

MODEL ENGINEER

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17 February - 2 March 2006

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dealing with clock mainspring winders.

This time we examine the tool supplied
by Meadows & Passmore.

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On the cover ...

Stephen Harbach's superb model of the
Burrell Showman's Road Locomotive The
Griffin. This model won a Gold Medal
and the Bill Hughes Cup at last year's
Model Engineer Exhibition and was
entered for this year's Duke of Edinburgh
Challenge Trophy competition.

After some considerable debate the
judges declared this exhibit the winner of
this prestigious award for 2005.
Read all about this and the other
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(Photograph by Neil Read)

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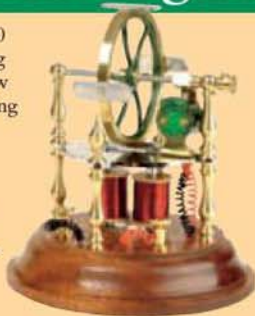
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MORE GOOD READING for the mechanically minded)



Steam in the Air • Kelly • £22.39

In the early days of flight, when man was thinking of powered flight rather than drifting around with the wind in balloons, or gliding beneath flimsy wings, steam was the only possible motive power; here Maurice Kelly looks at all the ideas proposed for propelling airships and aircraft by steam engine, as well as less viable ideas such as ornithopters. The problem was one of weight, and the real legacy of many of these brave experiments was to be in lightweight, high pressure steam units rather than successful flights. The coming of the lightweight IC engine largely stopped the idea of using steam power in aircraft dead in its tracks, so it is ironic that the one verifiable successful example of steam power being used in a controlled flight over a decent distance was to take place in 1933. But whilst it may depend on your definition of "controlled" and "distance", as this book shows, it is just possible there were other successful steam powered flights long before the Wright brothers. Fascinating stuff. 158 pages. 100 B & W illustrations, 10 in colour. Hardbound.



Watch Movement Manufacture • 1912 • £ 6.95

From MACHINERY MAGAZINE of 1912 came the series of articles combined here to show how the 'South Bend Watch Company' mass produced watches, and especially the tools developed and used in this process. Is this of practical use today? Just possibly. Is it interesting? Oh Yes! Mechanical watches were classic examples of very accurate mass production techniques, and seeing how this accuracy was achieved is both instructive and fascinating. 64 pages. Over 60 drawings and illustrations. Paperback.



LMS Locomotive Profiles No. 9 - Main Line Diesel-Electrics Nos. 10000 and 10001

• Hunt • £16.60

The latest in this excellent series abandons steam, and looks instead at one of the two pioneering diesel electric designs on Britain's railways, the other being Bulleid's one on the Southern. No's 10000 and 10001 were designed by H.G. Ivatt and his team, with considerable input from English-Electric, but only 10000 was actually an LMS engine - by 3 weeks. The Twins were uncommonly handsome engines, and they certainly grabbed attention as they journeyed up and down the WCML! Here you get their full history in every way, including a number of original drawings well reproduced, as well as numerous B & W photos. 80 pages. Paperback.



Smith's Work • 1899 • Hasluck • £ 7.95

Examples of Paul Hasluck's "Work" Handbook series pop up throughout our booklist. In many ways, most of the information in this book can be found in other books, but what makes this different is, firstly, it is aimed at amateurs, so the explanations are perhaps that bit fuller and clearer as a result. Secondly, this book strays into the forging and making of cranks, which we cannot recall seeing elsewhere to any extent. So it is definitely worth adding to your blacksmithing library, even if you are not a Hasluck addict - many are! 160 pages. 211 illustrations. Paperback.



Everything I know about Women I learned from my Tractor • Welsh • £15.39

Tractor restorer, writer & broadcaster Roger Welsh (aka "the sage of Dannebrog, Nebraska") divulges the secrets of handling women, as they came to him whilst he tinkered with his Allis-Chalmers tractors, in particular the dreaded secrets of Woman School. No, we don't get it either, but all true men should read this is a side splittingly funny, and politically incorrect book (for your eyes only, if you value your life). 216 page unillustrated hardback.



Dangerous Electricity! • pre 1914 • £ 5.75

This is a collection of articles reprinted from pre WWI issues of *Mechanics & Electricity Magazine* and *Modern Electrics Magazine*, on high voltages and high power machines. The latter are mainly Tesla coils, but also include an X-ray set, an induction coil, a small carbon-arc furnace, coil winding and a water rheostat. There is an element of danger in all these, but what takes the danger 'biscuit' here is instructions on building a plunge battery with mercury, potassium bichromate and sulphuric acid..... 64 inexpensive, but reckless pages, well illustrated with drawings and some photos. Paperback

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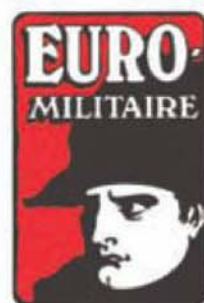
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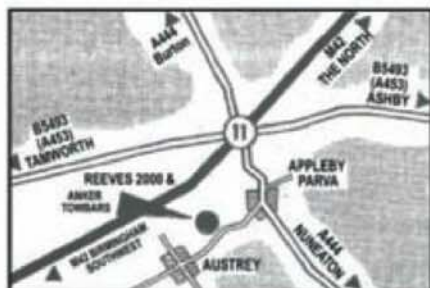
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SMOKE RINGS

With the Editors

Post Bag

When a readership survey was last carried out, an important outcome was that *Post Bag* was regarded as a highly popular feature of the magazine. In recent times, we have been blessed with bumper amounts of correspondence from readers, enough to change from the previous two pages of letters per issue to three.

As long as readers approve, and as long as you keep them coming, we will try to maintain this level. We welcome letters of all types, from controversy over Gatling guns and oriental machine tools, to requests for and offers of help, to disagreements over the finer points of locomotive valve gear and almost anything else. Who could forget those attempted explanations of the movement of a free balloon on a bus going round a corner?

Most of the content is rightly serious, and technical. However, we are happy to stray from that straight and narrow path from time to time.

We always think of *Model Engineer* as the magazine written by model engineers for model engineers. Whether it is a 20 part construction series or a single paragraph letter, all contributions are most welcome. With more space for letters we are now able to publish them more quickly than before. The same is less true of articles, as we are fortunate in having a healthy backlog, needed so that we can achieve a balance of articles in each issue.

Newcomers

Through all the trials and tribulations (especially in the obsolete slang meaning of the word) of recent times, we have tried to focus on the future development of *M.E.* One subject that keeps coming up in this context, is the desirability of encouraging new people into model engineering.

People often point out that the disappearance of apprenticeships, not to mention manufacturing, in the UK will lead to an extinction of our breed. Not sure about that.

We used to point to the number of visitors to the Model Engineer Exhibition with 'snow on the roof' as evidence of an ageing constituency. However, as someone pointed out: "They've always been that age." And there is a lot of truth in that.

Apprenticeships certainly provided us with knowledge and skills to enjoy our hobby. But did they inspire us? Well, did you go home to your Myford at the end of the day, or did you seek out pleasures?

I have the feeling that most of us graduated into model engineering from model aircraft, boats, Meccano, or some other allied hobby. Who could afford a workshop on an apprentice's pay, anyhow?

Many have come into the hobby, or returned to it, in later life when time and money have become less scarce. That move certainly is made easier if you learned all you need to know in your youth. On the other hand there are people who have come into it via alternative routes, perhaps getting interested after buying a ready-made model, or by buying a kit that (you hope) just requires finishing.

We know that some of our very best model engineers, Gold Medal and Duke of Edinburgh Award winners among them, who have had no

formal training at all. "I just try things and bumble around until something works," says one of them.

Things are a lot easier for newcomers today. You can buy a new lathe for a few hundred pounds, kitted out ready to go. A useable drilling machine and set of bits can be had for under a

James Alfred Batchelor 1926 to 2005

It is our sad duty to report that James Alfred Batchelor of Leeds SMEE, Bradford MES, and the Society of Ornamental Turners, died on 4 December 2005 after a long illness. Although very much a model engineer, Mr. Batchelor was better known for his interest in ornamental turning. His approach to this craft was unusual in that he adapted his Myford lathe rather than seeking out a purpose built machine. Some of the chucks he designed and built for his Myford ML7 were featured in T. D. Walshaw's delightful book on Ornamental Turning as an encouragement to others who might be considering using a standard centre lathe for work of this nature. A selection of Mr. Batchelor's ornamental turning chucks were also photographed on the Bradford MES stand at Harrogate last year and appeared in the report that was featured in *M.E.* 4252, 8 July 2005. In the report our Technical Editor requested further information on the unusual oblique chuck included in the display. It is a testimony to Mr. Batchelor's courage and commitment to the hobby that, despite being too ill to make the call himself, Mrs. Batchelor was requested to telephone us on his behalf and offer the necessary information. The sympathy of the staff of *Model Engineer* is extended to Mrs. Batchelor and her family and friends at this sad time.

hundred. Other essentials and consumable tools are much cheaper today, in real terms, than in days of yore.

Okay, we know that this is not the toolroom quality stuff you would ideally like. But it is cheap enough for people to suck it and see. Once hooked, then they can go for the Myford.

Dare we say that purveyors of inexpensive workshop equipment could do as much to popularise the hobby today, as LBSC did 40, 50, 60, 70 years ago?

All of which leaves us with a couple of issues. First, what can we, here at *Model Engineer*, do to help get beginners on the right track? No doubt readers will have some views, and practical suggestions.

Second, how can we inspire and educate youngsters? We are given to understand that although there are no longer metalworking classes in most schools, they usually have an NC machine of some sort, although the focus for these seems to be the IT aspect rather than cutting metal, or actually making anything.

We know that given a chance many youngsters would love to get involved in steam and other models. It is no less fascinating these days than at any other time, although there is much more competing for attention now.

Let us have your ideas on that, too.

Farewell Highbury

The long drawn out demise of former owners of *Model Engineer*, Highbury House Communications Plc, has finally come to an end, and 'ours' has now transferred to Encanta Media Limited.

All of us on the staff are now looking forward to a positive and settled future with Encanta Media. The past months have been difficult, and we have not been able to deal with enquiries about what was going on because we were as much in the dark as everyone else. Please, now, continue to be patient as things work out with the new owners.

CHUCK, the MUDDLE ENGINEER

by B. TERRY ASPIN



POST BAG

Water Jet Cutting

SIRS, - I see the Southern Federation (*Club Chat, M.E.* 4264 6 January 2006) want to know about water jet cutting. They should read *M.E.*, there was an article about it some while ago (*M.E.* 30 May 2003) that gave details of the firm, www.sciss.co.

We use Parker Steel of Canturbury, who are a big firm but very helpful, we currently have an order for about £3.5K worth of water jet cutting with them for all the steelwork for an L and B engine that will weigh over a ton when finished.

Another firm local to us is at sales@-profiles.co.uk.

A quick search of the 'net' will reveal many more I am sure.

John Dines, Kent.

Properties of copper at elevated temperatures

SIRS, - I cannot let the letter from Mr Collyer pass without comment.

Some time ago I got some data from the Copper Development Association on the effect of temperature on the strength of copper. At 24deg C the 0.2% proof stress is 9,370psi, at 100deg C it is 9,550psi, and at 204deg C it is 8,320psi. The temperature of boiling water at 100psi (and so the temperature of the copper in the

boiler) is 170deg C, and at 150psi it is 185deg C. Interpolating the CDA data gives proof stresses of 8,909psi and 8,670psi respectively.

Yes, there has been a drop from the room temperature figure, 5% at the temperature corresponding to 100psi, 7.5% at the temperature corresponding to 150psi, but this is small compared to the factor of safety inherent in a twice working pressure hydraulic test. The small loss of properties can easily be allowed for in the design process, as is fully covered in BS5500 (design of fusion welded pressure vessels). To make the hydraulic test

A Record of Sorts.....?

SIRS, - As 2005 was drawing to a close, I decided that it had to be the year I spent a couple of days of my holiday finishing off a Stuart Turner S50 mill engine. Nothing special, I hear

you say, except that I started this engine in January 1987!

It was at that time that I learnt that I had been successful in gaining a post in Singapore and, whilst I was delighted, it meant packing my workshop away for the foreseeable future. However, as I looked around the London Model Engineering Exhibition that January, I still couldn't resist buying the S50 from the Stuart Turner stand, the quality and fineness of the casting just bowled me away.

Then I couldn't resist starting the kit, and had the base, flywheel and crank completed before I left in late January. These parts were transported with the household effects and, in due course, painted and displayed as a rather strange ornament, for those not in the know.

Upon return in 1992 the model went back in the workshop, and although the cylinder was completed at some point, it was not until these final two days that it was all assembled and tested, almost 19 years after purchase.

That's not to say that my Myford lathe has been idle for all this time. In fact, hardly a week goes by when it is not being used to make something, including a Dore Westbury miller and many parts for my son's Locost kit car. It's just a question of priorities....!

Steve Elders, Lincoln.



Mr. Elders fine Stuart Turner S50 mill engine completed after 19 years.

demonstrate the same factor of safety just increase the 2 times working pressure to 2.05 times

Full size railways used copper fireboxes at pressures of at least 225psi, 203deg C, so I really cannot understand Mr Collyer's reservations. After all, C. M. Keiller had a loco working at 150psi back in the 1930s, with presumably a copper boiler. Martin Wallis's design is for a fire tube boiler, where stresses are generally lower than for a loco type. I would have no reservation in using this design.

Duncan Webster, by e-mail.

Model Engineering recollections

SIRS, - I thought the latest issue of *M.E.* was a particularly interesting one. It's clearly not easy to broaden appeal when there is so much excellent material on 'live steam' issues coming forward. I do, however, enjoy reading about all aspects of model engineering.

I was reminded of some childhood things.

I had the remarkable good fortune to have my own workshop from the age of twelve or thirteen - only a six-foot square, very draughty, conservatory. I think this was mainly to keep me out of Dad's shed when his model aeroplane and boat 'factory' was evicted from the house into a shed in the garden.

I only had two 'machine tools' on my bench - one was a massive and ancient cast iron vice (now in the care of my father) and the other an equally venerable Juneeero. I found this most useful for punching small holes in things and bending or cutting bits of piano wire. One unrealised ambition of my youth was to make the electric beam

engine pictured in one of those wonderful activity books for boys. I never did, until a year or so ago. It was made of cardboard in a few evenings. Sadly the friction in the paper bearings demands quite a current, and the coil heats up rapidly, limiting the running time.

Mamod was another part of my childhood; I have to take issue with Roly Williams. My 6-year old daughter, who is very much a technology-savvy 21st century child, delights in playing with my Mamod stationary engine, steamroller and Rolls Royce! I'm not ready to trust her with the meths and matches yet though!

Neil Wyatt, Burton upon Trent.

Global warming

SIRS, - Neil Wyatt unkindly takes Keith Wilson to task for doubting that climate change is influenced by CO₂, especially that produced "artificially". Mr. Wyatt presents no basis for his blithe assumption of righteousness but merely quotes the outpourings of supposedly knowledgeable environmental institutions that "would say that wouldn't they".

The 'evidence' for global warming by CO₂ invariably centres on the computer models that are being used to try to predict the future. What is rarely pointed out is that these models, if they are not to be utter rubbish must be accurate and totally comprehensive. This is, at this point anyway, totally incapable of being proved. The 'eminent' scientists have agreed to guess a figure (known, I believe as the 'Milan' formula) so that immediately dispels any thoughts of accuracy. The chaos theory shows that in the running of these

Floored

SIRS, - Reference your request in *Smoke Rings (M.E.* 4262 9, 22 December 2005). My workshop is small and I have a walking space between benches measuring 8 x 2feet. The floor is wood covered with self adhesive plastic tiles, which in itself is not uncomfortable to stand on. However, apart from scuffing up the tiles I found that swarf, filings etc became embedded in ones shoes and were carried indoors - not a good idea. I managed to obtain two industrial plastic mats each measuring 48 x 24 x 1in, which have a series of slots so that all debris from the bench passes through to the floor. Small items such as 10BA screws are captured within the mat and are usually easily found by lifting the mat. They also have slots and tabs on opposite sides that allow the mats to be interlocked. These have been in place for some 20 years and are as good as new.

The product is made by Arca Systems and can be obtained from their distributor Well Construct; tel: 08704 209032. The Part Number is 424001 and can be supplied in orange, blue or green. They are priced at £24.75 each.

Garth Bridgwood, by e-mail.



Mr. Bridgwoods workshop floor matting.

programmes with even the slightest inaccuracy can quite quickly produce errors of considerable magnitude. The usual test for checking the usefulness of programmes is to run them against the past so that the predicted outcome can be tested against a known past. In this the climate predictions show errors of between 35 and 40%. Not satisfying as a basis for reducing our western society to third world level!

There are many more points where the CO₂ warming theory has no basis.

The usual references to a warming earth start off with "....increase in temperature since records began in 1878" type of thing, showing an upward trend since. What is never mentioned is that around 1878 the temperatures were unusually low. Had records gone back to 1850 or even 1830 the temperatures were as high as or higher than now.

The other thing 'that we can't mention' is that the most comprehensive and accurate monitoring system there ever has been, NASA's satellites, indicate that there has been little or no change over the forty years in global temperatures. This is available to be seen on NASA's website.

As far as the veracity of environmental institutions is concerned the IPCC some two or three years ago organised a convention of the world's best scientists to debate whether man's actions had an effect of global warming. At the end, a vote was taken. The result was 'No' - 87%, 'Yes' - 13%. When the IPCC gave a resume at the subsequent press conference they reversed the figures saying that the Yes vote was 87% and the No vote 13%. Guess which figure was published! You really think that we should trust our future to this sort of deceit?

Obviously this is just a little of what might be said but enough to suggest that sneering at Mr. Wilson's disbelief of the current scam is unfounded and unnecessary.

Dave Robinson, by e-mail.

Henry Ford

SIRS, - It was indeed Henry 'Model T' Ford who founded the Dearborn Museum thereby demonstrating his respect for history. However, he did not say "History is bunk". What he said was "History is bunk, as it is at present taught in schools"; a perspicacious remark equally true

of our country and present times. The misleading misquotation was deliberately put about by his political enemies; in the same way that a mendacious gutter press here convinced people that Harold McMillan actually said "You've never had it so good!"

Alan Atkinson, Yorkshire.

Inches and millimetres

SIRS, - In a recent Post Bag letter (M.E. 4263, 23rd December 2005) Mr. John Harrison gives a very precise decimal conversion of millimetres to inches. This is in fact an out of date figure. The conversion is 1in = 25.4mm exactly.

It was decided some years ago by the ISO that the 25.399978 figure (quoted in the letter) was so close for all practical purposes that it made sense to round this up to 25.4 exactly.

As a matter of interest a metre was defined in the 1980s as the distance travelled by light in vacuum during 1/299,792,458 of a second. I have a feeling that this definition has been revised yet again since that date, something to do with the discovery of Laser Light etc. giving even greater stability.

I am sure that John Harrison is aware that his fathers gauge 1 railway is featured in the 1945 edition of *The Model Railway Handbook* by W.J.Bassett-Lowke. There may even be a picture of John on page 60.

Colin Usher, Cheshire.

Lead free solder

SIRS, - With reference to the article by Brian Lewis (M.E. 4257, 30 September 2005) which arrived in Western Australia last week, I feel I can make some helpful remarks.

For years now, I have used solders and 'brazing' materials which are free of cadmium, lead and other 'nasties' in my work as a volunteer with Technical Aid to the Disabled. (Some gadgets come into intimate contact with the client). I agree with the gentleman who recently pointed out that 'silver-brazing' is a nonsensical term, because brass doesn't come into the action, but it is a handy term to differentiate high temperature silver soldering from that down in the former plumber's range. Present day plumbers eschew lead (plumbum in Latin), and braze-weld copper tubes instead. It would be confusing to call them 'coppers'. The old wiped joint in lead pipes was a work of art, but we are better off without it!

I digress. It was joining bits of stainless steel that resulted in my acquaintance with the above-

mentioned silver solders. The high temperature rods work nicely, but the stainless steel seems to turn black, and requires a pungent pickle to restore its colour. I think the pickle contains strong nitric acid - this from its effect on human skin. I would not advise this as a test, but if one has made the test accidentally, one may as well make use of the result. Waste not, want not.

This brings me to the low temperature solder. At around 94% tin, the rest silver, it is quite strong, (tensile strength about 60 Mpa (4 tons per in.²)), melts at about 220deg. C, joins stainless steel to stainless steel and almost any other metal bar including aluminium and magnesium. It is available in hollow wire form with an acid flux core, and wire form with acid flux in a bottle, from Cigweld, BOC and Eutectic Castolin, (and doubtless umpteen others).

Use a soldering iron - I personally use a 'scope' with its quick heat and variability as you go. Once, in attempting to tin an area of stainless steel there did not seem to be enough flux in the cored wire I was using, and I was out of the liquid acid flux. In my workshop I had some hydrochloric acid, strongish at 300g/litre, obtained at the local hardware store and used for cleaning bricks and getting swimming pool pH's right. To 10 ml or so of tapwater in a suitable small container, I added two or three ml of the acid and applied this to the area with a 'cotton-bud'. Worked like a charm. Since then, like the old ad, "I have used no other". The dilution seems to be in no way critical, and while I have carried out no forensic test, I reckon that if the solder 'sticks', and one washes the flux away, all is well.

The solder has the virtue of

remaining bright and shiny, and is a good conductor of electricity. It is expensive compared to lead solders - but look at its virtues.

Derek Cooke, by e-mail.

A model section of the Steam Plough Club

SIRS, - Following comments by members we think the time is right to form a model section of the SPC covering ploughing engines and tackle. Models have an honourable place in the history of steam cultivation from the earliest times. Today the quality of models produced is outstanding and many have won major awards at national exhibitions.

In addition to the opportunity to show models, members of the section (which would be organised very informally) would have access to club archives and to the full size tackle whether it is for measuring up or the possible opportunity to operate it for real.

In particular we would like to have as many models of ploughing engines and tackle as possible at an exhibition to be mounted at the Steam Plough Club's Great Challenge on 9-10 September 2006 near Rempstone, Notts.

This event is a double size celebration commemorating 100 years of steam ploughing at Beeby's and the 40th anniversary of the Steam Plough Club. It is hoped to have 11 sets competing for a Challenge cup originally awarded to Robert Fowler. This will be an event not to be missed by all ploughing engine enthusiasts.

