

MODEL ENGINEER

Vol. 200 No. 4321

14-27 March 2008

PHOTO COMPETITION

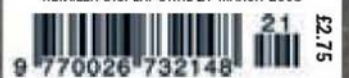
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MODEL ENGINEER

Published by
MAGICALIA PUBLISHING LTD.
Berwick House, 8-10 Knoll Rise,
Orpington, Kent BR6 0EL
UK Calls: 0844 412 2262
International Calls: +44 (0)1689 899 200
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Model Engineer is published for \$136.00 per year by Magicalia Publishing Ltd c/o EWA Magazines, 205 US Highway 22, Green Brook, NJ 08812. www.ewamags.com. Periodicals paid at Green Brook, NJ. Postmaster please send address correction changes to Model Engineer c/o EWA at the address above.



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(Photograph by Michael Jones)

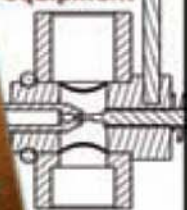
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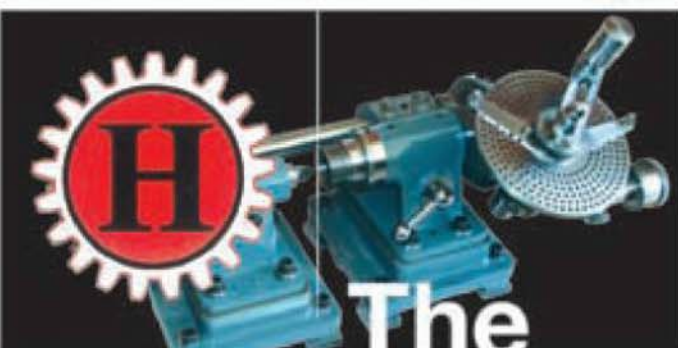
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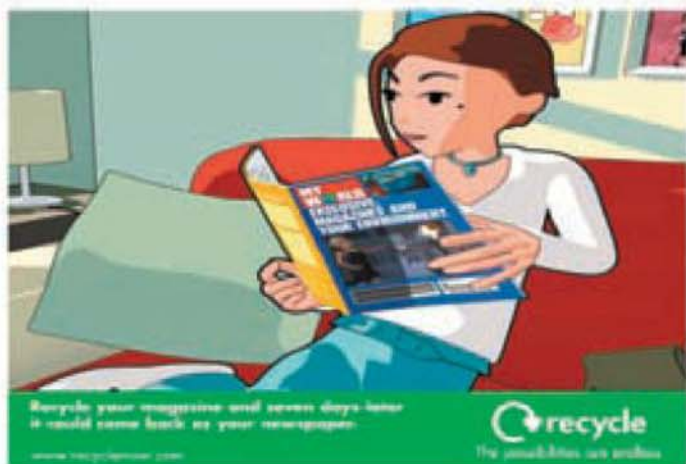
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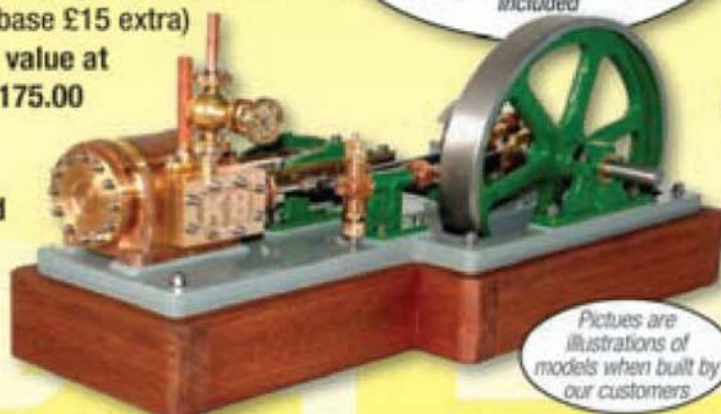
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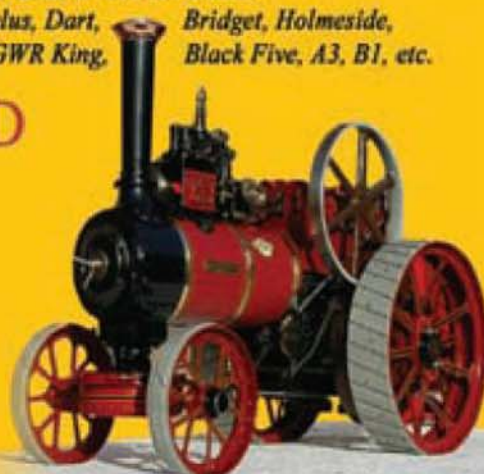
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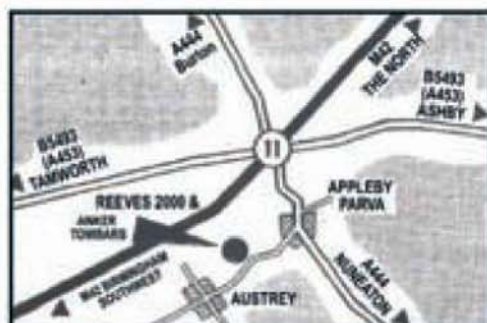


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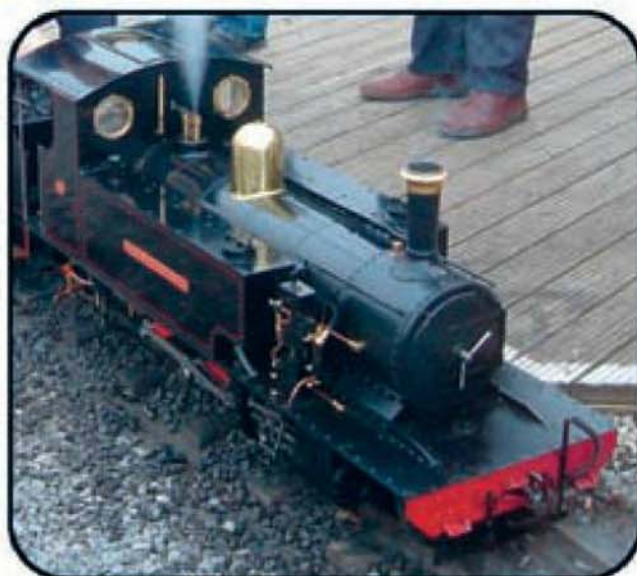
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Model Engineer is adding a new dimension. We are going multi-media.

We will be aiming to bring readers short videos of items of interest via your computer. We have just opened our first entry on YouTube and you can find it by entering our channel name, *modelengineermedia*, in the search box at youtube.com.

That first entry shows the fascinating self-start steam engine designed and built by Les Kerr (see page 316). You can watch the engine being put through its paces.

From now on we shall be adding in other video clips of things relevant to the content of the magazine, and of the various events we sponsor such as the Model Engineer Exhibition at Ascot, IMLEC, SEQLEC, and the Curly Bowl.

Get snapping

We greatly enjoyed the photo competition we organized last year to coincide with the Model Engineer Exhibition. So, we're doing it again this year.

You can find full details on page 333.

We were glad to see so many entries last year, and many of them of a high enough quality to make choosing winners a difficult business. No doubt it will be every bit a difficult again this year.

We have a bit more notice for the competition this year, so you have all summer to find that special shot that will find its way into *Model Engineer* and be displayed at Ascot in September.

Right for us

If you are right for us then write for us.

Model Engineer is a publication written by the people that read it, and we rely entirely on you for our success. So now and again we like to publish a little reminder that we really do welcome contributions from readers. And that includes everything from letters to the editor, to

major construction series.

We don't mind what form it comes in, though ideally, we would like everything in Microsoft Word format. Whether your work is in Word or some other program, it's a good idea to send a hard copy also so that we can always scan your article if there is any problem opening your file. Old-fashioned typing is fine, too. Articles may be edited to fit M.E. style.

Photographs can be prints, transparencies or electronic files. Prints should be about the same size they are likely to be used in the magazine. Electronic files should be in JPG or TIFF format, and the resolution should be 300dpi at the sort of size they will appear in the magazine. Low-resolution images as used on websites, and small images, are not suitable for printing.

Illustrations must not be embedded in the text. Text and pictures must be in separate files. Please include a separate caption list for all supplied photos.

Drawings can be sent as hard copies, TIFFs, PDFs, or JPGs. Send copies rather than originals, in case of loss or damage. Please do not send CAD files, as they do not lend themselves to use with our publishing software. Drawings may be re-drawn to make them suitable for magazine reproduction.

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Finally, here are a few hints and tips about writing articles for us.

- Keep paragraphs short, and keep sentences simple.
- Only use capital letters for proper names.
- Try not to use inverted commas, exclamation marks, underlining, and any punctuation mark you are not 100% certain about.
- Unless the article is highly technical, keep it simple. Remember we are writing for an audience with a wide range of abilities and experience.

Try your hand as a reporter

We would like to hear from any budding reporters out there to cover events for us. There is so much going on that we cannot hope to cover more than a fraction of it from our own resources. If you are going to a rally or show, and can take a decent picture, we would like to hear from you.

That applies to more than events. If you know of an interesting workshop, or an attractive model that would appeal to readers, then why not write them up for us?

We do pay for contributions to the magazine.

Ascot progress

Visitors to our Centenary Model Engineer Exhibition may have visited the Ascot Locomotive Society whose track borders the racecourse. At that time the first part was open after the whole thing had to be shifted due to the racecourse re-development. Progress has continued and the main loop (right) will be completed shortly.





Polygonal turning

SIRS, – I was prompted to write this letter after reading the excellent article entitled *A Polygonal Punching Tool* (M.E. 4310, 12 October 2007).

While browsing machine tools on YouTube I came across an incredible polygonal lathe video which can be accessed by searching on FASTCUT 1540 (space between the word and figures). The machine acts as a normal CNC lathe and also cuts polygons of all sorts while the work-piece is rotating. I spent ages trying to envisage the relative geometric movements of the work-piece and the cutter which produces the flats. I put the conundrum to Richard Stephen, who often writes for M.E., and he kindly drew my attention to a web address where there is an excellent animation which reveals all.

It is <http://video.google.com/videoplay?docid=-7831550688320827327>

The somewhat complicated address was cut from the web and pasted into this letter to avoid any possible error. There is no www and don't miss the hyphen after the equals sign.

I thoroughly recommend looking at the FASTCUT 1540 video and many of the others which are listed beside the animation. I had never seen, for example, 5-axis machines cutting patterns for impellers with complex blade shapes and producing cylinder blocks from the solid. I spent far too much time glued to my computer screen in utter fascination!

Roger Castle-Smith, Bucks.

Roger had included some illustrations in his letter, but we could not include those for copyright reasons and also because they were embedded in the body of the letter. Could readers submitting letters with illustrations please ensure that the pictures are separate.

A significant centenary

SIRS, - In 1908, *Model Engineer* organised the first ever 'model motor boat regatta' which took place at Wembley, in July of that

year. It will also be 100 years since a competitor asked if he could run his boat in a circle, so making 2008 the centenary of both organised competition, and tethered hydroplane racing. Initially boats were 'free run' but with increasing speeds, tethered or 'circular course' racing became immensely popular with numerous clubs and venues all round Britain. *Model Engineer* of course started the 'Speedboat Competition' in 1902 and featured tethered hydroplanes extensively for the next 70 or so years.

To commemorate this centenary I am planning a series of articles for my website, www.onthewire.co.uk looking at the boats, engines, venues and personalities involved in this aspect of model boating. I would ask for the help of your readers in gathering any information, photos, relics and reminiscences that might still exist. Any material would be very much appreciated, but information regarding any boats and engines that still survive, would be especially exciting.

This venture is in no way commercial, as can be seen by visiting my website. My sole intention is to retrieve and record material before it is lost for all time and there is the very real possibility that your readers could help greatly with this quest. Committed modellers never throw anything away, so there may well be a significant amount of material still lurking in lofts, sheds and on shelves. It may also be possible that any 'survivors' could be displayed, or even given an outing at some stage during next season.

Thanks for any help that readers might be able to offer. Any costs involved will of course be covered and any material will be fully acknowledged in the subsequent articles.

I can be contacted via the website admin@onthewire.co.uk or by phone on 01502 712570

Lynn Blowers, Suffolk.

British Association thread system

SIRS, - In the 1880s the British Association for the Advancement of Science, (a group of scientists, engineers

and industrialists who formed an association or body to promote technical advancement within Britain), defined a series of small diameter threads to cater for screws less than 0.25in. (6.35mm) diameter. This was largely based on the recommendation of a Swiss engineer, Thury, who had proposed a similar system some time earlier. This became known as the BA system and is still widely used in special applications such as scientific instruments and clocks.

The BA thread system was formally ratified in 1884 and widely adopted within the British electrical engineering industry by 1903. It is unusual as it is actually based on true metric dimensions, something that predated the general acceptance of metric fasteners in Britain by almost a century.

Although its roots are metric because of the politics at the time the sizes and pitches were converted into imperial measurements to the nearest one thousandth of an inch so they could be more easily understood by the layman, who was unfamiliar with this 'new European metric' system. The major difference is the thread angle, it is 47.5deg. (the same as the Thury thread system) and the metric thread angle is 60deg., so they are not interchangeable.

In fact the BSI standard insisted that the dimensions were denoted in imperial dimensions, as the metric system had not been formally recognised!

The BA series begins with the largest diameter, which is 6.00mm and a pitch of 1.00mm, the same as a metric series which was invented much later. This size is designated OBA. The series is then incremented in steps of one, all the way up to 25BA, a total of 26 different diameters. 25BA has a nominal diameter of 0.25mm and a pitch of 0.07 millimetre. Today the BA system is regarded as obsolete by the standard regulators; in fact in 1966 the BSI (British Standards Institute) declared the BA system as 'non-preferred'.

In practice the use of odd

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Responses to published letters are forwarded as appropriate.

Energy saving lamp data

SIRS, - Subsequent to writing my previous letter (M.E. 4312, 9, November 2007) regarding stroboscopic effects of energy saving light bulbs, I have carried out a little research on the matter of stroboscopic effects of various light sources. I became aware that a compact fluorescent lamp (CFL) did actually have a weak stroboscopic effect, whilst I was idly twirling the laundry basket lid in the bathroom - it has a pattern of two concentric circles of holes in the lid, and these showed, much to my surprise, a very weak stroboscopic effect when illuminated with a 10W Philips CFL.

Clearly the compact fluorescent lamp did have some stroboscopic effect, so I looked at the circuit diagram published by Philips (www.nxp.com/acrobat_download/applicationnotes/AN99065_1.pdf) which shows that for the 10W lamp that I observed, the incoming mains is full-wave rectified and smoothed with a 4.7 microfarad capacitor. At 10 Watts, the effective load resistance is 5760 ohms, so the time constant of the capacitor and the load is 0.027 seconds, which is about three times the 10 milliseconds cycle time of the 100 Hz rectified mains. Although the smoothing would be expected to achieve a ripple of less than 5%, this is still just detectable by eye.

I then looked at several light sources and rather subjectively ranked them in order of stroboscopic effect. I tried the same laundry basket lid twirling under a high pressure sodium street lamp (late at night when no-one was about, for obvious reasons), a standard choke fluorescent lamp, various tungsten filament lamps on an A.C. supply, a battery powered fluorescent camping lamp and a tungsten bulb powered by a car battery. The results are interesting, in that there were some surprises. In approximate order of effect, and ranking the effect from '0' where there is no stroboscopic effect whatsoever to '5' where the effect was very obvious, the light sources were as follows:

Sodium vapour street lamp on A.C.	5
Choke controlled fluorescent lamp on A.C.	5
25 watt 240 volt tungsten lamp on A.C.	4
40 watt 240 volt tungsten lamp on A.C.	3
100 watt 240 volt tungsten lamp on A.C.	2
40 watt 25 volt tungsten lamp on A.C.	1
20 watt 12 volt tungsten lamp on A.C.	1
Philips CFL 9 watt lamp	1
12v D.C. 20 watt tungsten lamp	0
12v D.C. Fluorescent camping light	0

There was no discernable difference between an A.C. supply and an unsmoothed rectified A.C. supply.

From the above, the most striking feature is that all the lamps running on a 50 Hz supply exhibited some stroboscopic effect, although on the scale of 0 to 5, '1' ranks as barely perceptible, so the compact fluorescent lamps offer very little risk of hazards from stroboscopic effects. For standard tungsten lamps, it appears that the effect is inversely proportional to the current, as the currents drawn for each are:

25 watt 240 volt tungsten lamp on A.C.	0.1A
40 watt 240 volt tungsten lamp on A.C.	0.17A
100 watt 240 volt tungsten lamp on A.C.	0.42A
40 watt 25 volt tungsten lamp on A.C.	1.6A
20 watt 12 volt tungsten lamp on A.C.	1.6A

From this, I conclude that to be absolutely sure to the point of paranoia that there are no stroboscopic effects in the workshop, use tungsten filament lamps running from a pure D.C. supply, i.e. a battery. As an alternative, use compact fluorescent lamps or low voltage lamps running from an A.C. source, where the current drawn is at least 1.6 Amps, or preferably more than 2 Amps (say a 60 W lamp at 25 Volts). I am going to continue to use the compact fluorescent lamps in my workshop, as the stroboscopic effect is barely detectable.

Graham Astbury, Cheshire.

number sizes fell out of use by about the 1930s, although LBSC and others persisted with the 5BA type for many years, and today only even number BA sizes are commonly used and hardly ever anything smaller than 14BA (1mm diameter) is now used, except for very special applications, such as spectacle frames, moving coil instruments and relays.

The standard metric thread system only goes down to 1.6mm although some specialist screws are made down to 1.0mm, but nothing smaller is recognised by the regulators. So the BA and other systems take over from the metric system where very small, fine pitch fasteners are required.

Many model engineering hobbyists still use the BA thread system because they already possess taps and dies for the common BA sizes. After WW2 there was on sale, in Britain and many other countries, war

surplus BA tap and die sets, made in huge volumes during the war by companies such as Moore & Wright in the UK and Starrett in the USA. These cost almost nothing to buy and many still exist today. Because model engineers require a fine pitch thread system, which the metric system fails to cover adequately, many tool manufacturers today still make BA taps and dies in significant volumes.

Some BA sizes are very close to common metric fasteners and may be substituted if the necessary taps and dies are to hand. OBA is exactly the same as M6, apart from the thread angle. 8BA is very close to M2.5, 6BA is very close to M3 and 4BA is very close to M4. In fact you may not spot the obvious connection to the imperial measuring system if you are not aware of the history.

An interesting fact about the BA thread system is how

it increments in size and pitch between adjacent thread sizes. The starting point is the OBA thread, which has a pitch of 1.00 millimetre. The next size smaller is the 1BA and this has a thread pitch of 90% of the OBA, or 0.9 millimetre. All the successive threads decrement by this 0.9:1 ratio, so the 2BA has a pitch of 0.81mm, 3BA is 0.73mm, 4BA is 0.66mm etc., rounded to two decimal points.

The diameters also decrement by a fixed ratio of 0.8833:1 between adjacent threads. The 1BA diameter is 5.3mm, 2BA is 4.7mm, and 3BA is 4.1mm etc, rounded to one decimal point up to 14BA and two decimal points for sizes smaller than 14BA. In the BSI standard for the BA thread system the specification of the pitch and diameter is:

Pitch for a particular BA size (denoted as k-BA) is given by the formula:

$$P = 0.9^k$$

Diameter is given by: $6p^{1.2}$
The spanner size for hexagonal bolts and nuts is given by 1.75 times the major diameter, and is the distance across the flats. Model engineering fastener suppliers typically supply scaled down hexagonal heads one size less than the correct value, as these look better on a scale model.

This 'mirrors' the move during WW2 where the hexagon size of Whitworth bolts was reduced by one size to save metal.

John Fielding, (aka Inchanga), Durban, South Africa.

Carbon sources

SIRS, - Reference Mr. Pridmore's query (M.E. 4311, 26 October 2007), Mr. Pridmore may find that discarded brushes from large motors or generators are a good source of carbon for his purposes. They are also useful for making pistons for hot-air engines, and brushes for small motors.

John C. Chappell, by email.



Model engineering health and tool quality

SIRS, - I was very interested to read Mr. Gardner's letter (*M.E.* 4316, 4 January 2008) titled *Model engineering health* most of which I agree with and also Mr. Castle-Smith's letter on *Tool quality* which also strikes a similar chord.

With regard to Mr. Gardner's letter I couldn't agree more, Airfix kits are just as much model engineering as 5in. gauge locomotives. I remember taking my sons to the wonderful Model Engineer Exhibitions of the 1990s in the holiday week at Christmas where you could see everything from model soldiers, wargaming, model boats, and tooling, to aero modelling which was and is my particular obsession. All of these demonstrated huge capability in craftsmanship and design and are rightly just as deserving of credit as the more conventional definition of our hobby, i.e. 'unless it steams it isn't model engineering'.

Aero modelling at Alexandra Palace and Olympia included real flying and operating models, alongside their operating boat, steam and land based brethren including model car racing, all great entertainment and the stuff to fire the enthusiasm of the kids, and let dad potter among the tools and materials. These shows were always packed and seemed to me at least to be a great success.

In the 2000s the decision was taken, - by the engineering purists we were told - to restrict the exhibition to 'Model Engineering' which meant the same old boring steam engines in one gauge or another (tongue in cheek!).

The exhibition also moved to some forsaken racecourse, on the south side of London, if you please, and although I went twice to Sandown there was very little on offer to interest me. So, in my opinion, the changed character of the exhibition has not helped to spread the gospel of model making among the young.

Mr. Gardner's point about public exposure through miniature railways in public

places is also very valid. One reason we sometimes feel for the decline in interest by young people in aero modelling is the lack of exposure of our hobby in the now overcrowded and restrictive public parks.

