 100% efficient, all the heat input would be available as mechanical work and none as heat so no cooling would be required. Even if inefficiencies such as air resistance or bearing friction could be eliminated completely, a degree of inefficiency is intrinsic to the operation of any heat engine, even those not yet invented. Short of providing a cool reservoir at absolute zero temperature, the laws of nature absolutely preclude us from building a 100% efficient engine, even in our imagination.

There is no doubt that in practice, many Stirling engines can be demonstrated to run without taking any special steps to provide cooling. In some cases it may be that adequate cooling results from unassisted heat loss into the engine's surroundings or it may be that the engine will only run for a limited time until the temperature of the 'cold end' of the engine has risen to a point that the engine can no longer function. If 'single reservoir' heat engines were possible it would open the door for all sorts of wondrous devices, such as ships able to propel themselves by drawing on the vast amount of thermal energy in the ocean.

David Hoskins, New South Wales, Australia, by e-mail.

Full size steam aircraft

SIRS, - Steam powered aircraft in full size not achievable? - *M.E.* 4248, 17 May 2005 Some time ago while researching the Illingworth boiler on the Internet, I stumbled across *Steam Car Developments & Steam Aviation* Volume III No. 28 of June 1934. One of the articles describes a number of flights by William Besler at Oakland Airport, California in an aircraft fitted with

a Doble-Besler steam generator and a V twin double acting compound engine which produced 150bhp at 1650rpm. The address of the site is www.firedragon.com/~kap/SCD&SA/Scd28.PDF

Issue 29 of the SCD & SA went on to argue the merits of interchangeable fireboxes so wood could be burnt in an emergency!
Paul Norton, Taunton.

Matchless water

SIRS, - Reading Malcolm Metcalfe's article in *M.E.* 4247, 13 May 2005 on moist fuel made me recall the days of my youth (1948-50) when I rode to work and for enjoyment on a 350cc single cylinder Matchless motor cycle. On damp wet mornings the bike always appeared that bit livelier in its performance. The Magazine Motor Cycling ran an article suggesting damp air improved performance and I was interested enough to try out this theory. I soldered a Cherry Blossom boot polish lid, by its edge to a jubilee clip which fastened around the inlet tube of the carburettor. The tin held the water and four pipe cleaners were inserted through a hole suitably cut in the top edge (at '12 o'clock') and spread across the carburettor intake. The simple contraption caused many ribald comments from my pals but believe it or not it worked. I eventually abandoned it because it required filling much too often.
John Hodgson, Yorkshire.

Which Myford?

SIRS, - I am writing to you in the hope that through your publications and connections with the model engineering world, you would be kind enough to help me identify the pictured 3 $\frac{1}{2}$ in Myford Lathe.

I have been in contact with Myford but they are unable to identify the model. They are only able to tell me that it was built prior to 1947.

The serial number on the machine is J3824.

I have included some photographs to help in this quest to locate parts and accessories within the United Kingdom. I would be most grateful for any assistance that you are able to provide.

R. G. Burton, Lusaka.





The arrangement used by the author in his workshop for drilling the lantern pinion bobbins.



The drill has been retracted into the chuck here and is being used to drill the face nearest the drill chuck.

AN UPDATED CLAUDE REEVE EIGHT-DAY REGULATOR CLOCK

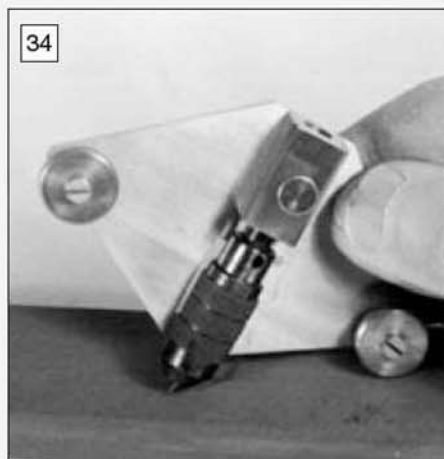
John Wilding FBHI
continues construction starting with
the lantern pinions.

●Part IV continued from page 103
(M.E. 4252, 22 July 2005)

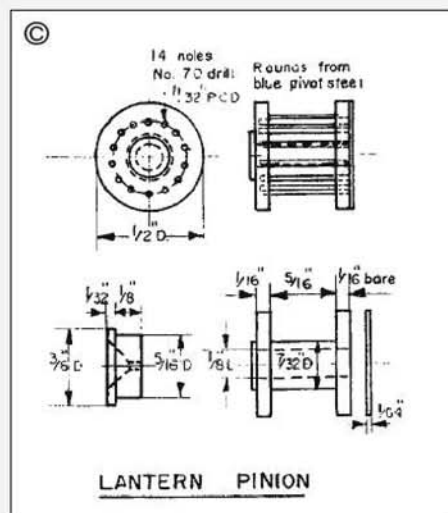
Lantern pinions are specified for this clock. They require 14 holes drilled in the flanges on a pitch circle diameter of 0.333 inches. The bobbins are turned in the lathe forming the centre recess with a parting tool. Although Claude specifies 1/2in. dia. for these the centre pinion will benefit by making the flange, which is secured to the centre wheel, a bit larger, say 5/8 inch.

The internal width of the centre bobbin should be some $\frac{5}{16}$ in. but the two upper pinions, where the thickness of the wheels is only $\frac{1}{16}$ in., can be $\frac{3}{16}$ inch.

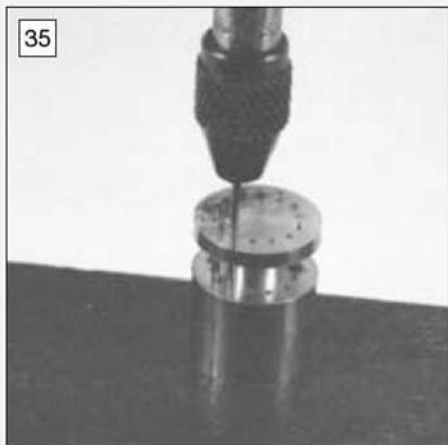
In **photo 32** I show the set-up in my workshop for drilling the bobbins. The milling spindle illustrated here is the Arrand spindle and it is fitted with a precision, No.1 Morse taper drill chuck which will close down to zero. The spindle



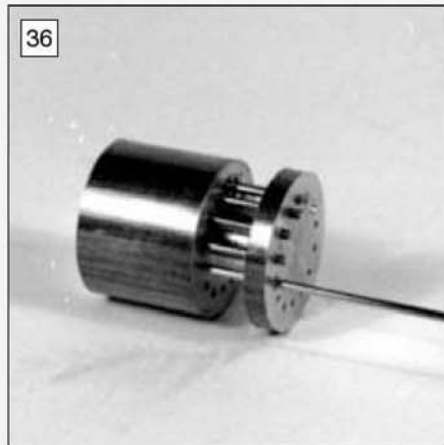
Sharpening the No.71 drill using the author's drill sharpening device.



LANTERN PINION



A pin chuck can be used to assist in fitting the pivot steel into the bobbin.

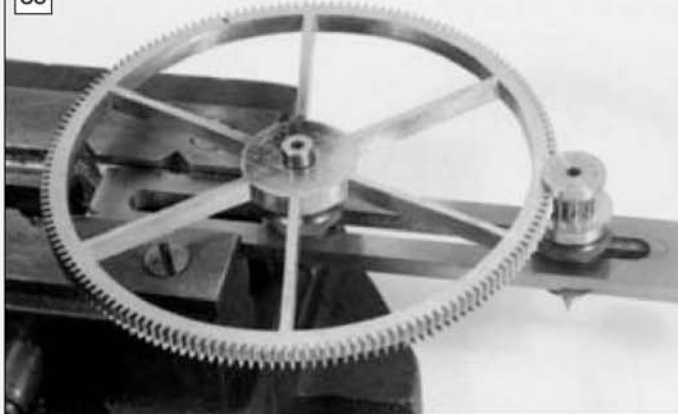


The excess pinion wire can be cut off with cutters or by nicking on a grinding wheel..



A pivot finished using the methods outlined in the article.

38



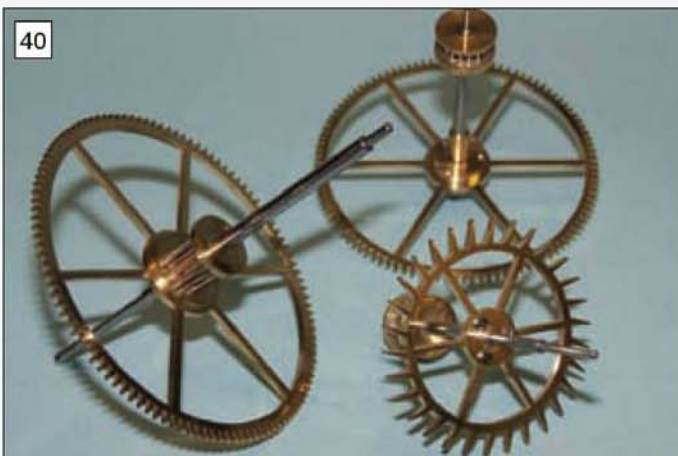
Depthen the main wheel with the centre pinion. Note the use of a simple depthen tool.

39



A simple jig was used to position the 10BA holes used to secure the bearing bushes in the front motion plate.

40



A group of train wheels assembled on their respective arbors. Note the delicate crossing out.

41



The main wheel assembly in position in the frames of the clock. The delicate ornamental piercing can be seen to good advantage.

withdrawn 0.166in. and the slide locked to prevent inadvertent movement. The drill is taken through the outer flange and then withdrawn from the chuck so that it can penetrate the inner flange by about $\frac{1}{32}$ inch. Before the bobbin is removed for pinning, the centre hole should be drilled to suit the centre arbor. In this way the pinion will run truly. Photograph 33 is a close-up of the operation. The drill has been retracted 0.166in. from the centre position and is ready for drilling the 14 holes through the outer flange. It is important that the drill is sharp and I recommend the use of my little drill honing jig which I illustrate here in photo 34. The jig can be made in a few hours (ref 2).

Pinning the bobbins

The blued pivot steel is held in a pin vice. Use a piece of fine emery paper (2/0) to remove the blue. Some people leave the blue but it will automatically be removed the first time the clock is cleaned, use a fine cutting broach to enlarge the outer hole in the bobbin the small amount necessary so that the pin will enter. The pin should be prepared by rotating it against the wheel of the bench grinder (preferably a fine stone – 80 grit) to form a V-shaped point. A drop of Loctite 601 is placed on the hole and the wire pushed in until it is up against the second hole. A tap with the hammer should force it right

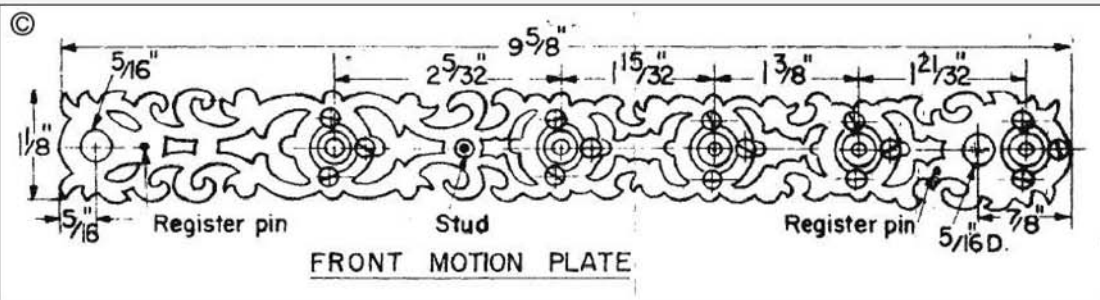
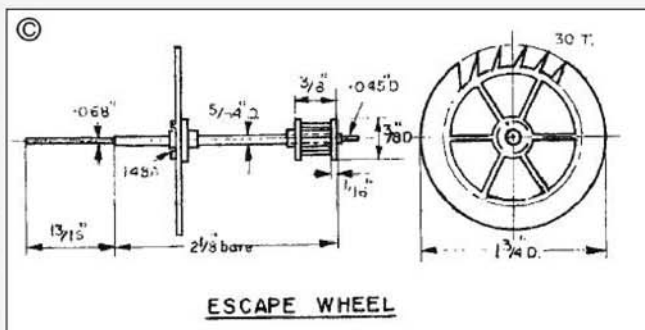
home. The surplus material is cut off with cutters or, if you are afraid of damaging your cutters, nick the wire on the corner of the grindstone and break it off. An illustration of the process is given in photos 35 and 36. The ragged ends of the pins can be offered up to the side of the grinding wheel and finally, with the bobbin held in the lathe chuck, the ends are stoned flush with a carborundum slip stone with plenty of oil.

Arbors

Again blued pivot steel is most suitable for these. It will machine in the lathe but the cutting tool needs to be really sharp. The pivot can then be treated with the pivot file and burnished using the opposite end of this tool. Constructors often tell me they cannot get on with the burnisher but this is because they have not cross

grained it on a piece of coarse emery cloth which itself is glued to a curved piece of wood. A pivot burnisher will not operate on hardened and tempered steel unless it has been treated in this manner. An example of a nicely burnished pivot is given in photo 37.

The distance between the pivot shoulders can now be ascertained by laying the arbors across the plates and marking the location of the second





42
First stages in polishing involve using abrasive paper to remove blemishes. A rubber mat is used to prevent slipping.



43
A photograph of the movement finished and assembled to the stage described in this article.

pivot shoulder. When doing this with the barrel arbor, matters should be arranged so that the back end of the barrel is as close to the back plate as possible. Before the wheels and pinions are fixed to their arbors the depthing should be carried out. This is illustrated in **photo 38** where the great wheel and centre pinion are being checked. The depthing tool in use here is the J. M. Wild tool (ref 3). With the most comfortable engagement of the two gears, this distance is marked out on the front plate. Make a centre dot at the centre arbor location and with one runner engaged in this mark out the barrel arbor position, this should come in the approximate centre of the designed area in the decoration. Do each pair of wheel and pinions finishing at the escape arbor location.

As I have said earlier on, the train can perfectly well be planted directly in the plates without using the bronze bushes suggested by Claude Reeve. If the bushes are to be used then each pivot hole in the plates must be opened out to $\frac{5}{16}$ inch. This has to be done most carefully. Each location on the plates is centre dotted and then enlarged with a pointed spade drill held in either an Archimedeian drill or pin vice. One way of bringing the hole to $\frac{5}{16}$ in. dia. is to use a pin drill. My $\frac{5}{16}$ in. dia. pin drill has a pilot pin $\frac{1}{8}$ in. dia. so the holes are enlarged to this size prior to using the pin drill.

Bushes

These are machined from bronze rod to the dimensions given on the drawing. Note the large oil sink provided in order to reduce the length of pivot hole. When machining the $\frac{5}{16}$ in. dia. on each bush check the fit with the holes in the plates, pin drills usually cut slightly oversize.

One advantage in using these bushes is that it is easier to adjust the end shake of the arbor precisely. If the end shake is insufficient the inside face of the bush can be reduced to give more clearance. Each bush is retained in place by three 10BA cheese head screws. These screws are not put through the flange of the bush but are placed round the edge so as to retain the bush which is captured under the head of the screw. For this to function correctly it is important that the screw holes are formed right up close to the flange of the bush. To achieve this I made a little jig (**photo 39**). The jig fits in the $\frac{5}{16}$ in. dia. holes and I drilled several holes at different radii to find the best position for the screws. Having found this I drilled two more holes at that radius. In this illustration you can see that the jig is held in place by one screw while the other two holes are drilled in the plate.

At this stage the wheels and pinions can be permanently secured to their arbors with full strength Loctite and I show a group of these in **photo 40**. The pivot holes are drilled slightly undersize and broached to fit the pivots. Because of the comparative weakness of the frame structure it is essential that the pivot holes are taper broached. I show the main wheel fitted in the plates in **photo 41**. Each arbor is fitted in turn and if there is a depthing error it can be corrected by making a special bush with the pivot hole drilled slightly off centre. The bush can then be rotated until the best position is found. The train must of course be quite free and it must pass the freewheeling test.

With the bulk of the work completed on the plate the constructor may like to clean these up. I show the preliminary stage of this work in **photo 42**. The plate is placed on the rubber mat and a piece of 240 grit wet and dry paper pinned round a cork block is used to remove burrs, scratch and scribe marks. This is used wet. On no account should any paper coarser than this be used. 600 grit paper can be used next, finishing with 1200

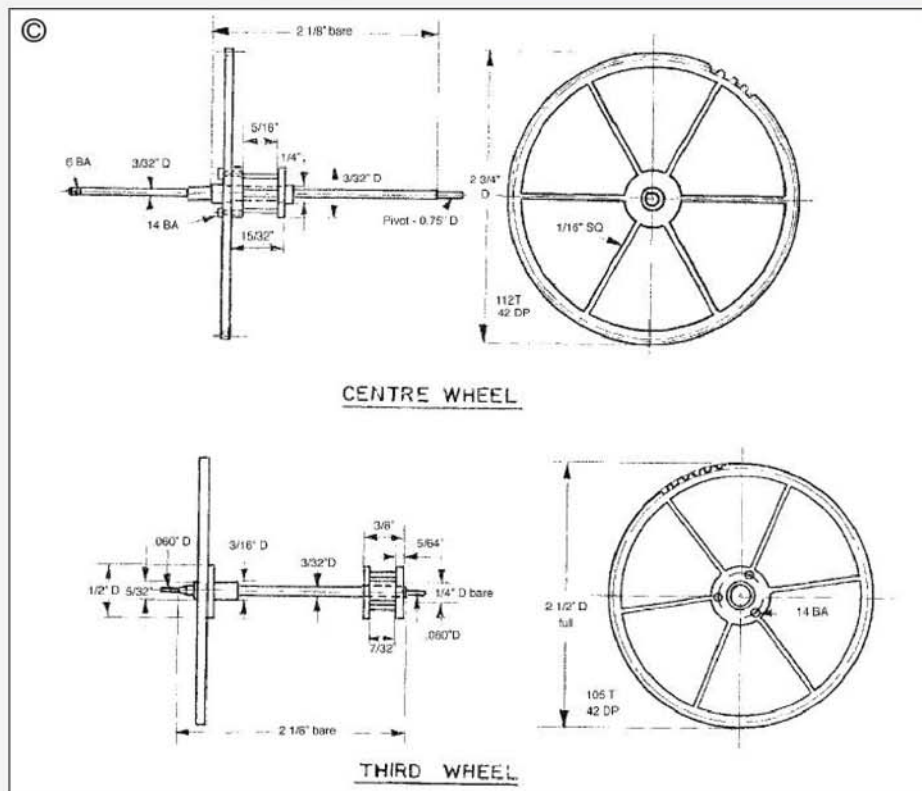
grit all used wet. This will do for the time being. The final polishing can be done at the completion of the construction.

Photograph 43 shows the movement at this stage. The next part of the construction will be the escapement.

● To be continued.

References

- 1: Blued pivot steel is available from the usual suppliers. Meadows & Passmore, Walsh, Cousins, etc.
- 2: The construction of this drill honing jig is covered in my book *Tools for the Clockmaker* available from Rite Time publishing
- 3: This depthing tool is available from J. M. Wild FBHI or a description on how to make one can be found in my book *Tools for the Clockmaker*.



SEQLEC 2005

Entries are now being invited for SEQLEC 2005 the efficiency trials for 7¹/₄ in. gauge locomotives.

Hosts this year are the
Fareham and District Society of Model Engineers
at their Titchfield, Hampshire site
on Sunday 11 September.

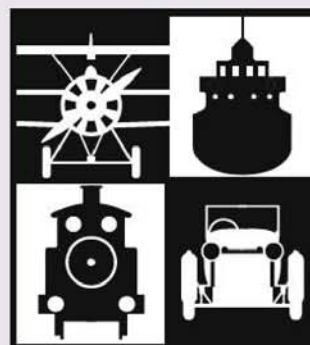
Contact:

Mike Machin **01489 860113** or
Pete Reynolds on **023 9226 8351**

IN THE NEXT ISSUE

- **Skeleton clock**
- **I/C Engines**
- **L.B.S.C. Weekend**
- **David Parker's Models**
- **New Steam Engine**

**and
Model Engineer Exhibition
2005**



ON SALE 2nd September 2005

(Contents may be subject to change)



Malcolm Stride

reports on the this fiercely contested event with some additional photographic contributions from Mike Chrisp and Neil Read.

The 2005 International Model Locomotive Efficiency Competition (IMLEC) was held at the Delapre Park track of Northampton SME. This is the third time that Northampton SME has hosted the competition, the other occasions being in 1996 and 1999. The track is situated in a corner of Delapre Park, Northampton and runs through heavily wooded ground with a maximum gradient of 1 in 183. Running for IMLEC was anticlockwise which is opposite to the normal running direction ensuring that local entrants did not gain an advantage.

There were a total of 28 entries for the competition this year with 15 runners on the first day and 13 on the second. One competitor, John Cottam, withdrew due to locomotive problems before the event and was replaced by Mike Gibbs with his B1 driven by Paul Bexfield.

With the first runs due off at 08:20 each day those attending were very pleased to be able to fortify the inner man (or woman) with bacon rolls available before the start of proceedings on each day.

The weather on both days was dry, although the first day was very cloudy making your photographer's job tricky under the trees. Day two was better with the sun breaking through in the afternoon.

On the track, drivers were riding in front of the dynamometer car this year and several carried a 'small person' as ballast to avoid derailments due to the driver having to lean forward. The tight curve into the tunnel caught several out because it followed the bank up through the station area and a row of chairs had been placed for spectators on this bend. Those using them had a good view of the struggles of several drivers trying to get away after stops on the bend.

James Brunning - 0-6-0T Speedy

James' 5in gauge Speedy to the LBSC design was built mainly from bar ends and scrap from the waste bin in the factory where James worked. The valve gear is as designed by LBSC rather than the modified version. A member of the Ascot Locomotive Society and the Guildford Model Engineering Society, James is a qualified production engineer who has worked on guns, underwater missiles, airliner undercarriages and lately diesel pumps. Now semi-retired he is busier than ever working on the new railway at Ascot and a 7 1/4in gauge Schools locomotive.