If this interests you please contact John Billard, Old Station House, Twyford, Reading, RG10 9NA, Tel 01189 340381 or e mail enquiries@steamplooughclub.org.uk John Billard, Berkshire.



A mystery object

SIRS, - A friend was tidying up his shed and came upon the pictured object which despite the combined efforts of the local drinking group has not been identified. The body appears to be graphite and the only sensible suggestion was that it was a casting mould for something or other. I would be grateful if someone could provide enlightenment and put us out of our misery.

John Howitt, by e-mail.

Chilling out

SIRS, - My shed is a 1970 DIY project. Wood floor, concrete block walls, Myford lathe 1955!

Traditional roof, somewhere to chill out!
W.B. Davies, Bristol.

Mr. Davies' workshop, an ideal place to chill out.



Metric threads on Myfords

SIRS, - The contribution by Adrian Garner (*M.E.* 4262, 9 September 2005) on cutting metric threads seems to be case of using a sledge hammer to crack a nut. Nine million combinations to generate the answers seem rather excessive as there is only a maximum of 823,680 possibilities.

Also, using the Monte Carlo method does not guarantee that you will have found all combinations. The probability of not getting all combinations may be vanishingly small, but as a mathematician he should know that vanishingly small is not the same as zero.

If the first driver/driven is G1,G2, the second G3,G4 and the third G5,G6 then the overall ratio is $(G1/G2) \times (G3/G4) \times (G5/G6) = (G1 \times G3 \times G5) / (G2 \times G4 \times G6)$ i.e. which driver drives which driven does not change the overall ratio.

From his table he has 13 wheels. The first driver can be chosen in 13 ways.

For each of the 13 ways the second driver can be chosen in 12 ways, so the total number of ways in which the first 2 drivers can be chosen is $13 \times 12 = 156$.

For each of the 156 the third driver can be chosen in 11 ways, so the total number of ways the drivers can be chosen is 156×11 (ie $13 \times 12 \times 11$) = 1,716. This figure regards selecting the gears in the sequence G1 G3 G5 as different to that when you chose G3 G5 G1, and so on.

For our application the order in which the gears are chosen is not important, only their product, so we must reduce 1,716 by the number of ways in which the gears can be chosen. This is $3 \times 2 \times 1 = 6$, so the total number of combinations of the drivers is $1,716 / 6 = 286$.

For the driven wheels, 3 gears have already been used, so the total number of combinations is $(10 \times 9 \times 8) / (3 \times 2 \times 1) = 120$.

So the total number of combinations of drivers and driven is $286 \times 120 = 34,320$.

On the gearbox, the selection lever has 3 positions and the gear selector has 8 positions, so the number of combinations for the gear box is $3 \times 8 = 24$. Each of these can be used with each driver/driven combination, so the total number of possibilities is $24 \times 34,320 = 823,680$.
E. Boardman, Cheltenham.

Extracting solder fumes

SIRS, - I recently needed to do a fair bit of soldering of electrical components and started to think about how to get rid of the fumes from the resin cored flux, since they normally tend to rise from the working area towards the operator's face. I had a look round various stores for small fans but it must be the wrong time of year for such things. Finally I hit upon the idea of using the fan in my small workshop fan heater - without heating of course.

Instead of blowing the fumes away, I set it up between six and nine inches away from the soldering iron so that it would suck the fumes through the fan and away from me. This had the extra advantage of avoiding any strong draughts that could either cool the iron or disturb small parts. I wasn't sure that there would be enough 'suck' to do the job, but a dab of resin cored solder on the hot iron produced a stream of smoke travelling almost horizontally into the fan heater. I was then able to solder for a couple of hours without the slightest inconvenience from the flux fumes.

I would be wary about using the same method with acid based fluxes

in case the fumes did mischief to the motor internals or bearings, but I think it is unlikely that this would be a problem with resin fluxes and it provided me with a much improved working environment with little effort and zero cost.

Arthur Rowe, Derby

Fyne Fort Fittings

SIRS, Can you, your staff or any reader help provide clues as to what's happened to one of your former regular advertisers - Fyne Fort Fittings? Maybe if any Isle of Wight club members or *M.E.* readers see this, they might be able to tell us if the firm is still in business at Clarence Boatyard?

Colin O'Keeffe, via e-mail.

Woods Metal

SIRS, - Your correspondent M.J. Atkinson (*M.E.* No.4264, 6 January 2006) might like to know that Wood's metal is available from Alec Tiranti Ltd at £21.37 per kilogram.

Further details are available from: <http://www.tiranti.co.uk>

Alternatively, they can be contacted for Mail Order at:

3 Pipers Court, Berkshire Drive, Thatcham, Berkshire, RG19 4ER, UK. Tel: 0845-123-2100 Fax: 0845-123-2101

One point is that Wood's metal is very toxic as it consists of 50% bismuth, 25% lead, 12.5% tin and 12.5% cadmium, and should not ingested, nor should dust be inhaled. In bulk it presents a low risk of ingestion, but can be absorbed through the skin, and it should not be heated excessively as the cadmium can vaporise. It should be disposed of properly and not just dropped in the wheelie bin. A Material Safety Data Sheet (MSDS) is available at: http://ptcl.chem.ox.ac.uk/MSDS/WO/woods_metal.html

I hope that this is useful.

G.R. Astbury, Cheshire.

Cerrobend

SIRS, - I assume Mr Atkinson, (*M.E.* No. 4264, 6 January 2006) is seeking his Wood's Metal as a filler

for pipes while bending. I too spent a long time seeking Woods Metal until, in 2004, I found what seems to be an equivalent in Cerrobend, <http://www.dgrdesigns.co.uk> which melts at below 75 deg. Celsius.

This material is not cheap. I have bought a small quantity with which to experiment but have not yet used it so cannot comment on its efficacy.

My supplier was:
DGR Designs,
388 Leymoor Road
Golcar
Huddersfield
West Yorkshire
Tel +44 (0) 1484-656111
Fax +44 (0) 1484-656111
e.mail address:
enquiry@dgrdesigns.fsnet.co.uk
Iain Miller, Fife.

Woods Metal - A supplier

SIRS, - I read with interest the letter requesting information of suppliers of Wood's metal.

I run a small business supplying tools and engineering supplies to model engineers and, amongst other things, supply Wood's metal in large or small quantities specific to customer's requirements.

For further information and prices my contact details are as follows:

SJS Tools, tel: 01427-718457,
email: sjstools@jics.co.uk

I would be most grateful if you could forward this information to M. J. Atkinson and any other interested reader. It would be even better if you could include it in your next issue of *Model Engineer* Post Bag!

Thank you very much in anticipation.

S.J. Shaw, Lincolnshire.

Woods Metal and Springs

SIRS, - I write in response to two recent letters asking for help.

M.J. Atkinson, Cornwall seeks Wood's metal. I tried a simple internet search which gave www.Goodfellow.com

Robin Howick, Devon seeks light springs in small quantities, HPC Drives, now Ondrives Limited, can supply a very large range of light springs in any quantities, www.ondrives.com

Hope this all helps.

Ken Willson, Hampshire.

We have received many letters advising us of sources of Wood's metal and have selected enough to mention all the suggested suppliers. We thank all those other readers who responded to this query.

Views and opinions expressed in letters published in *Post Bag* should not be assumed to be in accordance with those of the Editors, other contributors, or Encanta Media Ltd.

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or to david.carpenter@encanta.co.uk

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In the interests of security, correspondents' details are not published unless specific instructions to do so are given.

Responses to published letters are forwarded as appropriate.



THE 75TH MODEL ENGINEER EXHIBITION RESULTS AND AWARDS

THE DUKE OF EDINBURGH CHALLENGE TROPHY

Stephen Harbach

Burrell Showman's Engine *The Griffin*

Commended:

Ian Cornish

Miniature Vertical Steam Engine
Jemy Wren

CLASS A2: GENERAL ENGINEERING MODELS

Bronze Medal:

Brian Harding

12 Pounder Ship's Cannon from HMS
Victory 1806

Commended:

Ian Cornish

Miniature Overttype Oscillating Steam
Engine

Very Highly Commended:

David Eaves

A Four Column Beam Engine Circa
1820

CLASS A3: INTERNAL COMBUSTION ENGINES

Gold Medal and the Edgar Westbury Memorial Trophy:

Bill Connor

Matchless G45 Racing Motorcycle
Engine

Highly Commended:

Mitch Barnes

Modified Stuart Turner 10H Stationary
Steam Engine

Silver Medal:

Bryan Finch

Amanco Hired Man Stationary Engine





Fred Bearton



David Ball



Edgar Playfoot

CLASS A4: MECHANICALLY PROPELLED ROAD VEHICLES

Gold Medal and the Bradbury-Winter Memorial Challenge Cup:
Cherry Hill
1857 Blackburn Agricultural Engine -
Patent 414

Gold Medal and the Aveling-Barford Trophy:
John Bruce
Foster Traction Engine No. 14422

Silver Medal and the Bill Hughes Cup:
Roger Curtis
Minnie 1in. scale Traction Engine

Very Highly Commended:
Brian Englefield
Minnie Traction Engine

CLASS A5: TOOLS AND WORKSHOP APPLIANCES

Bronze Medal:
Alan Jackson
Lever Locking Lathe Top Slide

Very Highly Commended:
Peter Clark
Freehand and Profile Turning Device

Highly Commended:
Adrian Garner
Myford Lathe Chuck Backstop

CLASS A6: HOROLOGICAL, SCIENTIFIC AND OPTICAL APPARATUS

Silver Medal:
Christopher Orchard
Skeleton Clock

Silver Medal:
Roger Curtis
8-Day Skeleton Clock

CLASS A7: GENERAL ENGINEERING EXHIBITS

Gold Medal and the Tom Nevins Memorial Trophy:
Fred Bearton
Steam Crane No.
6618 by Thomas
Smith & Son, Rodley,
Leeds 1904

CLASS B1: WORKING STEAM LOCOMOTIVES

(1in. SCALE and OVER)

Gold Medal and the J. N. Maskelyne Memorial Trophy:
David Ball
GWR 0-6-0 Armstrong Goods - Rebuilt
1902

Silver Medal and the Charles Kennion Memorial Trophy:
Edgar Playfoot
Princess of Wales Midland Railway
Single

Gold Medal and the Crebbin Memorial Cup:
Clive Fenn
LMSR Duchess Class Locomotive

Bronze Medal and the New Zealand Cup:
Norman Barber
Southern Railway 4-4-0
in 5in. gauge

CLASS B2: WORKING STEAM LOCOMOTIVES

(UNDER 1in. SCALE)

Very Highly Commended:
Jack Evans
'B' Series Darjeeling
Locomotive No. 777

CLASS B5: SCRATCHBUILT MODEL LOCOMOTIVES GAUGE 1 (10mm SCALE and UNDER)

Bronze Medal:
Geoff Helliwell
Wantage Tramway Locomotive
No. 5 Jane

CLASS G1: TRAMWAY VEHICLES

Silver Medal:
Brian Simpson
Royal Army Veterinary
Corps Horse Ambulance
Mk. II

Bronze Medal:
Brian Young
Albion Expanding
Horse Rake



Clive Fenn



Norman Barber



Brian Simpson



Peter Morris



David Speed



Bryn Jones collects the Best Club Stand Shield on behalf of the Home Counties Meccano Group.
Below: One of the models on their stand

CLASS K1: NON-WORKING CARS

Silver Medal:

Graham Dean

Morgan Super Sports 3-Wheeler
(1934)

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

Bronze Medal:

Kenneth Mills

Hawker Fury Biplane

Highly Commended:

Peter Morris

EDF Hawker Hunter

CLASS L3: SCALE NON-FLYING MODELS, INCLUDING KIT AND SCRATCHBUILT

Bronze Medal:

David Speed

LFG Roland Walfisch 1916

BEST CLUB STAND

The Home Counties Meccano Group



THE DUKE OF EDINBURGH CHALLENGE TROPHY

AT THE 75TH MODEL ENGINEER EXHIBITION

Ivan Law

reports on the friendly rivalry and outstanding models at this year's competition.

The format of the Duke of Edinburgh Challenge Trophy is such that the Judges have a good idea what task they will have to face twelve months before the actual competition takes place! At every exhibition there are always some outstanding models in the various competition sections and the pick of these usually appear in the following year's 'D of E' competition. The 2004 Exhibition was remembered as a year of outstanding, high class exhibits and it was to be expected and, indeed, hoped for that the Judges but, more importantly the general public, would be given the privilege of inspecting some of these models again. I am pleased to report that this was the case. There were four entries in this year's 'D of E' competition, all the four having obtained Gold Medals and trophies in the previous year's Exhibition. The four models were the 5in. gauge

Rebuilt *Royal Scot* Locomotive No.46100 built by a previous 'D of E' winner, Mr. John Heslop. A model of an unusual prototype, the Savory Garrett ploughing engine constructed to a scale of 1½in. to the foot by Mr. Harold White, Christopher Vine's very impressive 7¼in. gauge LNER B1 locomotive *Bongo* and finally a ¼ full size Burrell Showman's Road Locomotive, the work of Mr. Stephen Harbach. From previous experience and a quick look at the four exhibits it was obvious to the judges that each one of them would be a worthy recipient of the award, but only one had to be selected! A competition of this nature could easily generate a little resentment or ill-feeling between the competitors but this was not the case. In fact quite the opposite occurred as there appeared to be quite a camaraderie existing between the contestants which is a credit to them and the model engineering movement as a whole.

The first thing that attracts the eye when viewing Christopher Vine's B1 *Bongo* is the superlative paint finish which is only equalled by the general finish of the machined and plate components of the model. Drawings and

information required for the model's construction were produced by the builder using the original works drawings together with the taking of many photographs and frequent visits to measure a preserved example. It was noticed that a few embellishments had been added over the last year. Cab doors have been fitted between the engine and the tender and a few accessories had been placed in the cab. These included a coal pick, a working oil can that actually contained oil and also a tea can and a couple of mugs for the crew. The connecting and coupling rods were originally criticised for not having the rear faces fluted but it was noted that this has now been done. Chris has run the model quite regularly over the last year and it has performed well. It has many notable features not usually fitted on a model. One is the steam and vacuum brakes with combined drivers operating valve. The operation of this follows full size practice. The brake steam pressure is regulated and is proportional to the lever position. The brake vacuum is also proportional to the lever position, the whole unit being adjusted on a test rig before being fitted to the boiler. Mr. Vine supplied us with a great deal

of information dealing with the model's design and construction. This was very interesting but to do it justice it really merits a special, dedicated article. Perhaps our Editor could persuade Chris to prepare one. If nothing else, information on how the paint finish was applied would I am sure be of considerable interest.

The second locomotive in the competition was the 5in. gauge *Royal Scot* built by Mr. John Heslop who is a member of the Ryedale Society of Model Engineers. Mr Heslop is no newcomer to this event having won the trophy in the past with a outstanding model of a LNER P2 locomotive. He started work on the 'Scot' in 1993 using drawings obtained from the NRM collection,

augmented by the usual visits to inspect preserved examples of this type of locomotive. Mr. Heslop does not use castings preferring to produce parts from solid chunks of 17 grade cast iron. Both the wheels and cylinders were produced in this way. In fact the inside cylinder, which incorporates the smoke box saddle, was machined from a billet 6in. dia. by 6in. long! The valve liners were shrunk into the cylinders and then lapped to remove any distortion. The valves, which

are plain with no rings fitted, are also lapped in in order to obtain a steam tight, sliding fit. The connecting and coupling rods and all the valve components were made from EN24T thus ensuring a long working life. A working water scope is fitted to the tender driven by a pair of home made bevel gears. All the fasteners used on the model were made by John, those on the boiler being made from corrosion resistance austenitic stainless type 303

while all the others were produced from 12 per cent free cutting stainless steel. The hexagons were made to scale size rather than the sizes commercially available. The model is a wonderful example of the model engineering art and goes to prove that a truly fine, detailed model is also capable of hard work on the track. This is obvious for the engine has been used extensively during the last twelve months.



Christopher Vine's superb 7¹/₄in. gauge LNER B1 locomotive Bongo.



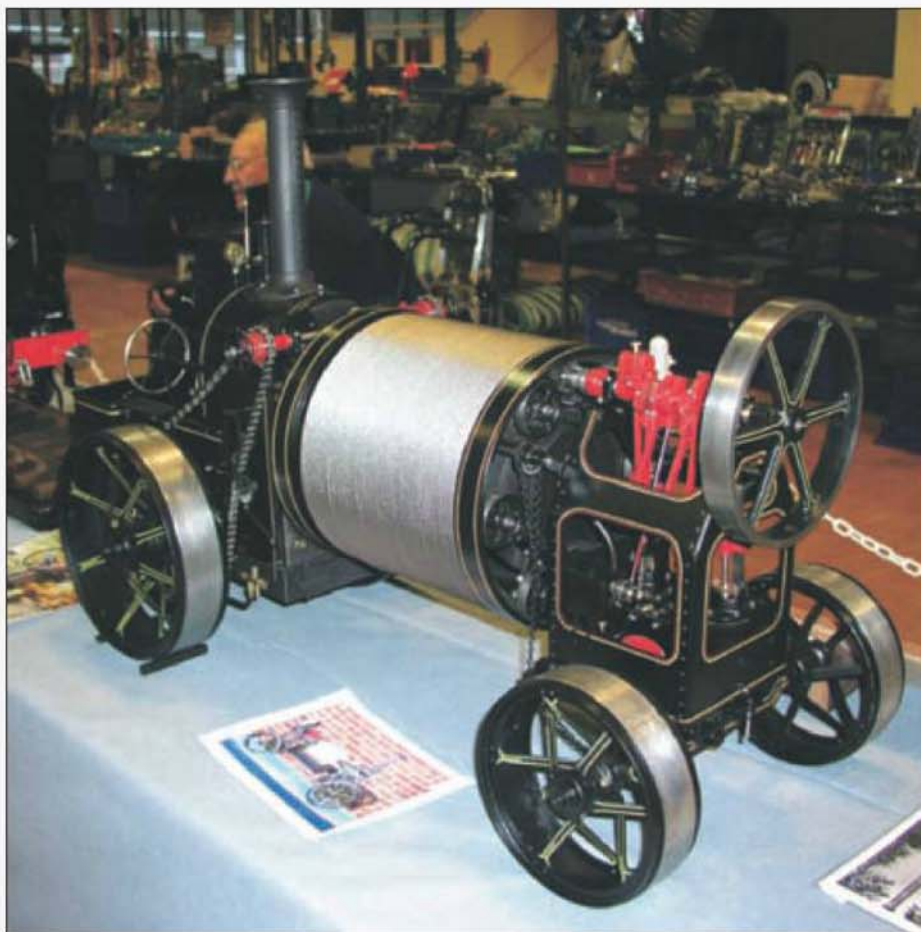
John Heslop's remarkable 5in. gauge Rebuilt Royal Scot.

The third model in the group was an example of an unusual prototype, being a 1 1/2in. to the foot Savory Garrett ploughing engine researched and built by Mr. Harold White of Crawley. Model engineers, in their search for something different to build, sometimes uncover a long forgotten machine that may have played its part in the development of engineering only to be discarded in the general advancement of knowledge. Cherry Hill has the ability to uncover some strange machines and then produce them in miniature in the way that only she can do. Mr. White has followed her example with his early ploughing engine. Models of this type not only give pleasure to the viewers but also introduce them to some long forgotten engineering designs. Obtaining details of these long forgotten engines is not easy, often the only information available is the drawings issued with the patent and these are vague to say the least. Old photographs are very useful but even these rarely show much detail. When the builder has obtained all the information he can there are still many gaps and these have to be filled by carefully studying engineering practice at the time. It was generally agreed that Mr. White had got everything just right and that the model conveyed the correct atmosphere.

Naturally Mr. White had to produce all his own drawings and patterns before completing his Gold Medal model. On show, along with the model, was a very old photograph of the prototype depicting a very elderly gent, presumably the proud owner, and driver. By a strange quirk of fate one of the SMEE members recognised both the engine and the driver. The pair of engines had actually belonged to his great grandfather, and it he who was in the photograph.

The final model in this section was a 3in. to the foot replica of *The Griffin* Burrell Showman's Road Locomotive. This type of model is always popular with the general public. These engines were built for travelling showman, to be the centre of attraction at their fairs with strong colours, plenty of polished brass, glitter and bright lights. For a model to succeed it must capture this spirit. Mr. Harbach's model did just that. This model was 25 years in the making during which time the builder had to acquire many skills to satisfy the standard of workmanship that he wished to achieve, not the least of which was the electrical knowledge needed to design and construct the generator. This produces 23 Amps at 12 Volts when running at the normal steady speed sufficient to illuminate all the lights on the model. The model was displayed with most of the tooling and patterns that had to be designed and made to construct the model. These were of great interest to the general public and it was nice to see them displayed. The judges are well aware just what goes on behind the scenes and always take this into account in their deliberations whether these items are displayed or not.

As mentioned earlier any of the four models would have been a worthy recipient of the trophy but one had to be chosen. The debate went on for a considerable time and finally, but not by a unanimous decision (these debates rarely are), the award went to Mr. Harbach for his Burrell Showman's Road Locomotive.



Harold White's 1 1/2in. to the foot Savory Garrett ploughing engine. Just right!



Stephen Harbach's stunning 3in to the foot Burrell Showman's Road Locomotive.



John Hartup's superb 3 1/2in. gauge K Class 0-4-4-0 Garratt. The first two Garratts were supplied by Beyer Peacock to the 2ft. gauge North East Dundas Tramway, Tasmania. The engines differed from subsequent Garratts in being compounds and the cylinders were at the inner ends of the bogies.



This 5in. gauge model Sgt. Murphy was built by David Lewin. Kerr Stuart supplied 70 engines of their 'Haig' design in 1918 to the 60cm. gauge system serving the trenches in France. Bought by the Penrhyn slate quarry in 1921, it was rebuilt by the Ffestiniog Railway and is now at the Teifi Valley Railway.

BRITAIN'S PRIVATE LOCOMOTIVE BUILDERS

Dave Roberts

continues the story starting this time with the Lancashire builders.

●Part II continued from page 80
(M.E. 4265, 20 January 2006)

The first locomotives built in Lancashire came from Liverpool. **Edward Bury** founded the Clarence Foundry in 1829. His locomotive *Liverpool* built for the Liverpool & Manchester Railway appeared in 1830, predating Stephenson's *Planet*, and had horizontal cylinders under the smokebox. An advanced feature of the construction of Bury's engines was the framing, which was forged from square iron bar and did not rely on the boiler for support. Much of Bury's engine design was due to his foreman, James Kennedy, who was later taken into the partnership when the firm became Bury, Curtis & Kennedy.