There is, however, another side to this perennial conversation. People's lifestyles have now changed due to work leisure balance being eroded. Many commute long distances to work where they work very intensively all week. They seem to start out at 7.00am in the morning, not get home till 7.00pm at night, have a meal, relax and go to bed. At the weekend they have to do the shopping, fix the house and garden, amuse the kids and perhaps go out for socialising.

Hobbies do not often appear in this scenario, especially model engineering which involves a heavy capital investment and a considerable steep learning curve and time to attain proficiency. (How many man hours does it take to build a 5in. gauge locomotive? - before the thing shows some sort of movement!).

I do feel, therefore, that as well as exposing the young to the constructive and educational pleasures of model engineering, we should target the post child adults, as they start to surface above the flood of mortgage repayments, the children growing up etc.

To this end the ready-built models and kits have a definite place, since for some of these potential recruits money seems to be easier than for those of us now on fixed incomes.

Finally, it should also be noted that all leisure and volunteer activities from cricket clubs to voluntary carers are suffering from a dearth of younger (i.e. under 50) members and a consequent increase in grey hair content for probably the same reasons, the younger element having less time and also many other diverse interests to occupy them.

Turning briefly to Mr. Castle-Smith's letter he is only pointing out, politely I thought, what we all know.

His slitting saw is only the tip of the iceberg. You get the

quality you pay for. For me British or West European drills reamers dies taps, machine tools etc are the only thing I look at if I want precision, quality and inevitably, if manufactured within in our affluent society, you have to pay for it. Horses for courses, if I want a drill or tool to do rough work or a one off job, then I buy the cheapest.

The problem with a lot of the Far East output is Quality Control. The Japanese early recognised the crucial importance of quality control, and swept the world with their products. I have a beautiful Toyo ML1 lathe which I treasure to this day.

Other Far East suppliers have not learned this lesson. The Chinese especially are very patchy. I am told by a very experienced British project engineer who works into China that one reason is the cut throat nature of business in China where, in order to get a contract, the bids are cut to the bone. So much so that the winner cannot produce the goods at the price quoted, and cuts corners. Mattel's experience in withdrawing lead painted toys is another example where quality control has failed, or was never applied.

The profusion of articles which have appeared over the years about how various pieces of Far East machinery are taken apart and reassembled to make them work properly, is also an indication of this. I quite frankly find it incomprehensible. Would you expect to buy a Myford and have to take it to pieces to make it work satisfactorily?

One supplier, whom I like and use, even offers some equipment with two options, one where it has been stripped down and re-built and the other cheaper alternative where the purchaser can do it themselves. At least this is an honest evaluation of the problem.

So there you are, you get what you pay for. But as for the problem of the grey hairs, this is so much more complex and wide spread throughout the whole of today's society, that we cannot expect to solve it in these columns!

Neil Cliff, Bedfordshire.

Left-handed scissors

SIRS, - I cannot allow Mr. Webster's comments about left-handed scissors to go unanswered. He correctly describes the problems suffered by left-handed users of scissors and it astounds me that he has never seen proper left-handed scissors.

Children's versions are readily available at the Early Learning Centre, and a quick Google search shows plenty of suppliers of adult versions, e.g. www.anythingleft-handed.co.uk All of these have the blades pivoted mirror-image to right-handed ones, and those I have seen also have the finger and thumb loops shaped for left-handed use.

My wife, a former teacher, told me of a left-handed pupil who had problems with scissors. I was similarly astonished that the head teacher refused to believe that these scissors are available - until we gave the school six of the ELC ones.

The boy was delighted, but I am sorry to say that readers of this magazine must find them for themselves.

John Kelland, South Devon.

Gunpowder mills

SIRS, - I am not an authority on gunpowder, but I am a chemist and I am concerned that chemical terms are used correctly.

Gunpowder is not an 'organic' material; it is a MIXTURE of two elements (Sulphur and Carbon) and one inorganic material, Saltpetre (Potassium Nitrate). These materials are simply mixed and have no formal chemical bonds to hold them together.

Nitro-glycerine is an organic chemical COMPOUND, wherein the constituent atoms of Carbon, Hydrogen, Nitrogen and Oxygen are formally bonded together by shared electrons (covalent bonding) to form molecules of Nitro-glycerine. These definitions do matter and are not there simply for those pedants among us to use against others - so no offence intended to Mr. Wilson.

John Johnson, N. Yorks.

Superheaters: PRACTICAL EXPERIENCES

Dennis Postlethwaite considers the merits of superheating based on over 30 years experience with several locomotives.

The old chestnut of superheaters arose during an informal lunchtime chat in the clubhouse of my local society, the **North Wales Model Engineering Society**. There have been strong protagonists for and against the use of superheaters in miniature locomotives. This was a debate in which I had actively participated in my previous society, the **Wirral MES** and, as its President, had written a short article detailing my experiences and views. The article had been

well received and provoked further constructive debate, as well as benefiting some members who were uncertain about aspects of the topic. In view of the resurgent interest in superheaters, especially in the *Model Engineer*, it seemed a good time to share my thoughts with a wider audience.

I hope readers find the article entertaining, thought provoking and perhaps even technically interesting. I emphasise that the views and opinions expressed are from my own personal perspective and experience – the intention

is neither to present these as 'tablets of stone' nor to denigrate the views of others, but to promote informed debate. I would stress that the article is based on my practical experiences and is not a technical treatise. That is the prerogative of others more qualified than myself. For those readers interested, I would refer them to the recent article in *Model Engineer* where the topic is given a very erudite theoretical treatment (ref. 1).

The merits of superheating steam, before it reaches the cylinders in miniature locomotives, is a very real issue, one which has been debated within the model engineering fraternity for many years, with ardent protagonists for and against. And there has been a lot of 'superheated steam' let off on the subject - not always by the most knowledgeable.

My own view is that there is nothing better than practical experience. In this respect, I am reasonably qualified, having built and operated miniature steam locomotives for nearly 40 years. Overall, my view is that superheaters in a working miniature locomotive are beneficial. They provide not so much better performance, but better efficiency by, for example, reducing water consumption, as explained later in this series. Therefore, they are worth the trouble of making and fitting ➤





major refurbishment in the author's workshop.

Once the refurbishment was completed, I couldn't wait to try the locomotive out and show it off to Mr. Roberts! **Photograph 3** shows *Arrowe Hall*, on the Royden Park track in June 1976, now resplendent and running well with a very youthful author at the regulator.

Photograph 4 shows *Arrowe Hall* on the Royden Park turntable. Adding 'ballast' to the back of the driving truck is my very good friend and mentor, Mr. A. Newton. He showed me how to make tight bends in stainless steel tube (see later) and, indeed, was the model engineer who launched me into this wonderful hobby. Mr. Roberts, was pleased with my efforts and enjoyed driving his invigorated locomotive.

Photograph 5 shows Mr. Roberts driving *Arrowe Hall* at a local fete in 1976. After the refurbishment, and with the teething problems ironed out, I had many pleasant hours running *Arrowe Hall*. Not only were they enjoyable but they taught me many valuable lessons about driving small locomotives, their servicing and maintenance.

Inevitably, in addition to routine maintenance, bigger problems occurred. One of these caused a sudden deterioration in steam pressure and a devastating lack of performance. In other words, the locomotive ground to a halt! The superheaters had failed! Symptomatic of this, according to Mr. Roberts, is a blow of steam into the firebox.

I took the locomotive home and removed the offending item, which was not easy and involved a lot of 'railroad esperanto'. In fact, it was very hard trying to undo encrusted and carbonised fittings within the confines of a very small smokebox. This in itself taught me a very valuable lesson, namely: Make parts accessible, easy to remove and maintain. For example, in all my locomotives, blind brass nuts are used in the smokebox to protect threads and make them more easily to remove.

— provided that certain rules are followed — and provided, of course, that the locomotive is intended to be run regularly. Superheaters are of no benefit to a model in a glass case or on the mantelpiece!

My earliest experience of superheaters was with a GWR Hall class locomotive in 3½in. gauge. This had been built by, and belonged to, my good friend and mentor, Mr. H. Roberts then Chairman of the Wirral ME Society (I was Secretary).

Photograph 1 shows *Arrowe Hall* on the original Wirral Track in 1969 with Mr. Roberts driving. The model was essentially to LBSC's Ivy Hall specification. It was a wonderful little engine, which had done yeoman service on the original Wirral raised track, alongside a 5in. gauge Stirling Single that Mr. Roberts also built. By the time I took over *Arrowe Hall* it was well worn. My remit from Mr. Roberts was: I could run it, but must treat it as my own when it came to maintenance etc. This I did, seeing it through two major overhauls, while taking time off from building a 3½in. gauge *Britannia*. But it was well worth it, not only for the actual pleasure, but also for the experience gained and the many invaluable lessons learned. **Photograph 2** shows *Arrowe Hall* undergoing its first



After removing the superheater elements from the *Hall*, it was obvious why they had failed. They were the traditional LBSC design, comprising $\frac{3}{16}$ in. dia. copper tube brazed into copper blocks at the hot end. The blocks were roughly shaped to fit the large flues. Near the blocks, the copper tube was paper-thin. There were several perforations and, as the bishop dryly remarked to the curate, looked 'like lacy underwear'! I replaced them with new pipes and blocks using stainless steel tubes brazed onto their respective headers. After more finger-wrenching fiddling in the smokebox, accompanied by more 'railroad esperanto', the new superheater was fitted and ready for action. Superbly successful!

Photograph 6 shows the new superheaters (upper) and the old superheaters (lower). The thinning of the old superheater elements at the firebox end is readily seen.

I continued running the *Hall*, through at least one more major overhaul, and enjoyed the delights of being engineman, fireman, maintenance man, cleaner, polisher etc until – you've guessed it – the superheaters failed again.

I was busy that week, but wanted to run the locomotive the following Sunday. The only way I could think of doing this was to quickly make a simple manifold connecting the wet header bush directly to each cylinder and to run without superheat (photo 6, top right). This raised the question: Are superheaters really necessary

and are they worth all the bother of fitting? The manifold was made and fitted and I was back at the track with *Arrowe Hall* unsuperheated and raring to go. There was no detectable difference in performance and the locomotive went like a

proverbial rocket! Superheating made no difference – was it worth the effort?

●To be continued.

Reference

1. M.E. 4307, 31 August 2007, pp269 et seq.



Self-starting single-cylinder double-acting steam engine

Les Kerr explains the circuitry used to control stepper motors.

Continued from page 199 (M.E. 4319, 15 February 2008)

A circuit for a stepper motor controller that uses the stepper motors is shown in **fig 9** and **photo 4**. It is made from six inexpensive CMOS ICs and a couple of transistors. It can be stepped one step at a time by the change over push button or it can free run, the speed is varied by the 1M potentiometer. The direction of rotation can be changed with a toggle switch.

Stepper driver operation

For those interested in electronics, the following is a brief description of the operation of the stepper motor driver board.

IC2 is wired as an astable that produces a square wave at its output pin 11. If pin 5 is high it will oscillate and low it will stop leaving the output high. The frequency of oscillation is determined by the resistance between pins 2 and 3 and the capacitance between pins 1 and 3. The frequency of oscillation can be determined

by the formula $1/(4.4RC)$. IC1a and IC1b remove any contact bounce from the single step push button. The output along with the astable output is fed to a NAND gate IC1c that enables either signal to be passed to the binary counter formed by IC4a and IC4b. The direction of count is determined by the two exclusive OR gates IC5a and IC5b. The output of the binary counter is fed to a high current amplifier IC6 that in turn feeds the stepper motor windings. To maximise the torque the motors will produce we feed them with a high current pulse that is switched on and off by the two transistors. If this current was left on continuously then the motors would soon burn out. To stop this from happening we only switch them on for 7.9ms each time the motor is stepped. IC3 determines this time, which is controlled by the 68K resistor and 0.047mfd capacitor. The formula for this period is $2.48RC$. However, to

hold the motor at its switched position we provide 100ma through each winding by the two 68E resistors.

The orange LED turns on with each input pulse to the binary counter.

Board building notes

All resistors are $\frac{1}{4}W$ 5%. Note that the power transistor is mounted on an aluminium heat sink $\frac{3}{4}$ by $\frac{3}{4}$ by $\frac{1}{8}$ in. thick. This is only necessary if you intend to run the motor at high speed for a long time.

If you are building the circuit mount the ICs on sockets. However, before fitting the ICs 'buzz' all the wiring out with a multimeter.

As the ICs are sensitive to electrostatic charge, ground yourself with a wrist strap when handling them.

Because the stepper motor takes a peak current of 0.5A we have two 0V wires going back to the power supply. They are marked 0V LC (low current) and 0V HC (high current). Doing this eliminates any voltage drop associated with the high current from affecting the power supply to the logic circuits.

Crankshaft sensors

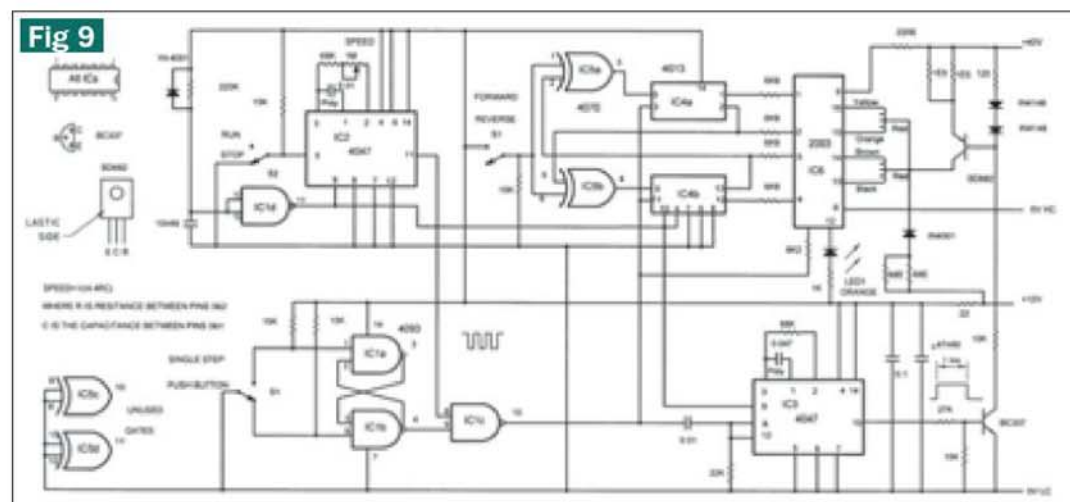
We saw previously that the piston would move up and down in the cylinder if the valves were operated 180deg. out of phase. What I want to discuss now is how to sense when they should be switched. You can buy cheaply a device called a photo interrupter. These consist of a light source (light emitting diode) separated by a 3mm

A video of this engine running and the author explaining its operation can be found on the YouTube website. Either search for 'modelengineermedia' or look for the video by number J6lgioGI7MI. www.youtube.com

Fig 9. The basic stepper motor driver circuit.

Fig 10. Cam used for detecting the crankshaft position.

Fig 11. Relationship between crankshaft and detecting cam for one revolution.



gap connected to a light sensor (phototransistor). When there is nothing in the gap you get a high voltage out of the device and near zero when an opaque object is inserted. **Figure 10** shows the cams and how they are attached to the engine with the photo interrupters (also see **photo 2** in M.E. 4319, 15 February 2008). The object of the exercise is to switch the valves when they are just past top and bottom dead centre. The position of each of the cams in relationship to the engine rotation from 15deg. to 345deg. is shown in **fig 11**. If we start with the engine rotated 15deg. clockwise, then interrupter A is blocked which causes pressure to be applied to port A. At the same time, interrupter B is open which results in port B being vented.

This pressure pushes the piston to the right until it the engine rotates clockwise to 165deg. where interrupter A is unblocked removing the pressure from port A and opening it to atmosphere. Port B is also vented at this time. The angular momentum of the flywheel continues the engine rotation to 195deg. where this time interrupter B is blocked pressurising port B and interrupter A is clear venting port A. The pressure causes the piston to move to the left till 245deg. rotation is reached where both ports are once again vented. The angular momentum of the flywheel continues the rotation back to 15deg. where the whole clockwise cycle starts again.

Reversing sequence

To reverse the engine all you have to do is connect Port A to interrupter B and Port B to interrupter A. This operation however must not occur at top or bottom dead centre as the engine would stall in these positions. The ideal time for this to happen is when the piston is in the middle of the cylinder. To sense this position a third interrupter and cam is added **fig 12**. The cam is mounted on the crankshaft and its position is set so that the notch is in the photo interrupter when the piston is at the mid point of travel. Initially I thought this was when the engine rotated 90deg. from top or bottom dead centre but **fig 13** shows this to be 95 degrees. Finally, the position of all three cams in relationship to the interrupters is shown in **fig 14**.

Stopping sequence

Previously we talked about stopping the engine by feeding two pulses to the solenoids. If we synchronise this operation with the mid point detector then the engine will always stop just after the mid point of travel of the piston between top and bottom centre. In this position the engine will always start. If we now feed six pulses to the solenoids the engine will start in the same direction as before.

Overview of all functions

Let's now tie it all together. In the above discussion I mentioned that to move the rotary valve one step it is necessary to pulse the solenoid

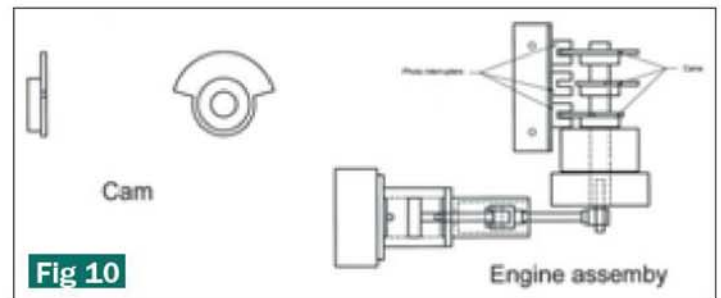


Fig 10

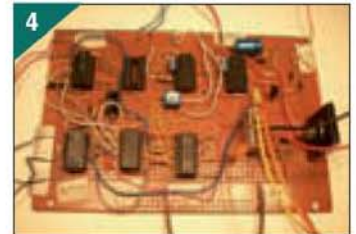
four times. If you pulse it twice then all the valve ports are blocked off. If you pulse it a further six times then valve returns to where it was. To do this electronically I have used a square wave oscillator that can be turned on and off. The time it is on determines how many pulses it gives out.

A circuit that gives a fixed time out is called a monostable. In the electronics there are four monostables. The first one gives out a pulse long enough to produce two pulses. The second gives out a pulse long enough to produce four pulses (there are two of these, one for each channel). The last one giving out a pulse long enough to produce six pulses.

In experimenting with the Minebea Electronics (NMB) PM35S-048 stepper motor I found that the quickest time that they could be pulsed and still have enough torque to turn the valves was 3ms. **Figure 15** shows these pulses.

Debouncing switches

All switches when operated, due to mechanical inertia of the moving contact, break and make several times before they settle down. This means that they give out a series of pulses rather



4. The author's stepper control board.

than a single one. As this pulse train only lasts for a very short time you don't notice it when say switching on a lamp but if you fed the pulses to a fast acting device multiple undesirable switching occurs. A circuit using cross coupled gates removes the contact bounce.

Reverse circuitry diagram

A block diagram of the forward reverse circuit is presented in **fig 16**. On pressing the momentary 'on' push button, one pulse is fed out of the contact removal circuit to the input of a flip-flop. The flip-flop changes state which means its output goes from zero (low) to 12 Volts (high). This output is fed to one input of a AND gate. When the mid point of rotation of the engine is reached 12 Volts (high) is placed on the second input of the AND gate. The output of the AND gate will only change when both inputs are high.

In plain English, when the push button is pressed and the engine reaches its mid-point of rotation the output of the AND gate goes from a low to high level. This is fed to the first flip flop to reset it back to its original state and to the input of the second flip flop. The second flip flop changes state causing the change over switch to operate. This connects the output of cam one to channel one (initially cam one was connected to channel two) and ➡

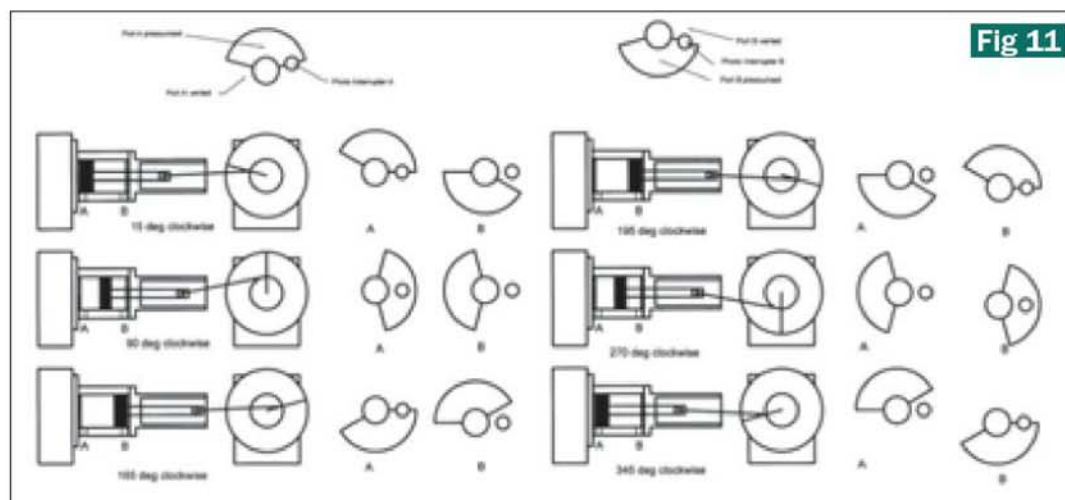


Fig 11

SELF-STARTING ENGINE

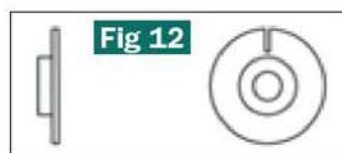


Fig 12

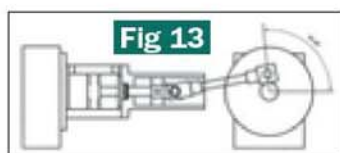


Fig 13

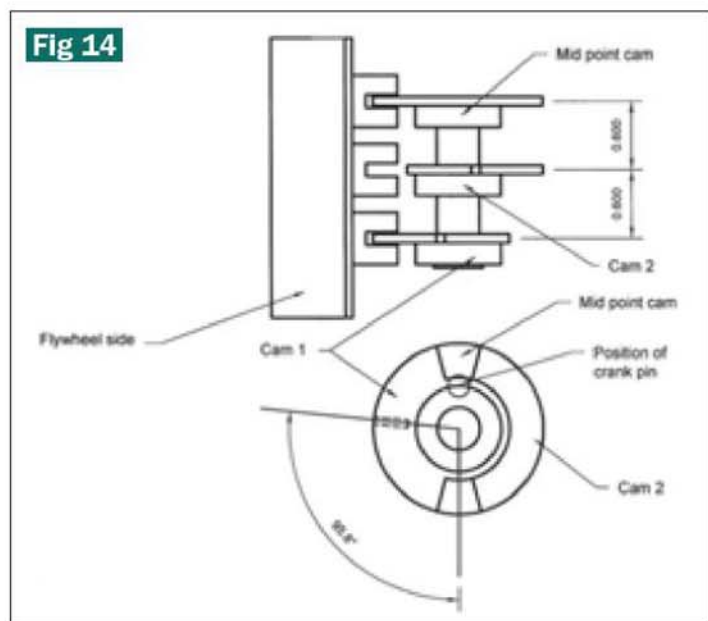


Fig 14

5. The circuitry for driving the stepper motors is mounted in a re-used CD player case.

Fig 12. The mid-point cam has a single slot (see text).

