

MODEL ENGINEER

Vol. 195 No. 4252

8-21 July 2005

GUILDFORD
MODEL
ENGINEERING
SOCIETY RALLY

16-17 July

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ORNAMENTAL TURNING

INJECTOR PLUMBING

CLAUDE REEVE CLOCK

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THE TALE OF A SHED

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constructed a custom built workshop at a
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SAVAGE'S UNIVERSAL CARRIER

Details of no less than three types of boiler
that can be used in this popular Road Steam
wagon.
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On the cover ...

One of the smartest exhibits at the
National Model Engineering & Modelling
Exhibition at Harrogate was this fine
model of a clinker built steam launch
made by T Cork. This was one of many
excellent models on the stand of the
Northern Association of Model Engineers
in this its Diamond Jubilee year. A report
on the club stands at Harrogate this year
begins on page 76. More than 40 clubs
took part making it a vintage year with
every branch of model engineering
represented.

(Photograph by David Carpenter)

BUILDING A STUART MODELS' LATHE

Completing this delightful model,
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IS YOUR PLUMBING IN GOOD ORDER?

Before blaming the injector, says Paul
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of poor operation.
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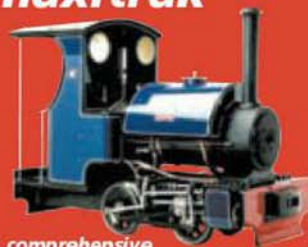
Recent activities and forthcoming events.
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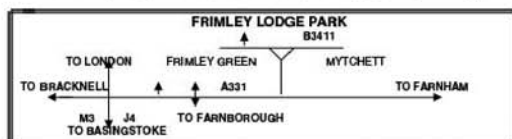
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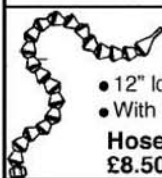
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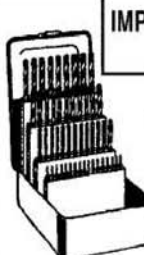
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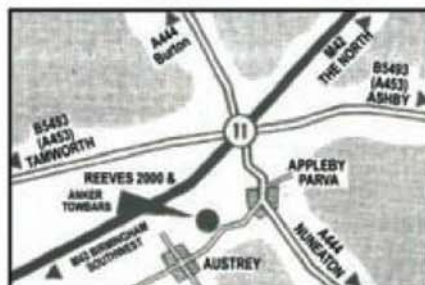


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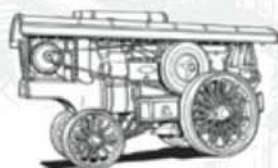


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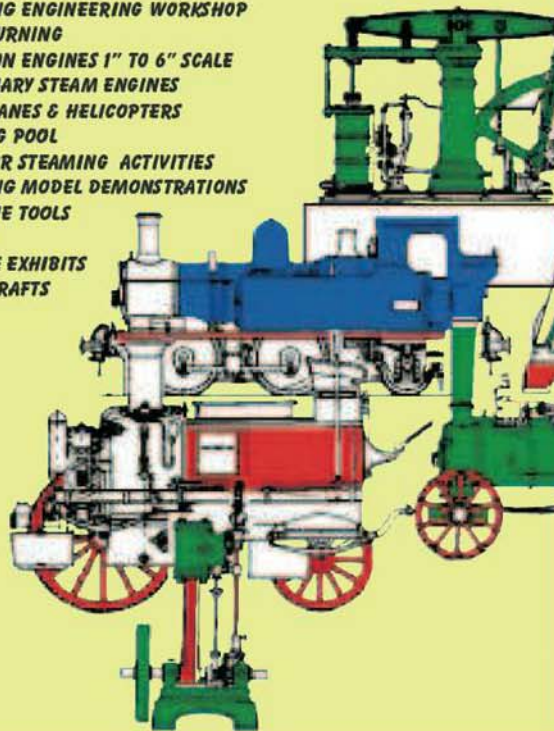
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FM2162
Part 1

SMOKE RINGS

With the Editors

If you don't want to lose it...

It is looking likely that the future of *Model Engineer* is to come under a serious threat. It seems more and more likely that an EU ruling could be adopted in the UK which would mean that it will become uneconomic for this, and many other special interest magazines, to be distributed through newsagents. If the UK is brought into line with European law it is almost certain that distribution through small retail outlets will come to an end. Only mass circulation titles sold through major multiples will survive.

The oligarchs at the Office of Fair Trading have told the Government that newspapers should be exempted from the EU law, but not magazines. Now we know what 'fair trade' means.

What to do?

First, write to your MP to ask him or her to oppose this move. His address is:

House of Commons
London SW1.

Secondly, take out a postal subscription to *M.E.* and your other favourite magazines. It may well be that magazines like ours will only survive if enough readers do that. By the way, you will save money, a whole 25%, and you will normally receive the magazine several days earlier, too.

And talking about lobbying...

The Nanny-State-Gone-Mad's latest idea to ban replica guns could affect model engineers, too. Think about it. Models could well be swept up along with new legislation, unless specifically excluded.

If your thing is to make full-size replica handguns, you had better start looking for a new interest. On the other hand if you enjoy making small-scale versions of non-firing models like our recently described 5.5in. medium gun, you might like to point out to your MP, and the Home Secretary, that model engineers have an

exemplary track record, and should not be lumped together with the sort of people this is really aimed at, and who will not be deterred, anyway. Indeed, it just might convert the criminally inclined to buy the real thing.

Shine shining light

With all the recent correspondence in *M.E.* about the difficulties of poor light, magnification, and *anno domini*, it was timely to receive details of a new magnifying light from Hopkins and Holloway or Peterborough. Originally developed to cater for the intricacies of tying fishing flies, the Stonefly Mag and Light will also find uses in many workshops for small, detailed work.

The good size central magnifying glass is 1.75x magnification. It is encircled by 8 LED daylight bulbs to provide illumination of small details.

A flexible arm permits right or left handed work, and fitting can be via a clamp or vice.

It is supplied with a power pack; low voltage.

Cost is £49.99 which includes Royal Mail recorded delivery to UK destinations.

We have tried this product, and found it a most useful accessory for the workshop, and will surely find it increasingly useful with time. It is available via www.hopkinsholloway.co.uk/maglight or tel 01527 853822.

Stuart clan reunited

Stuart Models of Guernsey was quick off the mark to acquire the Cheddar Models range of marine engines and locomotives after that range was taken off the market. In fact it's a return for many of the models that were part of the old Stuart range before it moved to the Channel Islands.

Naturally, it will take a while for Stuart Models to gear itself up to the new range. It will start off supplying parts, with completed models



WIN a Stonefly Mag and Light!

We have generously been sent a sample of the optical aid described above.

We are also setting out to publish some workshop hints and tips.

So please send in any hints or tips you would like to share with readers. The idea that appeals to the editors most, that arrives before the end of September will win for the sender the Stonefly Mag and Light.

coming along later. Progress can be checked on www.stuartmodels.com

Meanwhile, Stuart would like to have some feedback from Cheddar customers, so that they can find out how best to meet their needs in future.

Engine auction

Each year Gilding's the auctioneers in Market Harborough hold a sale of vintage and classic model engines. This year the sale will be on Saturday, November 19.

First couple of entries are two engines built by Mr Yokota and featured in magazines in 1933 and 1935. Both were bronze medal winners at the Model Engineer Exhibition.

The 1933 model was described in a magazine at the time as having "*daringly original features in design, and was remarkably well made and finished.*"

Last year's auction by Gilding's included a massive 683 entries, including some real rarities. Details of this year's sale will be available from 01858 410414. www.gildings.co.uk

CHUCK, the MUDDLE ENGINEER

by B. TERRY ASPIN

Theft

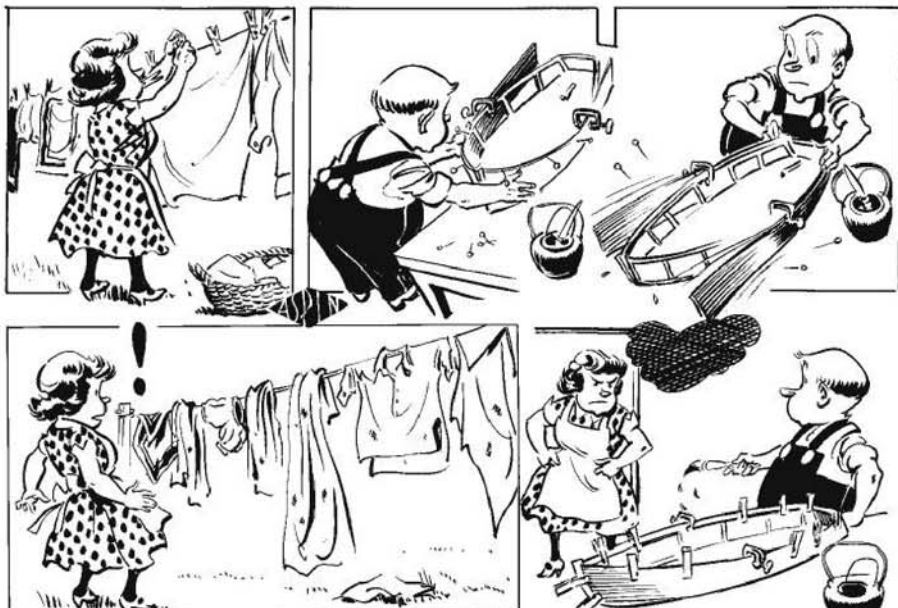
We are saddened to report that the 2in Burrell showman's engine belonging to Ron Dawe was stolen from his car on the evening of May 26, along with its Dragon Car. Ron is a good friend of *M.E.* and is the current president of the Road Locomotive Society.