Bury was given charge of the locomotive department of the London & Birmingham Railway on its opening in 1838, Bury supplying over 100 engines to that railway. The locomotive supply arrangements seem strange. The railway had its own works at Wolverton (laid out by Bury) used for maintenance and repairs, but the locomotives were built by Bury's own Liverpool works.

Bury's engines incorporated excellent workmanship, being robust and reliable, but he stuck too long to four-wheeled engines, which were of both 2-2-0 and 0-4-0 types. With advances in speeds and weights of trains his locomotives became increasingly inadequate and it was not until 1845 that six-wheeled engines appeared. The most remarkable engine built by Bury's firm was the eight-wheeled Crampton-type rear-driver locomotive, also named *Liverpool*, supplied to the LNWR in 1848. The engine was soon withdrawn, its 18ft. 6in. fixed wheelbase damaging the light track then in use. Many of Bury's engines worked at a steam pressure of 120psi, a high figure for that time.

The Clarence Foundry closed in 1850, having

built over 400 locomotives and other engineering products.

Across the Mersey in Birkenhead was the Canada Works of **Brassey & Co.** Started in 1854, it was a subsidiary of Brassey's railway contracting business, originally building stock for the Grand Trunk Railway of Canada. The firm closed in 1875, by which time about 250 engines had been built.

Midway between Manchester and Liverpool is the town of Newton-le-Willows, and it was here that Liverpool businessman Charles Tayleur established his **Vulcan Foundry** in 1830, the first locomotive being produced two years later.

Robert Stephenson became a partner in 1832, while Daniel Gooch, of GWR fame, served part of his apprenticeship at Vulcan and his brother W. F. Gooch was General Manager from 1864 to 1897. William Kirtley and Henry Dübs also served here for a time.

Vulcan's vast production included the first engines in India and the first in Japan. In the 1920s designs were evolved by the Indian Railways Standards Committee for a range of locomotives for India's railways, of both 5ft. 6in. and metre gauges, Vulcan Foundry building large numbers of these engines, particularly of the 'X' and 'Y' types. Vulcan supplied 24 large 4-8-4s to China in 1935, one of which has since returned for display in the National Railway Museum. From 1872 a number of Fairlie's Patent articulated engines were built, for New Zealand, Mexico, Portugal and Burma.

Like many other locomotive builders, Vulcan was heavily involved in munitions work during World War II. Prior to the war Vulcan had designed the 26-ton 'Matilda' infantry tank of which over 3,000 were built, 600 of these by Vulcan. In addition to munitions, from 1942 Vulcan produced 390 of the 'Austerity' 2-8-0s for service in Europe. These engines were based on the Stanier 8F design, but simplified for speedy production. The year 1946 saw the production of 120 'Liberation' 2-8-0s for use in Europe. Vulcan's last steam locomotive was delivered in 1956, making a total of 6,204, of which about half were sent abroad.

The year 1944 saw the takeover of Robert Stephenson & Hawthorns by Vulcan Foundry, which was itself acquired by English Electric in 1955. By that time English Electric incorporated Dick, Kerr (Preston), Willans & Robinson (Rugby), Ruston & Hornsby (Lincoln), Siemens Bros (Stafford) and Davey, Paxman (Colchester), among others. This huge concern became part of the GEC Group in 1968.

Of Britain's larger locomotive builders, Vulcan was the most successful in converting to Diesel power. The company produced its first Diesel locomotive in 1932, a 0-6-0 with mechanical transmission, and from 1946 collaborated with English Electric in the production of Diesel-electric locomotives. Eventually 873 main line locomotives were supplied to BR by English Electric. Among these were the 22 'Deltics', each locomotive being powered by two 18-cylinder Napier engines. In 1949 a main-line Diesel locomotive cost about three times the price of the steam equivalent. The Deltics were particularly expensive, costing around £225,000 each in 1961.

Vulcan's last Diesel locomotive was delivered in 1970. The works continued to build marine and industrial Diesel engines, eventually becoming MAN Paxman Diesels. Vulcan Works closed at the end of 2002, and is now Vulcan Industrial Estate.

A mile to the west of Vulcan Foundry was the Viaduct Foundry of another locomotive builder, Jones, Turner & Evans, later Jones & Potts. They produced over 200 engines before closure in 1852. The site then became part of 'railway town' Earlestown, the LNWR's wagon works, named after director Sir Hardman Earle.

Foremost of the early Manchester builders was **Sharp, Roberts & Co.** Richard Roberts had had a number of jobs including two years in London with 'the master' Henry Maudslay, before setting up in Manchester in 1816 as a 'lathe and tool maker'. He entered into partnership with Thomas and Robert Chapman Sharp and two others in 1822. The firm's speciality was textile machinery, Roberts making important

The Kerr Stuart plate.



improvements to the power loom and the spinning mule. By 1825 the firm was producing 80 looms a week.

The first locomotives designed by Roberts had vertical cylinders driving the wheels via a large bell crank at the side of the boiler. They were not successful. In 1834 a young German, Charles Frederick Beyer, joined the firm. He was soon head of the drawing office, and chief engineer by 1843. Roberts wisely seems to have left locomotive design in Beyer's hands. His neat elegant designs were to have a major influence on British locomotive practice. Sharps developed a more or less standard design of 2-2-2, the famous 'Sharpie', which sold in large numbers from 1837. They built the first locomotive to have a deep inside plate frame extending from front to back buffer beams, an 0-6-0 for the Manchester, Sheffield and Lincolnshire Railway in 1849.

The firm's products became highly regarded for their workmanship. The various machine tools introduced by Roberts reduced the amount of hand fitting required. Roberts however left the partnership in 1843 to set up on his own. Despite taking out patents for his numerous later inventions, Roberts failed to gain commercial success, dying a poor man in 1864.

The firm traded as Sharp Brothers for a few years until C. P. Stewart joined, when it became Sharp, Stewart & Co. The company supplied large numbers of engines to both the home railways, Europe and the widespread British Empire. Sharps set up a department to manufacture injectors under license from Giffard, and for a few years made injectors for The Patent Exhaust Steam Injector Co., forerunner of Davies & Metcalfe.

The cramped site of the company's Atlas Works near central Manchester restricted further expansion and had no rail connection, though it did have the Rochdale Canal alongside. Sharp Stewart moved to Glasgow in 1888 to more spacious premises and cheaper costs, of which more later.

Charles Beyer left his position at Sharp's to set up a new company in partnership with Richard Peacock and Henry Robertson. Peacock had been Locomotive Superintendent of the Manchester, Sheffield and Lincolnshire Railway, and would have known Beyer through Sharps supplying locomotives to the MS&LR. Beyer, Peacock & Co. opened for business in 1854 with a new works, Gorton Foundry, across the tracks from the MS&LR works, in green fields three miles east of Manchester.

The firm at first produced machine tools, especially lathes. The first locomotives produced were eight for the GWR's standard gauge Birmingham & Shrewsbury line. BP soon had a particularly good export business, sending locomotives to European countries

and India. Holland and Sweden were particularly good customers.

The name Beyer Peacock became most famous in connection with the Garratt articulated locomotive. Herbert William Garratt had obtained a provisional patent for this engine in 1907, but it was BP's draughtsman Sam Jackson who turned Garratt's rather sketchy proposal into a practical locomotive. The first two engines were supplied to Tasmanian Government Railways in 1909. One has to acknowledge the enterprise of the Tasmanian authorities in purchasing these totally untried machines. Garratt, and later his widow, retained the patent rights, receiving a royalty of £2 per ton of locomotive until expiry of the patent in 1928. The name 'Beyer-Garratt' was then introduced to differentiate the company's products from those of other builders. In fact Beyer Peacock only built about two-thirds of all Garratts, many of the remainder being constructed in Belgium and Germany.

Although Garratts became a major product of Beyer Peacock, the greater part of the company's output was conventional locomotives. The name Garratt, spelt with an 'a', is not to be confused with traction engine builder Richard Garrett of Leiston, Suffolk, which firm, surprisingly, Beyer Peacock took over in 1932.

In 1955 the works was so busy building

Garratts that a large number were sub-contracted to North British, yet the steam locomotive market collapsed so quickly that two years later they had built their last. The company were later involved in Diesel and Diesel-electric locomotives. Part of the works was converted to the building of 'Hymec' Diesel-hydraulic locomotives. The Western Region of British Railways ordered 101 of these, but unfortunately BR abandoned hydraulic transmissions in favour of Diesel electric. Although Beyer-Peacock diversified into non-locomotive products, Gorton Foundry finally closed in 1966, having produced about 8,000 locomotives.

Six miles west of Manchester stood the Bridgewater Foundry of Nasmyth, Gaskell & Co., later Nasmyth Wilson. The son of an Edinburgh painter, James Nasmyth had, like Richard Roberts, served under Maudslay in London. He set up as a general engineer in central Manchester in 1834, two years later moving to Patricroft where his works was built adjacent to the intersection of the Bridgewater Canal and the Liverpool & Manchester Railway.

Nasmyths produced a wide variety of machine tools, locomotives, and from 1843, their most famous product, the steam hammer. Nasmyth claimed the hammer was his own invention, but the French engineer Bourdon also has a good claim. The first locomotives were three for the London & Southampton Railway and sixteen broad gauge 2-2-2s for the Great Western in 1841. Out of the 1,307 locomotives built after 1873 1,188 were sent abroad, an unusually high proportion.

James Nasmyth had sold enough steam hammers by 1856 to retire to Kent, and took no



Art Nouveau foliage supports a Tilbury 4-4-2 tank engine, small steam hammers and, on the right, some kind of press in this 1901 advertisement. Of particular interest is the outstanding quality of the process engraving work.

The Fletcher Jennings plate.



further part in the firm. Nasmyth Wilson & Co. operated until 1939, when the works became a Royal Ordnance Factory. A small part of the works remain, now let out as 'units'.

Lancashire had a number of other builders active in the earlier days. William Fairbairn in Manchester made a wide range of iron products. The locomotives were mostly of Stephenson's and Bury's design. About 370 engines were built of which, unusually, very few were exported. Rothwell of Bolton built 200 locomotives between 1831 and 1864. Hick, Hargreaves (Bolton), Cross & Co. (St. Helens), and Mather, Dixon (Liverpool) were also active in the 1830s and 40s.

The Manchester area was also home to Gresham & Craven (Salford) and Davies & Metcalfe (Romiley). Both firms specialised in boiler fittings, brake equipment, injectors etc. supplied to other builders. The Superheater Company had its works in Trafford Park, and the Budenberg Gauge Co. in Altrincham, recently removed to Irlam.

Some other English builders

The company **Kerr Stuart & Co.** was rather a late-comer in locomotive building. Originally founded in Glasgow as iron and steel merchants and suppliers of railway equipment, they were evidently dealers rather than manufacturers. They purchased one of their suppliers, Hartley, Arnoux & Fanning of Stoke-on-Trent in 1892, Kerr Stuart then transferring their business to Stoke. The key man became George Glass Hooper, who made big investments at the California Works, building new, well-equipped shops. Locomotives were the main output, but carriages and wagons were also built.

The company developed a range of small contractors' locomotives notable for their extreme simplicity and reliability, the best sellers being the 'Wren', 'Tattoo' and 'Brazil' types. A Tattoo type engine was supplied to the Corris Railway in 1921 and is now Edward Thomas on the Talylllyn line. Narrow gauge locomotive builders were handicapped in making engines for stock owing to the multiplicity of gauges in use. Even the nominal 2ft. gauge had several variants.

From 1904 onwards Kerr Stuart built a number of rail-motors for various railways, the GWR taking twelve rail-cars in 1906. In the 1920s a number of larger locomotives were constructed, including in 1929, six 4-8-0s for the Buenos Aires Central Railway.

The firm were pioneers of I/C engined locomotives, the first being built as early as 1904. After K. W. Willans joined the company in 1927 (ex-Sentinel), the company produced geared steam locomotives, a range of Diesel locomotives and, in 1929, a Diesel lorry. The Diesel locomotives were mostly equipped with McLaren-Benz engines and many were sold for industrial use both at home and abroad.

Engineering historian L. T. C. (Tom) Rolt served part of his apprenticeship with Kerr Stuart, described in his autobiography *Landscape With Machines*. Locomotive frames were cut out by chain-drilling, the resulting holes joined up by hammer and chisel. R. J. Mitchell, designer of the Spitfire aircraft, also served his time with Kerr Stuart.

The company's end came suddenly in 1930. Kerr Stuart's chairman was involved in another company which had failed, resulting in the liquidation of Kerr Stuart. Although the goodwill, rights, drawings, etc. were acquired by Hunslet, many of Kerr Stuart's customers transferred their business to Bagnall's in nearby Stafford.

Stafford's Castle Engine Works was founded by William Gordon Bagnall together with, briefly, John Hill, in 1875. The first locomotive was built the following year. S. T. Price joined the company in 1877, becoming works manager, then in 1891 E. E. Baguley came from Hawthorn Leslie, making improvements and designing a range of narrow gauge saddle tank engines.

Baguley left in 1902, later setting up his own firm in Burton-on-Trent. He was replaced by W. S. Edwards as chief draughtsman, who had previously been with Kerr Stuart, and eventually became Managing Director. W. G. Bagnall died in 1907, after which the firm's history of ownership becomes too involved to detail here, but eventually became part of English Electric who transferred production to their Robert Stephenson & Hawthorns' works at Darlington.

The firm's early products were small and light engines for use by contractors, quarries and ironworks. A feature of Bagnall's early engines was the peculiar 'inverted saddle tank' which passed underneath the boiler and smokebox. The later engines, designed by Baguley, were more attractive-looking, many of these being fitted with his circular marine-type boiler, similar to the 'Sweet Pea' model design. Baguley patented his own valve gear, a variation of Walschaerts but without the return crank. After Baguley's departure this gear was modified by Price to avoid the payment of royalties. In addition to locomotives, the company supplied a wide range of railway equipment.

From the 1920s many much larger locomotives were built to export orders, such as four 2ft. gauge 2-8-2 tender locomotives supplied to the Mysore Ironworks in 1950. A fifth engine built in 1957 became Bagnall's last steam locomotive. In the 1920s petrol-engined locomotives were built, and from 1933 Diesel locomotives were constructed under license from Deutz of Cologne. From 1951, as Brush-Bagnall Traction Ltd., large numbers of Diesel-electric locomotives were built, and a range of Diesel-mechanical and Diesel-hydraulic engines.

In all, Castle Engine Works produced around 1,600 locomotives, though in making comparisons it should be borne in mind that most of these were very small engines.

In what used to be the county of Cumberland, the **Lowka Works**, Whitehaven was founded as early as 1763 by one Thomas Heslop. It became Tulk & Ley in 1830, building locomotives from 1840, the first being five for the Maryport & Carlisle Railway. Their most famous products

were eight engines of Crampton's rear-driver design of which six were 4-2-2s and two 2-2-2s. In 1847 the works was taken over by Fletcher, Jennings & Co., a firm probably best known today as the supplier of *Talylllyn* and *Dolgog* to the Talylllyn Railway in 1865-66.

The works later become the Lowka Engineering Co. Ltd., specialising in four and six-coupled tank locomotives. A serious fire in 1912 brought about closure of the works, by which time a total of 247 locomotives had been built.

Henry Stothert started his locomotive building concern in St. Philips, Bristol, in 1837. Four years later he was joined in partnership at the Avonside Ironworks by Edward Slaughter. **Stothert & Slaughter** supplied two engines of Gooch's 'Firefly' class for the western end of the Great Western, the Box tunnel not then being completed. More engines were later supplied to the GWR, but this market largely dried up when the railway opened its own works at Swindon. Fortunately Stothert & Slaughter were able to supply both passenger and goods engines to the Bristol & Exeter and South Devon railways.

In 1851 Stothert left to take charge of a shipyard the company had started at Hotwells, Bristol. The locomotive business then became Slaughter, Grunning & Co. until 1866, when it became the **Avonside Engine Company**.

The company continued to build engines for the broad-gauge routes in Devon, Cornwall and South Wales. Most of these engines were rather inelegant saddle tanks. From the 1860s Avonside supplied locomotives to many home railways and also built up a considerable export trade, engines being sent to Scandinavia, Australia, Canada, India and South America. Like Vulcan and Yorkshire Engine, Avonside produced locomotives to Fairlie's patents, building more of these articulated engines than any other British builder, and were sent all over the world. One of these engines, James Spooner, was supplied to the Ffestiniog Railway in 1872.

Avonside suffered financial difficulties in the later years of the 19th Century. Edwin Walker, of the Bristol firm Fox, Walker, joined Avonside, liquidating the company and re-establishing it, which then concentrated on small tank engines for industrial customers. In 1905 Avonside moved to new premises in Fishponds, Bristol.

After the First World War the company continued to build the smaller types of steam and I/C engined locomotives, but a number of heavier engines were built for overseas. Avonside became another victim of the inter-war depression, going into liquidation in 1934 having completed nearly 2,000 engines. The goodwill, designs etc were, again, acquired by Hunslet.

The firm **Fox, Walker** had commenced operations in 1864 at the Atlas Works, St. George, Bristol, building mostly small tank locomotives of which a considerable number were exported. Around 410 engines had been built up to 1880 when the firm was taken over by Thomas Peckett, becoming **Peckett & Sons**, who continued manufacture of similar locomotives. Their last engine was a 3ft. gauge 0-6-0 for a Mozambique sugar estate.

●To be continued.

LETTERS TO A GRANDSON

M.J.H. Ellis

gives further insights into the origins of the metre.

● Number 84

Dear Adrian, In my last letter, I did not quite reach the end of the story of how the length of the metre was determined. The arithmetic is really quite simple, although I think your poor father might run out of fingers. I give the following example using imperial measure, as obviously, metric measure could not be used, because the whole purpose of the calculation is to determine the length of the metre *in terms of some pre-existing system*. The French savants actually did their calculation in the old French system of length, the unit of which was the 'toise'. It was the equivalent of about 6ft. $4\frac{3}{4}$ inches.

Suppose the difference in latitude between Dunkirk and Barcelona was 9deg. 40min. 36s and the arc, measured over the ground, was 668 miles 158 yards. 9deg. 40min 36s is the equivalent of 34,836 seconds of arc, and 668 miles 158 yards makes 1,175,838 yards. The angle subtended at the centre of the earth by a quadrant is 90deg., which is equal to:

$90 \times 60 \times 60 = 324,000$ seconds. The metre will therefore, by definition, subtend $\frac{1}{10^7}$ of this angle; that is 0.0324 seconds.

We now have:

An angle of 34,836 seconds is subtended by an arc 1,175,838 yards long. So an angle of 0.0324 seconds is subtended by an arc of:

$1,175,838 \times (0.0324/34,836)$ yards, which works out to be 1.0936143 yards.

This equals 1.0936143×36 inches = 39.370114 inches. That is, the metre measures 39.370114 inches. There is this important point that I want to make clear, although I expect that you have thought of it already. It doesn't matter at all whether the 'inch' which we have used is accurate or not in relation to the Imperial Yard Standard. You could just as well have used a system of measurement derived from the cowrie shells used by a tribe of cannibals, provided that the measure used for setting out the length of the metre was concordant with that used for doing the survey of the arc of the meridian.

On 7 April 1795 the National Convention passed a law, which adopted metric weights and measures. The metre was to be given physical form in a platinum end-bar, but this could not be done before its length had been calculated. The survey was not completed until 1798, after which its length was worked out to be 0.513074 toises. Its rectangular cross section measured 25.3 x 4 millimetres. This doyen of the metric system was known as the Mètre des Archives. Subsequent surveys have shown that the Mètre des Archives was actually 0.2mm shorter than it was meant to be. However, it was more important for there to be a recognised standard, than for it to have been of any particular length; and when, later on, it was found expedient to replace it with a 'line' standard, the length was reproduced as accurately as possible.

The Conference Diplomatique du Mètre which met in 1875 recommended that an international

body, the Bureau International des Poids et Mesures (BIPM) should be set up. This was agreed, and its headquarters was established in the Pavillon de Breteuil in Sevres, on the outskirts of Paris. It was decided to create a new metre standard, in the form of a line-bar made of an alloy of platinum with 10% iridium. To combine the greatest strength with the minimum of weight, the bar was to have an X-section. The composition of the first castings turned out to be unsatisfactory, but in 1882 a batch of fresh castings, from metal supplied by Johnson Matthey & Co. was made, and gave no trouble. The best of these was selected to be the new International Prototype Metre and in 1889 it was proclaimed to be equal in length to the Mètre des Archives to within one part in a million.

The International Prototype Metre now replaced the Mètre des Archives, and reigned supreme as international standard for more than seventy years. Comparisons of the standard bar and the replicas, which had been made for the use of other countries and as sub-standards showed that they were remarkably stable. On the contrary, the Imperial Standard Yard proved to be shrinking at the rate of about a millionth of an inch per year. I can only suppose that in this respect the platinum-iridium alloy was superior to the bronze of the British standard. The shape of the International Prototype Metre is as shown in the sketch (fig 1). The graduations are on the face 'A', and so lie on the neutral axis. As a matter of interest, I have calculated how much the bar is worth as bullion. It comes to £34,200 (approx. US\$60,000) for the platinum alone.

As we shall see, it became possible eventually to define the metre in terms of immutable physical constants; the velocity of light, and the wavelength of the light emitted by the atoms of a selected chemical element. It was, to the best of my knowledge, a case of cutting the coat to suit the cloth. The International Prototype Metre remained the physical realisation of the theoretical ideal metre, defined in mathematical figures. Quite the opposite, in fact, of the definition in fine round terms, which its progenitors had in mind in 1795.