This run in fact took place at the end of the first day because James had a problem with his locomotive before coming to the line. Once on the track James had a good start with no slip and set off at a good pace although he had one stop after eight minutes. James commented "Excellent, really enjoyed that, good run". James achieved an overall efficiency of 0.7306%

Les Pritchard - 4-4-2 freelance Sapper (owner Paul Collins)

This locomotive was one of two entries by Paul Collins from the Harlington Society. It is a freelance design, believed to be based on the NER

OFFICIAL RESULTS						
Name of entrant	Driver	Society	Gauge (in)	Wheel arrangement	Model	Running time (min)
Ballan Baker	Ballan Baker	Lindsey Model Society	5	2-6-0	LNER Mogul K1/1	27.90
Steve Eaton	Steve Eaton	Chesterfield MES	5	4-6-2	Class 7 Britannia (<i>Rough Diamond</i>)	28.90
Glyn Winsall	Glyn Winsall	Rugby MES Ltd.	5	2-8-0	LNER Thompson 01	30.80
James Elliott	James Elliott	City of Oxford SME	5	0-6-0	Speedy	30.30
Leonard Steel	Leonard Steel	Guildford MES	5	4-6-2	Britannia 70007 (<i>Coeur de Lion</i>)	29.45
Paul Tompkins	Paul Tompkins	Guildford MES	5	2-8-0	Somerset & Dorset 7F	30.45
Alan Bibby	Alan Bibby		3 1/2	0-4-0	Hunslet (<i>Charles</i>)	30.75
Mike Gibbs	Paul Bexfield	Vauxhall MES	5	4-6-0	LNER B1 (<i>Impala</i>)	31.60
Neil Skellon	Neil Skellon	Urmston & District MES	5	2-10-0	9F (<i>Evening Star</i>)	31.20
James Brunning	James Brunning	Guildford MES	5	0-6-0	Speedy	31.30
David Gregson	David Gregson	Leyland SME	5	4-6-2	A1 Peppercorn Pacific	30.90
John Hurley	John Hurley	Kinver & West Midlands SME	5	4-6-0	LMS Jubilee	34.00
Stephen Coles	Stephen Coles	Sale Area Model Engineers	5	4-6-0	Garth Hall	37.00
Bernard Clark	Bernard Clark	Northampton SME Ltd.	3 1/2	0-6-0	Bassett-Lowke tank	32.40
Dave Tompkins	Dave Tompkins	Guildford MES	5	0-8-0	Netta	26.40
Lawrence Tatton	Lawrence Tatton	Lincoln & District MES	5	2-8-0	Nigel Gresley	28.16
Paul Collins	Les Pritchard	Harlington Locomotive Society	5	4-4-2	Freelance (<i>Sapper</i>)	31.00
David Mayall	David Mayall	Bracknell Railway Society	3 1/2	0-6-0	4F	31.45
Brian Eatock	Brian Eatock	Chesterfield MES	3 1/2	4-6-0	Black Five (<i>Doris</i>)	30.66
Peter King	Peter King	Northampton SME Ltd.	5	0-6-0	Simplex	31.95
Mike Honeybun	Mike Honeybun	Gravesend MES	5	4-6-0	LNER B1 Springbok	30.00
Paul Pavier	Ben Pavier	Southport MES	5	4-6-0	Manor 78xx (<i>Lynham Manor</i>)	29.95
Michael Casey	Roger Caple	Manx Steam & Model Engineering Club	5	4-6-2	Merchant Navy (rebuild)	27.40
George Golightly	Mary Knappman	Llanelli & District SME	5	0-6-0	Simplex	30.90
John Richardson	John Richardson	Brighouse & Halifax ME	5	4-4-0	Maid of Kent	26.25
Paul Collins	Paul Collins	Harlington Locomotive Society	3 1/2	2-6-2	L&B (<i>Lew</i>)	30.95



Above: James Brunning



Above: Les Pritchard



Below: Paul Bexfield



Below: Jim Elliott

Atlantics. Driver Les Pritchard is a seasoned IMLEC competitor having achieved two wins and a second place in previous competitions.

The first noticeable thing about this locomotive was the very noisy safety valves as Les came to the line. Les got off to a nice easy start with no

slip but came to a halt after about three laps. This was due to injector problems and the result of this was a 'lost fire'. These problems caused two more stops and a Les had to set back to get restarted from these. Never the less the run was completed with an overall efficiency of 0.5336%.

Paul Bexfield - 4-6-0 LNER B1 (owner Mike Gibbs)

This model was started in 1995 as a club project by three members of the Vauxhall MES. It was built over a period of seven years and was finish painted in 2003 winning the prize for the best steam model in the Bedford Club exhibition in the same year. It is to the Martin Evans 'Springbok' design with some modifications including a twin ram axle pump and a large capacity twin ram lubricator. Driver Paul Bexfield has been a model engineer for 30 years and has built two locomotives, an American type 4-6-0 and a Duchess in 3 1/2 in. gauge as well as contributing to this club locomotive.

Paul had a lot of slip to control but got away to a good start. Unfortunately just after the commentator commented "Going well, steaming well", Paul came to halt in the tunnel. Paul had one more stop due to a derailed driving car and also seemed to be slipping occasionally on his run. The overall efficiency achieved was 1.0033%.

James Elliott - 0-6-0T Speedy

James built his Speedy in 1986 to the LBSC design with Don Young valve gear. It was rebuilt and re-boilered in 1995 with radiant super heaters, modified draughting, a stainless steel arch and new valve bobbins. Jim is no stranger to IMLEC having competed four times with his best performance being at Northampton when he came first in 1999.

James' run can only be described as uneventful. He got off to a nice steady start with no slip and had the drain cocks shut after about 6 feet. Thereafter he just toured the track steadily. To show that all these things are relative, James

LTS IMLEC 2005

Coal used (lb)	Distance run (ft)	Work done (ft lbf)	Passengers	Average drawbar pull (lbf)	Specific fuel consumption (lb/dbhp hr)	Overall thermal efficiency (%)	Previous IMLEC winner?	Placed
1.061	14017	228195	10	16.2798	9.2061	2.0105	No	1
1.464	15014	271419	16	18.0777	10.6799	1.7331	No	2
1.840	15002	303239	17	20.2132	12.0143	1.5406	Yes	Best past winner
0.907	13960	124815	7	8.9409	14.3882	1.2864	Yes	
1.894	14961	248416	14.5	16.6042	15.0961	1.2261	Yes	
1.132	9985	138787	11.5	13.8995	16.1496	1.1461	No	3
1.264	16960	147360	7	8.6887	16.9837	1.0898	No	4 + best 3 1/2 in. gauge
2.000	13969	214666	14	15.3673	18.4473	1.0033	No	
3.176	14994	284418	18	18.9688	22.101	0.8371	No	
1.753	15981	137012	7	8.5734	25.3331	0.7306	No	
3.617	17998	268439	14.5	14.9149	26.6789	0.6938	No	
3.300	11011	238845	18	21.6915	27.3567	0.6766	No	
2.230	13990	155391	9	11.1073	28.4148	0.6514	No	
1.467	17023	98410	4	5.7810	29.5159	0.6271	No	
1.520	10999	91986	3	8.3631	32.7180	0.5657	No	
3.321	11014	191102	12	17.3508	34.4088	0.5379	No	
1.525	10426	87043	6	8.3487	34.6898	0.5336	No	
1.259	14002	71774	4	5.126	34.7315	0.5329	No	
1.281	14988	70801	3	4.7239	35.8241	0.5167	No	
3.012	12022	155945	9	12.9716	38.2427	0.484	No	
2.805	15970	138774	6	8.6897	40.0212	0.4625	No	
2.303	14989	111476	6	7.4372	40.9051	0.4525	No	
3.667	12026	175338	10	14.5799	41.4095	0.447	No	
2.230	11991	105339	9	8.7848	41.9161	0.4416	No	
2.850	16008	130153	6.5	8.1305	43.3567	0.4269	No	
3.264	11003	92422	8	8.3997	69.9262	0.2647	No	



Above: Len Steel



Above: Alan Bibby



Below: Steve Coles

commenting on his run afterwards said *"had a flap on, in danger of blowing off, too much coal"*. All I can say is that it appeared very relaxed to those watching! Jim's run resulted in an overall efficiency of 1.2864%.

Len Steel - 4-6-2 Britannia *Coeur de Lion*

Coeur de Lion was built by Lionel Flippance in the early eighties and entered in the 1985 IMLEC at Urmston where it came second. Len has been modelling since the age of 16 and is a member of several different model engineering clubs. He acquired this engine in 1988 and his IMLEC record includes a win at Llanelli in 1997 and a second place at Leyland in 2002.

With this combination we all looked forward to a good run and were not disappointed. Len got away to a good start and then toured the track in very relaxed style apart from a problem with lack of weight on the rear of the driving truck. To this spectator he seemed to be very laid back often to be seen sitting up with his arms folded just letting the locomotive run. His comment after the run tells a different story *"fought every inch, just me on the day"*. Obviously a career in acting beckons! This popular competitor achieved an overall efficiency of 1.2261%.

Alan Bibby - 0-4-0ST *Charles*

Charles is a 3 $\frac{1}{2}$ in gauge model of a 0-4-0 Hunslet, the original of which is in the Penrhyn Castle Museum in North Wales. Alan bought the chassis at a club sale nine years ago and has reworked most of it to make it functional and correct machining errors. Completion of the rest of the model was greatly helped by the loan of photographs of the original. Amongst the

modifications to the original design is a combined spark arrester and exhaust oil separator described in *Model Engineer* in February 2001. The loco ran in IMLEC at Leeds in 2002 being placed 11th overall and 2nd in the 3 $\frac{1}{2}$ in class.

Alan has also built a *Lion*, which he entered in the last IMLEC at Northampton, a *Princess Marina*, *Charles* and a *Romulus* as well as an Allchin traction engine and various machine tools and I/C and steam engines. He is a member of the Leyland club and produces the Northern Association of Model Engineers newsletter.

Alan's run started well setting off at what can only be described as a 'cracking pace'. This continued for the first half of the run but he then slowed a little due to a low fire but he then *"got it back again"*. Alan was seventh overall and the best 3 $\frac{1}{2}$ in gauge entrant with an overall efficiency of 1.0898%.

Mike Honeybun - 4-6-0 LNER B1 *Springbok*

Mike purchased his loco at auction in October 2003 with some parts missing which he has replaced. The loco is well travelled having run at Sinsheim in Germany earlier this year and recently at the De L'Orne steam festival in France.

Mike joined the Gravesend Model Marine and Engineering Society about 5 years ago, is constructing a 5in gauge 'Jubilee' and has an ongoing project to rebuild a Gresley 2-8-0 locomotive which he acquired in Africa.

Mike had some slip for the first few feet of his start but then the locomotive got a hold and got away well. Mike's run was very steady with no dramas although some slip could be heard on the gradients. Mike described his run as *"most enjoyable"* which is really what our hobby is all about. The overall efficiency achieved was 0.4625%.

Stephen Coles - 4-6-0 GWR *Garth Hall*

This locomotive was designed and built by Tom Curry over a 10 year period and has been in Stephen's possession for the past three years. It has been totally maintenance free during that period. This will be Stephen's third year at IMLEC and his first drive, last year, was at the controls of Arthur Eve's *Blue Steel*.

Stephen got off to a good start and controlled the slip well. He then suffered a derailment halfway through his run and slowed slightly but was going well until another derailment after the station area two minutes from the end of his run. After setting back to restart, Stephen dropped five passengers and got away to finish. Stephen was obviously disappointed to have derailed but described it as a *"good run"*. Overall efficiency was 0.6514%.

Mary Knapman - 0-6-0T *Simplex* (owner George Golightly)

Mary Knapman was taught to drive by her uncle, George Golightly, at the age of 13 and this was her first attempt at IMLEC. The original owner of the 'Simplex', John Golightly, wanted her to drive it in last year's IMLEC at Kinver but she didn't feel confident enough. He has recently passed away and Mary was determined to drive at this year's IMLEC in his memory.

Mary had an excellent start and set off well with occasional slip apparent during the run. The locomotive slowed after five minutes but Mary kept things going until a stop at the station for a 'blow-up' at 25 minutes. After restoring steam pressure Mary got away again (with lots of talking to the locomotive) to finish a good run. Mary reported *"no problems apart from lost steam"*. Overall efficiency was 0.4416%.



Above: Mary Knapman



Above: Dave Gregson



Dave Gregson - 4-6-2 A1 Peppercorn Pacific Alcazar

Dave, a passionate model engineer since the age of 11, built this locomotive to Michael Breeze's design over a four-year period with many of the castings made from his own patterns. The engine is painted in BR Blue livery post 1948. The boiler has a large combustion chamber with cross-tubes; the heating surface is 760in.² with a grate area of 46 square inches. Dave is a member of Leyland SME and this was his seventh IMLEC attempt.

David had lots of slip at the start but contained it well and got away to a completely uneventful relaxed drive. His comment at the end was "good, all right, enjoyed it". Overall efficiency was 0.6938%.

Paul Tompkins - 2-8-0 S&D Class 7F

Paul built this locomotive between July 2002 and May 2004 to the Martin Evans design, the boiler was constructed by Len Steel. The engine was not built as an exact scale model but more as a working model with oversize frame stretchers, simplified suspension and axle-boxes. Paul has been competing in IMLEC every year since 1995 with a 3rd place finish at Leeds in 2002. The locomotive was rebuilt following a major derailment when a coupling rod retaining pin worked loose causing the coupling rod to foul the crosshead.

Paul had a good start and got away well and kept a good pace up for the first five minutes before slowing slightly and completing a slow but steady run. Paul described the run as "the most nerve racking I have ever done". Never the less an overall efficiency of 1.1461% was achieved.

Below: Paul Tompkins

Ben Pavier - 4-6-0 GWR Lydham Manor (owner Paul Pavier)

This locomotive was built by a member of the Sale MES and has been owned by Paul for nearly a year. He has entered IMLEC three times previously, once with his own locomotives and twice with Frank Nixon's locomotives. His best place was in 1994 at Gravesend with *Bantam Cock* achieving best 3 1/2in gauge engine. This year Paul decided to let his son, Ben, do the driving in honour of Ben's 21st Birthday on the Sunday of the IMLEC weekend.

Ben must have learnt something from father Paul because he got off to a nice well controlled start and following a slow few laps built up speed to have a nice relaxed drive with no safety valve activity or panics. Ben described his run as "uneventful". This trouble-free run gave an overall efficiency of 0.4525%.

Brian Eatock - 4-6-0 LMS Black Five Doris

Brian is a member of Chesterfield and District Model Engineering Society. Now 73, he has been a model engineer for 15 years and as well as *Doris* has built a Rob Roy, a Minnie traction engine and a 1:6 scale Foden steam lorry.

At IMLEC last year Brian had trouble with the locomotive not pulling and was hoping for better things this year. He started easily with some very slight slip and had a very good steady run, leaving your reporter nothing to write about! Brian described the run as "Super, uneventful, brilliant!" Overall efficiency was 0.5167%.

John Richardson - 4-4-0 Maid of Kent

This model was acquired as a part built chassis



Below: Ben Pavier

and subsequently completed by John in 2002. He has also built a Minx, which shares many common parts with the Maid of Kent design, and the engine has been running since 1974. John, a member of Brighouse and Halifax MES, is a retired machine tool fitter and is currently building a large boilered GNR Atlantic.

John arrived on the line and the superb finish to his locomotive drew many admiring comments from those watching.

Once given the all clear John just pulled away smartly and set off at a good fast pace achieving a distance run figure well in the top quarter of the competition. I noticed occasional slip as he circulated but the run was very steady. John's comment was "excellent, really enjoyed that". John's overall efficiency was 0.4269%.

Paul Collins - 2-6-2 Lynton & Barnstaple NG Lew

The second of the two locomotives entered by Paul was this 3 1/2in gauge model of the Manning Wardle 2-6-2 tank locomotive Lew of the Lynton and Barnstaple railway. It is built to the Les Warnett design.

Paul is a member of the Harlington Locomotive Society and an IMLEC novice though he has competed in and enjoyed club locomotive efficiency competitions.

Paul got this very nice locomotive off to a good start with no slip setting off at a good pace until slowing into the station on his first lap. Paul had two stops, one after the tunnel where he set off with no problems after restoring pressure but following the second stop he had to drop two passengers before getting away again. He then speeded up and was going steadily until the end. He described his run as "alright". His overall efficiency was 0.2647%.



Above: Brian Eatock



Above: John Richardson



Below: Paul Collins



Below: Dave Tompkins

Dave Tompkins - 0-8-0 Netta

Dave's locomotive was built between 2000 and 2003 to the LBSC design, the wheels being the only castings used. The boiler was made by Len Steel. Dave is a member of Guildford MES and a lifelong railway enthusiast as a result of his father being a "permanent way man".

Dave took up model engineering by building LBSC's Tich in the late 1970s with no machining experience or tuition, a tribute to the Master's 'words and music'. This was followed by a Princess Marina and a Rail Motor. His current project is a King to the Perrier design.

Dave got away to a good well controlled start and had a steady run for the first 20 minutes when injector problems caused a stop to regain steam pressure. Dave's verdict on the run was "okay apart from the injector problem then it all went awry, including the driver". Overall efficiency achieved was 0.5657%.

Neil Skellon - 2-10-0 BR 9F Evening Star

This locomotive was bought as a chassis by Reg Hawes, of Sidcup, who finished it off, and sold it to Neil via the pages of *Model Engineer* in 1994. To date the engine has only run about 20 times. It has been extensively modified with a new regulator, injectors and return cranks to the valve gear. Neil is a member of Urmston DMES and has recently started building a 5in gauge Stanier tender locomotive to Don Young's design.

Neil took one of the largest loads (18 passengers) and had quite a lot of slip getting away. Once away things settled for the first 20 minutes when he had a stop to recover the water

level and steam. Neil had a "smashing run apart from the injectors, both failed". Overall efficiency was 0.8371%.

Steve Eaton - 4-6-2 Britannia Rough Diamond

Steve's father, Fred, started this locomotive in the 1970s and, after Fred died in 1994, Steve completed it in 1999. The full size locomotive, number 70047, was never named but the model carries the name chosen by Fred. Steve started modelling at about 12 years of age and is a prolific builder having completed about 14 locomotives. He is also the Secretary of the 2 1/2in Gauge Association.

Steve got away with one of the best starts of the day, no fuss or slip and very quiet. He then set a good pace for the first ten minutes, after which he slowed slightly but the run was uneventful and gained Steve a well deserved second place in the competition. Steve "enjoyed that, only had 10psi for the last few laps and no fire". This noteworthy run achieved an overall efficiency of 1.7331.

Brian Remnant - 0-4-2 NG Lady Margaret

Lady Margaret is based on the Jack Buckler Sweet Pea design and was built over a period of 12 years with the first run in 1987. Modifications to the original design include a steel boiler, steel tyres and Bremme valve gear. After a derailment in the 1991 IMLEC at Bristol a rear truck was added to improve stability. The locomotive has two injectors only, no axle or hand pumps and tips the scales at 240 pounds.

Brian Remnant still goes to work in his spare time. He is a driver on the Kent and East Sussex

Railway and is a member of both Romney Marsh MES and Maidstone MES. He is currently building a 5in gauge Dholpur.

Brian was another with a 'no fuss' start setting, off at a steady pace. After 15 minutes he came to a stop in the woods being "short of chuff". This was followed by another stop when he took on coal. Brian eventually retired after pushing back in with an empty train. His comment was "I was too mean with the coal".

David Mayall - 0-6-0 Derby 4F

David's 3 1/2in gauge 0-6-0 4F was the second locomotive he built and was completed in 1986. It is based on the Don Young design with minor modifications to suit David's driving preferences. The valve gear was rebuilt about eight years ago and David has improved the springing and changed the axle boxes recently. The locomotive has also been fitted with safety valves to the Gordon Smith design. David is a member of the Bracknell Railway Society and this will be his eleventh entry into IMLEC and he was the highest placed 3 1/2in gauge locomotive at the event last year. He has completed six locomotives to date including building the boilers and has two further engines under construction.

As an experienced IMLEC contestant, David set off at a steady pace which he maintained throughout his run which was completely uneventful. His comment: "That was a good run". Indeed it was and overall efficiency was 0.5329%.

Glyn Winsall - 2-8-0 LNER Thompson 01

Glyn won last year's event at Kinver so this year was running the same engine in the 'Past



Above: Neil Skellon



Above: Steve Eaton



Below: Brian Remnant



Below: David Mayall

Winners' competition. The locomotive is a combination of 'Nigel Gresley' and 'Springbok' to produce what was Thompson's rebuild of the Robinson 2-8-0 for the GCR. It was built in the 80's by Glyn's father Fred and Glyn has recently overhauled the motion on the locomotive.

Glyn is a member of Rugby MES and is another experienced IMLEC entrant. He took 17 passengers and had problems getting away with a lot of slip at the start followed by a very slow trip through the tunnel with more slip. After this he settled down to a steady run, slowing slightly after the halfway point and slipping occasionally. Following a stop on the last lap, Glyn dropped the passengers before completing his run. His (edited) comment ".....horrendous, the coal burnt quickly, lost everything". In spite of this he still managed to achieve an efficiency figure of 1.5406% and that gained him the 'Best Past Winner' award.

Lawrence Tatton - 2-8-0 Nigel Gresley

The locomotive is a first attempt at building straight from the Martin Evans 'words and music' to the 'Nigel Gresley' design and first ran in 1984. It has run over 2,000 miles since then and had its only overhaul this winter as the motion "banged harder than the full sized version". The overhaul involved removing everything on the engine, re-bushing all the motion, re-profiling the wheels and fitting a hand reverser as the original left-handed square thread screw reverser was totally worn out. It is fitted with PTFE rings, a stainless steel 'brick arch' and has the LNER cab and tender as this is how the class were remembered.

Lawrence Tatton is a retired power station engineer who worked in maintenance throughout his career. He feels it was an excellent industry to work in, "coal and steam every day, and wonderful scrap bins!"

Lawrence set back very slightly before getting away cleanly but came to a halt by the steaming bays on his second lap. After this it was a very relaxed run to the extent that Lawrence had time to doff his cap to the photographer as he went past!

Lawrence obviously enjoyed his run, his comment was "good fun, brilliant". This carefree run resulted in an overall efficiency of 0.5379%.