Fig 13. Piston and crankshaft relationship at mid-travel.

Fig 14. Detail of positioning of the cams in the detectors.

Fig 15. Monostable pulses used in timing the events of the stepper motor controller.

Fig 16. Reverse circuitry block diagram.

Fig 17. Stepper motor drivers circuitry block diagram.

Fig 18. Stop/start block diagram.

the output of cam two to channel two (initially it was connected to channel one). The result the engine changes its direction of rotation. Pushing the button again repeats the whole process reversing the direction of rotation back to what it was originally.

Motor circuits diagram

Figure 17 shows the block diagram of the two stepper motor circuits. The very first time you apply power, the position of the rotary valves needs to be set up. On pressing the set up push buttons once the binary counter advances, a high current pulse is produced resulting in the stepper motor

advancing one step. Both buttons are pressed until the valves are in the correct position for rotation. Complete details of this procedure are given later in the article.

Pressure is now applied to the valves and the engine start rotating. Amplified pulses from the cams appear at the channel inputs. For each edge of these the four pulse monostable operates. Its output is fed to an OR gate. An OR gate is a device that will let through either of the pulses applied to its input. Meaning the astable is either triggered by the four pulse monostable or the pulses appearing at the OR input. Four pulses for each input are produced by the astable with the end result being that the stepper advances four steps changing the position of the valves from open to closed. This sequence repeats keeping the engine rotating.

Start-stop circuit diagram

The stop start circuit works when pressing the momentary on push button (**fig 18**). At that instant, one pulse is fed out of the contact removal circuit to the input of a flip-flop. The flip-flop changes state which means its output goes from zero (low) to 12 Volts (high). This output is fed to one input

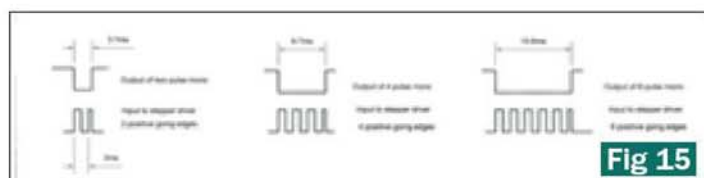


Fig 15

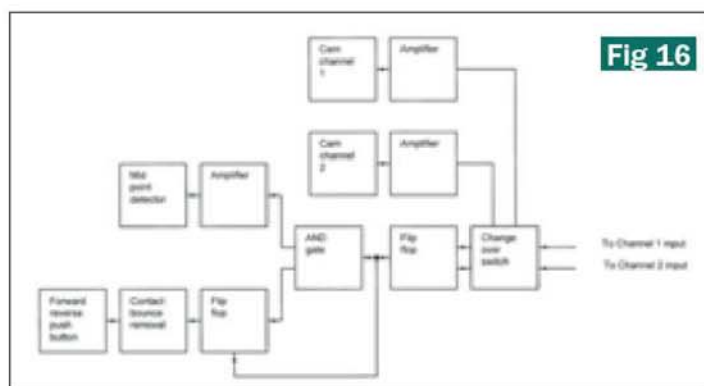


Fig 16



of a AND gate. When the mid point of rotation of the engine is reached 12 Volts (high) is placed on the second input of the AND gate. The output of the AND gate will only change when both inputs are high. Meaning when the push button is pressed and the engine reaches its mid point of rotation the output of the AND gate goes from a low to high level. This signal is fed to the two-pulse monostable. Its output is fed via an OR gate to the

OR gate input of both stepper motor circuits. The stepper motors advance two steps removing the input pressure to the valves and at the same time blocking both engine ports. This instantaneously stops the engine just after the mid point of travel of the piston. On pressing the push button again the flip flop changes state back to its start position which causes the six pulse monostable to operate. As before the monostable output is applied via an 'OR' gate to the 'OR' gate inputs of both stepper motor circuits. The steppers this time each advance six steps returning the valves and the direction of rotation to the original position.

● To be continued.

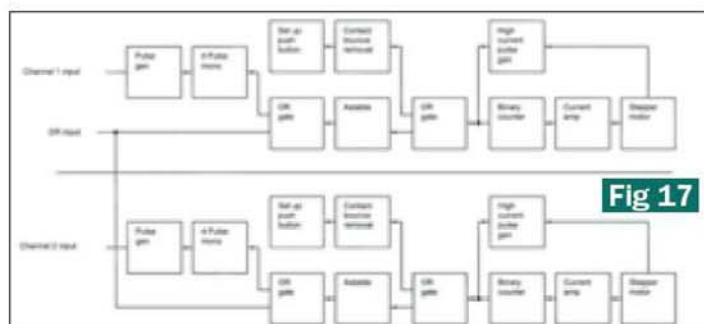


Fig 17

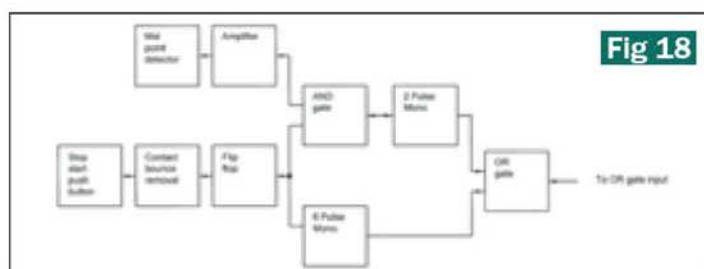


Fig 18

Nemett

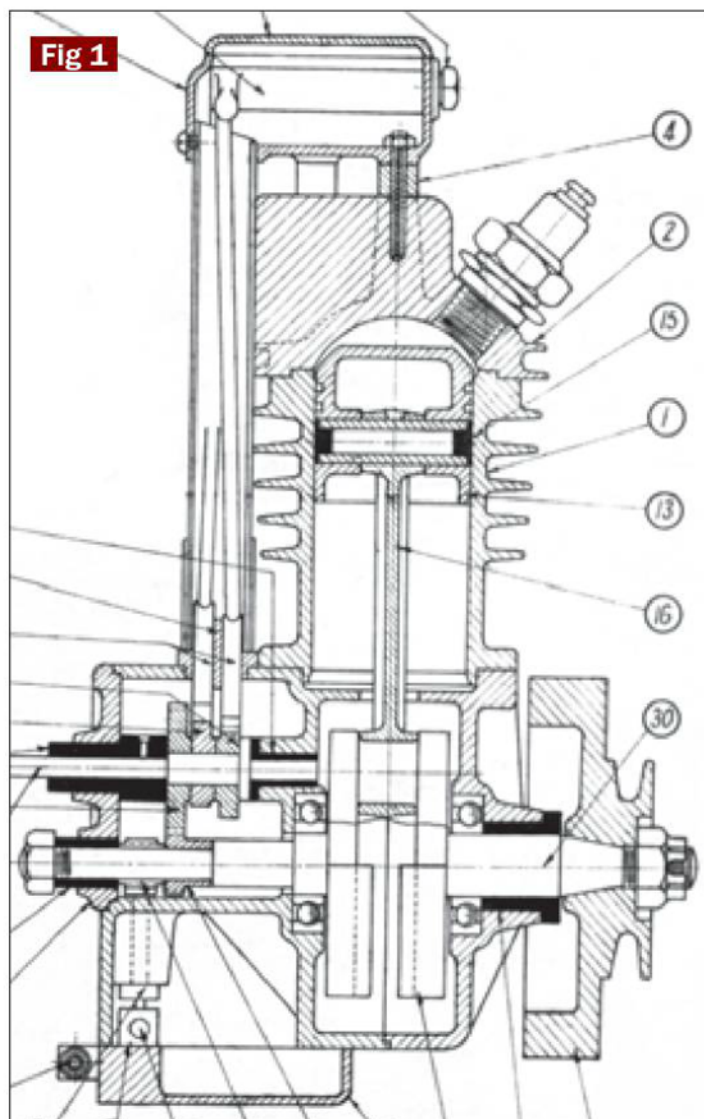
looks at the engines of Edgar T. Westbury and provides a picture of the NE15-IT in 'natural' colours.

The last of the fabulous collections of I/C engines seen at the Centenary Model Engineer Exhibition comprised designs by the late Edgar Westbury. Before looking at the engines from the show, I will spend a few words on the man himself. Edgar Westbury will be well-known to long-term readers of this magazine because he was a prolific contributor for many years from the early 1930s and became Technical Editor in the mid 1940s under Percival Marshall. Readers of this column will, no doubt, remember Westbury for his long-running *Petrol Engine Topics* column in which many of his engine designs were described. Many of you will also have copies of his many books on I/C engine matters, many of which have been republished.

Westbury designed something like 35 different engines, the range incorporating all types from the early (1930s) Atom 2-stroke designs to the sophisticated *Sea-Lion* 4-cylinder SOHC design from the late 1950s. In addition, at least one engine was designed for commercial production, namely the famous *Channel Island Special*. He was involved, with W. E. Bowden, in the very early days of development of lightweight engines to power free-flight model aircraft. His main interest was in the development of I/C engines for the increasingly popular tethered hydroplanes during the 1930s and 40s. I am sure many of you will, like me, have constructed engines of Edgar Westbury's designs.

Many of his engines were very advanced for their time. Engines such as the 30cc *Kittihawk* (fig 1) and the 15cc *Kittiwake* from 1944 had inclined valves, hemispherical cylinder head, enclosed pushrods and forced lubrication, all features used in full-size racing engines of the time. The *Sea-Lion* had an overhead camshaft in 1959.

A lot of the designs are still available from the plans service (www.myhobbystore.com) with



castings for some designs available from Hemingway Kits (www.hemingwaykits.com).

In addition to writing around 1,500 articles under his own name, Edgar Westbury also wrote under several nom-de-plumes, notably *Artificer* (over 120 varied articles), *Exactus* (over 100 workshop articles) and *Kinemette* (over 60 articles on photographic and cine-film topics). He continued to write for *Model Engineer* up until the time of his death in 1970 at the age of 75.

We have recently received some material for our archives and coincidentally this provided the photograph of Edgar Westbury (photo 1) included here. It was taken in the 1950s and shows Edgar (left) with another well-known model engineer of the period, James W. Message, who also wrote several articles for the

magazine. There is a very good list of the Westbury engine designs with more information on the man on the very useful modelengineneeds.org website run by Ron Chernich for those interested.

The small number of Westbury engines shown in the collection was slightly disappointing, although there were several other examples of his designs around the show. The first engine to look at is the *Ensign* 10cc 2-stroke car engine (photo 2), a design dating from the 1950s. This engine features rear rotary induction, twin exhaust ports and a bolted on transfer passage cover (seen on the front cylinder face). Drawings are available as plan PE19.

The next engine is also a single-cylinder 2-stroke, this time an example of the very successful *Atom Minor* design ➤

Fig 1. The sectioned side view of the 30cc Kittihawk high performance 4-stroke engine.



1. Edgar Westbury (left) discussing an example of his 4-cylinder side-valve Seal design with James Messing in the 1950s.

2. The Ensign 10cc 2-stroke car engine from the 1950s.

3. The ever-popular Atom Minor 2-stroke engine.

4. A desirable collector's item, the Channel Island Special 10cc single-cylinder 4-stroke engine.

5. The only Westbury compression ignition design, the Ladybird twin.



(photo 3) from the 1930s. This design went through several iterations and castings and drawings (PE13) for the 6cc Mk. III version are still available.

An example of the famous Channel Island Special 10cc single-cylinder 4-stroke is next (photo 4). This engine was designed for commercial production and features skew gear drive to the camshaft with enclosed push-rods and rockers. The contact breaker is on the end of the camshaft and lubrication is provided via the crankshaft from the

small reservoir to the left of the crankshaft in the picture. The carburettor is a very typical Westbury design. The name is derived from the location of the manufacturers, Jensen Ltd. from Jersey in the Channel Islands.

The only diesel (compression ignition) design that Westbury produced was the 2cc twin-cylinder Ladybird (photo 5) dating from 1949. This has a very typical layout for the period with traditional side ported cylinders. This design is also still available (plan PE22).





The next engine is also a 2-stroke twin, this time the much larger *Craftsman* 10cc flat twin (photo 6). This design dates from the late 1940s and has rear rotary induction into the split crankcase which is integral with the cylinder blocks.

The 10cc *Cherub* in-line twin (photo 7) has rotary crankshaft induction between the cylinders and I understand that it was based on the *Cadet* single-cylinder design. Drawings are available as PE28.

I would like to express my thanks to Eric Offen from the **I/C Engine Builders Group** for the loan of the above engines.

The next engine takes us back to single-cylinder 2-strokes and is the well-known 15cc *Phoenix* design (photo 8). Castings and drawings (PE24) for this popular engine are still available. Many examples of this side port engine have been constructed (there were two at the show) since its inception in the late 1940s and this example is from Malcolm Beak (to whom I express my thanks) and features electric start, magneto ignition and fan cooling.

The engines described are a small selection of Edgar Westbury's engines but include some of the less-common designs. It would be nice to get more of his engines for this year's exhibition.

The ICE 2-stroke Engine Evaluation Program

Some time ago (M.E. 4253, 5 August 2005) I wrote a review of the ICE computer program

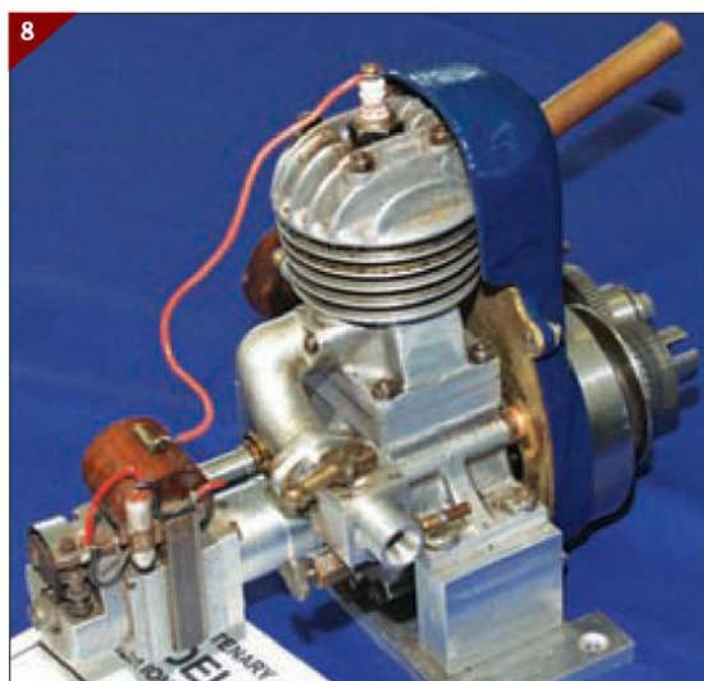
written by Gordon Cornell for evaluating and comparing 2-stroke engine performance. Gordon has now produced an updated version (1.6.1) and has contacted me to say that some of the discs will not install correctly. This apparently only affects those installing from scratch, not those upgrading an existing installation. Several copies were sold at the 2007 Midlands Model Engineering Exhibition, so if you have a problem, please make contact and we will pass details to Gordon so that the corrected version (1.6.2) can be sent to you.

The NE15-IT Alibre Pictures

Following the publication of the 3D cad pictures of the new design (M.E. 4317, 18 January 2008), several readers have commented on the unnatural colours ('garish' was one description). I am not sure about others, but the reason I do this is so that the individual parts stand out clearly, particularly for the sectioned and 'transparent' views and when working on the internal assembly details. For those who like to see more natural colours, I have included a picture of the finished design (fig 2) here.

A correction

Roger Castle-Smith has pointed out that that I provided an incorrect internet address for the Alibre UK distributors, Digitise in issue 4317. The



correct address should be www.digitise.ltd.uk I apologise for omitting the 'UK' off the end. Some internet set-ups will find the correct address, typically those with Google utilities installed, so many of you may not have had a problem.

ME

6. The *Craftsman* 10cc flat twin design dates from the late 1940s.

7. The 10cc *Cherub* in-line twin has rotary crankshaft induction and was based on the *Cadet* single-cylinder design.

8. The well-known 15cc *Phoenix* side port 2-stroke engine.

Fig 2. The NE15-IT, 15cc twin in 'natural' colours.



Nouveau Propri

Allan Sinclair

relates how an English couple acquired a large dual-gauge miniature railway in France.

Shirley and Michael Honeybun are nothing if not plucky and adventurous. With these attributes they have gone into numerous undertakings in many parts of the world.

In 2004 they opened a 'gîte' and 'chambre d'hôtes' business in a 13th century farmhouse ('La Comte') in Normandy, but despite its success - or maybe because of it - when the chance came in the summer of 2007 to acquire a large and important miniature tourist railway in Normandy they didn't hesitate. The farmhouse had to go!

The 'Minitrains des Marais' is located in the heart of the Cotentin Peninsula (also known as the Cherbourg Peninsula) on the edge of the Parc Naturel Régional des Marais and adjacent to a major golf course and tourist base and a convalescent home named after the 17th Century English doctor William Harvey. The main line is some 1,500 metres long and is located in its own 15-acre park with woodland, lakes, open areas and lawns. There is a large station with a scale station building and ticket office and a substantial locomotive

yard complete with turntable, water tower and coaling plant. All buildings and structures are to 1:3 scale.

If this sounds like a massive enterprise you are right. The former owner was Robert Delbauche, a retired Frenchman, who built the railway over a period of some 20 years on land he rented when the domestic department refused planning permission for one in the garden of his house in nearby Saint Lo. Eventually, he actually purchased the land and the railway continued to grow!

Change of track

Mike's major hobbies are his 7½in. and 5in. steam locomotives (he is a member of the **Gravesend Model & Marine Engineering Society**) and he was actually in the early stages of constructing a substantial railway at 'La Comte'. He had made several visits to the 'Minitrains des Marais' with his 7½in. LNER B1 4-6-0 in 2006 and was well-known to Robert and thus it was that in the summer of 2007 he found out that 80 year-old Robert was retiring and selling the railway.

There followed a hurried

family meeting and, as a result, an offer was made for the railway and 'La Comte' was sold. It took somewhere in the region of three months for all the paperwork to be completed and those days were not wasted.

Although it was not possible (or legal) to operate the railway, Mike and Shirley are not ones to let the grass grow under their feet (literally!) and assisted by many family members and friends were able to mow lawns, clear undergrowth, create gardens and paint the station building and ticket office. By the end of October the railway re-opened in time for the Halloween half-term and trains commenced running on Saturday 27 October for the first time for over a year.

Early advertising had not been possible, other than on a very small local scale, but for eight days the passenger figures were very encouraging with, for example, 83 passengers on Thursday 1 November which was a Bank Holiday in France. Interestingly, the adults outnumbered the children! Two communes meet at the railway and both local mayors and their secretaries

1. The 1:3 scale station building named St. Martin d'Aubigny and modelled on that at Torigni-sur-Vire.

2. A train hauled by a petrol hydraulic locomotive leaves St. Martin d'Aubigny.

3. Michael backs the LNER B1 off the turntable to reverse to join its train just visible in front of the white caravan. Also in shot is the massive coaling plant.

4. The B1 waits at the head of a two-coach train; an English scene set in the Normandy countryside.

5. The author brings the B1 on a Halloween Special into the station under the control of Michael's eldest grandson.

6. Shirley drives the petrol hydraulic hauled train through the reverse curves on the approach to the lakes.



ietaire!

were very supportive - an important factor in France.

From the car park access for intending passengers is via a drawbridge, of all things, and this gives added security to the site which is enclosed by substantial steel fencing. Crime is not usually a problem in Normandy, but the place can be very quiet in the evening and at night-time. After entering the site intending passengers cross the running line to gain access to the ticket office, an arrangement which Mike wishes to alter before daily running this year. The ticket office is a replica of a French signal box or 'posts'.

Having purchased tickets access is gained to the three-road station consisting of an island platform and the main platform with the station building which is a replica of that at nearby Torigni-sur-Vire. The platforms are typically French in height and appearance and, at the time of writing, are awaiting the completion of an all-over roof. The outer and middle roads are 7½in. gauge only and the inner road is 7½in. and 5in. mixed-gauge which is the format for the whole line.