Early in the 19th century Jacques Babinet, a French mathematician, suggested that a standard of length might be established which made use of

the wavelength of light of a particular frequency. However, it was not until September 1889 that Michelson and Morley (whose famous experiment cast grave doubt on the existence of the 'aether', through which electro-magnetic waves were supposed to be transmitted), published in the American Journal of Science a paper entitled "*On the feasibility of establishing a light wave as the ultimate standard of length*". Michelson was invited to Paris by the BIPM, where he worked with Benoit, the Director of the Bureau during 1892 and 1893 on the problem of measuring the metre in terms of the red radiation of the cadmium atom. Michelson's interferometer (an instrument in which wave interference fringes are employed to make precise measurements in terms of the wavelength) was used in these experiments, in conjunction with 'étalons' (literally, 'standards' or 'yardsticks'). When two beams of light of the same wavelength shine along the same path in opposite directions, they interfere with one another, and give rise to standing waves, which can be seen as alternating dark and light bands. When counted, the fringes give a precise measure of distance in terms of the wavelength of the light. The function of an étalon was to generate a short train of these standing waves. I had better come clean by admitting that I am not clear about how it did it. The étalons were rectangular blocks of brass, with parallel plane mirrors either fixed to opposite sides, or formed from opposite ends of them. I am sorry to be so vague about it, but my difficulty will, I hope, become apparent when I tell you that one source says that the reflecting surfaces faced one another, while another source says that both faced in the same direction. However, I know where to find out the truth of the matter and, as soon as I can give you a lucid explanation, I will do so.

At any rate, I can tell you this much to be going on with. There was a whole series of étalons each, apart from the smallest, being twice as long as the one before it. The distance between the reflecting surfaces of the shortest one was only 0.390mm., while the length of the longest was 100 millimetres.

The procedure was to start with the smallest étalon, and, by means of the interferometer, to count manually the number of fringes in the space of 0.390 millimetres. This wasn't exactly chicken feed, as there were over 1,200 of them. Once this was established, they replaced the étalon with the next larger one. This time, the work was less demanding, as it was necessary only to count the number of fringes corresponding to the departure from an exact 1:2 ratio. This process was repeated step-by-step until the 100mm étalon was reached. The distance covered could, then be extended to a full metre by using the étalon as a yard stick ten times over, the rear reflector being placed where the front one had just been. The 'metre' thus measured could then be compared with the length of the replica metre standard; at that time, of course, the International Prototype Metre. In 1906 the process was repeated, using improved étalons made from Invar, a nickel steel with a very low coefficient of expansion. The two results agreed within the limits of experimental accuracy.

Your affectionate Grandpa.

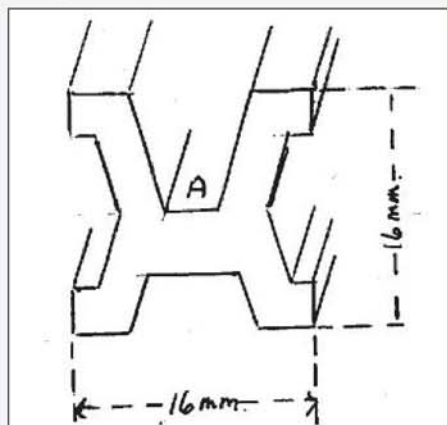


Fig 1 Section of International Prototype Metre.



CATTLE COUNTRY RAILWAY

Keith Wilson

reports on a recently built, country railway.

Looks like an American title doesn't it? But I can assure you that this project is British to the core. Building only commenced about Easter this year, amazing progress has been made. The line is just over $\frac{1}{4}$ mile at present, single track; with a passing loop about $\frac{1}{3}$ way along. This may beseem a little odd at first, but at the 'home' end lies a single-line station, where obviously passengers need to 'hall change' and re-load. At the top of a gradient of 1 in 36 (like Dainton), and since the end of the 'down' line there is at present only temporary buffer stops, it will be seen that 'time-wise' the passing loop is in about the ideal position.

When running two trains, a staff system is in operation, common sense of course; but the railways of England, Wales, and Scotland would do well to note that without the staff, crashes on single lines are no longer as rare as they were from 1926 (Abermule) until so-called 'improvements' came along.

The track is very well laid and firmly ballasted, so derailments are almost non-existent.

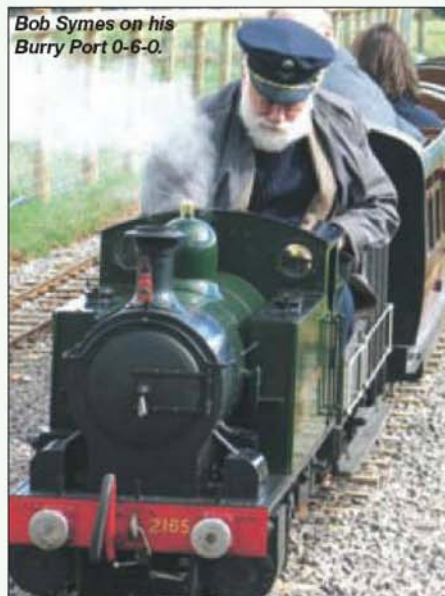
At the passing loop, points are spring-loaded to automatically direct trains into the correct line. The 'up' end of the passing loop is formed by a crossover, so the extension of this leads back onto a 4-track engine shed.

The far end of the track will be greatly extended a.s.a.p. to form a big return loop. The station will be equipped with a passing loop and turntable. Therefore, semi-continuous runs will be the rule of the road.

At present (September 2005) trains are pulled one way and propelled the other way. Visibility is good, so no risk is involved. At the far end, trains stop beside an enclosure containing some rare pigs, which, if called, will come and look hungrily at the train.

For locomotive stock, several alternatives are available. Pride of place is No. 4700 at present supported (not that it needs to be!) by 4701, both of course Great Western. I believe that allowing for power output, size (12ft. 6.5in. over buffers) and accuracy to prototype they are probably the finest and largest Great Western locomotive models (modest blush) in existence. I had personal experience of power output when I discovered that 4701 could propel a

Bob Symes on his Burry Port 0-6-0.



1 x 47 on track.



47xx plus Hunslet.



The non-stop, at speed (Don't ask me how fast!)

A fine Duchess.



L.N.E.R 4-4-4.



full train up the 1 in 36 with less than 40 'on the clock'. And it accelerated!

There are visiting locomotives, such as a fine Duchess, outside very accurate indeed for it fooled me, later I was told it was a bit over-scale to increase active life. A fine Hunslet is available, plus a pretty good Hymek. Present on the occasion of my second visit was the famous Bob Symes with his neat little Burry Port 0-6-0 side-tank locomotive. An L.N.E.R 4-4-4 was also present giving a fine performance.

We had various combinations of locomotives, for example on one train were, in order, Bob Symes' tank, the 4-4-4, and 4701 (2-8-0) the other train had 4700 only, all giving good performances. But, although I 'sez it meself', by far the finest runs were double-headed 47s.

On two occasions the line was clear for a non-stop 'up' train at a good speed, the effect was simply magnificent. Thundering (there is no other word for it) past the shed and then opened out for the 1 in 36 up to the station produced a simply wonderful effect. Either locomotive could have managed the train by itself, but I wished - in vain - for a sound and cine camera, but no luck.

I am most curious as to the maximum loading for a 47xx of this gauge. I recall the time on the Severn Valley line, they put just about everything they had behind just to see the operation and hear the sound.

For the curious, the change in experience from 5in. to 7¹/₄in. gauge driving matches the change from 7¹/₄in. to 10¹/₄in. gauge, there just ain't nothing like it.

The name of the railway seems to vary. 'Cattle Country' is the name of the park/adventure centre, but the better name for the railway is the Berkeley Railway. There is, at time of writing, a small notice stating 'Oakwood' railway, this I understand is from its old location. www.cattlecountryrailway.co.uk will get you to the website, as will www.berkeleyrailway.co.uk

To visit, leave the M5 at Junction 9, turning right (if southbound), proceed to the next roundabout and turn left onto A38. On reaching a road on the right (about 9 miles), sign posted 'Berkeley', turn into it and about 200 yards on the right is the entrance to the park.

Stock is gradually being increased, at present three carriages and three open wagons are supplied so there are seats for all.



IN THE NEXT ISSUE

- New boiler testing code
- Model Engineer Exhibition competition results and reports
- Building the new OMC engine

- Cutting helical flutes on the Quorn
- Jubilee clock improvement

Plus all your regular favourites

ON SALE 3 MARCH 2006

Content subject to change



THE GORGON STEAM SHIP ENGINE

Guenter Kallies

continues his description of how he built a replica engine of that fitted to the first of the Royal Navy's steam vessels, HMS *Gorgon*.

●Part II continued from page 97
(M.E. 4265, 20 January 2006)

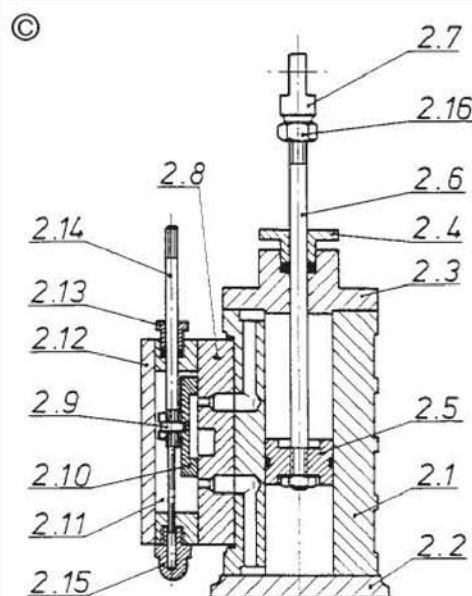
The main part of a steam engine is the cylinder (2.1) which is made from a piece of brass or gunmetal. It has to be first drilled and reamed to 15mm diameter. Then clamp to a piece of round brass or even aluminium. With this set-up the outside can be finished. Finally, the steam chest connecting face can be machined and the steam channels drilled.

The ground plate (2.2) is made similarly to the crown plate (1.3). Please remember that the attachment holes should be drilled together with the main ground plate (1.1).

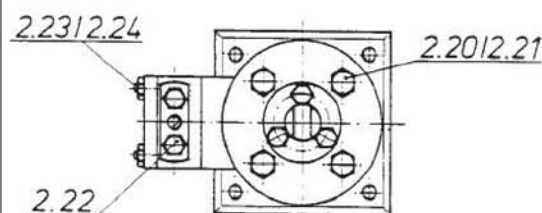
The cylinder cover (2.3) is made from round brass material the same as used for the cylinder itself. The studded gland (2.4) is easily made also from brass material. The piston (2.5) should be turned 0.5 to 1mm oversize. After it is assembled with the piston rod, it should be clamped in a collet and finished to the final dimension. The piston rod (2.6), made from stainless steel, gets an M4 thread at each end. The cross-head (2.7), turned from round stock brass, gets two plane faces which can either be machined or filed.

The steam chest is assembled from three components: the valve face (2.8), which includes the steam ports, the chest (2.11) and the cover (2.12). The method of port cutting using an end mill leaves ports with rounded ends, but this is no disadvantage. Please remember that the location of attachment holes on all components must match with the relevant holes on the cylinder (2.1). All the other small items in this group can be made without difficulty. The valve spindle (2.14) should be made like the piston rod from stainless steel.

●To be continued.



Cylinder and Steam Chest



Group No. 2: The Cylinders and Steam Chest Parts list:

Item	Quantity	Name	Material	Dimension
2.1	2	Cylinder	brass or gunmetal	Ø36 x 60
2.2	2	Ground plate	brass	40 x 40 x 5
2.3	2	Cylinder cover	brass	Ø35 x 15
2.4	2	Studded gland	brass	Ø18 x 10
2.5	2	Piston	brass	Ø16 x 15
2.6	2	Piston rod	stainless steel	Ø4 x 90
2.7	2	Cross head	brass	Ø8 x 20
2.8	2	Valve face	brass	45 x 20 x 10
2.9	2	Valve nut	brass	10 x 5 x 2
2.10	2	Slide valve	brass	25 x 10 x 10
2.11	2	Chest	brass	45 x 20 x 10
2.12	2	Cover	brass	45 x 20 x 3
2.13	2	Gland	brass	Ø18 x 10
2.14	2	Valve spindle	stainless steel	Ø3 x 70
2.15	2	Plug	brass	Ø8 x 15
2.16	4	Nut	brass	M4
2.17	8	Countersunk head screw	brass	M3 x 10
2.18	8	Hexagon head screw	brass	M3 x 10
2.19	8	Nut	brass	M3
2.20	8	Cap	brass	M3
2.21	8	Screwed rod	brass	M3 x 15
2.22	10	Hexagon head screw	brass	M2 x 10
2.23	16	Screwed rod	brass	M2 x 30
2.24	16	Nut	brass	M2

BUILDING LADY ANNE FROM THE KIT THE DIARY OF A BEGINNER

Dick Mundy

from France, gives us the benefit of his experience in a series that first appeared in *Garden Rail*.

●Part I

I started to consider the idea of changing to steam power when visitors to my railway began to come with real live steam locomotives. No doubt helped by a background in the electronics industry I was, up until then, firmly entrenched in electrified track and digital control (there could not possibly be any other way, surely?).

Was I being presumptuous or even disloyal to myself in looking at other possibilities? But those visiting steam people did seem to have a lot of fun setting up the engines and using steam oil, gas and sometimes methylated spirit. They were also able to run without having to clean the track and with weight enough to force their way through trailing points without having to set the route first. They did not seem to mind the weather either. I have seen two drivers in their anoraks outside in near horizontal rain, radio control transmitters at the high port; and with huge smiles on their dripping faces playing trains while I cowered inside afraid to get the new LGB set wet.

Then came the pleasure of helping run-in a brand spanking new Lady Anne. I got given firing up and driving instructions, got myself a bit oily and spat at by her ladyship. Then an Argyll came and performed impeccably. Astute readers will now know exactly what is developing, I think it is called being 'railroaded'.

Where to start? The first thing was to send for catalogues from the advertisers remembering to include a cheque for postage, etc. This resulted in an almost instantaneous response in some cases. Next stop was the web, more good results, and then a visit to *Expometrique* brought me in personal contact with Guy Ozanne, GEMME and a group of live steam, 45mm gauge modellers. Not for them a commercial product though but beautifully made brass models of their own creation, something that was unfortunately out of the question for me.

Studying the catalogues as they arrived, the illustrations indicated my preference would be for a locomotive with a proper motion. This promptly eliminates some of the more basic ranges. Also that gas firing would suit me as I had had some experience of that, albeit in only a passing way, and that radio control was essential. This latter because although my track is accessible all the way round, it is a long way round and provides an obstacle course. Besides how else could I sit down in the garden with a glass of wine in hand and just watch the trains go by, or bring one to a halt in Aufferville Station to pick up passengers and then start off again

without having to down the glass?

So the scene was set, a great choice is available and there is only one snag – the expense. Starting at well over 'a grand', how was I going to afford that? It exceeded my railway budget for the whole year! I did consider second hand for a while but bearing in mind my lack of steam experience I considered this a bit risky at a distance, sight unseen, and I have been disappointed before in buying so-called good condition second-hand models.

So it was back to looking at the more basic ranges although I still do not really like the look of them. However, that very day (really!) arrived a package from the UK from none other than the man who had brought over the first live steam locomotive to my track the year before! It contained a video he had made of part of the *Discovery* channel's production covering garden railways (he starred as the bridge man with a hot air locomotive – so you know who I mean). I watched it that afternoon. For what it is worth, I actually thought the overall production bordered on the pathetic but there were clips of 16 year old Oliver Clay who had built a steam locomotive from a kit. He said it took him two weeks. It ran and looked suspiciously like a Lady Anne – the very one that had spat at me earlier that summer. This could be the way to go if I give up all ideas of acquiring the much-needed passenger carrying stock for my railway, the ABCdeF, that coming year. I was not so sure about the two weeks build time though!

The excellent Roundhouse catalogue comes from a place called Doncaster, which I seem to have heard of before. Somewhere north of Swindon, isn't it? A good enough provenance I suppose. Nicely illustrated in colour, everything is clearly explained and I find I can get chassis, boiler, bodywork in separate reasonably priced chunks, and even a radio control fittings kit for later. Okay, the decision was made to go for a 0-6-0 type and stage by stage construction in case I derail at the first set of points. It is on a Tuesday that I phoned Chris Loxley at Roundhouse. The chassis kit was ex-stock and could be despatched that same day. My card details were passed over and it was now in the hands of the Post Office and *La Poste*! The feeling of euphoria at having reached and then acted upon a decision was followed by some doubts. Were the instructions going to be adequate? Have I wasted more money on 'the railway' (I have done it before)? Is it going to be within my capabilities?

I consoled myself with the thought that if I really got stuck perhaps Oliver would give me some advice and, after all, I had had all that experience of assembling Swedish flat pack furniture.

Exactly one week after placing the order a very nice man from United International Distribution (Melun base) knocked at the door and handed over a large box. It did not seem to weigh very much but the advice note he insisted I signed said

it was from Roundhouse. I could hardly wait to open it but it had to wait until late evening as I was involved in other things and when I got around to it I only took out the instruction manual. I took it back indoors and settled down to read it.

Well! All those strange sounding terms in the parts list such as "steel push rod & quick link connector", "weigh shaft", and "lifting arms with grub screws". At least I think I might be able to recognise the grub screws and washers and BA screws and nuts should not be too much of a problem. But on reading further everything was revealed on page 7 in an excellent exploded diagram and even before I got that far the detailed instructions began to make sense to me. I decided that the following day I would open up the packet and see what's what and to hell with paneling in the bath and boxing in those pipes!

It was heading rapidly towards mid-December and my unheated workshop is not a welcoming place so I decided the build would be in my office-cum-study. At least there is a length of running track along the back wall for testing if I ever reached that happy stage. I found a piece of melamine faced chipboard which, with four self adhesive soft plastic feet stuck underneath, served nicely as a 'bench' to protect my desk. It had a nice white, reflective surface so I thought it might be all right for photographs as well.

Assembly of the main frame was straightforward. I eased two holes to clear 6BA screws where burrs had been left on the inside of one of the frames, and also ran a 6BA plug tap into all the four 'two hole' frame spacers to clear burrs left by the cross hole threading. I assembled everything only finger tight to start with and then placed the chassis on an elderly plate glass mirror (the nearest thing I have to a surface plate) before tightening all screws to ensure at least parallel sides and trusting the frame spacers to keep the whole lot square. I checked that all three axles went through the bushes and turned freely – they did.

So far so good but painting the frames was the next recommended step and, as I am not renowned for my skills with a paintbrush, it meant aerosols and therefore hunting around for suitable boxes to make some sort of spray booth. I did remember to prime the buffer beams at the same time as the frames. These were to be eventually painted buffer beam red, but I forgot all about the wheels. These, according to the instructions, were to be fitted next but there is no mention of painting at this stage. I suggest you do them with the frames and buffer beams. At this stage decisions have to be made. What is the final colour to be? What colour should the discs of the wheels be? The same as the body work or plain black? I decided that they should be black as the black spray paint was out, same as the frames and therefore less noticeable. Have I made a mistake? Perhaps

green would have been visually better, which is the colour I chose for the bodywork - but what shade of green remained undecided until I went to Bricomarche and saw what they had got in the way of aerosols.

This painting business is something of a pain. I examined the chassis and it looked all right apart from one or two little places that will probably be out of sight but I gave it another spray anyway for luck and then left it alone. The spray can said to wait at least ten minutes between coats and only to apply very thin coats. After all the coats of paint I now had to wait at least 24 hours for it to dry 'to the heart' according to the instructions (in French) and that meant going back to boxing in those pipes and paneling the bath. Oh dear! But by now it was 6pm, it was getting a bit late and a glass of wine would help. Yes, it did help and I gave the wheels a thorough wash with paraffin to degrease them.

The thought of masking off the active parts of the wheels filled me with horror so I touched them in by brush. After all, I told myself, if they are going to turn round all the time, and it is an outside framed locomotive, is anyone likely to notice my lack of skill with the paintbrush? I hoped not. So I sprayed some of the aerosol into a bottle top and used the brush, working quickly because the paint did go off very quickly in my container - this was not an economical way of using spray paint.

Now the chassis looked okay and it was time to fit the wheels. These were such a tight fit on the axles that some easing was needed. I eventually found a length of $\frac{1}{4}$ in. dia. silver steel. I held this at an angle in the woodworker's vice and forced the wheels on one at a time and then push them up and down until a reasonably easy movement was achieved. This allowed me to get the wheels onto the axles in between the frames. I then fitted the cranks, right hand leading, using a large engineer's clamp to force fit them onto the axle stubs and put in the fixing screws. This seemed a reasonable time to set them to my chosen 45mm gauge, which was easy with the distance gauge supplied in the kit.

Things were going so well and quickly that I started thinking about the boiler kit. Was Roundhouse shutting down over Christmas? Should I order the boiler kit now?

I started fitting the coupling rods and this caused me a lot of aggravation. My fingers are not as nimble as they were and I found the repeated fitting and removal of the shouldered crank pins and their associated washers, while I eased the holes in the coupling rods to smooth the motion, very frustrating and time consuming. Perhaps I need not have bothered about ordering the next stage just yet as the present stage of assembly was taking long enough. It took me about four and a half hours including the last two hours or more spent clearing the last little bit of binding on the centre, left hand side wheel.

This latter problem was found by chance. I had the chassis upside down while fitting the coupling rods in order to provide easy access to the wheels to allow me to turn them manually. However, my final test was to roll the chassis up



The wheels fitted to the frame and coupling rods in place. The frame has been painted as have the buffer beams which are in the background.

and down a short line of track only to find that it would not.

Very careful examination revealed that the left hand side coupling rod was binding on the top of the centre wheel crank pin in the forward direction, so this was eased slightly until completely free movement was achieved in both directions. I suspect that my elongation of the driving wheel holes was not truly parallel but veered slightly downwards at the front end and the reversed but right running weight was pulling the coupling rod down into firm contact with the centre wheel crank. The moral of this story is not to expect locomotives to run upside down!

I checked that I had remembered all the washers and then the handbook said to move on to the cylinders but before I did that I fixed on the buffer beams, which were by now painted red, and the centre buffers. These are not part of the kit but I had obtained some from Ron M. Grant previously, and surprise surprise, he even supplied a three link coupling chain. It was also nice to find that Roundhouse provide an excess number of screws as spares, so very useful for all of us 'fingers and thumbs' people! The ears on the chassis carrying the tapped holes for fixing the buffer beams needed some slight bending with a pair of pliers to set them square with the sides to prevent distortion of the buffer beams. I opened up the fixing hole to 6BA clearance to suit the buffers I had but then found that the fixing stud projected so far in that it covered another hole. I decided to leave that until I found out what the other hole was for.

The cylinders came already pre-assembled in the factory with the slide valves fitted on top and only needed to be bolted on to the chassis.