John Hurley - 4-6-0 LMS Jubilee

John started this model in 1975 after visiting the railway centre at Dinting where he measured up the full size engine *Leander*. Patterns were made for the wheels, cylinders and horns and the casting was carried out at a local foundry.

John started work on the railways as a cleaner at age 15 and by age 17 was promoted to fireman. He left the railways in the late 50's and pursued a career as a draughtsman.

He is a founder member of the Kinver and West Midlands Society of Model Engineers and finished his first loco, an LBSC 3 1/2in gauge Britannia in 1963. John also worked as a driver for the Severn Valley Railway from 1971 to 1984.

John took on 18 passengers but could not get the locomotive away so dropped two at the start. He was very slow round the first bend but got into his stride after that until suffering a derailment by the steaming bays. After setting back to try to get away, he dropped five passengers and two trucks before finally getting away very slowly after the track was sanded.

After another stop John dropped the rest of his passengers in order to finish. This unlucky run resulted in an overall efficiency of 0.6766%.

Karl Midgley - 4-4-0 Maid Marion

Karl's grandfather, Ben, built this locomotive over a three year period finishing in 1983. Karl entered it at Kinver last year but had to retire. He is a member of the Gravesend MES, has been driving since he was five years old and passenger hauling since his 16th birthday at which he was given a part built Britannia as a present.

Karl's run got off to a very good clean start but the locomotive derailed on the bend after the station. The cause was eventually found to be the tender/locomotive safety chain knuckles fouling on the bend. Following a long stop Karl eventually got away having dropped two passengers and one truck. After 25 minutes he had another stop in the tunnel before retiring with a blocked blower jet.

Roger Caple - 4-6-2 Rebuilt Merchant Navy (owner Mike Casey)

This locomotive was built by Mike to Keith Wilson's design with a few added features including a working turbo-generator. The locomotive was driven by Roger Caple and is named *Isle of Man Steam Packet Company* although this name was never carried by a full size locomotive. Roger is a member of the Manx Steam and Model Engineering Club (as is Mike) and was a fireman and driver with British Railways at the end of steam before moving to the Isle of Man. He was stationed at Nine Elms and worked with the full sized locomotives of the class.



Above: Glyn Winsall



Above: Lawrence Tatton



Below: John Hurley



Below Karl Midgley

Roger set back slightly to get away easily and was blowing off steam after the tunnel. Fifteen minutes into the run he stopped to restore the fire and after a couple of attempts got going again to finish his run. Roger commented "had no more than 50psi all the way round, enjoyed it". Overall efficiency was 0.447%

Peter King - 0-6-0T Simplex

St Ella is a 5in gauge 0-6-0 to the Martin Evans Simplex design and was local man Peter's first attempt at building a locomotive. It was started in 1990 and finished in 1996 and has been a frequent runner and passenger hauler at the Northampton track since completion. It is now getting a little tired and a full overhaul is planned when the next locomotive (a 7 1/4in gauge Hunslet) is completed later this year.

Peter nearly did not get to the line after suffering clack problems in the steaming bay but once those were solved had a clean start and set off on a good steady run. After 20 minutes he suffered a stop by the steaming bay but got away to finish his run.

Peter's comment on the run was "haven't been as stressed as that since I got married". Overall efficiency was 0.484%.

Ballan Baker - 2-6-0 LNER Mogul K1/1

This LNER K1/1 2-6-0 named *MacCailin Mor* was completed in May 2004 after 15 years in the building. It is based on the Don Young drawings but with modifications designed by Ballan from photos and other sources. It has

three superheater flues with double return radiant elements in each. The blast pipe is adjustable whilst running.

Ballan, a member of the Lindsey Model Society and the GL5 Association, likes running on ground level tracks. He entered the last IMLEC at Northampton in 1999 with his LNER Y4 0-4-0 and achieved third place.

Ballan had a good smooth start and toured steadily until derailling just short of the tunnel. He recovered quickly and set off again before slowing into the station after 20 minutes before recovering again to complete a good run.

The run gained Ballan a well earned first place the Martin Evans Challenge Trophy and the Newton-Tesla award for the most efficient locomotive. His comment afterwards was that he "made a mess half way through but got it back".



The controls of the Northampton SME dynamometer car, which performed faultlessly during the event.

I suspect many of the other drivers would have been delighted with such a mess! His overall efficiency figure was 2.0105%.

Bernard Clark - 0-6-0T Bassett-Lowke tank engine

Benjamin is an 0-6-0 tank designed by local firm Bassett-Lowke. It was built by Bernard from original Bassett-Lowke drawings and castings in the 1970s and has been in continuous use since then. It was overhauled in 2000.

Bernard has been a model engineer since the 1970s and is an active member of the host club. The last time IMLEC was run at Northampton he entered his Southern D15 and won the award for the best placed 3 1/2in gauge locomotive.

Bernard started easily with four passengers on one truck and set off at a very fast pace

obviously intent on getting a good distance reading. He slowed a little after 25 minutes but regained speed, so much so that after being told it was his last lap he still had time left and carried on. Having run the fire down, he dropped all passengers on this lap before running round to finish. Overall efficiency was 0.6271%

At the end of the competition on Sunday, the prizes were presented by Councillor Sally Beardsworth, Mayor of Northampton, who certainly made life easy for your photographers and showed a keen interest in the competition. May we express our thanks and appreciation to Councillor Beardsworth for giving her time to support IMLEC. The final presentation of the day was the handing over of the IMLEC flag by Chairman Brian Reeve to Mike Chrisp who



Above: Roger Caple



Above: Peter King



Below: Ballan Baker



Below: Bernard Clark

received it on behalf of Fareham DMES of which he is President.

In addition to the competition the host society had organised several other attractions to entertain their visitors, an excellent Pig Roast was the attraction on the Saturday evening which was enjoyed by all who attended. Visitors could also admire the superb selection of member's models in the exhibition tent and a demonstration of brass casting by Ringstead Foundries on Saturday evening attracted a lot of interest.

There were also several trade stands in attendance including Reeves 2000, JB Cutting Tools, Polly Engineering, Keatley Metals and the Southern Federation of Model Engineering Societies. We thank them for their support and hope that business was brisk.

I think all who attended this year's event will agree that it was very well organised by the host club and our thanks must be extended to Chairman Brian Reeve and his team (with Mike Chrisp as overall adjudicator) who ran the competition in a very professional way throughout. They ensured that the timetable was kept throughout the weekend with good humour all round making the event enjoyable for all and ensuring that your intrepid reporter's job was very easy.

Special mention must be made of Garth Porter and Carl Bailey of the host society who built the new all electronic dynamometer car which performed faultlessly throughout the event.

Our thanks must also go to the 'catering staff' who provided refreshments throughout

the weekend, particularly for the pig roast with salad on the Saturday evening and the bacon butties in the mornings.

Finally let's not forget the competitors without whom there would be no event. It is a brave soul (particularly the first timers) who attempts to drive at maximum efficiency for half an hour on a strange track with an audience as critical as an IMLEC audience watching every move. So thank you all and well done.

All in all this must rank as one of the best and most efficiently run IMLEC events ever, helped by the weather, which stayed fine in spite of the forecast.

Well done and thank you all at Northampton SME and we look forward to seeing you everyone at Fareham in 2006.

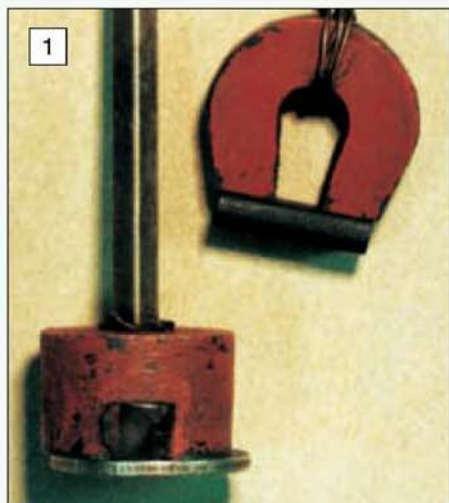


Event winner Ballan Baker receives the Martin Evans Challenge Trophy from Councillor Sally Beardsworth.



Northampton SME Chairman Brian Reeve hands the IMLEC flag to Fareham DMES President Mike Chrisp.

MAGNETS IN THE WORKSHOP



Two of the Eclipse magnets in use in the author's workshop.

Peter Spenlove-Spenlove discusses magnets and some of their uses in the home workshop.

First, a warning! Strong magnetic fields can affect some electronic devices, watches and medical devices. So please take advice if in doubt.

Apart from tiny magnets in 1930s toys, my first encounter with magnets was when the fair came to my home village. At the back of a stall was a tray full of small wooden balls with a metal pip on the surface. For one old penny I was handed a fishing rod with a similar ball on the end of the line. One had three dips to try to pick up a ball for a prize. The pips were bar magnets glued into a hole. My penknife proved this. Easy, I thought, magnets pick up things, don't they. I lowered my rod for the first dip and it would not stick to anything but mysteriously veered sideways. I tried another with the same result. My last go did stick but so weakly that my catch fell off. Someone told me that the exposed pips on the balls were 'like poles'. No wonder I caught nothing. The like poles repelled the dangling ball.

Decades later I visited the late Ken Whiston's industrial equipment surplus store at New Mills. Older readers will remember his well-known cat-a-log logo. He, being a model engineer, had the knack of stocking a vast cornucopia of things for equipping our workshops. I came away with the items I wanted plus an assortment of surplus equipment magnets, some of which were very powerful and made from a brittle sintered material. They were very cheap and I felt they might come in useful one day.

Now another warning! Being very brittle, do not let strong magnets crash together. The impact can cause chips to fly off. When separating two magnets it is better to slide them apart rather than pulling them directly apart.

Apart from old magneto magnets my first workshop magnets came from the Eclipse range. These are painted red and have 'keepers' (photo 1). Made of a cast alloy, these were useful in magnetising a small screw driver to help inserting screws in awkward places and to hold sketches and drawings on to a sheet steel surface. Self adhesive tape was not as common then! Tied to a wire they could be used to 'fish' for dropped steel items.

The round magnet is, in fact, a dumpy horseshoe magnet with a small hole into which I fitted an aluminium alloy rod handle. This was retained using Araldite and this adhesive was also used to fill the gap between the poles. When heat-treating silver steel I quench the part in a gallon can of 'quench oil'. The magnet is used as a stirrer and, when the part is cool, it can be used to fish the component out. Filling the gaps with Araldite prevents them filling up with debris from the quench tank.

It is usually best not to try and solder or weld magnets as the heat usually destroys their properties. Some special steels are air cooled from the furnace until a magnet will stick to them after which they are oil quenched. During the 1940s I had to stand with a magnet, dab the cooling part and then quickly tip it in to oil when the magnet stuck to it. Boring work but, with no heating in the works and snow outside, it was, at least, warm.

Another of Whiston's disc magnets is magnetised on one face only with north-south poles in strips across the face. Glued into a polymer or aluminium alloy cup with a little finger groove on the O/D, these magnets are ideal for 'pinning' up drawings or whatever.

Another use for magnets is to help form improvised guarding. In a crowded workshop some operations cause chips to fly everywhere. To avoid protracted cleaning up operations I erect temporary screens made from bin-bag plastic to catch the swarf. The face magnets described above are strong enough to hold such material to steel shelf brackets. The hot swarf sticks to the plastic so it is only fit for disposal after use but its use does mean less sweeping up.

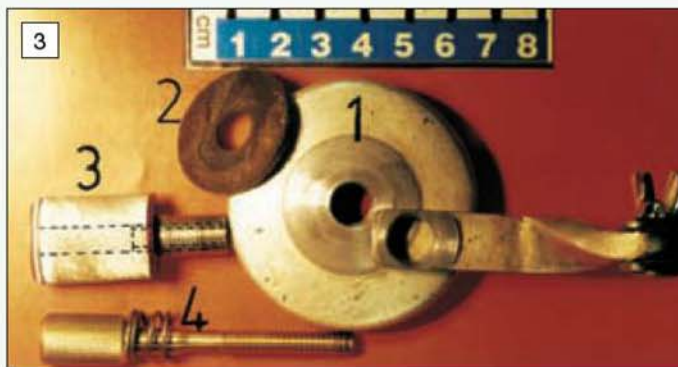
When it is inappropriate to use plastic sheet, a similar effect can sometimes be achieved by



The neat stand devised to hold a plastic guard and place it close to the cutting area.

placing a small swarf guard adjacent to the area of cut. Photo 2 shows a magnetic base with a swivel arm that can be adjusted to suit the application. Mounted on the arm is a piece of thin 'blister pack' retail material of approximately A5 paper size. This material can be easily cut to size with scissors and replaced if it becomes damaged or too dirty to use. However, choose your material with care. Set a match to a sample of the plastic in a safe place and see if it continues to burn after the match is removed. If it does reject the material as hot swarf may set it on fire.

The reasoning behind this small guard is that it is simple and easy to use. Difficult to use or adjust guards tend not to be used. The components are shown in photo 3. The base (item 1) consists of a disc magnet cemented in to an aluminium alloy cup and with a $\frac{3}{8}$ in. x 26tpi bush cemented in its centre. The cement used was body filler. My magnet is something of an oddity as its poles are duplicated on one side only. On the other side it is only weakly magnetic so it does not attract swarf. Item 2 is a leather washer used to add some friction to the assembly. It is placed between the arm and the magnetic base. A fibre washer is used above the arm and can be seen on the locking screw (item 3). The locking screw (item 3) is drilled and tapped for a knurled brass jacking screw (item 4). This helps when lifting the powerful magnet in the base off the machine table. The spring under its head is there to stop the screw from rattling when the machine tool is in use.



The components of the guard holder. It is designed to be quick to make and also quick and easy to use.

Neville Evans

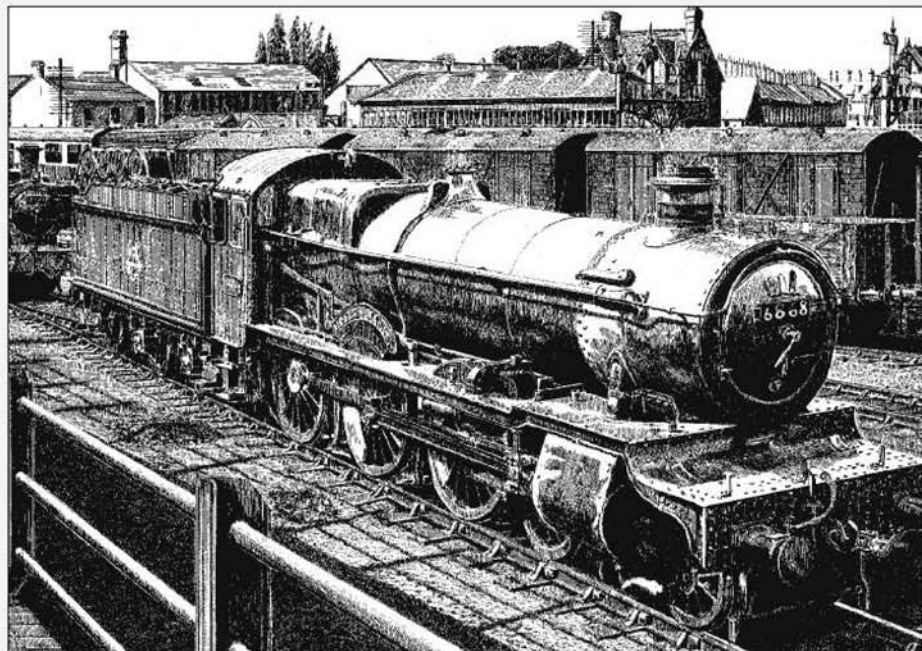
describes the Collet tenders for this splendid locomotive.

● *Part XXI continued from page 90*
(M.E. 4252, 22 July 2005)

A month or so ago, (time of writing), Pete Thomas mentioned to me that David Aitken had written two articles on the Collet tenders for *Engineering in Miniature*. These articles appeared in February and March 2005, and showed photographs of David's impeccable detail work on several of his models of these tenders, mostly in 7¹/₄in. gauge, together with his thoughts on the building of them.

The articles are so good in fact that Pete Rich was moved to congratulate David on them. Need I say more. Peter Thomas e-mailed me a copy and I can thoroughly recommend that anyone who is seriously contemplating building a Collet tender, beg, borrow or even buy these issues.

David is, in fact, a highly valued phone friend of mine, one of those many people whom I seldom meet, but talk to regularly. In my opinion, he is the very best professional model engineer working today. I was talking to him only this afternoon and he generously



PENRHOS GRANGE

offered me free access to his manuscript. Greater love hath no man.

To digress a little for a moment: while on the subject of professional model engineers, if

someone offers to build you a fully detailed model of a largish, 5in. gauge locomotive for £15,000 or so, please don't be tempted - disaster awaits! Consider the logistics. The first essential is the



This photo shows details of the brake hanger. Note that all the nuts and retaining pins are split pinned.



An example of a late type spring and axlebox assembly showing the flat fronted shock absorber.



A late type 4,000 gallon tender. This, like the other photos in this article, was taken at Didcot.



A three-quarters view of a similar tender to the adjacent one photographed in one of the engines sheds.

possession of a large, fully equipped workshop. These things don't come cheap, and this cost has to be absorbed in the cost of the engine. The price of castings and materials such as copper, has now reached astronomical proportions, I would allow at least £2,000 and possibly more if you include a large brass tender tank. Even for a professional, there has to be about 3,000 hours of work in such a locomotive. If your builder charges less than £10 an hour then he's a mug, and you are probably better off without him. What is now often forgotten is the profit bit. If you add the foregoing up, it comes to about £35,000, if you then add say 50% profit you come to a realistic price of £52,500 plus V.A.T. This is for a model that uses off the shelf castings. Something original that requires pattern making and research would cost more. I hope that I've made my point.

The development of the GWR tender had rather lagged behind that of the locomotives until the end of the Churchward era. Up until 1922 the basic design was that of the Dean tender which dated from the 19th Century. Collet redesigned these ancient things, eliminating the troublesome well tanks, by simply stacking the water a bit higher in taller and more imposing tanks. A curious anomaly of both the 4,000 and 3,500 gallon tenders is that the tank sits above the sole plate on lifting blocks some 2in. thick. The reason for this is that the GWR in their wisdom decided that to give adequate rim clearance for the wheels, they would

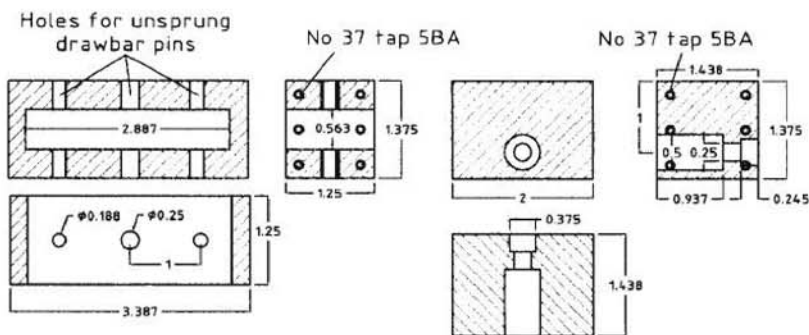
rather lift the tank out of harm's way than to put in little clearance splashers, inside said tank, such as were used by most of the other railways. My solution would be to use slightly smaller wheels, after all the Great Western did use 3ft. wheels on the bogie, with the same length bearings inside the

wheels where cooling breezes were less common.

The two basic designs were for 3,500 and 4,000 gallons respectively and as the only major difference was that the larger tender was 7in. taller, it seems like a good idea to detail both of them together.

