

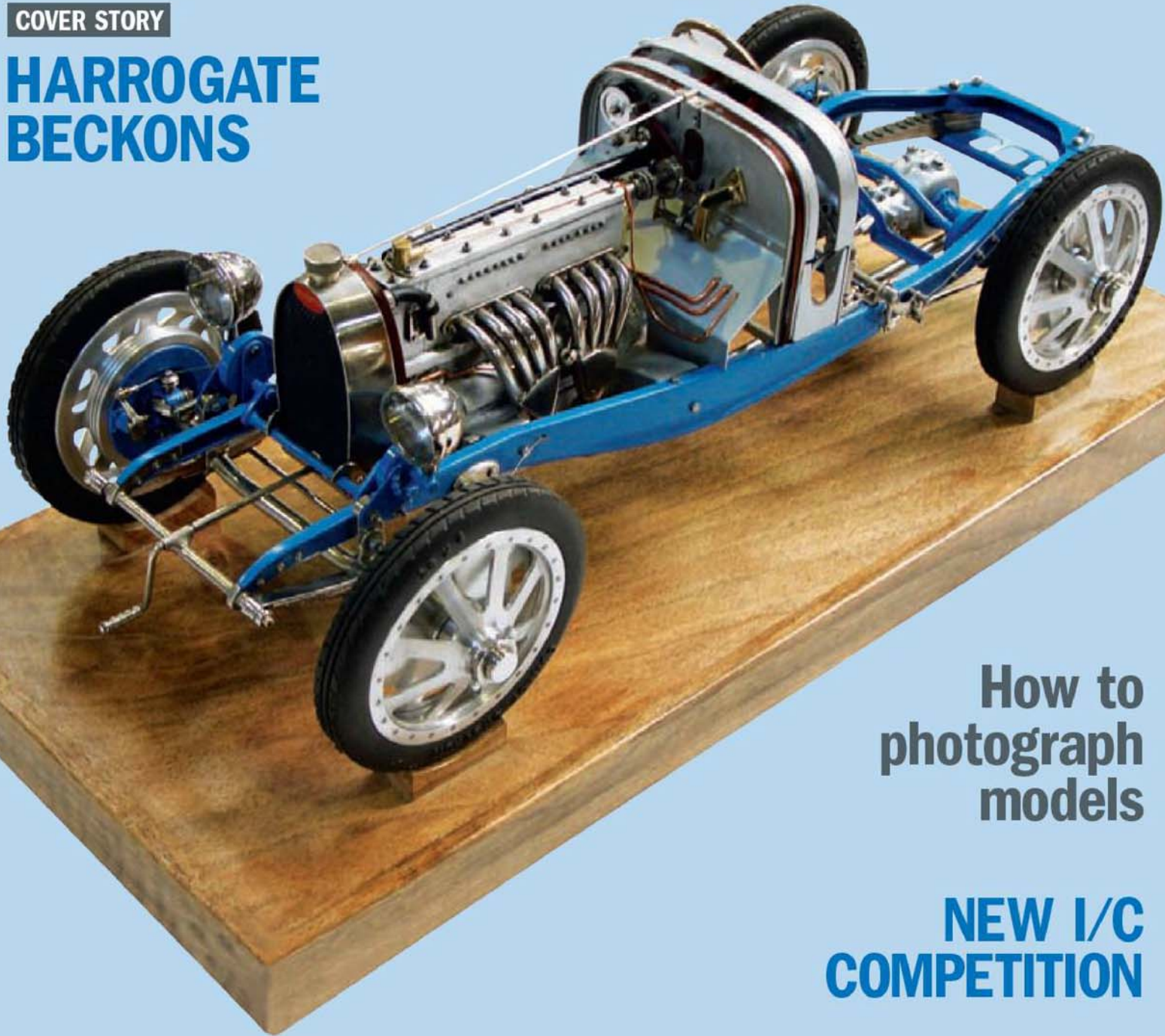
MODEL ENGINEER

VOL. 198 No. 4297

13-26 APRIL 2007

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ON THE COVER...

Delightful model Bugatti by Stephen Atkinson on show at Harrogate last year, which we look forward to seeing completed this year. Alex Whittaker takes a personal look at the Harrogate Exhibition in this issue, starting on page 444, and looks forward to this year with great enthusiasm. Put it in your diary: May 11-13, Great Yorkshire Showground, Harrogate. (Photograph by David Carpenter)

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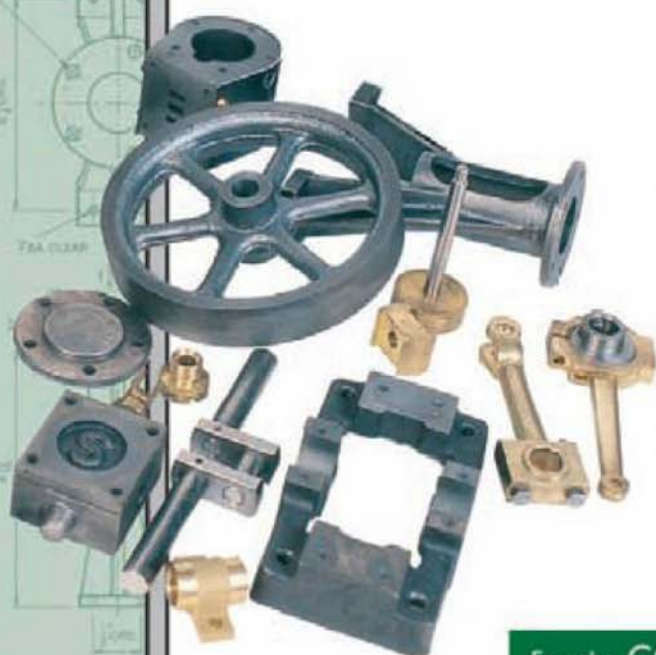
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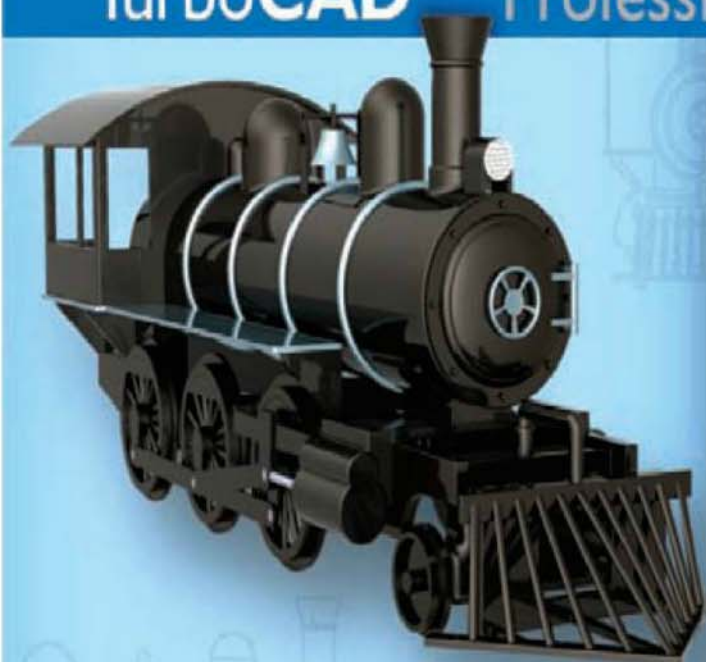
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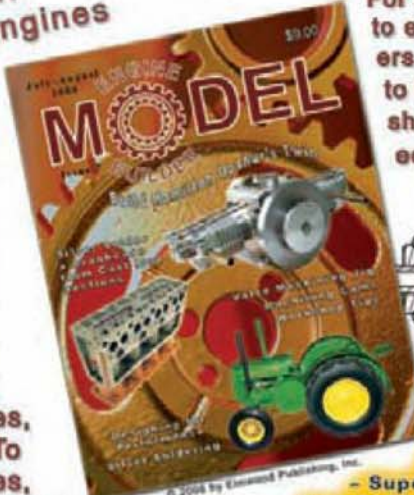
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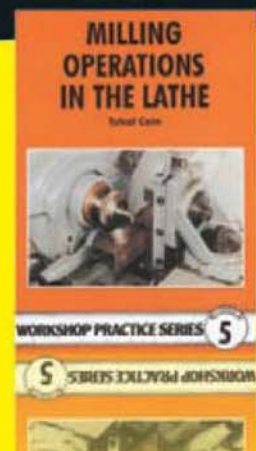
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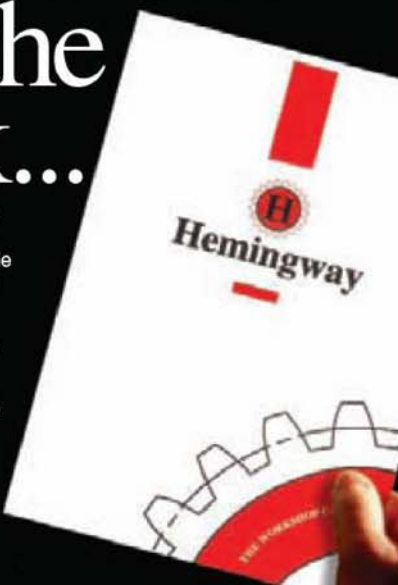
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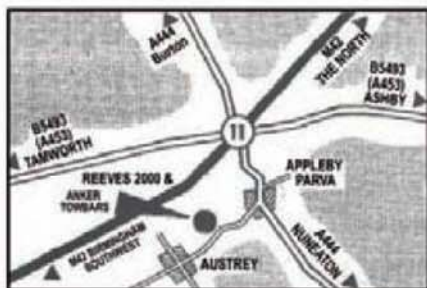




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Meet Glenn.



We asked Glenn (that's him on the left) to look over the project. He convinced us that it was possible (and affordable) to machine the whole valance from a solid billet of aluminium. We felt that this would be a tremendous solution as it would not only ensure we

maintained our quality standards; it would raise them to a much higher level. Glenn's enthusiasm for the project meant that we could also take the opportunity to incorporate extra fine detailing which we couldn't achieve with a casting. Birkdale Engineering had just had a new machining centre installed and the Western Valance was to be its first major task.

Hurco VM2 is the latest in CNC Machining Centres (You can see it behind Glenn). 8000rpm and sixteen-way tooling bring the manufacturing time down to less than three hours. Repeatable accuracy to the order of $\pm 0.0025\text{mm}$ means an amazingly high level of dimensional accuracy (shrinkage rates are now despatched to the dark ages).

You can see from the development pieces, the project was not a straightforward task. The valance is a complex shape and requires a lot of programming to get the CNC machining centre to produce the part we wanted.



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193701 ML10 Lathe, Serial No. V 129380 Imperial £1451.13
The lathe is fitted with a leadscrew clutch, leadscrew micrometer dial and pointer, and has resettable dials on the cross and top slides. A New Motor, reversing push button starter, and 4" 3-Jaw G.S. Chuck have been fitted.

182701 ML7 Lathe, Serial No. K 82137 Imperial £1686.13
The headstock bearings have been refitted to the spindle and the lathe was rebuilt fitting a new countershaft, a new tailstock base to correct alignments, a new 100mm (4") 3-Jaw G.S. Chuck, and a new 1/2 h.p. motor and switch.

179101 254V Plus Lathe, Serial No. ZS 1644701 Imperial £7418.36
This model is fitted to a tray top cabinet stand and is equipped with complete electrical safety switch package. During re-assembly the spindle bearings were carefully inspected, with the bearing pre-load being re-adjusted. The machine alignments were checked and reset where necessary. The machine has been fitted with a brand new inverter.

194701 Super 7 Lathe, Serial No. SK 125566 Gearbox with Power Cross Feed, Imperial £4112.50
Nearly new Tray Top Cabinet Stand. A new reversing push button starter was wired into a recently new 1/2 HP single phase motor, and a new 100mm (4") 3-Jaw G.S. Chuck is supplied with the machine.

185601 Super 7B Lathe, Serial No. SKL 120972 £5522.50
Long Bed, M&I Industrial Stand, Coolant System
This machine was the last new Myford lathe purchased by the late Geo. T. Thomas. The lathe then passed to Neil Hemmingway, who kept it right up until June 2004, when he traded it in against a new Connaisseur lathe.

194401 Super 7B Lathe, Serial No. SK 168858 £4876.25
Gearbox with Hardened Bedways, Power Cross Feed, Imperial
Mounted on a 20/038 Tray Top Cabinet Stand. As the lathe was re-assembled the headstock spindle was re-scraped into the front bearing and the alignments were set and checked and re-set where necessary.

193301 Super 7B Lathe, Serial No. SK 145291 Power Cross Feed, Imperial £4112.50
Mounted on a Cabinet Stand.

194501 Super 7B Lathe, Serial No. SK 14855 Gearbox Power Cross Feed, Imperial £4817.50
Mounted on a 20/038 Tray Top Cabinet Stand.

194301 Super 7B Lathe, Serial No. SK 166205 Gearbox Power Cross Feed, Imperial £4935.00
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Model Engineer Exhibition plans

Exciting plans are coming together for our exhibition at Ascot, September 7-9.

We are delighted to say that we will have on display all 12 of Cherry Hill's most recent models. Cherry has donated all of these outstanding models to the Institution of Mechanical Engineers, and they, in turn, have kindly allowed us to show them at this year's exhibition. These models have been produced over the last 30 years, and the majority are Gold Medal and Duke of Edinburgh award winners.

Also the IMechE are loaning one of the most famous models in model engineering history, Dr Bradbury Winter's *Rocket*. This model is made of silver, and was commissioned by the Mechanicals as a centrepiece for important functions. It was completed in 1932 and took some 12,000 to 15,000 hours to complete.

This is just the first of many collections of the world's top models that will be on display at Ascot. We will bring you news of more, as they are confirmed.

Help make this the best exhibition ever

Do you have a model to the design of one of the great model engineers who have graced the pages of this magazine over the years? With your help we would like to pay tribute to these people to whom we all owe so much. Even better, do you have a model actually built by one of them?

Authors who are no longer with us such as LBSC, Martin Evans, E. T. Westbury, John Haining, Don Young, George Thomas, Dave Lammas, Tubal Cain, Claude B. Reeve, Professor Chaddock, etc, etc, are all people we would like readers to help us to pay tribute to on this important occasion. We hope that those who still write for us will also mount displays. If you can help us in this endeavour, please contact the editor:

David Carpenter,
Model Engineer,

Berwick House,
8-10 Knoll Rise,
Orpington, Kent BR6 0EL.

Email:

david.carpenter@magicalia.com

You can also help by entering a model or clock or piece of workshop equipment, either for an award, or just to share with visitors as a loan model. A simple entry form will appear in the next issue. If you are pleased with a piece of your work, even if its not yet finished, show it at Ascot.

Award for a young model engineer

This issue sees the 100th *Letter to a Grandson* from Monty Ellis. Monty thought that this would be the ideal time to make his second award available to encourage a young newcomer to model engineering. It is worth £250.

Applications from under 18s resident in the UK and not in full-time employment should be sent to the editor, by 1 July 2007. They should be in the applicant's own handwriting and in no more than 300 words say why they should receive the award. Give details of any projects undertaken and future aspirations along with name, address, and age.

The applications must be attested by a reliable referee, who is not a relative. The referee should give evidence of his/her standing, and could be a teacher, minister, club official, or some other person in authority, and send any comments and recommendations.

Entries will be assessed by a panel of judges.

Send entries to:

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Metriation

It has been surprising how few people have been moved to try to stop the ending of the use of inch measurements in the UK in just a couple of years time. At the time of writing only about 170 people have signed the

petition to 10 Downing Street at: <http://petitions.pm.gov.uk/>

Metriation/

And we have only heard from a handful of people who have contacted their Members of Parliament.

Let's not underestimate this problem. Unless something changes, it will be illegal to sell or advertise anything measured in inches in Europe, including the UK, after 2010. We will not even be able to publish designs measured in inches, either in a magazine or as drawings.

This is serious for the UK model engineering trade, as well as those model engineers who still work in Imperial. Try ordering that 5/16in. x 26tpi die as 7.9375mm x 0.9765mm pitch!

Harrogate prospect

The Harrogate Exhibition will be with us again shortly, from May 11-13, at its usual Great Yorkshire Showground venue. Like our own show at Ascot, Harrogate is organised by Lou Rex. It is now firmly established as one of our favourite events.

Apart from our own exhibition this is one of the 'must' attend events of the year, with its superb club displays, some excellent models (see front cover) and the chance to meet up with some good company.

If you have not yet been to Harrogate, have a look at the article by Alex Whittaker in this issue. We hope that his infectious enthusiasm will inspire you to get along to this delightful town and the top event in the north of England.

What do you think?

It is now five years since our last readership survey, which proved most valuable in helping to shape the content of the magazine. Now we plan to look again to check that we still have the editorial balance that readers want. In addition, everyone is most welcome to write to the editor to tell us what you would like to see in the magazine in future. We are also developing a new website, and are most interested in your ideas about what the website should include.

One of Cherry Hill's models to be shown, the delightful Savage centre engine.





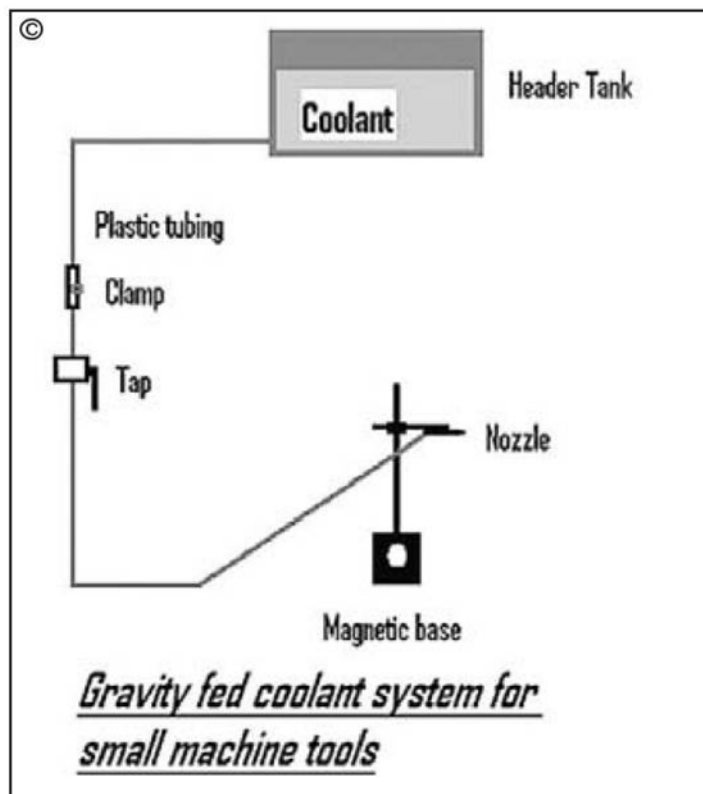
Mick Whittingham's neat and easy coolant system layout.

An easy coolant system

SIRS, - I am just starting out in the hobby of model engineering and have learned a great deal from reading **Model Engineer** over the last few months. It is especially good to see the ways in which experienced engineers set up work on their machines for various operations. Good photographs and a concise explanation have helped me to understand this fundamental need for successful machining practice.

I would like to offer my solution to other readers to the question of how to get coolant to the work piece in the cheapest and most effective way for a small workshop. I mulled over the idea of various pumps, sprays, squeegee bottles and the like before hitting on the idea of using a gravity fed system. Using compressed air push fit couplings it did not take long to produce a small plastic header tank (large popcorn bucket) with a 6mm quick couple union bonded into the base using silicone sealant. This sits high up on a shelf to provide a decent head of pressure. Connected to this by 6mm plastic windscreen washer tubing is a ball valve (again a compressed air fitting) which is fitted to the machine in a convenient position to turn the flow of coolant on and off during machining. Leading from this valve is a final piece of windscreen washer tubing of sufficient length to reach the relevant areas of the machine being served. A fabricated small-bore brass delivery nozzle is affixed to a cheap magnetic base so that I can position it where necessary to feed coolant onto the work piece. In a little less than half a day I had a rudimentary gravity fed coolant system on my lathe and mill.

The system worked so well that I could empty my reservoir of coolant much too quickly so, borrowing from the medical world, I fashioned a copy of the type of tube clamp used to regulate the flow of an intravenous drip into a patient. The clamp consists of a roller



running in a wedge shaped housing which can clamp the plastic tube to varying degrees. I fitted this between the reservoir and valve and it allows me to vary the flow of coolant very accurately from a drip to full flow, setting it at an appropriate level before commencing machining. Collection trays under the milling table and cross-slide catch most of the excess cutting oil and I strain this through nylon stocking material into a separate container before returning it to the reservoir for re-use.

All in all this was an easy system to design and put together once I had hit upon the concept of using gravity as the pumping medium for my coolant. Low tech it might be but it works a treat and leaves both hands free to work rather than juggling bottles and sprays as I did before installing the system.

A schematic diagram of the system is included to show the basic components but I leave the detail of the system you choose to fit up to the individual engineer, part of the fun for me was in utilising bits and bobs I had laying about the shop to create a functional and not too Heath Robinson looking affair.

Many thanks for all the help and inspiration *Model Engineer* has given me so far.

Mick Whittingham, South Yorkshire.

Planning law and railways

SIRS, - I was interested in the sad saga (Smoke Rings, M.E. 4291, 19 January 2007) of the model engineer in Nidderdale, over obtaining planning permission for building his garden railway. What puzzles me is, on what grounds did he need it?

When I decided to build my 5in. gauge garden track, one or two fellow club members asked me if I had had any trouble obtaining planning permission. My reply was always: "Planning permission, What for?" As far as I was aware, there were and are no planning regulations which specially cover garden railways, whether for Gauge 'O' or for 7 $\frac{1}{4}$ in. gauge, or for that matter any other feature of a garden other than a high (greater than 2m) fence, or buildings such as a greenhouse or a garden shed, which are covered in a limited way. The greater-than-two-metres rule would have applied if I had been erecting a ham radio aerial tower for example. As I was not erecting a building, nor was I

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making any construction over two metres high, but was creating a garden feature entirely within my own garden, as a part of my recreational hobbies, I saw no relevance of the planning regulations to it, other than that I didn't want to cause my neighbours a nuisance.

If there is some relevance, where is the line drawn between Gauge 'O' and 7 $\frac{1}{4}$ in. gauge, I wonder?

I did of course tell the immediate neighbours beforehand what I had in mind, but that didn't cause any problems, as I reassured them it would not cause them any significant nuisance, just a small amount of smoke when starting up, and no more than would be produced by a barbecue. I do of course use smokeless anthracite fuel. As for the occasional whistle, and the practically inaudible 'chuff-chuff', what about the noise made by the neighbours' lawnmowers when cutting their lawns? That is far more intrusive.

It occurs to me that if the model engineer in Nidderdale had built a traction engine instead, I imagine the neighbours couldn't have done much about it if he had driven that around his garden, which in no way could require planning permission, though they might have disapproved of his using the whistle. (Anyone fancy building a steam lawnmower?)

During the building of the railway, I answered quite a few interested questions from curious neighbours and passers-by (I think they mostly thought I was another English eccentric) and now it is finished and working it has been largely admired, and there has certainly been no adverse criticism. The neighbours' children and grandchildren aged 7-10, as you might expect, love it. It was steamed three or four times last year, but will probably get a bit more use in 2007. I have both a small steam locomotive and a battery electric one. My relatives are allowed to drive the electric locomotive at their own risk, but without any passengers (for insurance reasons).

Otherwise (a club social gathering at my house excepted) under the insurance conditions, I am the only one allowed to drive with passengers.

As I don't want to set hares running, or awaken sleeping dogs in the local authority here, if you publish this, please do not print my name and address! **(Name and address supplied)**

Garden railways and planning regulations

SIRS, - Your item on planning in *Smoke Rings* (M.E. 4291, 19 January 2007) was interesting and not a little alarming. I live in North Yorkshire also, in Ryedale. A few years ago I took the precaution of ringing the planning folk about my proposed 7 $\frac{1}{4}$ in. narrow gauge line, of about 220 yards. I knew my neighbours had no objections, but was thinking of the future.

I was told that as:

- I was not going to interfere with existing services (water pipes, drainage and so on) or make alterations to any buildings.

- The line was for the private pleasure of myself, family or invited friends.

My plans were of no concern to them. In their view, the line would be regarded as a garden ornament, there to enhance my enjoyment of my property! Should any complaints of nuisance arise, they would be the concern of other departments, such as Environment.

However -

- if I gave rides, charging fares or admission or not, to 'random' members of the public, then my railway would be regarded as a 'Fairground Attraction', and be very much their concern as it involved 'change of use' of the property.

Also I would have to satisfy 'Elfin Safety', and the whole caravanserai of public parasites, as to provision for safe parking, vehicle ingress/exit, access for the disabled, qualified first-aid attendance, separate male/female toilets, clear all staff as 'safe' with children, insurance cover, quality of

construction and maintenance, brakes, signal and communication procedures and equipment, emergency arrangements and so dreadfully on and on.

All these drones and noddies would have to have yearly inspections, at my considerable expense, to justify their existence on the public payroll.

I just thought, ***** it, and built it anyway.

It strikes me that Harrogate planning has got a bit above itself, and could be challenged.

Are there no coherent national guidelines or rules on such matters?

Any bets on how long it will be before some half-baked green zealot howls about how the CO₂ emissions by each of our little chuffs are endangering Planet Earth?

Alan Atkinson, North Yorks.

Trackers and model security

SIRS, - Reading through some back numbers of M.E. over Christmas I was disturbed at the frequency with which models are being stolen, taking into account thefts that are not reported to M.E. the number must be even greater.

I only have a scruffy 20 year-old *Ajax* and a *Tich* built 50 years ago, so not a lot of value in monetary terms but irreplaceable in other ways. The theft of a model that has taken so much care and time to build must be heartbreaking, in particular when the model will probably never see the light of day again, gracing as it will a table in some millionaire's private collection.

I have been putting some thought into how we may lessen the possibility of model theft, if not prevent it altogether. Automobile owners have the option of security alarms fitted to their vehicles, what would be the possibility of fitting a similar device to a model? With today's electronics such things can be made very small, even the audible device need not be very large.