The engine took some 4,500 hours to build over a 20-year period, and won a gold medal at the Model Engineer Exhibition. It is unique. It was not insured.

The engine is painted red with yellow wheels. Painted on the canopy is "*Scenic Golden Dragons On Tour.*" The engine called *Excalibur* is 44in. long and weighs 2 1/4 cwt.

Ron asks if model engineers and those in the trade can keep a look out for it. Also watch out for a high quality Burrell model with a new paint job. Please report any sightings to us and the police.

Theft of such a heavy item may well have been to order. So will overseas readers also please look out for Ron's Burrell.



POST BAG

Workshop lifting beam

SIRS, - Mr. Bellamy's article on a workshop lifting beam has prompted me to get on and do something similar before I put my back out handling a locomotive which gets significantly heavier as it approaches. However, Unistrut, is 41mm wide by a range of heights, so I suspect Mr Bellamy's runway is sliding door track, hardly surprising as it came from a scrap sliding door. This comes in a range of sizes, the nearest I have found is 305, which is 57mm wide by 93mm high, the next down is 301 at 55mm wide by 66 mm high. Type 301 is stated to be suitable for a 300kg door, hung on two trolleys, so should be okay for a 150kg locomotive hung from one trolley. This is available from PC Henderson, 0191-3771441, www.pchenderson.com
Duncan Webster, by e-mail.

Bringing the roof down!

SIRS, - Arthur Bellamy should be congratulated on his ingenuity in turning a redundant door track into a very useful lifting beam (A workshop lifting beam, M.E. 4246, 29 April 2005).

However, I am a little concerned by the safety aspects associated with hanging a lifting beam from the roof of one's workshop. Arthur rightly states that each individual must make his own judgement as to the structural integrity of the device, based on the circumstances prevailing. The accompanying diagram is clearly intended to be indicative only, but nevertheless, it depicts an example of bad practice that should not be copied by others. The angle bracket is shown as being fixed to the joist by two bolts. If ever it is necessary to drill through a joist, this should be done on the neutral axis only; otherwise the joist will be severely weakened. This means that if two bolts are necessary, they should be placed side by side and not as shown. Ideally, the angle bracket should be designed as a stirrup enclosing the joist, such that drilling is unnecessary. In any event, the point of application of the load should be directly under the joist, so that twisting of the joist is avoided.

The strength of any beam is governed by the tensile strength of the material, and by the second moment of area of the section, taken about the neutral axis of bending. In the case of a 4 x 2in. joist, and using the formula $I_{xx} = (b*d^3)/12$, the second moment of

area is 10.667 in⁴. If we drill a 1/2in. diameter hole on the neutral axis, I_{xx} is reduced to 10.646 in⁴, a loss of less than a quarter of a percent, which is totally insignificant.

Now supposing two 1/2in. diameter holes are drilled at 2in. centres, equally spaced about the neutral axis. I_{xx} will now be reduced to 8.626 in⁴, representing a loss of strength of nearly 20%. Cause for concern indeed!

The method of lifting the locomotive also needs to be considered. The accompanying photo is not too clear, but if the load is taken on the buffers, the strength of the buffer fixings must be considered.

I am aware that the method of fixing buffers varies, but it would be a terrible calamity if the buffer bolts, which might be no bigger than 8BA on a 5in. gauge locomotive, were to fail and cause the locomotive to fall to the ground. A simple calculation will establish the safety factor, which I suggest should not be less than three.
Ron Head, Oxfordshire.

This is one of a number of letters received urging caution when fixing lifting devices to roof trusses. We urge any readers contemplating a similar device ensure the method of fixing does not weaken the supporting beams, Ed.

Interlocking signal frames

SIRS, - The caption to photograph, top right page 522 of M.E. 4246, 29 April 2005 is incorrect likewise its reference in the text. The model lever frame is of 'McKenzie & Holland' design and not Saxby & Farmer as stated. This design of interlocking frame known as 'No. 16 Apparatus or Pattern' was first introduced c1902 on the North Eastern Railway where it was more or less adapted as standard. In later years both the LNER and NE Region of British Railways perpetuated the design and many remain in use to this day. The last installation of a 'New' frame, but actually using recovered material would be early/mid-1960s. That is of course discounting the world of preservation where some excellent work has been carried out.

Mick Nicholson, East Yorkshire.

Hot air power for heating

SIRS, - I too have come across the suggestion to use a Hot Air Engine and Alternator as a power source

for the control circuit and ignition of a domestic central heating boiler but not as an electrical generator supplying the network.

The system used waste heat after the boiler was no longer required 'boiler pump run-on' prevents overheating of the heat exchanger. Hence the power output would not be in the order of Kilowatts but sufficient to charge a battery capable of supplying the control, ignition and perhaps the requirements of a circulating pump. This would improve the overall system reliability by making it independent of power outages spoken of by Richard Barnes.

Jon Nixey, Suffolk.

Cam information

SIRS, - I have renovated a 200cc Barn Engine of unknown age and manufacture which used nothing more than an eccentric providing sufficient lift to open a contact (0.75mm). The engine is not a scale model so I upgraded the ignition by using a car contact breaker, mounting plate and distributor cam. The two unused cam lobes were simply ground away. I am not worried about my four stroke engine firing on the exhaust stroke as some cars do this.

Two stroke motor cycle (MZ) and car (DKW) cams are even simpler being eccentrics as mentioned earlier but advance the timing a

little to ensure the engine runs in the desired direction.

Jon Nixey, Suffolk.

Sintered bushes

SIRS, - An important feature of sintered bearing bushes is the manufactured size. The bushes are, or were some 40 years ago, made with the outside diameter oversize to ensure a press fit in the housing, and the bore to size. The representative of the makers explained to us, as makers of prototype equipment, that a shouldered mandrel should always be used when fitting the bushes to maintain the desired running clearance of the shaft. The mandrels were of mild steel with a good turned finish. Sometimes bushes had to be made from cylindrical stock, and these were only ever drilled, never bored or reamed. The trick of lubricating the bushes before fitting, in those days, was to fill the bore with oil and close the ends with thumb and finger and squeeze until the oil oozed out of the outer wall.

Ivan Turner, Sheffield.

Rocking and rolling

SIRS, - The article on the 'rocking engine' by Mr Stride recalls memories for me. When I was a child (long ago, before WW2) I had a toy engine which worked on the same principle. It was of course

Aeronautical steam

SIRS, - Edward Perera deserves real praise for his steam powered aircraft (M.E. 4248, 27 May 2005). However, a trip to the website <http://www.archive.org/details/BeslerCo1932> will reveal a film of a full size steam powered aircraft actually flying. The steam railcar and road car also in the film are interesting as well.

Nearer home I have a copy of *Model Aeroplane Handbook* published 1949 by F. J. Camm. Chapter 32 describes a flash steam plant and three

cylinder motor for a model. Photographs are shown of the boiler and motor, but none of it fitted into an aircraft. Blueprints were available from the publishers, Newnes, although I think there is enough information in the relevant chapter if anyone was interested in making such a device.
David Usher, Keighley.



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cruder in construction than that illustrated, but it cost a few shillings at most, not the best part of a hundred pounds.

Derek P. Winks, London.

Can I suggest that Derek's "few shillings" before the war would equate to somewhat more than the rocking engine costs in today's money. M.S.

Choosing a lathe

SIRS, - Perhaps you or your readers can help me with choosing a lathe. I am about to retire and I want to resuscitate my model engineering hobby - dormant for many years while I helped bring up two sons.