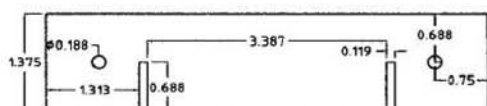
Tender frames

From the outset I should make it plain that there is as much work in a set of detailed tender frames as there is in a rolling chassis for a locomotive. The main drag forces are transmitted through the inner frames of the

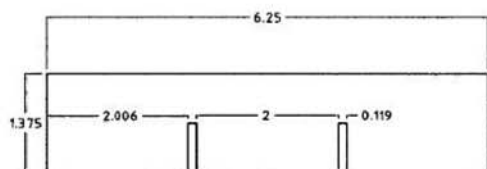


FORWARD FRAME STAY

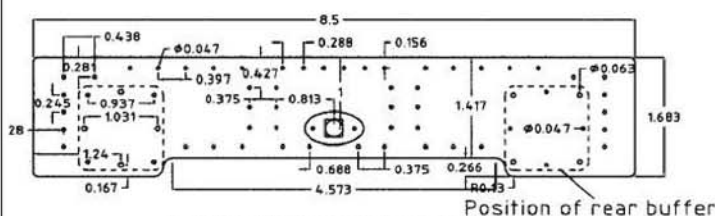
REAR FRAME STAY



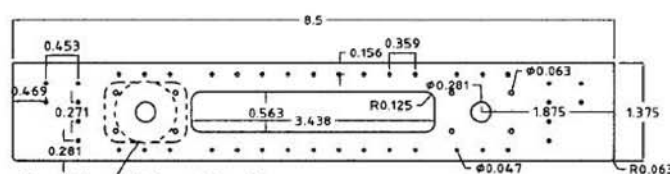
FRONT INNER CROSS MEMBER 1 off 3mm BMS



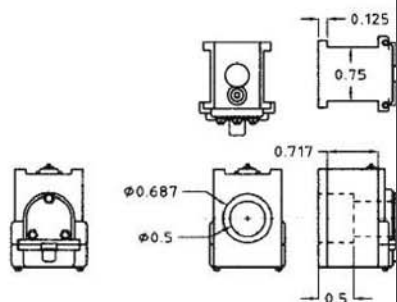
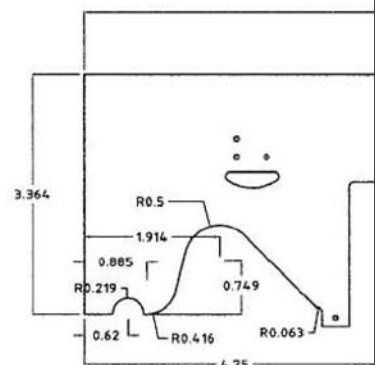
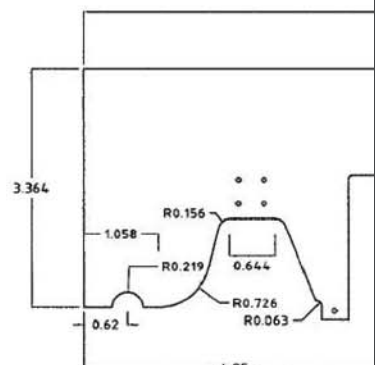
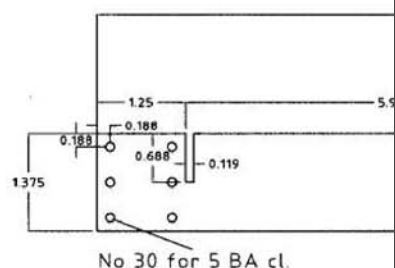
INNER CROSS MEMBER 3 off 3mm BMS



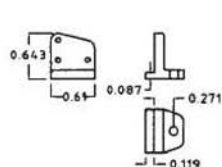
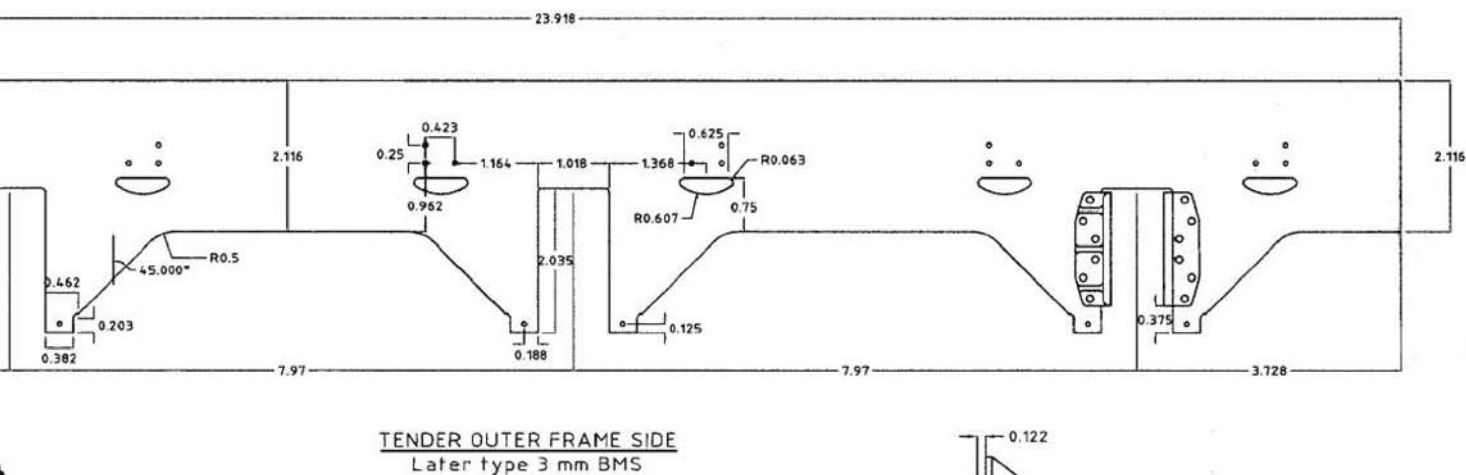
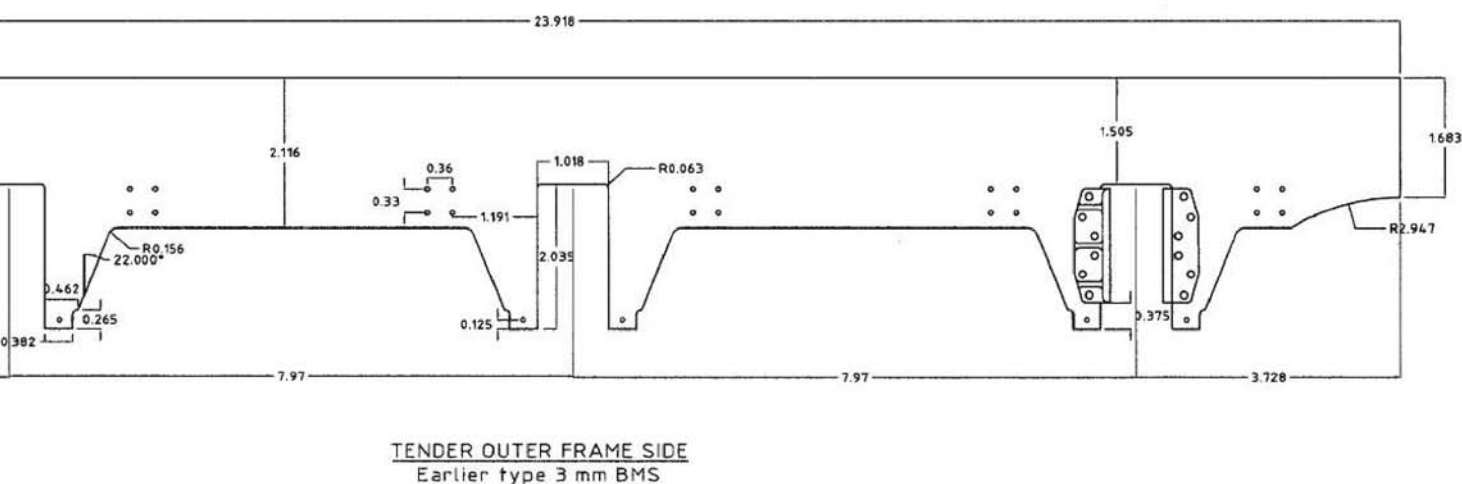
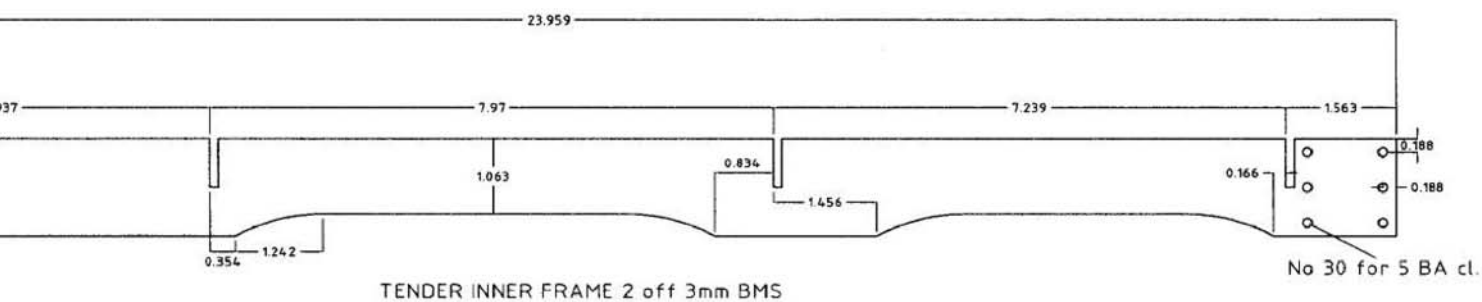
REAR BUFFER PLATE 1/16" BMS



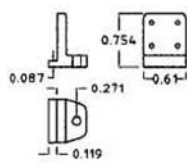
FRONT BUFFER PLATE 1/16" BMS



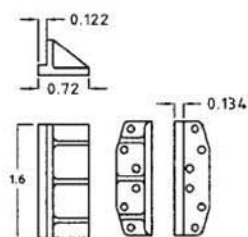
TENDER AXLEBOX 6 off L.W.c.
Bore for 1/2" i.d. needle roller



Late spring hangers
12 off L.W. castings



Early spring hangers
12 off L.W. castings



TENDER HORNCHEEKS 12 off L.W. castings
n.b. Place rivetholes in the appropriate position and make a drilling jig to ensure uniformity

tender and the outer frames support the axle boxes and wheels.

You could really say that there are two separate bits: the rolling part, that is the outer frames and the tank, and the pulling part, the inner frames. I have followed my usual practise

in that there are two substantial blocks behind the buffer plates, which do all the pulling. These buffer plates to my mind look awful if they are over scale thickness. It will be noted therefore that they are only $\frac{1}{16}$ in. thick. The front block has perforce to have a wide slot cut into it as the

Great Western tenders carry 3 obtrusive draw bars, as will be seen in the accompanying art work for the next gripping instalment. The inner frame therefore tapers inwards slightly after this block, to the second stay, where it becomes parallel again. The four frames, buffer plates,

stays and brake equalising beams are available as precision laser cut items complete with slots for their assembly from Bruce Engineering at very reasonable prices.

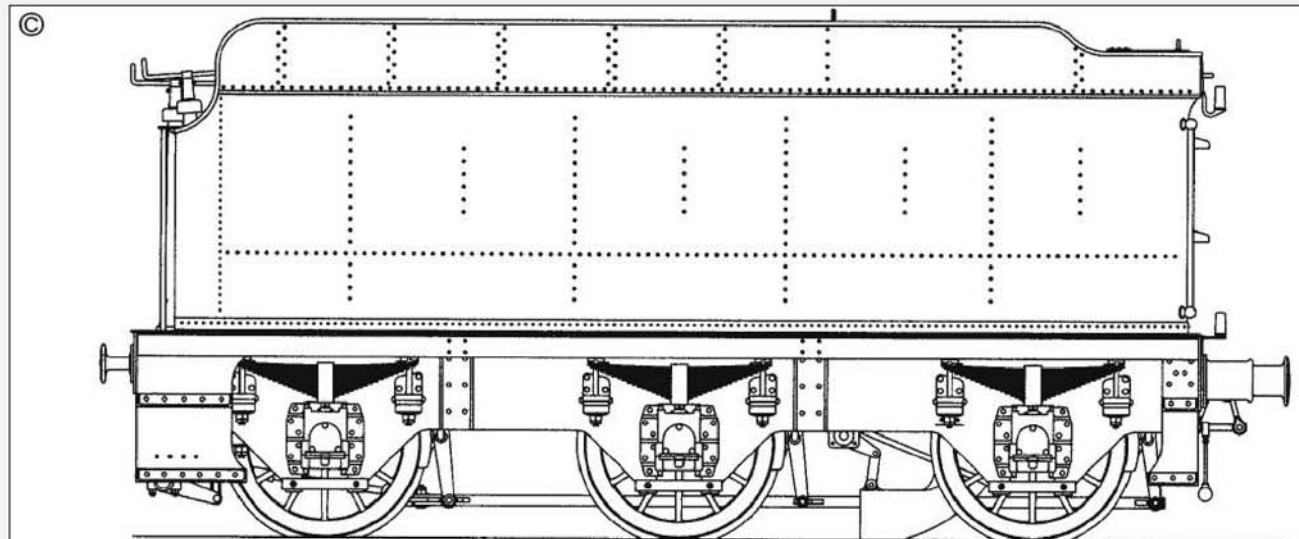
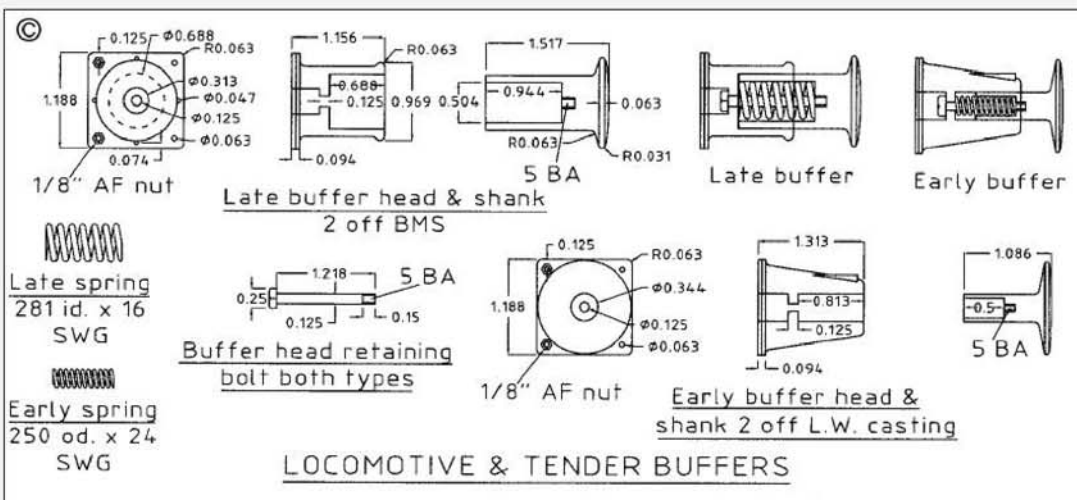
I never cease to be amazed at the bewildering variety of so-called 'standard' parts that can be seen on GWR rolling stock. As David says, the smaller details were constantly changing. These include three different frame shapes, of which I have included two, two tank support brackets, and three different brake hangers. The axle boxes themselves were supplied with hinged lids for the lubricators top and bottom. These lids, however, could be replaced by round bosses with corks stuck in, as can be seen on our lost wax castings and in the accompanying photographs.

I am pretty certain that the Granges were turned out as new with the smaller tender and

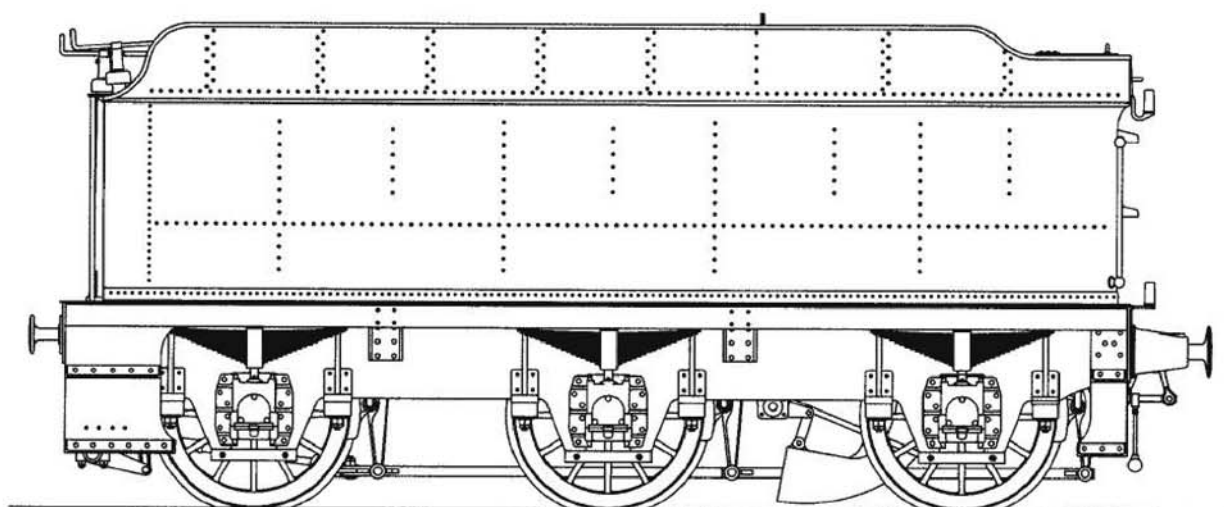
that the 4,000 gallon type started to be applied by British Rail after 1949. In fact tender tanks, as did many other bulk carriers, suffered from a great deal of hard wear - large lumps of coal would sometimes be dropped into them from great heights, and large men wearing 'tackety' boots 'galumphed' over them all the time. They were therefore replaced quite often, and as the frames didn't suffer the same rate of attrition,

you could find any type of frame under either type of tank. So take your pick. You may notice that in the close up photo of the later type axlebox assembly, there is a clip rivetted to the outer angle plate. This clip was a modern addition and presumably prevents the main spring from moving outward. Could someone please elucidate?

●To be continued.



4000 GALLON COLLET TENDER



3500 GALLON COLLET TENDER



A view of the author's workshop showing how tools are stored in racks and essential accessories are neatly grouped around the lathe.



Tins used for the storage of nuts, bolts and other small parts should be clearly labelled as an aid to rapid identification of the contents.

CHANGING HINDSIGHT INTO FORESIGHT

Mick Appleyard shares his experience with those new, and perhaps not so new, to the hobby.

These articles have been written to share some of my experiences of building a steam locomotive and, more recently, a pair of 2in. to the foot, 7 nhp Fowler Class R3 compound road locomotives. This latter project has been on the go for some ten years and will shortly be coming to an end.

The purpose of these articles is not to tell the builder how to make their model but to talk them through a long duration project and guide the builder through the long and tortuous road to model completion. Any model project, once started will take many years of dedication until completion. No matter what the project is there are many fundamental issues that are common to all.

Foresight is a wonderful thing however, in most cases, it only comes with experience. My aim is to pass on some of my experiences of working on projects, both in model engineering and in industry, to assist the model engineer to achieve their goals in model production.

As model engineers we all thrive on component manufacture, and those days when manufacture has been good we feel very satisfied. On the other hand there are those days when we come out of the workshop thinking: "What have I spent all my time doing, with nothing to show for my efforts?" Of course, this can be for many reasons. Remember that time lost is gone forever, and can never be regained. By using some fundamental planning techniques and simple thought processes I hope to reduce your frustrations and unproductive time.

Model making general fundamentals

I call this 'setting out the stall'. When we go to the shops to buy something we know that we need some method of payment, some means of getting there and some means of getting the goods to their destination. We do this without too much thought; it is part of everyday life. What we need to achieve is to adapt this simple

Technical advice

The author Mick Appleyard has been a model engineer for some 30 years and a boiler engineer/ department head in a modern power station for some 10 years out of a 35 year career. He is now retired from full time work.

Having run many hundreds of long and short-term project over his career he is willing to talk over any given problem with a project and will try to give advice if possible providing contact is made at reasonable times. He is available at 17 Aintree Road, Lordswood, Chatham, Kent, ME5 8PY; tel: 01634 669875; email: mickapple@aol.com

These articles are available in book form at a cost of £7.00 plus £1 postage and packing. A CD with the photographs referred to in the text is also available for £5 if purchased with the book. If purchased separately postage on this item is 50 pence.

By design, the book is produced in small batches so that there is an opportunity to update it as customers request information about specific topics, which have not previously been covered. In addition, those topics that require expanding can be dealt with more fully and added to the next reprint. The plan is to enable the author to keep in touch with customer requirements and pass on additional information for the benefit of you all. Is there a topic which you think may be useful? If so, why not let the author know?

The information in the following text details the methods used in the author's workshop. It is up to each individual to assess if these are applicable to them and suitable to his or her way of working.

planning process to our model making. This is a little more complicated than doing the weekly shop but is quite easily achieved by any model engineer. Before you set out on the build programme, or if you have already started, stop and spare some time and thought as to how you approach your model project. We must bear in mind it will take many years to complete,

together with the fact that for a long time you will see little progress. It is important that the complete picture is set out. This does not only mean the making of the model components, but should include other features such as how they are made and how you operate your machine tools, together with planning the order of manufacture, how you finance the project and a whole host of other dependencies. One must also understand what you want to achieve from the model manufacture and of course this will vary according to the individual. Generally I would expect to get the following from any model that I build: -

- 1: Enjoyment from the manufacture;
- 2: To produce a high-class model to be proud of.
- 3: Where possible to make all parts (except castings if available)
- 4: To complete the model in the shortest timescale.
- 5: To complete the model at the lowest cost.
- 6: To still maintain a family life

There are many ways to achieve the above goals and all will have dependencies on other factors. These goals will be different for each and every one of us; therefore it is important that they are understood.

In order to complete your model one must sustain a continuous output of component production, this being difficult to achieve over a long period of time, given all the distractions of a home workshop. In my case there is no doubt that I get greater enjoyment on the days when positive production has been achieved. This then leads us onto finding ways to increase our production efficiency and reducing non-productive time. In looking at non-productive time we must examine every action we carry out even those seemingly unrelated activities.

As an example I will detail below some of the things, which I have done to improve my efficiency: -

- 1: I have set my tools out in racks and draws so that each tool has a home and is easy to find. ▶



The specially adapted box used by the author to store his BA taps and dies. Each size is located in its own marked compartment.



The method used to store steel stock and similar larger items. Being systematic and tidy in the workshop saves time.

Make sure that those tools frequently used are the most accessible.

2: All those little tin boxes that contain screws, nuts, bolts and odds and ends have been labelled up on the tin front face so that their contents can be seen at a glance.

3: Each accessory, which needs to be bolted to a machine, has its own set of holding down bolts.

4: My lathe has been set out such that I have shelves above and to the front and the right hand side for holding all the necessary tools so that they are readily to hand.

5: Where my entire set of BA taps were in a wooden box this has now been made into eleven compartments numbered 0 to 10 BA. Each contains all taps and dies of that size.

6: All my drills are on display in drill stands with no loose drills held. This also helps me to cross check should I break or lose a drill.

7: I have drilling and tapping charts strategically placed on the wall.

Let us look at each item in detail:

Item 1: If your tools have a home and are returned there when not in use they can be found in seconds.

Item 2: Let us say we have ten tins containing various items, and each time we want something we have to open the tins. On average we will have to open five before we find the item, this could take one minute not a long period until you do it many hundreds of times over the project build.

Item 3: How many times do we fumble through our box of bolts to find one of the correct length to bolt down the accessory to the machine.

Item 4: By having a good shelving system all tools are to hand. I have my drills and small accessories on a shelf in front and above the lathe splash guard. Lubricating and cutting oils in a basket attached to the splash guard. On the right I have a wall rack with all the lathe spanners, chuck keys, drill chucks, callipers, etc. Below this are two other shelves to hold lathe tool holders and general items together with items to be machined. This method suites my way of working.

Item 5: Are all your taps together, if so how many times do you go through them to find the one required? I can now go straight to the correct size.

Item 6: Are all your drills together, if so how many times do you go through them to find the one required. By returning them to the drill stand I can go straight to the correct size.

Item 7: Let us select a BA tapping drill from our Zeus tables. Find the tables, flick through the

pages to find the page, and then look up the size. Say it took 30 seconds now think how many times you do this. All wasted time! With a suitable wall chart, the time would be cut by 30% or more. One should hang the chart or charts in a prominent position near the appropriate machine so they can be quickly referred to. If you have other information, which, you regularly use, then make up your own chart.

However significant the above list is, it is not exhaustive or by any means my top time saving items, however it is meant to show how those every day unrelated activities can distract the builder from production and waste a lot of time.