Clockwise running is the order of the day as, once clear of the station, the railway is single track until it arrives back at the station. At the moment there is no signalling although various gantries and colour light signal posts are in position.

Together with all the land and the railway infrastructure, Mike also acquired locomotives and rolling stock. The main passenger-carrying train consists of a petrol hydraulic locomotive with six articulated coaches with capacity for 36 passengers. In addition, there are two SNCF Diesel (battery) yard shunters of a class known to the French

as Yo-Yo's and about 20 bogie passenger vehicles and about half a dozen hopper wagons. Then, of course, there are Mike's two 7½in. steam locomotives; the B1 and a Hercules 0-6-0 tank engine. Two English bogie coaches finished in maroon provide the coaching stock for the B1.

A trip along the line

We board the train in the main platform and take our seats as Shirley starts up the Peugeot engine on the hydraulic locomotive. The 'chef de gare' checks the tickets and raises and locks the sides of the coaches. The 'right away' is given to the 'chef de train' in the last coach and in turn to Shirley who increases the engine speed, sounds the horn and opens the throttle. We pass the water column to our right and proceeding under a large signal gantry we negotiate the pointwork outside the station.

To our right a branch leads from the inner road to the locomotive yard. For the next 30 metres or so the line appears to be double track but isn't and we soon negotiate another set of points for access to the main line.

Another branch also joins here from the locomotive yard. For some distance the line is straight, passing over streams and ditches, where sometimes coypu can be seen grazing. Passing a reverse curve, first to the left and then to the right, and then we are into another straight, this time on an up gradient as we pass the first of the two lakes.

By the small boathouse another reverse curve takes us into an even steeper gradient and to our left in the Autumn and Winter can be seen the house of one of Mike's neighbours, a local French

farming family who all visited the railway in October attracted, they said, by the B1's whistle! Shirley sounds the locomotive horn as the track curves to the right and onto a substantial bridge over a small river fed by the lakes. Under the bridge can be seen the trackbed for a projected extension disappearing tantalisingly northwards with another large bridge in the distance.

Once across the bridge the track curves again to the right and now we are travelling through woodland. The horn is sounded again as we pass over a small level crossing adjacent to one of the access gates. The line here is a series of gentle curves through woodland with the second lake to our right. It is just possible to see Shirley's tame ducks which came from 'La Comte' and were soon joined by some wild ones.

We are now roughly two thirds round and another blast on the horn announces the approach to the tunnel. Entering the tunnel we see that it is, in fact, a huge storage area with four storage roads, the main line and a workshop.

Substantial steel doors at either end are closed at the end of the day when the main line becomes another storage road.

7. The B1 and its two-coach train crossing a substantial bridge over a river fed by the lakes. The twin arches are for a future extension. The balls in the tree at left are not bird's nests but great bunches of mistletoe, which can only grow where there is no pollution, and is very common in Normandy.

8. The B1 complete with 'The West Riding' headboard waits at the station with the petrol hydraulic in the background.

Another blast on the horn as we leave the tunnel and again the railway appears to be double track (but isn't). A branch to the right leads to the yard but we carry straight on and negotiate the points taking us back into the main platform which we had left eight minutes earlier!

More work to be done

A the time of writing, a lot more work remained to be done before running re-commences this year. The grass needs cutting weekly and weeds growing on the track need to be removed. However, Mike and Shirley hope that they will be able to welcome visiting steam locomotive owners further information call Michael and Shirley Honeybun on 00 33 2 33 07 91 77 or Vanessa on 00 33 2 33 41 77 71. **ME**



LETTERS TO A GRANDSON

M. J. H. Ellis

looks at the removal of metal using the Electro-chemical Machining process.

Dear Adrian, I do try to make my letters a lucky dip of varied subjects so this time, it will be a quite different one. Our model engineering activities consist mainly of the removal of metal; sometimes by hand, as in filing, or else by the use of some sort of machine tool, which uses a sharp tool to tear the metal away in the form of swarf. In industry, however, there are more gentle methods to be found, by which the material is, as it were, dissolved away molecule by molecule by means of electricity. These techniques require the use of expensive specialised equipment, which puts them far beyond the reach of the model engineer; but in any case, they are only intended for mass-production, and not for 'one-off' jobs.

Nevertheless, they are novel departures from traditional workshop practice, and I am sure that you will be interested to hear about them. The first is Electro-chemical Machining, (ECM), which was introduced in 1959 as 'a serious and useable metal-working process'.

It is particularly well-suited to jet-engine manufacture, in which it is able simply to 'dissolve' away tough, heat-resisting alloys, leaving a complex shape, difficult to produce by any other means.

The process is essentially high-intensity electrolysis, a phenomenon discovered by the great pioneer of electrical discovery Michael Faraday (1791-1867). I expect that you know already that electrolysis is what takes place when two electrodes are immersed in a conducting fluid, such as a solution of a salt in water, and a current is made to flow between them.

It has long been applied in electro-plating, where metal is eaten away from the positive plate (the anode) and deposited in a thin film on the negative electrode (the cathode), which is the article being plated.

In the case of ECM, however, it is not where the metal goes to, but where it is eaten away from, which is the important factor. The work is now the anode, and a very heavy current is used to erode surplus metal according to plan.

Roughly formed, perhaps by casting, it is secured in a watertight, box-like chamber, which needs to be substantially constructed since it has to withstand an internal pressure well above that of a steam boiler. Facing the anode closely, but without touching it, is the copper cathode, which is made the exact negative counterpart of the shape which the work is required to assume.

As the process of forming the workpiece proceeds, means are provided for maintaining the gap between anode and cathode at about 20 thou. at the narrowest place. The current density in this space is not uniform, being greatest where the gap is least, and so it is in those areas where the most metal is eaten away.

Because of this, the work gradually becomes a better and better fit with the cathode, which, of course is not eroded at all. Neither is the waste material from the anode deposited on it. The electrolyte is circulated at great speed, 100 to 200ft. per second. In addition to the pump, it also passes through a cooler and a filter, in which the waste material is extracted in the form of particles of a metallic hydroxide, (fig 1).

Now for a few figures which illustrate dramatically the impressive scale of ECM compared with electroplating. Because of the high velocity at which the electrolyte is circulated, the pressure inside the container may be as high as 500lb/in.².

The current used is of the order of 100 to 1,000 amperes per square inch. As the potential difference between the electrodes may be around 20 Volts, this means that the power employed amounts to as much as 1,000 x 20, = 20,000

watts, or 20kw per square inch of surface. Little wonder, then, that the source of energy is the 3-phase mains supply. This, of course has to be transformed to a lower voltage and rectified.

The rate at which metal can be removed is quite significant. A current of 10,000 amperes will take off a cubic inch in one minute.

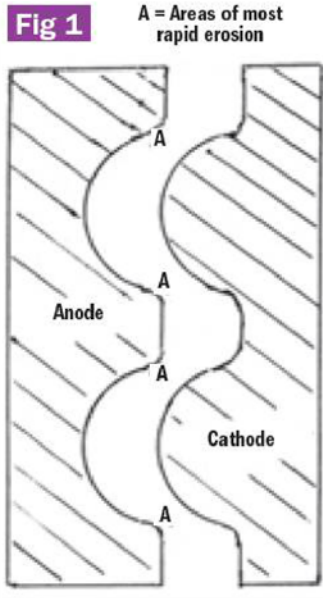
The forces generated are considerable. For example, a pressure of 300lb/in.² applied over an area of 30in.² would generate a force of over 4 tons weight - comparable with the forces produced in conventional machine tools.

It is possible to work to an accuracy of +/- 0.020in. over a contoured surface and +/- 0.010in. on a specific dimension. The shapes which can be now be produced include the counterpart of turned parts and metal extrusions.

There is nothing special about the electrolytes which include: aqueous solutions of salts like sodium chloride (common salt), sodium nitrite and sodium chlorate.

There is one minor disadvantage of the process: the surface of the work is left less resistant to fatigue. However, this can be improved by some other form of mechanical working, for example, glass bead peening, grit blasting, or polishing.

Your affectionate Grandpa.



ANNA

A MANNING WARDLE LOCOMOTIVE FOR 7¼in. GAUGE

D. A. G. Brown and Mark Smithers examine the history of Manning Wardle works plates and nameplates suitable for *Anna*. Also, a few boiler design changes and some construction tips are discussed.

*Continued from page 628
(M.E. 4287, 24 November 2006)*

With completion of the main fabrication tasks for *Anna*, we now move on to two of the most important finishing touches, namely the works plates and nameplates. In order to get these features right, one must first make certain observations about the maker's normal practice regarding these matters, especially during the period in which a full-size *Anna* might have appeared.

Works plates

Taking the works plates first, it was normal practice throughout most of Manning Wardle's existence to use a pair of elliptical plates. This was certainly standard practice by the early 1870s, although some very early examples of the company's products did persist with rectangular plates of a type similar to that used by the predecessor concerned, E. B. Wilson & Co. The type of elliptical works plate in common use until the early years of the 20th century was of the customary non-ferrous pattern with engraved characters. It is best illustrated by the accompanying rubbing of plate 517 of 1875 (**photo 1**), itself only three locomotives away in the works series from an 18in. gauge specimen of the 'Woolwich' pattern that was exported to Russia. Main dimensions of this plate are: length across major axis 11in., height of minor axis 6¾in., overall thickness ¼in., pitch of fixing screws 6¾in. centres, diameter of screw holes ¼in.

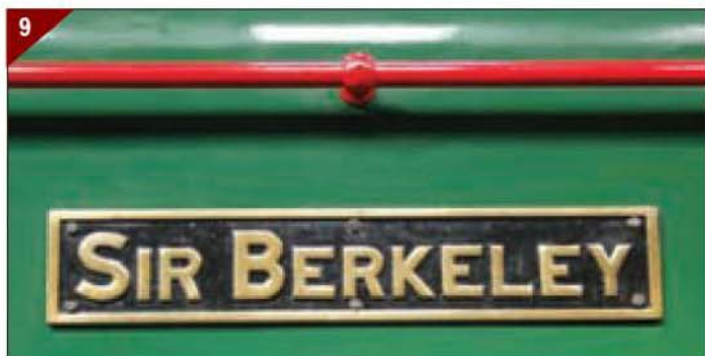
In order to place the design of late 19th century Manning Wardle works plates in its

proper context, it is constructive to look around at what was going on at Manning Wardle's Leeds contemporaries and rivals. Not surprisingly, the firm with the closest historical ties to Manning Wardle, Hunslet Engine Co., produced the most similar pattern of works plates during this period. This is exemplified by the accompanying photograph of one of the plates from ex-Dinorwic 'Quarry Hunslet' Cloister (542 of 1891) now based at Kew Bridge Engine Museum in West London (**photo 2**). Close examination of this plate will reveal that once again we have the general elliptical shape, engraved characters and fixing screws located within the inner engraved ellipse on the major axis. Even with this plate, however, there are some important differences. The two major ones are that the engraving process carves out only the borders of the characters (rather than the whole of the characters themselves) and that the centre of the plate is reserved for the locomotive's 'birthplace' (i.e. Leeds) rather than the maker's number and date.

From the point of view of further comparison, it is interesting to look at Hudswell Clarke plate 344 of 1890 (**photo 3**) which follows the Hunslet precedent of putting the city of construction at its centre, and Thomas Green plate 441 of 1908 (from the still-extant Harrogate Gasworks 0-6-2ST Barber) which places it Manning Wardle fashion at the bottom (**photo 4**). In both of these latter instances, however, the fixing screws are located



1. Rubbing of a Manning Wardle works plate.
2. Works plate of 'Quarry Hunslet' Cloister now at Kew Bridge Engine Museum.
3. Hudswell Clarke works plate of No. 344 of 1890.
4. T. Green & Son, Ltd. plate from No. 441 built in 1908.
5. A 1920 built Manning Wardle works plate for No. 1982.
6. Hunslet Engine Company plate from 1903.
7. Bogus work plate from Criciuma (see text).



8. Nameplate from 1875-built *The Lord Walden*, with lettering style appropriate for *Anna*.

9. *Sir Berkeley* (No. 1210 of 1891) showing the Manning Wardle style of lettering still in use.

10. Boiler former plates and firebox drilling templates.

11. The copper plates after flanging.

between the two engraved ellipses rather than inside the inner one.

Both Hunslet and Manning Wardle eventually dispensed with engraved works plates in favour of the more modern relief variety, shown in the photographs of the plates of Manning Wardle 1982 of 1920 (photo 5) and Hunslet 823 of 1903 (photo 6). In both cases, the earlier respective positions of the 'LEEDS' lettering and the maker's number and building date were retained.

An important point to note regarding the authenticity of these works plates generally is that the fixing screws must be located along the line of the major axis. The works plates currently fitted to the preserved ex-Davington light Railway metre gauge 0-6-OSTs in Santa Catarina, Brazil are, therefore, quite clearly fakes (photo 7). The works plates fitted to the last two Manning Wardle 18in. gauge '6 by 8' locomotives for Argentina (No. 1818 of 1913 and No. 2039 of 1924) would have been of the relief pattern.

Having made these general observations, the important question to ask is: what would be an appropriate works number for *Anna*? Here one simply has to look for the closest 'unused' number in the Manning Wardle works list to the period of construction that the locomotive represents. Unused numbers occur in works lists normally as a consequence

of abortive projects, but the earliest unused Manning Wardle number is 680 of 1878. This is 5 - 6 years later than one would have ideally liked, but the only technical feature of the locomotive that would give rise to any possible anachronistic difficulties would be the early pattern of Giffard injector. Surviving works notes for standard gauge Manning Wardle products of this period suggest that by the late 1870s, the makers were using their own pattern of injector, but no notes were apparently made to show when the changeover was made in the case of the 18in. gauge locomotives. We shall therefore allocate the number 680 and assume that *Anna* was made from standard 'Chatham' components of earlier pattern that happened to be on hand at the time. This is not unreasonable as the fringed canopy of 1860s/1870s pattern persisted on one of the maker's locomotives for Brazil as late as 1894.

Turning now to the question of the style of nameplate to be adopted for *Anna*, the first observation that can be made is that Manning Wardle adopted more than one style of lettering on their nameplates throughout the period of narrow gauge locomotive construction. Three styles prevailed, in each case in conjunction with the customary rectangular plate with raised rim. These styles were: (1) uniform serif upper case lettering, which tended to be used on larger narrow gauge locomotives (and standard gauge ones); (2) uniform uppercase sans

serif lettering, a type found on many of the company's narrow gauge locomotives including those built for Woolwich and Chatham; and (3) proper case sans serif lettering, again widely associated with Manning Wardle narrow gauge products, at least from works No. 558 of 1876 *The Lord Walden* onwards (photo 8). This latter styling has a certain 'celebrity' endorsement, having been used on the best-known Manning Wardle narrow gauge products, *Yeo*, *Exe*, *Taw* and *Lew* of the Lynton and Barnstaple Railway and it will be adopted on the replica L&B locomotive, *Lyd* when this eventually enters service. The same general styling is also found on the ex-Penrhyn survivor, 0-4-OST Jubilee 1897 at Tywyn.

The choice of styling to be adopted for *Anna*'s nameplates therefore realistically rests between options (2) and (3) and whilst historical arguments would appear to favour the former (see the previously appended photographs of *Florence* and *Arquebus*), the 'celebrity' argument is a strongly persuasive one, particularly when viewed in the light of current enthusiasts' preferences. It has therefore been decided to base the nameplate design on the surviving original Lynton & Barnstaple plates in the National Railway Museum at York and photographic evidence from locomotives using similar styling. This is exemplified by the accompanying photograph of No. 1210 of 1891 *Sir Berkeley* (photo 9).

Fortunately, detailed



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measurements taken from the nameplate of *Exe* have been published elsewhere and these, together with a rubbing taken from the plate from the sister locomotive *Taw* provided the starting point from which to work. The finalised measurements for *Anna's* plates, with their theoretical full-size equivalents (in brackets) are therefore: overall height $2\frac{3}{4}$ in. ($5\frac{1}{4}$ in.), overall length $5\frac{1}{4}$ in. ($15\frac{1}{4}$ in.), pitch of fixing screws from corners $\frac{3}{8}$ in. by $\frac{3}{8}$ in. (1in. by 1in.), plate thickness including reliefs $\frac{3}{4}$ in. ($\frac{3}{4}$ in.), letter and border reliefs $\frac{3}{32}$ in. ($\frac{1}{4}$ in.), pitch of lettering $105\frac{1}{2}$ in. ($2\frac{3}{4}$ in.) from either end of plate, uppercase letter equidistant from top and bottom, uppercase lettering $1\frac{1}{16}$ in. by $\frac{1}{16}$ in. ($3\frac{1}{2}$ in. by $\frac{5}{16}$ in.), and lowercase lettering $\frac{1}{16}$ in. by $\frac{1}{16}$ in. ($2\frac{1}{2}$ in. by $\frac{1}{2}$ in.).

Figure 1 is the drawing for *Anna's* nameplates which takes into account all of the above observations. Another important point to note is that it was normal Manning Wardle practice to attach the nameplate to the longitudinal centre of the tank on locomotives of this general type even though this may have resulted in at least one of the plates being 'cluttered' by fittings such as feed pump inlet controls or sandbox valve linkages. On many 'Quarry Hunslets', this difficulty was circumvented by mounting the nameplates forward on the tank. Any builder wishing to adopt this solution for the Manning Wardle design can take heart from the fact that

2ft. gauge Manning Wardle 0-4-0ST *Colonel Wilson* (No. 1371 of 1897) was fitted with forward mounted nameplates, a fact confirmed by a photograph taken of this engine shortly before it was scrapped in 1944.

Boiler construction progress

It seems right, now that most of the construction is out of the way, to review some of the highlights and to report on some of the more unusual or challenging processes in the workshop. Understandably the boiler has been the biggest challenge of the lot, not forgetting the large monetary outlay involved in sourcing the copper and silver solder. Before I start on the details, let me record my thanks to two of the boiler makers in the trade, John Ellis and George Brannigan, both of whom have offered me extremely valuable advice during my construction.

Boiler design changes

Three design details are worth mentioning. The first is the fitting of a few extra longitudinal stays around the area of the regulator. The argument for these hinges on stability of the front and back firebox plates under pressure, while preserving a path for inserting and removing the regulator assembly. The new stays can just be fitted into the design, which has been altered on my master set of drawings.

The second alteration is the increased water-wall thickness of both sides of the firebox to $\frac{3}{8}$ in., with the attendant

provision of some extra wash-out plugs for good measure. Both changes are intended to minimise the risk of scale blockages in this area.

The third alteration is the elimination of the inner reverse flange in the firebox throatplate. In its place, a simple ring is inserted, which is soldered initially inside the boiler barrel and then sticks through the throatplate, where it is easy to form a sound joint.

Material preparation

Some of my construction methods may seem slightly unconventional, but they have worked well for me and have produced a good boiler which has its certificate and a clean bill of health.

Before flanging and assembly, I pre-drilled, in each piece of copper, every hole that would eventually be required. So, laser cut flanging plates ($\frac{1}{4}$ in. thick) were made which had holes for the stays drilled at $\frac{3}{16}$ in. dia. and most of the larger holes at $\frac{1}{2}$ in. diameter. An extra one of each of the outer and inner firebox shapes was produced to use as a backing plate for the

12. BCA jig borer being used to nearly cut through the dome bush hole (see text for further details).

13. Plate bolted to milling machine table to have excess flange height removed.

14. Throat plate with flange height partially machined to size.

flanging process (**photo 10**).

So, for instance, the inner firebox had its front and rear former plates drilled with the appropriate holes for the tube plate and firehole ring positions. For flanging, both plates were placed over the pre-drilled copper shape and strategic $\frac{3}{16}$ in. bolts were put through not only these three items, but also the extra steel plate which became a backing plate. One edge of each of the drilled flange plates had been chamfered about $\frac{1}{16}$ in. to allow a smooth bend in the copper.

In **photo 10**, it will be noticed that there are two firebox wrapper drilling templates, in 1.5mm steel sheet. These were laid over the copper sheet to produce all the stay holes - easy work in the drilling ➤

13



14



machine before annealing.

Acting on advice, at least $\frac{1}{8}$ in. of spare copper was allowed all round the perimeter to be flanged. Starting with the copper in soft condition, the first flanging operation with a 2lb hammer deformed the flange to more than half the desired 90deg. angle. One further annealing was generally sufficient to complete the bend. It is during such flanging operations that the function of the backing plate becomes apparent. If the copper were merely clamped somewhere near its edge, the deformation forces would cause the back of the copper to wrinkle and form a great swelling which would subsequently have to be worked out. Do not underestimate the effort required to flange $\frac{3}{16}$ in. copper!

Photograph 11 shows the copper plates after flanging. Note the ring for the throatplate joint. The rear firebox plate has its stays and firebox ring fitted. The inner wrapper has been bent around the MDF former shown in the upper left corner of photo 10. Note the throatplate ring in the top of centre in photo 11.

The large hole for the dome bush was cut by milling on the rotary table of my little BCA jig borer (**photo 12**), the milling was not quite full depth, so as to leave a soupçon for hand removal after rolling to correct radius. Now it does not take a magician to work out that it is impossible to swing this copper plate past the throat of the mill. However, by careful positioning of the table it was possible to take only three

'bites of the cherry' to cover a complete circle, with the table rotating more than 120deg. on a couple of passes.

I repeat what I have said before, namely that it is prudent not to take out all of a large hole before rolling a cylindrical shape.

Having formed or rolled all of the plates, the flanges had excess metal on them, which had to be taken back to a net overhang of $\frac{3}{16}$ in. - allowing just this amount for the solder to penetrate. Each plate was bolted to the milling machine table and milled to correct thickness (**photo 13**). Inevitably in the sharp bends around the top corners of the inner firebox quite a lot of excess material was thrown up in the flanging process. The finished result can be seen in the picture, just before final machining to thickness (**photo 14**). The large hole for the boiler barrel insertion in the throatplate has already been produced on the BCA rotary table, in similar fashion to that in the firebox outer wrapper.