Better still is the device called 'Tracker' which is an electronic beacon linked to a security company and or the police which, when activated uses GPS

to accurately show the location of the stolen vehicle. One obstacle is that the device, as fitted to a car, uses the car's 12 Volt battery as its power source. However, I am sure that the actual power requirements are very small, similar to a cell phone I would guess.

Having spent many years living in third-world countries I am well aware of the risks in relation to theft. Ex-pat property has always been a prime target for those who believe that all foreigners are well heeled. I have made a point of having a high quality printed notice on the outside wall of my house that states "This house is fitted with 24 hour video surveillance".

In all cases this was not true, the camera being a suitably sized tin box with a bit of glass in a tube for the lens and a small pilot light for effect! Fear of the unknown can do wonders, and the thieves clear off to look for an easier, less protected target!

It would be interesting to hear reader's comments and perhaps some ideas could come from this.

Harold Pearson, Cambodia.

Jack Strickland

SIRS, - Further to Philip Bellamy's request for information about the late Jack Strickland I believe I can fill in some of the gaps as I knew him from our membership of the Birmingham Society of Model Engineers though as I am now the tenth longest it is just possible that some above me may be able add further detail.

In addition to the locomotive models Philip lists, there was a batch of 'for sale' O-6-O *Hackflies* on which radical design by H. Turpin (described in *Model Engineer* 1964 volume 130) the late LBSC poured a torrent of abuse. The design actually produced a very successful machine. One of the batch - I believe there were five or six - was an annual attendee at BSME Gala Days.

The pilot 'American' locomotive was built by Brian Woolston of the Rugby MES, and Jack can be seen on the train locomotive driving his Chicago, Burlington >>

and Quincy RR Atlantic. I am uncertain if this machine is the same as the 'Pennsy C class' referred to by Philip but it performed as well as it looked, and that was superb. One BSME wag created the acronym "Come Back Again Queenie" from those initials; another, obviously an LMS fan, referred to the Great Western Railway with the acronym "Goes Wrong Regularly" - well they all went wrong occasionally, didn't they?

David Piddington, W. Midlands.

Memories of Hipp clocks

SIRS, - Frank Taylor's article about the Hipp clock brought back happy memories of when I was a teenager in about 1955 and built a working Hipp pendulum. An older friend of mine had built a complete clock from a design in a booklet, which he passed onto me. I had only a few hand-tools, a Woolworth's hand drill was one, and scrounged most of the materials. It was a time when pre-war radios were being thrown out and they were a mine of brass screws and spacers.

I started with a vertical wooden post, about 2 by 3 inches in section, mounted onto a base and the pendulum rod was of straight grained oak supplied by my school woodwork master, 1.5 by 1 inch in section. The pendulum weight was cast in lead into a syrup tin with a slot to take the pendulum rod and weighed about 10lbs. The bracket supporting the pendulum was made from two pieces of angle from an old bed frame, sawn with an Eclipse Junior Hacksaw. I had a problem in finding a suitable shim of material from which to hang the pendulum because the 10lb weight would tear it if it was too thin.

What Frank Taylor calls the notched blade was a quarter inch long piece from an annealed triangular file, filed to shape and soft-soldered to the arm. The shape can't have been too critical because I got it right the first time! The arm carrying the 'notched blade' and the trigger

blade were supported in bearings consisting of 4BA nuts swinging on the mating screws, a very neat and useful method I have used since where a few thou. of lateral movement is unimportant.

The trigger blade was made of eighth inch diameter steel rod filed to a chisel point and possibly hardened at the tip.

I have forgotten how the electromagnet in the booklet was constructed but it was powered from the mains through a suitable light bulb. I modified a mains transformer, and considering that I had no means of measuring either resistance or current, successfully ran it without a lamp. I got it to run quite well as a pendulum, but the only place I could run it was in my bedroom. It was noisy and the electromagnet had a loud mains hum so it had to be switched off at night. I had plans to rectify the A/C to overcome this hum but the general operation would still have been too noisy.

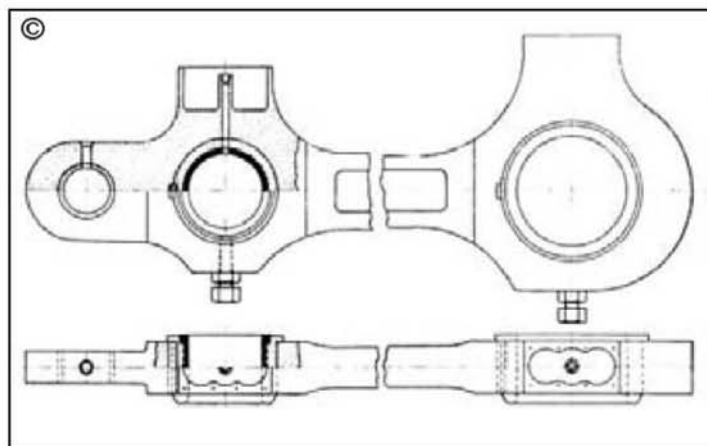
I could never make it work a clock escapement and I think the booklet was a bit sketchy in this aspect. It appeared insurmountable because the pendulum swing was not constant so, as with many teenage projects, I lost interest and it was stripped down. Various components survived a considerable time before being thrown out but the pendulum weight remains today, 50 years after. I wonder if any teenagers of today would tackle such a project or even have the simple hand-tools which I possessed?

Eddie Hamlin, Bingley.

'Schools' big-ends

SIRS, - After having read the article on Stowe, the Southern Schools currently being described, I just had to reply to Neville Evans request (M.E. 4290, 19 January 2007) for confirmation on the 'securing bolt' on the big-end of the outside connecting rod. This is I am sure put there to help retain the white metal lined bronze bush, however it isn't the only item normally required I think.

In Norway these round bushings in both coupling and



connecting rods were secured against turning in their seats by a parallel key, halfway in the bushing and halfway in the boss of the rod. This ensured that the bushing could not rotate in service. The thought of such a bushing rotating in service on a locomotive doing 90kph makes me shudder! The bushings were retained by a bolt from underneath fitting into a depression in the bushing and the bolt itself being secured in its place by a lock-nut. The bushings were of course flanged on one side. I have enclosed a drawing of a coupling rod which I have; the big ends of connecting rods were secured in the same fashion.

I would imagine that this was pretty well standard practice on all round bushings for connecting and coupling rods the world over! Or was it?

Antony Cook, Norway.

Safety valve settings

SIRS, - I've been reading part one (M.E. 4291, 19 January 2007) of what promises to be a very interesting series of articles by Michael Duggen on his steam propulsion unit.

One point I'd like to query though is his choice of safety valve settings, 100psi for his steam drum and 105 for the superheater. I wondered whether it should be the other way around.

Although I don't have marine experience I did work for a number of years, including an apprenticeship, in power stations. Testing and resetting safety valves was never the most popular of jobs, being in

Mr. Cook's big-end drawing showing the method of securing the bearing bush.

the hottest part of the boiler house, in summer after an overhaul and with dust coming off the disturbed lagging, which in my day was asbestos. The safety valves on these boilers were set so that the first valve to pop was the last in line nearest to the outlet and the last would be on the steam drum itself.

The rationale for this being that, no safety valve operation could starve the following section(s) of steam which also acted as a coolant. Steam starvation would lead to tube failure.

I'd be interested to know Michael's thoughts on this.

Peter Gregory, Wiltshire.

Mystery engine

SIRS, - I just received M.E. 4282, 15 September 2006) where Peter Spenlove-Spenlove asks about a "mystery two-stroke" in Post Bag. The answer is, of course, the 1938 Deller. This was the engine of the month on my website (www.modelengineneers.org) in April 2005. But I bet many have already come forth with this vital information.

The website review has an almost complete set of scans of the original Newnes' *Practical Mechanics* articles (Parts II, V, and the blueprint are missing). For completeness, I'd love a copy of the missing items if anyone came up with them!

Ron Chernich, Australia.

DIGITAL PHOTOGRAPHY

For Model Engineers

PART 1

Malcolm Stride provides some insights into the tools and techniques needed for photographing engineering models as an introduction to the Model Engineer photographic competition for which details will be published shortly.

A keen photographer and a model engineer for many years, I have used my camera to record progress on model construction and to photograph model engineering activities of many types. I now work exclusively with digital cameras and hope that, by passing on some of my experiences concerning differences in technique and equipment required, those new to the field may be helped to avoid some of the pitfalls.

How do digital cameras work?

In a digital camera, the light entering the lens is focussed onto an electronic sensor which consists of a large number of minute light sensitive detectors - each equating to one pixel (see below) - and arranged in a rectangle, where hitherto the film would be.

When a photograph is taken, the electronic signals from the sensor are amplified, processed into the digital image and stored on a memory card.

The images on the (usually removable) card can then be printed using a photo-printer or transferred to a computer.

1. An enlargement of part of a digital photograph showing the pixels.



Some terms clarified

Digital photography involves the use of new terminology and the following explanations may be of help.

Pixels - the dots of colour (**photo 1**) that make up the image. In any digital camera the maximum number of pixels is fixed. The value is quoted in 'mega pixels' and is important because the number of pixels sets the maximum size of print obtainable.

Resolution - a measure of the quality of the picture produced, expressed in 'dots per inch' (DPI). The generally accepted resolution for home prints is around 200 DPI whilst images for publication need to be at 300 DPI. The 'dots' equate to the pixels in the original picture file, so mega pixel value is important when choosing a camera.

Focal length - keen photographers (particularly those using single lens reflex cameras) will be familiar with the term 'focal length'. Zoom lenses allow the focal length to be adjusted within a defined range but with digital cameras the sensor is usually smaller than the standard 35mm film frame, so the 'equivalent focal length' of the lens is often quoted. With an image sensor half the size of a film frame, a standard 14 - 45mm zoom lens has an equivalent focal length of 28 - 90 millimetres.

Digital and optical zoom - digital cameras have two types of zoom - optical and digital. As with film cameras, optical zoom does not affect the image quality. However, with digital zoom, the narrow angle of view in telephoto mode is achieved electronically by taking the centre part of the image and enlarging this to fill the frame. This results in only a fraction of the sensor pixels being used

for the final photograph, resulting in a reduction in image quality. For regular long-range shots, it is important to get a camera with a wide optical zoom range.

White balance - on digital cameras this allows for different types of lighting (e.g. daylight or artificial) and can be changed, automatically or manually between photographs.

Sensor speed - as with film, the sensitivity of the sensor to light is expressed using the ISO scale. This speed can also be changed between shots. As with film, the faster speeds may reduce the quality.

File types - Image files come in many different formats but three are commonly used in digital photography. These are JPG (or JPEG), TIFF and RAW files and each has its pros and cons.

Most cameras default to a JPG file when saving pictures to the memory card, because the files are smaller. However, the JPG file is a 'compressed' format which can affect the quality of the image because the process 'loses' some of the pixels.

The amount of compression can be set on the camera. Higher quality settings use less compression but produce bigger files.

For maximum quality, use TIFF or RAW files; neither is compressed, but file sizes are four or five times larger.

An important difference between file types is that whereas JPG and TIFF files both have some processing carried out in the camera (white balance, sharpening etc.), RAW files are unprocessed and are a copy of the information captured by the image sensor. RAW files are specific to a camera which comes with computer software to enable



2. An example of a consumer camera, the Olympus FE-5500.

3. A 'prosumer' camera the Olympus C5050.

4. The useful tilting rear screen on the C5050.

5. The Olympus E300 DSLR with the standard zoom lens.

images to be processed and saved as JPG or TIFF files.

Compared to other types RAW files have a greater dynamic range (the range between light and dark before detail gets lost in shadow areas or burnt out in highlight areas). Not all cameras can produce RAW files, so check camera specifications before buying and remember that a computer then becomes mandatory.

Camera Types

Digital cameras are generally grouped into three main categories by the photographic press; consumer, prosumer and DSLR.

They have a large screen on

the back which, for non-DSLR types, may be used as the viewfinder, and allows the photograph to be checked before moving on. The screen is also used to display a variety of technical information concerning settings and images.

Consumer cameras - are compact point and shoot type cameras. These produce good results for most subjects but their restricted manual over-ride is a disadvantage under difficult conditions.

Most come with a small built-in flash, but no facility for external flash. Many do not have an optical viewfinder so the photograph is composed using the screen on the back of the camera.

One big advantage is that they are small and light, and can be taken anywhere. A typical example is the 5-mega pixel Olympus FE-5500 (**photo 2**).

Prosumer cameras - are a halfway house between the consumer type and a full DSLR. Although they come with 'point and shoot' options they also provide manual over-ride. Many



of the settings can be changed using buttons on the camera rather than the menu.

Such cameras often have an optical viewfinder, (beware of cameras with a digital viewfinder because the viewfinder image often lags behind real life, making capturing moving objects difficult) and generally have facilities for an external flash unit and accessories such as close-up and telephoto attachments.

An example is the 5-mega pixel Olympus C5050 (**photo 3**), the camera I used when first writing for *Model Engineer*.

It has a useful tilting rear viewing screen (**photo 4**) which makes low-level photography (such as on ground level tracks) very easy.

Digital single lens reflex (DSLR) cameras - are almost identical to the equivalent film camera (**photo 5**) apart from having a display screen on the back and a larger collection of knobs and buttons on the body.

DSLR cameras have negligible shutter lag. This is the delay between pressing the shutter release and the picture actually

being captured. An appreciable lag can make capturing moving objects difficult.

Depending on the make of camera, interchangeable lenses from SLR film cameras can be used with DSLR cameras but may not give such good results as special digital lenses. Some of the facilities on older lenses (e.g. auto-focus) may not work when used on digital cameras.

Camera choice

This will depend on the type of photography being considered and personal preference and budget of the buyer. Those who already have a SLR film camera and lenses may want to look into DSLR bodies from the same manufacturer. For close-ups and detail shots, a prosumer type is the best starting point but a DSLR gives the greatest flexibility.

Lighting

One of the most difficult things to get right when photographing engineering models and it is very easy to spoil a shot with unwanted reflections from



bright metal or gloss paint. Unless you have access to studio lighting equipment, the choice is daylight, artificial light or flash. This is where the white balance function becomes invaluable because different lighting types can be tried to see which gives the best result.

Note that the switching system in modern cameras is not designed to handle the high trigger voltages found on some older flashguns and could be damaged.

If you are going to use flash, get a good dedicated flashgun (**photo 6**) with a tilting head. These can be obtained for many cameras and enable techniques such as 'bounce flash' to be used, to give a softer, more even light.

A flash extension lead allows the flash to be positioned away from the camera, and a white reflector will get light into dark corners which abound on things like locomotives. A large sheet of white card is good but less convenient to carry around than one of the proper folding reflectors. These are useful with any type of lighting.

Cheap home studio

When taking 'posed' photographs of static models, a cheap home studio (**photo 7**) can be set up using suitable non-reflective background cloth. Polyester fleece is a good option.

The material should be draped in a smooth curve to avoid shadows and be far enough back from the subject to be out of focus. For a large locomotive, this may need a large sheet of material and several pairs of hands!

The background colour used will depend on the model but if using anything other than black or white, beware of colour casts being produced.

Some photographic theories

Exposure - is the control over the amount of light hitting the image sensor. Too much (over-exposed) and the image will appear very light with the colours 'washed out'; too little (under-exposed) and the image will appear dark with no detail in the shadow areas.



The exposure is controlled by two things; the shutter speed and the lens aperture. Most cameras have a variety of automatic settings for different subjects, but it is useful to understand the process in order to get good photographs.

Shutter speed - is the time the shutter is open, and for modern cameras can range from minutes down to $1/4000$ of a second. Longer focal length lenses or moving subjects need higher shutter speeds.

Lens aperture - is the size of the hole (expressed as a fraction of the focal length - the f number) through which the light passes. 'F4' means that the diameter of the aperture is $1/4$ of the focal length. Obviously the smaller the aperture number, the larger the physical aperture.

As with shutter speeds the choice of aperture depends on the subject, and in particular the 'depth of field' needed.

Depth of field - is the distance range from the camera within which a subject is in focus. Shorter focal lengths and smaller apertures give a greater depth of field.

Exposure Metering - Exposure is controlled by a combination of aperture and shutter speed, and the choice depends on the subject.

In simple cameras, different settings are achieved by selecting a suitable 'scene mode' such as 'moving object', 'portrait', 'close-up' etc.

In addition to fully automatic modes, more complex cameras will allow the user to control certain of the settings and will include modes such as 'aperture priority' and 'shutter priority' (which allow control of aperture or shutter speed

respectively) or full manual control where both are set, in which case the metering system will indicate over or under exposure.

The metering mode can be changed and will typically include full multi-point metering (calculated from a number of readings at different points in the picture), centre weighted (calculated from an average of the background and the centre with emphasis given to the centre values) and spot metering which takes the value from a small central area of the picture, effectively ignoring the background.

Most cameras have an exposure compensation facility which allows the photographer to deliberately over or under-expose shots.

Various options are provided for checking the exposure once the shot has been taken. The histogram display found on prosumer and DSLR cameras is the most useful.

The histogram - is a graph showing the number of pixels falling into each light intensity value. An average correctly exposed photograph will



6. A fully dedicated flashgun, the Olympus FL-36 features tilt and swivel head and a range of flash programmes.

7. The cheap home studio set-up in use showing use of the reflector to bounce the flash.

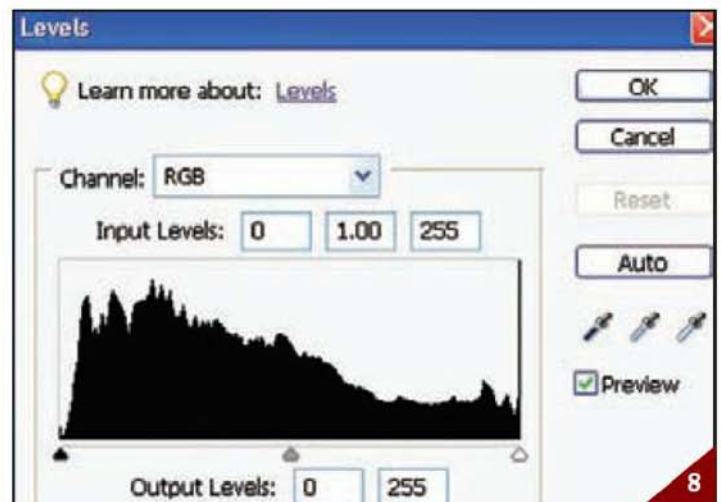
8. The histogram is used to check the exposure accurately. This is for photo 1 and shows a correctly exposed shot.

approximate to the shape shown (**photo 8**).

If everything is pushed to one end, the photograph is either over or under-exposed. Histograms are also used on computer imaging software. Use of the camera histogram display allows correct exposure to be checked at the time of photography.

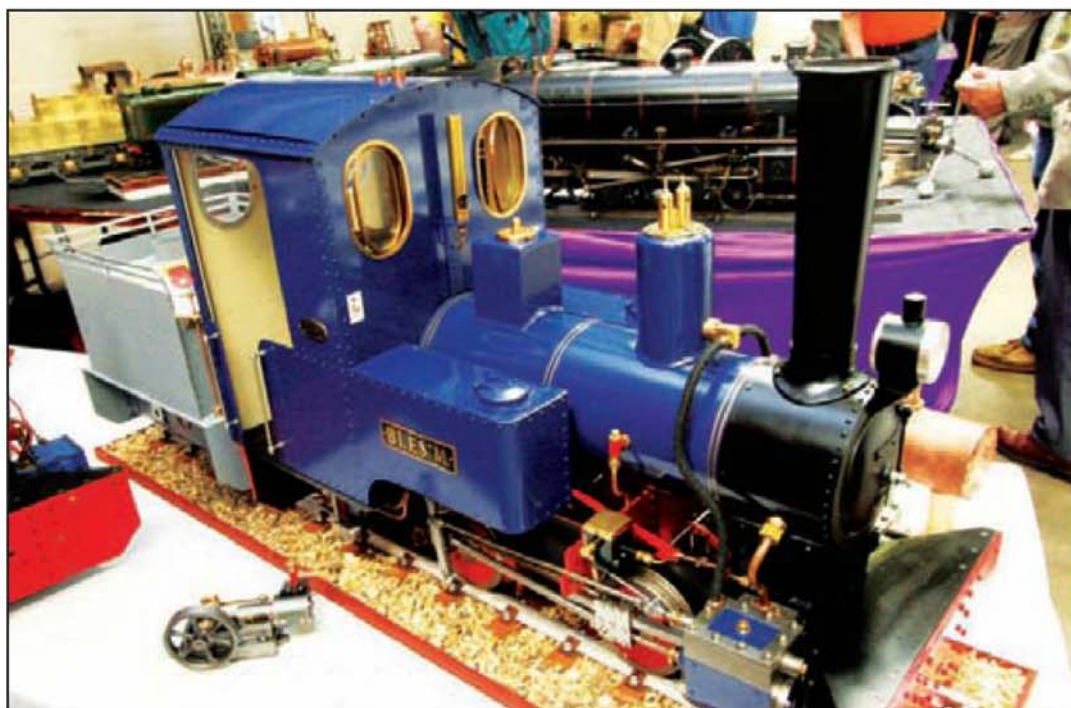
With digital photography it is better to err on the side of under exposure rather than over exposure. The sensor will record more detail in shadows than film, but if the light areas are over-exposed, detail is lost forever.

● To be continued.



LOOKING FORWARD TO HARROGATE

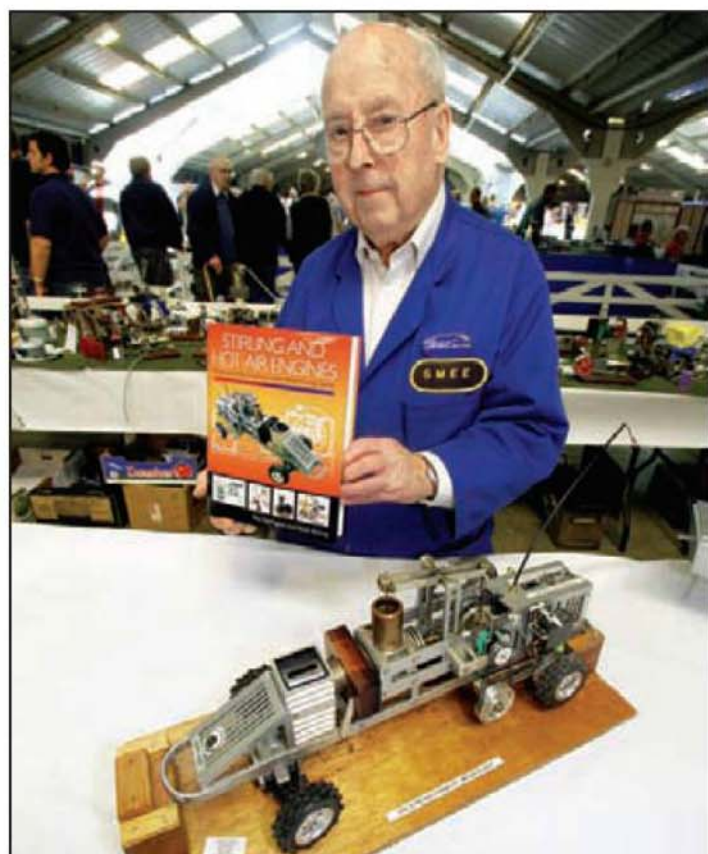
Alex Whittaker looks forward to the next Harrogate Exhibition in May, and recalls last year's visit.



Below: Roy Darlington, book and cover model, through a wide-angle lens.

Right: Walter Scott's narrow gauge Hunslet.

Opposite: Joe Cartledge's delightful fen brush wagon.



I'm a beginner model engineer, whose main interest is internal combustion aero-engines and simple marine steam plants. In fact, I've been 'beginning' in model engineering for about ten years now. Harrogate is one exhibition I never miss. It allows me to look at other peoples' work, raise my sights, ask lots of questions of the contributors, and stock up on all those important bits and pieces a proper workshop needs. Walking up to the pavilions and smelling that unmistakeable amalgam of coal smoke and steam oil from all the traction engines outside is a treat in itself.

Heavy metal

As a lathe addict, first stop for me is always the lathe and milling machine stands. I guarantee that no matter what lathe you already have in your

shed, you'll find a newer, better, more powerful one to lust after. The first thing I noticed last year was that the big suppliers are offering milling attachments for a number of their newer variable speed lathes.

I have no chance of affording the ones I really like. However, the free catalogues I Hoover up at each stand provide me with many happy hours of bedtime reading. It is not all about just new machines either. If you want to haggle over a low-mileage second-hand Myford, there are quite a few of those too.

Last year I noticed that two new features were becoming much more prominent on a range of commercial machines: stepless electronic speed control on both lathes and milling machines, and the ineluctable rise of ever-cheaper digital read out systems. I own a simple Chinese lathe/mill combination machine, so I

bought three modestly priced DRO scale units to bolt on to the x, y, and z axes of my machine. Altogether this cost less than £70, which I thought was very fair.

Back in my shed, I had also been having problems getting a consistently good finish with my milling machine using just the supplied drill chuck and drawbar. So, at the Chronos stand, I bought a well-priced, wooden-boxed, Posilock milling chuck complete with a set of Imperial and metric collets. This investment should help with tool rigidity, and hopefully improve the finish I achieve. It should also partially introduce me into the mysterious world of collets.

Models and club stands

I'm a bog-standard M.E. punter and I am not particularly interested in model engineering competitions, though I adore seeing whatever has won. However, as a mere 'gongoozler', I reckon you would need two full days to do Harrogate Exhibition justice. On a day visit I only got a snapshot. Although I'm an aero engine and marine plant fan, I must confess that I do find motion work, and the bare chassis of a well crafted scale locomotive hard to resist. Consequently, I was delighted to see Ian Matthew's superb LMS Duchess, crisply presented in smart grey primer, and built to the Jim Vass plans.

A similarly impressive chassis was F. Bilney's 5in. gauge *Jersey Lily*. I'd love to get that level of finish on my ferrous metal components! Another aspect of steam locomotives that has always fascinated me is the all-important pipe-work, gauges, and regulators on the back-plate. In this regard Walter Scott's immaculate Hunslet narrow gauge *Russell* did not disappoint. I loved its chunky lines and superb overall finish.