Lateral thinking

We all want to build our model in the shortest possible time scale and the lowest cost, however there are many factors that will influence this. In order to achieve the shortest time scale planning is essential together with a little lateral thinking. Making any model will require many thousands of machine tool set-ups over a long period of time. Getting to the end will be a combination of man and machine working in harmony.

Let us take a simple operation of setting up our rear tool post parting off tool. In my case I have a Myford Super 7 and the tool post slips into a T-slot and is tightened up with a spanner. It is a simple operation until you cannot find the spanner. You may laugh but it happens all the time, until you do something about it. In my case I removed the hexagon nut and made a conical nut with a short bar set at about 60 degrees. Now I do not need the spanner. This one lathe



A great time saver - the special nut made for the Myford rear tool post.

modification will, over the time scale of the model, save many hours.

An even bigger time saver was my switch to a quick-change tool post. Just stop and think how many times you change the type and shape of your tool to machine a simple component, now I just change the tool holder. If you do not already own one then I suggest this one item will be one of the biggest time savers in the workshop, however make sure that you do purchase enough spare tool holders. I currently use up to 5 in my machining operations.

The same goes for drilling a hole using the lathe. Centre drill, pilot drill, and final drill. If you are making several components think how many times you will change the drill. I overcame this by having five tailstock drill chucks. One of them permanently holds a centre drill, with the others available for production. A little extravagant, but think of the time saved on changing the drill. In each case just eject the chuck and insert the next.

Another modification was to fit a keyway in the base of my milling machine vice together with cutting a recess in its jaws both for quick and easy alignment (these items are both detailed later in the text).

Since much of the time taken to build your model will be spent on machining operations it is essential that we continually try to refine and improve these. There are many tools and accessories that we can make and buy to improve them, however one should try and achieve a balance between money and time spent versus time and money saved. We do not want to spend, say £50, on an accessory if we are only likely to use it once and save a small amount of time. It would be far better to spend £100 if we saved 10 minutes every time we went into the workshop providing the item can be used for whatever model we are making. It is important that we keep the whole picture in our mind, since making components without equipment can be a long drawn out process, which will only get one frustrated. You will find that as your workshop equipment increases components become easier, quicker and more enjoyable to make. This has the knock on effect of making one feel good. I have given a few examples above of lateral thinking, which give huge time-savings in machining operations together with reducing frustration.

When making a component ask yourself a few questions:

1: What will make the manufacturing process quicker, what is required and how will I achieve this?

2 Can I construct a jig, which will speed up the process and can possibly be used for other components?

3: Can I afford to purchase a machine component that will speed up the process?

4: Do I own all the vital tools necessary, if not, how will I get around the problem?

5: What other repeat processes do I carry out that might benefit from a similar assessment?

Remember that these processes may not necessarily be directly related to the manufacture of components. It could be as simple as making a draw for tools, to set them out in compartments to make them easier to find. My approach here is that tasks carried out every time we enter the workshop have the potential to save the most time so put in the effort here first. Given a model build duration of say 5 years, a saving of 30 seconds a day in a single workshop process will save 15 hours over the period. This seems small but when you look at all the areas where 30 seconds can be saved the time savings soon mount up. I would not expect one to carry out a time and motion study on your workshop activities but just get into the habit of being time conscious and applying lateral thinking. It will pay off in the long term.

If we spare a little idle time on the thought process you will be amazed at the amount of time that can be saved, and the frustrations which can be reduced. These may not always be apparent at the time. Remember the enjoyment and the interest will be enhanced if the frustrations are reduced and the build duration kept to a minimum.

Take a look at your workshop together with your method of working and produce a list of what will be your top five time savers based on the above thought process. You will now have started on the road to improved production and reducing frustrations. Now work through your list to correct them. As you complete one add another to the bottom of the list.

I hope I have started you on putting the thought process into action. I suggest that the first five items be corrected at the expense of model production as these will start to save a lot of time. As others are added, they can be worked on over a longer time scale.

Workshop Layout

We cannot build our model without some form of workshop whether it be in a room in the house, a garage, a shed or a purpose built workshop. Depending on the type of workshop we have, and the equipment we own, this will have a large influence on determining how long our model will take to make. With many of us model engineers, our workshop has evolved over time, without too much thought to production needs. It is only after you have moved house a few times that one can start again and make a few improvements.

Take the time to stand back in the workshop for a few minutes and ask yourself the following questions: -

1: If I started again would I build my workshop with the same layout?

2: When I make a component on any of my

machines am I working efficiently, and do I have all the machine tools /accessories necessary?

3: Do I have all the tools to hand when carrying out a routine machining process?

The answers to these will help you to understand how your workshop fits into your production needs. What you should be looking to achieve is a mini production line around each machine with all the tools and equipment for the common machining tasks close to hand and in an uncluttered environment, which you feel comfortable in.

Having answered these you may find that your workshop does not fit any of the above criteria so where does this leave you. Still in your workshop I hope but you have taken another step to understanding how your machining efficiency may be causing a lot of wasted time. For the next few months while making your components make a mental note of how things could be improved around your machines and if after this process you have identified a lot of time wasting then it may be prudent to re-organise the workshop. Remember here that we only want to spend time in re organising if we can get back many more times that time in increased production. In addition you must feel comfortable in the new environment.

What Type of Model

If you are new to model engineering then deciding what model to build will be your biggest decision so it is crucial that you spend a little time in assessing all the aspects. Most model engineers will know what type of project they want to build i.e. a clock, locomotive, traction engine, etc., so what we need to do is to cover all the other aspects. Start off by asking yourself the following questions: -

1: What do you want the model to do?

2: Is it purely for its visual aspects?

3: Do you want to run it, if so will you want to sit on it or behind it to drive it? Will it need to pull other vehicles along i.e. carriages/trailer, etc.?

4: If you are considering building a locomotive consider where you will run it (you do need a track). How easy will it be to get access to the track when you wish to run it? Can you have access by yourself?

5: What is my goal for the build time in years?

6: How much money can you afford?

7: How big is your workshop and what machining facilities do you have?

8: What type of craftsman are you, must you have every component spot on. If so this will add a considerable amount of time to the build, so it may be prudent to consider a smaller or less complicated model.

9: How impatient are you, remember models take a long time to build.

10: Do you know what models are available and by what supplier.

11: Have you seen a previously built model at an exhibition or built by a colleague if so it is worth talking to the owner to identify how complicated the build was and if the drawings contained any errors and what the build time scales were.

12: Do you wish to make all the components or would you consider buying a kit, which will have many of the components pre-machined. If so, what kits are available?

13: Should you consider buying a second hand part-finished model? If so remember you will not be able to guarantee the standard of workmanship or accuracy of the parts already made. Are the castings still available and from whom? Why is the model for sale? Most important is it the model you wish to build and will be happy with. Do not buy it just because it is cheap.

If this is going to be your first model, then try to select one that is a simple design without too much fine detail as fine detail models take twice as long to build. If there are two suppliers offering a Fowler traction engine then compare what each are offering and how the finished models differ. The answers to the above, should help to guide you towards the model scale. The points to consider here are: -•

1: Take time to visit model suppliers and ask to see drawings for the chosen model. From this you should be able to assess if you can make all the components within your workshop. If you cannot how will you get these made and at what cost. Alternatively, you may be able to talk to an owner of a previously built model to obtain this information.

2: Take specific note of the larger components. Are they within the capacity of your machines?

3: Take note of the final model size and weight and decide how much bench space you will need for the assembly. If the finished weight is not specified then ask the question. Can you lift it during the build and when completed? If not how will you deal with this problem?

4: When the model is completed do you need to transport it? Remember you would be unwise to transport it without a travelling case and this could add another 20 to 40 lb. to the total weight. In addition, what will it be transported in? As an example, I have a 3¹/₂in.gauge loco which weighs 120lb in its travelling case which measures 32x12x12 inch. Its tender has its own case which weighs 35lb. and is 19x10x12 inch. In addition, my Fowler traction engine is 37x15x23in. and weighs 224lb. without its travelling case. If you also need a trailer or passenger carriage for this model this will also need to be packed in the car/ trailer.

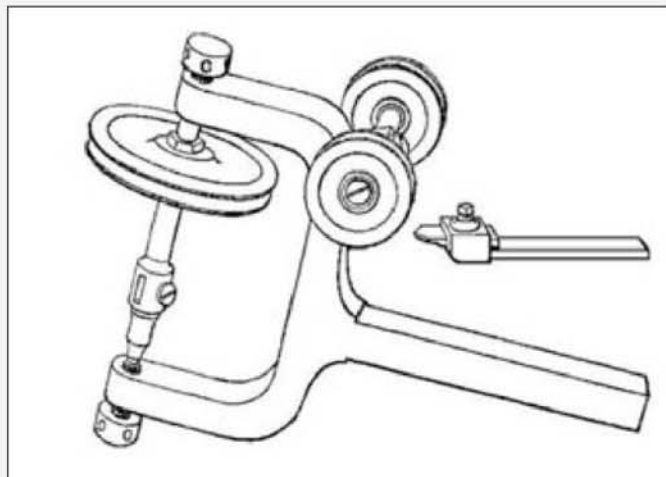
5: When the model is completed where and how will you store it?

6: For the smaller size models, do you have nimble fingers and good eyes as these are essential for making those small components.

7: When the choice has been narrowed down then make an assessment of the costs for the scale model you have selected (see the later paragraph on costs). In the case where two suppliers are being assessed then cost out both options. Remember the costs can run into many thousands of pounds so it is worth doing.

In summary it is better to spend a little time, effort and money at this stage to choose the correct model for you than find out at a later date that you have made an error in your selection.

●To be continued.



The Horizontal Cutting Frame

is used with a single point cutter or occasionally with a small horizontal milling cutter. Individual plunge cuts may be taken at regular intervals to create a variety of patterns or, continuous swathes cut to produce curved areas. Long or short cutters may be used for large or small radius cuts.

PLAIN MAN'S GUIDE TO ORNAMENTAL TURNING

John Edwards

In this second article of the series he examines some of the ornamental cutting frames, their uses, and the results produced.

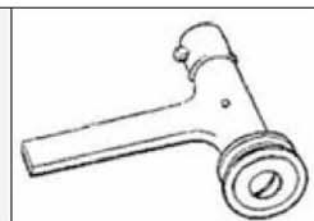
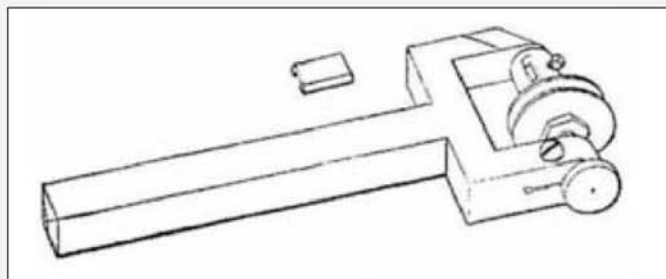
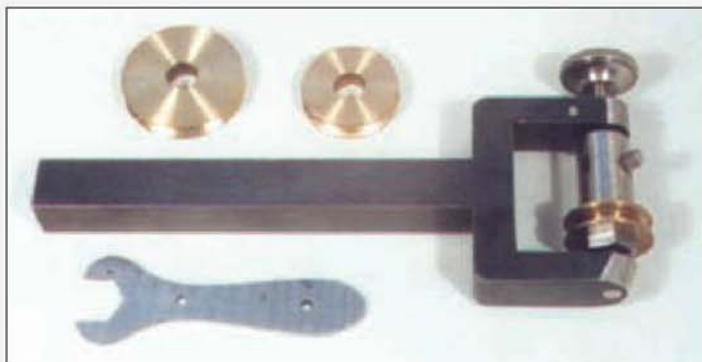
•Part II Continued from page 85
(M.E. 4252, 22 July 2005)

Cutting Frames are a series of frames to hold flying cutters which describe different movements. These include: gashing cuts at any angle, routing cuts for flutes and mouldings, planing cuts and circular, elliptical and epicycloidal cuts. The cutting heads or spindles are driven over pulleys by a thin round belt from overhead as described in the previous article.



The patterns on these boxes were cut with the Horizontal Cutting Frame; one using a round-nosed cutter and the other a point tool.

The Vertical Cutting Frame



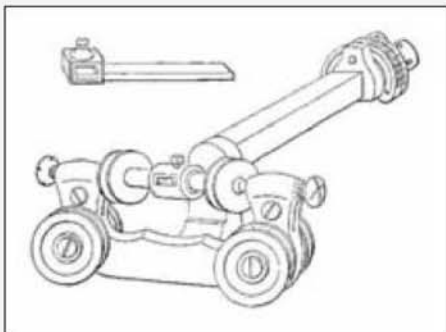
The Vertical Cutting Frame rotates in the vertical plane so cutting a vertical slash, groove or flute and it is used with a single point cutter cutting vertically upwards; the inconvenience of throwing wood shavings into the face of the operator is preferable to the real risk that cutting downwards can loosen the chuck on the spindle nose thread and spoil the work. The closed-end type runs very efficiently on point bearings but the open-ended type is more versatile as it can take a longer cutter for those times when a large radius concave cut is required.



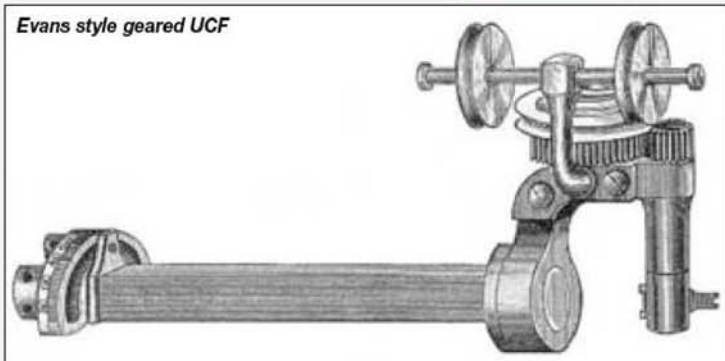
Here a bamboo pattern is being cut vertically on the main component of a Wassail Bowl; the wide flutes were also cut vertically.

The Geared Universal Cutting Frame

The Geared Universal Cutting Frame has the advantage that the cutter may go very close to the work surface as the drive pulleys do not obstruct it, thus allowing a very small radius cutter to be used.



Evans style geared UCF



The Birch Style Universal Cutting Frame

The Birch style Universal Cutting Frame uses bevel gears to transmit the drive and the more modern type uses a continuous loop driving band.



Modern type

The Universal Cutting Frame

The Universal Cutting Frame is used in exactly the same way as the Vertical and Horizontal Cutting Frames except that the cutting head may be adjusted to cut at any angle between the horizontal and the vertical. The enclosed type has the disadvantage that the pulleys may foul the work if it is required to cut up close to a shoulder.



Here are some Perspex wine coasters with patterns cut with the Universal Cutting Frame.

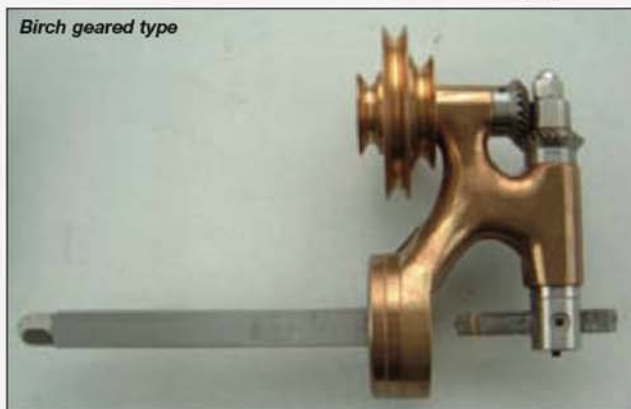


Hotzapffel style



The description of ornamental cutting frames and their uses will be continued in the next article which will deal with the Internal, Eccentric and Elliptical Cutting Frames. If any reader wishes to find out more about the subject, and the Society of Ornamental Turners contact the author on 01732 355 479 or johnf.edwards@virgin.net

Birch geared type

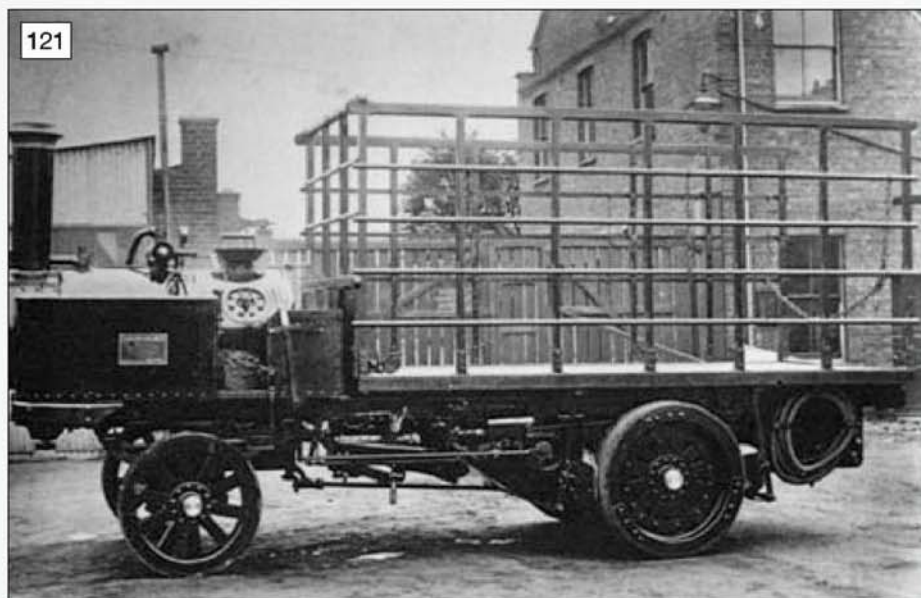


ROAD STEAM

Stan Nipper and Martin Wallis now turn to the locomotive type boiler used with this wagon and start by looking at the design constructed from steel.

● *Part XII continued from page 94 (M.E. 4252, 22 July 2005)*

The prototype locomotive boiler had a heating surface of 75ft.² and a grate area of 3½ft.². There were 55 tubes 1¾in. dia. and 2ft. 9in. long. Thirteen of the tubes were screwed in and acted as stay tubes, a wise move as the working pressure was 200 pounds per square inch (psi) with a test pressure of no less than 450 pounds per square inch. Why a test pressure of more than double the working pressure was required does not seem to have been recorded. The barrel was 2ft. 4in. in diameter, which in 3in. scale is a nice round 7 inches. The completed prototype boiler weighed 21 hundredweight. Just how many wagons were built with locomotive boilers by Savages is a matter of conjecture, as no register of their wagons seemed to have been kept, but the total is



An early example of Savage's Universal Carrier with the locomotive style boiler. The customer is unknown but the body type would suggest a brewer.

SAVAGE'S UNIVERSAL CARRIER



A model boiler. Note the vertical firing chute and the plate stamped at foundation ring level (photo: Bell Boilers).



The backhead. The number BB87 is Bell Boilers reference number. The number at foundation ring level is again plate stamping (photo: Bell Boilers).



Another view of the finished locomotive boiler photographed on Stan Nippers work bench (photo: Stan Nipper).



The boiler mounting plate is rivetted underneath the chassis frames. Note the rear boiler retaining keeps (photo: Stan Nipper).



W.P. 150 PSI HTP 300 PSI
All Material to be certified boiler quality 1501-161-4308
All welding to pressure vessel specification BS EN 287

127

Figure 127 shows two metal components. The top component is a curved bracket with three holes. The bottom component is a flat plate with four holes. Technical drawings are overlaid on the components, showing dimensions. The bracket has a width of 1.50 and a height of 1.25. The plate has a width of 1.50 and a height of 1.25.

SAVAGE'S UNIVERSAL CARRIER
Figure 58 Steel locomotive type boiler details

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128
The assembled front boiler mount after a coat of undercoat (photo: Stan Nipper)



129
Spotting the front boiler fixing bolt holes through to the mounting bracket (photo: Stan Nipper).



130
A rear boiler mounting. The bracket can slide under the retaining keeps (photo: Stan Nipper).



131
Bell Boilers make a variety of different boilers for various applications and are well respected among model engineers.

Expanded tubes

Sixteen $\frac{3}{4}$ in. O/D fire tubes are fitted which, in common with all the other boiler components, must be to an approved boiler specification. They are expanded into the tube plates. While copper tubes may be expanded with every satisfaction they usually are considered to be more likely to leak in service. Two reasons are usually given for this, the first being that as an inherently softer metal the 'force fit' that may be achieved between the tube and the plate is proportionately less and secondly that when hot the copper tube will expand more than the steel barrel resulting in a potential 'working' or 'fretting' as the boiler heats/ cools. This may disturb the fit and result in those annoying little weeps.

Good compounding

A brief pause may be sensible to 'unpack' the statement 'compound satisfactorily'. On a compound engine the steam is expanded twice, first in the high-pressure cylinder and then in the low-pressure cylinder before being exhausted up the chimney. As the steam expands it cools but if a respectable economy/ efficiency is to be achieved it should not condense. Hot steam is what is needed, either through a higher working pressure or superheat. On a model a sure sign that condensation is taking place is water droplets around the chimney.

A compound engine will of course work at a lower pressure; it will still haul a load and

perform work. What is compromised is efficiency. I know from experience that a 12 mile journey I do from home to work on my half size Fowler can be achieved on significantly less than $\frac{3}{4}$ of a tank of water at 160-180psi but that the same journey at 100-120psi used up all the water - and I began to wonder if I would make it.

Integral smoke box

Both the steel and copper boilers have integral smoke boxes. On the steel boiler it is worth asking if the builder will put the 2.5in. dia. hole for the chimney in the top of the smoke box and the 1in. diameter hole for the exhaust steam in the bottom. This will be considerably easier than chain drilling them later.

A casting is available for the chimney base and the smoke box door. They are both very similar to the Savage *Little Samson* designs which were described quite recently, so repeat verbiage is not offered.

Chassis considerations

It is hoped that when the chassis was assembled it was noted that the brake stretcher is 4in. further back on the locomotive boiler version, but if this was missed it is happily not a major job to drill out the rivets and re-locate it. The loco boiler must not be rigidly fixed front and back, as when in steam the boiler will expand and some movement must be allowed for against the cold chassis. The boiler is therefore held firmly to a

specially shaped bracket at the front but allowed to 'float' at the back.