In photo 14, half of the flange length has been reduced to correct height by use of the end mill which is held in the spindle collet. I would advise here that for this sort of operation an end mill is the correct tool to use, rather than a slot drill. We are not producing a slot of critical width and the larger tooth count is quicker and produces a smoother cut.

My machine has not got enough throat depth to avoid resetting the job, mirror image fashion, in order to remove metal off the other half of the flange.

Another job at this stage

is to bore all the holes for tubes and the many small bushes, virtually all of which are standardised to $\frac{1}{8}$ in. dia. with $\frac{3}{8}$ x 32tpi threads. I set the plate up on the milling machine, enlarged the already drilled pilot holes, using a large slot drill. The job was finished by boring, using my Lushington boring head with a manual down feed. The machine table was protected by a sacrificial piece of MDF (**photo 15**). It is an easy matter to pick up the original small, drilled holes and to define a centre datum in the tube nest. From there each hole will be located in its correct X and Y coordinate position.

I aimed for an easy fit after boring for the tubes in their holes by making three small scores in the nicely bored surface, to encourage the solder to penetrate perfectly.

Firebox wrapper shaping

It now remains to shape the flat pieces to their correct forms. First, form the inner firebox wrapper. This has 16 holes drilled in it for the crown stays and, roughly in the middle of them, the larger hole for the fusible plug. Referring to photo 10 (upper left), the stack of MDF in the form of the inner firebox has those sixteen holes repeated in its top surface, and a steel plate on top of it with some of the same drillings. Notice the dowels through this plate, which is designed as a backing plate for the bending process on the copper. The dowels locate the assembly, so that the bend is symmetrical about the centre line, a most important property. With the



15. Boring the tube holes to size.

plate clamped over one side of the exposed copper surface, this is probably too big a stretch to hold in the bench vice, so you may have to improvise by clamping it to a bench surface while hitting the free copper surface with a blunt instrument.

It takes considerable effort to deform $\frac{3}{16}$ in. copper round a sharp bend. You may well prefer to involve a local friendly fabricator who is used to performing such a feat standing on his head, or in other words, with an hydraulic press! You can see my finished results in photo 11, where the plates are nearly ready for the assembly process after pickling to remove the scale.

In the next instalment I shall cover the assembly process, defining the heat and insulation requirements for the large lump of metal as it becomes a boiler. There will also be some observations about some of the other methods which have been mentioned and for which there is now photographic evidence.

● To be continued.



Fig 1

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

Contact D. A. G. Brown, T. 01780 753162, E. dag@brownmailards.org.uk or Mark Smithers T. 01609 773734, E. marks_northall.yorks@tiscali.co.uk

EDWARDIAN ELEGANCE: CHARLES PARSONS AND THE FIRST OF THE TURBINE DRIVEN PASSENGER STEAMERS

Ron Isted

concludes his look
at the *Victoria* before
moving on to the *TS
Brighton and Dieppe*.

*Continued from page 212
(M.E. 4319, 15 February 2008)*

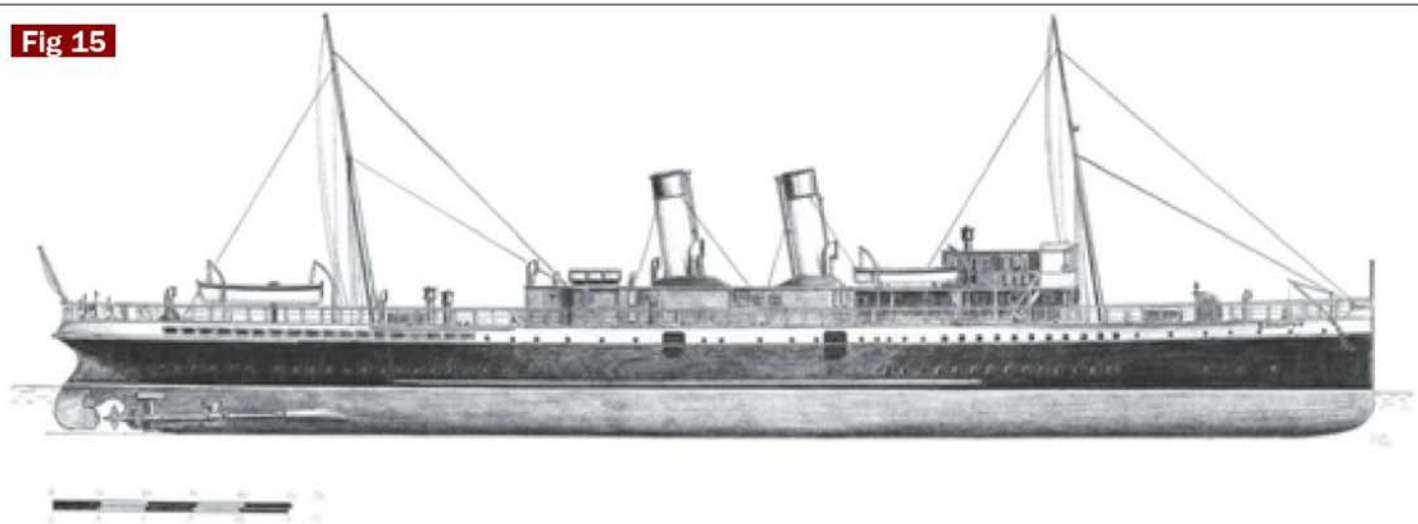
The *Victoria* achieved the longest career of any of the five sister ships, missing her 50th birthday by just six months. Launched from Denny's Dumbarton yard in February 1907, she indulged her youthful exuberance by averaging as much as 22½ knots on her initial delivery trip all the way from the Clyde to Dover, in spite of adverse weather conditions. According to a contemporary report, she then proceeded to shatter all previous records by crossing from Dover to Calais in just 46 minutes, knocking no less than seven minutes off the previous fastest timing by her elder sister *The Queen*. Now, this gives an average of almost 25 knots, which I find difficult to credit, but I suppose with favourable wind and tide, it is just about possible. *Victoria* survived to be taken over by the Southern Railway in 1923, but five years later followed her other older sister,

Onward, aka *Mono's Isle*, to the land of tail-less felines and the famous three-legged emblem, being sold to the Isle of Man Steam Packet Company for £25,000. The IOMSP Co. got a good bargain: *Victoria* gave her new owners over 28 years of service, becoming the company's last twin-funnelled ship and, unlike her sister, retained her original name throughout her career. She remained a flyer to the end of her days, her very final crossing in August 1956, from Douglas to Liverpool, 70 miles, (112 km), being accomplished in 3 hours 18 minutes, a fast time for any vessel, let alone an old lady approaching her jubilee year. She was broken up at Barrow a few months later.

The other two SE&CR sisters, *Invicta* and *Empress*, had rather shorter careers, as the Southern Railway withdrew both of them in 1933. A further pair of similar, but more powerful, vessels, *Riviera* and *Engadine*,

were built by Denny's for the SE&CR in 1911 and were the first to have specially allocated areas on deck for transporting motor cars. In those days, decades before the drive-on, drive-off era, vehicles were individually craned aboard either by means of four chains hooked underneath the corners of a simple unfenced wooden platform, or alternatively by four hooks attached directly to wheel slings with no platform at all. The sight of one's Rolls-Royce, or even Ford Model T, swinging precariously above the water must surely have struck terror into the hearts of their owners. Both ships again had long and adventurous careers: *Engadine* spent a season cruising the Thames in the early 1930s, before departing for the Philippines, but met her end during the Second World War. *Riviera* changed her name to *Lairds Isle*, also in the 1930s, and spent a quarter of a century running between ➤

Fig 15



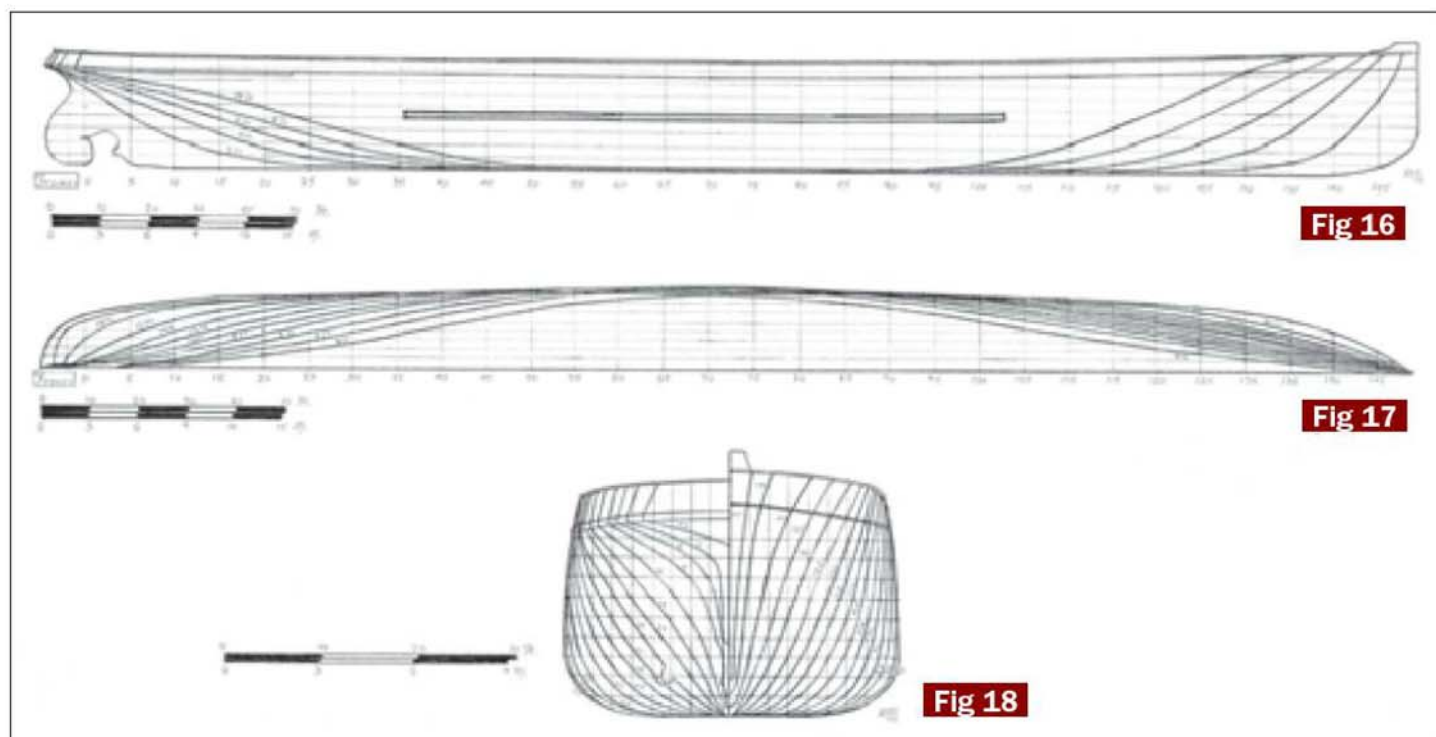


Fig 16

Fig 17

Fig 18

Ardrossan and Belfast until scrapped in 1957.

The TS Brighton

We left the LB&SCR impatiently awaiting delivery of its first turbine steamer, the building of which was delayed by the fire at Denny's Dumbarton shipyard. The *TS Brighton* (fig 15) was finally launched on 13 June 1903, when the naming ceremony was performed by Mrs. Forbes, wife of the Brighton's General Manager, and incidentally, 'niece in law' (if there is such a thing) of a former General Manager of the Chatham Railway, another instance of keeping rivalries in the family. In passing, the name originally put forward for the LB&SCR's first turbine steamer was *Chichester*, but in deference to possible pronunciation problems for their colleagues of the *Chemin de Fer de l'Ouest* across the channel, not to mention the large number of French passengers actually using the vessel, this tongue-twisting proposal was abandoned early on. After fitting out, *Brighton* sailed for Newhaven on 22 August, and was officially handed over to her owners six days later, four weeks after the contracted date, which cost Denny's £600 in penalty

payments. However, even if she had been handed over on the scheduled date, 31 July, this would still have been a month after her Chatham rival started the first ever cross-channel turbine service, so perhaps the builders did have some reason, financial or otherwise, to favour the SE&CR, even though the Brighton Railway had signed their contract first.

The ship cost the LB&SCR £64,917. It was paid in four instalments on which Denny's made a profit of just under £3,000 - less the penalty payments, of course, although their insurance company presumably footed that little bill. Apart from the means of propulsion, the *Brighton* was almost identical to the *Arundel*, fitted with triple expansion reciprocating engines and built for the company by Denny's three years earlier. However, I believe the new turbine-driven ship was fractionally bigger - that is to say as far as I can tell from the amazingly conflicting reports of her dimensions that appeared in various contemporary documents: for example, her length has been quoted as 269ft., 273ft. 1in., 273.6ft., 276ft., and 282ft.! All the above purport to be the length between perpendiculars, while yet other sources quote

various figures between 277ft., and 280ft. 6in. over rudder, i.e. the overall length. Probably the most reliable source is Denny's Sheer Draught drawing, the basis for figs 16, 17 and 18, which gives the length between perpendiculars as 273ft. 1in., (83.2m) and length overall of 280ft. 6in. (85.5m). An interesting feature is the spacing of the frames: the first 50 (reading from the stern) are 22in. (559mm) apart, the next 17 are spaced at 21½in. (546mm) intervals, the next 21 at 22½in. (572mm), the next 53 at 22in, and the final 16 up to the bow at 21in. (533mm), a good example of Denny's attention to detail. There is reasonable consensus that her beam was 34ft. (10.4m), although even that has been quoted as 34.1 and 34.2ft., and the depth of the hull, 14ft. 6in. (4.4m), or 22ft. (6.7m) to the underside of the promenade deck, with a draft of 9ft. 2½in. (2.8m) Unfortunately, the original builder's side elevation/rigging plan seems not to have survived, so I fear I cannot guarantee the absolute accuracy of fig 15, which is intended to show the ship as originally built. It is based on the LB&SCR rigging plan, kindly supplied by the National Maritime Museum,

Greenwich, supplemented by details culled from a large number of photographs from various sources. The LB&SCR rigging plan appears to have been copied from an original Denny drawing, but was made in 1913, specifically to show the extension to the upper 'shade' deck and the proposed position of an additional pair of lifeboats.

Old plans - a warning!

At this point, may I digress slightly in order to warn anyone intending to use copies of these century old plans that, although the National Maritime Museum produces superb 'same size' photocopies of the original drawings, some of which are several feet long, the originals have in many cases stretched and/or contracted unevenly over the years. This causes the scale to vary across the plan, sometimes to quite a large extent, which can lead to all sorts of incompatible dimensions!

Like all turbine vessels built for commercial service at this period, *Brighton* was equipped with one high-pressure and two low-pressure turbines, but, as with the overall dimensions, the various accounts of the disposition of the propellers are contradictory. Two contemporary

technical magazines claim she began life with five propellers, as did the three previous turbine steamers, and several later books have repeated this statement. *The Engineer* of 4 September 1903, however, reports that she was fitted with single propellers on each shaft from the beginning. According to this publication, which is usually fairly reliable, that on the HP shaft was 66in. (1.68m) diameter by 6ft. pitch and ran at approximately 600rpm at a speed of 21½ knots, while those on the LP shafts were 67½ in. (1.71m) diameter and turned over at about 520rpm. Just to confuse the issue still further, on the LB&SCR rigging plan, scale ½in. to the foot, the props scale off at 66in. and 45in. respectively, so all I can say is 'yer pays yer money and yer takes yer choice'. Steam was supplied by four single-ended boilers with a working pressure of either 150 or 160psi - once again, contemporary reports differ - and she was equipped with two surface condensers.

Luxuriously fitted out

Like her Chatham Railway rival, the Brighton was luxuriously fitted out, with copious amounts of anaglypta, fine veneers and gold silk tapestry curtains. To quote *The Engineer*, the first-class Deck Saloon was "of Sheraton character", while the Ladies Boudoir was in "the French Style", and the first-class Dining Saloon was in "the Elizabethan Style". Now, this may have been an interesting environment for a charter by The Society For The Study Of The History Of Interior Design, but it does seem a bit OTT for ordinary mortals. The passenger complement of the Brighton was certainly higher than that on her reciprocating sister Arundel, but yet again quoted figures for both ships vary, the turbine vessel being credited with between 970 and 1,000. On her test over the Skelmorlie measured mile, Brighton averaged 21.37 knots, a figure that was frequently exceeded when she entered regular service between

Newhaven and Dieppe. Her fastest crossing would appear to have been achieved in November 1903 with a time of 2 hours 59 minutes, an average speed of 21½ knots, including the tortuous exit, stem first and at reduced speed, from Dieppe harbour. This exploit was duly reported at the time by the *Model Engineer & Electrician* and compares with the current (2006) schedule of four hours by Transmanche Ferries, but I suppose we are fortunate to have any ferry service between Newhaven and Dieppe these days.

Brighton's immediate predecessor, *Arundel*, was equipped with the latest design triple expansion reciprocating engines, and naturally trials were carried out to compare the two vessels, the results of which were recorded in the minutes of a meeting held in November 1903 between the LB&SCR and their French partners, the **Chemin de Fer de l'Quest**. Taking an average of 30 voyages over the 65 miles between Newhaven and Dieppe, the *Brighton* gave a mean running time of three hours nine minutes per trip, consuming 17¼ tons of coal, while the respective figures for the *Arundel* were 3 hours 13 minutes and 18¼ tons of coal. "Comparison was therefore wholly in favour of the turbine vessel, which moreover gave satisfaction on all other points" is the conclusion of the report, though it was not perhaps quite such a decisive victory for the turbine as elsewhere. One detail not mentioned in the report was that the number of engine room staff on the *Brighton* was reduced by two compared to her reciprocating sister. The results of these trials apparently helped to convince the mighty Cunard company that Charles Parsons' turbines might perhaps be a Good Thing, and as mentioned earlier, their first turbine-driven liner, the 19,500 ton *Carmania*, was launched a year or so later. In trials against her sister ship *Caronia*, fitted with reciprocating engines, the turbine vessel once more

proved superior on all counts.

The gross tonnage of the *Brighton* was 1,129, the heaviest at the time on the Newhaven-Dieppe run, but this proved no match for a pitch-in with one of the world's largest sailing ships, the 5,000 ton five-masted all steel German vessel, the *Preussen*. This horrifying event took place on a misty Sunday in November 1910 and although the steamer made a 15ft. gash in the side of the sailing-ship, the latter's massive bowsprit played havoc with the superstructure of the *Brighton*, bringing down her mainmast and fore funnel, severely denting the aft funnel and reducing at least one of her four lifeboats to matchwood. Despite substantial damage, the turbine steamer managed to limp back to Newhaven under her own power, and a tug was sent out to tow in the windjammer. Unfortunately, the tug lost control of its charge and the magnificent sailing ship went aground on the South Foreland rocks, where she broke her back and became a complete loss. The sailing ship's cargo, incidentally, included 100 grand pianos, some of which were successfully salvaged from the stricken vessel and hauled up the cliffs to safety - surely an even more heart-stopping vision than seeing one's motor car suspended in mid-air 'twixt quay and ship. Although there were fortunately no fatalities at the time of the accident, the subsequent Official Inquiry found against Captain Hemmings of the *Brighton*, who lost his 'ticket', and tragically later took his own life.

Ignominious end

Like so many passenger craft, the *Brighton* was requisitioned by the Admiralty during the First World War, and carried several distinguished passengers, including HM King George V, HRH the Prince of Wales, Lloyd George the British Prime Minister, and the American President, Woodrow Wilson. At some point, either just before or during the conflict, the 'shade deck' was extended aft

and the vessel acquired two more lifeboats, probably while serving as a hospital ship. Fortunately, she survived the war unscathed to return to her old haunts.

Like *The Queen* of the SE&CR, *Brighton* carried sails and is reputed to have been the last vessel on the cross-channel services regularly to hoist her foresail when entering Newhaven harbour in adverse wind and tide conditions. She came under the ownership of the Southern Railway in 1923, but spent only seven years with the new company before being sold to Sir Walter Guinness - and just in case you're wondering, yes, he did have connections with a well-known Dublin brewery!

Brighton was thereupon despatched to John Thornycroft's yard at Southampton, for conversion into Sir Walter's luxury private yacht - and I have to say I would not have thought it possible to metamorphose such an elegant vessel into quite such an ugly duckling. She was at first converted for oil burning, with minimal change to her external appearance, but two years later, twin Atlas Polar diesel engines, each of 870bhp, replaced her steam turbines, and she became almost unrecognisable. The fore funnel was removed entirely and a podgy, stubby excrescence - it would be an insult to the Honourable Society of Shapely Funnels to call it anything else - replaced the aft funnel, giving this once attractive ship a really horrible, unbalanced, look. The hull was modified to take 500 gallons of diesel fuel, so that she could cruise as far as Canada, but her maximum speed went down from 21½ knots to just over 15. Last, but certainly not least, her name was changed to *Roussalka*, a slav word meaning water nymph, although in her new guise there was little of the nymph about this ungainly looking vessel. *Roussalka*'s life as the plaything of the Guinness millionaire was brief, as a year after she was 'diseaselised' (acknowledgements to Keith ➤

DIEPPE

Wilson for the invention of that brilliant word), the former pride of the LB&SCR cross-channel fleet was wrecked off the Irish coast.