Broaden your horizons

A good, broadly-based model engineering exhibition allows you to expand your modelling horizons. I find that the deeper I travel into model engineering, the more the siren voices of

clock-building, rolling stock construction, and amateur wheelwrighting draw my attention. For example, Joe Cartledge's impressively detailed fen brush wagon was a long way from my nominal interests, but utterly captivated me, nonetheless.

Even my normal immunity to the cult of the Sterling engine was weakened by their superbly presented stand. Here I met author Roy Darlington and perused his new book *Sterling and Hot Air Engines* (www.crowood.com). Roy also had a particularly snazzy Sterling-powered motor boat.

This prompted me to tour the model boat club stands, as well as those model engineering clubs that housed marine engines. On one stand, the colourful and amphibious *Puddle Duck* DUKW by R. Ord was great fun.

Since I'm fascinated by steam plant, I currently have two tiny beginner's twin cylinder launch engines on the go. Therefore, a good gawp around the club stands soon recharged my marine inspiration batteries. Two marine steam plants/engines took my eye. One was Raymond McMahon's impressively executed marine plant complete with glass windows to allow you to see the precise bevel gear work. This stunning model won the Edgar Westbury Trophy in 1997. I studied this a long time.

The other was D. Lidster's triple expansion marine steam engine. Utterly astounding. When I grow up I'm going to build one of these, or maybe a very much simplified Stuart version. The quality of workmanship on both models was fastidious. Another beautifully observed model, though not a marine subject, was P. J. M. Southworth's Palmer compound engine – a treat in polished brass, burnished steel, and proper British Engineering Green paint.

OS locomotive

Returning briefly to locomotives, on another stand I noticed a very convincing model of *The Rocket* which had been donated

by the OS Company of Japan. I have a shed full of OS aero engines, so I was extremely interested in this beautiful commercial model. Visions of digging up the back garden for a Garden Railway flashed before me.

People I saw

The SMEE stand always provides an excellent display. The SMEE are smashing people, and they always seem to be able to present complex and demanding model engineering in a way that seems both fun and sociable. Later on, I believe I caught a glimpse of star designer, engineer, and ace photographer Mrs. Cherry Hill, but didn't like to disturb her conversation with her engineering chums. Over from California was Mike Rehms, editor of the new subscription-only magazine *Model Engine Builder*, which is advertised in M.E. each month. What with that, and the fine Nemett column in M.E., things are looking up for us glow, diesel, and petrol fanciers.

In some sort of record, I even managed to meet no less than four editors and/or editors emeritus of model engineering titles as I cruised around the halls of Harrogate. In fact, I had a liquid lunch with three of them in the conveniently licensed Harrogate cafeteria. I won't tell you who paid.

Bits and bobs

One of the best things about Harrogate is the lines of small

traders who stock all those hard to source items. For example, with electronics of all sorts playing an increasing role in model engineering, and especially in the shed, electrical and battery specialists Modelpower were doing very good business. I bought some high capacity cells there at a good price, and then went in search of one of my all time model engineering favourites, Tracy Tools. I am messing about with own-design needle valves in my home-brew glow-engine carburettors at the moment, so I needed to buy some obscure fine metric threading tackle. Needless to say, Tracey Tools had it. While there, I also bought a set of metric counterbores – something I have been wanting to try for a good while, in order to smarten up my cylinder heads.

I also noticed that kit specialists Hemmingway had a number of useful and very reasonably priced tooling kits. Their graduating tool, and their spherical turning attachment were particularly interesting to me.

The verdict

Besides seeing what's been achieved by other modellers - and stocking up - a good exhibition raises your game. Model engineering can be a solitary, shed-bound activity, so getting out and about to the exhibitions also fulfils a valuable social function. On all counts, Harrogate is in very good health.

ME



MAGNETIC DRIVE CLOCK

PART 3

Continued from page 329
(M.E. 4295, 16 March 2007)

Richard Stephen continues his instructions with a different type of pinion drive and the various arbors.

The threaded holes in the two lower pillars are for the screws that secure the movement to the feet blocks and the base. Machining these components should present few problems. The two screw covers still need to have the ends fitted to the two lower pillars. This can be done once the base and the feet blocks are made.

Fitting the back cock

The back cock is fitted to the back plate next. To initially position the cock you will need to make a peg to position and

secure the cock to the back plate before you can drill the 1.5mm holes for the two register pins. The peg is made from a scrap of 8mm brass rod about 8mm in length. Face off both ends and turn down one end to 5mm for a length of 6.2 millimetres. Drill a 2.6mm hole and tap it 3 millimetres. Mark a centre line on the back surface of the L-section of the cock.

Assemble the cock on the back plate. Align the centre line of the back plate along the x-axis of the mill. Position the back cock so that the centre line you have just marked also coincides with the centre line of the back plate. It is very important to precisely align the back cock as the cock carries the non-return ratchet for the pin wheel.

Figure 9 illustrates the position of the non-return ratchet relative to the pin wheel. The arbor of the ratchet must be precisely at the position indicated if the ratchet is to function correctly. This in turn requires the back cock to be correctly positioned. With the back cock correctly positioned the holes for the 1.5mm register pins can now be drilled at the positions indicated on **fig 10**. The two register pins are secured in the back cock with Loctite 326. The cock is re-assembled on the back plate and the register pins cut off flush with the inner surface of the plate.

The pinion drive mechanism

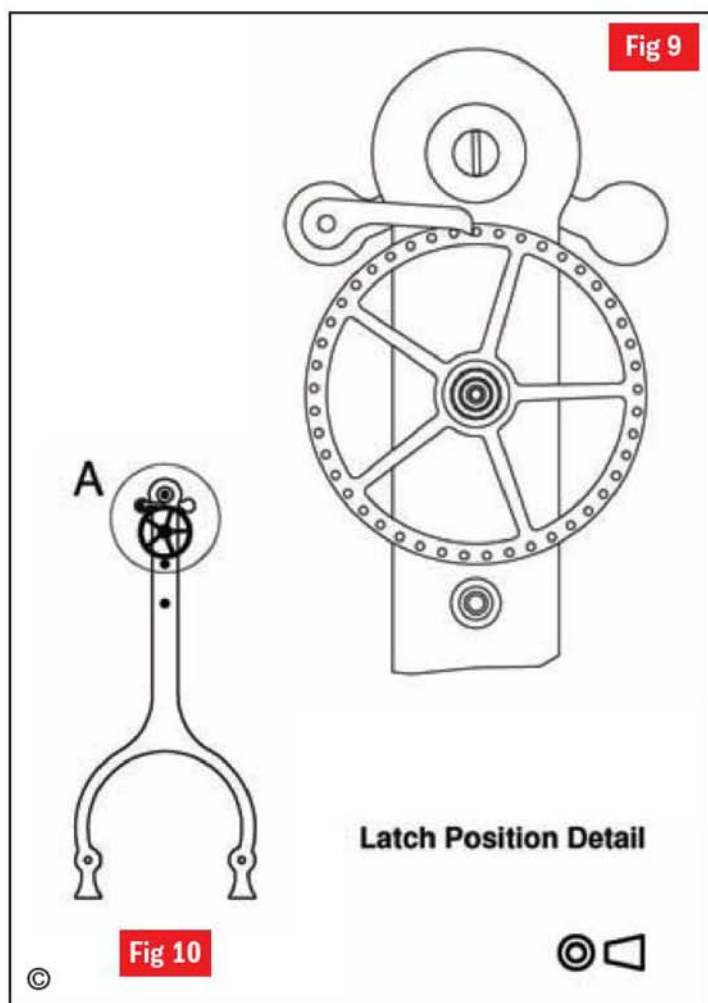
The pinion drive mechanism is illustrated in **fig 11a**. As mentioned earlier, the train of this clock is different to the train of all conventional clocks that are wheel driven. Energy to

maintain the pendulum motion is derived from a falling weight or tensioned spring and transmitted to the pendulum by a train of wheels and pinions. In the majority of magnetically driven clocks the motion of the pendulum is maintained by applying energy directly from an external source.

A magnet attached to the pendulum is either attracted to or repulsed by a magnetic field induced in a solenoid by an electric current applied to the solenoid as the pendulum swings. A portion of the pendulum's energy is used to drive a train to move the hands of the clock. The basic problem with this system is that the swinging pendulum rotates both clockwise and anti-clockwise, whereas the train that moves the hands must only rotate in one direction i.e. the centre arbor must rotate clockwise.

A variety of mechanisms have been developed for this purpose in magnetically driven clocks usually involving some form of ratchet and pawl type mechanism. In these movements the pendulum is suspended in the conventional way using a suspension spring. The ratchet and pawl mechanism has to be attached at some point on the pendulum rod. The closer to the point of suspension this mechanism is attached the greater will be the torque the pendulum can apply to the train.

To maximise the available torque the pendulum of this clock is suspended on ball races and attached to the arbor that forms part of the train. As the pendulum swings the pendulum arbor rotates both clockwise and anti-clockwise. A roller clutch incorporated in the drive mechanism and attached to the drive pinion allows the pendulum arbor to rotate freely anti-clockwise but locks to the arbor when the pendulum rotates clockwise and so drives the train. Since the centre wheel rotates 80 times slower than the drive pinion there is more than adequate torque available at the centre wheel, to drive the motion work and the hands without significantly



compromising the motion of the pendulum.

The details of the drive mechanism are illustrated in **fig 11a**. Begin by making the housing for the roller clutch. This is made from a 12mm length of 10mm diameter EN1A mild steel. Face both ends of the piece of steel and reduce the length to 9mm and just clean up the outer diameter.

The hole for the roller clutch needs to be made next. The diameter of the roller clutch is 6.5mm, the diameter of the hole in the housing is just slightly less than this as the clutch is a press fit into the housing. The hole in the housing needs to be 6.4985mm exactly. To facilitate boring the hole to this size you will need to make a test bar 6.498mm in diameter. Drill a hole in the housing 6.3mm in diameter. Using a small very sharp boring bar gradually bore the hole until you can just insert the test bar. The diameter of the hole should now be just right.

Check that the roller clutch will just not slip into the hole. Using some fine wet and dry paper wrapped around a length of 5mm dowel rod, taper the front of the hole for about 2mm until you can just insert the end of the clutch. Do not insert the clutch at this time. Cut off a piece of 8mm diameter EN1A about 8mm long. Face both ends; reduce the diameter to 7mm and the length to 5mm. Now turn down one end for 3mm to make an easy fit (not loose) into the end of the housing (not the tapered end). You may need to slightly chamfer the edge of the hole in the housing to get the insert to but snugly.

Attach the piece into the end of the housing using Loctite 326 adhesive. Holding the housing in a collet turn down the insert to 6mm and drill a 4mm hole in the end. Fit the housing and the pinion into the pin wheel and check that they line up accurately. The pinion bearing housing is made next. This is made from a piece of EN1A mild steel 6mm diameter and 5mm long. Face both ends

and drill and ream a 4mm hole. I used an aluminium bronze bush for the drive bearing.

Turn a piece of aluminium bronze to 4mm diameter and cut off a 3mm length. Fit the piece into the end of the housing to a depth of 2mm and secure with Loctite 326 adhesive. Turn down the end flush with the end of the housing. Drill and ream a 2mm hole through the aluminium bronze insert. Reverse the housing in the lathe and drill the insert to a depth of 1mm with a 3mm drill to reduce the length of the bearing to just under 1 millimetre. The drive mechanism can now be assembled and fitted to the pin wheel. Do not insert the roller clutch at this time.

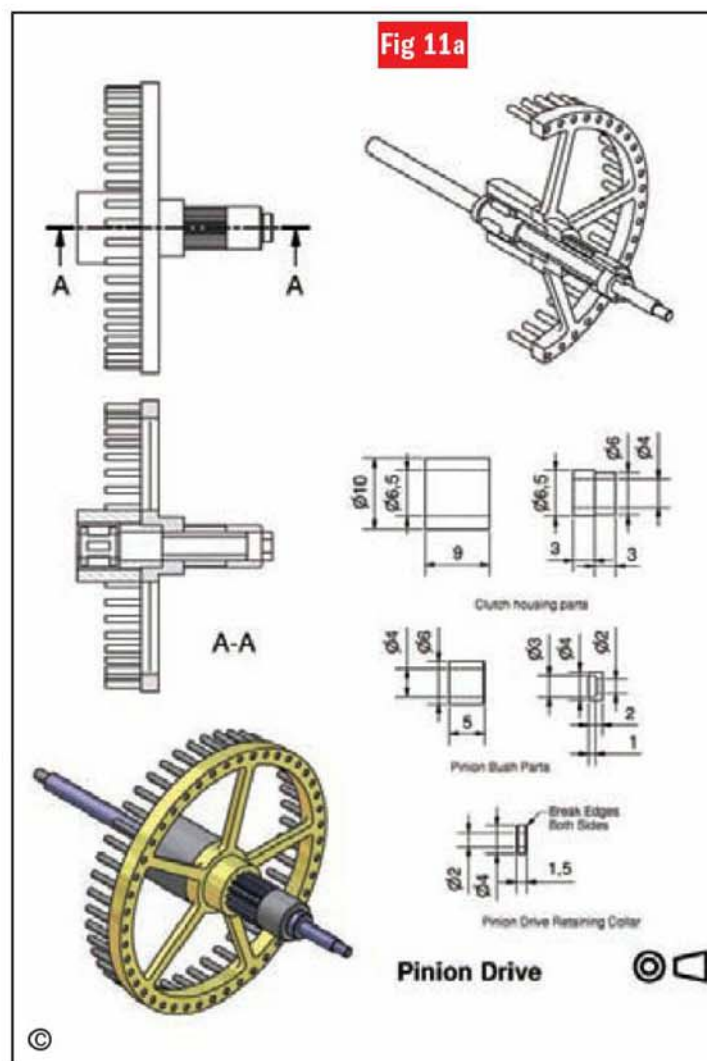
The arbors

The details and dimensions of the arbors are shown in **fig 11b**. All the pivots except one on the pendulum arbor and the front of the centre arbor are made from 1.5mm pivot steel rod inserted into the ends of the arbors and secured with Loctite 326 adhesive.

The intermediate and centre arbors

The intermediate and centre arbors are illustrated in **fig 11b**. The intermediate arbor is made from a length of 2.5mm silver steel. Measure the spacing between the plates and make the arbor 0.5mm less than the measured length. Drill a 1.5mm hole in each end to a depth of 4mm. Loctite lengths of 1.5mm pivot steel (blue removed) into the holes and reduce the length of each pivot to 2.5 millimetres.

The centre arbor is fabricated out of a length of 4mm silver steel and a length of 2mm silver steel for the motion work arbor. Again measure the spacing between the two plates and note this value. Cut off a length of 4mm silver steel 7mm longer than the spacing you have measured. Face off one end and drill and ream a 2mm diameter hole in the end to a depth of 12mm for the 2mm motion work arbor. Turn down the end to 3mm diameter for a length of 6mm to fit the front 3mm ball race.



Square off the shoulder and check the 3mm race is an easy fit right up to the shoulder. Face off the other end and reduce the length from the shoulder to 0.5mm less than the measured spacing. Drill a 1.5mm hole for the pivot to a depth of 4 millimetres. Fit the pivot and reduce the length to 2.5mm. Now turn down the end to 2.5mm for a length of 9 millimetres. I gently tapered my centre arbor as can be seen in **fig 11b**. This looks a bit more elegant than leaving it plain. The 2mm front section for the motion work will be made and glued in position later when the dial is in place and the motion work is completed. This will allow the correct arbor length and position of the retaining groove to be determined.

Pendulum arbor

The pendulum arbor is fabricated in two parts from a length of 2.5mm diameter silver

steel rod and a length of 4mm diameter silver steel rod. The constructional details of the arbor and the drive assembly are illustrated in **figs 11a** and **11b**. Assemble the plates, pillars and the back cock.

Measure the distance between the inner surface of the back cock and the inner surface of the front plate. The pivot that fits into the front plate bearing is integral with the arbor. Add 2.5mm to the measured length to allow for the pivot. Turn a 1.5mm pivot on the end of the piece of rod. Carefully square off the shoulder of the pivot and check that the pivot is an easy fit in the 1.5mm ball race. Now turn down the arbor for a length of 35mm to 2mm diameter. Drill a 1.5mm hole in the other end of the arbor to a depth of 4mm for the second 1.5mm pivot. Set a piece of 1.5mm pivot steel (remove the blue with fine wet and dry) into the hole with

CLOCK

Loctite 326. Cut off and reduce the pivot length to 2.5mm and chamfer the end.

Make the hardened sleeve from a length of 4mm silver steel about 12mm long. Face both ends. A 2mm hole is now drilled and reamed through the full length. Check after you have drilled the hole that it is central. Turn down to 3.0mm diameter for a length of 7mm, remove all tool marks and finish the surface with fine wet and dry paper. Now reduce the length to 8mm leaving a collar 1mm long. Again remove all tool marks and finish with fine wet and dry leaving a fine polished surface. Now insert the sleeve into the roller clutch. The clutch will grip the sleeve when turned one way and rotate when turned the other way. You will feel a small amount of resistance when the sleeve turns 'freely'. If required, carefully reduce the diameter in small increments until the sleeve turns freely in the clutch one way but still grips when turned the other way.

The sleeve now needs to be hardened. To hold the sleeve taper the end of a 100mm length of 3mm mild steel rod to fit into the end of the sleeve. Grip the rod in a cordless drill and fit the sleeve onto the end. Check that the sleeve runs true. With the drill running heat the sleeve cherry red and with the drill still running, quench

the sleeve in cold water.

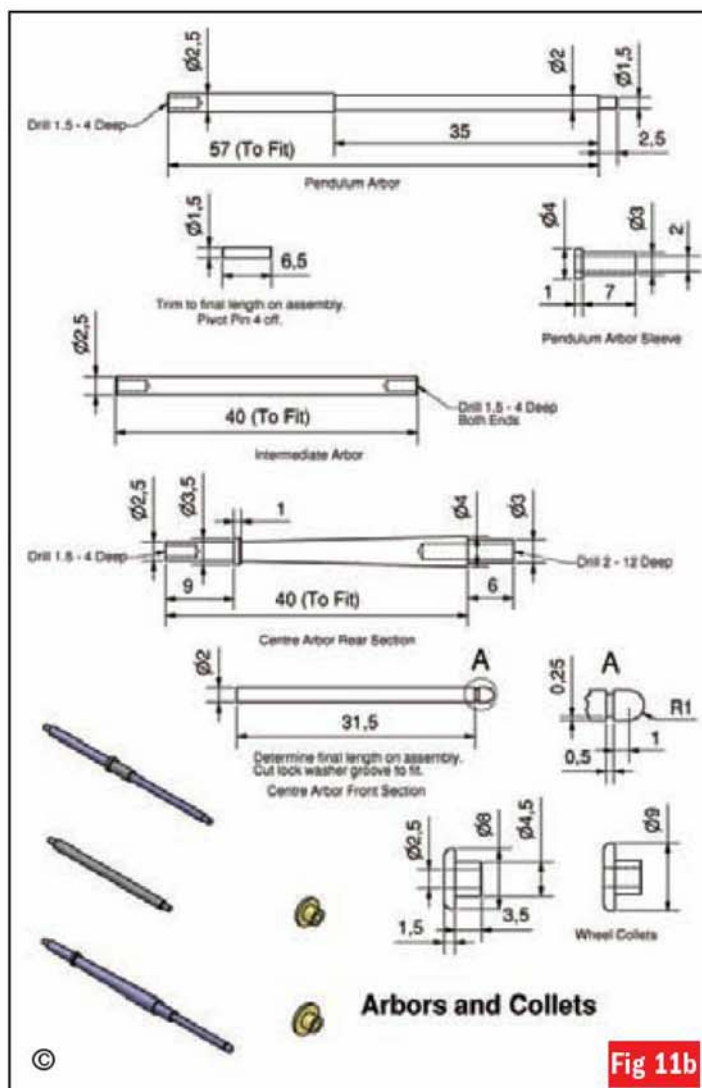
Return it to the lathe and repolish the end. Grip it again in the drill and heat to a pale straw and quench in water. Polish the surface again. The 2mm bore will have oxidised as a result of the hardening and will have to be cleaned before it can be fitted with Loctite to the arbor. Loctite will not cure properly if the surfaces are oxidised.

The easiest way to clean the bore is to use a wooden toothpick covered with Autosol paste. Grip the long end in the lathe and with the spindle running quite fast run the toothpick in the bore until all scale is removed. Clean off all traces of the paste. Fit the hardened and tempered sleeve in place on the arbor using Loctite 603.

Inserting the roller clutch into the drive housing

The roller clutch can now be fitted into the housing of the drive mechanism. Before fitting the roller clutch into the housing it is necessary to check that it is being inserted correctly. Once you have pressed the clutch into the housing it will be very difficult to remove it again.

The roller clutch must grip the arbor when it is turned clockwise i.e. the pin wheel must turn clockwise when viewed from the



front of the clock and remain stationary when the arbor is rotated in the opposite direction. Once you have determined the

correct orientation of the crutch
it can be pressed firmly in place
in the housing.

● *To be continued.*

ISSUE NEXT ISSUE NEXT ISSUE NEXT ISSUE NEXT
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- New methods used in making model locomotives
- The Imperial measurement debate
- Taking digital photos of models
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- Centenary Model Engineer Exhibition

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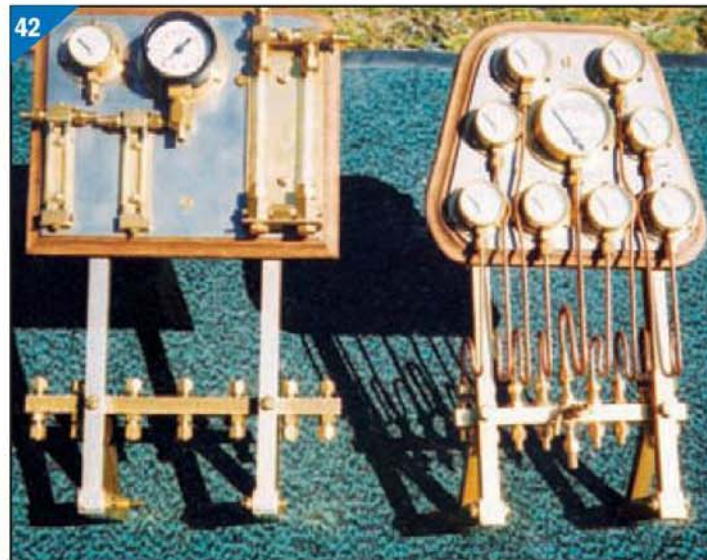
ON SALE 27 APRIL 2007

PART 4

Continued from page 344
(M.E. 4295, 16 March 2007)

Michael Duggan concludes the construction of his own-design for a river boat steam plant.

A MARINE STEAM PLANT



The ancillary equipment includes all the instruments I deem necessary for setting-up the plant. Few of these are necessary for operating the engine in the punt but, in view of the many unknowns, I plan to measure various temperatures and pressures on the test bed. At present I am making two gauge boards and these are shown partly-finished

in photo 42. On one are mounted nine pressure gauges. The large 2in. gauge was made and calibrated for me by Fred Dennis in 1988, probably one of the last that he made. It will measure the boiler pressure. The others are of 1in. dia. but contain a variety of threads and cones but will measure various pressures in the plant. The syphons are all connected to the rail by various sizes of

copper pipes but after the rail I have standardised on a common size of 1/8in. O/D copper pipe to the point I wish to measure. Here I have fitted a shut-off cock in each case. The cock on the top of the circulating pump is clearly visible in photo 26 (see M.E. 4293, 16 February 2007). I made some of the cocks and had no difficulty in turning the parts but when I bent some of the handles they often broke if I did not get it right first time, I assume due to work hardening. The answer may be to make a suitable jig, and perhaps careful annealing, or by the choice of material. This board will be mounted near the main engine.

Plastic tubes

The other board for measuring the boiler consists of two pressure and three manometers at present. The latter I have made, and will be used initially to measure the airflow from the forced draught fan, the furnace pressure, steam and fuel pressures. The manometers are fitted with plastic tubes (at present during construction (from ball point pens) which happen to be the same bore. From tests so far I am not very satisfied with their behaviour as they are a bit sluggish, which I assume is due to surface tension. The next test I plan to use a different medium to water, or increase the pipe bore, no scales are fitted yet to the manometers for this reason. I have made a Pitot tube for tracking across the square tube and it is shown in photo 43. This will help me to determine the airflow to the burners. A schematic plan of the pressure and temperature measurements >>>



42. Gauge boards.

43. Pitot tube.



44. Multi-point Galvanometer.
45. Thermo-couple pocket.

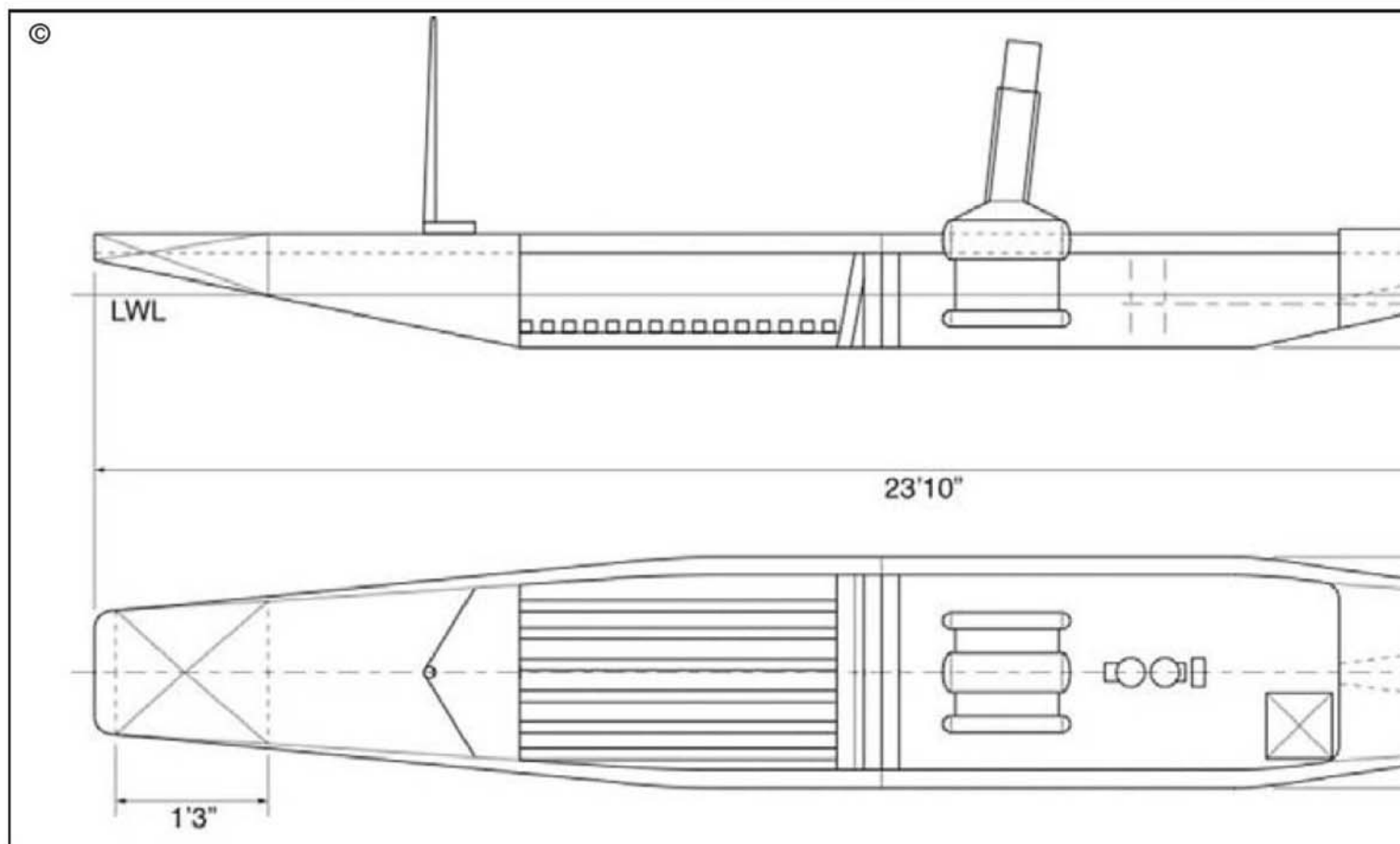


is illustrated in **fig 11**. For measuring the water level in the steam drum two gauges are fitted. These are the three-cock type as in normal marine practice. These are aligned up

on the curved surface of the drum end and the drains are visible, (**photo 12**, M.E. 4291, 19 January 2007).