Some 25 years ago I bought a very well-used Myford Super 7 and I spent a lot of time renovating it - time I would rather have spent making something - but I never got it to a state with which I was really happy and so I sold it a little while ago.

I want to replace it and since I am not willing to spend £6,000 or more on a new Myford and I don't want another second-hand machine I will have to look at another make.

In fact, I would like a bigger machine. Mr. L. H. Sparey, in his excellent book *The Amateur's Lathe*, recommended buying "as large a machine as the pocket or the accommodation will allow" and I can remember, when I was at school, being more comfortable with a Colchester Student than with any of the smaller machines - although all of them were bigger than a Myford.

I have it in mind to buy a Chester Craftsman (the same as the Warco BH600) or the geared-head Crusader. Both are 6in. centre height and have screw-cutting gearboxes and so far as I can see, very complete specifications.

Do you or your readers have any experience of these machines? Is there anything about them that would make them unsuitable for model engineering? Any opinions would be most gratefully received.

Bear in mind that I do not want to perform any milling operations on my lathe. There are plenty of reasonably-priced milling machines available and I intend to get one to replace my very old Archdale which I also disposed of recently.

Brian Thompson, Hertfordshire.

Mystery gauges

SIRS, - Re. the Mystery gauge, *M.E.* 4246, 29 April 2005, page

490. I can possibly help with the identification of the first three hole pairs. I dug out my collection of old round pin electrical plugs.

Pair 1 corresponds to 2 pin, 2 amp, pair 2 to 2 pin 5 amp, and pair 3 to 2 pin 15 amp. I believe these are all to a BS standard, though I don't know the number. The current BS for round pin plugs seems to be BS546 1950, I don't know whether this covers 2 pin plugs.

The other three pairs I cannot help, I assume that they correspond to some propriety brand, of which there were many in the early days of electrical installations.

I have an electrical contracting book published in 1926, all illustrations of connectors are 2 pin, there is not a earth wire in sight!

E. Boardman, Cheltenham, by e-mail.

This is one of many letters received providing the same answer to this question. We thank all those who responded, Ed.

Electric beam engine

SIRS, - The article on OMC-1 Rocking Engine (*M.E.* 4246, 29 April 2005) was fascinating, so much so, that a request for one of these kits will be presented to the missus on this year's Christmas list. Well, this scheme has worked well in previous years for other items: Westbury Whippet, The Junior, Little Angel...

I thought readers might be interested in 'The Katy' (named after my bright and inquisitive niece) - a very basic representation of a three cylinder ship's engine worked by electricity. Each 'piston' is fitted with a powerful permanent magnet and operates inside a copper cylinder. The centre-tapped coils are wound over the cylinders, things being arranged so that at half-stroke the centre of each magnetic piston aligns with the gap between its two coils.

The three throw crankshaft is built up from aluminium, silver steel and Loctite. The brass flywheels each carry a small magnet which sweeps three magnetic sensors arranged 120 degrees apart. Their signals instruct the drive circuit to sequentially

energise the coils so that the pistons are pulled or pushed at appropriate crank angles. The engine is thus 'double-acting'. The drive circuit also deals with re-sequencing the phases for reversing and 'chopping' the coil currents to affect speed control. The engine is nominally self-starting and will run down to a very realistic slow speed. All bearings are provided with oil holes.

Julian Kemp, Surrey, by e-mail.

Bushes

SIRS, - Further to the comments by the editors on the subject of 'Oilite' bushes, I have several times come across reference to 'Broaching' these to size. The only illustration of this being done that I have seen (40 or so years ago) was so bad that it was not possible to ascertain what sort of broach was being used. I have never seen an 'Oilite bush broach' in any catalogue either. The admonition not to use a reamer is that whilst the leading taper cuts cleanly the following section burnishes and smears the pores. I would have thought that a sizing ball would do the same. I have from time to time wondered what sort of tool would do the job of sizing. All the bushes that I have fitted - some two or three dozen (largest about 2in. shaft, smallest about 1/4in. diameter) - were sized so as to shrink to a correct fit when pressed into place. There is also the problem with blind holes where a sizing ball becomes a permanent fixture. A 'clockmakers' five sided broach would only smear worse than a reamer. The other admonition along with not lapping is - don't use Loctite, I knew a sad lad who did!

Peter King, New Zealand.

Injector adjustment

SIRS, - You recently mentioned successfully upgrading the pressure range of an injector by reducing the annular gap between steam and combining cones. Sorry to say, this is not really sound, but you got away with it because you must have gone from one end to the other of the acceptable range of gap for the particular instrument involved - a lucky stroke.

The correct way to increase the steam pressure rating is by reducing the bore of the steam cone - usually 0.002 or 0.003in. does the trick and takes the steam pressure up from say 90 to 150psig maximum. There is a very good thermodynamic reason for this: Hp steam has slightly more enthalpy than Lp steam and you achieve a slightly higher exit velocity at the tip, with the ability to maintain the steam to water ratio. As a consequence, the injector remains stable over a wide range.

Sorry for the dogma - my book on the injector subject has become a little delayed by a certain design project in this hallowed magazine - as you might imagine.

D. A. G. Brown, Lincolnshire.

Soldering wire

SIRS, - I have read with interest the series of articles on Electro-Pneumatic Contactors. The method described for preparing the coil lead wires (*M.E.* 4241, 18 February 2005, page 209) reminded me of an alternative method I saw over 50 years ago and which was being used in a telecommunications equipment company.

In this method a small piece of copper foil was folded in the middle and put longitudinally over the wire end before being dipped in methylated spirits.

The foil was then heated to redness and finally quenched in the spirits.

This resulted in a bright clean wire ready for tinning and soldering without the risk of mechanical damage which might lead to premature failure in service.

W. S. Wilkinson, Oxfordshire.

Automatic drain cocks

SIRS, - I am currently building a 3 1/2in. gauge 'Schools' class locomotive and have got to the stage of making and fitting the cylinder drain cocks. Stan Bray, in his excellent book *Model and Miniature Locomotive Construction* seems to recommend automatic drain cocks (page 119). I have asked several members of our club, Rotherham DMES, if they have had any experience of this type of drain cock or know someone who has. but to no avail. I should be most grateful if you would publish this letter in your magazine in the hope that someone with such experience will contact me and offer advice.

Colin Roberts, Rotherham by e-mail.



Neil Read

takes a tour of the club stands that attended this popular event plus some of the other attractions.

● *Part II continued from page 19*
(M.E. 4251, 8 July 2005)

One of the problems with events like the Harrogate show is that it is all too easy to miss things. You know how it is; one minute you are making a 'beeline' for a particular model or stand when you meet up with someone you know. The next thing you are deep in conversation and the intentions of a few moments before are lost forever. It is only later when a fellow model engineer asks if you saw a

particular model that the penny drops and you realise that you missed it. It makes you think that attending these shows in disguise might be a good plan!

Well, I hope that this article will help to fill in some of the gaps and bring back memories of a fine show. Those who were unable to attend can also glean some idea of what they missed. As usual, the choice of exhibits is mine so if you dislike them intensely I hope you will go and see the show for yourself next year.

Let us start with a locomotive, in this case a neat example of the 7¹/₄in. gauge 0-6-0 tank engine *Hermes* (photo 1) on the Grimsby & Cleethorpes MES stand. This engine is an adaptation of the 7¹/₄in. gauge 0-4-0 *Hercules* design, which was designed by the late Dick Simmonds, and was intended for heavy passenger hauling duties without being

excessively bulky. This particular example was exhibited by P. Collins.

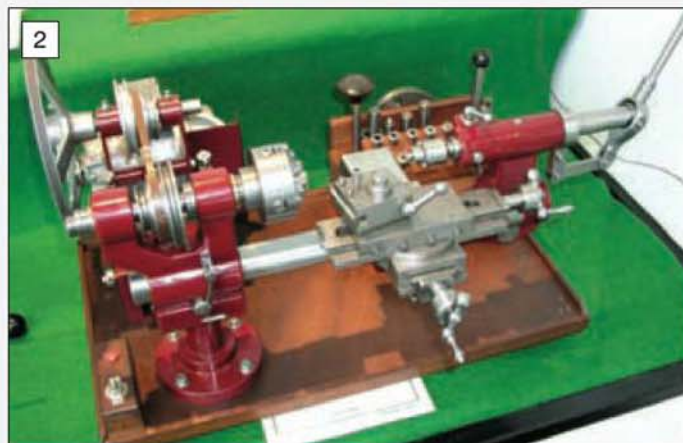
One occasionally hears complaints that people do not make their own machines and tools anymore. Well, Jim Burlingham of York City & District SME Ltd. obviously likes to keep his hand in with such matters and the resulting 2¹/₂in. centre height clock makers lathe (photo 2) was a credit to his skill.