The Dieppe

Two years after having acquired the *Brighton*, the London, Brighton & South Coast Railway placed an order for a second turbine-steamer for their Newhaven-Dieppe service. She was named *Dieppe* (figs 19 and 20) and was in most respects a sister ship to the earlier vessel, except that the launching ceremony on 6 April 1905 took place not at William Denny's shipyard at Dumbarton, but a few miles further up the River Clyde in the heart of Glasgow, at the Govan yard of the Fairfield Shipbuilding & Engineering Co Ltd. I have been unable to discover the reason for this abrupt change of shipbuilder for what amounted to a repeat order: had Denny's been banished to the Brighton Railway Doghouse because their Chatham rival won the race to put the first turbine-steamer on the cross-channel service? This is pure speculation on my part, as I have no evidence to support the suggestion, such as comparative costs for example, and in any case,

Fairfields had built ships for the LB&SCR in earlier days, including the supremely elegant pair of paddle steamers, *Paris* and *Rouen*, for which William Stroudley was responsible, in the 1880s. So perhaps I'm being uncharitable, but it does seem odd, particularly as the two turbine-steamers were virtually sisters. Whatever the reason, the change of builder has caused me a few problems in producing figs 19 and 20, as unlike most of the Denny-built ships, none of Fairfield's original plans of *Dieppe* seem to have survived. My drawing is based on a small outline drawing that appeared in *Engineering* in April 1905, together with as many photographs as I could lay my hands on. The plan view in particular must be treated with a certain amount of caution, I'm sorry to say, although the basics should be pretty accurate. I have, however, had to omit detail items such as deck seating, as it is quite impossible to work out the exact positions from the available material.

The *Dieppe* was 274ft. (83.5m) between perpendiculars, with a 34ft. 8in. (10.6m) beam, a depth of 14ft. 6in. (4.4m) and a draught of just over 9ft. (2.74m). As usual, she was fitted with one

high-pressure turbine driving the central shaft and two low-pressure coupled to the wing shafts. There is no doubt that she was fitted with a single screw on each shaft from the beginning, the diameter of all three reported as 63in. (1.57m), though I do not know the pitch. Four Howden forced-draft, single ended boilers working at 150psi (10 bar) provided the steam to give the new ship an estimated HP of 6,500, slightly more than *Brighton*, which increased the maximum speed on her trials to almost 22 knots. It is evident that, despite the success of the Denny demonstration with *The Queen* described earlier, there was still disquiet in some quarters about the ability of the new high-speed turbine ships to reverse quickly enough in emergency. As a result, the contract specification for *Dieppe* stipulated that she must be brought from a speed of 12 knots to a dead stand in only 100 metres, less than one and a quarter times her own length. On trial outside the harbour after which she was named, the new vessel improved on the contract requirements by about 8 metres (26ft.) from a speed of 12½ knots, at which speed the engines were running at

just under 400rpm. They were reversed within six seconds of the order being given, and 35 seconds later, the 1,215 ton ship was actually moving astern, a most impressive performance.

Like *Brighton*, the *Dieppe* was luxuriously fitted out and included one or two improvements compared to her elder sister, the most obvious being the plating in of the exposed aft section of the main deck, a modification soon extended to the earlier vessel. The so called 'shade deck' was also extended in both width and length, so that it housed both pairs of lifeboats, instead of one pair cluttering up the aft end of the promenade deck as had been the case on the *Brighton*. The sides at the bow end of the promenade deck of *Dieppe* were also covered by what I believe is technically known as a spirket plate, subsequently extended aft. Other modifications in later years included an extra 'storey' to the bridge and the complete plating in of sides of the promenade deck, which gave the ship a much more modern appearance. Like her sister, she also acquired an extra pair of lifeboats while serving as a hospital ship in World War One.

● To be continued.

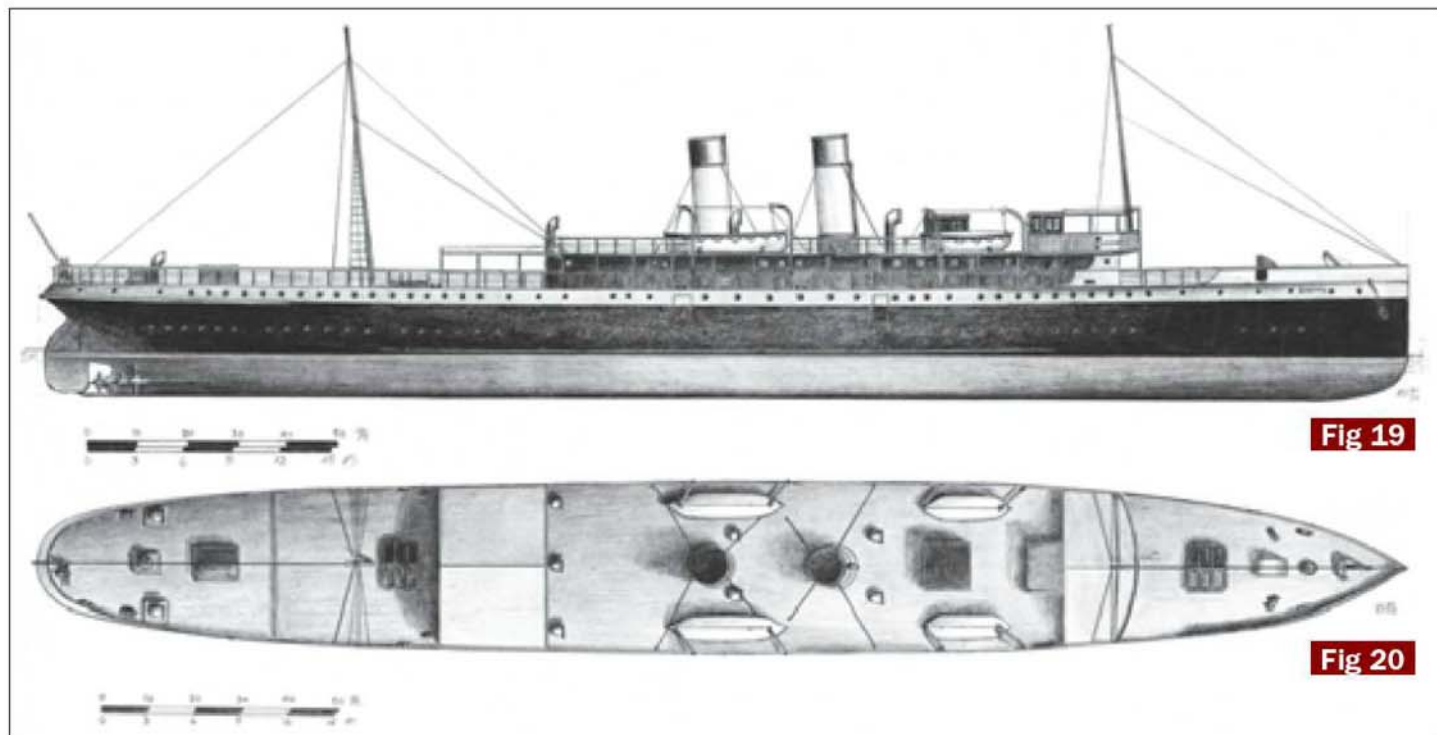


Fig 19

Fig 20

Following last year's successful competition we will again be holding a digital photography competition to be judged at the Model Engineer Exhibition.

The Model Engineer photography competition

Readers are asked to submit photographs of model engineering subjects which illustrate any aspect of the hobby. This could include full-size subjects of the type that appear in this magazine. The entries last year were of very good quality and we hope to encourage more readers to 'have a go' this year.

Photographs can be of any model engineering or related subject you consider suitable and a selection will be published in the magazine after the exhibition. Some typical photographs are included here.

A short list of photographs will be selected for final judging and display at the show.

The judging will be carried out by the editorial staff and we will be looking for photographs that capture any aspect of model engineering and which will help

inspire others to become involved in the hobby. Needless to say, good technical quality of the photographs will be essential. The winning photograph will be featured on the magazine cover if suitable and for that purpose; portrait format pictures are best but not essential.

Submitting photos

Entries can be submitted as digital images on CD-Rom, via e-mail (JPG files please) or prints (maximum A4 size).

All entries must be clearly identified with the full contact details of the entrant.

If submitting digital files, please include a separate Word or text document on the disc containing those details. Prints should have a label on the reverse.

Each photograph should be accompanied by details of the camera (and accessories) used and details of the subject, location, and date of the photograph.

Entries with file sizes less than 2Mb each can be submitted by e-mail to MEphoto.comp@magicalia.com with 'M.E. Photography Competition' in the subject line. This address must not be used for any other purpose.

Postal entries must be sent to: The Editor, Model Engineer, Berwick House, 8-10 Knoll Rise Orpington, Kent BR6 0EL. The envelope must be clearly marked 'M.E. Photo Competition'.

Please do not include any other material with your entry.

Competition rules

A maximum of two photographs per entrant will be accepted and will not be returned.

Entries not submitted in the correct manner will be excluded.

Copyright must reside with and will remain with the photographer although Magicalia Publishing Ltd. reserves the right to publish any entries (in printed or electronic form) deemed suitable.

Photographs can be of any relevant subject but the judges reserve the right to exclude entries deemed unsuitable.

Photographs which include children must be accompanied by a signed release form from the parent(s) or guardian(s) giving permission to use and publish the photograph.

All photographs must have been taken by the entrant.

Photographs must not have been previously published.

Final judging will take place at the exhibition and the judge's decision will be final.

No correspondence will be entered into regarding the competition.

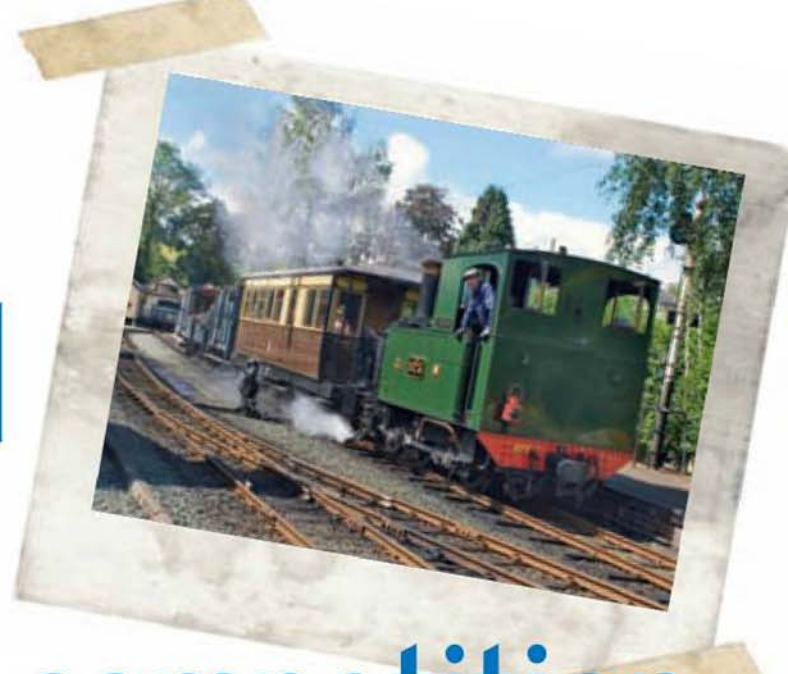
The closing date for entries is 25 August 2008

Cash prizes will be awarded to the top three entries.

**1st prize - £100
2nd prize - £50
3rd prize - £25**

We look forward to receiving a good selection of entries this year.

ME



Steam sensa

Michael Jones reports on some of the locomotives and trains at the steam show held in Sinsheim, Germany.

*Continued from page 281
(M.E. 4320, 29 February 2008)*

After an initial walk around the halls to see what's what, one is usually drawn by the buzz of the main exhibition hall and the ground level track.

The long track

Each time I visit Sinsheim it is striking how diverse the visitors and participants are. For example, kids are encouraged to participate in preparing and running the trains and whole families can be seen riding around the track with mum, dad and one of their offspring driving. This event is an opportunity for the youngsters to show their elders how to do it properly. It seems it's never too early to introduce kids to a steam locomotive (**photo 1**).

Driving locomotives also means learning to oil them before setting out on the track. An aspiring driver helps dad by oiling round before they light up (**photo 2**). Later, the boy was seen driving the locomotive with dad pointing to a control and telling him what to do.

The 'hill' is an interesting place to watch the action. Here, steam locomotives have to work on the upward climb which makes for interesting and exciting viewing. This 0-6-0 tank locomotive was a frequently seen on the track - here

reaching the hilltop with ease (**photo 3**). This particular model bears a resemblance to a Prussian T-3, yet differs in some details. Sinsheim provides so many new locomotive types to learn to spot!

Some locomotives and drivers make the summit with ease (**photo 4** and **5**); others, who approach without enough steam in their boilers, struggle and occasionally need assistance (often foot power).

The following distance, which isn't much normally, would make signal engineers groan with anxiety. If the train brakes are not enough, occasionally you will see that the driver's feet can be employed to add that extra bit of braking needed to avoid a collision. Feet work better on smooth concrete than on the chippings on outdoor tracks.

Locomotive models

The loading gauge of German engines is quite a bit bigger than was permissible on British railways. Tenders were longer and taller. To avoid an awkward riding position, the cab controls of this German 4-6-2 are routed through the tender so the driver can sit comfortably astride a riding car (**photo 6**). This particular locomotive is gas-fired, with

the tanks in the riding car.

Set at eye level just inside the main entrance were two spectacular locomotives built by Christopher Timm. *Kriegslokomotiven* (often known as *Kriegslok*) were perhaps the most prolific locomotive design ever built with over 6,700 units constructed between 1938 and 1945 and classed by the Deutsche Reichsbahn (DRG) as '50' and '52'. A small number of '42's (a larger variant) were built. During WW2, the design was further simplified to use the minimum amount of material and 17 different works built them.

The model seen in **photos 7** and **8**, a class '52', is a wartime version of the *Kriegslok* (war locomotive).

A pre-war type (class '50') is the newest model by Herr Timms, and the two engines back to back allowed visitors (those who understood these subtleties) to admire them and compare the differences in complexity, livery, and fittings (**photos 9** and **10**). From **photographs 7** and **9** one can see the greatly reduced number of pipes on the outside of the '52' locomotive.

The Shay locomotives attract a unique following. There were two at the exhibition, including one on the Seven and Quarter

1. Father and son are out for a loop of the track.
2. A youngster helping dad oil his steam locomotive before a run on the track.
3. The bright headlamps of German locomotives made a striking contrast to UK practice.
4. Even going uphill, a hand on the brake is a wise precaution in case the train ahead stalls.



tion at Sinsheim



Inch Gauge Society stand. While not particularly fast, they can pull substantial loads in real life as well as in scale while giving the impression of lots happening while their steam motors churn away.

This four-truck shay was a particularly nice example of the type (**photo 11**). It was coupled to a rather lengthy train of about 13 cars (goods and passenger). The impression was just as with a real train. The locomotive would pass and then an eternity would pass as the rest of the train followed.



5. A German 2-8-2 locomotive, of unknown class, easily reaches the summit of the 'hill'. Note the close following of the train behind (the driver on the far right).

6. Locomotive controls are lead through the body of the tender to allow the driver to sit on a riding car.

7. A Kreigslok class '52' 2-10-0 locomotive built by Christopher Timms.

8. The detailing of the class 52 was superb. This Westinghouse-style air pump could easily be mistaken for the prototype.

9. Another Kreigslok, based on an earlier prototype. This class 50, by C. Timms, is fitted with a snowplough.

Unusual models

There were some models of unusual prototypes. On the last day, I spotted a train consisting entirely of track maintenance vehicles-ballast graders and tampers, etc. I was so surprised by this odd sight that I could not get a good picture of it - maybe next year.

Armoured trains have been seen at Sinsheim in previous years in various configurations, usually with artillery of some form. This train took WW2 a prototype (possibly) as its inspiration and featured an armoured diesel-powered locomotive (**photo 12**). Although the model is electrically-powered, one can only imagine the fitter's nightmare if the





armour had to come off the prototype for some reason. With the plethora of WW2 German military equipment designs, it is hard to know if this is a true prototype of something built or designed, or if it is a bit of conjecture; an interesting train to watch and speculate on.

Electric traction

Not every train was steam-powered. Modelling electric and diesel traction in 5in. gauge was popular and many models were on the track (**photo 13** and **14**). Trams were also popular (**photo 15**) and they had their own depot on the sidings of the track layout.

Although not a running model,

on display was this DRB type VT99 101, a 5in. gauge diesel-driven passenger car (DMU) (**photo 16**). The builder, Mr. Werner Weigel has added a witty touch by displaying his model carrying a crate of beer on the roof luggage rack (**photo 17**).

The loads pulled by many of the trains exhibited a similar humour with faux wine barrels mounted on wagons used as water tenders for steam locomotives and small empty beer kegs used for loads in open goods wagons (**photo 18**).

Weird and wacky trains

Outside of the ground level running halls, some curiosities were to be found. On one track,

'Chain Gang' was running (**photo 19**). It was built by Neff Cla to his own design. He is a member of the Rocky Mountain Live Steamers who build models of 'prototypical' equipment seen in the mining areas of Colorado.

A regular visitor to Sinsheim is this flaming dragon (**photo 20**). As it races around its track, flames spew from its nostrils. It's a real crowd pleaser. A video of this model can be found on the YouTube website www.youtube.com Search for modelengineermedia or 'flaming dragon'. Other short video clips from the Sinsheim Echtdampf-Hallentreffen will be posted there as well. **ME**

10. A tender view of the class '50' locomotive.

11. A four-truck Shay locomotive with a three-cylinder motor. It pulled an impressively long train, albeit not at great speed.

12. A German railway artillery train.

13. Trams were popular models, usually articulated as seen here.

14. Diminutive shunters are available as kits and are extremely popular for their low cost and ease of transport.

15. A small steeple-cab electric locomotive is pulling a beer train. The first tank wagon has the legend 'Cheers my angel' on it.

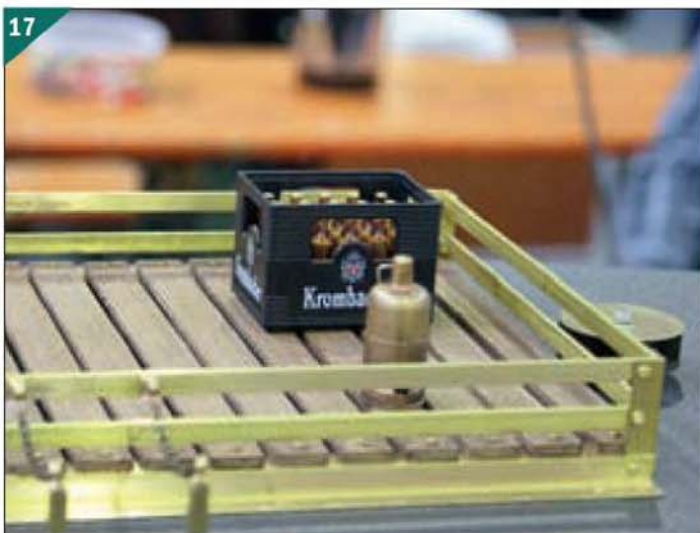
16. A pre-WW2 diesel rail-car under construction. Limited passenger space and a roof-mounted luggage rack meant it was used on rural routes.

17. The roof-luggage rack has plenty of room for more crates of beer. An example of 'beer humour' seen through out the exhibition.

18. Wine barrels and beer kegs were popular loads. It's unclear if the driver of this train had consumed the beer in the wagon before over-running the end of the track.

19. 'Chain Gang' a whimsical model to show off the imagination of its builder, Neff Cla.

20. The flaming dragon locomotive which races around a track with large flames spewing from its nostrils. It stops the crowds whenever it runs.



STUART MODELS SHAPING MACHINE

Anthony Mount finishes this super model machine tool with guidance on painting and assembly.

*Continued from page 217
(M.E. 4319, 15 February 2008)*

The ram pivot (part 35) is another tricky item to make. Once again, start by facing off the end in the lathe. Clamp it vertically in the machine vice on the milling machine and, with an end mill, form two rebates either side. Change to a dovetail cutter and form the undercuts. As for the other slides, take great care to get as good a fit as possible and remember to take off the sharp edges before trying for fit.

Screw the end plate to the slide and fit it to the ram pivot and use the end plate as a template to drill the screw hole, which is tapped 5BA. The hole does not need to be tapped full length. It can be counter bored half way, 5BA clearance size, and the counter bore can then act as a guide for the tap.

Next turn the spigot that fits in the ram; all done by measurement since you cannot try it for fit. Part off carefully as there is precious little for the chuck jaws to hold onto to face off afterwards. The small size of the completed unit can be seen in **photo 22**.

The final part is the tool (**part 37**), which is made from mild steel and cannot actually cut anything. Face off both ends and then file a chamfer on one end to represent the cutting edge. It is locked into the clapper box with a couple of grub screws.

Painting

There is no standard colour for shaping machines so you can paint it any colour you fancy. However, as the shaper represents late 19th early 20th century practice, and typical colours of the period were black, grey and green, those are appropriate.

Only three parts need painting - the base, ram and angle plate. With painting, preparation is important, so it will pay to spend some time rubbing down the rough castings to remove as many blemishes as possible.

Next mask off those areas that do not require painting. Again, make a neat job of the masking to avoid having to touch up the paintwork afterwards. All three parts have holes in them that can be utilised for fixing to suitable sticks that can be hand-held while painting the objects.

The choice of method: brush, airbrush or aerosol is up to you, but I have never had any success with a brush. Airbrushes are very good but need extensive cleaning after use. Aerosols give an excellent finish with no cleaning or clearing up afterwards.

The ram and angle plate only need a few coats of primer but the base could take say five coats to start with all in one colour perhaps grey, then another five coats in red primer. Allow to dry overnight and then give a good rub down, the two colours will give an indication on how far you have gone in the rubbing down process.

If you are happy with the result give just one more primer coat and then a coat of colour. Wait until dry and then give another coat, which should be enough. If not satisfied you can

always rub down again and try another coat of colour.

Allow it to dry overnight again. Aerosol paint is dry to the touch after only few minutes but handling it can leave finger marks. Remove the masking tape and you are ready for assembly.

Assembly

There is not a lot to say about assembly as it is pretty obvious which piece goes where. You might like to assemble the two slide assemblies first. Use a little oil on assembly as it is surprising how much more smoothly everything works when lubricated.