The engine revolutions are recorded on a mechanical counter that is $3 \times 1\frac{1}{4} \times 1\frac{1}{4}$ in. and made by Counters Ltd. of Borehamwood. It counts up to 9999.9 and then returns to zero.

Initially on bench tests all temperatures will be measured by thermo-couples connected to a 12-point multi-channel recorder. This galvanometer, one of four, was salvaged from a ship in 1961 when it was scrapped and I thought it might come in useful some time! (**photo 44**). Suitable pockets



have been made during construction and one is shown in **photo 45** and this will measure the saturated steam temperature.

Experimental whistles

So far I have made and experimented with two steam whistles, (**photo 46**). These are based on the design given in *Model Engineer* some years ago and, whilst both work, I consider they are both of too high a note. I plan to make my Mk. 3 version of bigger diameter and approximately the same length as the smaller one.

The all important tea maker will consist of a plated copper tube with a lid containing the water. This will be heated by a steam coil and fed with steam from the saturated steam line as shown in **fig 1**, (*M.E.* 4291, 19 January 2007). The container will be fitted with a tap for the hot water. I have yet to make this device but it is on the list.

The Punt

The idea came to me some years ago but in June 1980 I had the opportunity of punting

on the River Cherwell at Oxford, and took this chance to measure it. Some of my basic measurements are shown in **fig 12**.

For my purposes these will be internal dimensions, the boat will be double-walled, each space being 3in. wide but for transport I plan to make it in two halves bolted together. Each half will have two transverse watertight bulkheads and the space created with the double skin will be used for buoyancy. The conventional

punt is propelled by the punter using a long pole who stands at the aft end. The boat is surprisingly manoeuvrable and a skilled punter knows where to place the pole each time, and not use the pole for leverage on the punt or for steering. In my case I plan to install a rudder to the rear of the propeller for steering.

Hopefully, I will carry two passengers in the forward section and the steam plant and driver in the aft section. The normal punt can carry five

people comfortably, say 850lbs.

To cope with the trim I will have a deck at both ends, instead of the convention at one end and at the forward end I propose to install a tank and the after end the cone for the propeller. The punt is surprisingly close in length and draught to Uffa Foxes airborne lifeboat Mk. 1 and his Mk. 2 is a bit longer. His propeller for Mk. 1 was 12in. diameter.

For various reasons I propose to increase the draught by 2in. >>

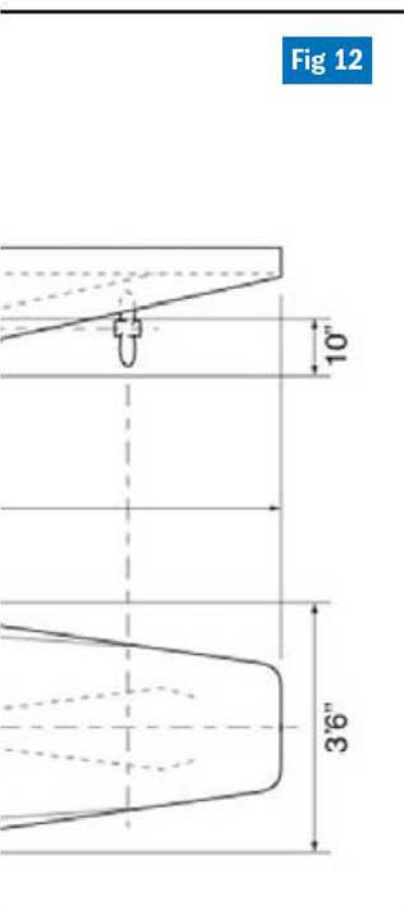


Fig 12

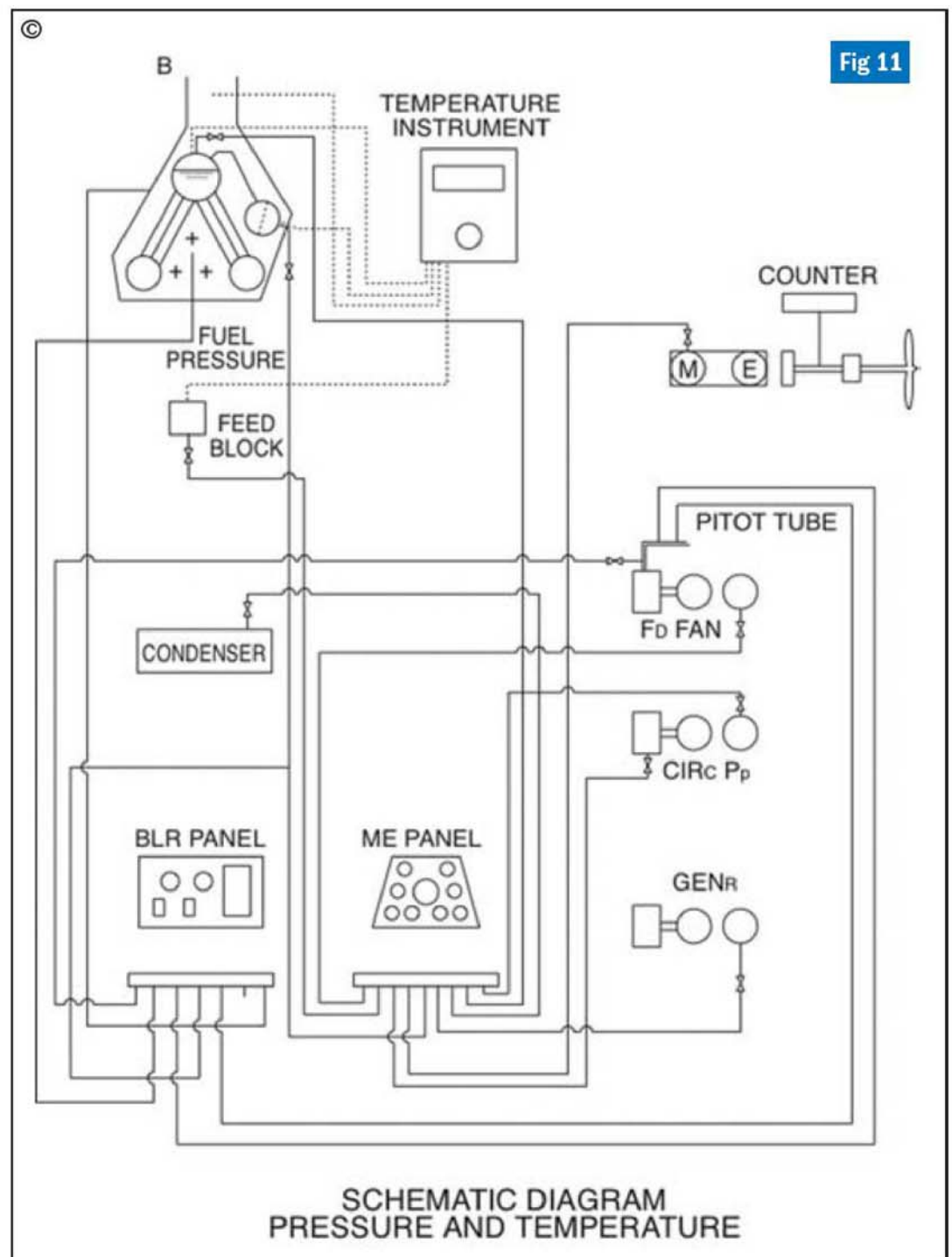


Fig 11

TABLE OF WEIGHTS

Fig 13

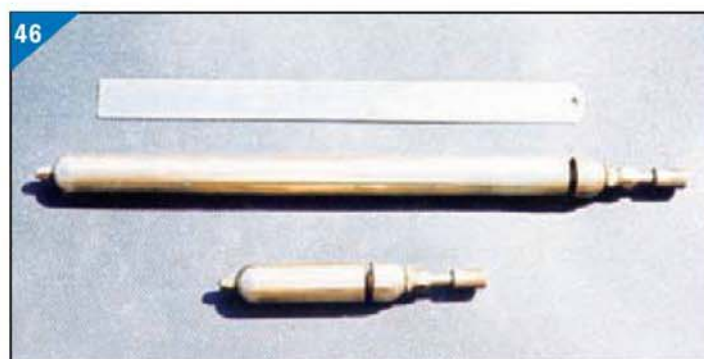
	Lbs-Oz
Main Engine, gearbox, L.O pump and oil tanks, L.O, 2 feed pumps, 2 air pumps	76-00
Boiler (empty)	61-00
Condenser	26-00
Feed heater	5-00
Circulating pump, engine and base plate	15-00
Forced draught fan, engine and base plate	10-00
Generator and engine	5-06
Air pump	4-13
2 Strum boxes	7-10
Vertical feed pump	13-00
Horizontal feed pump	1-07
Hand feed pump	1-04
Feed discharge block and valves	1-02
Whistle	0-07
Hotwell	23-00
Propeller	5-12
Shaft	13-00
2 Gauge boards	7-01
Water in Boiler, Hotwell, and Make-up tank (estimated)	101-11
Fuel, tank and reducing valve (estimated)	27-00
Copper piping and valves (estimated)	9-00
TOTAL lbs/oz	414-09

46. Steam whistles.

and fit a 3in. combing and breakwater all round either compartment. The conventional punt normally operates in a calm river and about 4ft. or 5ft. of water, a hard bottom, and no powered craft operate. I am concerned that mine may be in a different environment and have to contend with wash and small waves. I estimate the buoyancy will be about 280lbs per inch of immersion.

The boat is normally constructed of mahogany $\frac{3}{4}$ in. thick with knees and frames but of course I will have to consider the static weight of the plant and several gallons of water. Some of the weights are shown in the accompanying table, (fig 13) and of course the weight of water in the boiler, the hot-well, the reserve tank and piping when steaming, as well as the fuel, should be added.

For pumping out the bilges I will fit a hand-operated pump. Sooner or later it is bound to rain with the plant shut down, or a passing boat will swamp us. I have considered a bilge



injection system as in many merchant ships, after all the main circulating pump adds to the pumping capacity considerably in an emergency but the risk of flooding, contamination with solids, or even air locks is too great to consider it seriously.

Conclusion

The machinery is about 80% complete and the next job will be to make the boiler casing, uptakes, and the burners but I have not started on the punt. Apart from any existing skills new ones such as pattern making, the use of a fly-press and milling in a lathe had to be experienced, and the construction has given many hours of enjoyment, challenges and of course working to close tolerances. Although quite

complex as a model, it is still much simpler than a real full-scale ship.

In hindsight, and with the Tew conversion for my lathe, I might have selected a bigger engine such as the Compound 6A with an L.P cylinder of 4in. dia. and a 3in. stroke. The size in my case was largely dictated at the time by the throw of the crankshaft.

A marine engineer was expected to answer any of more than 2,400 questions for the engineering knowledge part of the examination but only a fraction of this applies to a model plant. Even so it is a good exercise as such things as flow rates, size of pipes and thermal conductivity of different materials may play their part. Steam has been used to propel model boats for at least 130 years and some

have quite complex plants on larger sizes, but there seems to be a dearth of data for larger plants.

A marine engineer has to live by his knowledge, skills and wits. He has to deal with everything on board, and there is often no help for thousands of miles. Great things have been achieved in the past. This partially-completed model will show up any mistakes I have made but it only deals with one subject - steam propulsion. **ME**

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AYESHA II

PART 3

Continued from page 336
(M.E. 4295, 16 March 2007)

Tony Weale
gives instructions for
making the water
pump, axles, axle
boxes and wheels.

Starting on the pump with the 3-jaw chuck operations, the two valve chambers are made identically, and can be bronze or brass, of round or hexagonal section. Chuck enough material for both. Begin by facing one end, centre-drill and put a $\frac{3}{32}$ in. hole through to the full depth of the fitting, then open out to $\frac{7}{32}$ in. diameter, $\frac{5}{16}$ in. deep, and tap the female thread. Part the fitting off to length, and repeat. Re-chuck each fitting in turn, blank end outwards. Face off, turn down the shoulder to $\frac{3}{16}$ in. length, and cut the male thread, preferably using a tailstock die-holder.

The outlet fitting now requires a ball seating, which will work quite well on a conical base, so there is no need to counterbore the hole. Drill and tap a $\frac{1}{4}$ in. x 40tpi hole in an off-cut of brass bar or plate in which to stand the fitting safely, put a $\frac{5}{32}$ in. steel ball in the top of the fitting, insert a drift and tap smartly but carefully with a small hammer to seat the ball. This will probably distort a stainless ball, so for preference use a plain steel one, and then fit a

new stainless or bronze one when assembling. The inlet fitting, which is the bottom one, has to be relieved internally so that water can pass the ball as it is sucked upwards. Support the fitting as before, and either notch the edge of the $\frac{3}{32}$ in. hole with a small chisel in two or three places, or file to an oval section with a small rat-tail.

Turning union bolts

The two pump union bolts are turned, bored and threaded from $\frac{3}{8}$ in. hexagonal stock. Note the relieved area centred on the cross holes. This should be positioned to coincide with the centre of the union ring. It will help to turn up the ring first, and drill a $\frac{3}{32}$ in. pilot hole at the pipe location, then assemble the bolt and ring to the pump, with the hole in the ring in line with the axis of the pump. Tighten the bolt, then spot through the $\frac{3}{32}$ in. hole, and the cross-hole in the bolt will align with the pipe which will optimise water flow.

One bolt must have a ball seating, as detailed above, for use on the inlet side. The other bolt must be notched so that the water can get out of the pump. Make each bolt slightly over length, so that when the union is assembled the length can be adjusted to allow $\frac{1}{32}$ in. lift on the ball, it should just be possible to hear the ball rattling when the fitting is shaken. Check the non-return action of the valves by blowing through them.

Machining the body

The pump body should preferably be bronze, but hard brass is a possibility. Chuck a length of $\frac{5}{8}$ in. diameter in the 3-jaw, face the end, and turn down $\frac{5}{8}$ in. length, for threading $\frac{1}{2}$ in. x 26 or 32, using a tailstock die holder. Centre-drill the face, pilot-drill $1\frac{1}{16}$ in. deep, and open the bore out, finishing with a $\frac{5}{16}$ in. reamer. Centre-pop for the cross hole, then part off the barrel to length. The cross hole will require the 4-jaw chuck for accuracy, so we will return to this later.

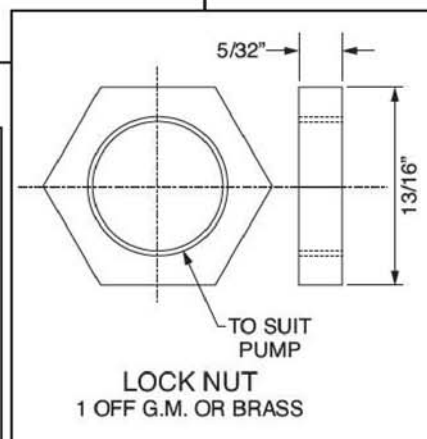
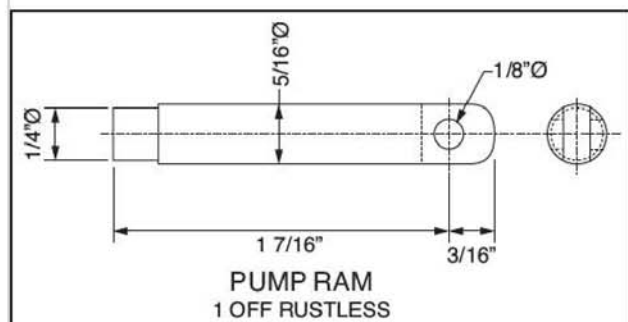
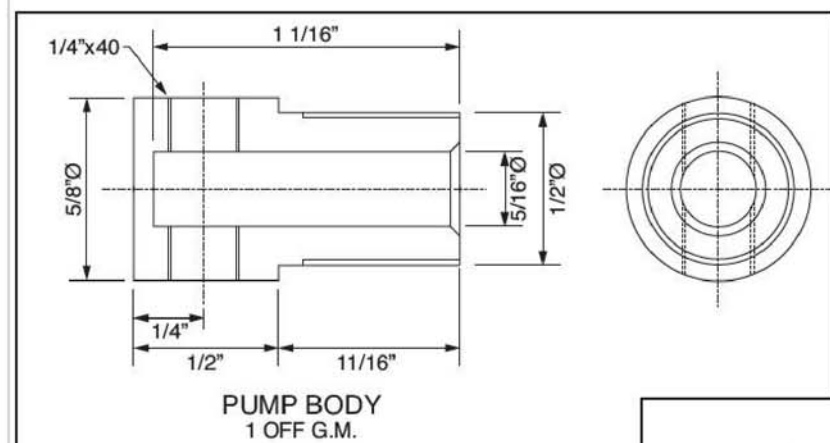
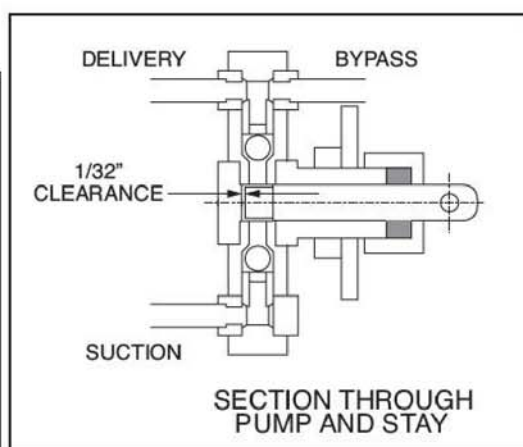
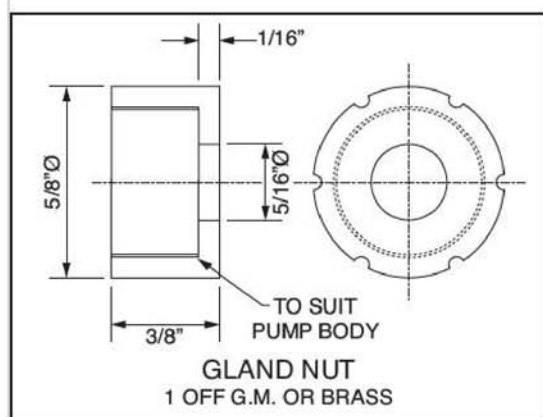
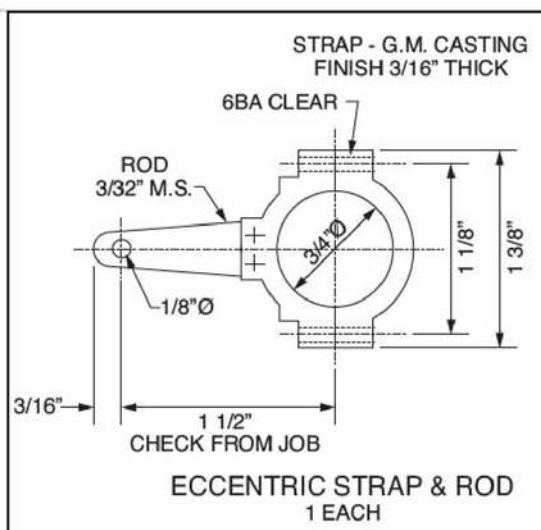
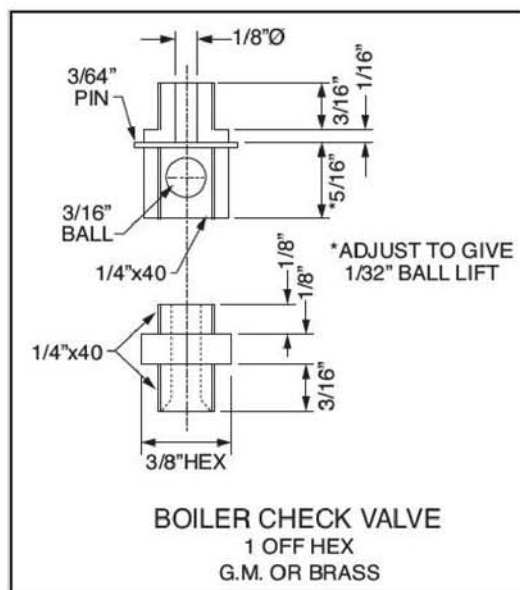
The pump ram is made from $\frac{5}{16}$ in. diameter rustless steel, it

should be a good sliding fit in the pump bore, and should have smooth finish, but it does not have to fit as closely as a steam piston. The rustless steel supplied by the model engineering trade is not difficult to machine, and is usually true enough to be used as a pump ram without machining all over, but do not omit the reduced diameter at the 'small' end of the ram.

Completion of the ram requires use of the 4-jaw chuck, so the remaining jobs in the 3-jaw chuck are the gland nut and the lock nut, both of which are threaded to match the pump body and should be fairly self-explanatory. They can both be either hexagonal, or circular with filed C-spanner grooves, as preferred: six equally-spaced grooves can be marked off with reference to the chuck jaws. Use a small boring tool to open out for tapping, and finish the thread with a bottoming tap. If the gland nut is made over-length, a section can be parted-off to form the lock nut.

Now, transferring to the 4-jaw chuck, make a holder for the ram from a piece of steel or brass bar, say $\frac{1}{2}$ in. square and about 1in. long. Chuck this to run truly, face the end, and bore right through to suit the ram. Slit the bar lengthways on the centre of one face, and deburr the hole. When the ram is inserted, it can be clamped in the vertical slide, toolpost, or vice, without damage. The fork can then be cut in the end of the ram with a lathe-mounted slitting saw, or by careful hand sawing and filing, using a piece of $\frac{3}{32}$ in. plate to gauge the width.

The final operation on the ram is to cross-drill and ream the $\frac{1}{8}$ in. pin hole at right angles to the completed slot. This requires care. At a pinch it can be done freehand in the drilling machine, but it is preferable to make a fixture, consisting of another bit of square-section bar. Scribe centre lines on two adjacent faces, then drill a big hole on one face to accept the end of the pump ram, and a small hole on the other face to the required size for the pin-hole. All being well, >>



the small hole will then pass perpendicularly through the centre of the big one, and there is your drilling jig.

To finish the pump barrel, set it up crosswise in the 4-jaw chuck so that the centre-pop runs true, and pilot-drill right through the workpiece, taking care when breaking into the bore. Open out to tapping size, and cut the thread, supporting the tap with the tailstock and turning the chuck manually. It should be possible to run the tap right through. Remove from the chuck; put the reamer through the bore again to deburr the cross holes.

Trial assembly

Now for a trial assembly. Thoroughly deburr and clean all the parts, and screw the valve chambers to the pump body, noting which valve is which, and check that they do not foul the ram. Shorten the male ends if necessary. Put the balls in, and add the unions, again remember that these are different; the outlet is at the top and the bolt is notched. Pack the gland with graphited or PTFE yarn, and screw up finger tight. Dip the inlet fitting into a tub of water, operate the ram a few times and the pump should oblige, which will make all the hard work worthwhile. It can now be dismantled, and the barrel fitted to the locomotive chassis. The valve chambers and unions are best left until a later stage of assembly when they can be permanently attached and sealed with Loctite thread lock or a similar compound.

The use of soft gland packing has just been mentioned. This will be suggested throughout the construction of this locomotive because it is the simplest method and requires less accuracy in machining. More experienced workers may prefer to use O-rings and, in the case of the pistons, properly made PTFE split rings. These will give better and longer-lasting results, provided they are correctly fitted. In some cases the given dimensions will require modification to achieve this.

Axleboxes

With the pump complete, we can turn our attention to the driving wheels, axles and axleboxes. At this stage accuracy, in three dimensions becomes important if an efficient and free-running chassis is to result, since there are many potential sources of binding. However, a four-coupled chassis is easier to cope with than a six, eight or ten-coupled type.

Axleboxes are usually made from cast gunmetal bar. With possible inaccuracy on a long cut, and the limited travel of many vertical slides, it is best to cut sufficient material to make two boxes at a time, or even to make them individually.