If a homemade machine tool is an example of a rare breed then you would think that home-brewed steam cars are positively extinct. Well not quite, as could be seen on Leeds SMEE stand. Here one could admire the monotube steam generator and some associated parts for a modern steam car made by D. Beale (photo 3).

Walking on I arrived at the stand of the City of Sunderland MES Ltd. and paused to admire the non-dead centre engine by J. Cogden



A neat example of a 7¹/₄in. gauge 0-6-0 tank engine *Hermes* by P. Collins on the Grimsby & Cleethorpes MES stand.



An useful 2¹/₂in. centre height clock makers lathe made by Jim Burlingham and exhibited on the York City and District SME Ltd. stand.



3
D. Beale's monotube boiler intended for a steam car and seen on the Leeds SMEE stand.



4
J. Cogden's unusual non-dead centre engine on the City of Sunderland stand.



5
The model Blacker power hammer by C. Bramley on the PEEMS stand.



6
A nice example of the 30cc OHC 'Sea Lion' engine by J. Pullen displayed on the Scunthorpe SME stand.



7
Displayed on the South Durham SME stand was this fine 3 1/2 in. gauge Shay logging locomotive by Eric Addington.

(photo 4). As its name suggests, this engine has a special mechanism which means it can start from any position. The model was made without the use of castings.

Continuing the theme of the unusual, Pickering Experimental Engineering & Model Society were exhibiting a fine 1:3 scale Blacker power hammer by C. Bramley (photo 5). This model was displayed complete with a copy of the original handbook for the machine so visitors could gauge the fidelity of the model to the prototype.

I am always glad to see examples of a nicely made I/C engine and J. Pullen's 30cc OHC 'Sea

Lion' certainly fitted that description (photo 6). It was spotted on the Scunthorpe SME stand and I wonder if Mr. Pullen will let us into the secret of what he plans to power with this fine engine?

South Durham SME had a well-stocked stand and among the exhibits was a rather handsome, part built, 3 1/2 in. gauge Shay logging locomotive by Eric Addington (photo 7). Not quite so handsome but rather endearing was a set of platform scales by J. Lummas on the Cleveland Association of Model Engineers stand (photo 8). I well remember using a full size example of these as a boy when helping a farmer friend to weigh out potatoes.

The Bradford MES stand took the award for the Best Stand this year and among many fine exhibits I spotted some ornamental turning chucks made by J. A. Batchelor (photo 9). The item on the far right of the photo is, I believe, an oblique chuck but I cannot remember ever seeing a description of how to use this particular item. If he happens to read this could Mr. Batchelor please oblige?

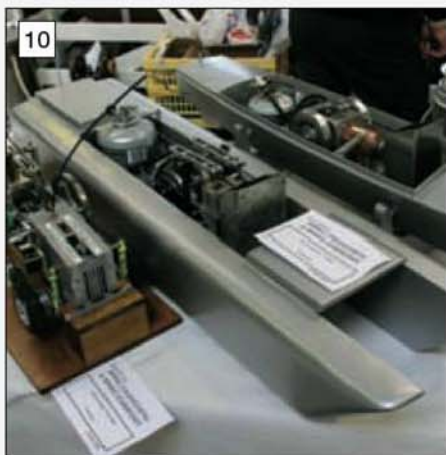
When making my tour of the club stands I always take the time to spend a few minutes on the Stirling Engine Society stand. Roy Darlington or one of his co-conspirators will usually have something new to surprise or



8
There was plenty of variety on the Cleveland Association of Model Engineers stand including this set of platform scales by J. Lummas.



9
Seen on the award winning Bradford MES stand was this range of ornamental turning chucks by J. A. Batchelor.



Roy Darlington's latest - a twin hulled Stirling engine powered boat.



Tony Phillips' (SMEE) neat hydraulically locked nut seen in use on a Myford lathe.

amuse. This year Roy's new Stirling engine powered boat Stirling Silver was making waves (sorry!) among the visiting public (photo 10).

The SMEE stand was its usual hive of activity with demonstrations being carried out by a number of luminaries of the model engineering world. Regular exhibitor Tony Phillips had a rather neat lock nut for use on the Myford lathe Dickson tool post (photo 11). This utilised a form of hydraulic locking and could be readily locked or unlocked by means of the small lever in the top.

It has been said that the Harrogate show is a paradise for those interested in 'road steam'



Eric Hughes from Northern Ireland puts Freddy through his paces.

National Model Engineering and Modelling Exhibition 2005 Harrogate Results and Awards

Section 43 - Locomotives

1st	43/1	7 1/4 in. gauge LNER B1 <i>Bongo</i>	C. Vine
1st	43/5	5 in. gauge Large Prairie tank locomotive	A. Crossfield
2nd	43/2	5 in. gauge GWR pannier tank locomotive	R. McMahon
2nd	43/4	5 in. gauge GWR Manor	D. Wainwright
3rd	43/3	5 in. gauge O&K version based on Sweet Pea	B. Rylance

Section 45 - Workshop Equipment

C	45/5	Model engineers dividing head	P. J. H. Bowler
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Section 46 - Road Vehicles

2nd	46/5	1:4 Atkinson steam wagon	J. Walker
3rd	46/3	1:3 Dodman traction engine	M. Angus

Section 48 - Stationary Engines

1st	48/19	Gnome 9-cylinder monosoupape rotary aero engine	J. G. Winrow
1st	48/11	106cc 14-cylinder aero engine	D. Bramwell
1st	48/18	200cc supercharged V8 engine	I. Dahlberg
1st	48/17	130cc 9-cylinder radial engine	I. Dahlberg
2nd	48/5	1:4 Bentley BR2 radial engine	J. Healey
3rd	48/3	Tandem compound horizontal mill engine	C. Gibson
3rd	48/4	Stothert & Pitt beam engines	M. Worthington
C	48/12	James Booth rectilinear engine	J. A. Cogdon

Section 49 - Miscellaneous

1st	49/1	2:5 Mercer Raceabout 1910	I. Dahlberg
2nd	49/15	1:6 German Tiger tank	D. Hodgson
2nd	49/14	1:16 vintage lorry and tractor	D. Brook
2nd	49/13	Grasshopper skeleton clock	D. Lawson
2nd	49/11	1:8 MG TC car	S. Atkinson
2nd	49/5	1:50 Bucyrus Erie 1200T walking dragline	N. Wilkinson
3rd	49/8	22 calibre PCP 5 shot air rifle	B. Walker
3rd	49/9	22 calibre PCP single shot air rifle	B. Walker

Section 50 - Fairground Models

2nd	50/8	Model fairground	B. Rathmell
3rd	50/2	Model cars scratch built	G. Ryall
C	50/7	1:24 Scammell Showtrac	M. Slater
HC	50/9	1:12 carousel	E. Wilkinson

Section 51 - Model Boats (Kit Built)

1st	51/1	580 series E-boat	P. Redman
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Section 52 - Model Boats (Scratch Built)

1st	52/6	Landing craft	H. Barrow
2nd	52/10	1:12 Thames launch (<i>Bluebird of Chelsea</i>)	B. Young
2nd	52/3	Flower class corvette HMS <i>Bryony</i>	B. Seaman

Model Wheelwrights

2nd	53/13	1:12 Albion expanding horse hay rake	B. Young
2nd	53/15	1:8 Bavarian waggon	B. Simpson
3rd	53/11	1:8 diorama of rescue equipment	J. Cartledge
3rd	53/14	1:8 quarry wagon	J. Cartledge

Rolling stock

1st	54/1	5 in. gauge passenger coach	R. McMahon
HC	54/2	5 in. gauge covered carriage truck	D. Ventress

Barry Jordan Trophy for Best in Show

43/5	5 in. gauge large Prairie tank locomotive	A. Crossfield
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Precision Paints Award for Best Finished Model

49/1	2:5 Mercer Raceabout 1910	I. Dahlberg
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Raymond McMahon Trophy for Best Road Vehicle in Steam

47/16	1:3 Foster 6nhp general purpose traction engine	T. Halliday
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Myford Shield for Best Locomotive

43/5	5 in. gauge large Prairie tank locomotive	A. Crossfield
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Chester Shield for Best Workshop Equipment

45/5	Model engineers dividing head	P. J. H. Bowler
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Eventex Shield for Best Boat

52/6	Landing craft	H. Barrow
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N.A.M.E. Shield for Best Club Stand

Bradford Model Engineering Society

Warco Trophy for Best Stationary Engine

48/19	Gnome 9-cylinder monosoupape rotary aero engine	J. G. Winrow
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Doug Hewson Trophy for Best Rolling Stock

6/22	5 in. gauge NER 10 1/2 ton hopper wagon	C. Garton
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13
The much admired half-size Foden steam wagon of D. Evenson. Hope he didn't need the Myford lathe for any repairs.