The long slide can then be bolted to the base and the ram fitted. Fix the connecting rod to the disc crank and slide in the crankshaft through the base boss into the disc crank. Lock with the grub screw and fit the pulley. Put the drive pin in place through the ram and connecting rod and you can try the operation for the first time.

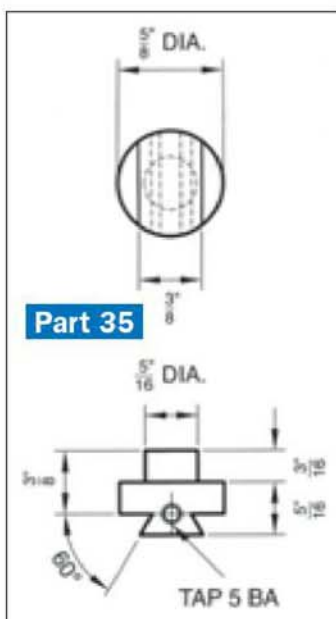
Though the shaper is free standing it looks much better if displayed on a purpose made hardwood base. This can have a moulded edge and be polished to a high finish.

Do not forget to fit a nameplate giving details of what it is and, of course, your name and the date. Who knows where the shaper might end up in years to come and at least the owner will know who built it.

An alternative to a separate base is to build some of the other machines in the Stuart machine tool range and to set up your own engineering workshop - driven by a steam engine of course. You could display it alongside the Wife's doll's house, if she has one!

ME

22. The small ram pivot.





KNOTTY

A UNIQUE LOCOMOTIVE

Designed for 5in. and 7 $\frac{1}{4}$ in. gauge

Keith Wilson
describes the springs
and suspension for
Knotty

Continued from page 215
(M.E. 4319, 15 Feb. 2008)

On the matter of leaf springs (at least one engineer's reference book calls them elliptical springs) the calculations are quite easy, the same cannot be said of coil springs - regretfully. Some years ago I developed a program for Microsoft Excel. It is fairly straightforward, but to get the screen showing exactly what is required when printing for 'ours' isn't easy, but with a bit of extra text I think we can manage. The trouble is that when a formula is required - as most computer buffs will know, the formula has to be preceded by the 'equals' sign, which in turn makes the computer do the calculation and show the answer as distinct from displaying the formula itself, so a few words may not come amiss.

The top left-hand block of words [cell A1] gives the

complete formula (fig 1), and then below follows the instructions for entering known information, down to 'enter deflection'. To the right we have various figures, and except for the 10,000,000 they should be ignored. The 10,000,000 is the modulus of elasticity for phosphor bronze, steel is 30,000,000; that for Tufnol is 10,000,000. Entering your own parameters in as shown will result in your spring calculations being done for you.

The writings inside the block show how the calculation formulae should be loaded into the program. Some of the lines seem mutually contradictory, but number of leaves, length and thickness thereof are fixed by the design itself. If you enter these figures plus load, then you will get the thickness of each leaf. The figures shown in the 'entries' column add up quite nicely, and some juggling with figures, such as going to nearest standard thickness for leaves, entering the calculated weight back into A2 will give fresh figures for load, deflection, thickness.

To assist in entering the program, the top line of the first section goes into A1, 'Entries' into B1, '3Lcubed' into C2, and '3*B2*B6^3' into D2; other

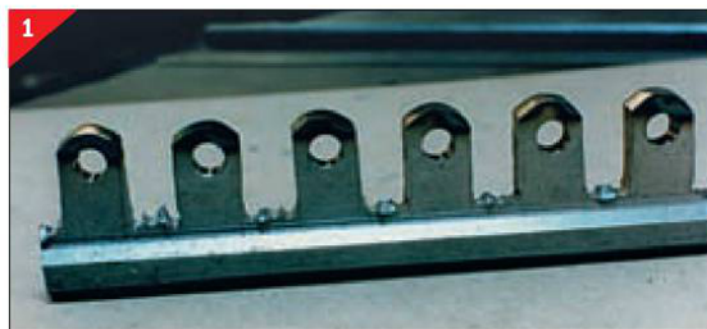
lines following in order. I have calculated leaf springs now for about 24 locomotives, meaning 284 springs, 2,272 leaves, so I think the program works.

For steel springs, that is for steel leaves plus possibly leaves of other materials, you can commence with hardened and tempered or annealed stock. There are arguments for and against either type and each presents its own problems.

If annealed, making is easier, but heat treatment is required. I do not advise doing this yourself unless you have a good muffle furnace and know what you are doing. I remember many years ago I did try this, alas no temperature gauge was available and the leaves finished up brittle. I tried one and it deflected a little way and shattered - obviously the leaf was badly tempered. I slung the lot, incidentally they were for carriage use and there were three per set, about 10 x 1 x $\frac{1}{4}$ inches. Don't forget to roll them to about the right radius before tempering.

Examination of the famous 'yellow pages' will produce a heat-treatment firm, take my tip and leave it to them.

Surprisingly enough, if starting with heat-treated stock, it can be cut with a bench

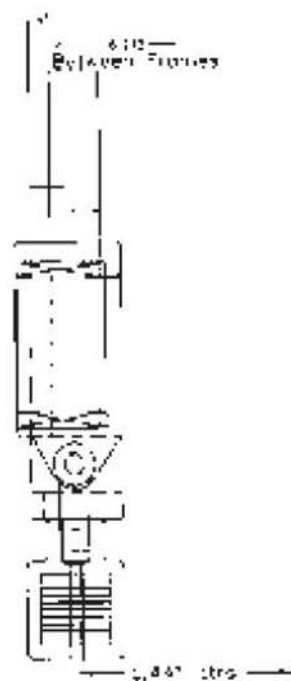
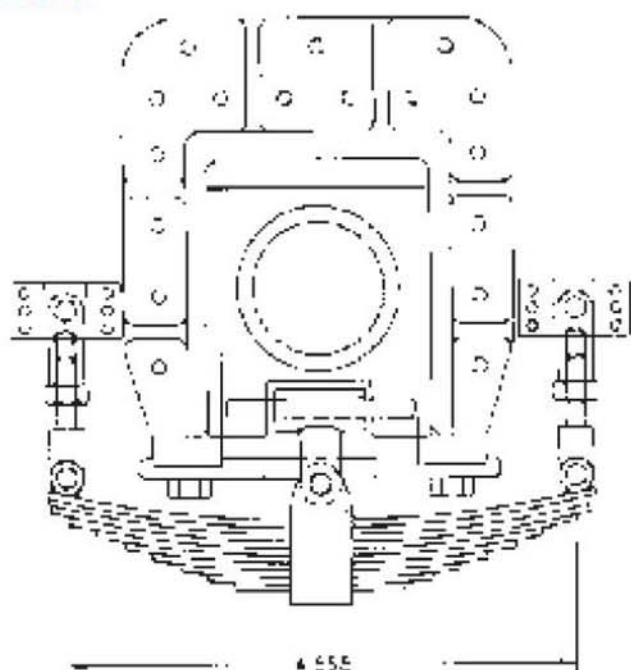


1. The link 'twixt spring and axlebox under mass production.

Fig 1. Screen shot of the Microsoft Excel spreadsheet for spring calculations.

	A	B	C	D	E
1	3.W L^3 = 8.F.E.N.B.T^3	Entries	Calculations		
2	Enter W (Load) in B2	22	2415.226288	3.W.Lcubed	
3	Enter N (No. of Leaves) in B3	10	37500000	8FENB	
4	Enter B (Width of Leaf) in B4	0.375	0.040213573	t	
5	Enter Modulus in B5 PHOS-BRONZE	10000000	19200	8ENBt cubed	
6	Enter L (Length of Spring) in B6	3.32	0.12579314	deflection	
7	Enter t (Leaf Thickness) in B7	0.04	109.783104	3Lcubed	
8	Enter Deflection in B8	0.125	2400	8FENBt cubed	
9			21.86128751	LOAD	
10	Calculated Thickness shows in in D4	0.040213573			
11	Calculated Deflection shows in in D5	0.12579314			
12	Calculated Load shows in D9	21.86128751			
13					

Fig 1

Fig 2

guillotine, can be punched for the hole in the centre, and rolled to radius as required, although the rolling is a bit tougher for more distortion is required than for annealed stock. A few sharp edges can be removed on a finisher.

Silver-brazing (not 'braising') the lugs on the end should be done quickly (minimum time at temperature) and the leaf allowed to cool naturally, surplus flux can be removed in a pickle-bath. A used sulphuric-acid bath obviously contains copper sulphate from brass and copper silver-brazed items previously 'dunked'.

Of course, should a citric acid bath be employed, then no need to worry about acid attack on the steel portion; either way do NOT quench from hot.

Buckle up, lads!

I dealt with buckle-making some time ago, but here goes. Due to the fact that these buckles are in tension rather than compression, built-up buckles are dicey. Many years ago I made some by fabrication and even although I took special care over silver-brazing, one or two of them parted under use and of course were very difficult to repair. So, machining from solid is safer.

Begin with a jig to drill smallish holes (I suggest $\frac{3}{32}$ in.) at each corner of the 'inside' of the buckle, plus all round the inside edges. Make this cut-out a teensy bit smaller than shown, and if you choose hole spacing a little more than $\frac{3}{32}$ in. the holes can be safely opened out so as to nearly break through. Using high speed (aim at 4,000rpm) and plenty of 'juice' and you should have no great trouble.

Use of jig-boring methods for making the jig is easier in the long run, and making the full batch initially as one piece (buckles side by side) also makes life easier (**photo 1**). When all are drilled, rest the block on two parallel bits on the anvil and hold a piece of $\frac{3}{16}$ in. dia. vertically above one of the cut-outs (drill-outs?) and biff the end heartily with a club-hammer. This will punch out the cut-out (bejabours) and it takes very little work with a square file to change the shape from rough to smooth. Before parting each buckle from its neighbour, mill the top gap to suit the link. Part each, trim outside with files or finisher, put in 4-jaw chuck and drill the hole for the central retaining pin. This pin can be of any metal, I used a bit of Sifbronze stick.

Suspension bits

To assemble the spring is a bit time-consuming. If a piece of 'pin' is roughly pointed at one end and gripped in the vice with about 2in. proud and vertical, it is matter of juggling with buckle and leaves to assemble the complete spring. Make sure you get leaves in right order and buckles with link-lug at top (all right, I have) then the pin can be bashed over at the top, then trimmed to length underneath and again bashed to stop it slipping out. There is no great load on it. Once the 'threading bits on' has finished, a roll-pin (or groverlok) pin can be pushed in, but I have never bothered.

The correct type of link is shown, also there is a photograph showing a stage in their making (**photo 1**). This shape is correct on full-size puffers, but probably not so important for us. The plain link (as on *Penrhos Grange*) is adequate for us and is a bit easier to make, so it is a matter of choice. It is a sore point that although the last time I made sets of buckles I photographed them, but be blown if I can find the photograph!

The adjustable bolts are plain machining bits. It is easier to put the holes in

first, later cutting just over-length and putting in lathe for drilling and threading. A 4-jaw self-centring chuck is a good item to have if you can afford one, it can save a lot of time, although extreme accuracy (in this case concentricity) is not particularly important.

The hole on the lower end of the link should be one drill-size larger if you use roll pins (grover-lock) at this pivot point; the upper hole ream to size. For there is no danger of the pin coming loose by itself, it is held in by the hornblock on assembly into the chassis. There are no endways forces acting on it, but using mild steel pin with rounded ends works well. It also greatly aids dismantling when required; it is one thing to use force and a special punch to drive out a roll pin, but quite easy to push out the plain pin, a scriber can be used without damage to either. The special punch is merely a piece of mild steel the same diameter as the pin that needs removing, with the business end turned down to go into the pin.

Tip: For punches, round off the upper end to be semi-spherical, it makes for better use. For if left flat with only sharp edges removed, hitting the punch on its exactly longitudinal axis is very tricky, if semi-spherical then it is just about impossible not to.

Once the upper pin has been pushed out, it is comparatively easy to rest the spring and buckle on the partly-opened vice jaws to bash out the lower pin; but to try to remove this pin whilst the spring unit is assembled and it can move freely and invariably away when punched. In any case, examination of the hornblock assembly drawing will show that this would be nigh-impossible anyway.

Another problem is provided by the retaining nuts for the horn stays. Direct end-on access for these items is prevented by the springs. It follows that since it is hardly practical to turn the locomotive upside down, these nuts might have to be undone with jaw

spanners through the spokes with engine balanced on two rests, one at each end under buffers. I do not know definitely what were the sizes and locations of the prototype locomotive, but I do know from experience that the fewer the better. Fortunately they are not under stress, so fingers might well suffice once the nuts are loosened. I know from experience that the worst axle to contend with is the drive centre – especially on Kings, Castles and Stars, or on practically any locomotive with inside cylinders and balanced crankshaft webs. It's likely that 3-cylinder locomotives are somewhat easier, for perforce the cylinder has to be on the centre-line, therefore better clearance.

It is not always the case that the suspension is common to all driving axles, several examples come to mind. In full-size, GWR Kings come to mind, where the trailing wheels had more, and thinner, leaves for to 'soften' the springing. The numerous locomotives of the 57xx class (0-6-0T) had a leaf spring on the leading axle, ditto on driving axle, and coil springs on the rear axle, (these coil springs were in the cab, more or less unguarded, I bet there

were cases of nips and words when a bump on the track announced its presence the hard way. Dean Goods were the same, and pretty certainly the Armstrong Goods. I am not sure why, unless it was the idea that the 'bounce effect' for each type of spring would tend to cancel out. Some later classes had leaf springs on all axles (84xx class, from memory).

Inside cylinder 4-4-0s had 4 leaf springs on the drive centre, and two similar but with 1 extra leaf on the trailing axle. I don't know about the 4-4-0 Counties, but it's likely.

The Castles had equalising beam at first, but they were found to un-necessary, the 47xx 2-8-0s were so fitted, and as far as I know retained, I think this applied to the 28xx class also.

The big tanks and all the locomotives with pony trucks had an adjustable equaliser fitted 'twixt pony' and leading wheels. To alter this suspension it was necessary to lift the engine so the weight was off the wheels – at least I can see no other method of altering the adjustment. The standard Swindon bogies had equalisers fitted in the sense that there were only two springs fitted to a beam the ends of which rested on the

axleboxes, but in about 1923 there were worries about the system because some rivets were working loose or cracks appearing – not sure which – so when it came to the Kings a new bogie was designed with individual springing for each wheel and plate frames

It was found impossible to fit such into the King works, so the outside-inside system was sketched out and submitted to Collett without much hope, however it was approved and so the King assumed a new appearance that can hardly be described as other than majestic. The American flagship of GWR was the 6001, which was derailed near Midgeham. As a result, the bogie springing was softened by the addition of coil springs. The Atlantic telegraph gave details and some modifying was done to KGV's bogie. Perhaps not surprisingly it was not exactly the same as the Swindon version.

I only know this last bit because, when going round the London Science Museum I, and one of the museum's 'bigwigs', spotted a photograph of KGV as he was unloaded from the ship in Cardiff. If memory is correct the Westinghouse air pump was not yet removed.

Fig 2. Suspension for 7 $\frac{1}{4}$ in. gauge Knotty.
Fig 3. Springs and buckle details for 7 $\frac{1}{4}$ in. gauge Knotty.

What happened to this bogie I know not, I reckon it was rapidly modified or removed at Swindon. Also, I do not recall if he had the bell on or not. I saw every King in my time, 6016 being my last 'cop'. As a final envy-producing event I, and a friend, rode on KGV from Old Oak Common to Paddington over the flyover tracks too, after an 'official' visit to the sheds.

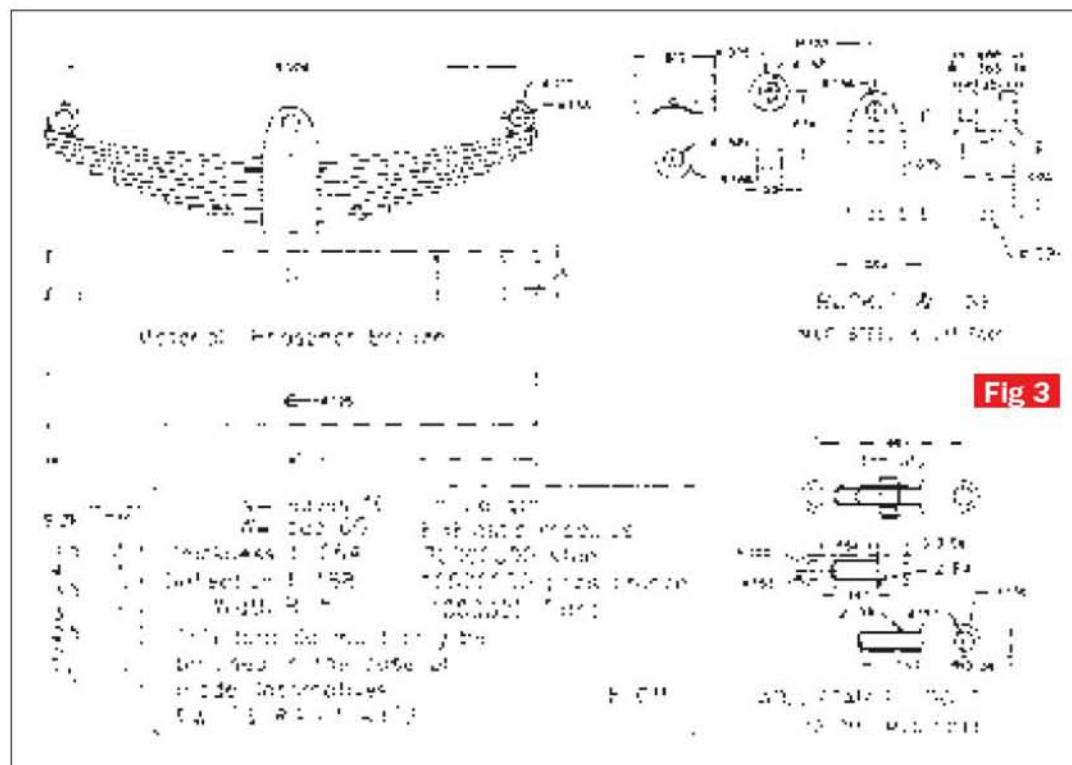
The Knotty elevations

I have discovered an interesting matter with this design. I have two nice elevation drawings, one of left-hand side and t'other of right-hand side. Trouble is, in some details they don't agree. Nothing too important, but unless both sides have adequate photographs I have to guess. Since No. 23 was scrapped 72 years ago, it is not at all likely that anyone is still living who can remember her.

To give a couple of cases, the left-hand view shows an extension on the front valve cover to help steady the valve rod, but the slightly more detailed right-hand view hasn't. The left view shows a straight brake lever on the front wheels, the right-hand shows a curved one.

I live in hope that it will not be long before I get the G/A drawings done properly. It is a slow job for the reasons mentioned above. A reasonable drawing was shown a few articles ago – as long as you didn't look too closely, but the proper one will be somewhat better informed.

●To be continued.



WILSON'S WORDS OF WISDOM

Most of our imports come from outside the country.

American President. Best left as anonymous!



Malcolm Stride reports

1. Station canopy construction commencing at Norwich DSME.
2. The new raised to ground level track link at Reading SMEE with drivers enjoying the February sunshine.
3. Work taking place at the Audley End Railway base of Saffron Walden SME.



Notices

For those who love efficiency competitions but feel their locomotive is too small,

Guildford MES is organising an event on 24/25 May this year, known as LittleLEC. It is an event along the lines of the well-known IMLEC, but intended to give drivers of small locomotives a chance to see what they can do in competition. To this end, a weight limit of 50lbs has been chosen, limiting models to the likes of *Rob Roy*, *Tich*, *Juliet*, *Jenny Lind* etc., and only in 3½ and 5in. gauges. It will be a less formal competition than IMLEC, having no on-train observers, no dynamometer and permitted use of the hand pump. Efficiency will be arrived at via calculation of the work done based on the known characteristics of the Guildford track, and the coal used during a 20-minute run. The society held a small version of LittleLEC last year to prove that it was possible over the track, and great fun was had in proving that the answer was a resounding YES!

Model Engineer has offered a prize of one year's subscription to the magazine, and GMES will be putting up two other prizes. Those interested should contact organiser Peter Langridge (E. peter.langridge@ntlworld.com or T. 01252-654675) for more information. The number of contestants will be limited to

24, chosen on a first-come first-served basis.

South Lakeland MES is holding an open day on Saturday 17 May 2008 from 10.30 to 16.30. For further information contact Secretary Adrian Dixon (E. adriandixon1@yahoo.co.uk).

City of Oxford SME is to host the Sweet Pea Rally on 7/8 June 2008 at its Cutteslowe Park track site.

The **Northern Mill Engine Society** is planning a slightly extended programme of steaming days at the museum for next year and hope to be able to run in steam on all these dates:

Sunday and Monday, May 25/26 - Bank Holiday Weekend.

Sunday and Monday, August 24/25 - Bank Holiday Weekend.

Saturday and Sunday, September 13/14 - Heritage Open Days Weekend.

Saturday and Sunday, January 3/4, 2009 - New Year Steam-Up.

The museum is situated 1½ miles west of Bolton town centre in Lancashire and further information can be found on the website www.nmes.org

UK club news

The Autumn term visit for members of the school-based **Ashcombe Miniature Railway** was a trip to the Bluebell Railway Giants of Steam weekend in October. The visit was enjoyed by all. It looks like the society will close in April and, because of this, it is planned to hold a final track day on Saturday 29 March. The society hopes that all past members of the Ashcombe Society and its predecessor the **Therfield Miniature Railway** will be able to join current members to see the final form of the railway and to talk over old times with the possibility of a steam locomotive being present.