When it came to fitting the cylinders this is where I deviated from the script. According to the book of words the cylinders are secured on to the frames with slotted, cheese head 6BA x $\frac{3}{16}$ in. screws fitted from the inside. Because of the angles involved for screwdrivers I found this impossible so I reverted to 6BA hexagon head screws and I also thought back to my one, supervised experience of running a Lady Anne when the left hand cylinder could be seen to be oscillating because of a loose screw. At this time I also removed the buffer beams as the end projections made it difficult to manoeuvre the chassis. They would be refitted later.

My limited stock of BA sized screws revealed some $\frac{1}{2}$ in. steel ones, which I cut down to slightly longer than $\frac{3}{16}$ inch. The threaded ends were cleaned up and used with a 'crinkle' washer instead of the slotted cheese head screws

provided. These were much easier to install and I hoped the extra washers would help in locking the cylinder in place. A drop of the 'not too strong' grade of Loctite might be appropriate here but I had not got any - for the future perhaps. I noticed that the hexagon head screw and washer partially cover up two additional holes in the frames behind the cylinders - I hoped these would not be needed later on to locate some other fitting.

So now it was on to the parts with all the strange names and everything

went fairly well with the exception of fitting the return cranks where the 'book of words' needed following very carefully indeed. I found some binding when I fitted the eccentric rods and I took all the bits and bobs off again down to the coupling rods only to find it worked smoothly again. A bit annoyed with myself, I started reassembling everything again checking for smooth running at every stage. I found it tended to bind again on the left-hand side when I refitted the eccentric rod. I pushed the chassis up and down a short length of track looking closely at all the moving parts and found the problem was a bit of distortion on that eccentric rod making it a tight fit on the expansion link at full forward. A twist with the pliers in the wrong direction seized it up completely so a reverse twist with the pliers plus a bit more and *Voila!* I guess I must have put a slight bend in the metal when I was easing the hole with a needle file for a nice loose fit around the shouldered screw. My heavy handedness was at fault, no doubt. There was no problem at all on the right hand side and it all went together like a dream. I only hoped I had got those return cranks in the right order.

Radius rods next the book said. I did file off the projecting screw thread, which forms the slide block in the expansion link because the book says so. However, for the life of me I could not see why it was necessary, as there appeared to be plenty of room for a projecting thread. In fitting the radius rod at the valve rod end I had a clearance problem in the hole for the 6BA screw. I did not check it first. I found that although the laser cutting of parts gives accurate dimensioning, it can leave behind some nasty burrs and most of those parts needed cleaning up. It would be worth checking all pieces first before trying to fit them in their final position. In this case I had to undo the radius rod end in order to clean out the hole at the other end.

Now it was a matter of fitting the lifting mechanism which all went together quite easily apart from my full size fingers having to deal with 10BA screws and nuts. So I resorted to watchmakers screwdrivers and tweezers and just using the spanner to tighten the lock nuts finally by screwing them up tight and then winding back a $\frac{3}{4}$ turn to allow free play of the motion. I misread the instructions for setting the valve gear into mid-position and tried to set both sides simultaneously. So I read the instructions again and then found it to be fairly straightforward. Follow the instructions to the letter I reminded myself for the 'umpteenth' time.

●To be continued.



The Meadows & Passmore mainspring winder is based around a robust cast iron frame.



The winder is supplied with ten steel retaining springs as standard having the bore size range of $\frac{7}{8}$ in. to $2\frac{3}{8}$ in. diameter.

MAINSRING WINDERS

Ian Beilby

discusses the final tool in this informative series.

Part III continued from page 82 (M.E. 4265, 20 January 2006)

This mainspring winder, supplied by Meadows & Passmore, is different to the other winders described in the previous two articles in two specific ways. Firstly the clock movements' own winding arbors are recommended to be used as winding arbors for the springs and, secondly, steel retaining rings or shells are provided to constrain the springs until the springs are safely wound or unwound.

The winder can be seen in **photo 1**. You can see this winder is provided with a steel spindle and handle fitted to a cast frame. The spindle also carries a substantial steel ratchet wheel and double click. Directional control is provided by a pivoting lever placed with easy access at the front of the frame. With the lever depressed the spindle rotates anti-clockwise and with the lever raised, it rotates clockwise.

The spindle is provided with a 4-jaw collet chuck, which is capable of gripping clock arbors ranging in size from 2.5 to 5 millimetres.

An adjustable hooking bar is provided with two attachments for loop and hole-end

mainsprings. Ten steel retaining rings are provided in graded sizes from $\frac{7}{8}$ in. to $2\frac{3}{8}$ in. internal diameters, **photo 2**.

The size of the retaining rings and the capacity of the collet chuck thereby limits the sizes of arbors and springs that can be accommodated with this winder.

With the retaining rings, $2\frac{3}{8}$ in. is about sufficient for the largest spring encountered in the average domestic clock, and likewise the square on the average domestic clock does not usually exceed 5mm across the flats.

As it is intended that the winder chuck grips the winding square of the clock mainspring arbor, the suppliers do not recommend the winder for use with very large or tapered arbors.

Using the existing clock arbor as the winding arbor is a good idea, as long as the winding squares are in good condition. This is one of the few reservations that I have with this winder. The winding squares on some antique clocks can become very badly damaged over the years. The use of incorrectly sized keys leads to burrs being thrown up, and the squares becoming disfigured. A common remedy is to flatten the burrs and re-file the square to shape. If this repair has been carried out badly, or has been carried out several times in the past, this can lead to some very oddly shaped winding squares, rectangular and tapered, which may be difficult to grip firmly in the

chuck. To overcome this problem, the suppliers recommend saving and using good, undamaged spare arbors from old redundant movements.

I have personally made a set of winding arbors of differing diameters, all provided with parallel squares suitable for use in the collet chuck. The arbors are tapped 4BA, and steel countersunk screws are used to form a hook.

The arbors can be seen in **photo 3** and for anyone with a lathe they are not difficult to make. However, if the repairer does not possess a lathe this could create a problem.

I do not wish to put anyone off this winder by mentioning this potential problem, but if a set of arbors was provided by the manufacturers this would alleviate any concerns or restrictions that this may cause.

Again, strong gloves and eye protection should be used at all times when working with mainsprings. In order to remove a spring from a barrel, a retaining ring slightly smaller than the internal diameter of the mainspring barrel is chosen and placed behind the collet chuck on the winding arbor, the slot in the retaining ring should be facing the barrel. The square of the winding arbor should be inserted into the chuck and the collet firmly tightened.

The barrel should be offered up to the winding arbor and the eye in the centre of the spring caught on the hook of the arbor, **photo 4**.



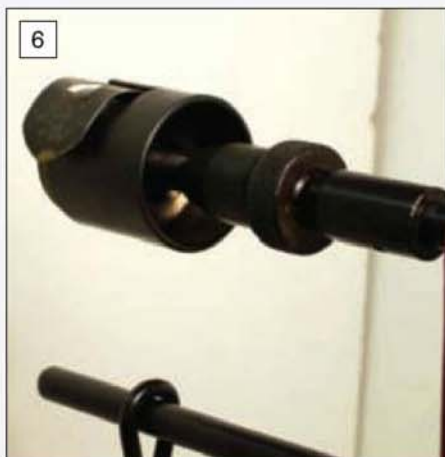
The set of winding arbors made by the author to suit this particular type of mainspring winder.



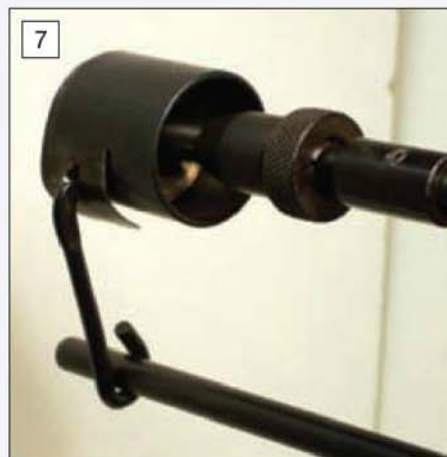
The first stage in removing a spring from its barrel is to offer the eye in the centre of the spring up to the hook on the arbor.



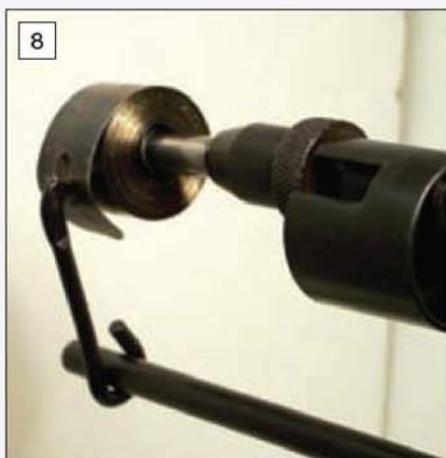
5
Wind up the spring and insert the retaining ring. 1in. of the spring should protrude from the slot.



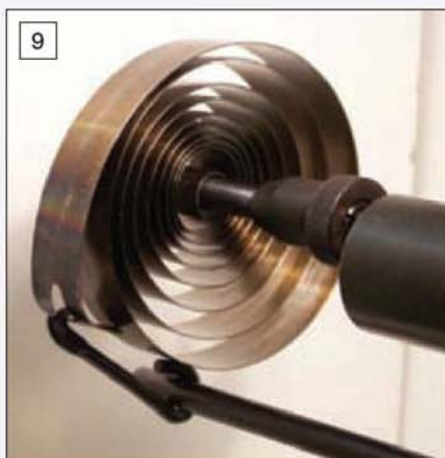
6
Unwind allowing the retaining ring to restrict the spring. The barrel can then be removed.



7
Engage the hook attachment in the hole in the tail of the spring.



8
The spring can now be wound up to allow the retaining ring to be removed.



9
The spring can now be unwound using a gloved hand to guide it if necessary.



10
When rewinding a spring, first wind it up using the hook then fit the retaining ring.

Gripping the barrel firmly, the spring is wound-up until the retaining ring will enter the barrel. The retaining ring should be inserted into the barrel, thereby containing the spring, and rotated until the tail of the spring protrudes through the slot in the ring for approximately 1in., **photo 5**.

Still securely gripping the barrel and holding the spindle handle, the ratchet lever is depressed, reversing the direction of the spindle and allowing the spring to unwind within the retaining ring in a controlled manner.

Once the steel ring restricts the spring, the spring can be unhooked from the wall of the barrel and the barrel removed, **photo 6**.

In order to remove the spring from the retaining ring, the hook attachment is fitted to the hooking arm and the hook inserted into the eye in the tail of the mainspring, **photo 7**. The spring should then be wound up sufficiently to free the retaining ring, and the ring withdrawn behind the collet chuck, **photo 8**. Holding the spindle handle, the ratchet should be reversed and the spring allowed to unwind slowly. The unwinding spring may require guiding with a gloved hand, **photo 9**. The spring can then be safely removed from the winding arbor.

To rewind the spring the same procedure is followed only in reverse order.

The retaining ring is first placed behind the chuck with the slot facing the spring. The square of the winding arbor is then firmly tightened in the collet chuck and the eye in the centre of the spring caught on the winding arbor.

The eye in the tail of the spring is hooked onto the hooking attachment of the hooking bar, and the spring carefully wound up until the diameter of the spring can be contained by the retaining ring. The retaining ring is placed over the spring, containing the spring and allowing the tail of the spring to protrude from the slot in the ring by approximately 1in., **photo 10**.

The spring should be kept to the front edge of



11
Once the spring is safely contained by the retaining ring the clock barrel can be refitted.



12
Engage the barrel hook on the hole in the tail of the spring, wind the spring up slightly to release the retaining ring and pull it clear.



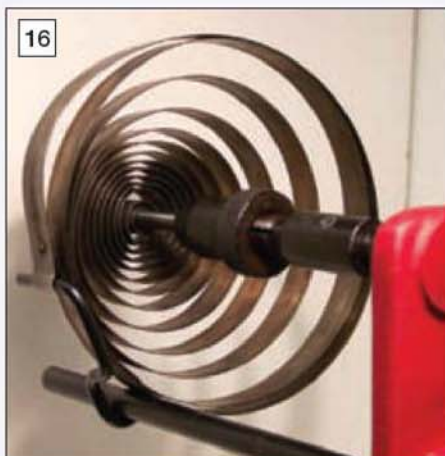
13
The spring can then be unwound into its barrel. Note the gloved hand.



14
This form of mainspring winder is well equipped to deal with clamped loop-ended springs.



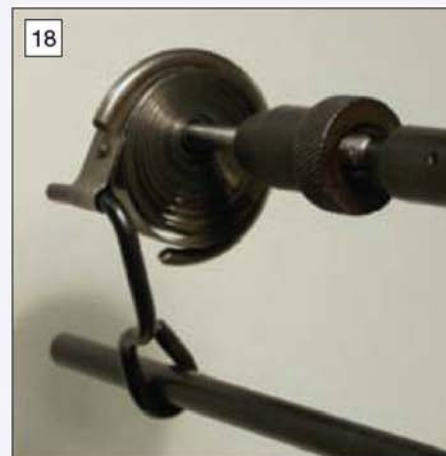
15
By winding the spring up slightly the clamp can be released.



16
The spring can then be unwound under controlled conditions.



17
Rewinding is best carried out using a gloved hand to control the spring.



18
The clamp ring can then be refitted to the spring if required.

the ring in order to make it easier to engage the barrel hook when inserted into the barrel. The direction of the spindle should then be reversed allowing the spring to unwind into the retaining ring. When the spring is fully constrained by the ring, the hook in the tail of the spring can be removed.

The barrel is then offered up to the contained spring, and the barrel manoeuvred until the eye in the in the tail of the spring is hooked onto the hook in the wall of the barrel, **photo 11**.

Keeping a firm grip on the barrel, the spring is then wound up until free of the retaining ring. The ring is then withdrawn from the barrel, and placed behind the collet chuck, **photo 12**.

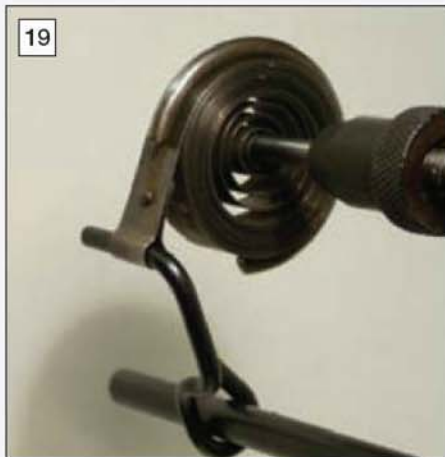
Still gripping the barrel firmly, and holding the spindle handle, the ratchet is reversed and the spring allowed to unwind slowly into the barrel, **photo 13**. The inner coils of the spring should be disengaged from the arbor, before finally removing the arbor from the collet chuck.

The procedure for unwinding new or clamped loop-ended springs is very simple with this winder. Of the three winders that we have looked at this is the only one specifically designed to accommodate these springs. However the use of the actual movement arbor as the winding arbor with some American and German clocks could prove to be rather difficult. A lot of these

movements have their main wheels rivetted to the arbors, and there could be the possibility of the wheel getting in the way or becoming damaged.

As already mentioned, the suppliers suggest using spare arbors from redundant movements, and I think this is the better alternative. The wheels can be removed and the arbors retained specifically for use with the winder.

The winding arbor is tightly held in the chuck and the inner coils of the clamped spring caught on the hook of the arbor. The loop attachment is fitted to the hooking bar, and inserted into the loop of the spring, **photo 14**. The spring is wound up until small enough to remove the C-clamp,



19
Unwinding the spring then allows it to expand into the clamp.



20
For new barrel springs retained by wire first fit the spring to the arbor and wind up slightly.



21
Gripping the spring tightly fit the hook attachment as shown.

22



Now wind the spring up until the tension on the retaining wire is released.

photo 15. Still holding the spindle handle, the ratchet lever is depressed, reversing the direction of the spindle, and the spring allowed to unwind in a controlled manner, photo 16.

To rewind an unwound spring, tightly secure the arbor into the chuck and hook the centre of the spring onto the hook of the arbor. The loop attachment is fitted to the hooking bar and inserted into the loop of the spring. Guiding the spring with a gloved hand, photo 17, the spring is wound until it is small enough to fit the C-clamp, photo 18. Still holding the spindle handle, reverse the direction of the spindle until the spring is fully contained by the clamp, photo 19. The spring can then be removed from the winder.

When releasing new barrel springs contained by wire, a suitable arbor is tightly held in the spindle chuck and the centre coils of the spring caught on the hook of the arbor. The hooking attachment should be fitted to the hooking bar.

Using a gloved hand, the spring is firmly gripped with the eye in the tail of the spring

facing you, and in a downward position, photo 20. Firmly gripping the spring in your hand, the spring is wound up until the inner coils tighten and it is possible to insert the hook on the hooking attachment into the eye in the tail of the spring, photo 21. Should the spring, at this stage, slip in your grasp the wire would still contain the spring. Once the tail of the spring is securely hooked onto the hooking attachment, the spring should be wound up a little more to free the restraining wire, photo 22, which can then be removed, photo 23.

Holding the spindle handle, the ratchet is reversed, and the spring allowed to unwind in a controlled manner as shown in photo 9.

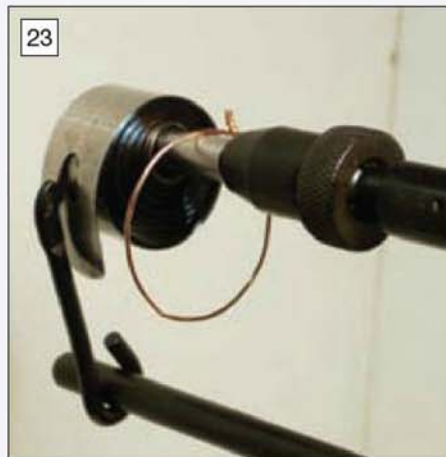
Without doubt when removing or inserting barrel springs, by containing the springs in steel retaining rings this winder provides a very safe means of working with mainsprings. The spring is contained virtually all the time, reducing the risk of accidents and harm to the operator to a minimum.

This model of Mainspring Winder is obtainable from: Meadows & Passmore Ltd, 1 Ellen Street, Portslade, Brighton, East Sussex BN41 1EU; tel: 01273 421321; fax: 01273 421322; website: www.m-p.co.uk; email: sales@m-p.co.uk

The winder comes with a complete set of illustrated instructions and helpful advice fully detailing the operation of the winder.

In conclusion I sincerely hope this review of mainspring winders will have been of help to model engineers who repair and restore spring driven clocks and, of course, to anyone contemplating buying a mainspring winder. I hope it has been especially helpful to those, who perhaps up to now have avoided working with springs, or wound their springs by hand.

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The wire can now be removed with the spring safely retained by the arbor and hooking arm.

I know a lot of competent repairers possess an understandable apprehension when it comes to working with springs. I hope that by describing the different models available, and more importantly trying to explain some of the practical points not always apparent when viewing the tools in a catalogue, any fears or misconceptions may have been explained away. All three winders perform their task perfectly well, only differently.

As I have tried to stress in the articles, irrespective of which winder you use, great care should be exercised at all times when working with clock springs. Inert on the workbench, springs pose no problem whatsoever, however when being manipulated by the repairman they take on a totally different persona, and must be treated accordingly.

As long as you work with the springs correctly, using appropriate tools and common sense, you should experience few problems. As I am sure you do not need reminding, the greatest dangers to the operator when using any tools or equipment, are complacency and a lack of concentration.



BUILDING A REAL GAS LAMP

Richard Gomersall

takes a break from a major locomotive project to make an atmospheric addition to his house.

I started my current locomotive project, a 7.25in. gauge German DRB class 2-10-0 Kreigs locomotive, back in 1993. I commenced by gathering information, taking photos and dimensions from the preserved engine at the Nene Valley Railway, then on to preparing drawings, pattern making and finally beginning to cut metal in September 1997. The chassis has now been air tested and the boiler, cab and most fittings are completed, so I needed to stop and have a painting session. Painting is my least favourite job and it is at times like this that you can pause for thought. Do you ever stop to ask yourself why go to all this time, trouble and expense? Aren't most hobbies there to allow you to escape from this mad world? Or have we already gone mad and making model trains is an outward manifestation of some form of dementia! Either

way, our hobby seems to be preferable to many other hobby activities I have noted.

For my last birthday, I was given a book entitled *Images of the Spen Valley*, which is full of photos taken of local Yorkshire towns, mainly from the period up to World War Two. A lot of features are still instantly recognisable, but a lot of features have now gone. These include trams, Methodist chapels, picture houses, railway stations, horse muck in the road and a wide selection of gas street lamps; some with wonderfully ornate lantern tops. Also of note is the lack of motor vehicles and traffic congestion creation measures. Obviously not all these items are desirable but I thought a wall mounted gas lamp on the corner of my house would make an attractive feature.