Boiler mounting plate

A substantial plate, the full width of the chassis, is rivetted to the underside of the channel. The plate makes the chassis about as rigid as it ever could be and transfers the weight of the boiler straight to the front spring hangers. A large cut out is needed to clear the firebox, different cut outs being needed to suit the vertical, locomotive and water tube boiler. With the chassis upside down the rivets are inserted from below (orientation as per fig 5) and rivetted up using a dolly with a slot in it so it can support the rivet head inside the channel. The home made head will be on the underneath of the chassis when it is the correct way up.

An alternative copper locomotive boiler and the drawing of the boiler mounting plate and front boiler support will have to wait until the next instalment.

● To be continued.

Drawings and castings

Drawings and castings for the Savage *Universal Carrier* are available from:

Little Samson Models, 38 Wheatsheaf Way,
Linton, Cambridge CB1 6XD
website: www.littlesamson.co.uk
e-mail: edward@littlesamson.co.uk
Bell Boilers may be contacted on 01452 722211



1
A view of the submarine chassis before enclosure in the Perspex tube hull. The ballast tank can be seen at the top of the structure.



2
A side view of the chassis. The sliding lead weight that is used instead of hydroplanes can be seen right of centre.

MINIATURE SUBMARINE

A MODEL REMOTELY OPERATED VEHICLE THAT CAN EXPLORE THE DEPTHS

Trevor Benjamin
describes a fascinating project undertaken by Dr. Brian G. Freer.

When Brian (an industrial chemist) first suggested that he would like to build a submarine, I was a little puzzled. You can see a model ship as it manoeuvres on the surface, or a model plane that is usually almost visible in the sky, but a submarine?

However the project began to get more interesting as the peculiar requirements of neutral buoyancy of submerged vessels revealed themselves. Submarines have held a fascination for most people, as Jules Verne realised and the popularity of scuba diving and snorkelling bear witness. Even 'James Bond' films rely frequently on silent underwater battles, a contrast to violently noisy, explosive, terrestrial shoot-outs.

To see under water has fascination; the secret world, unseen by others. Tales of wrecks and treasure add lustre to the unknown. Simply the experience of seeing fish and flora drifting in the current make water a draw for many. From RMS *Titanic* to dolphins there is an attraction of the deep.

But, submarines are tricky to build. Big and small they have often displayed a tendency to sink. Model sub-surface craft have a problem of their own. Models cannot carry men to control them and they cannot be controlled by radio, as radio is not too effective at the air and water interface. Low frequency sound generated through the water might be promising, it is the way whales communicate, but that is not for the present. A floated control wire is presently the best option. At least you can track where the model is!

All submarine vessels have to float under water. A ship floats on the water. If it is a little heavier than designed it sinks a little into the surface and displaces a little more water to keep it afloat (a floating body displaces its own weight of water). Once the hull is totally submerged however there is no more displacement possible and the hull sinks to the bottom. The converse is true for a lighter hull.

On the surface a hull just lifts a little. Under

the surface the hull rises until it breaks dear and floats. If a ship sails out from a fresh water river to the sea it rises slightly on the denser water and the Plimsoll line rises a small amount accordingly. The reverse occurs if it returns to a freshwater port. A submerged vessel cannot do this and it has to continuously trim its ballast. The problem is aggravated if the hull goes deeper as slight compression of the hull reduces its volume, increasing its density and sending the hull further downwards. We all know about 'blowing the tanks'. This brings the vessel bodily up quickly but is too coarse to control the trim and roll of underwater travel. The air supply is limited and has to be replenished when on the surface.

Just as the Wright brothers realised that the secret of flying was the control of pitch and roll the submarine designers realised that flying under water required fine balance. This they achieve by trim tabs, not dissimilar to the flaps or ailerons of aircraft. These they call hydroplanes. (Recommended reading: *Model Submarine Technology* by Norbert Bruggan, published by Traplet and also good reading: *Build Your Own Underwater Robot* by Harry Bohm published by Westcoast Words)

The fore end and the aft end of the vessel and also the roll are kept in trim by the hydroplanes. Provided the vessel is moving forward or backwards the crew can keep things level. They can dive or rise under control by gently angling the hydroplanes, even by hand wheel.

To achieve neutral buoyancy there are tanks, which can be opened to the sea. As they fill up under the pressure of the sea the air they contain is compressed or expelled and the buoyancy of the vessel is reduced. Blowing the water out again with compressed air at a pressure greater than the depth, increases the buoyancy and the vessel rises. Shutting off the tanks to the sea when the buoyancy becomes neutral, neither floating nor sinking, stops the trim becoming erratic and the hydroplanes can be used to fine 'fly' the neutral hull through the water at a constant level.

Fish achieve neutral buoyancy by squeezing an

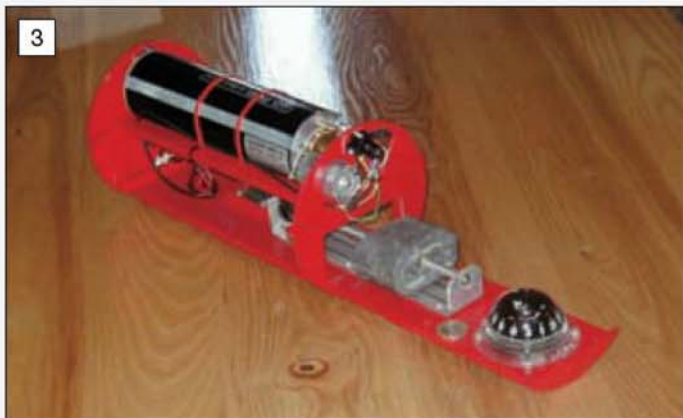
air sac by muscle power. Scuba divers use lead weights to become nearly neutral in the water and make up for the imbalance by muscular control of their flippers. Our model has no muscles as such and compressed air and control valves have proved cumbersome. Fortunately some ingenious modellers have come up with a ballast tank that is simply a piston in a cylinder, open to the water (photo 1). The tank is the large black cylinder on top of the chassis. An electric motor draws the piston back letting water in, adjusting the overall density of the model to be just neutral. This is easily controlled by signals from the surface, (provided you can see what is happening).

The hydroplanes would be tricky to reproduce as they need power and a seal through the hull and again the ingenious model engineers have come up with an acceptable solution. In photo 2 you will be able to see a lead weight just forward of the middle bulkhead, on the right of the black ballast tank. This is threaded onto a screw and slides fore and aft under the control of a motor. The fore and aft pitch is therefore smoothly controlled. Roll is not controlled in this case but the ballast weight is low in the frame to keep the centre of buoyancy high compared with the centre of gravity (the metacentric height in marine terms). The motor for the trim weight can be seen in photo 1 just below the black ballast tank.

Ballast is also carried as lead weights on each side of the hull. These slide on the tie bars of the hull and are locked with grub screws in a neutral position when the moveable ballast weight is central (see later).

A compass, one of the readily available marine types mounted in gimbals, allows the direction of travel to be seen without being affected by the pitch or roll. Provided that you do not use mild steel or magnetic stainless steel close to this compass you will not need to 'swing' it and provide correction figures.

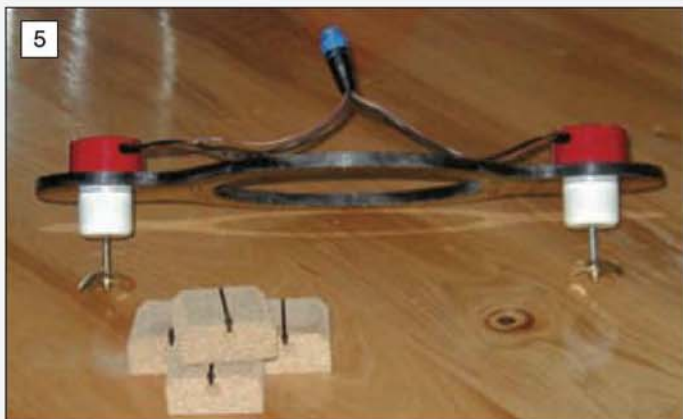
But what use is a compass when it is under water, out of sight? Photograph 3 shows how. Just in front of the black ballast tank is a small television camera (black). It points over the compass and picks it up at the bottom of its frame.



3
The TV camera (black) is mounted in the centre bulkhead and looks out across the marine compass.



4
The control plug in the end bulkhead with its O-ring and the all important light (bottom left).



5
The vessel does not use a rudder. Instead two motors in a yoke plate both drive and steer the vessel.



6
A fish out of water? The submarine rests on dry land before undergoing her first sea trials.

The camera looks out through the clear 'Perspex' end bulkhead into the murk beyond. A powerful torch lights the way ahead. **Photograph 4** has the torch at the lower left. This photo also shows the aft bulkhead with its watertight plug for the control signals. It is sealed by a soft O-ring in a groove.

The six holes for the tie bars are arranged so that two on each side form rails to steady the external lead ballast pieces. There is no need to be worried about the electrical connections as they are only low voltage. Any damp will not seriously impair the operation or cause loud bangs, although it will cause a bit of corrosion. (*Scrapheap Challenge* has proved time and again that ordinary car electric motors run under water without much fuss). Batteries that might come into contact with water however must be totally

sealed or the acid types will lose electrolyte and in sea water the salt will liberate highly poisonous chlorine.

Cables need not be heavily insulated for the same reason. Weight and flexibility are more critical. Multi-strand flexibles are more expensive but worth it. Special soft rubbers need more care in handling. Instrument wires are worth investigating.

Now let us look at drive power? A cunning solution is to use two submersible bilge pumps. These can either be used with a suitably sized small jet, as in a jet-ski, or as Brian did here, the pump volute and impeller are removed and a marine propeller fitted.

Bilge pumps are not designed for deep immersion and if your ambitions are for depths greater than a metre or so you will have to invest in better shaft seals and better cable entries. The propellers and their motors in this design are mounted on a yoke plate (**photo 5**) which slips over the tie bars and the hull. It is secured with short spacers fixed with grub screws to the tie bars. The motors are red and white in the picture with brass propellers.

By altering the speed of the motors individually the hull can be steered. This saves a rudder and its links and controls. Aircraft servos could be used but the fewer the number of holes in the hull the better.

The cork cable floats are also shown in **photo 5**. These are necessary to relieve drag on the remotely operated vehicle (ROV). They also help tell the proud owner where his invisible model is!

A heavy wall 'Perspex' tube encloses the works (**photo 6**) and makes an attractive way of seeing what is going on. The ballast weight moves, the buoyancy chamber goes in and out

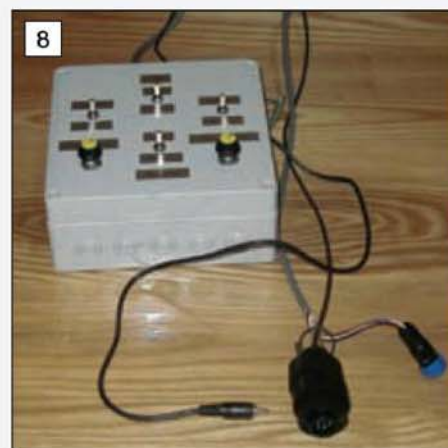
and of course the propellers 'whirr' on the outside. Stainless steel rods are threaded to act as tie bars and hold the end plates tight. 304 stainless steel is adequate for intermittent immersion. The basin trials commenced with the family in the bathroom, which was great fun for all, before the serious matter of the launch in real water (**photo 7**) and the 'sea trials'.

To see what is going on the cable is linked to a lap-top computer which displays the underwater scene from the TV camera on its screen to everybody at once. Right up to date!

The control box navigates the ROV and whilst the Titanic may still be a little deep for it this project puts into perspective the skill that Robert Ballard and others practice in adventurous engineering.



7
A submarine's eye view of the weeds and marine life in the murky depths.



8
The captain's cabin. The control panel used to navigate the submarine.

SOME STRANGE BUT USEFUL NUMBERS

Ted Wale

introduces us to some fascinating mathematical concepts.

A long time ago I was asked by our club's program officer to produce something different for our club's monthly meeting. My mind was a blank on matters engineering but I had been reading an interesting little article in Scientific American (see refs.) and, separately, had been following up on an exciting watch design by Derek Pratt so I put together a presentation on 'strange numbers' which probably would have been better titled 'unusual and lesser known numbers'. That was quite a while ago but in a recent conversation with our editor he expressed an interest in it so here it is reworked.

There are a variety of strange and interesting effects that can be produced by manipulating some very simple numbers in ways different from our usual $2 + 2 = 4$ and $2 \times 3 = 6$. These effects are found to be very useful in many and varied fields of activity. I am not a mathematician nor am I a numerologist. The latter is a special branch of mathematics, which deals specifically with numbers in and of themselves. Far from it! However, I have stumbled over a few of these effects while doing what all we model engineers do - making things that spark our interest. I give some of the references at the end. In this article I am going to introduce three of these in the simplest possible way (it has to be simple for me to understand it) and indicate how useful they are each in at least one field of their many applications.

These three examples and at least one of the disciplines where they are each applied are

- 1: Golden Rectangles in architecture.
- 2: Reuleaux polygons in mechanical engineering.
- 3: Fibonacci numbers in arts and crafts.

Please remember that there are many other applications for these things and we are going to look at only one for each although I may indicate others in passing.

Golden Rectangles

Very many years ago, in ancient Greece, there were many beautiful architectural constructions

made for many purposes, as we all know. Some are still standing or, at least, parts of them are. In the course of the construction of these marvels the designers noticed that some shapes were more pleasing than others. If your knowledgeable Greek of those days wanted to put an opening in a wall, or wanted to erect a rectangular shape, he made these so that their dimensions met the rule of 'The Golden Rectangle'. This was because it was, and still is, the most 'acceptable', the most 'pleasing' to the eye. Modern architecture does not accept this and has thrown away 2,500 years of experience so as to be able to do something different but that is not our concern here. One may say: "But windows are all different heights and widths, how can only one shape apply?" The lovely thing about Golden Rectangle windows and doors (in a large building particularly) is that two Golden Rectangles side by side to make one window are still reckoned to be 'most pleasing'. No further discussion on this subject, which will become contentious as opinions certainly differ. Let us see what this Golden Rectangle is.

In fig 1 is shown a rectangle 'abcd' - fig 1a. In fig 1b an arc has been struck with its centre at 'a' and its radius equal to 'ab' to intersect 'ad' at 'j', then the horizontal line 'jk' is drawn between 'ad' and 'bc'. In fig 1b it is seen that this deducts the square 'ajkb' from the original rectangle 'abcd' leaving the rectangle 'jkcd'. This smaller rectangle, by accurate measurement, will be found to have the same ratio between its sides as 'abcd'.

$$\text{i.e. } ab/ad = jd/jk$$

It is a Golden Rectangle just as 'abcd' is. This can be continued for ever but only one more step is needed here to confirm this fact. This last step is in fig 1c where an arc is struck with centre 'd' and radius 'dj', followed by the line 'pq' to yield the further rectangle 'pqkc'. This can be measured and seen to be another golden rectangle.

$$\text{i.e. } ab/ad = jd/jk = pk/pq$$

What is this wonderful ratio? It is 1:1.618034....

The dots after the number show that it goes on virtually for ever without repeating anywhere - it is commonly called an infinite number. We are

all familiar with another one of these things. In a circle the ratio of the diameter to the circumference is the number:

$$\pi = 1.314159....\text{which also goes on for ever.}$$

How do we know this Golden Number (of 1.6 something)? Well, our mathematical boffins have determined that, in a Golden Rectangle, the long side is found from the formula

$$x = 1 + 1/x$$

(If you prefer to work in quadratic equations this converts into $x^2 - x - 1 = 0$.)

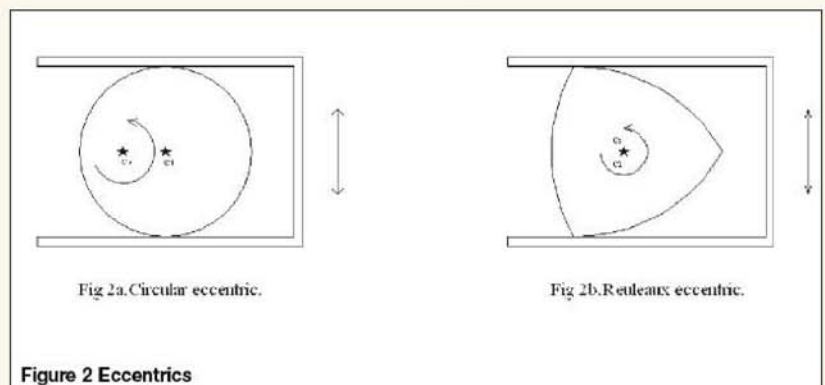
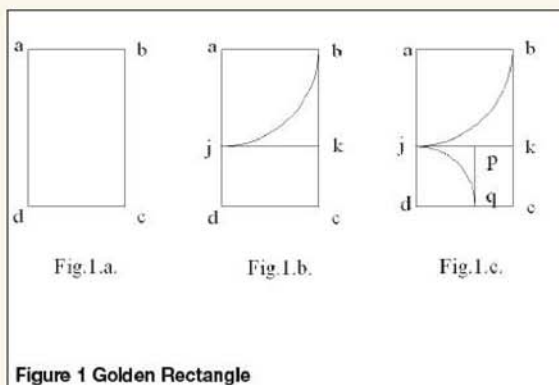
Also careful measurement on a draughting board, many times size, will yield this number or very close to it. At the end of this article we will come back to another way of reaching this Golden Number.

Reuleaux polygons

These are variously referred to as Reuleaux triangles, which is a poor name as it is limited to only one possible construction - as Reuleaux cams, which is a much better name but it refers to the use in one application rather than the underlying geometric figure. Polygons (many sided figures) is better still as long as we remember that all Reuleaux polygons always have an odd number of sides; even sides do not work as we shall see. Reuleaux eccentric is another name and this describes its use in many mechanical applications.

It is as in an eccentric application that I will describe it here. See fig 2. An 'ordinary' eccentric consists of a circular shaft that is mounted so as to rotate off its own centre line as in fig 2a. The well known result is that the fork (or much more often the circular ring) that contacts both sides is driven vertically as indicated by the arrow. The excursions of the fork are once per revolution i.e. up-down-up. The distance that the fork travels is called the throw and is twice the distance between Cr - the centre of rotation- and Cl the centre line of the eccentric. The Reuleaux eccentric however rotates about its own centre line - Cr and Cl coincide as in fig 2b.

In fig 3 is shown the construction of a Reuleaux triangle (the polygon with three sides). Firstly, an equilateral triangle ABC is drawn (in



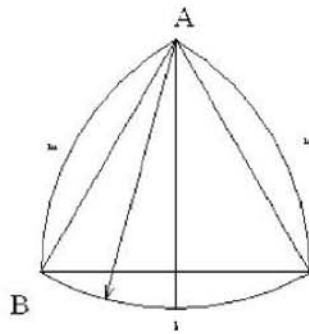


Fig 3.1.

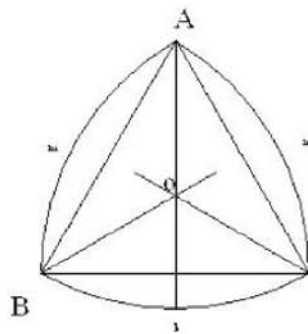


Fig 3.2.

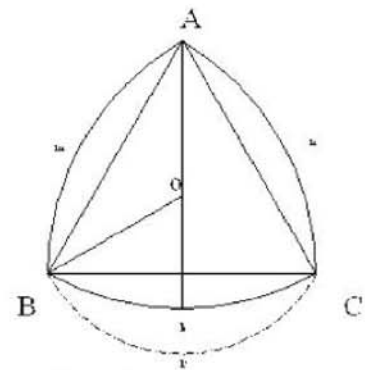


Fig 3.3.

Figure 3 Construction of a Reuleaux cam

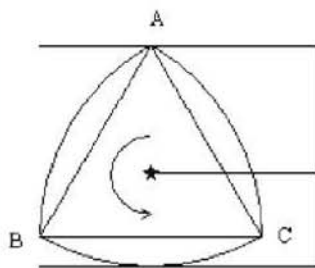


Figure 4.1 @ 0 deg.

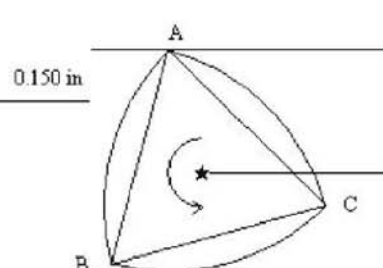


Figure 4.2 @ 15 deg.

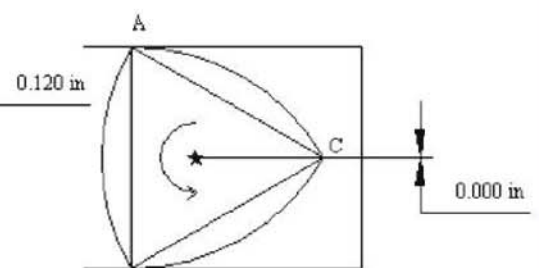


Figure 4.3 @ 30 deg.

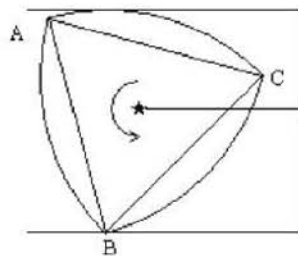


Figure 4.4 @ 45 deg.

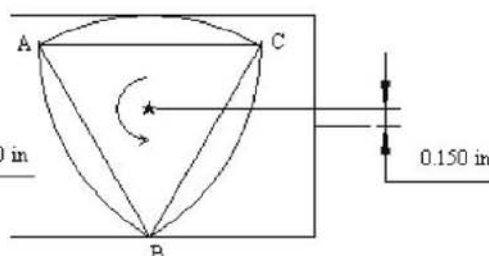


Figure 4.5 @ 60 deg.

Figure 4 Rotation and throw (where side = 2in.)

my scale it was 2in.). Then, with A as centre an arc BkC is struck with BC as its chord. Similarly CnA and AmB are arcs struck with B and C as centres. The outline of the cam is AmBkCnA. This is as in fig 3.1.