The GWR Day held at **Birmingham SME** last September was attended by a good selection of models of Great Western prototypes including both steam and diesel locomotives. The *Road Vehicles Update* in their newsletter contains updates

on two high-speed projects, the British Steam Car Challenge (www.steamcar.co.uk) and the diesel-powered DieselMax car. The steam project has had a successful boiler performance test with the first boiler cassette to perform above its required output. The Diesel Max (www.jcbdieselmax.com) car has set a new record for diesel-powered cars by raising the previous record from 235mph to 350.695mph. Not bad for a JCB!

The traction engine circuit is proving successful at **Bristol SMEE**, although only one member has run regularly on public days. Some scale road signs have been purchased to provide control and warnings so that all can be operated safely. Hopefully more traction engines will be operating this year. The track replacement on the raised track has made good progress with 20 sections of track laid in six weeks, so that a complete circuit was back in action for the Santa Specials in December. Work is now continuing on other parts of the track.

Some significant work has taken place on the clubhouse at **Chesterfield DMES**. The back and side walls have been painted and, using a member's contact with a contract flooring contractor, the floor has been completely refurbished and has a carpet with a two metre wide strip of vinyl flooring to take the hard wear in the door area. The contractor was happy to fit the job in with club working days and it was completed once the furniture and other items had been moved into the newly completed carriage shed. The club shop, Auntie Wainwrights, is moving into two new Portakabins to provide a better display of the items and better service. Judging by some of the items in the shop, it is well worth a visit. A few 'fresh' items listed include a 3½in. gauge *Jenny Lind* rolling chassis and castings, a professional gas-fired marine boiler, several surface plates etc. If you want to know the special (very) member prices, you will have to join the club!



The October running session at **Chichester DSME** attracted 'a few brave souls', despite the wet weather. The early part of this year is likely to be busy with several projects just beginning. The locomotive *Bonnie Lass* has been taken out of service for some remedial work following a failed boiler inspection. A decision has to be taken on whether the boiler is repairable or will need replacement.

At a recent meeting **Colchester SME** members were entertained by Mr. Martin Hunt who presented an illustrated talk on the transport system of Moscow. Using his own slides he showed members the railway locomotives, the Metro system, buses of all ages, trams and the various types of river boats used for transport. Also used were the maps of the systems in use, which appeared not unlike those of the London Transport system.

Some work has been carried out on the track at **Derby SME** during the winter. The track near the golf course had become 'a bit of a switchback' and needed some attention. It was also decided to replace a drain which had been removed when some sleepers were replaced a few years ago. The job turned into a bigger exercise than originally thought because the track bed had to be dug out in places to make it possible to lower the track sufficiently.

The replacement of the aluminium track with steel at

High Wycombe MEC has been completed in less than three weeks following the end of the running season last year. The new track was opened in grand style on 4 October with a cavalcade of locomotives of all gauges doing the honours on the opening laps. The day concluded with bacon butties, beer and coffee which were described as "most satisfactory".

Discussions are taking place at **Ickenham DSME** on the best way to celebrate the 60th anniversary this year. The various projects taking place at the track site have all made good progress. They include an upgrade to the electric wiring, an upgrade to the engine shed, and some paving and bricklaying at various points.

Members at **Model Engineers Society (NI)** had an unusual talk for the last meeting of last year. This was on financial matters and was given by financial consultant Peter Yarr. Perhaps the idea was to provide members with ways to free up additional funds for model engineering activities?

Mike Ruffell has been elected as the new locomotive section leader at **North London SME** following the retirement of the previous incumbent, Adrian Reddish who was warmly thanked for his work in the post. The report on the garden railways section carries a picture of a 9F which was built from an Aster kit in just a week. Is this a record? The newly



assembled portable stove has proved so popular that it has had to be moved into the centre so that there is room for everyone to stand round it and warm their nether regions. The January locomotive section meeting featured several videos taken by members, covering the Steam on the Met event held in 2000, some tarmac laying using a steam roller, the 100th operating year of the Wolsztyn Depot on Poland, the Mallaig to Fort William Railway and the Toy Boat Association visit to the society. This sounds like a very varied evening's entertainment.

Nearly all the activity at **Norwich DSME** recently has been devoted to two projects. The first has been the beginning of the construction of the canopy (**photo 1**) over the platform of the ground level track. The 16 steel supporting columns were clad in wood in advance to improve their appearance. Each in turn was carefully aligned and the tops levelled then concreted in position.

Much of the other timber for the longitudinal members and the pre-assembled trusses for the roof have been delivered; some of the longitudinal members have been bolted on to the tops of the columns. It is hoped, given reasonable weather, that this canopy will be complete before public running begins.

The second project has been the improvement of security to the new building, in particular

the basement storage area. When finished it will be an additional deterrent to those whose intent is mischief.

Because passenger numbers have outstripped the available motive power capacity, the society has decided to purchase a new electric-powered Class 42 *Warship* diesel outline locomotive.

No doubt in common with many members of clubs around the country, members of **Reading SME** have been enjoying the brief spell of unseasonably warm weather (in early February) and have taken the opportunity to get out on the track. My photograph (**photo 2**) shows the newly completed link ramp between the raised and ground level tracks which makes transfer of locomotives in steam from one to the other very easy. The member enjoying the sun and honing his driving skills (on the left) is junior Alex Webb who gained a junior award at the Ascot Model Engineer Exhibition last year (*M.E.* 4313, 23 November 2007). We are always pleased to receive information on junior model engineer's achievements or activities.

Members of **Saffron Walden SME** carried out some track alterations (**photo 3**) at the Audley End Railway with the result that two trains can now pass on the River Cam Bridge. The track length is now increased to two miles.

Progress is being made on the ground level track update ➡

at **Tyneside SMEE** with the first section of the concrete base laid before Christmas. The late summer rally was well attended with several visiting locomotives in attendance in the warm sunshine. Even the club *Maid of Kent* had an outing and 'a few members did a few laps to keep their hands in'. Members are being asked to donate any scrap copper and brass for sale to bolster funds for the new track.

The **Wimborne DSME** newsletter contains an article by Dave Knight on building 24 Volt diesel outline locomotives. Dave's skills are in the woodworking and modelling areas, so he builds the locomotive bodies from wood. This sounds like a good route into model engineering for those with limited metal working skills. Dave has now almost finished his seventh locomotive.

The newsletter also has a description of an accident last year when a *Desiro* class 444 train hit a tree which had blown across the line in stormy weather. Dave Edwards, who wrote the article, attended the accident and assisted with the recovery of the damaged train. The accident was caused by the tree having been undermined by the construction of a track to some new farm workshops.

World club news

Canada

We have received reports of another well-supported Bits & Pieces evening at **Toronto SME**. Bill Salt brought in the front axle assembly of his 1:4 scale *Little Sampson* traction engine he is building. Brian Glover brought in a Stuart 10H. He mentioned that it had taken a few years to complete. Nigel Coppola, a guest of Dave Powell, brought

his partially completed 2in. scale traction engine that had a very professional paint job. He went into detail on preparing the parts and the equipment used to do the actual painting. Charles Foster, also a guest of Dave Powell, talked about two of his hit and miss engines. One was a Vaughn side shaft and the other a Paul Breisch Associated.

He also mentioned that he took up the challenge after seeing some of Bill Huxhold's engines, and is working on a 1/4in. bore and stroke model that has 1/2in. valve stems. Asked what he uses for fuel, he said he has most success with Coleman fuel with a little bit of WD-40 added.

Ernie and Jim Hill brought in some VW parts they are working on. They have put a turbo from a Cummings 5.9l diesel engine onto the head of a VW 1.9l 4-cylinder diesel. Their plan is to get up to 200hp from the original engine that put out 75!

South Africa

Alex Groothuizen, Editor of the **Centurion Society of Model Engineers** newsletter has discussed the subjects of CAD/CAM and CNC in the latest newsletter. He comments on the progress made in the early days of such things in the motor industry and also its use in racing engines such as those used in Formula 1.

Trade news

Ellingham Engineering

We have received information about this new engineering model dealer based at Ellingham on the Norfolk/Suffolk Border. The company offers the following services:

'Services in buying and selling all types of steam engines, steam models and

miniature railway items.

A workshop where overhauls, modifications and renovations can be undertaken.

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One off items can be manufactured to complement or repair your models.

Driver training, locomotive preparation and maintenance courses (free if purchasing an engine).

As the business grows they intend to hold a small selection of clack valves, safety valves, globe valves etc and general small engineering items'.

The company has a website at www.ellinghamengineering.co.uk or can be contacted on E. ellingham@live.co.uk or T. 01508 518399 (evenings, answerphone during the day), M. 07981 561274 (anytime).

Myford spring show

This event will take place from Thursday 17 April to Saturday 19 April inclusive and will be open from 9am until 5pm on the first two days and until 4pm on the Saturday.

The show will be at Myfords premises in Wilmot Lane, Chilwell Road, Beeston, Nottingham NG9 1ER where there is free parking. There will be free tea and coffee and a free prize draw. Visitors who arrive in a classic car or on a classic motorcycle will receive free entry into a prize draw worth an additional £250.

There will be some excellent show offers and this year the added attraction of a display by SMEE with some working models. Model engine judges Ivan Law and Harry Paviour will be on hand as will Derek (D. A. G.) Brown.

Humour time

Guidance for the workshop from Bristol SMEE

You only need two tools in life - WD-40 and Duct Tape.

- If it doesn't move and should, use the WD-40.
- If it shouldn't move and does, use the Duct Tape.

And:

If you can't fix it with a hammer, you've got an electrical problem.

RY DIARY DIAR

MARCH

- 13 **Cambridge MES. AGM.** Contact Tim Coles: 01954 267359.
- 13 **Cardiff MES. Mike Wilcock:** *Modern Railways on Video.* Contact Don Norman: 01656 784530.
- 13 **Sutton MEC. Michael Whewy:** *Wainwright's Coast-to-Coast Walk.* Contact Bob Wood: 020 8641 6258.
- 14 **Hereford SME. Anthony Mount:** *Stationary Engines.* Contact Nigel Linwood: 01432 880649.
- 14 **High Wycombe MEC. AGM.** Contact Eric Stevens: 01494 438761.
- 14 **Ickenham DSME. Stuart Smart:** *Not a Drop out of Place.* Contact Ian Mortimer: 01895 635596.
- 14 **Norwich DSME. Meeting.** Contact Shirley Berry: 01379 740578.
- 14 **Romford MEC. Noel Shelley:** *Casting Non-Ferrous Metals.* Contact Colin Hunt: 01708 709302.
- 15 **Cardiff MES. Steam-Up & Family Day.** Contact Don Norman: 01656 784530.
- 15 **Halesworth DMES. AGM.** Contact Chris Walliman: 01362 695735.
- 15 **SM&EE. Rummage Sale.** Contact Maurice Fagg: 020 8669 1480.
- 15 **York City & DSME. D.A.G. Brown:** *Church Clocks and the Origins of Time.* Contact Pat Martindale: 01262 676291.
- 16 **Frimley & Ascot LC. Club Run.** Contact Bob Dowman: 01252 835042.
- 16 **Northampton SME. Boiler Testing Day.** Contact Pete Jarman: 01234 708501 (eve).
- 17 **Leicester SME. AGM.** Contact John Lowe: 01455 272047.
- 17 **Model Steam Road Vehicle Soc. Bring & Buy Sale.** Contact Geoff Miles: 01869 247602.
- 18 **Chesterfield MES. AGM.** Contact Mike Rhodes: 01623 648676.
- 18 **Nottingham SMEE. AGM.** Contact Graham Davenport: 0115 8496703.
- 18 **Romney Marsh MES. AGM.** Contact John Wimble: 01797 362295.
- 18 **Taunton ME. Bits & Pieces.** Contact Nick Nicholls: 01404 891238.
- 19 **Birmingham SME. AGM.** Contact John Walker: 01789 266 065.

In Memoriam

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

Diane Garland *City of Oxford SME*
John W. Rae *Bristol SMEE*

- 19 Bristol SMEE.** *On The Table.* Contact Trevor Chambers: 0145 441 5085.
- 19 Chingford DMEC.** *Dave Whiting: Progress on the new signal box.* Contact Ron Manning: 020 8360 6144.
- 19 Guildford MES.** *Bits & Pieces.* Contact Dave Longhurst: 01428 605424.
- 19 Leeds SMEE.** *Meeting.* Contact Geoff Shackleton: 01977 798138.
- 19 MELSA.** *Meeting.* Contact Graham Chadbone: 07 4121 4341.
- 20 Cardiff MES.** *Club Chat.* Contact Don Norman: 01656 784530.
- 20 Halesworth DMES.** *Meeting.* Contact Chris Walliman: 01362 695735.
- 20 Sutton MEC.** *Chat Night.* Contact Bob Wood: 020 8641 6258.
- 20 Worthing DSME.** *Bits & Pieces.* Contact Bob Phillips: 01903 243018.
- 21 Brighton & Hove SMLE.** *Ian Wright: A Visit to Ecuador & Columbia.* Contact Mick Funnell: 01323 892042.
- 21 Colchester SMEE.** *Models Night.* Contact Jon Mottershaw: 01206 383456.
- 21 Ickenham DSME.** *Driving Trains Now & in the Future.* Contact Ian Mortimer: 01895 635596.
- 21-23 Model Railway & Transport Exhibition at Forum 28, Duke Street, Barrow in Furness, Cumbria.** *Friday: 10am-6pm; Saturday: 10am-6pm; Sunday: 10am-5pm. Adults £3.60, Concessions £1.80.* Contact Ian Edwards: 01229 583595.
- 21-24 British Columbia SME.** *Easter Meet.* Contact Sean Laurence: (604) 931 1547.
- 21 Rochdale SMEE.** *Annual Models Competition.* Contact Bob Denyer: 0161 959 1818.
- 22 Brighton & Hove SMLE.** *Public Running.* Contact Mick Funnell: 01323 892042.
- 22 Chesterfield MES.** *Public Running.* Contact Mike Rhodes: 01623 648676.
- 22 South Lakeland MES.** *Bunny Hunt.* Contact Adrian Dixon: 01229 869915.
- 22 Stockholes Farm MR.** *AGM.* Contact Ivan Smith: 01427 872723.
- 23/24 Bristol SMEE.** *Public Running.* Contact Trevor Chambers: 0145 441 5085.
- 23/24 Cardiff MES.** *Open Day.* Contact Don Norman: 01656 784530.
- 23 Halesworth DMES.** *Easter Sunday Steam-Up.* Contact Chris Walliman: 01362 695735.
- 23 Harlington LS.** *Public Running.* Contact Peter Tarrant: 01895 851168.
- 23 Leighton Buzzard NG Rly.** *Special Easter Running.* Enquiries: 01525 373888.
- 23 MELSA.** *Bracken Ridge Run.* Contact Graham Chadbone: 07 4121 4341.
- 23/24 Oxford (City of) SME.** *Running Days.* Contact Chris Kelland: 01235 770836.
- 23 Romney Marsh MES.** *'G' scale Get-Together.* Contact John Wimble: 01797 362295.
- 23 York City & DSME.** *Easter Steaming.* Contact Pat Martindale: 01262 676291.
- 24/25 Bedford MES.** *Public Running.* Contact Ted Jolliffe: 01234 327791.
- 24 Brighton & Hove SMLE.** *Public Running.* Contact Mick Funnell: 01323 892042.
- 24 Frimley & Ascot LC.** *Easter Monday Charity Run.* Contact Bob Dowman: 01252 835042.
- 24 Northampton SME.** *Easter Monday Running Day.* Contact Pete Jarman: 01234 708501 (eve).
- 24 South Lakeland MES.** *Bunny Hunt.* Contact Adrian Dixon: 01229 869915.
- 24 Stockholes Farm MR.** *Easter Open Day.* Contact Ivan Smith: 01427 872723.
- 24 Taunton ME.** *Public Running.* Contact Nick Nicholls: 01404 891238.
- 24 Westland & Yeovil DMES.** *Running Day.* Contact Gerald Jarman: 01935 434126.
- 25 Romney Marsh MES.** *Track Meeting.* Contact John Wimble: 01797 362295.
- 25 Stafford DMES.** *AGM.* Contact Chris Dobbs: 01889 270533.
- 26 Bedford MES.** *School Holiday Public Running.* Contact Ted Jolliffe: 01234 327791.
- 26 Birmingham SME.** *Bits & Pieces.* Contact John Walker: 01789 266 065.
- 26 Chingford DMEC.** *Talk & RAF Vintage film.* Contact Ron Manning: 020 8360 6144.
- 26 Guildford MES.** *AGM.* Contact Dave Longhurst: 01428 605424.
- 27 Cambridge MES.** *Talk by John Scott.* Contact Tim Coles: 01954 267359.
- 27 Cardiff MES.** *Bits & Pieces.* Contact Don Norman: 01656 784530.
- 27 Sutton MEC.** *Meccano Night.* Contact Bob Wood: 020 8641 6258.
- 28 Hereford SME.** *Mike Chrisp: Going for Gold.* Contact Nigel Linwood: 01432 880649.
- 29 Brighton & Hove SMLE.** *Public Running.* Contact Mick Funnell: 01323 892042.
- 29 Romney Marsh MES.** *Boiler Testing.* Contact John Wimble: 01797 362295.
- 29 York City & DSME.** *Jim Burlingham: Especially for Beginners.* Contact Pat Martindale: 01262 676291.
- 30 Chichester DSME.** *Steam on Sunday.* Contact Brian Bird: 01243 536468.
- 30 Guildford MES.** *Boiler Testing Day.* Contact Dave Longhurst: 01428 605424.
- 30 Harrow & Wembley SME.** *Public Running.* Contact Roy Goddard: E. RSGwattford@aol.com
- 30 Maidstone MES (UK).** *Public Running.* Contact Martin Parham: 01622 630298.
- 30 MELSA.** *Sunday in the Park.* Contact Graham Chadbone: 07 4121 4341.
- 31 Canterbury DMES (UK).** *AGM.* Contact Mrs P. Barker: 01227 273357.
- APRIL**
- 1 Romney Marsh MES.** *Track Meeting.* Contact John Wimble: 01797 362295.
- 2 Bristol SMEE.** *Chris Macdonald: Life and Times of LBSC.* Contact Trevor Chambers: 0145 441 5085.
- 2 Chingford DMEC.** *Bits & Pieces.* Contact Ron Manning: 020 8360 6144.
- 2 Leeds SMEE.** *Meeting.* Contact Geoff Shackleton: 01977 798138.
- 2 Tyneside SMEE.** *DVD selections.* Contact Malcolm Halliday: 0191 2624141.
- 3 Halesworth DMES.** *Annual Auction.* Contact Chris Walliman: 01362 695735.
- 3 South Lakeland MES.** *Meeting.* Contact Adrian Dixon: 01229 869915.
- 3 Sutton MEC.** *Bits & Pieces.* Contact Bob Wood: 020 8641 6258.
- 3 Westland & Yeovil DMES.** *AGM.* Contact Gerald Martyn: 01935 434126.
- 4 Colchester SMEE.** *Mike Gipson: From the Paxman Archive.* Contact Jon Mottershaw: 01206 383456.
- 4 Maidstone MES (UK).** *Bring & Buy.* Contact Martin Parham: 01622 630298.
- 4 North Norfolk MEC.** *Club Auction.* Contact Gordon Ford: 01263 512350.
- 4 Rochdale SMEE.** *Bits & Pieces.* Contact Bob Denyer: 0161 959 1818.
- 4 Romford MEC.** *Competition Night.* Contact Colin Hunt: 01708 709302.
- 5/6 Dockland & E. London MES.** *Public Running.* Contact John Slocombe: 01708 222658.
- 5 Ickenham DSME.** *Public Running.* Contact Ian Mortimer: 01895 635596.
- 5 SM&EE.** *Training Seminar.* Contact Maurice Fagg: 020 8669 1480.
- 5 Sunderland (City of) MES.** *Meeting.* Contact Albert Stephenson: 01429 299649.
- 5/6 Taunton ME Exhibition 2008 at Heathfield Community School, Monkton Heathfield, Taunton, Somerset. *10am-4.30pm. £5 Adult, £4 Senior Citizens, £1 Children.* Information: 01460 63162.**
- 6 Bristol SMEE.** *Public Running.* Contact Trevor Chambers: 0145 441 5085.
- 6 Cardiff MES.** *Steam-Up & Family Day.* Contact Don Norman: 01656 784530.
- 6 Frimley & Ascot LC.** *Public Running.* Contact Bob Dowman: 01252 835042.
- 6 Northampton SME.** *Boiler Testing Day.* Contact Pete Jarman: 01234 708501 (eve).
- 6 Oxford (City of) SME.** *Running Day.* Contact Chris Kelland: 01235 770836.
- 6 Plymouth MSLS.** *Public Running.* Contact Malcom Preen: 01752 778083.
- 6 York City & DSME.** *Running Day.* Contact Pat Martindale: 01262 676291.
- 8 King's Lynn DSME.** *AGM.* Contact Mike Coote: 01533 673728.
- 8 Romney Marsh MES.** *Track Meeting.* Contact John Wimble: 01797 362295.
- 8/9 Saffron Walden DSME.** *Public Running.* Contact Jack Setterfield: 01843 596822.
- 9 Chingford DMEC.** *Martin Masters: Helicopters & Fixed Wing Models.* Contact Ron Manning: 020 8360 6144.
- 9 St Albans DMES.** *AGM & Models in Progress.* Contact Roy Verden: 01923 220590.



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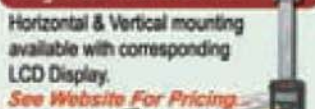
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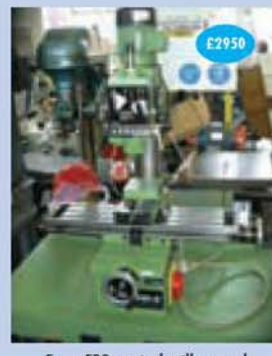
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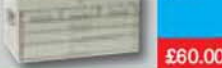
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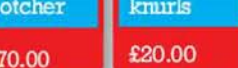
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