14
H. Upton's single cylinder Foster traction engine enjoys one of the fine spells during the course of the weekend



15
The 1:3 scale Garrett single cylinder traction engine of B. Fairbank

exhibits and particularly those who like to steam their vehicles. With miles of private roads to explore and a friendly atmosphere what more could you want? Well, some decent spring weather would help and that was in short supply this year, conditions deteriorating quite badly at times. Nevertheless a large number of hardy souls were not to be thwarted by the vagaries of the weather and a fine show was still put on for the public. So to show appreciation of their efforts herewith a few photographs.

Harrogate regular Eric Hughes of Northern Ireland had his full size steam car *Freddy* in steam throughout the show. Eric's forte is giving

rides to unsuspecting individuals who usually get quite a shock at the acceleration and speed of his car. **Photograph 12** shows Lynda Read (Mrs. Technical Editor) having regained her composure after a typically spirited ride with Eric in *Freddy*.

Many admiring glances were cast the way of the next exhibit to be featured. This was the half scale Foden steam wagon belonging to D. Evenson (**photo 13**). Mr. Evenson may have been expecting trouble with his wagon as he appeared to have a Myford lathe in the back. I hope he never had to use it and that it was properly protected during the rain showers.

Fosters always seem to be a popular choice for a model and **photo 14** shows the smart example owned by H. Upton. This is a 4in to the foot scale model of a single cylinder traction engine.

Garretts also made fine engines and a 1:3 scale example of a single cylinder traction engine owned by B. Fairbank is shown in **photo 15**. It looked very tasteful in its blue livery, a pleasant change from the reds and greens favoured by many.

The 4in to the foot Tasker is a neat little engine and that by Mr. H. Clyne is a nice example of the breed (**photo 16**). If a 4in. to the foot traction engine is a little large for your tastes then perhaps a 3in. to the foot Marshall general purpose traction engine might appeal. **Photograph 17** shows Mr. and Mrs. J. Cashmore taking a ride on their fine example. Note the umbrella at the ready – a wise move as the weather was decided unsettled!

Alternatively you may wish to realise the dream of owning a new full size traction engine. This, too, is now possible as the Great Northern



16
H. Clyne's attractive little Tasker steam tractor was in steam throughout the exhibition.

Steam Company Ltd. (tel: 01325-464616) can supply you with a new machine based on the Foster Wellington tractor (**photo 18**). Not only that but the customer can specify the exact specification as each one will be bespoke. I wonder if air-conditioning will be an option?

Well, that concludes our short tour. As always we have far more photographs than space but we hope readers will have enjoyed those we have been able to show. The staff of *Model Engineer* send our congratulations to all the Club stand and individual exhibitors for making this years Harrogate a splendid event to visit. We hope to see you all again next year.

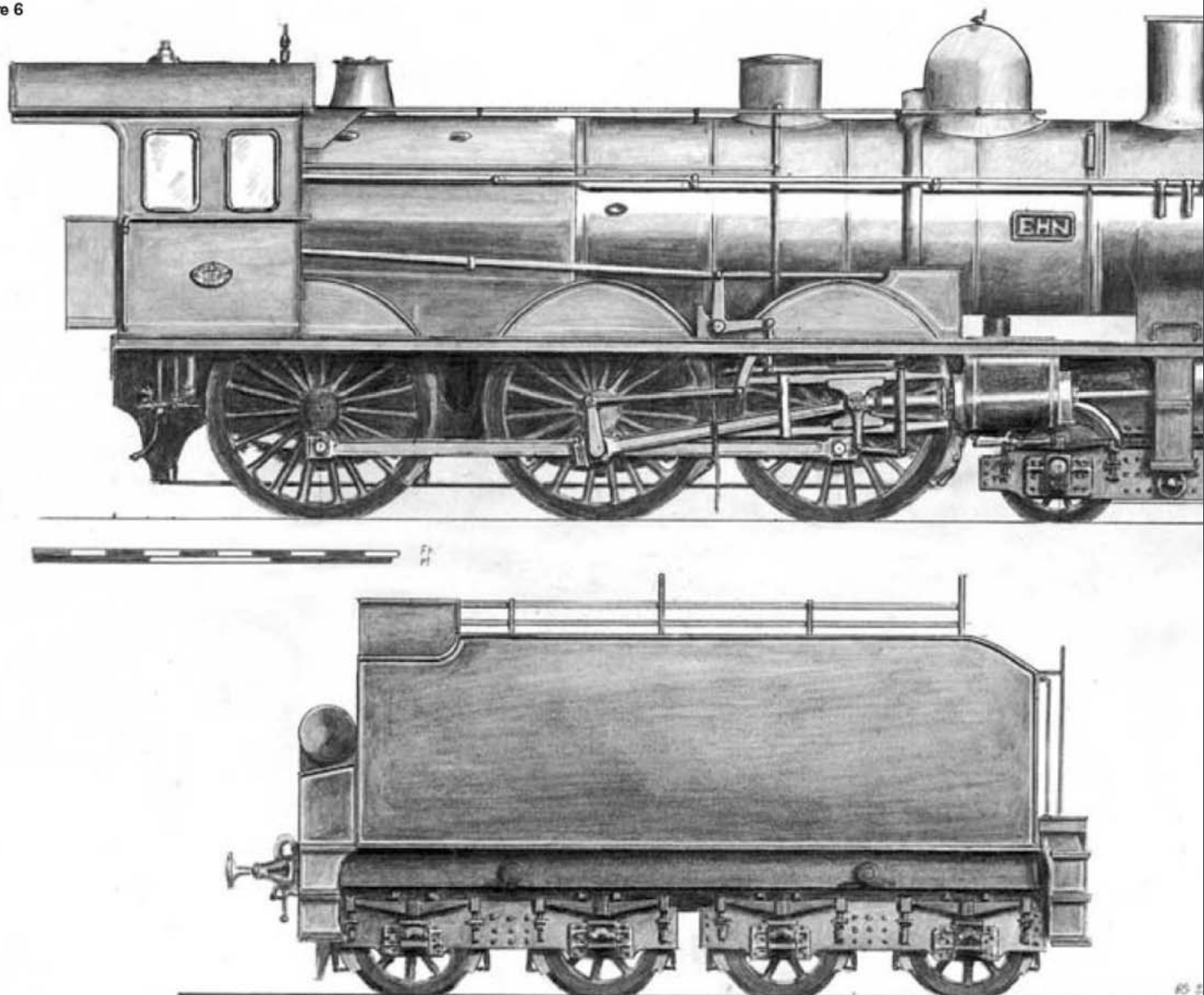


17
Mr. and Mrs. Cashmore exercising their 1:4 scale Marshall traction engine with an umbrella at the ready.



18
Fancy a full size traction engine? Then speak to the Great Northern Steam Company Ltd.

Figure 6



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EDWARDIAN ELEGANCE

Ron Isted

concludes his description of the GWR No. 102 *La France* and the De Glehn Compounds.

●Part XII continued from page 735
(M.E. 4250, 24 June 2005)

Another nice little challenge in a miniature version of *La France* is the equalisation between coupled and trailing wheels, essential on the full size machine with its adhesive weight of little more than 33 tons. Both pairs of coupled wheels were equalised with the trailing wheels, producing a rigid wheelbase of almost 15ft., which on a 5in. gauge model, to quote one example, will require a minimum curve of about 30ft. radius and probably double that figure for fast running. As the equalising beams are a very prominent visual feature of the

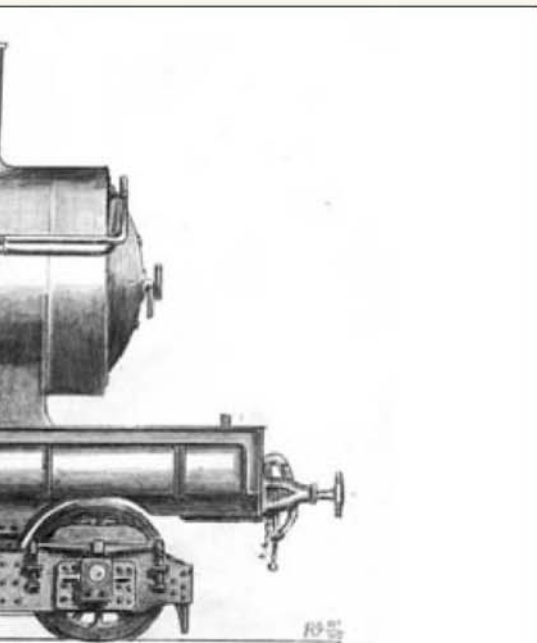
full size engine, omitting them is not really an option and would in any case have a severe effect on the adhesion weight at starting. If you are faced with the task of moving the maximum number of people round a club track on a public running day, *La France* is probably not for you, but one of the many 4-6-0 variations on the de Glehn compound theme might, to coin a phrase, both fill the bill and cut it at the same time. In other words, a six-coupled version would have the required haulage capacity and could possibly achieve some small economy in fuel consumption compared to a simple. With this thought in mind, (but mainly because I think she is particularly elegant), I have produced a drawing of the stylish machine shown in fig 6 to be described later.