To work out the throw it is necessary to first find the centre of this figure at 'O' - one way is to bisect the angles as shown in fig 3.2. Join OB and strike an arc 'p', with the centre at O and radius OB, between B and C. It is clear that, with the cam centred on and rotated about O, the apex B will travel along the arc 'p' from B to C in fig 3.3. Now is the time to see the Reuleaux cam fig 2b in action and to see the differences from the action of the normal eccentric in fig 2a.

In fig 4 is shown the cam and a simple fork outline (k, m and n are omitted for clarity). In fig 4.1 the fork constrains the cam between apex A and the centre of the arc k. In fig 4.2 the cam has rotated 15deg. and the fork still contacts the cam

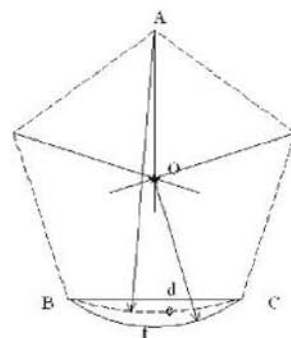


Fig 5.1.

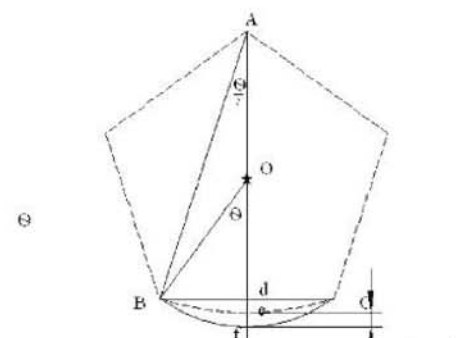


Fig 5.2

Figure 5 General solution

between A and k but in a different position. However, the total distance between the arms is still the radius of the arc BkC so this distance is unchanged. In fig 4.3 the arms touch the two apices A and B which is still the same distance as the radius of the arc was set at length AB in the original construction (above). In fig 4.4 apex B and arc n have taken over and in fig 4.5 the position is reached where the fork touches the cam at exactly the opposite position to that in fig 4.1. From this it can be seen that the total rotation for one throw, i.e. up-down-up, is 120deg. so there are three throws for each revolution of the triangular cam, the same number of throws as sides to the starting figure, an equilateral triangle. The fork is at its highest in fig 4.1 and lowest in fig 4.5 and this throw is equally spaced about the position in fig 4.3 when two apices are touching the fork. The actual value of the throw as shown for each is simply that entered by the CAD program on this diagram where the sides, as stated above, are 2 inches. This is one practical answer for this particular case but in order to be able to use a Reuleaux cam in any design work it is necessary to derive a formula for the throw in terms of the number of sides and the length of a side for any desired application.

In fig 5 is shown a pentagon (i.e. a polygon of five sides). The general solution for a Reuleaux figure is easier to see with a figure of more than three sides as the construction lines stand out away from the sides. So let the number of sides = x

In fig 5.1 find the centre O by the same method as before which is bisecting the internal angles (two will do but three adds a confirmation). With centre A and radius AB draw the arc BeC, which is one side of the Reuleaux figure. With centre O and radius OB draw the arc BfC, which is the path of B as it rotates about O. From fig 4 it is seen that the throw (T) is the length 'ef'. The formula for the throw in the general case is:

$$T = (S/\sin \theta - S/2\sin \theta)$$

Where x = number of sides
 $\theta = 180/x$
 S = length of side

For those readers who would like to see the derivation of this formula it is given in the appendix.

The Reuleaux cam appears in many different mechanisms from automatic transmissions to watch escapements. Two examples of these latter are firstly in a beautiful watch made by Derek Pratt who lives in Switzerland. He used it in a unique escapement where a small spring is rewound every few seconds to drive the lever escapement. Such a device is called a remontoire and appears in many precision timekeepers but in this case it was part of a small assembly called a tourbillon, not much more than 1cm across,

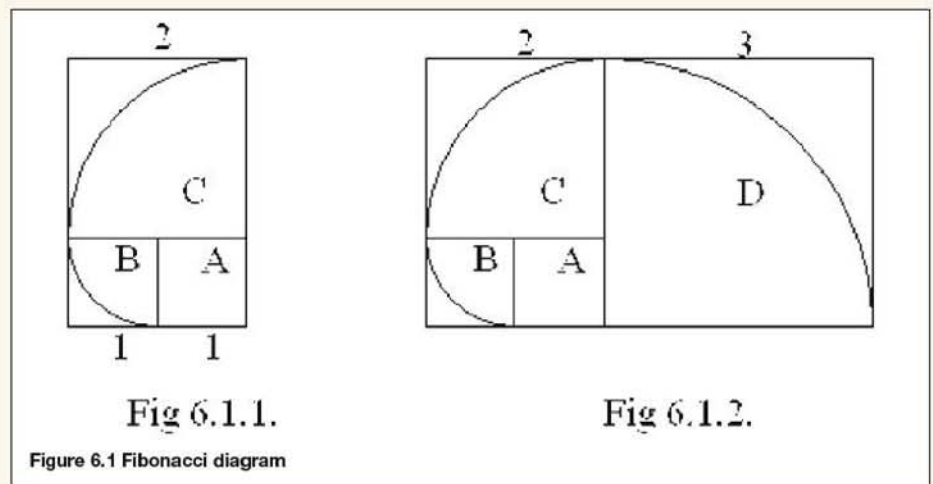


Figure 6.1 Fibonacci diagram

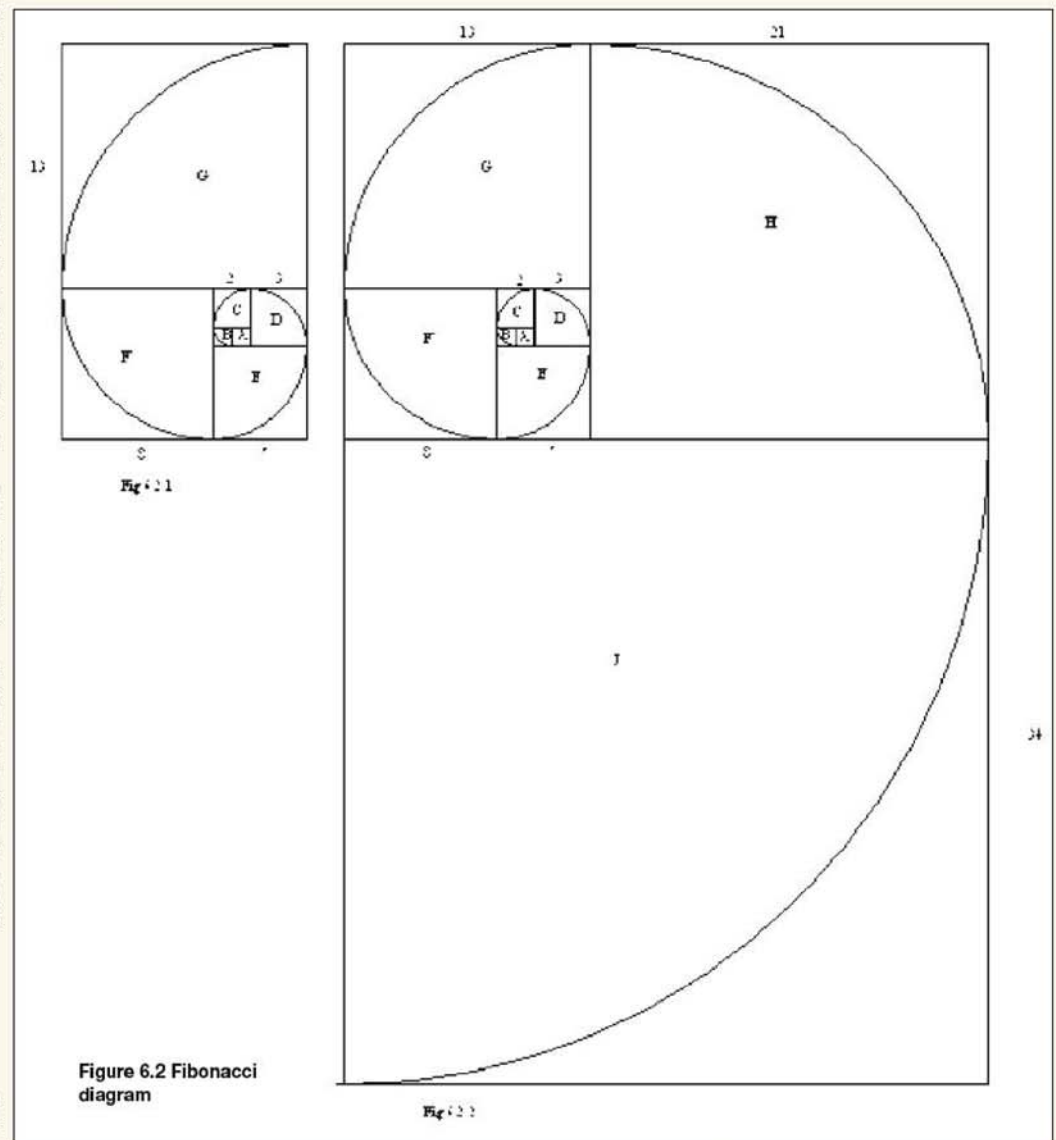


Figure 6.2 Fibonacci diagram

where the whole escapement assembly is rotated every minute so that it is never stationary in one particular plane so eradicating any timekeeping errors due to position. Secondly, soon after details of this lovely little machine were published, John Cronin made a mantel clock containing the same system but made large enough so that one can watch it operating and see how the system works helped by the fact that the pendulum beat is so much slower than the speed of the watch beat.

It should also be noted that the cam can be

enclosed within a square, a rhombus, and other shapes each of which produces different throw amplitudes and angular velocities.

Fibonacci numbers

Most people have tried, at one time or another, to draw a continuously expanding spiral like the shape of the shell of a Nautilus mollusc, often referred to as a logarithmic spiral. It is not easy to do freehand and becomes virtually impossible as the curve rapidly increases. An Italian numerologist named Fibonacci, who lived in Pisa

around 1200AD, investigated a series of numbers that will do this for us (approximately) if a simple form of construction is used. Fibonacci was definitely not trying to draw seashells. His research was of a much higher intent in his field of numerology.

Figure 6 illustrates this effect. In fig 6.1.1 the starting square A is drawn and let it have sides of 1 unit. Beside it is drawn another square, also of size 1. Now proceeding in a clockwise direction square C is drawn touching A and B so it has a side of 2 units. See fig 6.1.2. D is then added touching A and C so its side is 3 units and in fig 6.1.3 square E with sides of 5 units is added.

Returning to Fig 6.1.1, a quarter circle is drawn with centre on B's upper right hand corner and radius equal to the side. The same is done in C where the lower right hand corner is the centre and the radius is 2. In D the centre is the lower left hand corner and in E it is the upper left hand corner. Note that the 'next centre' is always the next clockwise one, it moves in the same direction as the new squares are added. Figure 6.2.1 adds the squares F and G with their quarter circles while this is continued in fig 6.2.2 with H and J.

The curve appears smooth because the end of one quarter and the start of the next is always in exactly the same direction. For instance in B the curve completes in a vertical direction at the junction of B and C while the curve in C starts at the same point and in the same direction. This smoothness is a bit of a delusion as the whole curve is made up of quarter circles with large steps in the radii. It can be seen from the drawing that the radii are 1, 2, 3, 5, 8, 13, 21, 34 so the curve is not continuously increasing but in steps that are not immediately obvious to the eye. It would be better to call it a pseudonautilus curve for, in real life, our clever mollusc would increase his roof with the radius increasing smoothly as he builds his home. However if we wish to make a piece of jewellery or other artifact this is an easy way to make a very passable job.

From this little drawing exercise arises a simple means of writing down any Fibonacci number. In fig 6.1:

$$C = B + A;$$

also $D = C + B$ and $E = D + C$, which put into words is that any number equals the sum of the two previous numbers. This continues in fig 6.2 where the last number shown is $J = H + G$. To put this in mathematical language we have a formula where:

$$F(n) = F(n-1) + F(n-2)$$

One of the things that intrigues is the ratios of these numbers. The first $C/B = 2$; then $D/C = 3/2 = 1.5$; $E/D = 5/3 = 1.667$; $F/E = 8/5 = 1.6$; $G/F = 13/8 = 1.625$; $H/G = 21/13 = 1.615$; $J/H = 34/21 = 1.619$; and the next would be $55/34 = 1.618$. As the numbers get higher and higher the ratio of successive numbers swings either side of and gets closer and closer to the Golden Number with which we started this examination of strange numbers.

It can be shown by Calculus minded mathematicians that the Fibonacci numbers do in

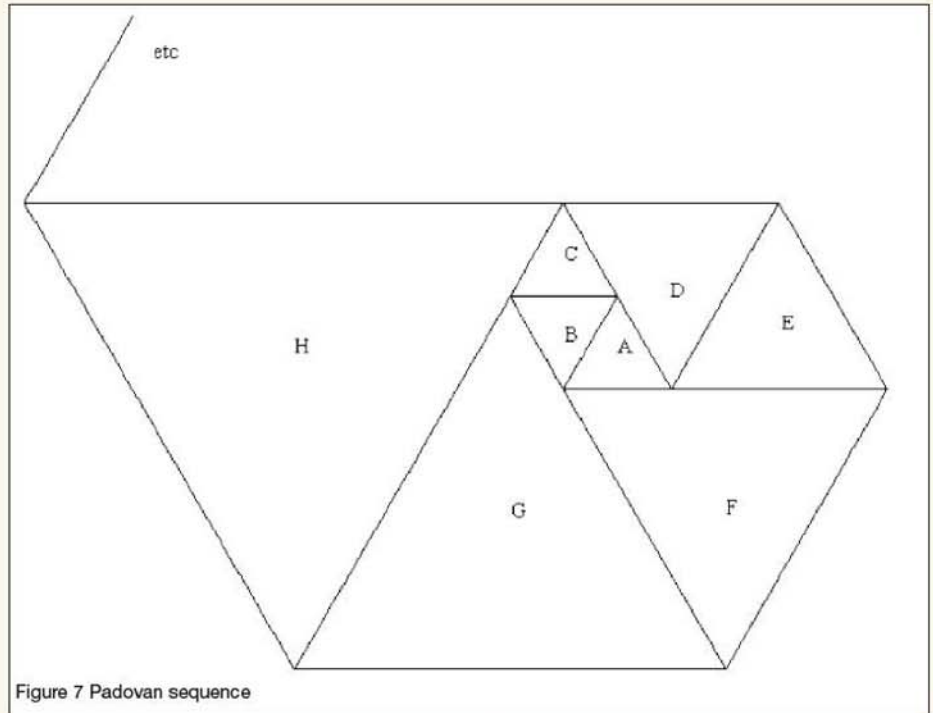


Figure 7 Padovan sequence

fact settle on the Golden Number if enough ratios are calculated. (If you care to try this again but using equilateral triangles instead of squares you will be following in the steps of one Richard Padova who apparently lived within 100 miles of Fibonacci. The start of this is in fig 7. This does not give the Golden Number but enough of this for now.) Clever people these renaissance mathematicians.

References

- 1: Tales of a neglected number, Ian Stewart, *Scientific American*, June 1996.
- 2: Kinematics of machinery. Reuleaux (Circa 1840) Tran- Harvard Library.
- 3: Escapement, Derek Pratt, *British Horological Institute Journal*, July 1991.
- 4: Mantel Clock, John Cronin, *British Horological Institute Journal*, June 1993.

Appendix

Let the number of sides be X.

In Fig 5.2 join AB and OB.

Now angle BOC = $(360/x)$ deg.

So angle BOd = angle $1/2$ BOC = $(180/x)$ deg.

Also angle BAd = angle $1/2$ BOD = $(90/x)$ deg.

Let $(180/x) = \theta$ and $(90/x) = \theta/2$

So angle BOd = θ and from this

$$\sin \theta = Bd/BO \dots \dots \dots (1)$$

and angle BAd = $\theta/2$ and from this

$$\sin \theta/2 = Bd/BA \dots \dots \dots (2)$$

Also from Fig 5.2 ef = Of - Oe

add AO to each, then

$$ef = (Of + OA) - (Oe + OA)$$

$$= 2 AO - Ad$$

$$= 2 OB - AB \dots \dots \dots (3)$$

$$\text{Now } OB = Bd / \sin \theta \dots \text{from (1) above} \dots \dots \dots (4)$$

$$\text{and } AB = Bd / \sin \theta/2 \dots \text{from (2) above} \dots \dots \dots (5)$$

by construction (above) we made side BC = 2, so:

$$Bd = 1$$

$$\text{So } OB = 1 / \sin \theta \dots \text{from (4) above} \dots \dots \dots (6)$$

$$\text{and } AB = 1 / \sin 1/2 \theta \dots \text{from (5) above} \dots \dots \dots (7)$$

$$\text{So } ef = [2 / \sin \theta - 1 / \sin 1/2 \theta] \text{ from (3), (6), (7) above.}$$

As required here where the length of the side is 2. For the general case where the side is a given then:-

Let the side length be S, so in fig 5:

$$BC = S \text{ and } Bd = 1/2 S$$

$$\text{and } OB = S / 2 \sin \theta$$

$$\text{and } AB = S / 2 \sin 1/2 \theta$$

$$\text{So the throw (ef) } = (S / \sin \theta - S / 2 \sin 1/2 \theta)$$

Therefore, to design a Reuleaux cam all that is necessary is to decide the throw required and from this calculate the necessary combination of number of sides and length of each side to satisfy it.

CLUB CHAT

With Malcolm Stride

UK News

Readers of this column may remember that a few issues ago I launched the new *Club Profile* feature in which I invited clubs to publicise their activities and hopefully gain some new members. The result so far has been an almost total silence! A mention in this column does work; I have just received a letter (and a club profile) from Robert McLuckie of the **Edinburgh SME** who tells me that as a result of the club being mentioned for the first time recently, they have gained four new members. Remember that our last reader survey showed that less than half of you belong to clubs so that means there are a lot of model engineers out there just looking for a club to join!

As I write this column I am 'fresh' from covering IMLEC and would just like to express my thanks to all those *Club Chat* contributors who made themselves known to me and to say that I much appreciate being able to put faces to some of

the names mentioned in these pages.

Colchester SMEE has a new secretary

following the decision by the long standing holder of the post, Leslie Hammond to stand down. The new man is Keith Wraight who can be contacted at 63 Munnings Drive, Clacton-on-Sea, Essex CO16 8YL or telephone 01255-434091. We wish Keith every success in his new role and look forward to hearing from him at regular intervals.

Crawley Model Engineers have been busy with public running at their Goffs Park track. The early May run was eventful with a locomotive derailling on a defective rail joint. The track fault was soon rectified and fortunately the passenger trolleys stayed on the track. The society entertained the 1st Langley Green Cub pack at the end of May with about 30 children being treated to rides and some even having drives on the electric locomotives. The society was rewarded with a "big box of tea" for their efforts.

Work continues apace at the **Edinburgh SME** with the new

bridge completed in time for the first open house in May. Further work includes ground work and levelling and it is hoped to have the inner circuit of the track completed by the time you read this. Members had a visit to the Edgar Allen Steel Foundry in April and following refreshments and a talk the group had a very informative tour of the working areas of the plant. A total of 33 members, joined by 11 from the **Glenrothes Club**, visited the Harrogate Exhibition this year. The society is holding an efficiency competition at their Newliston track in September.

Some 35 members and friends of the **Fylde SME** also had a day out at the Harrogate Exhibition in May stopping off en-route at the Craven Heifer public house for refreshments. The Editor reports that "The section between Skipton and Harrogate is when the moths are persuaded to fly from traveller's wallets, i.e. the raffle tickets are on sale". After a good day at the exhibition members boarded the coach with their "bags of goodies" and returned home via the aforementioned Craven Heifer. The

day was described as "a very satisfactory club day out".

The proposed amalgamation of the **Hereford SME** and the local ham radio club has died a natural death as neither club could see any mutual benefit in the arrangement. Chairman, Brian Moorey describes the Tuesday gang as "going from strength to strength with good jokes, good soup, plenty of tea and we have done a little work as well". All this sounds like a recipe for success. Plans for the new carriage store have been approved and plans for the station canopy are in hand. The club locomotive *King Offa* has had a major overhaul and the existing Hackworth valve gear has been replaced by a gear based on the modified Marshall type. The work was carried out by John Martin. The base structure of the new gauge '1' layout is complete and almost half a track circuit has been laid.

One of the people I met at IMLEC was Lawrence Tatton from **Lincoln DMES** who, apart from being so relaxed on his run that he had time to raise his cap to the photographer (Me!) as he went past, asked me to publicise the annual

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.