It is possible to see gas lamps preserved in a good number of private local properties and on many pubs, alas all I have seen have electric illumination. However, a great place to view a wide selection of gas lamps is the Keighley & Worth Valley Railway, especially at Oxenhope Station, happily these are all lit correctly, by gas. Being a

'The Lamplighter'

by Robert Louis Stevenson

*My tea is nearly ready and the sun has left the sky;
It's time to take the window to see O'Leerie going by;
For every night at tea time and before you take your seat,
With lantern and with ladder he comes posting up the street.*

*Now Tom would be a driver and Maria go to sea.
And my papa's a banker and as rich as he can be;
But I, when I am stronger and can choose what I'm to do,
O'Leerie, I'll go round at night and light the lamps with you!*

*For we are very lucky, with a lamp before the door,
And O'Leerie stops to light it as he lights so many more;
And O! before you hurry by with ladder and with light,
O'Leerie, see a little child and nod to him tonight!*



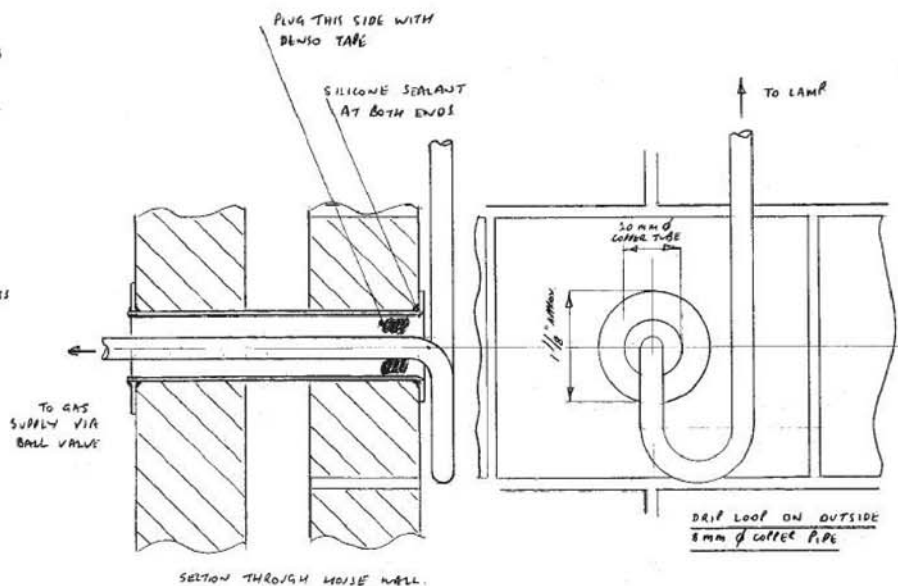
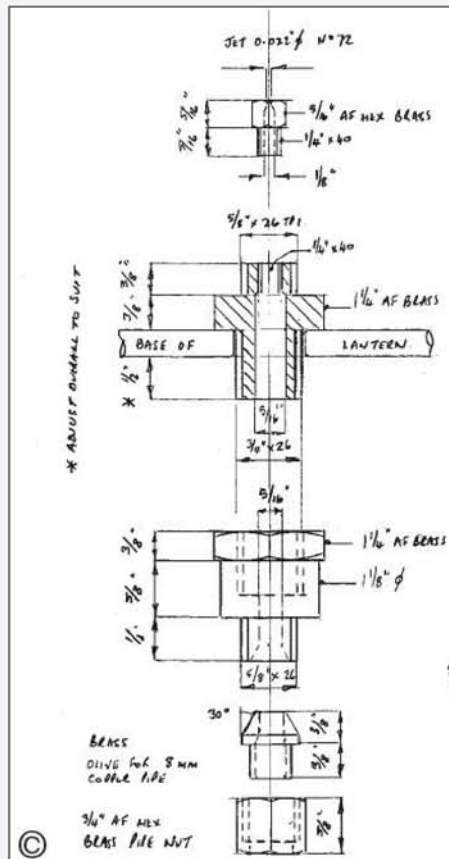
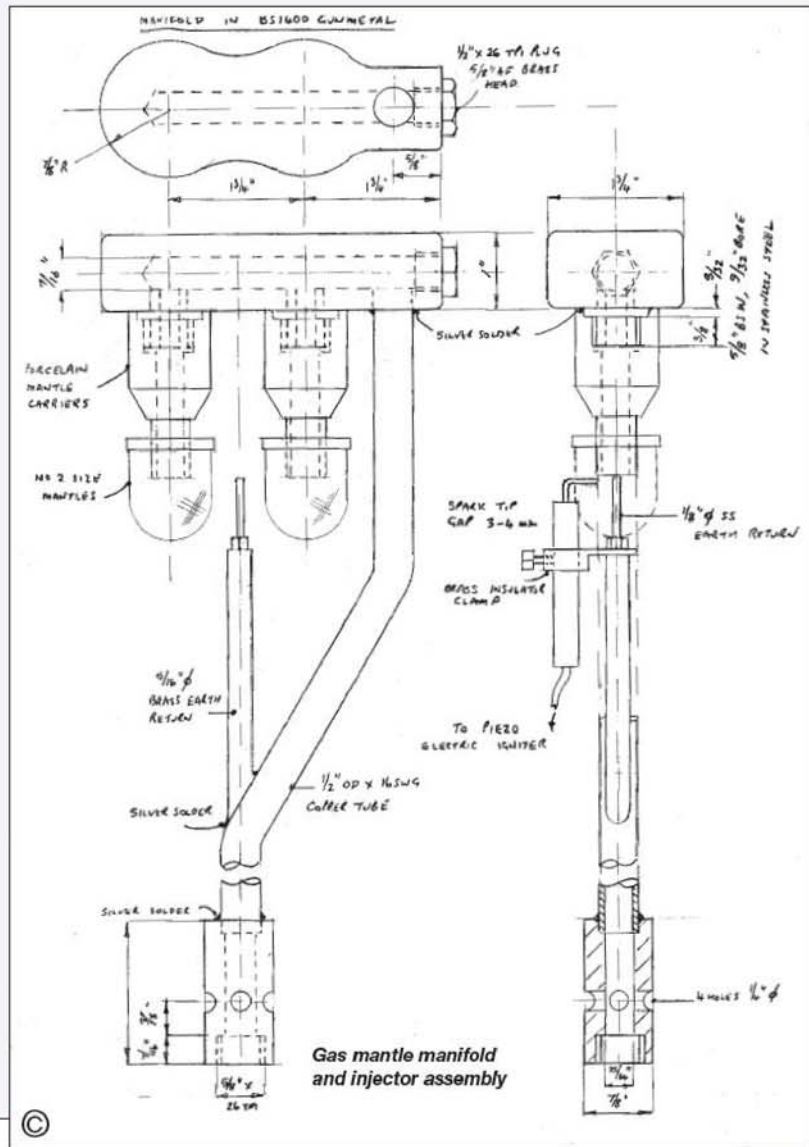
Completed lamp makes a pleasant and unusual addition to the house.

former slave at Haworth, I sought out their gas lamp expert, and he allowed me access to measure and take details of the gas/air injector and mantle carriers which were used by a former Bradford manufacturer called Foster and Pullen. He also pointed me in the direction of a small business that has been set up to make good replica lantern tops. Mantles and ceramic holders are still available at caravan/camping retailers.

Armed with this information, I ordered a lantern top and mounting bracket (called a frog) then drew out the required mounting bracket and gas fittings and consulted a gas engineer for advice on routing the gas pipe into the house and fitted a piezo electric igniter between the mantles. So a little pattern making, turning, silver-soldering, pipe bending, fabrication, wall bolt fixing and later the installation was ready for a return visit by

the gas engineer to connect and test my pipe run for leaks. All was pronounced well and the lantern was lit for the first time on November 24, 2001.

By modern day standards the light from two Number 2 size mantles is rather feeble, but is useful and pleasant nonetheless. The lamp is lit by opening a gas valve, conveniently placed inside a kitchen cupboard, below the hob unit and pressing the igniter button - I do not have to send for O'Leerie in Robert Lewis Stevenson's Poem 'The Lamp Lighter' to come with his ladder and lamp! Now I must get on with that painting job.



©



A view of the digital readout scale fitted to the tailstock of the author's lathe to give a direct indication of barrel position.



This photo shows how the digital readout slide bar is mounted on the front of the tailstock barrel.

CHANGING HINDSIGHT INTO FORESIGHT

Mick Appleyard
continues his advice on speeding
up production on the lathe.

*Part VII continued from page 93
(M.E. 4265, 20 January 2006)*

Picking up the theme from last time, in the first instance make the upper section of the stud on the long side, as this needs to be set to length during slide bar alignment.

Now make a bracket that will clamp to the tailstock housing to carry the read out section of the slide bar. Mine is made from a piece of $\frac{1}{16}$ in. thick brass, 2in. wide and bent almost to right angles (about 100 degrees). Position this and drill and tap one hole to hold it, I used 5BA set screws. Bolt the plate onto the housing and hold the slide bar into position with a pair of toolmaker's clamps. (A note here, there is a barrel oil nipple in the middle of the housing which had to be removed, I will oil the barrel from the outside).

Now retract the barrel and position the free end of the slide bar against the spacer and mark the height. Wind out the barrel to full length and position the free end of the slide bar up to the spacer and check that the height is the same. If it

is not tilt the slide bar on its bracket and repeat until both heights are the same. Now remove the spacer and machine it to length, drill and tap the end 5BA and replace it. Bolt the free end to the spacer and extend the barrel to full length, then using a square off the bed check that the slide bar runs parallel with the barrel and clamp in place. Drill through the mounting plate and mounting bracket and fit a 5BA bolt. Drill the other hole in the tailstock housing mounting bracket and fit the set bolt. Confirm that the barrel operates freely. The tailstock is now ready for use. (photos 1, 2 and 3).

One other job, which may require a little modification, is the screw cutting indicator alignment mark. This normally sits on the right hand side of the saddle and the alignment mark may become obscured by the slide bar. I have overcome this by making a little bracket, which bolts onto the indicator with the alignment at 90 degrees - photos 4 and 5.

Putting all this all to work

My first exercise was the need to manufacture sixteen, big end bolts. The stock material was $\frac{5}{16}$ in. diameter. The bolt head diameter was 0.275in. and its length was $\frac{1}{8}$ inch. The bolt shank diameter was 0.141in. (4BA) and its length

was 1 inch. The lathe needs to be fitted with a quick-change type tool post. We will be needing to record some readings during the machining so make up a chart with two headings 'Dial gauge readings inner dial' and 'Dial gauge readings large dial' and under that have four rows- 'Roughing cut'; 'Finishing cut 0.275in. dia.'; 'Finishing cut 0.141in. dia.'; 'Length of thread on bolt'.

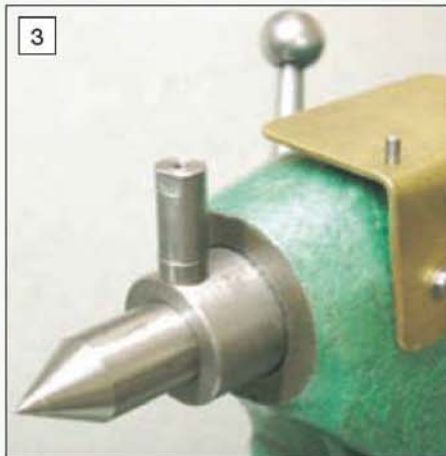
First bolt

1: Roughing tool - face off stock and set slide bar to zero. Touch the tool on the stock and set the dial gauge to zero. Apply 0.075in. cut using the dial gauge, and machine for a length of 0.990 inches. Record the dial gauge readings under 'Roughing cut' (both inner and outer dial readings).

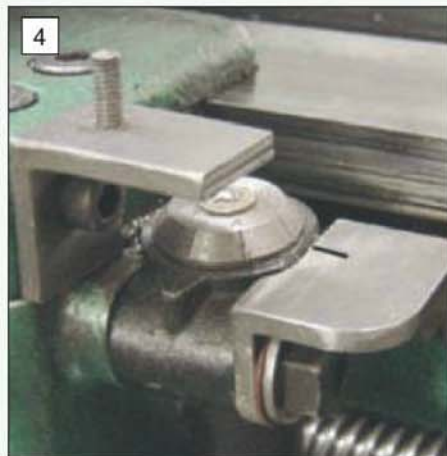
Change the tool.

2: Finishing tool - touch the tool onto the stock and apply a 0.010in. cut and, when the tool starts to cut, zero the slide bar. Machine the head diameter slightly longer than the length required. Measure the diameter and calculate the cut needed to get to finished size. Apply the cut using the dial gauge and machine. Re-measure to confirm the 0.275in. diameter. Record the dial gauge readings (both inner and outer dials).

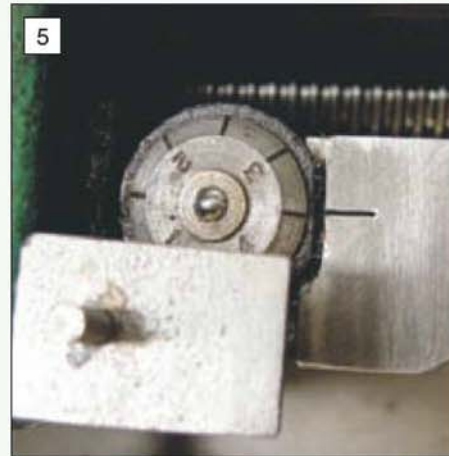
3: Touch the tool onto the stock (shank dia.)



Another view of the tailstock barrel pillar that supports the slide bar.



Additional brackets on the lathe mean that the screw cutting indicator is difficult to read.



An additional zero line has been added to give a clearer view.



Photographs 6 to 11. The digital readout scales fitted to the author's milling machine showing details of the fixing brackets.

apply a 0.005in. cut and, when tool starts to cut, zero the slide bar. Machine the shank diameter for a length of 0.995 inch. Measure the diameter and calculate the cut needed to get to finished size. Apply the cut using the dial gauge and machine for a length of 1in. and face off. Re-measure to confirm the 0.141in. diameter. Record the dial gauge readings (both inner and outer dials).

4: Offer up the die holder to the bolt and wind out the tailstock barrel until it touches. Zero the slide bar. Thread shank to length rotating the die holder while winding in the tailstock barrel to desired length.

Align the parting off tool to the end of the bolt and zero the slide bar, move saddle along $1\frac{1}{8}$ in. plus the parting off tool width and part off.

Now, for the second bolt I have an adjustable square set to the length of bar that is to protrude from the chuck. The chuck is released and the bar pulled out to the required length.

Second bolt

Change the tool.

5: Roughing tool - face off the stock and set the slide bar to zero. Move the tool forward to the clock reading for the roughing cut as in (1) above and machine for a length of 0.990 inch.

Change the tool.

6: Finishing tool - move the tool forward to the dial gauge reading for the final finishing cut to give 0.275in. dia. as in (2) above and apply the cut. When the tool starts to cut zero the slide bar. Machine the head diameter slightly longer than the length required.

7: Move the tool forward to the dial gauge reading for the final finishing cut to give 0.141in. dia. as in (3) above and apply the cut and when the tool starts to cut zero the slide bar. Machine the shank diameter for a length of 1in. and face off.

8: Offer up the die holder to the bolt and wind

out the tailstock barrel until it touches. Zero the slide bar. Thread the shank to length rotating the die holder while winding in the tailstock barrel to the desired length.

Align the parting off tool to the end of the bolt and zero the slide bar, move saddle along $1\frac{1}{8}$ in. plus parting off tool width and part off.

I produced five bolts without the need to measure and taking only three cuts each. At this point I lost my nerve and thought I had better check sizes. I should not have worried as all were within 0.001 inch. You will find that once the dial test gauge has been set you will get consistency every time cutting out the need to take multi-cuts and measurements.

Added benefit

As previously stated, if one thinks about the digital read out bar installation method and make it such that the bars can be easily removed they can then also be used on the milling machine giving you an added benefit. My installation is such that each bar is held in place on one 4BA and one 5BA stud. Both bars can be removed from the lathe and fitted to the milling machine in two minutes. My 8in. bar is used on the longitudinal axis, the 6in. on the cross-slide axis and the dial gauge denotes quill travel- **photos 6 to 11.**

These three modifications to my lathe have transformed my production rate such that I would estimate that I save at least 30% on production time, the only draw back is the fact that the machine appears a little cluttered, I just need to get used to it. I cannot urge you too strongly to carry out these modifications.

Alternative tailstock depth measurement

An alternative to having a digital readout unit on

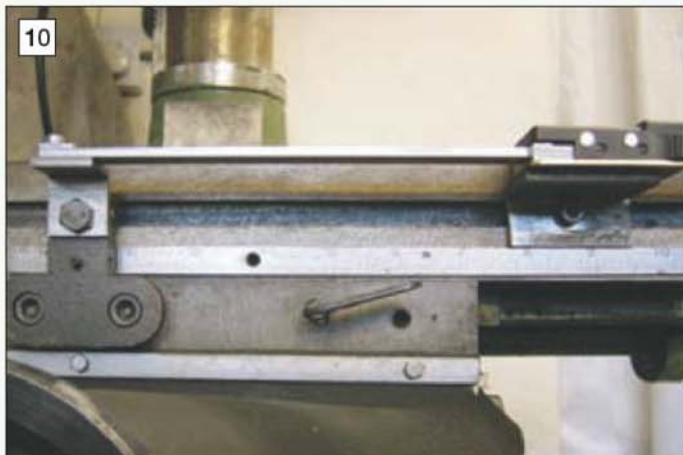
the tailstock is to scribe a rule on the tailstock barrel. First I fitted my drill chuck and retracted the shaft until I could just feel it starting to eject the chuck. I then marked the shaft adjacent to the housing with a scriber. I repeated this with my other chucks. My aim was to have the first calibration line just before the chuck is ejected. Also mark a line for the bottom of the rule.

Unscrew the tailstock barrel until just before the screw becomes disengaged and mark the end line. The tailstock barrel was then removed and fitted into the chuck and set to run true. A V-shaped tool was ground and fitted horizontally in the tool post. The tool was aligned with the rule bottom mark and the first position mark. The tool was then advanced into the tailstock barrel by 0.005in. and the saddle run along the bed to broach the line. Two other lines were broached $\frac{1}{16}$ in. apart to form the rule quarters, halves etc.

The tool was refitted as normal and aligned with the first position mark. The vertical line was made, by rotating the chuck. The saddle was then advanced $\frac{1}{16}$ in. using a dial gauge and the next division made. Look at your 6in. rule to see the length of each line as a guide. Continue until all calibration marks are made and remove the barrel from the chuck. Number the 1in. divisions using a number stamp. Using a fine oilstone with plenty of oil, go over the divisions to remove all burrs and refit into tailstock. You now have a tailstock barrel with a direct reading rule. The whole job took less than an hour - **photo 12.**

Applying a 0.0001in. cuts on the lathe compound slide (alternative method)

If your lathe is well used with wear on the cross-slide nut and you are having trouble applying



Above: The rule markings on the lathe tailstock.
Right: Setting the top-slide round to 5deg. to provide a fine feed facility.

those small cuts below 0.001in. then set your top-slide round to 5 degrees. Now instead of applying the cut using the cross-slide apply the cut using the top-slide, at 5 degrees this will give an approximate ratio of 10:1, so move the slide 0.010in. to obtain a 0.001in. cut - photo 13.

Thread lengths

When threading a piece of bar in the lathe get into the habit of counting the turns of the die holder during threading. This way you can easily repeat the thread length on another item.

Aligning thin flanges in the lathe chuck

If you are having problems getting thin flanges to run true in the chuck, first set the flange in the chuck gripping it lightly. Now fit a drill chuck into the tailstock and open the jaws fully

and clean the front face. Position and lock the tailstock and extend it until the drill chuck touches the flange, lightly push the flange to be machined into the lathe chuck until it is fully in contact with the face of the drill chuck. Tighten up the lathe chuck and remove the tailstock. Your flange should now run true - photo 14.

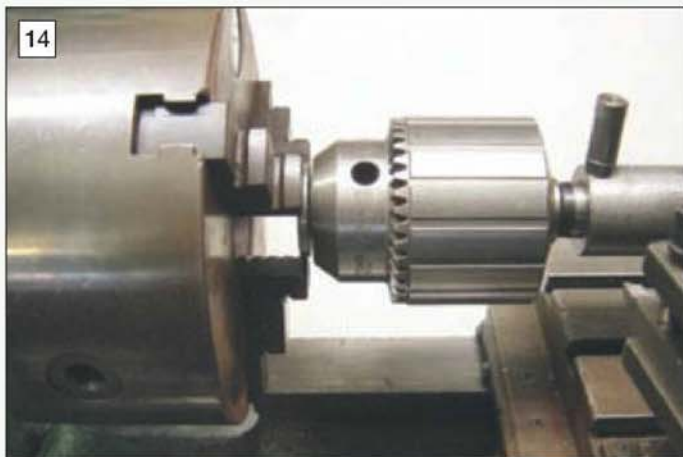
How to hold short multi-diameter items in the lathe chuck

Do you have problems holding those short multi-diameter items, where the section to be gripped and machined is the smaller diameter and the length of the item is less than the length of the lathe chuck jaws? If so proceed as follows.

Select a piece of suitable round bar; its diameter should be equal to or greater than the largest diameter of the item being machined.

Cut it to the length of the section to be gripped, now set it in the lathe chuck and face off, drill and ream to the diameter to be gripped. Remove from the chuck and cut it down its length on one side only and deburr. You will now have a collet, which can be fitted over the section to be gripped. Set it up in the lathe chuck with the cut in the collet, between two of the chuck jaws and tighten. Your item is now held and should run true. I have also used this method for holding tapered items. A point to consider here is that if the wall thickness is too thick the collet will be hard to tighten. In this case split the sleeve into two halves or, alternatively, machine additional slits into the side of the collet that do not break into its bore at 120deg. to the first cut. Keep the collet for further use - photo 15.

To be continued.



Using the tailstock drill chuck to set a thin component square to the main axis of the lathe.



A selection of special collets made from bright mild steel for different jobs and carefully stored for future use.

GWRs FINEST - THE 57xx PANNIER TANKS

Peter Rich

extols the virtues of the go anywhere, do anything, 0-6-0 tanks, built in their hundreds.

Some years ago a friend asked me: "Which do you think was the best locomotive the Great Western ever built?" I didn't really have to give it a great deal of thought because over the years I had come to the conclusion that the honor must go to C. B. Collett's 57xx pannier tanks. If it wasn't the best then it must have run a very close second to whatever was.