Start by facing the front and back to the finished dimensions in the 4-jaw chuck, then transfer to the machine vice in the vertical slide with an end-mill of about $\frac{3}{8}$ in. diameter in the chuck, for machining the flanges. With one side completed, reverse the material, place a length of parallel bar between the completed flange and the back of the vice, and the job should be square to the cutter for the second side. Aim for a tight fit in the horn slots, since this will be easier to correct than a loose fit. A vernier calliper set to the width of the slots makes a useful gauge.

Correct positioning

Now separate the axleboxes, return to the 4-jaw chuck, and face the top and bottom of each box to produce $\frac{3}{4}$ in. overall length, and prepare for some careful marking-out. The apparent problem with axleboxes is how to get all the axle holes exactly through the middle. In reality, any slight vertical error will be absorbed by the springs, but it is important that the locomotive has an equal wheelbase on both sides. If the frames and horns are true it does not matter if the axle holes are slightly off-centre, as long as all are equally so. Therefore, mark which edge of each axlebox will be the front, and which will be the bottom, and set out the

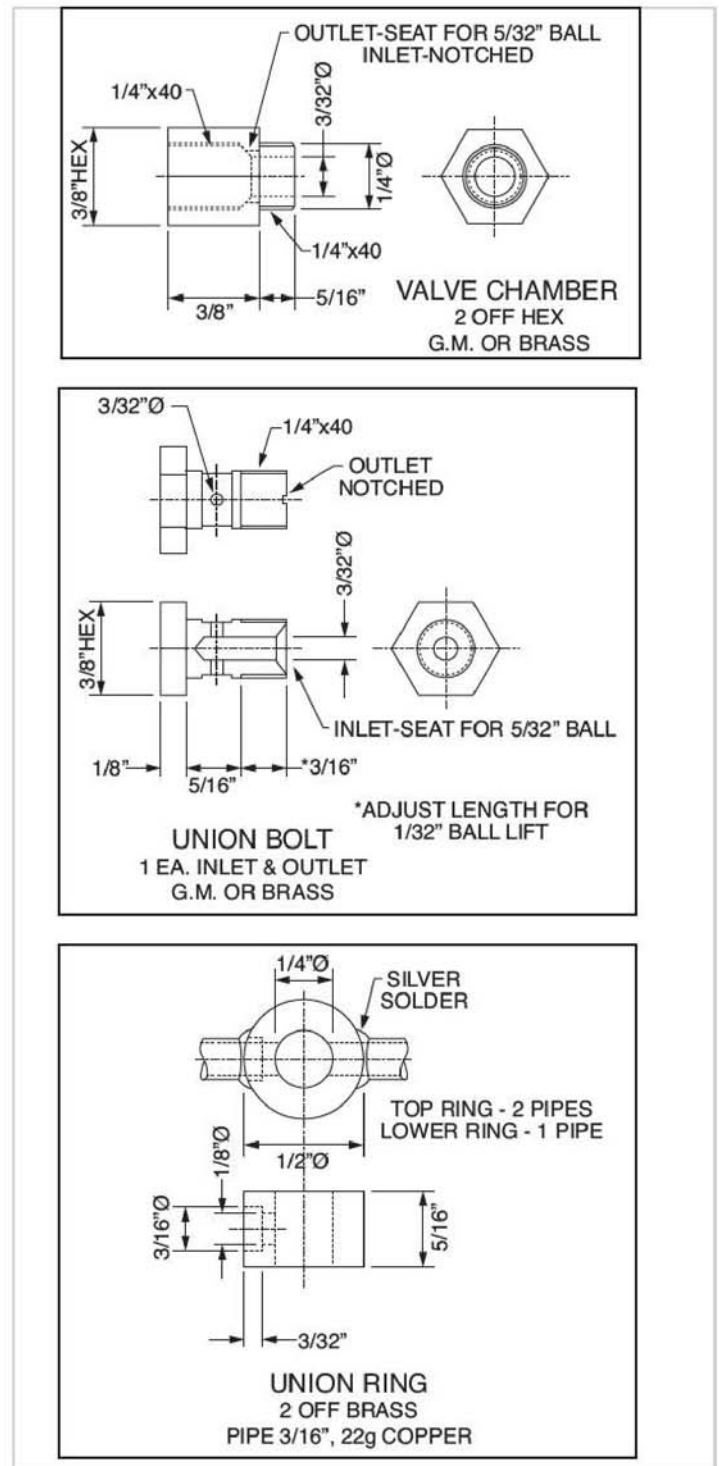
'centre' with reference to these edges.

The axleboxes can either be drilled, opened out and reamed to size individually, or while clamped back-to-back in pairs. Use the lathe for all these operations. The finished bore depends on the axle material, but normal $\frac{3}{8}$ in. rod is usually undersize, so a $\frac{3}{8}$ in. reamer should do nicely. Otherwise, finish with a boring tool. A running fit without side-play is required, and as with the horns, too tight is preferable to too slack at this stage.

Now, with the chassis inverted, try the axleboxes in the horns, check for a good sliding fit, and ease with a fine file if necessary. Insert some $\frac{3}{8}$ in. rods as dummy axles, and check for squareness. This will be easier to spot if fairly long rods are used, say 8 to 10in., but make sure they are straight. If all is not well, check the alignment of the chassis itself, then if necessary try interchanging the axleboxes, side to side and corner to corner - this is called 'selective assembly'! When completely satisfied mark the boxes and their respective horns with number stamps or centre-pops.

Fit the previously made hornstays, wedge the axleboxes against them, and spot the axleboxes through the central holes in the stays. You can now drill and tap the axleboxes for the spring guide pins, and make the pins themselves from $\frac{1}{8}$ in. steel rod. It is convenient to break the pin holes through into the axle bore, but remember that the pins themselves must stop short of this when screwed right in, or the axles will mysteriously refuse to rotate! A drop of Loctite is advisable to retain the pins, but again, keep this away from the bearing surfaces. Do not forget the oil holes in the top face of the axleboxes.

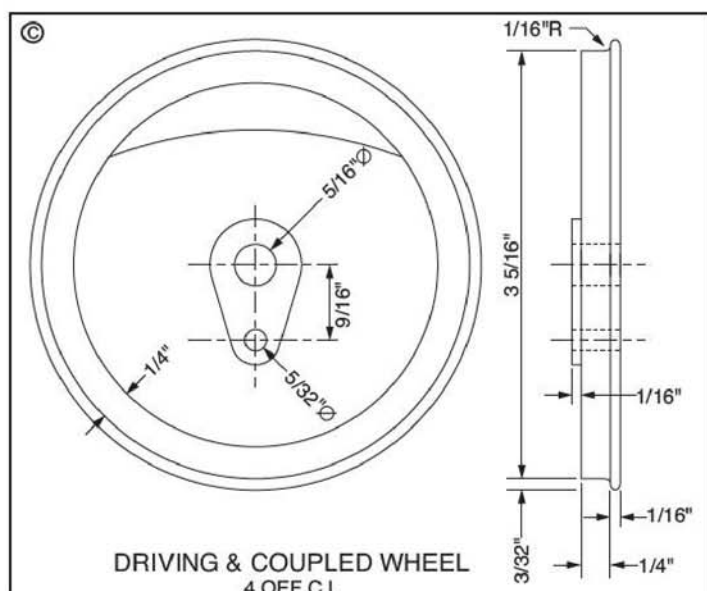
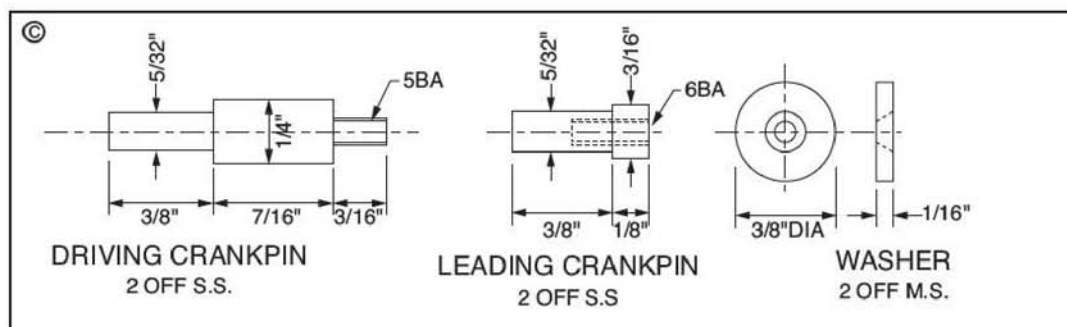
The axleboxes could also be built-up from mild steel or cast iron bar, with the flange made from $\frac{1}{16}$ in. mild steel or brass sheet, attached with countersunk screws, one near each corner. A steel axlebox would need a bronze bush



pressed in for the axle bearing, but either steel or cast iron should give good results and might well outlast a bronze casting. In passing, LBSC used to suggest putting a reamer through each pair of axleboxes and working them up and down in the horns while reaming to ensure free movement over uneven track. This seems risky, and I have never found it necessary, since with a little side-clearance between axleboxes frames and wheels,

enough freedom will develop of its own accord. Perhaps tracks were rougher in those days.

The axles have to be made to fit the bore of the driving wheels, so we must complete these and add the crankpins next. We will also require the eccentrics before fitting the wheels to the axles. Wheel turning has already been discussed in relation to the bogie, and the procedure for the driving wheels is very similar. The faceplate needs to >>>



be larger, say, 3in. diameter and the crank boss and the balance weight have to be dealt with as part of the facing operations. The bosses are finished 1/16in. proud of the tyre, and the axle holes are finished with a 5/16in. reamer. Take light cuts and use a very slow speed to minimise chatter. It is important for good adhesion that all the driving wheel treads are identical in diameter.

Crankpin holes

The next stage is to drill the crankpin holes. Clearly these must all be at the same radius, also the crankpins must all go in straight, otherwise the coupling rods will bind. So a jig will be required. This is simply a few inches length of flat steel bar, at least 1/4in. thick, drilled for a spigot which will push-fit into the wheel bore, with a 5/32in. hole drilled at the required 9/16in. crankpin radius. Scribe a line on the face of the crankpin, from the centre of the axle bore to the top of the crankpin boss. Clamp the

jig to each wheel in turn, with the crankpin hole centred over the scribed line and drill through, either in the lathe or the drilling machine. It is preferable, but not essential, to finish the hole with a reamer. Mild steel is perfectly adequate for jigs of this sort. They do not need to be hardened unless you are contemplating mass-production, but they should be regarded as essential parts of the locomotive and made with equal care. It is also possible, though no doubt frowned upon, to drill the crankpin hole in the first wheel and then use this, with a spigot in the axle bore, as the drilling jig for the remainder.

Turning crankpins

The crankpins themselves are ideally turned from silver steel, though mild steel is acceptable. The journal must be concentric with the spigot which fits into the wheel, the threaded part is less critical, it is sensible to retain the pins with Loctite since there is a risk of splitting the wheel casting if a press fit is made too tight.

So, if you are able to chuck the material truly, preferably in a 4-jaw chuck with the aid of a dial gauge, or in a suitable collet. Use material of the finished diameter, turn down the spigot to a tight sliding fit in the wheel boss - nominally 5/32in. - then reverse in the chuck and face to length. The driving pins are then shouldered for a 5BA external thread. The leading pins, which are much shorter, require drilling and tapping 6BA. The drawing shows a blind hole, but it can go right through the pin if a bottoming tap is not available. If you have difficulty getting the job to run truly in the lathe, use oversize material and turn the journal size first, then continue as described. Now trial-fit the crankpins to the wheels, and if all is well, degrease everything in petrol, allow to dry, then put the pins in permanently with a drop of high-strength Loctite, or equivalent.

Driving axles

The driving axles are, essentially, larger versions of the bogie axles, but they require greater care. To avoid binding of the coupling rods, the wheel seats must be turned concentric with the bearing journals, so the axle material must be chucked truly. Ideally this means a 4-jaw chuck, or a collet, and checking with a dial gauge.

A 3-jaw chuck alone is unlikely to run accurately enough; so if you have to use one, or if you have no dial gauge, make a split bush to hold the axle, it sounds better to call it a split collet! Make one from a piece of brass or soft steel rod, say 5/8in. diameter and about 1in. long. Chuck it, face the ends, and bore right through to suit the

axle, finishing with a reamer. Mark the position of number 1 chuck jaw on the bush, then remove from the chuck, split it lengthwise with a hacksaw exactly opposite the number 1 mark, and put the reamer through again to deburr the cut edges. Put the axle blank - 3/8in. mild or silver steel rod - into the bush and replace it in the chuck, with the mark once again aligned on number 1 jaw. The axle should now run truly, and you can face the end, and start on the first wheel seat. You may like to make it over-length, to give some margin for error, as suggested for the bogie wheels.

Assuming that high-strength Loctite or a similar product is to be used for retaining the wheels, reduce the axle diameter until the wheel will almost go on, then very carefully take off a little more metal (use a fine flat file, or abrasive paper, if you prefer) until the wheel can be pushed all the way on tightly by hand. Face the axle flush with the wheel boss, and centre drill. Then remove the axle from the bush, mark the 29/32in. back-to-back distance from the turned shoulder, re-chuck in the split bush and machine the second wheel seat. Keep each wheel with the seat to which it has been matched, since the bores may vary. A final detail, on the driving axle only, is to file a flat halfway along where the pump eccentric will be positioned. This will provide a seating for the setscrew and a positive drive for the eccentric, which may otherwise rotate on the axle and cause a baffling pump failure. Only a small flat is required: say 3/32in. wide and 1/32in. deep.

● *To be continued.*

- Drawings for Ayesha II are available from:
PO Box 87, Leominster,
Herefordshire, HR6 6AJ
- Details of castings are available from:
Box 2500, Model Engineer,
Berwick House, 8-10 Knoll
Rise, Orpington, Kent BR6 0EL



Nemett

shows us the new I/C trophy on offer at MEEX 2007, comments on a number of issues from our readers and introduces a readers version of the popular Atom Minor engine by Edgar Westbury.

1. The Nemett Cup, to be awarded to the builder of the best NE15s entered into Class A3 at MEEX2007.

2. Peter Gain's part complete Atom Minor at the Model Engineer Exhibition 2005 shows the general layout.



As I mentioned last time (M.E. 4295, 16 March 2007), the Nemett Cup (photo 1) will be awarded to the best NE15S at the Model Engineer Exhibition in September. If you have built the engine and wish to enter, use the entry form published in the magazine and put the engine in Class A3. You do not need to specify separately that the engine is to be put forward for the award.

It would be nice to see a good entry for this, the first competition. Some 35 sets of drawings have been distributed and I am aware of several more engines being built from the magazine. If you do not wish to enter the competition, you can still put your engine in as a loan entry.

Protecting ignition circuits

Following the suggestion from Ian Maxwell-Hart regarding the use of a diode to protect the electronic ignition circuit, Mr. D. Thompson has sent in the following letter:

"SIRS, - In I/C Topics (M.E. 4295 16 March 2007) there is a recommendation to use a 1N4148 diode across the ignition coil. This is a low power signal diode, not normally used in this way. I don't know how much back EMF is being generated in this coil but I would suggest that a more robust diode, such as the 1N4004 should have a much longer lifespan in this application."

D. Thompson, Huddersfield

Looking at the data sheets on the Internet, the 1N4004 has a peak reverse voltage of 400v and an average forward current of 1amp compared with figures of 100v and 200milliamp for the 1N4148 which would support Mr. Thompson's comments.

The maximum instantaneous forward voltage is approximately the same in both cases. As I said at the time, I have not tested this out yet and for various reasons unconnected with the magazine have still not done so. I suppose the only time we will know if there is a



problem is when the diode fails and we won't know that unless we test it. I did contact Ian Maxwell-Hart who tells me that he has used signal diodes across coils before but that the ignition coil may produce a higher back EMF than a relay coil so a more robust diode may be better. I thank both Ian and Mr. Thompson for their interest and comments.

The Atom Minor Mk. III

Fans of Edgar Westbury will need no introduction to this popular design which was the final version of a series of designs of different capacities started with the 15cc Atom Minor in the early 1930s. The Mark III was produced in 1947 to meet the needs of aero modellers needing a 6cc competition engine. The Westbury construction book for the engine quotes output of 0.29bhp at 11,000rpm from a highly tuned version developed by a Mr. J. Cruickshank for model tether car use.

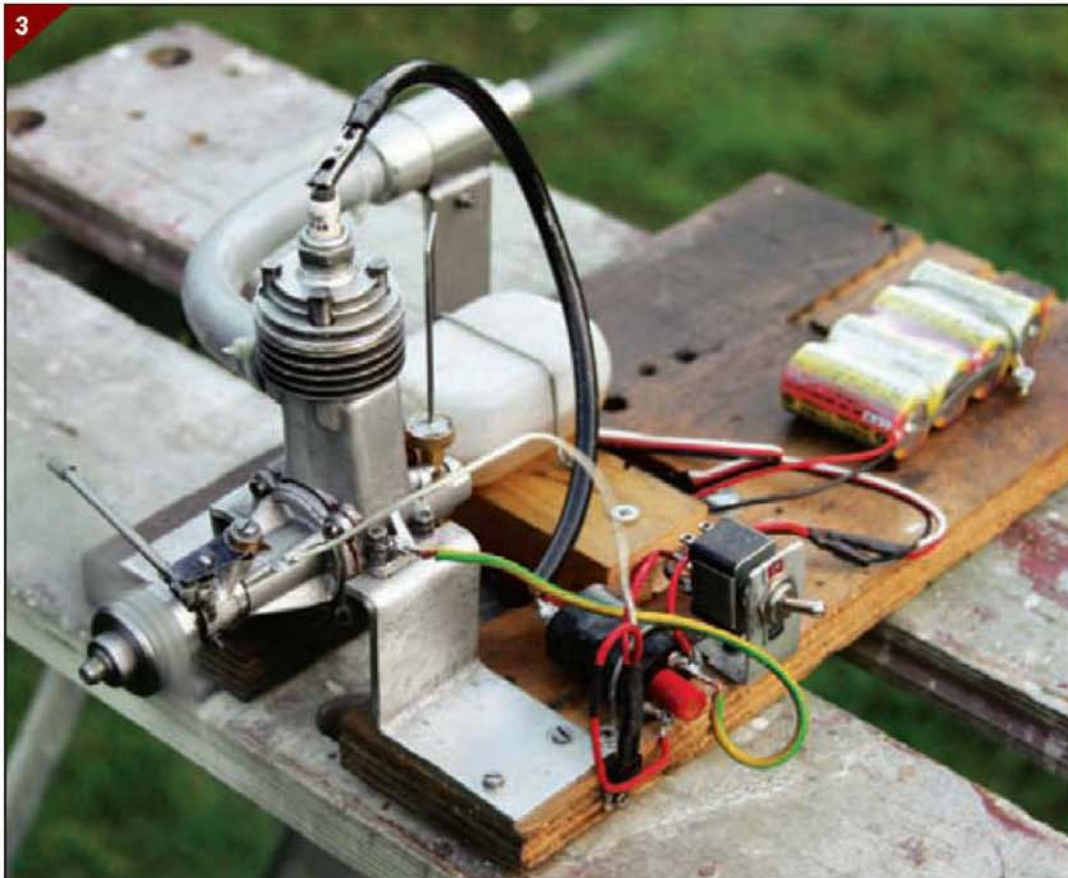
The engine is a 6cc capacity 2-stroke engine with rear disc induction, a simple spray bar

carburettor, plain bearing crankshaft and spark ignition.

The engine features a cast crankcase assembly with separate front bearing housing and rear cover with an integral carburettor. The crankcase extends up past the exhaust port and encloses a cast iron cylinder liner with integral fins. The finned cylinder head is machined from the solid. The piston is a deflector type machined from cast iron and lapped to fit the cylinder. The contact breaker is a simple mechanical type operated by a cam on the propeller driver.

I have not built one, but the engine looks easy enough to machine apart from the crankcase which has to be machined accurately for the cylinder liner and bearing housing. This requires some tricky holding operations using jigs on the faceplate or perhaps boring in the mill.

One of my regular contacts, Peter Gain, prompted the mention of this engine by sending me the latest information on his own example (photo 2) which is now running. >>



3. The Atom Minor running well on the bench.

4. This is what to expect, the full set of components for Peter Gain's Atom Minor.

Peter has so far achieved 6,600rpm (**photo 3**) although he does not say what size of propeller was used.

Peter has also sent a nice photograph (**photo 4**) of all the 'bits' which provides a good idea of what to expect for those thinking of constructing the engine.

Along with the photographs Peter sent me some notes which I reproduce here:

"The first piston was tight around top dead centre, so I dismantled the engine and lapped the piston a bit more. No prizes for guessing what happened next! I over did it and the engine would only start with an electric starter, it had lost nearly all compression. I had to re-lap the bore and then machine a new piston to match. It has now run for 75 minutes on a 3:1 petrol/oil mix. It will maintain 6600rpm but gets very hot. The

problem seems to be that it was not designed to have a muffler and fitting one causes the over heating.

I have made three mufflers so far, all have allowed far too much noise. This will have to be resolved as it is intended to install it into a 'Junior 60' radio assist aircraft. Our club committee is rightly very strict about not exceeding the agreed limits."

There will be many who can sympathise with the lapping problem; it is amazing how quickly metal is removed when you don't want it to be!

If any readers have advice on suitable silencer design for this engine, I will be pleased to put notes in the column and pass such information to Peter. It may be that the engine will start to run cooler as it runs in.

An interesting suggestion

One of the suggestions for the next Nemett engine design is a very interesting engine and details were sent in by John Rippengal. The engine in question is a full-size aero-diesel engine designed by Michael Zoche in Germany.

has filed several patents for the engine features including one (American patent 5197416) for the connecting rod arrangements, but unfortunately there are no illustrations on the useful website

(www.freepatentsonline.com) that I use to find such things. The engine patent (number 5197416) is also on the site.

The engine website (www.zoche.de) does not appear to have been updated for some years and unfortunately I have not had any response to my request to publish a picture or other details.

It is certainly an interesting design but does not appear to have made it into full production, although the website does have a video of an engine running in a wind tunnel test. The site shows a variety of engines from two to eight cylinders, all radial layouts. If anyone has further information, I would be pleased to receive it for the column.

That is all for this issue which was in fact a small milestone, being the 25th I/C Topics column. I thank all those who have supported the column and sent in information and suggestions, keep it all coming for the next 25!

ME





NO. 100

M. J. H. Ellis concludes the construction of his own design micrometer-adjustable lathe tool-post.

Completed micrometer adjusted toolpost.



Last time we got as far as cleaning up the block after the silver-soldering operation. While you are about it, now is the time to reduce its length to the specified $2\frac{3}{4}$ in. (plus $\frac{1}{8}$ in. for the end-cap). You should not exceed the $\frac{1}{8}$ in. between the centre-line of the bore and the right-hand end-face. Drill and tap the holes for the pinch-bolt and the two $\frac{1}{4}$ in. Allen screws. The depth of a 20tpi thread is 0.032in., and the theoretical root diameter of a $\frac{1}{4}$ in. thread is therefore $1.250 - (2 \times 0.032) = 1.186$ in., but I think that it would be as well to leave a little clearance over the crest of the thread by making it 1.180in. and reducing the depth of cut of the screw-cutting tool to 0.029 inch. the next operation is not the screw-cutting, but cutting the slot with a $\frac{1}{16}$ in. (0.0625in.) slitting saw. This width is not absolutely essential, but I would not make it any less, and made it easy to find a bit of scrap material from which to make a small plate which filled the slot during the screw-cutting, and which was held in place by the pinch-bolt. The idea was to obviate the formation of any troublesome burrs, and it did.

With this piece in place you can set up the block once more in the 4-jaw with the under-sized hole running true, and if there is any danger of the tools cutting into the face of the chuck standing it off by packing-pieces. So now you can bore it out to 1.180in. and get the screw-cutting done. For the pillar we hack off a $3\frac{1}{2}$ in. length of $\frac{1}{2}$ in. dia. BMS round bar. My practice with this sort of work is to catch it up in the 3-jaw, centre the end with a centre-drill, and support it with the tailstock centre while I face off the end as far in as possible. Then I turn it round in the chuck, and tighten the jaws with it tight up against the face of the chuck. The idea being, that it not only helps it to run true, but that the support which it gets from the body of the chuck helps to prevent it shifting under the

load imposed by the tool.

Face off the far end, and centre with a centre-drill. Supported by the tailstock centre, take a light skim over the entire length. Now you can turn down the end to 1.244in. dia. for a length of what I have shown on my drawing as $1\frac{11}{16}$ inch. This is what the piece actually measures, but as the block is $\frac{1}{4}$ in. deep it would appear that I intended to provide a round figure of $\frac{1}{2}$ in. adjustment, so if I were you I would make the length $1\frac{3}{4}$ inches. Turn a groove $\frac{1}{8}$ in. wide and $\frac{1}{16}$ in. deep at the left-hand end for the screw-cutting tool to run off into. I made it 1.244in. dia. to allow a little clearance over the crest of the thread, and ensure that it should be the flanks of the threads, male and female, which were in contact.

As for turning the thread, I believe in taking it steady; 5 thou. feed for the first cut, 3 for the second, then 2 for most of the way, reducing to 1 towards the end. At 25 thou. I would start to try the block on the thread. By this time also, you have almost certainly raised a feather on the thread and you should check the overall diameter with the 'mike'. If it exceeds the original 1.244in., I would remove the feather by lightly applying a fine file to the rotating work. I say this in the full knowledge that purists will condemn it as rank heresy; my defence is, that performed with restraint, I have never known it to fail. You can do it two or three times, until the 'mike' tells you that you are down to the basic diameter. Try the 'mike' in several places.

Eventually, the block will show signs of trying to screw on. Now is the time to make sure that there is no feather, and to reduce the feed to half a thou. When it becomes possible to screw the block on by hand, it is worthwhile to wipe the work free of all bits of swarf, applying oil, and seeing whether the fit can be eased by screwing the block to-and-fro a few times. If so, all well and good, but if not, take another half-thou. cut and try again. This procedure

should result in a good fit with no perceptible shake.

When you are satisfied with the fit, remember to disconnect the drive to the leadscrew, drill through the whole length of the pillar, and open up to $\frac{7}{16}$ in. or whatever size suits your lathe. To ensure that the pillar would seat round its periphery on the top-slide, my final operation was to face it back from the bore by a few thou. to within $\frac{1}{4}$ in. of the outside radius.