One very interesting detail, which appears to have been mentioned only in *Model Engineer*, but was presumably standard on the de Glehn/du Bousquet compounds, was the setting of the main cranks. While HP and LP were set at right angles to each other, the two cranks on each side

of the engine were set at 162deg. rather than the 180deg. you might expect. To quote M.E. 232, 5 October 1905:

"The object of this is to prevent any loss of time at starting, and by its adoption, the admission of steam to at least three of the cylinders is ensured. This disposition of cranks is also favourable to greater regularity of the torsional moments acting upon the axles". Could somebody please translate the last sentence into modern layman's language, as I would have thought the opposite was true?

The boiler on *La France* consisted of three telescoped rings, with the largest at the front, the reverse of the usual practice. Once again, this seems illogical to me, but it probably makes no practical difference to the circulation, while the smokebox was larger still and was telescoped over the front ring of the barrel. The outside diameter of the cladding, which is the crucial figure in a miniature version, was 1600mm (a few thou under 5ft. 3in.) and it was flush throughout, including the smokebox: no visible



joints please! However, two cladding strips over the smokebox are just visible on photographs, one just in front of the saddle, the second midway between the saddle and rear of smokebox.

The original boiler was equipped with *Serve* tubes, a French speciality of the period, which, theoretically at least, increased the heating surface. They were fitted with internal ribs, so were of larger diameter than normal, hence fewer tubes were necessary, and because of more efficient heat extraction, the boiler barrel could be shorter. Thus spake the theory. In practice, besides being a great deal more expensive than plain tubes, the ribs created a splendid resting place for soot and cinders, and doubtless engendered a great deal of railroad Esperanto on shed, since cleaning them out, a job done manually in those days, was extremely difficult. They were generally soon jettisoned by those unfortunate enough to take delivery of locomotives so fitted - although *La France* kept hers until 1909, the two later French compounds imported by the GWR retained theirs for less than two years from new.

The Belpaire firebox was the largest of that type in use in Britain at the time, with a grate area of 29½sq. ft., compared to the 27sq. ft. of

the GWR *Stars* or the 26sq. ft. of the original Midland compounds described in a previous article. This large grate is a big advantage in a model, as with this engine you can't cheat by extending the firebox back into the cab: my drawing (fig 1, *M.E.* 4250, 24 June 2005), shows the backhead on the full size machine already clearly visible through the cut-outs in the cab side sheets. The large, well-lagged pipe straddling the boiler just in front of the dome and which apparently disappears into the front sand-box is in fact the main steam feed-pipe from the regulator (situated in the dome), to the HP cylinders. It is based on the design produced by another emigre British engineer, Thomas Russell Crampton, he of the low centre of gravity, large rear driving wheel locomotive, once so famous in France that the equivalent of our phrase "to take the train" was rendered as "prendre le Crampton". He began his railway career at Swindon - whence he is reputed to have departed abruptly after an argument about locomotive design with the redoubtable Daniel Gooch, so it is ironic that his influence should have returned home after 60 years.

This main steam pipe fitted to *La France* as built, was of generous diameter and very direct, but causes major problems in a miniature version fitted with a superheated boiler, normal in 'our' sizes. There are at least three possible solutions, apart from using a 'saturated' boiler: one is to install the Crampton pipe as on the engine in its original condition, but use it as a 'top feed' similar to the later GWR design. This at least retains the appearance of the engine as built and would be the one I would go for if possible, but it does raise the small matter of finding an alternative route for the main steam pipe from the superheater header to the HP cylinders! On checking the G/A diagram of the *Stars* as originally built with inside steam pipes, a similar layout does seem just about feasible, but of course the inside cylinders on those engines were set much further forward and were only 14¼in. diameter, compared to the 22in. on *La France* as built. The other two possibilities involve the elimination of the Crampton main steam pipe altogether and the substitution of 'elbow' outside steam pipes, as first appeared on the full size engine in 1913, when the original boiler was superheated and fitted with Swindon top feed. These elbows were retained when the engine's appearance was more radically transformed (in my opinion not for the better) by rebuilding with a Swindon No. 1 taper boiler three years later and were the precursors of the design used later on all the Collett 4 cylinder 4-6-0s and some of the Churchward *Stars*.

The initial alterations to *La France* in 1913 appear not to have been up to the normal Churchward standard, as a member of that gentleman's design team, Harold Holcroft, has recorded his horror when opening the smokebox door, at being "confronted with a veritable tangle of pipes" and described it as "a very crude job". Even more bluntly, a later authoritative writer and distinguished member of the staff of the Science Museum and NRM, John van Riemsdijk, accuses Churchward of having "ruined her (i.e. *La France*) by various ill judged alterations". His main criticism was the very small diameter and

contorted passages of the main steam pipe through the elbows to the HP cylinders, which had replaced the generously dimensioned and very direct Crampton pipe. Maybe it's no coincidence that the diameter of the LP cylinders was reduced by 1¼in. shortly after this first re-building.

Certainly, the Swindon elbows look very skinny compared to those fitted in later years to the Atlantics across the channel and the criticism is perhaps substantiated by the later career of the engines in this country, compared to some of their French cousins. Three of the Nord engines were rebuilt in the 1930s with large diameter piston valves, even larger steam passages and Lemaitre exhaust: on test, the remarkable figure of 1,600hp at the drawbar at 56mph was sustained on level track. Up to the World War Two, both original and modernised engines were regularly booked to work the fastest train on the line, the 350-ton *Blue Bird* Pullman, scheduled at 67.5mph, the same average speed as the GWR 250-ton *Bristolian*. Compare this with the fate of the GWR 'Swindonised' French Atlantics, all three of which had gone to the scrapheap by 1928, after spending their last 15 years or so at Oxford on secondary services - in fact ever since they had been rebuilt with superheaters and altered steam circuit.

Was *La France* ever equipped with piston valves for the HP cylinders, as the technical journals would have us believe? As many readers of this magazine will know, on most engines fitted with Walschaerts valve gear this question can be easily resolved, simply by checking the relative positions on the combination lever of the radius rod and valve spindle joints. For inside admission piston valves, the radius rod is connected to the top of the combination lever, with the valve spindle joint below it, while for outside admission slide valves, the positions are reversed. Unfortunately, most of the motion work on *La France* is masked by the slotted cover-plate, (see fig 1, *M.E.* 4250, 24 June 2005), so it is almost impossible to see the connections. The modernised French engines on the Nord, were certainly converted to inside admission piston valves for the HP cylinders, as is obvious from the large cylindrical valve chest covers to be seen in photographs taken in later years. As a matter of interest, an extra piece of linkage was fitted on these locomotives to reverse the motion of the valve spindle to avoid reversing the radius rod and valve spindle joints. I am 99% certain that *La France* never ran with piston valves, in spite of more than a century of statements to the contrary, as the valve chest covers appear unchanged throughout the engine's life and I don't think it would have been possible to fit piston valves without altering the external appearance fairly drastically.

To anyone wishing to build a model of this very elegant locomotive, the late Roy Amesbury's excellent series on building No. 103 *President*, a 5in. gauge version of one of the two larger French compounds imported by the GWR in 1905, would be a great help and references are given at the end of the article. His engine, which incidentally won IMLEC in 1982, is in rebuilt condition, i.e. equipped with a Swindon No. 1 taper boiler, but as one would expect from this fine model engineer, it is fitted with the correct balanced slide valves to the HP cylinders. I

Figure 4



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should warn you, however, about a few quirky little details peculiar to *La France*, which it would be only too easy to miss until you appear in public for the first time with your engine - and the armchair experts materialise instantly from nowhere! For a start, the sandboxes forward of the two pairs of coupled wheels are *not* the same size. On the engine as built, the front ones are slightly taller and appear to be longer from front to back than the rear boxes, although the extra length is a snare and delusion, merely masking the main steam pipe mentioned above. In the engine's rebuilt form, with the elbow pipes in place of the Crampton pipe, the front sandboxes are actually shorter, but still taller.