I hear you shout: "What about the Kings and Castles?" Yes, yes! I know they were excellent locomotives and all that, but they were really only intended for main line passenger work. In those days if the railway had to rely on that kind of traffic it wouldn't

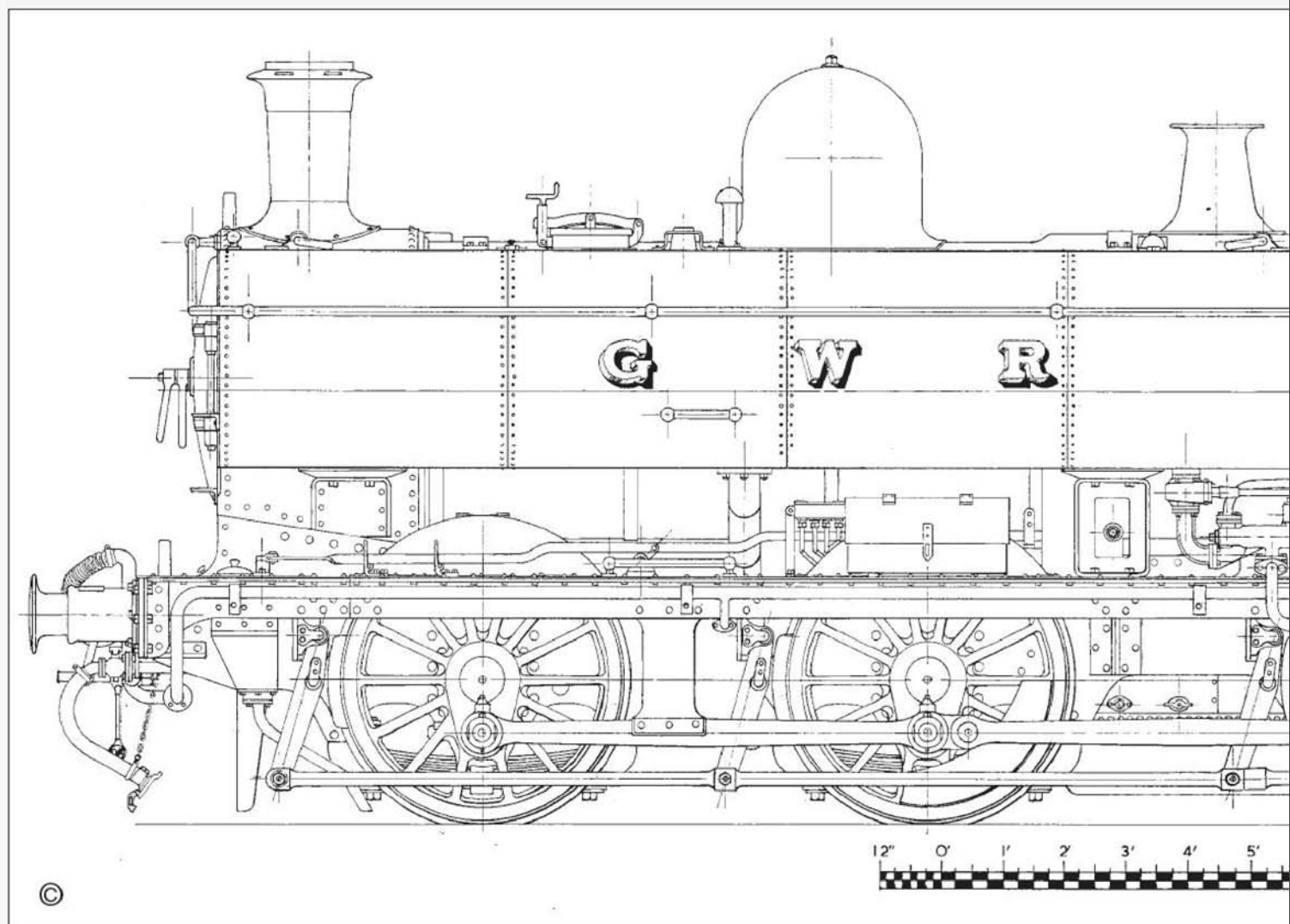
have done at all well. Unlike today the railways then were common carriers, which could and would convey virtually anything you cared to put on it.

The types of trains then reflected what the railway was about. Yes, you could see single load trains such as a 1,000 tons of coal, but you would also see mixed trains of assorted wagons conveying almost everything you could think of. I have seen it written that in 1910 (95 years ago) you could put a sack of potatoes on a train in South London in the morning and it would be delivered in North London in the afternoon. I doubt if that is possible these days but this was what railways were about in those days up to World War II.

When they came on the scene in 1929 the 57s fitted in very well. It was a go anywhere, do anything locomotive and I have seen them on every type of train from express passenger down

to humble shunting. Whatever they were engaged on they always seemed to acquit themselves very well. Years ago there was a Manchester to Swansea Express, usually a 12 coach train, which used to change engines at Pontypool, where a 41xx or 56xx class usually took over for the run to Cardiff. However, I have seen a 57xx working this train, probably because one of the other types was not available. I do know if they had any regular express working on the Western but when required to deputise for a failed engine they weren't averse to having a go. I don't know that they could often be seen sprinting along the main line between Newport and Cardiff with local passenger trains, occasionally with express headlamps up.

With regard to South Wales it is often related about the importance of the 0-6-2 tank locomotives in working the valley trains. However, I can tell you that as far as Ebbw



Junction Depot and the Monmouthshire valleys are concerned it was the 57xx and the 42xx locomotives that had the real effect. In fact, I can recall only one Monmouthshire valley passenger train, working in to an out of Newport, which was regularly allocated to a 56xx 0-6-2 tank, everything else being covered by the 57xx with the exception of the Brecon passenger trains which were worked by the Dean Goods 0-6-0s or 22xx and later by Ivatt 2-6-0s from the Brecon end. Even these trains had succumbed to the 57s by the late 1950s.

Most of the Western Valley passenger trains were allowed only a 30 seconds stop at each station and I well remember, in the 1950s, standing on Bassaleg (local Welsh pronunciation is Baise leg) Junction Station and seeing the 57s running in two or three coach passenger trains, which believe you me was enough for them on the Western Valley banks. They would be approaching under full power almost to the platform end when the driver would shut off and bring the train to a screeching halt. Doors would fly open, passengers board or de-train, and the guard would then race along the platform making sure doors were closed. Thirty seconds after arrival he blew his whistle and with a toss of a

green flag would step smartly into his compartment lest he be left behind. Station work was always very slick and smart. The train would blast out of the station on its way to its next stop at Rogerstone a mile away. You must appreciate the Valley Lines had to handle a lot of coal traffic in those days and the passenger trains couldn't afford to hang about hence the smart working.

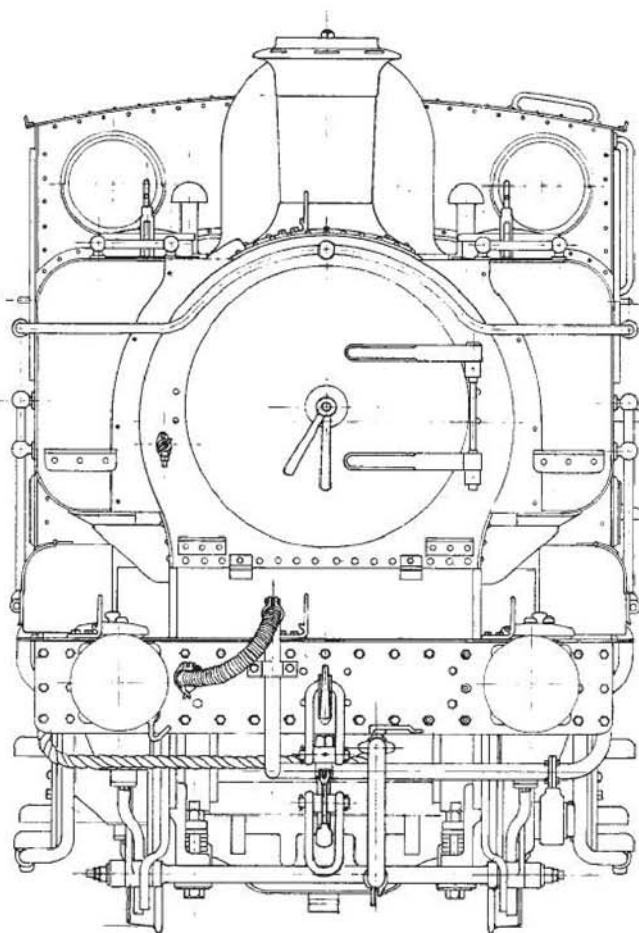
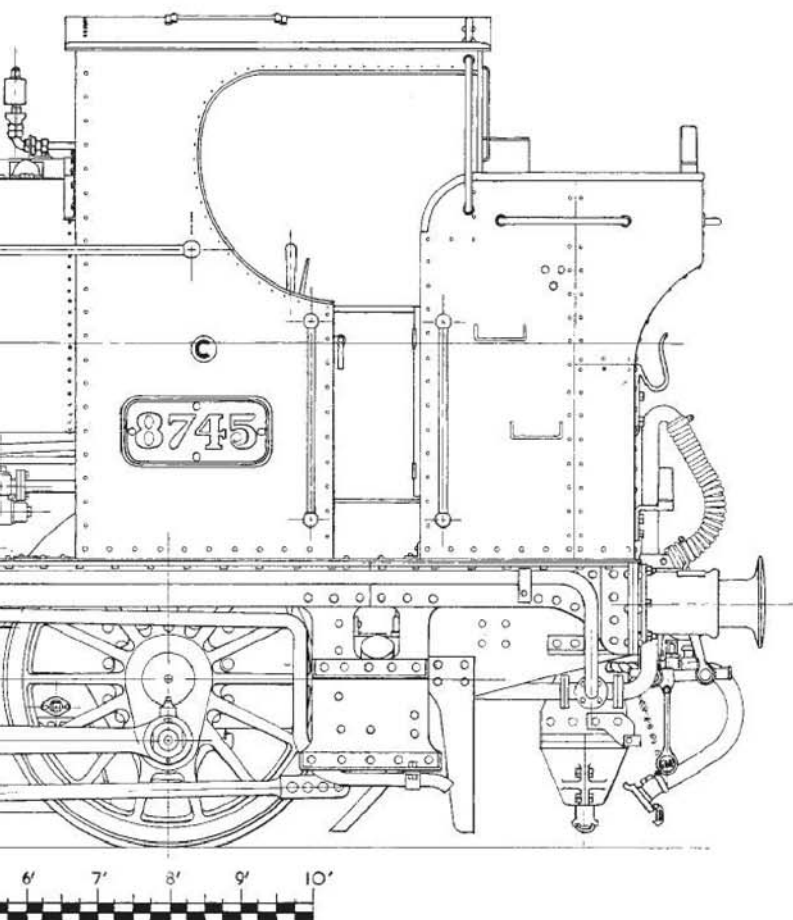
When they were introduced the Western had not built any 0-6-0 tanks for 24 years. However, the 57s were virtually a continuation of the 2721 class of 1897, albeit it with pannier tanks rather than saddle tanks, and could trace their ancestry back to the 645 class of 1872. So by 1929 the design had been well tried and tested. Basically Collett took the 271 design and updated it in accordance with current practice but rather surprisingly did not include superheating even though the earlier classes had been modernised with it under Churchward's regime years before. The boiler did include two super heater flue tubes at the top corner of the firebox but this was to prevent cracking at this point. Between 1929 and 1950, 913 of these boilers, now designated B4 groups (K) and (L), were built, and it is interesting to note that when the earlier members of the class were cut up in the late 1950s some

of their boilers were overhauled and became stationary boilers at a number of depots. Although B4 boilers were found on other classes such as the Dean Goods, I believe these particular groups were confined to the 57s.

The class eventually totaled 863 engines, which is probably the best measure of their usefulness. Although generally known as the 57xx class, they were subdivided into four classes, the 57xx, 67xx, 8750s, and finally the 97xx class.

The 57xx series built as seen in my drawing were fitted with the Dean type cab and totaled 300 engines: No's 5700 to 5799, 7700 to 7799 and 8700 to 8749. Originally the vertical cabside handrail on these engines was typical of Dean designs in that it was fitted in line with the cab side sheet, but from about 1946 were fitted with cabside doors as with the later locomotives, and the handrail was moved onto the cab side as shown.

In 1933 Collett modified the design of the cab now giving it rounded corners at roof level making the roof and part of the cab side in one sheet. The first of the modified engines was number 8750, giving its number to the class series, which became the most numerous at 552



P. J. Rich.

Basic dimensions of the 57xx class were as follows:-

Cylinders	Dia. 17 in. Stroke 24in.
Boiler	Barrel 10ft. 3in. Dia. 4ft. 5in. Pitch 6ft 11in.
Firebox	Length outside 5ft. 4in.
Tubes	2 off, 5 ¹ / ₈ in. dia. 233 off, 1 ⁵ / ₈ in. dia.
Heating surface	Tubes and Firebox total 1178 sq. ft.
Grate area	15.3 sq.ft.
Boiler pressure	200 psi.
Wheels	4ft. 7 ¹ / ₂ in. dia. new
Wheelbase	7ft. 3in. + 8ft. 3in. total 15ft. 6in. Leading overhang 5ft. 6in. Trailing 6ft. 6in.
Total Weight	47tons 10cwt.
Tractive Effort	22,515 lb.
Tank Capacity	1,200 gal.
Coal capacity	3tons 6cwt.
Height at chimney	12ft. 3.0625in.
Power class/Route availability	C Yellow

units and were contained in the number series, in the order introduced, 8750 to 8799, 9711 to 9799, 3700 to 3799, 3600 to 3699, 4600 to 4699, 9600 to 9682.

In the 67xx series up to 6749 had the earlier Dean type cab while 6750 to 6779 had the 8750 type and the reason for the 67s to be regarded as a sub-class is that they were intended only for shunting and local transfer duties and were thus fitted with three link couplings and steam brake only. Most of this series were allocated to South Wales for the Docks and Steel Works lines.

The 97xx class consisted of just 11 locomotives, 9700 to 9710, which were fitted with condensing gear for working over the Metropolitan lines in London. They were also visually different from the others in that the rear of the pannier tanks were extended down to the running plates to form side tanks while the pannier part of the tank was cut short at the smokebox, and the associated pipe work for the condenser was very visible on top of the tank and smokebox.

These locomotives had coil springs for their rear axle which consisted of four coils for each axlebox mounted in two columns each per box with two coils per column, and were overhung thus protruding vertically into the cab. This could be disconcerting when firing these engines as your backside nearly always bumped against them. Some firemen developed a method of

firing these engines whereby they turned the blade of the shovel over while it was still inside the firebox and then swung it pendulum fashion back past their body to slide it under the coal. Thus they didn't have to turn their body and bump into the springs. When watching them firing it looked as if their hands were performing a figure of eight.

As would be expected of such a numerous class they were liberally spread throughout the system and, in 1947, of the 62 substantive engine depots only five did not have an allocation of 57s. With the exception of the 67s all were equipped with Automatic Train Control and had welded pannier tanks except for the following which had riveted tanks as shown in my drawing: 6700 to 6749, 7700 to 7724, 8700 to 8749 and 9700 to 9710. The welded tanks were made in four sections as per the riveted tanks and the weld

of the joint could always be seen through the paint even though it had been ground back.

In their Great Western days the livery was the normal Middle Chrome Green for boiler, tanks cabside and bunker. Black for the smokebox and front of the tanks and for everything below footplate level, except for the buffer beams and buffer stocks which were finished in China Red. The inside faces of the mainframes from the rear of the cylinders to the front of the firebox stay, the eccentrics and rods and crank webs were also China Red but connecting rods and coupling rods were always left bright metal. The rear of the cylinders to the inside of the front buffer beam was Black, as it was from the rear of the firebox stay to the inside of the rear buffer beam.

In British Railways days they were painted black all over except for the buffer beams and inside of the frames and depending on where the engine was overhauled the safety valve cover could sometimes be left cleaned brass. Depending where the engines were overhauled the position of the BR monogram was applied either in the centre of the tank or on the tank but at the centre of the engine. Some in the 8750 series were lined out in LNWR style lining in the early 1950s while they were engaged in working empty stock into and out of Paddington.

Up to 1950 their power and route classification was 'C' Blue but from then on, except for 9700 to 9710, they were re-classified 'C' Yellow.

My old friend Bob Gale was a fireman at Ebbw Junction (he was also a brilliant model engineer) used to tell a story about one of the new 8750s sent to Ebbw and was put on the Valley passenger trains. Bob had it but couldn't get it to steam no matter what.

After three days of tearing his hair trying to find out what was wrong with it, he went in early one day and had a good look around the engine and the only thing he found different to the rest was that the firebars in the fire great were closer together. He immediately thought that the air flow through the grate was restricted so he removed one firebar and re-spaced the rest. From that moment on that engine was a brilliant steamer. The powers that be had redesigned the firebars. Perhaps there is a message in this for us model engineers.

The last to remain in service with British Railway appear to be numbers 4646 and 4696 both withdrawn in November, 1966. Some had been sold out of service to London Transport and to the National Coal Board. Some of these lasted into the 1970s and I'm pleased to say that no less than 17 of these gallant locomotives have been preserved.



The 57s were one of the few classes of GWR locomotives that were also built by outside firms, as well as at Swindon.

Beyer Peacock
North British Locomotive Co.
W.G. Bagnall
Kerr Stuart
Yorkshire Engine Co.
Armstrong Whitworth

No's 8700 to 8724
5700 to 5749 and 7725 to 7774
6700 to 6724 and 8725 to 8749
7700 to 7724
6725 to 6749
7775 to 7799

Nemett

goes to the Model Engineer Exhibition and enjoys the variety and quality of the excellent engines on display.

● Number 9

This month I am going to review the excellent range of I/C engines exhibited at the Model Engineer Exhibition. This year we had a wide variety of different engine types on show in the various areas and classes at Sandown.

I will start off with Bill Connor's magnificent Matchless G45 racing motor cycle engine (photos 1 - 2) which was one of two engines in the competition classes. Incidentally, I must apologise for inadvertently christening Bill's Matchless G50 engine a 'Norton' in my review of the engines at the Guildford Rally. Bill's G45 engine, which many of you will have seen at various events during its construction, gained a very well deserved Gold Medal and the Edgar Westbury Memorial Trophy. The superb finish on this engine can be seen in the carburettor detail (photo 3). I look forward to hearing this engine running during the year.

The only other competition entry was Bryan Finch with his very nicely finished Amanco *Hired Man* stationary engine mounted on a traditional trolley (photo 4). This engine features a low tension ignition system (photo 5) and Bryan was awarded a Silver Medal for this very well finished engine.

Another superb and unusual model from a well known builder is the 14-cylinder Gnome Rotary Engine (photos 6-7) by Les Chenery. This engine is unusual in that there is only one cam



operated valve on each cylinder. This is for the exhaust, the inlet is controlled by a spring loaded valve in the piston which admits the mixture from the crank case when the piston descends.

Also in the loan section was a group of engines that I was personally pleased to see at the show. These were the engines designed and built by the late David Parker and kindly loaned by his son Ian. Readers may remember my feature on David last year (*M.E.* 4255, 2 September 2005). The first of David's engines is the popular 'Vega' V-twin four stroke glow engine (photos 8-9). The spark ignition flat twin is seen next (photos 10-11).

The next two photographs show two versions of the 10cc single cylinder 4-stroke that David developed for *Aeromodeller* magazine in the early 1940s. Photo 12 shows the prototype whilst the next picture (photo 13) shows the final version.

A different concept, the high performance two-stroke engine (photo 14) is shown next and completes the line up.

Another 2-stroke engine is the Edgar Westbury designed Atom Minor under construction by Peter Gain (photo 15).

Moving from the loan section to the club stands, I found some interesting engines tucked away. Hopefully this reflects a growing interest in this branch of our hobby.

The most noticeable group of engines was that by John Carter (photo 16) on the Guildford SME stand. This group included a Stentor 2-stroke and three other smaller 2-stroke engines including the diminutive 0.1cc compression ignition engine. The partially hidden engine in the photograph is a small four stroke engine.

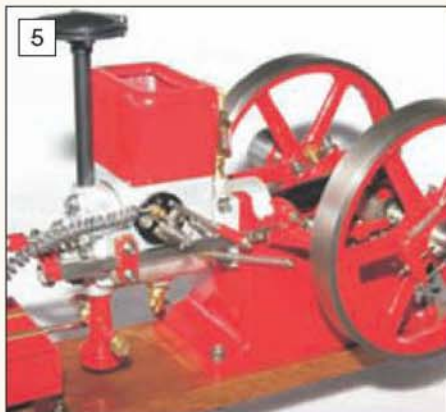
Also on the Guildford stand was the *Stone crankcaseless 2-stroke* engine by John Day (photo 17). This engine has spring loaded valves for the induction and exhaust, both of which can be seen clearly in the photograph.

On the North London SME stand, I found the neat overhead cam 4-stroke featuring toothed belt drive to the camshaft (photo 18). Unfortunately this engine was not labelled to identify the builder.

The ultimate club stand for I/C engines is obviously the I.C. Engine Builders Group who had their usual display on the mezzanine floor. I

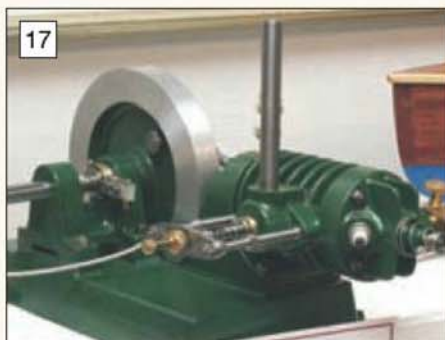
1. Bill Connor's magnificent Matchless G45 twin cylinder motor cycle engine.
2. A rear view of the Matchless G45.
3. Exquisite carburettor detail on the G45.
4. The Amanco *Hired Man* stationary engine by Bryan Finch.





5. The low tension ignition system and other details on the Amanco engine.
6. Les Chenery's unusual 14-cylinder double row Gnome rotary engine.
7. The rear of the Gnome rotary engine showing the ancillary parts.
8. The popular Vega V-twin design by the late David Parker.
9. Rear view of the Vega showing the valve gear drive.
10. The flat twin spark ignition 4-stroke by David Parker showing the distributor and valve gear.
11. The cylinder head detail on the flat twin.
12. The prototype 10cc 4-stroke engine by David Parker produced in the early 1940's
13. The final version of the Parker 10cc 4-stroke.
14. A high performance 2-stroke engine, also by David Parker.





have picked a general shot of one of the tables (photo 19) showing Eric Offens's collection of smaller engines with Ron Hankins' V12 glow engine (centre) and his Bentley BR2 rotary engine (right) also in the picture.

The next two pictures (photos 20-21) show some incredible examples of CNC machining by Glen Tomlinson (of Deltic fame). This time the parts are for his water-cooled 24-cylinder, 'H24' configuration sleeve valve Napier Sabre engine.

The final picture (photo



22) shows another view of Ron Hankins V12 engine which many of you will have seen and heard running at the Guildford rally.

I think that the collection of I/C engines at Sandown this year was a good range and the quality of all exhibits was very high. I hope that seeing this fine selection of engines will encourage more of you to try your hand at this branch of the hobby!

15. The Atom Minor 2-stroke engine under construction by Peter Gain.
16. A fine group of engines by John Carter on the Guildford MES stand.
17. Another engine on the Guildford stand, this time the unusual 2-stroke engine by John Day.
18. The over head camshaft 4-stroke engine on the North London SME stand.
19. A varied selection of engines on the I.C. Engine builders Group display.
20. A superb array of parts for Glen Tomlinson's Napier Sabre engine.
21. One of the cylinder block components for the Napier Sabre.
22. Ron Hankins magnificent own design twin overhead camshaft V12 glow engine.