To engrave the 50 graduations around the drum on top of the pillar, screw on the block the right way round, until it is firmly against the drum. Make a mark on the drum corresponding to where the chisel edge of the index would come (see my plan view; the index is $\frac{1}{16}$ in. long). This is where the zero line of the graduations will come. In an earlier letter (No. 37 - Ed.) I told you about my system of indexing in the lathe by mounting a change-wheel on the left-hand end of the mandrel, and you can make use of it for the present purpose. A screw-cutting tool laid on its side will do for the inscribing, and the only difficulty will be in limiting its travel to ensure graduations of equal length. I described in one of my earlier letters (No. 6 - Ed.) a heavy clamp which clamped onto the front shear of the lathe.

When you have done this, saw off the excess metal, screw it into the block, and use this in the 4-jaw to face the other end and bore out the recess in the top. All that remains now is to make and fit the index, for which I used a piece of stainless steel. It was $\frac{1}{2}$ in. thick to begin with. I then drilled the screw-holes and counter-bored them deeply, and clamped block and index together in the vice in order to spot-drill the corresponding holes in the block. When these had been tapped (very carefully!) I screwed the index down on the block, which I then held in the 4-jaw with the pillar screwed in place, and adjusted the chuck to get it running true. Then I turned the index down as shown to just short of the screw-heads.

Your affectionate Grandpa.

James Beggs and Co. BOTTLE FRAME ENGINE

PART 6

Continued from page 340
(M.E. 4295, 16 March 2007)

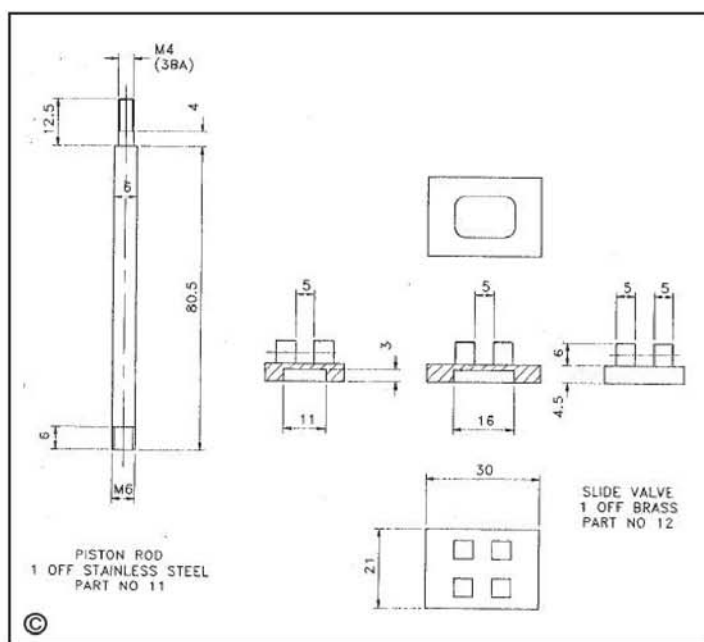
Anthony Mount finishes the piston and then moves on to describe the piston rod and slide valve for this elegant engine.

You will notice on the drawing published last time that there are two 3mm diameter holes drilled in the top of the piston at 20mm centres, you will find these useful on assembly of the engine. With the engine partly assembled and the cylinder in place, but without the top cover, the piston and rod are pushed into the cylinder and screwed into the cross head.

As the piston will be below the level of the top of the cylinder a pin spanner will be needed to be able to screw in the piston and rod. I used a 25mm diameter short length of mild steel with two 3mm pins in the end at the same centres as the holes in the piston top. It was then simple to screw in the piston.

Piston rod (part 11)

Stainless steel rod 6mm dia. is used for the piston rod. Turn down the end to 4mm diameter and thread M4. The other end of the rod is faced off and threaded M6. The act of threading can raise a burr above the surface of the rod so dress it down with a very fine flat file.



Do be particular in the choice of material, pick only the smoothest, ground stainless steel rod, as a poorly finished rod will play havoc with the gland packing whatever type you use. Do not worry about the price only get the best. It is only a few pence extra anyway.

Slide valve (part 12)

As an alternative to the turning operations of the last few components, the slide valve is

all milling work. Machine a slab of brass bar to the finished overall dimensions. Clamp the slide valve by the edges in the machine vice and mill out the cavity in the underside.

The jaws of my machine vice have two rebates facing each other and are ideal for clamping objects such as this, which are quite thin. Turn the slide valve over and machine in the two slots for the valve nut and rod. Excess material around the

28. The slide valve was produced on the milling machine.

29. The completed crosshead and eccentric rod head. Each was made from 6mm square material.

30. Special packing pieces will take the pressure of the chuck jaws and grip the eccentric sheave.



slots can be machined away to form the pins.

I have recently been using one of the new machine vices from Warco (*described in M.E. 4284, 13 October 2006 - Ed.*). It is quite different from the usual pattern being supplied with three removable jaws. They can be positioned in a number of orientations making it possible to have about eight different combinations of jaw position. The length of component that can be held in relation to the size of the vice is far in excess of the usual machine vice. There are two sizes of vice, a small one suitable for most model engineering use and a large one more suitable for commercial use or large-scale model engineering.

Rub the sliding surface of the slide valve on a fine piece of abrasive paper laid on a flat surface so that it will sit flat on the cylinder valve face. A completed valve is shown in **photo 28**.

Slide valve nut (part 13)

For the slide valve nut not only a small scrap of brass bar is needed, 6 x 5mm section and 11mm long. Drill and tap M3 in the middle 2mm up from the bottom and the job is complete. The nut should be a sliding fit in the valve, not tight as the valve needs to be able to seat itself down without any hindrance.

Eccentric rod head (part 14)

The eccentric rod head is a nice little component to make. Start with a length of 6mm square

mild steel bar and face off the end in the lathe using the 4-jaw self-centring chuck. Drill and tap M3 and turn down to 5mm diameter for a length of 6 millimetres. Remove from the lathe and transfer to the milling machine for cross drilling the pivot hole, which should be reamed 3mm diameter. Put back in the lathe and part off.

Valve crosshead (part 15)

The valve crosshead is also from 6mm square stock. Turn down to the different diameters and thread the end 8BA with the tailstock die holder.

A few years ago I made up a set of holders for all my dies so they could be permanently set up, then all that needs to be done is to change the holder in the body of the tailstock die holder, which involves turning one Allen screw and all is ready for threading, a great time saver.

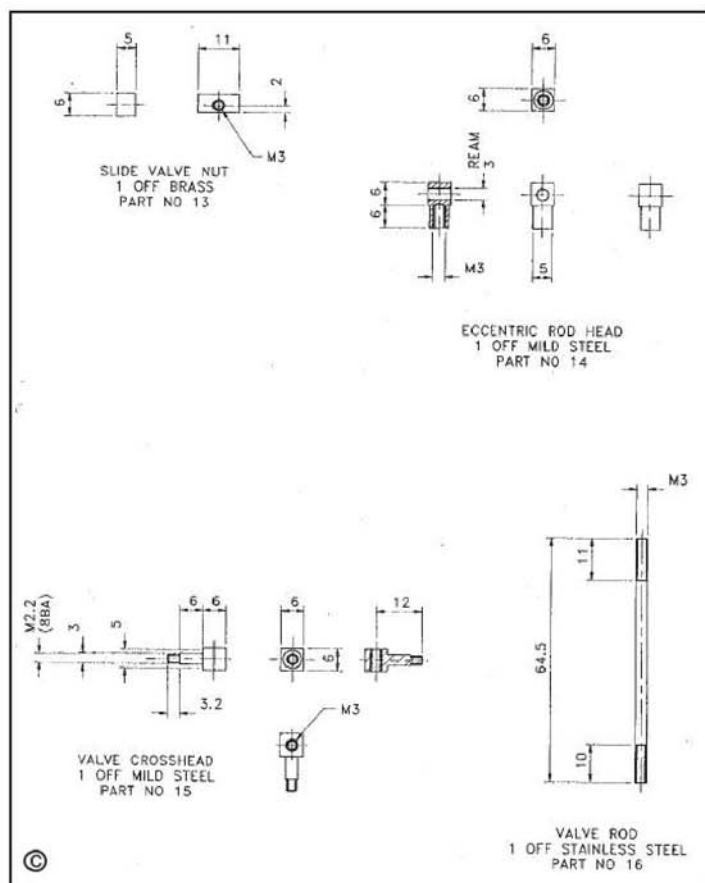
Change again to the milling machine and, holding the bar horizontally in the machine vice, drill and tap the cross hole. Change back to the lathe and part off. The completed crosshead and eccentric rod head are shown together in **photo 29**.

Valve rod (part 16)

The valve rod is a straight length of 3mm diameter stainless steel threaded each end M3. As for the piston rod, select a nicely ground piece of material with a smooth finish.

Eccentric rod (part 17)

The eccentric rod could be in mild steel but stainless steel is



even better. As for the valve rod, it is just a straight length of material threaded M3 at each end.

Eccentric sheave (part 18)

I have followed usual model engineering practice and made the sheave with flanges to guide the strap. But in full size practice the strap and sheave was often flush sided. We could do this ourselves by making the sheave only 6mm thick with a 3 x 1.5mm groove and increasing the diameter to 32mm, and putting a tongue on the inside of

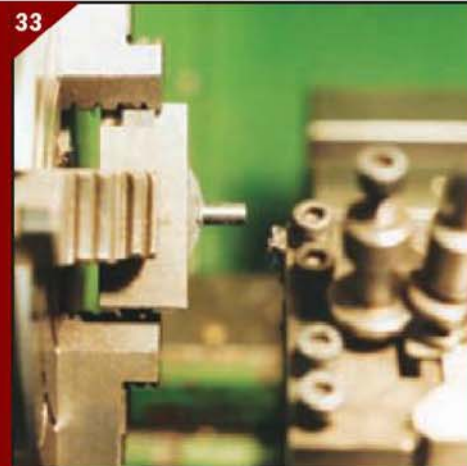
the strap to fit into the groove.

Sheaves came in two types, one solid and the other with two large cut outs to reduce the weight. I cannot see from the original engraving which type was used. For the solid type,

31. The first operation on the eccentric strap clamps was milling the mating faces.

32. Boring out the eccentric strap to fit the sheave using the 4-law chuck.

33. Turning the spigot on the eccentric strap prior to drilling and tapping for the eccentric rod.



34



34. The eccentric strap and sheave after all machining operations had been completed.

hold a short length of 30mm dia. cast iron rod in the self-centring chuck and form the groove. Change to the 4-jaw independent chuck and offset the rod by 5mm, then drill and ream for the crankshaft and turn the boss. If you are using bright mild steel bar for the crankshaft, this is usually produced with a very small undersize tolerance. So in this case it would be better to bore out the hole in the sheave to fit the actual crankshaft rather than ream the hole.

Drill a couple of radial holes in the groove through to the crankshaft hole and tap them M5 for the locking grub screws. Rather than tap them all the way the holes can be counter bored and only the last 6mm need be tapped. The counter bored holes will act as a guide for the tap.

This method avoids showing how the eccentric sheave is fixed. However, there is a small spigot to the sheave and this can be drilled and tapped to take M3 screws and, though they will be visible, it is much easier to set the valve without having to keep removing the eccentric strap.

Simple as the plain type is the eccentric sheave with the cut outs look much better and I have shown this type in the drawing. Machining them from solid is a time consuming job involving much work with the vertical milling machine and rotary table. But modern

technology has come to the rescue, as I was able to get them water jet cut from 20mm thick mild steel plate.

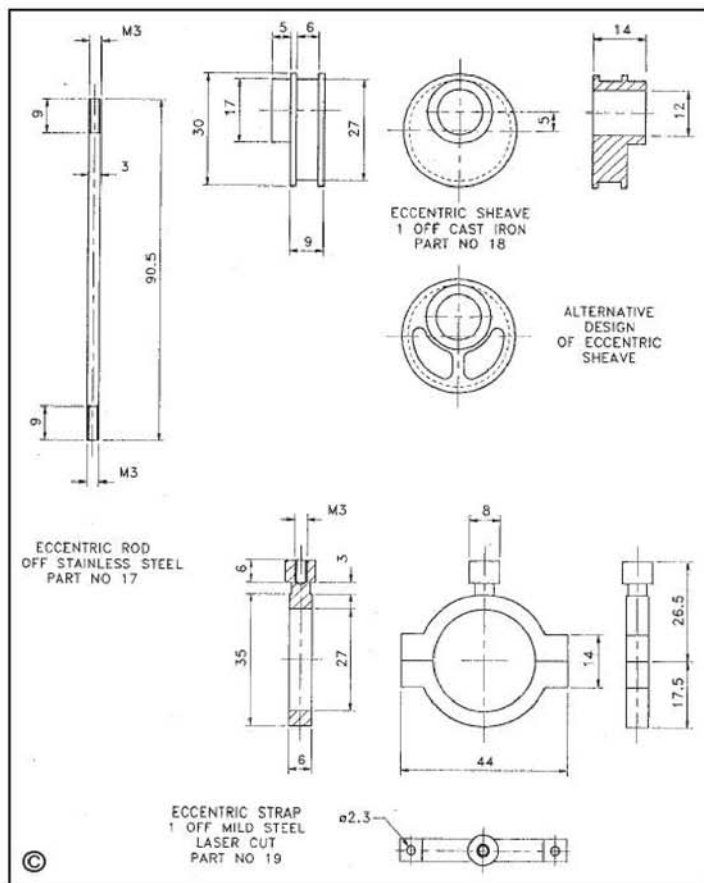
Just think what that sentence means, a jet of water is cutting through mild steel plate 20mm thick. A fine stream of water a fraction of a millimetre in diameter at about 60,000psi - mind boggling. Anyway, the result is a lovely blank with the decorative holes cut out to size and the bore for the crankshaft also cut out but leaving 2mm in diameter to be bored out in the lathe to fit the crankshaft.

Packing pieces

Start by bolting the blank to a short length of mild steel bar about 30mm diameter. Allen cap head screws can be used passing through the water jet cut holes. Then set the blank to run true in the 4-jaw independent chuck in the lathe and face off the front, just enough to clean up the surface. Change to a parting tool and, proceeding with care and gentle feeding, produce the groove for the strap.

The next operation is to reverse the sheave in the chuck, turn the boss and bore out to size. For this the blank needs to be off-set in the 4-jaw by 5mm. However, before doing this turn up a ring 27mm inside diameter and 30mm outside diameter by 6mm wide. Cut in half to form two crescents and fit into the groove of the sheave. These packing pieces will take the pressure of the jaws and distribute it to the sheave as shown in photo 30.

Having offset the sheave, and the pre-cut hole should be running true, it can then be bored out to fit the crankshaft.



Drill and tap two holes in the boss for M3 (4BA) grub screws.

Eccentric strap (part 19)

The eccentric strap is not the usual casting but is supplied as a laser cut blank. This is much closer to size than the usual casting and takes less work to complete. Start by clamping one blank, as seen in photo 31, at a time in the milling machine vice and take a cut across the meeting faces to clean them up and bring them true. They are supplied oversize to allow for the machining. At the same setting drill for the bolt holes, bolt the two parts together and set up as shown in photo 32, for boring out the strap to fit the sheave. As it fits into a groove you will have to use measurements only to achieve the fit.

Now the eccentric strap half with the spigot can be sandwiched between a couple of small plates and set up in the 4-jaw independent chuck, as indicated in photo 33, for turning the spigot and drilling and tapping for the eccentric rod.

A small collar can be turned and fixed with Loctite to the spigot to finish it off. The completed eccentric strap and sheave are shown together in photo 34.

Crankshaft (part 20)

The crankshaft is an easy job as it consists of a length of 12mm diameter mild steel turned down at one end to 10mm diameter to fit into the crank disc. Lightly centre each end for appearance sake.

● To be continued.

Wainwright's SECR might-have-beens

PART 2

Continued from page 348
M.E. 4295, 16 March 2007

Ron Isted continues this fascinating examination of events that took place approximately 100 years ago.

When it comes to cylinder castings, if you wish to retain the valves-between layout of the full size locomotive, the short answer is that there are no suitable commercial castings as far as I can tell, so it becomes a matter of fabrication or making your own patterns. As I discussed the problems and some possible solutions of the valves-between layout in our sizes in both the LTSR article mentioned above and also in M.E. 4198, 27 June 2003, I will refrain from rabbiting on about it again. If you are willing to accept valves on top, then several designs could be utilised, including LBSC's O-6-2T *Mona*, which, incidentally, is at least named after a London Chatham & Dover engine, even if it bears no physical resemblance to the original full-size locomotive, a rather ungainly O-4-2T.

Stephenson link

As shown last time in fig. 3, the valve gear on our SECR O-6-2T is Stephenson with locomotive type links, the weighshaft mounted below the motion, and

connected to the upper (forward) eccentric rod pin, which we all know is 'thoroughly bad practice... and can only lead to unequal valve events', don't we? Well, in the days of steam-hauled commuting, I kept detailed timings of literally hundreds of trips behind H class O-4-4Ts, which had an almost identical valve gear layout to the proposed O-6-2T, and I can honestly say that within my experience and whether running chimney or bunker first, no other small tank engine was more lively (though the GWR 14xx O-4-2Ts were their equals). I never heard a Wainwright engine of any class, even when badly run down, suffering from a syncopated or off-beat exhaust, or worse, that painful 'three woofs and a ssssh' racket associated with certain other company's designs. So perhaps there is sometimes not quite such a difference in terms of practical results between the theoretically correct and incorrect as one might suppose.

As mentioned earlier, the cylinders of the proposed O-6-2T would have been 18 $\frac{1}{2}$ in. diameter, with the valve chests between them, and although most of the dimensions are unfortunately indecipherable on the GA, they look very cramped. At this point, the main frames are 4ft. 11 $\frac{1}{2}$ in. apart of which space the two cylinders require a total of $(2 \times 18\frac{1}{2}\text{in.}) + (4 \times 7\frac{7}{8}\text{in. walls}) = 3\text{ft. } 4\frac{1}{2}\text{in.}$, leaving just nine inches for the two steamchests, including walls, although they were offset vertically above the cylinder centre line by an inch. Both cylinders and motion were inclined at 1 in 9 down towards

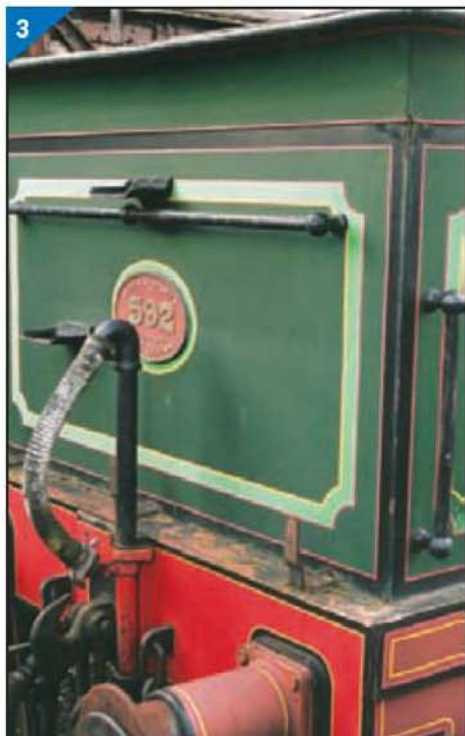
the crank-axe. The lap of the valve was certainly one inch, and I think the ports were the same as the H class, that is 1 $\frac{1}{4}$ x 16in. for steam and 2 $\frac{1}{2}$ x 16in. exhaust, these dimensions having been scaled off the drawing as the dimensions are illegible. Once again, on paper these figures do not look too promising, but as I said, the H tanks were wonderful little engines, and there is no reason to think the O-6-2T would be any less successful. Further dimensions of the valve gear components are listed in the table. Please note that the Ashford GA specifically states that the left hand crank leads, the opposite to the normal practice.

Boiler

The boiler on our radial tank, identical to that on the C class O-6-0s, would have measured 4ft. 10 $\frac{1}{2}$ in. dia. over cladding, and 11ft. 13 $\frac{1}{16}$ in. between tubeplates, equal to 35 $\frac{5}{16}$ in. and 85 $\frac{5}{16}$ in. respectively for a 3 $\frac{1}{2}$ in. gauge version. However, as the full size engine was unsuperheated and the interior of the smokebox measured less than three feet from front to rear, I would suggest recessing the front tubeplate into the barrel to increase the smokebox volume and provide a little more space for a superheater - and for our non-scale fingers to make the various connections. The smokebox of the full-size engine would also have been somewhat cramped for space, as it was to be equipped with 'Stone's Patent Spark Arrester and Fuel Economiser', a fearsome looking device that, at least on the Ashford drawing, bears some resemblance to an >>>

2. SECR 'P' Class O-6-0T undergoing overhaul at the Bluebell Railway, April 2006 (this and subsequent photos: Ron Isted).

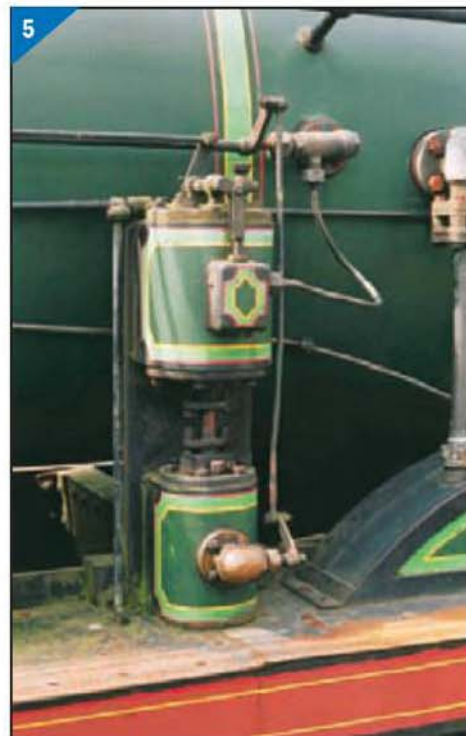




3. Rear of tender of SECR 'C' Class No.592 at the Bluebell Railway, April 2006.

4. Cab of SECR '01' Class No.65 at the Bluebell Railway, April 2006.

5. Stirling steam reverser and boiler feed clack on SECR 'C' Class No.592, Bluebell Railway, April 2006.



upside-down, wire-mesh version of an angler's keep-net. I would have thought it would have had a very detrimental effect on the engine's steaming capacity, but as the H class 0-4-4Ts, arguably Wainwright's most successful design, were similarly equipped, the device as fitted must have offered less resistance to the exhaust steam than one might imagine from the GA. The plain round-top firebox was 5ft. 10in. long ($4\frac{3}{8}$ in.) and could possibly be extended slightly to the rear on a miniature version to increase the grate area, but as the cab cut-outs are quite large, the backhead fittings will become obtrusively visible if this is carried to extreme. The grate would also have to be sloped in order to clear the rear coupled wheels, so on balance it is probably not worth it. Martin Evans' boiler design for his Caledonian 0-6-0T *Rob Roy* would work in very well, although the barrel would need

to be lengthened by about half an inch.

Pagoda

One of the visual trademarks of South Eastern & Chatham tank engines was the shape of the cab, (fig 2 in Part 1, and photo 2), the roof of which overlapped each side sheet by a little over 8in. and was presumably intended to avoid rainwater dripping down the driver's neck when leaning out.

It first appeared on the H class 0-4-4Ts in November 1904, and for obvious reasons was immediately christened the 'pagoda' by the footplate crews. I can vouch for its effectiveness through having travelled on the footplate of these engines and one particular trip, on the branch line from Dunton Green to Westerham, springs instantly to mind because of a combination of a howling gale, rain coming down like stair-rods, and a keen driver determined to make up lost time due to a late-running mainline connection. Despite belting along through the appalling weather, we remained perfectly dry in the cosy warmth of the cab, although I have to admit that much of the cosiness was due to the cramped conditions and I fear the fireman must have silently

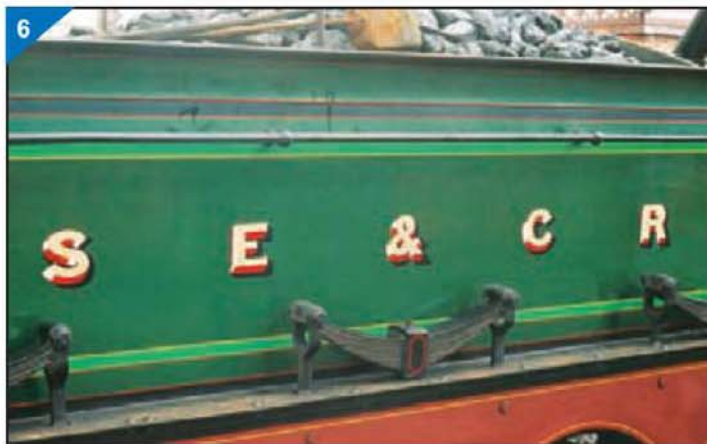
cursed the presence of a third person on the footplate - especially one brandishing a bulky 16mm movie camera! To the builder of a miniature version, however, the main advantage of this particular cab design is that it allows an easily removable roof to be incorporated for driving purposes, without spoiling the locomotive's appearance in any way when it is doing its day job of being admired on the exhibition stand. One detail that I do not remember from my trips on the H tanks is a series of 1in. diameter holes drilled in both the front and back of the cab just below the roof, but they are shown on the GA drawings of both the H and the C class, and I also noticed them recently on the diminutive P class 0-6-0Ts on the Bluebell Railway, (fig. 4), so it is pretty certain the radial tank would have had them.

As in other contemporary SECR locomotives, teak tip-up seats were provided for the crew, but the radial tank design also had a few little quirks of its own, maybe put there specifically to trap the unsuspecting model builder at some future date, as I can think of no other explanation for some of them. For instance, the front footsteps were slightly

narrower than those fitted at the cab exit, while for some reason the front and rear buffers were different sizes(!) - 1ft. diameter at the front and 1ft. 2in. at the rear. The H class were similarly equipped and I am at a loss to understand the logic behind this: surely one of the main reasons for employing a tank engine is to avoid turning, which means that it will run almost as much mileage bunker first as chimney first, or have I missed something? Both front and rear buffers, by the way, were cushioned behind the buffer beam by 'A. J. Spencer's No. 195 rubber cylinder' - I presume he is the same Mr. Spencer who joined forces with Mr. Hodge to provide the auxiliary bearing springs mentioned earlier. A more subtle but equally inexplicable oddity is the unequal spacing of the two Ramsbottom safety valves, both $3\frac{1}{2}$ in. diameter, but the front one is $5\frac{1}{8}$ in. ahead of the spring, while its twin is $5\frac{3}{16}$ in. to the rear.