Next, the spacing of the handrail knobs along the side of the boiler is *not* evenly divided. The reason for this I have been unable to discover, as they don't appear to tie in with the sections of the boiler barrel. Anybody requiring details of the exact spacing is welcome to contact me via the editor. A third eccentricity, and one that would surely cause much anguish to any present day HSE man worth his salt, is that the footsteps on engine and tender do *not* line up with one another. No tender was provided with the SACM kit of parts that made up the French Atlantic, so the metrically dimensioned *La France* was paired with an imperially dimensioned standard GWR 4000 gallon tender, and nobody thought to modify the height of the footsteps on one of them. This looks really hazardous from photographs, but footplate crews in those days were used to a hard life and probably took it all in their stride (boom boom! - apologies to Basil Brush).

When first assembled, *La France* had her running number, 102, painted on the leading splashers, and the letters GWR on the trailing, while the SACM makers' plate (fig 3) was fixed to the cab side sheet above the nameplate. The latter was apparently cast by SACM, as the lettering and style of plate are identical to those carried by the Alsace Lorraine 4-6-0s described later. In spite of having allocated a Swindon works number to the locomotive, even the Jove-like Great Western Railway lacked the temerity to put it in writing by fixing a Swindon works plate to the engine. By the time she entered revenue-earning service, the engine carried a standard GWR numberplate (except of course for having only three figures!) on the cabside, with the SACM nameplate directly below, (fig 4), while the makers' plate had been moved to the trailing splashers. An attractive brass casting, 12in. diameter, of the company's armorial device enclosed in a garter (fig 5) was carded on the leading splashers, in similar fashion to the famous Dean singles, but without the crests either side. This was retained by the engine until withdrawn in October 1926.

La France livery

The most surprising visual feature of this locomotive though, was the general colour scheme, which looked a bit like a cheap copy of the LNWR: an overall black, but lacking the beautiful high gloss finish of Crewe, if contemporary photographs are anything to go by. Lining was in the form of a single broad creamy white line round the edges of the splashers, top and bottom panels of the cab, four boiler bands (but none on the firebox casing), the tender coping and three panels on the tender body. In all cases, the white line was edged either side with a thin red one and this thin red line also appeared solo on the footplating, round the edges of the framing of bogie and tender and edges of footsteps. In the middle tender panel was that intricate GWR monogram that gave me such a headache when I drew it for the first article in this series (*M.E.* 4190, 7 March 2003), you'll have to refer back to it if you want to check it out!

Just why the French Atlantic was decked out in this uninspired garb is a mystery, but one other engine, the first GWR 2-8-0, No. 97, carried a similar scheme, although without the white lines. It has been suggested that this was a possible future colour scheme for the company's locomotive stock, but I have not found evidence so far. If it was, I'm glad someone vetoed it, before it spread any further - I can remember the depressing sight of the unfortunate express passenger engines that suffered the British Railways lined black scheme after nationalisation, and how the external condition of engines so painted quickly deteriorated, as there was little incentive to clean them. All right, I know the North Western and a few others painted their engines black, as mentioned above, but I still think a green, red, blue or even yellow locomotive is more likely to receive TLC from the shed staff and footplate crews.

There is no doubt that *La France* was repainted in standard Great Western middle chrome green long before the engine was superheated in 1913, but confusion reigns over exactly when. It was probably in October 1905, but another record shows 1907, together with the additional information that initially "the tender retained three panels, with the GWR garter crest in the centre, but no lettering". This was "soon changed to a single panel", with the standard "Great (garter crest) Western". One alteration that does not seem to have been recorded was the removal of the reducing valve on the right-hand side of the smokebox, but there is photographic evidence that this took place before the engine was superheated. Was this another of the "ill-judged alterations" for which G. J. Churchward bore ultimate responsibility?

When first superheated, *La France* retained her SACM cast iron chimney, but when she was rebuilt in 1916 with a Standard No. 1 boiler, the pitch, although only $\frac{3}{4}$ in. higher than the original, would have put her height outside the loading gauge, so she received a copper cap chimney and short safety valve bonnet. Seven years later came the final humiliation when the ugly GWR plain cast iron chimney was fitted - but I have already expressed my opinion of that. The engine was withdrawn in October 1926, presumably because the completely non-standard cylinders had

Figure 5



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reached the re-boring limit, and I have a very sad photograph of her, in a very unkempt state and minus tender, waiting outside Swindon works probably for the last time. In her 22 years and eight months of revenue earning service, she ran 728,031 miles, not a bad figure for a completely non-standard express passenger locomotive.

An interesting alternative

If you prefer a six-coupled de Glehn compound, I recommend the locomotive shown in fig 6, which I would suggest is an extremely elegant machine and completely refutes the opinion commonly held in this country, that all continental locomotives are ill-proportioned and invariably festooned with gadgets and miles of ugly pipework. She was built by SACM at their works at Graffenstaden in 1903 (the same year as *La France*), for the Alsace-Lorraine Railway, which, like the firm itself, had been under German control for the previous 30 years as a result of the Franco-Prussian War. Incidentally, even though they won the war in 1871, the victorious Prussians actually paid the French owned loco-building firm in real cash as compensation - and I just wonder whether the same thing happened in reverse when SACM and the Alsace region were handed back to France after Germany came off second best in World War One? In spite of this somewhat unlikely financial transaction, the locomotives built by SACM remained very French and the majority were built for railways in France or for French-owned railways abroad.

Ehn was virtually a six-coupled version of the Nord Atlantic, (and therefore of *La France*), except that the driving wheels were smaller at 6ft. $\frac{13}{16}$ in. diameter, and the bore of the high pressure cylinders was smaller, although other cylinder dimensions remained the same. The boiler was identical to the Atlantics. The bogie wheels were slightly larger, at 950mm (3ft. $\frac{13}{32}$ in.) diameter, but the main difference lay in the adhesion weight, about $46\frac{3}{4}$ tons, compared to the $32\frac{1}{2}$ tons of the Atlantic. When first built, the 30 engines, all of which carried names, were considered as express passenger locomotives, but in later life were downgraded to mixed traffic duties. Two engines were written off in World War One, five were sold to Luxembourg and 23 were taken over by the French National Railway (SNCF) in 1937, becoming class 230C of the Eastern Region. They were neither rebuilt nor even superheated, and in the succinct words of a French account of their history: "their career was worthy, without being anything more"(!) They could not have been too bad, as apart from the two fatalities during the war, all put in more than 40 years service, the last one being withdrawn in 1953. I have chosen *Ehn* for my drawing, as this

is the only one of which I have a decent photograph, and more important for any prospective builder of a small version, the name couldn't be much shorter, with all the letters consisting of straight lines! I have few details of the colour scheme used by the Alsace Lorraine Railway, but I believe it was a pleasant olive green, lined in yellow.

These locomotives, with minor modifications, were built by SACM for most French railways and an almost identical version to fig 6, except for a shorter cab and an inside-framed bogie, was exported to Portugal. Even China acquired a few, fitted with cow-catchers! The basic design was also copied by builders in other countries, including the famous German firm of Borsig and as we have seen, G. J. Churchward incorporated several features into his standard designs, which in turn spread to other British railways. Perhaps the most outstanding development of the de Glehn/du Bousquet collaboration was the series of 4-6-0s built for the Nord from 1908, mentioned early on in this article. Their steam passages compared to La France were 25% larger for HP and 30% for LP, and in modernised form with superheater and Lemaitre exhaust, these machines were on a weight for weight basis little inferior to the magnificent results achieved by André Chapelon, as that great engineer has acknowledged. One of them is alive and well, living at Peterborough, and would make a wonderful project for an aspiring IMLEC winner, but is even less suitable for a first attempt than La France. I have some works drawings of these locomotives and anyone seriously interested is welcome to contact me via the editor, but in all honesty, I would not call them elegant.