Elmdon Model Engineering Society's Hunslet is regularly pressed into service.

RETUBING A BOILER

Dennis Herbert

describes how he retubed a boiler on a 7¹/₄in. *Highlander* locomotive.

I joined the Elmdon Model Engineering Society in 1994, this was not a good time, inappropriate sites, vandalism and theft had dispirited the membership and attendance was at an all time low. Things took a turn for the better when the society was invited on to the site of the

Birmingham and Midland Transport Museum at Wythall. This move brought with it an awful lot of hard work for our depleted membership, plus a firm commitment to run trains on the museum open days. This commitment was to cause a great deal of nail biting amongst the membership, as our only 7¹/₄in. gauge Hunslet locomotive was repeatedly pressed into service.

Things took another turn for the better when an elderly local gentleman attended one of the open days and quietly asked us if we would like another engine. When he said it was a

Highlander we all looked at one another speechless. He had built the locomotive himself, now age and ill health prevented him doing needed repairs and he wanted to see that it got a good home.

The following Wednesday, four of us went to his home and there on a scale track, along with station, signal box and engine shed, was this lovely hernia gauge, 8ft. long monster. As we loaded the engine on to a trailer I could only feel some sadness that countless hours of this generous man's work was now leaving his possession. I could not imagine what he must have been feeling emotionally. I have always since felt some responsibility that the locomotive always got appropriate attention.

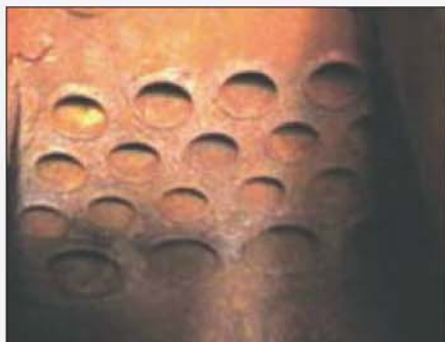
At home in my garage, I jacked up the driving wheels, put 20lb of air into the boiler and immediately wheels spun round at great speed. The valve gear was set perfectly. It was a great pity that the boiler now had to come out of the frames for a thorough examination. The boiler was steel, professionally built and carried an insurance certificate, but it had been constructed in 1986, ten years earlier.

With a trolley jack under my garage roof beams the boiler was winched from the frames, the cladding and fittings then removed. Things looked good, so I humped it on to my back yard and put the jet washer through it. I was even more encouraged when there were also no signs of any 'cornflakes' coming from the washout plug holes. After a good clean, the outside was given a coat of red lead, blanked off and the 200lb hydraulic test went perfectly.

Personally, I had no experience whatsoever with steel boilers, so the matter was raised at our next club meeting. Unfortunately, we were all pretty well in the same boat. A lot of discussion



Seventeen years of heat and corrosion!



Noticeably more corrosion at the firebox end, removing the tubes looked impossible.



The jig to bridge the tube plate.



The collet fitted in the firebox.



Applying some pressure on the drawbar.



Suitable spacers used to fully extract the tubes.



Fortunately the old tubes were removed without damage to the tube plates.



The homemade tube expander at work.



The proof of the pudding, the pressure at 160psi, not a weep.

followed and the opinion was that we would have a professional boiler examiner to test it. John Glaze, of Wolverhampton, eventually cast his experienced eye over it, repeated the hydraulic test and when the engine was reassembled a final steam test saw us with a certificate of safety.

The Black Five was an immediate favourite with most society members and up until last year John Glaze gave us repeated 14-month intervals of peace of mind. Sadly, the donor Geoff Featherstone never kept many invitations to drive, or even see his locomotive perform on a continuous circuit before he died.

We had always followed the boiler inspector's advice, that the boiler should always be blown down after use and water treatment added. This care, no doubt, went a long way to giving us long trouble free service. However, nothing lasts forever; last year saw two tubes weeping under the hydraulic test.

Some members thought that a new copper boiler was the answer, but financial reasons would have put the locomotive out of service for a very long time. John Glaze indicated that it was possible to re-tube the boiler with copper tubes, but the boiler would need an ultra-sonic test once the old tubes were removed. The new tubes would also have to be traceable copper of C101, or C106 quality.

Foremost, the tubes had eroded more at the firebox end than on the front tube plate, but the ends of the tubes were still standing proud in the firebox. These had to be carefully ground off so that they would not peen over as the tubes were extracted. This proved a bit laborious; as I wanted to be sure that the tube plate was not damaged in any way. A mini drill proved inadequate in the limited space, so James Gorton, our most enthusiastic young member, patiently stood holding my power drill as I continued the work with a flexible drive shaft.

I then made a hefty jig to go on the front of the boiler barrel; the essence of success again being not to damage the tube plates. Mild steel rod was screwed at both ends and collets made to fit exactly in the tubes at the firebox end. With the collet screwed on at the firebox end and a big nut on the rod passed through the first tube, pressure was brought to bear.

Seventeen years of seal was not easy to break, it then became a big hammer job and a drift had to be passed through the firehole. Successive sharp blows and tightening of the Whitworth nut eventually brought success, but the mild steel rod broke after the second tube had been removed. Ron Scott quickly turned another rod to the maximum diameter that would pass through the



Successful test underway.

tube, this being of EN8 quality steel it proved a total success.

A series of spacers put on the front end of the extractor allowed us to pull all the tubes completely out. Successive tubes became easier as we were able to apply WD-40 into the boiler once the first tube was out. The superheater tubes were a bit more stubborn and needed an even bigger hammer!

With all the tubes removed a small flap wheel was applied to the tube holes to clean them up, amazingly the light machining marks made at the time the boiler was constructed could still be seen. John Glaze came back with his ultra-sonic equipment, the signs were again good, the most thickness the plates had lost in any one place was 0.025 inch. On 0.250in. and 0.375in. plate work

this was well within the limits allowed. Some shopping around was necessary for the copper tube, the prices asked by some dealers was mind blowing. Finally, it was obtained quite reasonably, so any delay was worthwhile.

The 14 gauge tubes fitted perfectly back into the tube plates, an initial test with the tube expander on a piece of the scrap copper tube also suggested to me that the copper would not require annealing. Barrie Chalmers supplied one tube expander, but we were short of a larger tube expander, which I am led to believe are quite expensive. So, a day in my workshop was spent scaling up the smaller tool. Once

made, both tools worked perfectly.

Another coat of red lead on the outside of the boiler tidied up the job and the vessel was again blanked off. I fully expected to have to use the tube expander again once the hydraulic test was carried out, yet 180lbs pressure saw both tube plates bone dry. Not bad for a novice I thought!

Elmdon Model Engineering Society website is: www.wythallsteamrail.co.uk

The Birmingham and Midland Transport Museum is owned and managed by the Birmingham and Midland Omnibus Trust. The site is completely run by volunteer enthusiasts, there are no paid staff whatsoever. The museum is therefore totally reliant on public support. Website: www.bammot.org.uk



Ready for the road again.

CLUB CHAT

With Malcolm Stride

UK News

Following a busy season which included a successful open rally weekend and hosting the 'Curly Bowl' Bedford MES is busy preparing for the 2006 season with some major operations taking place on the track including a new signalling system, realignment of track to the new bridge and rebuilding some of the points.

A major event took place at Bradford MES in July with the annual 'Rubber Powered Locomotive Competition' and the 'Pop-pop Boat Competition' both taking place on the same day. The locomotives had to complete a 30 metre course in the shortest time and Jim Jennings was off first with an initial time of 30.7 seconds which he reduced to 20.5 seconds at his third attempt. Brian Ward then ran John Holroyd's single twisted rubber propeller powered machine and achieved 26.5 seconds on the third run. Graham Done's locomotive was the star of the show with a full steam outline and four twisted rubber propulsion units hidden away in the boiler. Graham started with a time of 12 seconds and achieved 10 seconds dead and first place by his third run. On that run the locomotive just carried on and travelled more than halfway round the track, an estimated distance of about 86 metres. The club Editor's Catapulta design was next achieving a best time of 11.7 seconds and second place before suffering a derailment when one rubber tyre came off. John and Russell Copin took third place with their very lightweight dragster type design which achieved 14.2 seconds on its best run.

The Piot Trophy for the fastest pop-pop boat was eventually won by junior member Elizabeth Knowles with a time of 30 seconds. Other entries were by Daniel Murgatroyd, Rhys Braddock and Ken Shipley. On a happy note, member Stan Wade is to be congratulated on reaching his 90th birthday in August last year. Stan celebrated the occasion at the track with "a cup of tea and a bun" for fellow members.

Following a few months gap, we have received the latest newsletter from the East Somerset SMEE which reports the opening of the new track, 'The Bath & West Railway' at the Bath and West Show on 1 June 2005. The ceremony was performed by the Marquess of Salisbury who unveiled a commemorative brass plaque and cut the ribbon on the track before enjoying the first ride behind Tinkerbell driven by Stephen Wessel. The weather was wet, so as a precaution this train, heavily loaded with dignitaries, was banked by Pete Sheppard's Bagnall locomotive Shirley driven by Mike Colburn. The event featured on the local radio and television stations. During the four days of the show trains on the new track carried nearly 4000 passengers in spite of the wet weather. Can we congratulate the society on their achievement? It does not seem very long since I reported that negotiations for the new track had started. Members are now planning 'Phase Two'.

Vectimod, the journal of the Isle of Wight MES has got a new look with a contents list and higher printing quality enabling the use of more colour photographs. I must say that it looks very



Three Suffolk dredging tractors at Sacrewell. L to R Lee Betteridge, Peter Jackson and Peter Nixon. Photograph by Tony Meek.

professional. During the rebuild of the club Ajax locomotive it was discovered that one of the inner dome fixing holes had a broken screw in it. Further investigation proved that the 'screw' was in fact a broken tap so the 'Pumphouse Crew' built a simple spark eroding machine and removed the tap. Member Norman Godfrey was present at the fleet review last year on the steam launch Kariat owned by John Power. The launch had to be at its allotted position some four hours before the review so after a lively trip in the force four conditions the crew arrived somewhat wet at the position and then suffered several hours of "rocking and rolling" in the lively sea conditions. Norman Reports that "the champagne, salmon sandwiches, cans of beer, 14 year old malt whiskey and Cornish pasties did help to pass the time in a most enjoyable manner". The return trip was also eventful with thunder, lightning and torrential rain soaking everyone but as Norman comments "it was a one off memorable occasion, the like of which I will never see again".

The members of Kings Lynn DSME are in for a busy time for the next few years because the decision has been taken to install a running loop and also to refurbish the entire track. It is anticipated that this will take place during the winter months over about five years. I suspect new "volunteers" would be welcome at the club. We also welcome Ben Cannell who has taken over as Editor from Mike Coote who stood down from the committee after some 23 years service and is concentrating his efforts on completing 'forgotten' projects. I look forward to receiving the results of Ben's efforts at regular intervals. Ben also built the club web site which can be found at www.kldsme.org.uk. The life of working party members has been eased by the moving of all the maintenance equipment from its original storage location (the Lynnsport plant room) into the Cabin which is much nearer the track.

John Baguley of the National 2 1/2in. Gauge Association addresses the thorny question of whether future model engineering drawings should be produced in metric or imperial units. In an article on using CAD for drawing and design he suggests that only one set of drawings need be produced as the dimensioning units can be changed at will and some packages can display dimensions in alternative units alongside the primary unit, so metric and imperial equivalents could be shown on the same drawing. (The problem I found with this is that this facility is often only available in the 'professional' versions of such products with an often substantial price

penalty. In the case of Turbocad which I use the 'Professional' version is about six times the price of the 'Deluxe' version). In the same journal, 'Spanner' suggests a tip to enable the easy identification of files when selecting them from their racks. He paints the handles different colours to denote the type such as red for round, orange for half round etc.

Members of the North London SME are now thinking hard about the suggestions for the extension of the track facilities on their newly acquired site extension and have held a meeting for all interested parties to put forward ideas. At the July meeting, Mike Chrisp presented a video and chaired a discussion on heat treatment. During this Derek Perham volunteered the tip that in the absence of Kasenit case hardening compound, sugar can be used instead.

A lot of work has taken place at Norwich DSME during recent months with the installation of a new gate and platform area, three steaming bay sidings, a hydraulic locomotive lift and a traverser. Arnold Hoskins reports that the most notable achievement has been the provision of proper sanitary facilities with the installation of proper drainage. Peter Lewis has also completed a new 7 1/4in gauge electric locomotive for the club. This is to his own design and is of a Swiss/Austrian outline and has come into being "due to the generosity of Arnold Hoskins".

The ninth Miniature steam gathering organised by Peterborough SME and hosted by Sacrewell Farm & Country Centre took place on July 16th and 17th, one of the hottest weekends of the year. With 50 engines in steam over the weekend, most of the well-known makers of steam vehicles were present in model form. It seems that a record may have been set with three Suffolk dredging tractors in steam? This year Lee Betteridge brought his along for its first rally. Lee purchased his Suffolk last autumn and has been refurbishing and repainting it over the winter. Although Peter Nixon started building his Suffolk back in the 1980s he has only been steaming for a couple of years. Peter Jackson's Suffolk has been on the rally fields since 1987. Other John Haining designs at the rally were a pair of 4 1/2in Caradoc steam tractors, one built by Eddie Lancaster and now owned by Samuel Morgan and the other by Mick Lowe. Colin Allan showed a 3in Savage steam tractor, under construction. Colin has been building for 2 years with all the machining, fabrication and gearcutting carried out in his workshop. Alan Garside was steaming his 3in Allchin, built over a 4-year period using the Royal

Chester drawings, and was completed in 1991. The only 2in engine attending this year was John Lewin's *Minnie*, based on the design of Len Mason and completed in 2001. Dave Coulson built his 4in Coulson & Weir traction engine in 1993 and based it on engines built in Stamford during the mid 1880s. This engine is more like a portable with the cylinder at the back and crank at the front with chain drive. The junior steamers, Mathew and Timothy Riley, Jack Eyres and Matthew Coulson were steaming Mamod and Wileco engines. With the working watermill and a good collection of farming implements and bygone a very interesting visit can be had. This year's gathering is set to take place over the weekend of July 15 and 16.

World News

Canada

Ken Klakowich, President of the **British Columbia SME**, reports that the site is looking good due to the activities of those involved in keeping ahead of the undergrowth and lawn maintenance. The 2005 season has been on a par with the last few years and the society "expects to be in very good shape by year end". Nick Buell has had a successful steam run with his partially completed 4-6-2 locomotive.

New Zealand

Vandalism seems to be a world-wide problem. **Maidstone MES** report that the club premises were burgled with the perpetrators gaining entry by tearing the metal skin off one of the garage doors. The club cash float was stolen and two small fires were lit which fortunately did not do any further

damage. On a happier note, Brian Hawke is making good progress in improving the controls of the club electric locomotive and has fitted an electronic speed control before carrying out further modifications.

At a recent meeting of the **Hutt Valley MES**, thanks were expressed to someone who many may consider the most important man in the club, John Beeforth who has assumed the mantle of "self designated tea man". At the same meeting Rex Hill gave a presentation on the development of firearms, that was well illustrated by examples from his collection of antique examples. Brian Wheeler showed his part built Stuart No.5 engine. Claude Poulson brought a substantial piece of brass found at a scrap merchant. This was found to be a roll of honour for employees of a long lost local company and Claude will be making sure it goes to a good home rather than being chopped up for model engineering use.

United States

A topic that has featured recently in this magazine is that of planning model engineering projects. Tom Piccirillo, President of the New



John Lewin on his 1:6 scale *Minnie* at Sacrewell. Photo: Rudi Miehschlager.

Jersey Live Steamers has put forward his own thoughts on time management in the latest issue of *The Whistle Blast*. His basic rules are:

- 1: Plan Ahead
- 2: Get out of bed early
- 3: Do not watch a lot of TV
- 4: Dig in (once started don't deviate from the course)
- 5: Do it right first time.
- 6: Luck Out (have a supportive wife, plus a guy who will mow the lawn for you).

Reader's views on these will of course be welcome.

Three members reported on a live steam event where there are huge crowds who come to watch an 0-6-0 locomotive carrying thousands of passengers in a week who spend thousands of dollars on souvenirs. You will guess when I say that the locomotive is blue and called *Thomas*. It seems that *Thomas the Tank Engine* events are big business world wide these days.

The newsletter also carries a report on the *Green Goat*. This is a switcher (shunting locomotive in UK) which is powered by "a very large, long-life, recyclable array of batteries supported by a small diesel generator". The locomotive produces 2,000hp with up to 90% reduction in smog causing particle emissions and 60% more fuel efficiency than conventional switchers. The locomotive is also virtually noiseless.

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.

Terry Clarke	Fylde SME
Len Dightham	Norwich DSME
David Holliday	Portsmouth MES
Ray Marshall	Kings Lynn DSME
Al Mullen	New Jersey Live Steamers
David Rogers	North London SME
Roger Spalding	Bradford MES
Robin Young	East Somerset SMEE

CLUB DIARY

A minimum of 6 weeks notice is required for diary entries. Clubs and Societies are asked to include a telephone number for the assistance of would-be visitors.

FEBRUARY

- 17 North London SME. Members' Talking. Contact David Harris: 01707-326518.
- 17 Rochdale SMEE. Doug Hewson: Lost Wax Castings. Contact Mike Foster: 01706-360849.
- 19 Frimley & Ascot LC. Club Running. Contact Bob Dowman: 01252-835042.
- 20 Peterborough SME. Quiz Night. Contact Ted Smith: 01775-640719.
- 21 Chesterfield MES. Ken Grainger: Great Western Broad Gauge. Contact Mike Rhodes: 01623-648676.
- 21 West Wiltshire SME. Derek Stamp: Malden Model Engineers Track Signalling Project. Contact R. Nev. Boulton: 01380-828101.
- 23 Cardiff MES. Patrick Hassell: Ghosts and Goblins. Contact Don Norman: 01656-784530.
- 23 Sutton MEC. Chat Night. Contact Bob Wood: 0208-641-6258.
- 23 Worthing DSME. AGM. Contact Bob Phillips: 01903-243018.
- 25 Chesterfield MES. Public Running Day. Contact Mike Rhodes: 01623-648676.
- 25 Hornsby ME. Family Day & Boiler Inspection. Contact Ted Gray: 9484-7583.
- 26 MELSA. Sunday in the Park. Contact Graham Chadbone: 07-4121-4341.
- 27 Bedford MES. D. Billington: Boilers - the effect of the new testing procedures. Contact Ted Jolliffe: 01234-327791.
- 27 Hornsby ME. Meeting. Contact Ted Gray: 9484-7583.

MARCH

- 1 Andover DMES. Bits & Pieces. Contact John Berry: 01960-882616.
- 1 Bradford MES. AGM. Contact John Mills: 01943-467844.
- 1 Guildford MES. Video Evening. Contact Dave Longhurst: 01428-605424.
- 2 Cardiff MES. Club Chat. Contact Don Norman: 01656-784530.
- 2 Sutton MEC. Bits & Pieces. Contact Bob Wood: 0208-641-6258.
- 2 Westland & Yeovil DMES. Mike Johns: The Restoration of 'Braunton'. Contact Gerald Martyn: 01935-434126.

- 3 Aylesbury (Vale of) MES. Gerry Cullen: Australian Flying Doctor Service. Contact Andy Rapley: 01296-420750.
- 3 Maidstone MES (UK). AGM. Contact Martin Parham: 01622-630298.
- 3 North London SME. North London SME through the years. Contact David Harris: 01707-326518.
- 3 North Norfolk MEC. Doug Hewson: Wagon Building & Detail Casting. Contact Gordon Ford: 01263-512350.
- 3 Rochdale SMEE. Don Cash: Rails around Manchester. Contact Mike Foster: 01706-360849.
- 4 New Jersey Live Steamers, Inc. Work Day. Contact Karl Pickles: 718-494-7263.
- 4 York City & DSME. Members' Talks. Contact Pat Martindale: 01262-676291.
- 5 Frimley & Ascot LC. Public Running. Contact Bob Dowman: 01252-835042.
- 6 Furness MRC. FRMC Quiz Evening. Contact Colin Burns: 01229 837079.
- 6 Peterborough SME. Bits & Pieces. Contact Ted Smith: 01775-640719.
- 8 High Wycombe MEC. Christine Breden: The Work of the Chiltern Society. Contact Eric Stevens: 01494-438761.
- 8 Norwich DSME. Jim Bacon: The Weather & Forecasting. Contact Paul Reed: 01603-462925.
- 8 St. Albans DMES. Club Night. Contact Roy Verden: 01923-220590.
- 9 Cardiff MES. Bring & Buy. Contact Don Norman: 01656-784530.
- 9 Sutton MEC. Meccano Night. Contact Bob Wood: 0208-641-6258.
- 9 Worthing DSME. Bits & Pieces. Contact Bob Phillips: 01903-243018.
- 12 Hornsby ME. Running Day. Contact Ted Gray: 9484-7583.
- 12 Sutton MEC. Track Day. Contact Bob Wood: 0208-641-6258.
- 12 York City & DSME. Running Day. Contact Pat Martindale: 01262-676291.
- 13 Bedford MES. Polly Model Engineering: Commercial Locomotive Building. Contact Ted Jolliffe: 01234-327791.
- 13 Saffron Walden DSME. AGM. Contact Jack Setterfield: 01843-596822.

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DRILLING CAPACITY	25MM
END MILLING CAPACITY	25MM
FACE MILLING CAPACITY	65MM
TABLE WORKING SURFACE	190X585MM
MOTOR	1HP
SUPPLY	240VOLT
NET WEIGHT	200KGS

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DRAWBAR (M12 THREAD)
NVR SWITCH GEAR
INTERLOCKED CHUCK GUARD
MANUAL & PARTS LIST

SPECIFICATIONS

DRILLING CAPACITY	32MM
END MILLING CAPACITY	20MM
FACE MILLING CAPACITY	76MM
TABLE WORKING SURFACE	730X210MM
MOTOR	1.1KW 1.5HP
SUPPLY	240VOLT
GROSS WEIGHT	287KG

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DRAWBAR (M12 THREAD)
NVR SWITCH
INTERLOCKED CHUCK GUARD
MANUAL & PARTS LIST

SPECIFICATIONS

DRILLING CAPACITY	32MM
END MILLING CAPACITY	28MM
FACE MILLING CAPACITY	80MM
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MOTOR	1HP
SUPPLY	240V
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