AUGUST

- 19-21 **Bristol S.M.E.E. Bristol Model Engineering and Hobbies Exhibition** at Thornbury Leisure Centre, Nr. Bristol, South Glos. 10am-6pm (Fri) 10am-6pm (Sat) 10am-5pm (Sun). Adult: £6, Child: £2.50, OAP: £5.50, Family (2+3): £14. Contact 0117-967-5878.
- 19 **Canvey R&MEC. Meeting.** Contact Brian Baker: 01702-512752.
- 19 **Erewash Valley MES. Steaming Evening.** Contact J. Matthews: 01332-705259.
- 19 **Rochdale S.M.E.E. Video Night.** Contact Mike Foster: 01706-360849.
- 19 **Romford MEC. Track Maintenance.** Contact Colin Hunt: 01708-709302.
- 19-21 **Guild of Model Wheelwrights. Bristol M.E. Show, Thornbury, Nr. Bristol.** Contact Biddy Hepper: 01492-623274.
- 20 **Brighton & Hove SMLE. Fun Run for Members.** Contact Mick Funnell: 01323-892042.
- 20 **Cardiff MES. Steam-Up Day and Barbecue.** Contact Trevor Jenkins: 029-2075-5568.
- 20 **Chesterfield MES. Running Day.** Contact Mike Rhodes: 01623-648676.
- 20/21 **Furness MRC. Leyland MRC Exhibition.** Contact Fred Firth: 01229-821192 or Colin Burns 01229-837079.
- 20 **Guild of Model Wheelwrights. Ruthin Show, Denbighshire.** Contact Biddy Hepper: 01492-623274.
- 20 **Hollycombe Steam & Woodland Garden Society. Fairground at Night.** Enquiries: 01428-724900.
- 20 **Hornsey ME. Train Day.** Contact Ted Gray: 9484-7583.
- 20 **Romford MEC. Trackside Afternoon.** Contact Colin Hunt: 01708-709302.
- 20 **York City & DSME. Practical Sheet Metal Working.** Contact Pat Martindale: 01262-676291.
- 21 **Canvey R&MEC. Gala Day.** Contact Brian Baker: 01702-512752.
- 21 **Frimley & Ascot LC. Club Running.** Contact Bob Dowman: 01252-835042.
- 21 **Guildford MES. Public Running.** Contact Dave Longhurst: 01428-605424.
- 21 **Guild of Model Wheelwrights. Mid-Somerset Show, Shepton Mallet.** Contact Biddy Hepper: 01492-623274.
- 21 **Leicester SME. Competition Day.** Contact Raymond Wallis: 0116-285-8824.
- 21 **N. W. Leicester SME. Public Running.** Contact John Elliott: 01455-847040.
- 21 **Oxford (City of) SME. Public Running.** Contact Chris Kelland: 01235-770836.
- 21 **Plymouth MSLS. Public Running.** Contact John Brooker: 01752-671722.
- 21 **Rugby MES. Public Running.** Contact David Eadon: 01788-576956.
- 21 **Taunton ME. Public Running.** Contact Don Martin: 01460-63162.
- 21 **Westland & Yeovil DMES. Public Running.** Contact Gerald Martyn: 01935-434126.
- 21 **Wimborne DSME. Public Running.** Contact Eric Basire: 01202-897158.
- 22 **Bedford MES. Workshop Progress.** Contact Ted Jolliffe: 01234-327791.
- 22 **Hornsey ME. Meeting.** Contact Ted Gray: 9484-7583.

- 23 **Stafford DMES. Running Night.** Contact Chris Dobbs: 01889-270533.
- 25 **Bedford MES. School Holiday Running.** Contact Ted Jolliffe: 01234-327791.
- 25 **Wimborne DSME. Steam & Chips Night.** Contact Eric Basire: 01202-897158.
- 25 **Worthing DSME. Tony Bentley: Matters Maritime.** Contact Bob Phillips: 01903-243018.
- 26 **Brighton & Hove SMLE. Workshop Evening.** Contact Mick Funnell: 01323-892042.
- 27 **Brighton & Hove SMLE. Trackday.** Contact Mick Funnell: 01323-892042.
- 27-29 **Harrow & Wembley SME. Open Weekend.** Contact Dr. Roger Greenwood: 020-8427-2755.
- 27 **Hollycombe Steam & Woodland Garden Society. Fairground at Night.** Enquiries: 01428-724900.
- 28 **Amnerfield Miniature Railway.** Contact David Jerome: 0118-9700274.
- 28/29 **Bristol S.M.E.E. Public Running.** Contact Trevor Chambers: 0145-441-5085.
- 28/29 **Cardiff MES. Open Days.** Contact Trevor Jenkins: 029-2075-5568.
- 28/29 **Claymills Pumping Engines. Open Days.** Contact B. Eastough: 01283-812501.
- 28/29 **Elmdon MES. August Bank Holiday.** Contact Chris Giles: 0121-458-1291.
- 28 **Harlington LS. Public Running.** Contact Peter Tarrant: 01895-851168.
- 28 **Hereford SME. Public Running.** Contact Richard Donovan: 01432-760881.
- 28 **High Wycombe MEC. Public Running.** Contact Eric Stevens: 01494-438761.
- 28/29 **Leicester SME. Steam Weekend.** Contact Raymond Wallis: 0116-285-8824.
- 28/29 **Malden DSME. Public Running.** Contact John Mottram: 01483-473786.
- 28 **MELSA. Sunday in the Park.** Contact Graham Chadbone: 07-4121-4341.
- 28 **York City & DSME. Running Day.** Contact Pat Martindale: 01262-676291.
- 29 **Bedford MES. Public Running.** Contact Ted Jolliffe: 01234-327791.
- 29 **Brighton & Hove SMLE. Trackday.** Contact Mick Funnell: 01323-892042.
- 29 **Canterbury DMES (UK). Club Night.** Contact Mrs P. Barker: 01227-273357.
- 29 **Frimley & Ascot LC. Public Running.** Contact Bob Dowman: 01252-835042.
- 29/30 **Northern Mill Engine Society. Open Days.** Contact John Philp: 01257-265003.
- 29 **Oxford (City of) SME. Public Running.** Contact Chris Kelland: 01235-770836.
- 29 **Portsmouth MES. Charity Day - Blind Association.** Contact John Warren: 023-9259-5354.
- 29 **Saffron Walden DSME. Running Day with Barbecue (public running after 2pm).** Contact Jack Setterfield: 01843-596822.
- 29 **Stockholes Farm MR. August Bank Holiday Running.** Contact Ivan Smith: 01427-872723.
- 29 **Taunton ME. Public Running.** Contact Don Martin: 01460-63162.
- 31 **Hull DSME. Tony Finn: Quiz.** Contact Tony Finn: 01482-898434.

SEPTEMBER

- 1 **Brighton & Hove SMLE. Workshop Evening.** Contact Mick Funnell: 01323-892042.

open weekend at their North Scarle track on the 17/18 September. Further details can be obtained from lincolnmes@yahoo.com or on 01522-88828.

Maidstone MES (UK) has welcomed two new members recently, Philip Goacher and son Howard. The reason for the particular mention is that Philip is a brewer by trade and as the newsletter Editor points out "samples are always welcome here". They are also welcome here and will guarantee Philip a special mention in this column! The newsletter also carries some notes on "How to Become Popular in the Club" which I reproduce as an aid to encouraging readers to become very popular in their own clubs.

Bring yummy cakes and make the tea.

Volunteer for station duties.

Tell all the chaps what a wonderful engine they have built and how clever they are.

Admire the ladies and tell them they are beautiful and shouldn't be expected to do such menial duties as washing up – you will do it.

Clean and tidy the clubhouse.

In Memoriam

It is with deep regret that we record the passing of John Winsor of Maidstone MES (UK). The sympathy of staff at *Model Engineer* is extended to the family and friends he leaves behind.

I should be careful about admiring the ladies, especially if hubby is bigger than you, but other than that I think you will become very popular very quickly!

Road 'n' Rail the newsletter of the **Maxitrak Owners Club** carries a useful article for those intending to visit other club tracks with their locomotives. One point made is to check that your locomotive is the correct gauge for the track you are intending to visit. Apparently it has been known for visitors to arrive at a 5in. gauge track with a 7¹/₄in. gauge locomotive. It couldn't have been any of our readers, could it? (All answers to that last question will be treated in the strictest confidence!). Bernard Fenton comments on his experiences with what he calls "The Maxitrak Effect". This is the "distaste" he has occasionally come across from individuals who consider kit built locomotives somewhat inferior to

those taking many hours to scratchbuild. He has even experienced this attitude from those who have purchased their own locomotive from the original builder! The view of this column is that if building a kit locomotive gets someone into this hobby who would not otherwise do so, then that can only be a good thing. After all, engineering skills are disappearing fast in this country and any method of getting more people to take up those skills is to be encouraged. This is why the Winsor collapse was such a bad thing for this hobby, and I am very pleased to see that ModelWorks are succeeding in their endeavours to produce good quality kits that can be built into good working models by those with lack of skills, equipment, time or inclination. The photograph overleaf shows the fine 7¹/₄in. gauge *Britannia* built by Mike and Chris Jones (**Romney Marsh**

MES) from a ModelWorks kit.

Another group with a new format to their newsletter is the **Model Steam Road Vehicle Society** whose offering is now a very nice large format glossy publication. One of the reasons for the new format is that it is actually cheaper to produce at the printers than the previous smaller format. John Benfield has been elected to the post of Chairman of the society. The new newsletter carries an article marking the centenary of the manufacture of the first Sentinel steam wagon in 1905. This used the now familiar Sentinel high pressure vertical boiler. The new style of newsletter is very good but the readers can judge from the following whether the jokes have improved:

A couple go for a Chinese meal, both decide to order the 'Chicken Surprise' the meal arrives served in a cast iron pot. The wife is just about to serve herself, when the lid rises slightly, and she sees two beady eyes looking at her before the lid shuts down firmly again.

'Good Grief did you see that?'

Her husband didn't see it, so she

- | | | | |
|-----|--|-------|---|
| 1 | Leyland SME. Project Night - Museum Quality or Scrapheap Challenge! Contact A. P. Bibby: 01254-812049. | 5 | Peterborough SME. Bits & Pieces. Contact Tony Meek: 01778-345142. |
| 1 | South Lakeland MES. Meeting. Contact Adrian Dixon: 01229-869915. | 6 | South Durham SME. Meeting. Contact B. Owens: 01325-721503. |
| 1 | Sutton MEC. Bits & Pieces. Contact Bob Wood: 0208-641-6258. | 6 | Stafford DMES, Track & Social Evening. Contact Chris Dobbs: 01889-270533. |
| 2 | Aylesbury (Vale of) MES. Track Night. Contact Andy Rapley: 01296-420750. | 6 | Taunton ME. 7¹/₄in. gauge Loco Night. Contact Don Martin: 01460-63162. |
| 2-4 | Bedford MES. Visitors Rally. Contact Ted Jolliffe: 01234-327791. | 7 | Bradford MES. Meeting. Contact John Mills: 01943-467844. |
| 2 | Canvey R&MEC. On the Table 3. Contact Brian Baker: 01702-512752. | 7 | Brighton & Hove SMLE. Wrinklies Running Day. |
| 2/4 | East Somerset SMEE. RB&W National Amateur Gardening Show. Contact Roger Davis: 01749-677195. | 7 | Contact Mick Funnell: 01323-892042. |
| 2 | Maidstone MES (UK). Evening Run & Fish 'n' Chips. Contact Martin Parham: 01622-630298. | 7 | Leeds SMEE. Meeting Night. Contact Colin Abrey: 01132-649630. |
| 2 | North London SME. On the Table: Work in Progress. Contact David Harris: 01707-326518. | 7 | West Wiltshire SME. Steam-Up. Contact R. Nev. Boulton: 01380-828101. |
| 2 | North Norfolk MEC. Bits & Pieces. Contact Gordon Ford: 01263-512350. | 8 | N. W. Leicester SME. David Hulse: Early Steam Engines. Contact John Elliott: 01455-847040. |
| 2 | Portsmouth MES. Bob Aldred: Machining a Crankshaft. Contact John Warren: 023-9259-5354. | 8 | Westland & Yeovil DMES. Public Running. Contact Gerald Martyn: 01935-434126. |
| 2 | Romford MEC. Competition Night. Contact Colin Hunt: 01708-709302. | 8 | Worthing DSME. Bits & Pieces. Contact Bob Phillips: 01903-243018. |
| 3 | Birmingham SME. Garden Party. Contact John Walker: 01789-266065. | 10/11 | Bournemouth DSME. Autumn Run. Contact Dave Fynn: 01202-474599. |
| 3 | Cardiff MES. Steam-Up and Family Day. Contact Trevor Jenkins: 029-2075-5568. | 10 | Brighton & Hove SMLE. Fun Run for Members. Contact Mick Funnell: 01323-892042. |
| 3/4 | Chesterfield MES. Open Weekend. Contact Mike Rhodes: 01623-648676. | 10/11 | Claymills Pumping Engines. Heritage Non Steaming Open Days. Contact B. Eastough: 01283-812501. |
| 3/4 | Furness MRC. Warrington MRC Exhibition. Contact Fred Firth: 01229-821192 or Colin Burns 01229 837079. | 10/11 | Edinburgh SME. Locomotive Efficiency Trials/Competition. Contact Robert McLucke: 01506-655270. |
| 3 | Guernsey Model Engineering Society. Track Day. Contact Dave Simon: 01481-251017. | 10 | Hollycombe Steam & Woodland Garden Society. Fairground at Night. Enquiries: 01428-724900. |
| 3 | Ickenham DSME. Public Running. Contact David Sexton: 01895-630125. | 10/11 | Leighton Buzzard NG Rly. Steam-Up Weekend. Enquiries: 01525-373888. |
| 3 | South Lakeland MES. Open Day. Contact Adrian Dixon: 01229-869915. | 10 | Malden DSME. Families Day. Contact John Mottram: 01483-473786. |
| 3/4 | Tyneside SMEE. Late Summer Rally. Contact Ian Spencer: 0191-2843438. | 10 | North London SME. MENCAP Children's visit. Contact David Harris: 01707-326518. |
| 3/4 | Urmston DSME. Open Weekend. Contact A. L. Fussell: 0161-748-0160. | 10 | Westland & Yeovil DMES. Track Running Day. Contact Gerald Martyn: 01935-434126. |
| 3/4 | Guild of Model Wheelwrights. Chatsworth Country Show, Derbyshire. Contact Biddy Hepper: 01492-623274. | 10 | Guild of Model Wheelwrights. Usk Farmers Club, Gwernesney. Contact Biddy Hepper: 01492-623274. |
| 4 | Frimley & Ascot LC. Public Running. Contact Bob Dowman: 01252-835042. | 11 | Bristol SMEE. Public Running. Contact Trevor Chambers: 0145-441-5085. |
| 4 | Guildford MES. Members' Running Day. Contact Dave Longhurst: 01428-605424. | 11 | Birmingham SME. Simply Trains. Contact John Walker: 01789-266065. |
| 4 | High Wycombe MEC. Family Day at Track. Contact Eric Stevens: 01494-438761. | 11 | Canterbury DMES (UK). Public Running Day. Contact Mrs P. Barker: 01227-273357. |
| 4 | Malden DSME. Public Running. Contact John Mottram: 01483-473786. | 11 | Guildford MES. Driver Training Day. Contact Dave Longhurst: 01428-605424. |
| 4 | Northampton SME. Public Running Day. Contact Pete Jarman: 01234-708501 (eve). | 11 | Harlington LS. Exhibition Day. Contact Peter Tarrant: 01895-851168. |
| 4 | Oxford (City of) SME. Public Running. Contact Chris Kelland: 01235-770836. | 11 | Hornsby ME. Running Day. Contact Ted Gray: 9484-7583. |
| 4 | Plymouth MSLS. Public Running. Contact John Brooker: 01752-671722. | 11 | Leeds SMEE. Running Day. Contact Colin Abrey: 01132-649630. |
| 4 | Reading SME. Public Running. Contact Brian Joslyn: 01491-873393. | 11 | Leyland SME. Boiler Testing Day. Contact A. P. Bibby: 01254-812049. |
| 4 | Rugby MES. 7¹/₄in. Gauge Society Invitation Day. Contact David Eadon: 01788-576956. | 11/12 | Northern Mill Engine Society. Open Days. Contact John Philip: 01257-265003. |
| 4 | South Durham SME. Running Day. Contact B. Owens: 01325-721503. | 11 | North London SME. Boating Regatta. Contact David Harris: 01707-326518. |
| 4 | Taunton ME. Public Running. Contact Don Martin: 01460-63162. | 11 | Sutton MEC. Track Day. Contact Bob Wood: 01460-63162. |
| 4 | Westland & Yeovil DMES. Public Running. Contact Gerald Martyn: 01935-434126. | 11 | Wimborne DSME. Young Members' Running Day. Contact Eric Basire: 01202-897158. |
| 4 | Wimborne DSME. Public Running. Contact Eric Basire: 01202-897158. | 11 | York City & DSME. Running Day. Contact Pat Martindale: 01262-676291. |
| 4 | Wortley Top Forge ME. Annual Open Day Contact Alec Butteris: 01226-728423. | 12 | Bedford MES. More from the Heys Archives. Contact Ted Jolliffe: 01234-327791. |
| | | 12 | Frimley & Ascot LC. Evening Meeting. Contact Bob Dowman: 01252-835042. |
| | | 12 | Rochdale SMEE. Alan Taylor: Malta Railways. Contact Mike Foster: 01706-360849. |
| | | 12 | Saffron Walden DSME. Club Night. Contact Jack Setterfield: 01843-596822. |

asks him to look for himself. He reaches out and again the lid rises just a little on its own. He sees two beady eyes looking back at him, then it shuts down sharply again.

A little perturbed the couple ask the waiter what is going on. 'What did you order Sir?' We both chose the 'Chicken Surprise'.

'OH! I do apologise, this is all my fault' says the waiter. I've brought you the Peeking Duck!!!!

The work on the new container at the Saffron Walden DMES is continuing apace with the roof now complete and the guttering partly installed. One set of rails has been installed so that riding trolleys can now be moved on and off the track easily.

The Southern Federation has upgraded its quarterly newsletter. It is now printed on good quality glossy paper and includes colour photographs. Those who wish to take out subscriptions (£7.50 inc. postage) should send the correct remittance and their address together with details of the club to which they belong to Mr. J. Walker, 23 Redwing Close, Stratford Upon Avon, Warwickshire CV37 9EX. The federation autumn rally will be held at the Prospect Park track of Reading SME on 17 September. The federation is another organisation with a new secretary. The man in the frame is Mr. I. Hurst, 16 Cypress Grove, Ash Vale, Guildford, Surrey GU12 5QN.

Stafford DMES are hosting the Northern Association rally this year, also on 17 September. Further details can be obtained from Chris Dobbs at chris.dobbs2@virgin.net or telephone 01889-270533. Those wishing to run locomotives are asked to give prior notice to Clive Hewitt on 01785-614113.

Jo Dobson, Editor of the Stamford MES newsletter, has a problem many will be familiar with. Having built the biggest purpose built workshop he could without needing planning permission, he has installed the machinery and is now trying to work out how to fit everything else in. As he says "the acquisition of machines, tools, materials and odd bits of junk is a gradual process that carries on over a period of many years so that you never fully realise what you have amassed". A group of members have cleaned and inspected the track in order to identify those sleepers which need replacing. The May meeting was a talk by Stuart Jackson of Arrand Tools. The title of Stuart's talk was "Accuracy and Tooling". During his talk, Stuart



Mike and Chris Jones' (from Romney Marsh MES) Britannia from the Modelworks kit.

defined "precision" as "producing parts to parameters laid down on a drawing". The newsletter also reports that my plea for information on clubs (reiterated above) was discussed at the committee meeting with the result that I should be receiving some information soon.

York City DMES exhibited at Harrogate again this year and were very pleased with the display of member's models on their stand. They felt that completion of the ground level track had influenced the size of models on display because there was a predominance of large scale locomotives this year. Three members won awards at the show, Jim Winrow, Dennis Lawson and Dave Ventress. Congratulations to all three, particularly Dennis who gained two awards for his clocks. Newsletter Editor, Ken Bateman has decided to retire after producing 50 issues over his ten year period in the post. As he says, "fifty is not a bad score to retire on". I thank Ken for his contribution to this column and look forward to receiving the results of his successor's labours. Because the rabbit population seems lower at the track site, there is an abundance of young plants emerging all over the site. Also doing well are the nettles and advice was taken on the best way to control them. Following this some herbicide has been used but such is the level of growth that further application will be necessary. The Best Work of the Year award went to Trevor Boulton for his 7 1/4 in. gauge Hunslet locomotive. Unfortunately Trevor was at work on the award evening.

World News

Australia

Keith Botting has been elected as Chairman of the Hornsby Model Engineers Cooperative at the first board meeting following the AGM in April. Can we congratulate Keith

and wish him success in his new role. Shane Austin produced a 100 minute timetable which was tried out in March with seven locomotives running a variety of movements including some "wrong road" working. The train day was very successful and Shane now has the challenge of adding some more trains to the timetable. John Snowden reports on the 24th Annual Meccano Exhibition sponsored by the Sydney Meccano Modellers Club and held on 30 April. A wide variety of models were on show including Shay and Heisler locomotives and a railway breakdown crane complete with accompanying match truck.

The newsletter carries a report from a "Visiting Pom", alias Reg Silk, who was visiting relatives in the country and paid a visit to the track in February. He was very impressed by the warm and friendly welcome he received from the host society.

Canada

The Wisteria Tunnel at the Burnaby track of the British Columbia SME was in full bloom in June and travelling through the 80ft. tunnel was described as "like travelling through a perfume factory". The tunnel was formed by putting a frame over the track for the wisteria to grow over. It is likely to need extending this year as the wisteria grows. There can't be many tracks that have an expanding tunnel. On 18 May members were trained in the safe dispensing of propane from the storage tank and the tank has now had an electric pump installed making the dispensing process less arduous. At the annual model competition, Daniel Boutin won the general category with his model trebuchet which can throw a golf ball 200 feet. Would this be legal in the UK we wonder?

New Zealand

At the May meeting of the Hutt Valley MES members were entertained with a showing of the Train Mountain video which was projected and explained by Gavin McCabe. Ross Johnson had brought his partially built ME Beam Engine to show the progress he is making. Murray McKenzie described his CNC on a Zero Budget system which uses stepper motors and various other parts salvaged from redundant photocopiers. I have said before in this column that we model engineers are champions at recycling.

Maidstone MES has been busy carrying out work on the station canopy and also checking the track anchor bolts. At the annual general meeting in June a draft asset register was presented. The document was described as "a practical step towards placing our records on a sound business footing". The club officers remain unchanged following the AGM.

South Africa

At the Centurion SME the earthworks for the new tunnel are essentially complete and the building of the new tunnel walls and roof will shortly come under final discussion. The society will be installing tracks and points for the tunnel using material from the former Witbank club. This material has been checked and should meet most of the immediate needs at the tunnel and station. The newsletter carries a description of an oil engine (Lister or similar) seen at the national meeting which had been coupled to a load. The load was a refrigerator compressor unit which was being used to cool beer! In addition the exhaust was designed to be used for grilling steak (or similar) thus providing the operator with a constant supply of refreshment.

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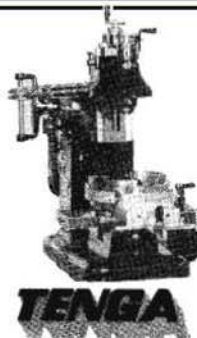


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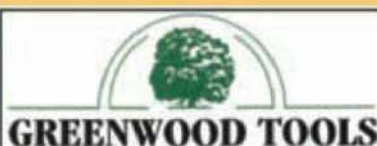
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