Colour scheme

As I discussed the South Eastern & Chatham colour scheme in M.E. 4198, 27 June 2003, this time I will merely invite you to take a look at the photographs, taken a few



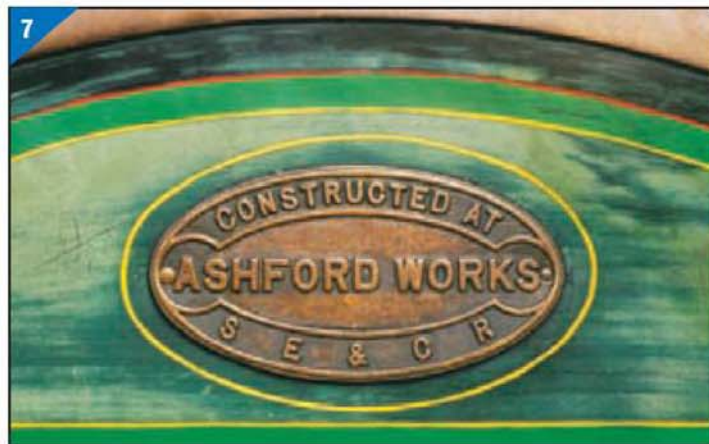
months ago when I spent a very enjoyable day at the Bluebell Railway in Sussex. They show details of 01 0-6-0 No. 65, C 0-6-0 No. 592 and H 0-4-4T No. 263, the latter pair awaiting overhaul, which explains why they are not quite in the same pristine condition as the 01. This latter engine really was a joy to see and hear. One of the main reasons for my visit was to photograph the South Eastern & Chatham's heraldic device, which I knew to be on the tank side of the H, but unfortunately it has been all but worn away - presumably by over-enthusiastic cleaning. However, I did include a black and white drawing of it in my article in *M.E.* 4198, and of course, the beautifully restored D class engine at the National Railway Museum in York carries it. The two 0-6-0s on the Bluebell Line are not so adorned, as they were officially goods locomotives, in spite of spending a fair amount of time on passenger duties throughout their careers. **Figure 5** shows the standard Stirling steam reverser fitted to No. 592 and all I can say is, good luck with: **a.** Producing a scale working example in $3\frac{1}{2}$ in. gauge and **b.** Painting it when you have done so!

I think it is a great pity that the Wainwright 0-6-2T was not built, as I feel sure a tank engine would have been extremely useful on the shorter trips, both passenger and goods, and for shunting work. I remember seeing C class 0-6-0s regularly engaged in shunting Wandsworth 'New' yard, just off the LBSCR main line south of Clapham

Junction, and thinking they were not the ideal locomotive for such duties, especially when the weather was bad. The yard (which is now a housing estate) was very exposed and footplate crews would rig up a tarpaulin between the rear of the cab roof and the tender when it got really nasty. This did not exactly improve visual communication between them and the shunter and conditions on the footplate generally must have been very unpleasant compared to a tank locomotive. With their 5ft. 2in. wheels, the radial tanks would also have been ideal for stopping passenger trains and could probably have tackled heavier loads than the H class 0-4-4Ts. That the 0-6-2Ts were intended for passenger work is proved by the colour scheme on the BR-credited Ashford drawing referred to earlier, which shows the SECR heraldic device on the side tanks. Finally, a further advantage of a tank locomotive, apart from not needing to be turned, is that it takes up less space both on shed and when undergoing overhaul. So, the £64,000 question is: why didn't these potentially useful and versatile locomotives get beyond the drawing board? I'm sorry to say I cannot answer that, my general arrangement drawing just carries a cryptic, hand-written note in the top right corner: "not built".

Cancelled error

The last time I dealt with a South Eastern & Chatham locomotive in these articles, about three years ago, Neville Evans had a gentle go at me (quite rightly) for including what was essentially a Victorian locomotive in what is



supposed to be a series on Edwardian engineering. So, in an attempt to make amends - and cancel out the era error - **fig. 4** shows another SECR might-have-been (held over till next time due to lack of space - Ed.), the original drawing for which was prepared at Ashford in 1912, a couple of years after the death of King Edward VII. It was Wainwright's (or Surtees') fourth attempt at a 4-6-0, and like the previous efforts, is very reminiscent of some of J. G. Robinson's Great Central locomotives of that wheel arrangement. As a matter of interest, in addition to the various permutations of 4-6-0s, the Ashford drawing office was kept busy throughout the Edwardian period in producing proposals for a much enlarged 4-4-0, an Atlantic, an 0-8-0 goods engine, a Pacific tank, a larger version of the H class 0-4-4T, and, of course, the radial tank already described. One of the earlier Chatham 4-6-0 schemes shows an engine fitted with cylinders no less than $19\frac{1}{4}$ in. diameter inside the frames, with the valves between - by my reckoning this would leave a maximum of just seven and a half inches to squeeze in the two steamchests, which may be one of several reasons that particular version of the design progressed no further. My drawing shows a rather more modern looking machine, equipped with outside piston valves, together with a Schmidt superheater providing as much as 418 square feet of heating surface. This figure, incidentally, is almost identical to that of the very similar Great Central class 8C 4-6-0 when rebuilt with a

6. Tender of SECR '01' Class No.65, Bluebell Railway, April 2006.

7. Ashford Works plate on SECR 'H' Class No.265 engine awaiting overhaul hence worn paint work. Bluebell Railway, April 2006.

superheater, also in 1912, but is more than twice the amount of the Maunsell design fitted to that gentleman's SECR 2-6-0s a few years later. As was the fashion when using superheated steam at that period, the pressure on Harry Wainwright's proposed 4-6-0 was lowered, in this case to 160psi, to reduce wear and tear on the boiler, and in an effort to compensate for the decrease in tractive effort, the cylinders were enlarged to a substantial $20\frac{1}{2}$ in. diameter. But the grate expected to provide sufficient heat to boil enough water to satisfy the requirements of these two cavernous dustbins, covered an area of only a fraction over 26 sq. ft. and, although admittedly almost identical to the Great Central engines mentioned above, I would have thought it would have severely limited the machine's capacity to sustain a high power output over a long period. Nearly twenty years later, Maunsell's brilliant Schools design had a grate area of well over 28 sq. ft., and so did the Deeley Midland Compounds, both of them 4-4-0s. Another dimension that seems rather questionable is the use of piston valves only 8in. diameter in conjunction with such large bore cylinders.

●To be continued.

TWO SIMPLE WORKSHOP DEVICES

The late Len Walker describes a couple of handy, workshop devices; one to assist lathe work and the other to provide neat material storage.

We start with the author's version of the ubiquitous lathe tool height setting gauge.

When this article goes to print I can well imagine that the response from readers will be: "Not another one to swell the ranks of the endless variety of these useful devices?"

Well this one, for my money, is more versatile than the others I have seen. Placed on the lathe cross-slide it instantly checks a turning tool for centre height. A glance at the tool being checked gives a visual indication of the packing required then a thumbnail or rule drawn across the tool tip and the gauge will accurately check the final height setting to within 0.001in. or so - no sweat.

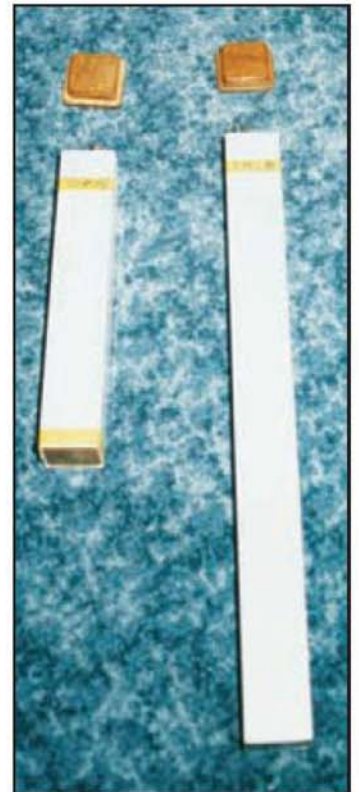
An additional feature of this gauge is that it can be slipped under a boring bar and used to check the tip height of the mounted tool, or used to check tools like parting off blades mounted in a rear tool post for correct setting. Its very simplicity allows it to reach places barred to more cumbersome gauges. The drawings show the design used for my lathe, which is a Myford ML10. Some details may need to be changed to suit your particular machine. Construction hardly merits comment, however, do ensure that the tapped hole in detail 1 is nice and square to the base. Detail 3 is made from a $\frac{5}{16}$ in. BSF x 2in. long bolt with the head modified as shown. Case harden the head and polish the top face to leave a 0.04in. 'land' or ring at 90deg. to the top surface.

Now assemble the parts carefully setting the top of detail 3 to the lathe centre height with the base resting on

the cross-slide. This can be done from the known centre height of your lathe (always useful to know) or by turning a centre point on a scrap of material held in the 3-jaw chuck. Lock the nut securely and you are in business. I made mine in a hurry many years ago, quite off the cuff. However, its cheeky simplicity and versatility has earned it a permanent place in my tool kit. Try it before you get involved with making something more complex.

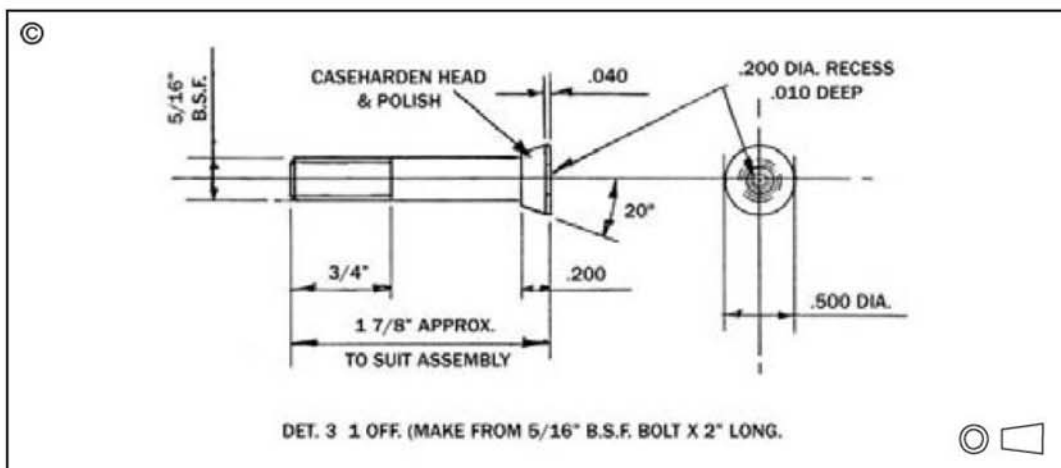
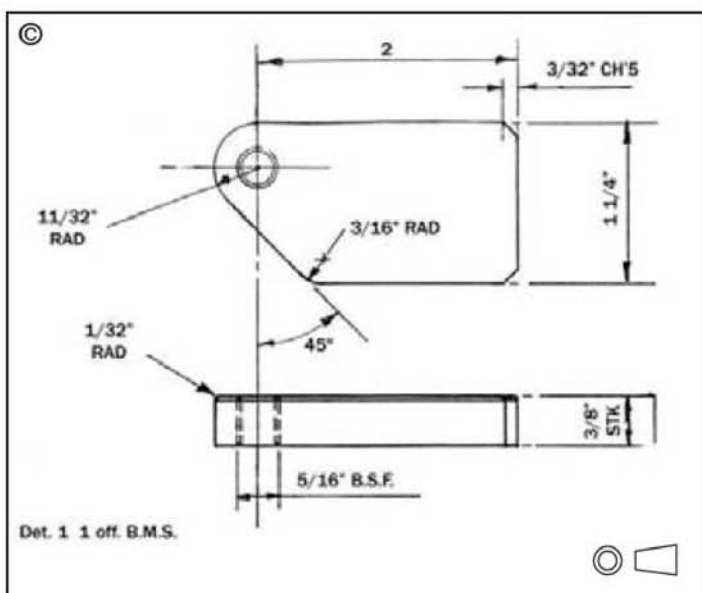
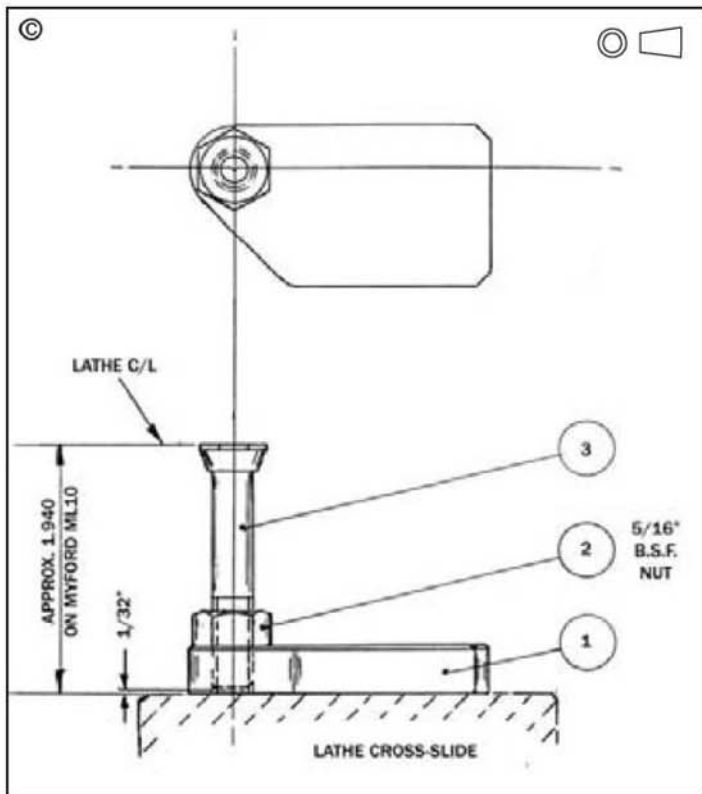
Stock storage tubes

These containers were designed to organise the storage of the lighter sections of bright mild steel, brass and silver steel up to, say, $\frac{1}{2}$ in. diameter. They protect stock against bruising and rust, take up very little space and enable you to put your hands on what you seek quickly and conveniently.



Top: Two of the stock storage tubes designed and made by the author to keep his material stock clean and safe.

Below: The lathe tool height setting gauge in use on the Myford ML10 lathe.



At present I have four short tubes. One caters for small flat sections of mild steel, mild steel up to $\frac{1}{2}$ in. square, brass (round and square), and silver steel. In addition I have three long tubes to suit 24in. long stock lengths. These take bright mild steel - one for round material, one for square and one for flat sections. You can make your own selection based on your own stock needs. Mine just seemed to sort themselves out into the arrangement described!

The body of all the containers is made from ordinary PVC down-pipe approximately $2\frac{1}{2}$ in. square. This is sometimes found in rubbish skips but I was lucky enough to acquire some being thrown away on a housing development. Have you ever noticed how the world is full of useful things being thrown away by someone - the trick is to be in the right place at the right time.

Construction is simple. Make the bottoms from any piece of decent timber. I cut mine from a length of joist. They should be made a firm push fit in their tube. Number the tube ends so that each has its own position. Give them a coat or two of varnish but do not assembly them in the tubes yet.

Mark out the length of each of the tubes required with a pencil, cut to size and clean up the rough edges with a file. If a wooden plug is pushed in just inside the end of the tube as a support the tubes can be nipped in the vice for filing. Finish the filed edges off with glass paper.

Be sure to knock the temporary plug out before doing the other end or you will have two 'corks' sealing off the tube. Don't laugh - I nearly did it!

The caps were made from plywood and need to be a snug push fit. The small but useful amount of give in the tubes should allow you to get a nice 'self sustaining' fit - one that needs reasonable force to remove the lid and gives a firm grip when in place. Mark the caps like the bottoms so that they can always be fitted in the correct manner. Assemble with glue and/or screws and varnish to taste.

Now glue and screw the bottoms into position. I used countersunk wood screws just lightly countersunk into the plastic leaving the heads slightly proud. Round head screws might be simpler and probably stronger.

Having made and assembled your storage tubes put a clear label on the tube and cap of each so you can see what they contain. I used a yellow plastic tape and a bold, felt tipped marker pen.

Useful tip

One useful tip - put an oily rag in the bottom of each tube. It helps keep rust at bay and also cushions the shock of material being put away inside the tubes. From long habit I always remove the sharp edges from new stock before storing so it does not damage the plastic tubes. This makes it safer to handle too. A rub with an oily rag and safe storage will keep your precious stock safe for years to come.

These storage tubes take up little space and have proved to be a useful addition to my 'tool kit'. Moreover, they help keep my workshop neat and tidy by encouraging an orderly approach to storage.

Good luck and work safely.

ME

D1-D3 Tool setting gauge - for a Myford ML10 (or similar) lathe.

LILLIAN

A narrow gauge locomotive for 7 $\frac{1}{4}$ in. gauge

PART 32

Continued from page 351
(M.E. 4295, 16 March 2007)

Keith Wilson discusses accuracy in marking out and machining before describing the front and rear spring buckles for *Lillian*.

Accuracy in marking out is a thing greatly to be desired; this is obvious. There are many devices available for this, one being a magnifying glass in a magnetic stand where the glass can be removed without disturbing the stand; after which a centre punch replaces it and a thump with a hammer makes a well-located centre-pop. The glass of course is used to set the device accurately on scribe-made location lines.

Another useful device is a long thin punch with an acute-angled point on the end. The ordinary centre punch has an angled point of something like 120 degrees. The long thin punch (possibly/probably known as a prick punch - ouch!) enables much easier planting of a tiny dent at correct position; after which the heftier punch can be used to make a nice big dent. A long thin etc. can be purchased quite easily under the name of nail punch, at least two sizes, $\frac{1}{8}$ in. and $\frac{3}{32}$ in., though they are probably measured in metric units now.

There is also a neat prick punch on the market - not sure what it's called - but it works without use of a hammer - I

think that Eclipse make it - but you line up the point with the appropriate scribed lines, then just press it down by hand. The pressing operation loads a spring with a small steel mass, at the end of the operation this mass is released and acts as the hammer. It doesn't make a very large dent, but it is easier than the usual punch to locate the correct place, following which the much heftier punch makes for a drilling location. It proved useful in the days when I was literally one-handed. Ever tried marking out with one hand only, or indeed carrying out almost any other workshop operation?

Recommendation

The technical workshop books generally recommend that for a large hole you use dividers to scribe a circle (same diameter as drill) round the dent and then put four more punch-marks round it. If the drill isn't drilling where it's supposed to be then you knock some punch-dents to pull the drill over. Nuts! If you first drill a small hole into the punch-dent (the chisel-point of the drill ideally must be smaller than the punch mark) and follow up with a larger drill, it is better. For an example of size, it is obvious - I hope - that each drill is slightly larger than the chisel point of the next larger drill. Obviously, starting with a big drill (which clearly has a wide chisel point) the chances of it being truly guided by the punch-dent are not very high.

There is the dodge of marking out straight lines for filing or whatever and putting centre-pops along the line to make it clearer; but clearly even this cannot normally make for

accuracy, for if the pops are a fraction out and/or the line not accurate, then bang goes the ultimate accuracy.

A fairly good method, but where is the mechanic who can accurately mark out within 0.001 inch? Not I, 'me ludd'! Fortunately there is a method of marking-out, which makes for a far superior accuracy. Now the things that need greatest accuracy are almost exclusively holes, especially in valve gear items. In boiler tubeplates for example, a few thou out of line makes next to no odds in most boilers. In a 5in. gauge locomotive for example, a gap of about $\frac{1}{8}$ in. between tubes is ideal; both in view of scale (not the linear type!) and possible re-tubing. For 7 $\frac{1}{4}$ in. gauge, aim at $\frac{3}{16}$ inch.

Criticism

I am regretfully criticising dear old Curly here, he always advocated as many tubes as could be crammed in as possible. There are two things to note here, he almost always used rainwater, which is of course slightly acid (CO₂) and well free of hardness (scale). So the scaling argument hardly arose. If you don't at first believe me as to tube placings, then try drawing out a large scale, high-accuracy drawing of the Doris boiler tubes; it will open your eyes. If it can be done by computer, so much the better. I regret that due to removal from existing house to a bungalow all my *Model Engineer* back numbers are temporarily out of reach, so I cannot draw it up for you. However, when boilermaking with John Short, we did several Doris kettles and tubes in

1. The jig boring set up described in the text.



actual contact with the firebox tubeplate flanges and each other were not rare. In fact it was not impossible for some of the tubeplates to have jagged holes where the various holes tended to overlap!

In the case of items where great accuracy is far more important, then the use of lathe or milling machine for jig boring increases accuracy several fold. Using the usual marking out methods, I would expect accuracy to be about 0.01in. (one hundredth of an inch) to be about the best attainable; with jig-boring methods, accuracy should be about 0.001in., clearly at least 10 times better.

Jig boring set-up

Take a look at **photo 1**; this shows the set-up for jig boring in the milling machine. Using this method, you may expect a tolerance of 0.001 inch. The holes were all located by movements of cross-slide and long-slide, aided by digital read-outs (reads-out?) These last however mainly make things easier; juggling the thing into place for the next hole using the dials on the handles does very well.

Note that a small centre drill is used in the chuck to locate the hole; it only needs a small dent to locate the normal drill. I usually take it in as deep as the 'secondary' cutting faces of the centre drill. Should there be need for great accuracy regarding location of holes from an edge, put a piece of metal of known diameter in the chuck and adjust the appropriate slide so that this rod just touches the required edge. There is more than one way of doing this.

If doing it by eye, do it against the light. It will be easy to be sure of the contact, for the thin beam of light vanishes at the right point. Another way is to use some feeler gauges; when the gauge refuses to move on a gentle pull, add half the rod diameter plus thickness of gauge. A piece of paper of known or verifiable thickness can be used, if the gap is slowly and gently closed and the paper cannot be moved without

tearing, there you are. There are 'wobblers' available; these are probably better still in use.

Digital system

There are two methods of using the digital system for a row of holes; you can reset the appropriate read-out to zero each time; which means it is only necessary to remember the distance between two consecutive holes. A better way is to take a little bit of time out with computer or calculator and make a list of the needed dimensions. So rather than add consecutive increments, you only need to advance the table to the next reading. For those with Excel in their computers a few minutes will enable you to set up a program that will calculate and print out the figures for you and can be used to set up almost any set of increments required. It is wise to work to the fourth place of decimals, i.e. 0.0001in. - pretty much beyond our needs. However, in adding up one after the other they are cumulative (they keep adding up) and need to be taken into consideration. In other words, if you have some recurring decimals, then calculate to the fifth decimal place. By this means if you are doing circular batches of holes the last will line up at the correct distance from the first; or in another way, the last-plus-one will fall exactly onto the first one, the maximum tolerance being 0.001 inch.

This method also aids angular location of holes using a rotary table, cylinder ends come to mind, also GWR brake control valves (31 in the outside ring, 24 in the middle ring, 20 in the inner ring - or 24-20-16 - and what's more they are radially staggered so that nowhere is there a group of 3 holes in a radial straight line). Hope that's clear!

The actual piece in **photo 1** is the jig for making the buckles for the rear springs of Lillian, the smaller set being for the front spring buckles. It is important that these rear buckles are strong, for they are in tension under load. The front springs however have buckles

in compression, so they do not need to be so strong. But you might as well make them in the same way.

Weakness

I have in the past made leaf-spring buckles by bending up the outer parts and silver-brazing to the core blocks, but have on occasions seen them coming apart under load and working conditions; recollect that it is an oscillating load which of course makes things more serious.

If you base your original holes with a No.30 drill (or even $\frac{3}{32}$ in.), opening out later with $\frac{7}{32}$, you should end up with a block of steel about $1\frac{1}{4}$ in. by $\frac{7}{8}$ in., about $4\frac{1}{2}$ in. long, with two neat batches of holes in it. The jig should be used merely to locate the hole centres on the actual job, drilling them through is done later; for there is no point in trying to drill through jig and block!

A very good example of when greatest accuracy is required is clearly for expansion links, be they Stephenson's or Walschaerts'; Joy's, or any such links with curved slide surfaces. With straight links, except Allen's but as Hackworth's, it is not quite so important, however it does no harm to be 'spot-on'. It would do no harm for just about all valve gear rods and levers to be set out as described above. You may recall that I gave jig

boring details for the expansion links for Lillian; they worked out okay and the two parts of each link fitted just about perfectly. Also, when I assembled the GWRillian valve gear, all linear dimensions were spot on; it only remained to set the return crank to its correct angular position. I see no great reason for not being able to pre-set this, but have not yet tried it. It should be simple enough. This reminds me of something I learned whilst doing the design work on Ariel. I no longer have the original drawings of the conversion to plain, outside Walschaerts' valve gear, but remember one dimension concerning valve gear details; one dimension (I think it was the location of the expansion link relative to the drive centre) was given to four decimal places - one can only wonder how near to this dimension was actually reached. Also, the drum on the reversing screw was graduated to the nearest 15 thou, forwards and backwards!

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2. The buckles underway. The big one at the top is the less useful 'drilled' blank buckle, centre one is the front spring buckle still under machining; lower (red) one is the rear spring buckle also under construction. All were made from pieces of scrap steel, hence the rather uncouth appearance.



Break out

If the embryonic buckle as described above be rested on the jaws of the vice, or on a couple of bits of steel on an anvil, then use of a piece of steel about 1/2in. square or round rested on the bit between all the holes and given a good thump with a hammer then it will break out the central bit and leave only some work with a square file to trim it. After that, some attention with a milling cutter will reduce the buckle to its correct outside width. It is better that the break-out operation takes place before trimming the outside to size in case this break-out causes too much distortion. In my case, the anvil mentioned above is the heavy plate on the base of my bush press, with the ram itself holding the 1/2in. bar in place, a load of about 1 1/2 tons can be applied with the press handle. When the top of the ram is struck with a big hammer, the break-out force must run to quite a few tons shock loading; if this don't cause the breakout then hit harder. If still no joy then open out the holes to 15/64in. diameter. Mine took a lot of heavy thumps with 1 1/2 ton bush press plus some help from a sledgehammer. After that, much interior trimming was done by a small portable finisher by Black and Decker, not sure what they call it but 'tis about the size of the average hand drill. A square file taught the buckle manners.

A possibly safer way is shewn on the drawings, it is less fatal to small drills, but leaves a bit more filing to clean up the interior. It is possible to mill out the inside of the buckle, but you will have to take it gently, for it means a cutter of about 1/4in. diameter and in the end quite a deep cut; and there is still the problem of squaring the corners.

Ironically, after carrying out the drilling method, I tried milling out the buckles with a 1/4in. long-series slot drill, using of course the digital read-outs; the result was much better than I expected. The normal slot-drill of this size is happy with about 1,600 revs/minute, and a feed

of about 33/4in. per minute, and a depth of cut of 1/8in. at a time, keeping the coolant juice flowing. For the long-series slot drill, halve the feed; keeping speeds, juice, and depth of cut the same.

Even with digital read-out it is by no means easy to get the traverse to stop exactly on the required reading if using the power feed; so cut out the drive at about 1/16in. to go and feed by hand. Another useful tip is to start each feed by hand for about the same distance, for if for some reason the power feed is in the wrong direction (much easier than you might think) it

can be stopped before overmuch damage has been done. A normal slot drill of this diameter can reach up to 5/8in. depth, which is why a long-series is required.

Nemesis

I made some errors on this. I had changed the speed of the power feed in order to lower the table rapidly - saves time - and forgot to re-set it. The long series took it for a while, but Nemesis took her toll - luckily I had several spares. I also once missed the cut-out of feed by a few thou. But it didn't affect the job seriously.

Drawings shew better method

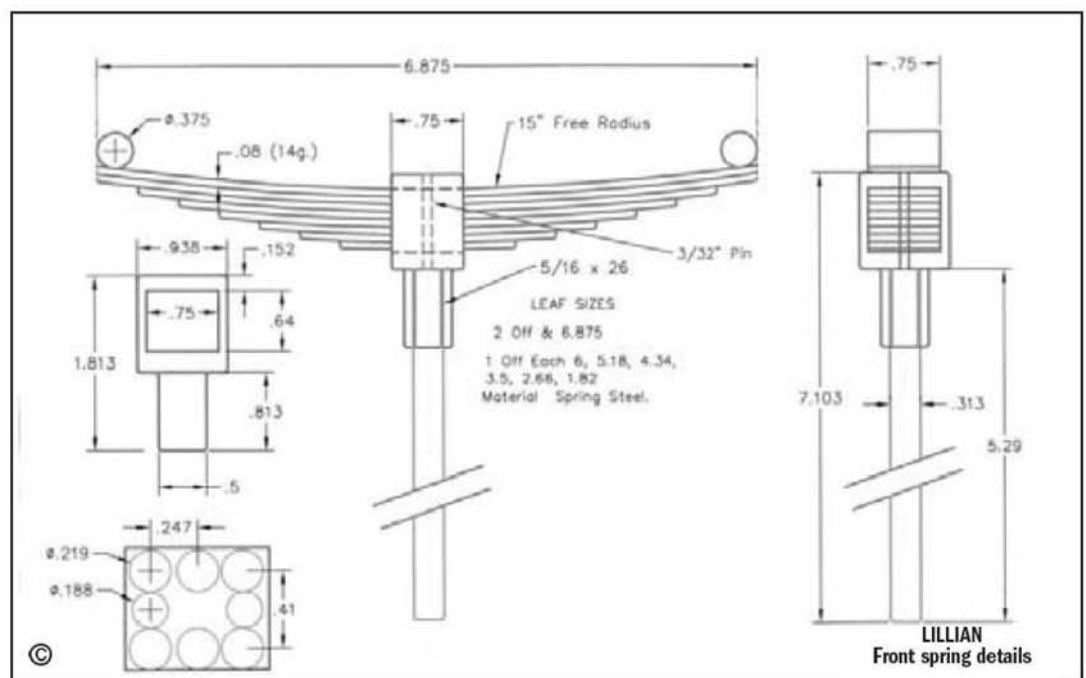
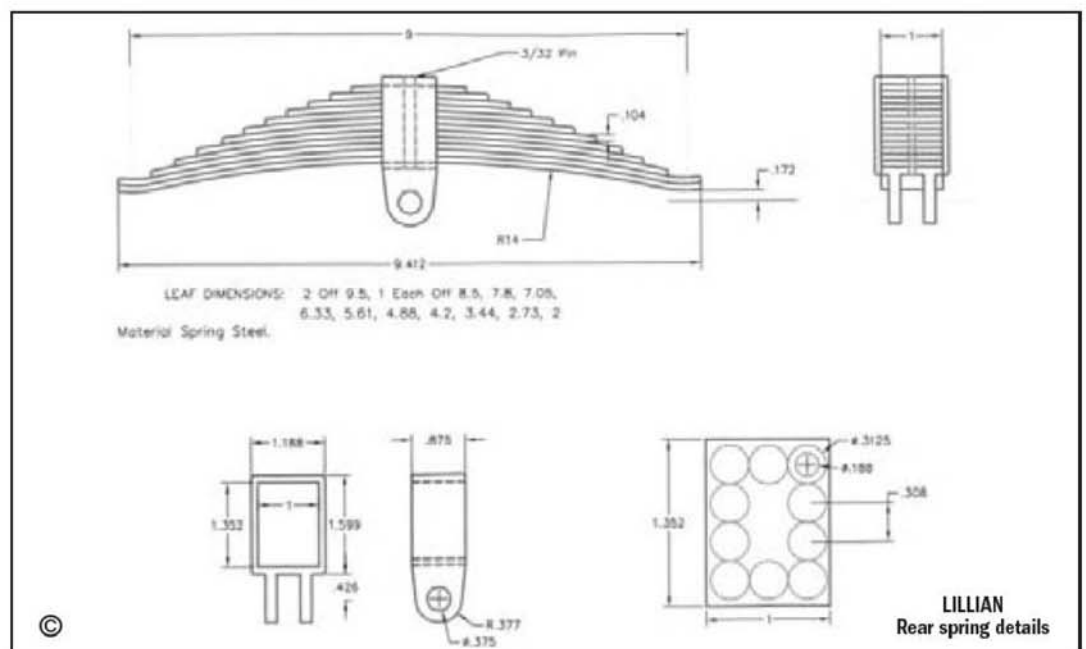
of making spring buckles than originally shewn. **Photograph 2** show up some of the difference in results from various methods but at time of writing the buckles ain't finished so no pix as yet.

● To be continued.

Wilson's Words of Wisdom

Opinion is a preference for an idea that is pleasing to the past experience of the individual.

Ralph Maxwell Lewis





We have received the following sad news of the death of a very talented model engineer Cedric Charles Mell.

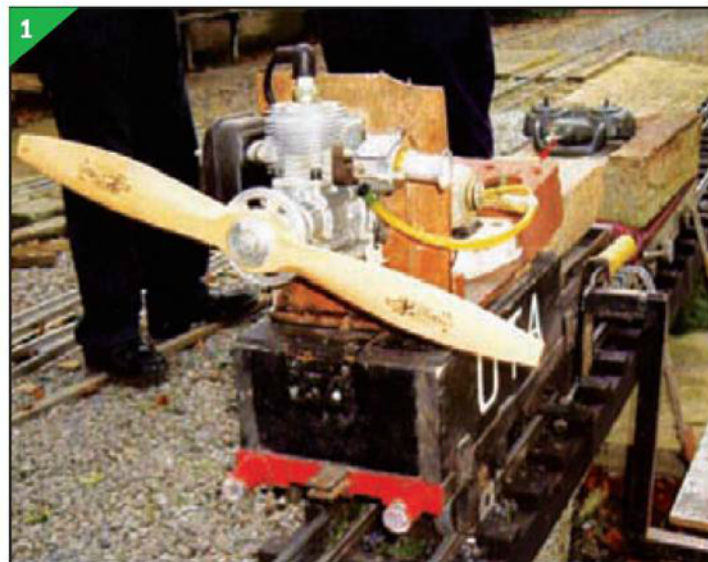
The news was sent in by Cedric's daughter, Valeri Dunn, and we extend our sympathy to Valeri and the rest of the family on their loss:

"I regret to have to tell you of the death on 28 February 2007 at the age of 92 of the well-known model engineer Cedric Charles Mell. His Benz and Peugeot Vis-a-Vis models took Gold Medals in 1989 and 1991. Silver Medals were awarded for his Otto and Langden gas engine (1991) and the Bishop gas engine (1993). Also in 1993 he gained a Bronze for his Paris Electric Cab. Amongst his many other models, Stirling engines were a constant interest. He worked from scratch on his mostly unique models, and never made detailed drawings, using key dimensions as his guide. A week before his death he was still working, now largely in wood, on building miniature carriage wheels by entirely traditional methods and materials."

A Correction

In the Club Profile of **Sunderland MES** (M.E. 4291, 19 January 2007) I published an incorrect contact telephone number. The correct number is 01429-299649. I apologise for any inconvenience this may have caused.

1. Is it a locomotive or is it a plane? Stewart's unusual rail vehicle at the Cultra track of the Model Engineers Society (NI).



Notices

Basingstoke DMES has a new Secretary in the shape of Malcolm Duckett who can be contacted at Medstead Lodge, Medstead, Hampshire GU34 5LY, e-mail:

malcolm.duckett@speed-trap.com or telephone: 01420-562835.

Bournemouth DSME is to hold a model engineering exhibition at the Ringwood Town and Country Experience Museum over the weekend of 28/29 April 2007. The museum is on the A38 Ringwood to Salisbury Road and the event will be open between 10:00 and 16:30 each day.

On the 20 May **Bradford MES** will be holding a theme day entitled 'Flora & Fauna'. Visitors are invited to run or display any model with an animal or plant connection in its name, e.g. *Springbok, Lion, Sweet Pea, Pansy, Jersey Lily*, etc. The two tracks in Northcliff Woods, Shipley, comprise 440ft. of 3 $\frac{1}{2}$ and 5in. gauge raised level and approximately 2000ft. of 5 and 7 $\frac{1}{4}$ in. gauge at ground level with a gradient through woodland. Locomotive entries are limited to 25, so early booking is recommended. Tables will be available for display of appropriate model engines and boats such as *Merlin, Otter, Seagull* etc. Light refreshments will be available in the Clubhouse. Please contact Ken Shipley for further details; tel: 01274-511425 or e-mail: ken.shipley@virgin.net

Esk Valley MES is to hold a *Midsummer Night Steam-up and Barbecue* over the weekend of 23/24 June 2007. The event will take place at the track site at Vorie Estate Country Park, south of Edinburgh and will commence at midday on the Saturday and finish at 17:00 on the Sunday. The ground level track caters for 3 $\frac{1}{2}$, 5 and 7 $\frac{1}{4}$ in. gauges and has a minimum radius of 13 metres. Camping is available and Brian Hird (tel: 0131-660-3898) and Geoff Thrower (tel: 01875-822388) are the contacts for information.

UK Club News

Ascot Locomotive Society has a new member who is not very welcome. A mole seems to have taken up residence in the steaming bay area. Progress on the site has been steady over the past few months and a lot of track is now in place.

Now that the **Basingstoke DMES** has agreed a new 10-year lease on the Viabes site, it has sold the Broad Halfpenny Field which was purchased as a future site when the continuation of the Viabes lease was in doubt. Along with an assured future, the society also has a new electronic newsletter which will be published four times a year. Further information about the society can be found on the website at www.basingstoke-dmes.co.uk

Dave Martin, Chairman of **Bournemouth DSME** described his low cost tender water filters in the newsletter. Dave uses plastic filters designed for suction pot spray guns. These are modified to enable them to be pushed over the tender outlet pipes to pumps and injectors. The top loop woodwork on the 16mm narrow gauge track has been completed and will now be covered with roofing felt before laying the track.

Work on the installation of five electric window shutters on the clubhouse at **Canvey Railway and MEC** has been completed. The first side of the elevated station canopy is roofed meaning that "at last engines and their drivers can have cover in showers, and station staff can be protected from strong sunlight". Another ongoing major project is also nearing completion. The installation of concrete edging stones to the ground level track is on the last leg after four years work by "Mike, Norman and a few stalwarts".

At the December meeting of **Edinburgh SME** Derek Morgan was awarded the Farr Trophy for his 3 $\frac{1}{2}$ in. gauge Shay locomotive. The reporter notes that the turnout of members and models was much higher than in recent years. At the



2. Steve Gosling's locomotive weather vane silhouetted against a lovely sunset.

3. This 1911 Rolls-Royce visited British Columbia SME on Boxing Day 2007.

auction, items that could not be sold off were bundled together in 'lucky bags' and palmed off on members along with their intentional purchases. Don't worry chaps; they will all be brought back next year! Edinburgh is another club that suffered damage from fallen trees in the stormy weather late last year. A tree caused substantial damage to two steaming bays and knocked the turntable out of alignment but the worst damage was repaired in time for the Christmas Steam Up with only one steaming bay still out of action for the event.

Work continues at **Erewash Valley MES** on the changes to the ground level track with the temporary track now replaced with the permanent section which joins the inner loop to the outer loop. Work continues on the track bed and once the pile of hardcore is cleared, the foundations for the ground level steaming bay will be started.

An interesting I/C engine has been unearthed at the **Isle of White MES** by member Ken Harrison. The engine is a 5-cylinder rotary engine with the same piston mounted inlet valve configuration as the early Gnome rotary engines (prior to the *Monosoupape*). The engine is incomplete but Ken has cleaned it all up and mounted it on a suitable display base. He is not aware of a full-size 5-cylinder rotary engine and would be interested if any readers can throw some light on the engine.

The Chairman of **Leeds SMEE**, John Hunt, has expressed the following in the newsletter "Our hobby is a very diverse one and it is there to be enjoyed. Get out there and burn coal, burn petrol or dissipate watts, there is a summer coming soon"; an excellent sentiment indeed.

Work is also progressing on new steaming bays for the



ground level track at the **Model Engineers Society (NI)** and the steps to the clubhouse have been completed. A locomotive that would bring a smile to Nemett was seen circulating the track recently. The unlikely vehicle (**photo 1**) was attributed to the "Stewarty school of weird designs" and is powered by what looks like a Zenoah engine driving an 18 x 6in. propeller. Perhaps the perpetrator goes under the name Stewarty to avoid identification by Elf 'n safety?

North Norfolk ME is another busy club with a lean-to being added to the hut at Holt to give more room for carriage storage and to provide a work area with more shelter.

The new electro/hydraulic lifting table has been completed at **North Wilts MES** and no doubt makes the loading and unloading of locomotives much easier. A note quoted in the newsletter describes two laws which apply to committees. The first states that "a committee will spend

proportionally more time as the amount of money it is asked to spend diminishes". The second states that "over a given amount of time, committees tend to grow". The original was part of an article in the *Bristol Evening Post* and I am sure the laws cannot possibly apply to any model engineering club, can they?

Work on the **Norwich DSME** site at Eaton Park continues to make progress with the trench dug for the return loop on the ground level track. Overhaul of the society 7¹/₄in. gauge LNER A3 locomotive is also progressing with the boiler overhauled, tested and ready for reuniting with the frames.

Work at **Reading SME** has included alterations to the removable track section allowing access to the centre of the raised track. This is now fitted with wheels and a pivot to enable it to be opened more easily. Two passenger trolleys are to be purchased for the raised track. These will be fitted with an overrun brake for

use in pairs. Editor John Billard is looking for a supply of 9BA steel nuts which scale to 1in. Whitworth in 5in. gauge.

The main event for 2007 at **Rochdale SMEE** looks like being the Society's 75th Anniversary which falls on 11 June. The society will be holding an open day on Saturday 9 June to celebrate with friends from across the North of England.

Saffron Walden DSME suffered storm damage in January when the fence around the picnic site was demolished and a large tree was blown down. In five working days the Wednesday Gang demolished the fence, salvaged the reusable items, dug out 23 holes, installed concrete posts, fitted timber posts to the concrete and fitted the top rails. By the time you read this, the fence should be repaired in time for the first public running day of the season. That sounds like an excellent case of everyone pulling together for the good of the club.

Les Proctor from **St. Albans DMES** has an unusual method of picking numbers for his locomotives. His 5in. gauge *Tich* has the number 306 which was the number of the bus that used to run past his house. News of any other unusual name or numbering schemes will be welcome. The club was another suffering several trees down in the winter gales, but fortunately no major damage was done to the track. For those building kits from Modelworks, John Johnston has set up a website

www.britanniabuilder.co.uk

which has details of his Britannia building progress. John comments that the quality of these kits is now very good and his chassis ran well from the start on compressed air.

Progress at the Creech site of **Taunton Model Engineers** has been "steady if unspectacular" according to the newsletter. The North loop is completed with two sets of points in position with the intervening track realigned. The three points for the north end of the shed are under



construction. A steel gate is being installed to control access to the station area. Steve Gosling has come up with a good idea for a family Christmas present. Three years ago he made a locomotive weather vane (**photo 2**) for his mother. His mother was delighted, but unfortunately this meant that Steve was out on the summerhouse roof on the Boxing Day fitting it. After three years it is still going strong, so Steve suggests that we all make one. Another present described in the newsletter is also by Steve, this time it was a miniature ride in Land-Rover for his nieces.

World Club News

Canada

The February edition of *"The Whistle"* from the **British Columbia SME** has a picture of a 1911 vintage Rolls Royce (**photo 3**) from the Boxing Day antique car run to the railway. Ken Klakowich and Bruce Laws have installed a digital load cell just inside the workshop to measure the axle weights on

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.

Ronald Brookes
Alf Chadwell Leyland
John Dempster
Derek Jones
Jim Proud
Terry Robinson
Ted Secrett
Stewart Viner

Bournemouth DSME
SME
Erewash Valley MES
Norwich DSME
Hull DSME
Leeds SMEE
Ascot Locomotive Society
Ascot Locomotive Society

locomotives and riding cars. I hope this is not a sneaky check on driver weight?

Trade News

Autopaint Meets the Needs of Model makers

Model makers are discerning and demanding users of automotive-grade refinishing paints, usually requiring special shades to match original colour specifications, different gloss levels and shades to create particular effects. The latest EU legislation limiting emissions from vehicle refinishing

products seemingly exempts many such small users, but as the onus is on paint manufacturers to produce solely compliant finishes, supplies of traditional cellulose, 2-packs and other solvent-based formulations are being severely squeezed.

One specialist retailer that has pledged to maintain supplies of non-compliant coatings for the foreseeable future is Autopaint International, the leading chain of automotive paint stockists, which also offers an online

paint supply service at www.autopaintinternational.com

Autopaint employs a team of expert colour mixers, who will match virtually any shade and finish no matter how obscure; can offer colour-matched paints in small tins, cans from 1-30 litres and aerosols.

A typical small Autopaint customer is Peter Money of Poole, an enthusiastic model maker, who applies a professional touch to his 'OO' railways and 1:48 scale aircraft. Peter has regularly challenged Autopaint mixing technicians to replicate such details as oily frame dust on the underside of BR locomotives or rust streaks on a boiler, regularly mailing samples to the company's Liverpool headquarters for colour analysis and mixing.

Further information from Autopaint International, Marl Road, Knowsley Industrial Park, Kirkby L33 7UM, telephone 0151-549-1409, e-mail sales@autopaintinternational.com

DIARY DIARY DIARY DIARY DIARY DIARY DIARY DIARY DIARY DIARY

APRIL

- 13 Hereford SME. Twilight Electric Engines Rally. Contact Nigel Linwood: 01432-270867.
- 13 North Norfolk MEC. N. Shelley: Casting. Contact Gordon Ford: 01263-512350.
- 13 Romford MEC. Competition Night. Contact Colin Hunt: 01708-709302.
- 14 Canterbury DMES (UK). CRAMEC 30th Birthday Lunch. Contact Mrs P. Barker: 01227-273357.
- 14 SM&EE. Training Seminar. Contact Maurice Fagg: 020-8669-1480.
- 14 Sunderland (City of) MES. Meeting. Contact Albert Stephenson: 01429-299649.
- 14 York City & DSME. D.A.G. Brown: Good by Design. Contact Pat Martindale: 01262-676291.
- 15 Basingstoke DMES. Members' Running Day. Contact Guy Harding: 01256-844861.
- 15 Frimley & Ascot LC. Club Running. Contact Bob Dowman: 01252-835042.
- 15 Nottingham SMEE. Public Running. Pete Towle: 0115-987-9865.
- 15 Plymouth MSLS. Public Running. Contact Malcom Preen: 01752-778083.
- 15 Saffron Walden DSME. Public

- 15 Running. Contact Jack Setterfield: 01843-596822.
- 15 St. Albans DMES. Puffing Field Morning. Contact Roy Verden: 01923-220590.
- 16 Erewash Valley MES. Derek Brown: 4 and 6 Facet Drill Grinding. Contact Jim Matthews: 01332-705259.
- 16 Saffron Walden DSME. Club Night. Contact Jack Setterfield: 01843-596822.
- 17 Chesterfield MES. Meeting/Slide Show. Contact Mike Rhodes: 01623-648676.
- 17 Nottingham SMEE. Dave Morris: Signals & Signalling. Contact Graham Davenport: 0115-8496703.
- 17 Romney Marsh MES. Track Meeting. Contact John Wimble: 01797-362295.
- 17 South Durham SME. Afternoon Steam-Up. Contact B. Owens: 01325-721503.
- 17 Taunton ME. John Hancock & Nick Nicholls: Gliding. Contact Don Martin: 01460-63162.
- 17 West Wiltshire SME. Work in Progress. Contact R. Nev. Boulton: 01380-828101.
- 18 Bristol SMEE. Talk on Electric Locomotives. Contact Trevor Chambers: 0145-441-5085.
- 18 Chingford DMEC. Paul Harrison: Quiz

- 18 Contact Ron Manning: 020-8360-6144.
- 18 Guildford MES. Bits & Pieces. Contact Dave Longhurst: 01428-605424.
- 18 Hull DSME. Members' Current Projects. Contact Tony Finn: 01482-898434.
- 18 Leeds SMEE. Video Evening. Contact Colin Abrey: 01132-649630.
- 18 MELSA. Meeting. Contact Graham Chadbone: 07-4121-4341.
- 19 Isle of Wight MES. Meeting. Contact Malcolm Hollyman: 01983-564568.
- 20 Canterbury DMES (UK). Quiz Night. Contact Mrs P. Barker: 01227-273357.
- 20 Rochdale SMEE. Malcolm High: Laser Cutting. Contact Bob Denyer: 0161-959-1818.
- 20 Romford MEC. Talk on Restoration of Heavy Oil Engines. Contact Colin Hunt: 01708-709302.
- 21 Canterbury DMES (UK). Members' Only Running Day. Contact Mrs P. Barker: 01227-273357.
- 21 Chesterfield MES. Public Running. Contact Mike Rhodes: 01623-648676.
- 21 SM&EE. Gauge 1 Track Day. Contact Maurice Fagg: 020-8669-1480.
- 22 Bristol SMEE. Public Running. Contact Trevor Chambers: 0145-441-5085.
- 22 Guildford MES. First Members'

- 22 Running Day. Contact Dave Longhurst: 01428-605424.
- 22 Harlington LS. Public Running. Contact Peter Tarrant: 01895-851168.
- 22 MELSA. Bracken Ridge. Contact Graham Chadbone: 07-4121-4341.
- 22 Nottingham SMEE. Public Running. Pete Towle: 0115-987-9865.
- 22 Saffron Walden DSME. Public Running. Contact Jack Setterfield: 01843-596822.
- 22 Taunton ME. Public Running. Contact Don Martin: 01460-63162.
- 23 Bedford MES. Our American Odyssey members report on their trip of a lifetime. Contact Ted Jolliffe: 01234-327791.
- 24 Romney Marsh MES. Track Meeting. Contact John Wimble: 01797-362295.
- 25 Chingford DMEC. Dave Whiting: Auction. Contact Ron Manning: 020-8360-6144.
- 25 Stockholes Farm MR. Members' Running Evening. Contact Ivan Smith: 01427-872723.
- 26 Leyland SME. Jazz Band Night. Contact A. P. Bibby: 01254-812049.
- 27 North London SME. Workshop Evening. Contact David Harris: 01707-326518.
- 28-29 Bournemouth DSME. B&DSME Model Engineering Exhibition. Contact Dave Fynn: 01202-474599.

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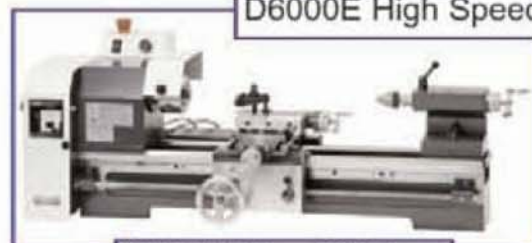
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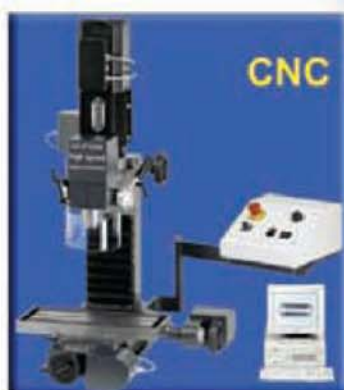
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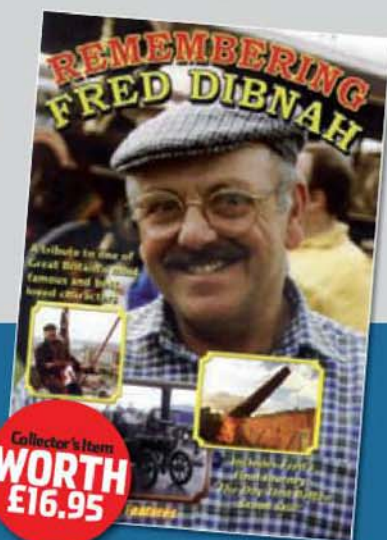
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