Having mentioned André Chapelon, I wonder if the editor has room for what LBSC used to call a "Tail Lamp"? It is probably not generally known that M. Chapelon designed the 'works' for at least one 5in. gauge locomotive (fig 7) and I am proud to say that I had the honour of driving it on one occasion at a private ground level track just North of Paris. That occasion was of course extremely enjoyable, but was also somewhat intimidating, since having done my stint, I would

be handing over to either a top link driver from the Northern Region of the SNCF, whose regular duties included the *Golden Arrow*, or to his friend, another senior *mécanicien* from the South Eastern Region (ex-PLM). Obviously, letting the fire out or dropping the plug were even more to be avoided than usual! The situation was not helped by the fact that my own experience of driving any sort of locomotive was, shall we say, limited. I need not have worried: that engine was almost inaudible, even when starting away, just a very gentle hiss, hiss, and the regulator was incredibly sensitive - but the acceleration was amazing! It really was the easiest locomotive to drive that I have ever come across, and it was certainly no reflection on my driving skill that I duly handed over with a decent fire and three-quarters of a glass of water. Now, there is a prequel to this little anecdote (assuming the editor has not run out of space and/or patience), but before recounting it, please take another look at fig 7, and note the fine crop of runner beans in the top left-hand corner.

A year before my visit, no less a person than the great man himself, André Chapelon, then in his 80s, had come to carry out tests on this latest product of his genius. In the words of one of my French friends: "he turned up in the usual black homburg hat and his 1947 demob. suit", and as there were no sophisticated testing devices like dynamometer cars available, he soon had them weighing trolleys and concrete fence posts in preparation for the weight haulage trials. Having spent several hours hauling this lot round and round at various speeds and making copious notes, the trolleys and posts were removed and Monsieur Chapelon set off 'light engine', apart of course from himself on the driving trolley, for an all-out speed test. To quote my friend again: "it was immediately obvious to us what would finally happen, it was just a matter of when". Round and round he went, faster and faster, until sure enough, this man, probably the greatest steam engineer of all time, writer, historian, distinguished war veteran and acknowledged expert in other disciplines such as thermodynamics and fluid-dynamics, failed to make

allowance for centrifugal force. On the curve immediately before the runner beans, he and the engine parted company at high velocity - flying through the air with the greatest of ease, he felled the complete crop of beans at a single blow. The engine, possessing a lower centre of gravity and not wearing a homburg, carried on regardless.

I regret to inform you that both my friends did exactly what I would have done in similar circumstances: they dashed after the locomotive, leaving their distinguished octogenarian guest to extricate himself, fortunately unhurt, from the mangled wreckage of the runner beans and retrieve his homburg from the hedge.

References

1. SACM/Swindon Works drwg (number. indecipherable), NRM ref. IIGW16500: side elevation and plan of pipe and rods arrangement: does not show motion work.
 2. SACM/Swindon Works drwg No. ?23748, NRM ref. 1/GW/6684: full side elevation, but original drawing in very poor condition.
 3. SACM/Swindon Works drwg No. 23484, NRM ref. 1/GW/6502: side elevation and plan of frames, stretchers, equalising beams etc.
 4. SACM/Swindon Works drwg No. 23737, NRM ref. 1/GW/6681: three cross sections of Nord Atlantic, including section through HP and LP cylinders.
 5. SACM/Swindon Works drwg No. ?23666, NRM ref. 1/GW/6499: cab layout of *La France*, including outline of cab roof.
 6. *Locomotives of the GWR Part 8*: various authors, pub. RCTS 1953: useful dimension details and photos, poorly reproduced by current standards.
 7. *A Pictorial Record of Great Western Locomotives Vol. 2*: J. H. Russell, pub. OPC 1975: excellent photographs and outline side elevation.
 8. *G. J. Churchward: a Locomotive Biography*: H. C. B. Rogers, pub. Allen & Unwin 1975: photos of *La France* (a) as first assembled, unpainted, (b) in original black livery. Also excellent text with reference to Crampton, de Glehn, du Bousquet etc.
 9. *Compound Locomotives*: J. T. van Riemsdijk, pub. Atlantic 1994: a superb book, beautifully presented. Contains excellent photographs and sectional elevation of first Nord Atlantic.
 10. *Fiches Documentaires series 25*: pub. Loco-Revue, 1970: Side and front elevation of superheated Nord Atlantic and main dimensions.
 11. *Model Engineer* 3673 - 3735 (15 Jan 1982 - 17 Aug 1984): excellent 29 part constructional serial by Roy Amesbury on 5in. gauge version of GWR No. 103 *President*, but as rebuilt with Swindon boiler. Other useful information from *M.E.* is identified in the main text.
- For anyone interested in the Alsace Lorraine 4-6-0, reference 9 above contains a small photograph, and the SNCF archives kindly sent me a couple of photocopies of contemporary small side elevations, which I am happy to lend. Website <http://elsassbahn.free.fr/P7.htm> contains photographs, side and front elevations and sections, together with dimensional details and brief history - but text is French and German only.





PLAIN MAN'S GUIDE TO ORNAMENTAL TURNING

John Edwards

Following interest expressed by the many visitors to the stand of the Society of Ornamental Turners at the Sandown Park Model Engineer Exhibition it was thought that readers would be interested in knowing something of the equipment used in ornamental turning and how it works.

Complex lathes were first developed in about the 15th century when the nobility of Europe commissioned and collected the beautiful wood and ivory turnings made on them. During the 17th and 18th centuries kings and princes employed the best turners and engineers to produce ever more complex machines and fantastic artefacts. Many of the nobility took up ornamental turning as a hobby.

Following the French Revolution the centre of interest in this hobby transferred from France to England where it spread widely, not only among the aristocracy but later to the wealthy middle classes. This change was largely influenced by

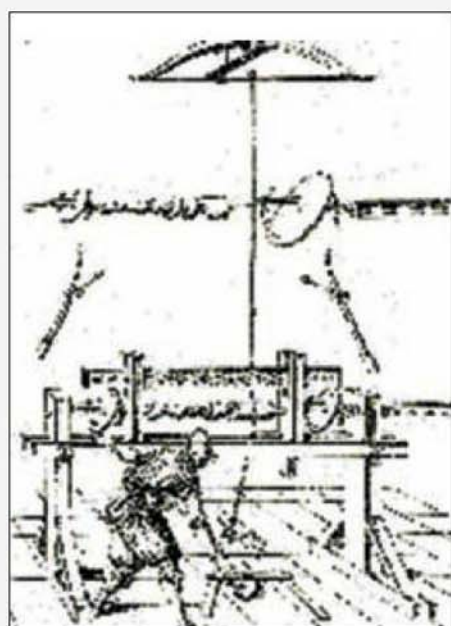
John Jacob Holtzapffel, an engineer of Alsatian descent who moved from Strasburg to London in 1792 and set up a lathe-making business that was to flourish until the First World War. With the advent of the motor car the hobby of ornamental turning was largely abandoned until 1948 when the Society of Ornamental Turners was formed.

An ornamental turning lathe can be described as a combination of a light engineering lathe with a milling or engraving machine plus additional complexities to position the work and/or the cutting tool to move on a path other than circular.

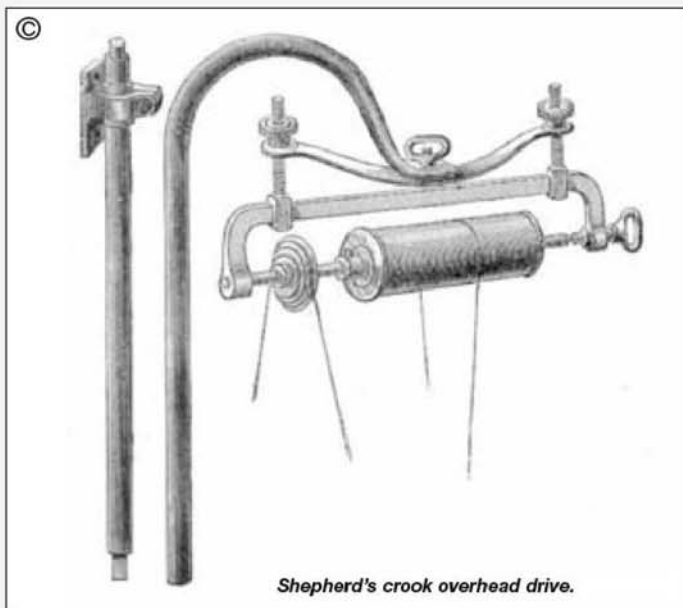
The traversing mandrel or screw mandrel (or lathe spindle) traverses (or slides) so that the work may be advanced towards the cutter under the control of a swash-plate for obliquely-inclined cutting, by a rosette for cutting wavy lines on cylinders or by a screw-thread guide for cutting short screw threads.

The overhead drive is a system of bands and pulleys to drive a cutting frame (holder of a flying cutter) which cuts shapes or patterns into the work according to the profile of the cutter and its path of movement.

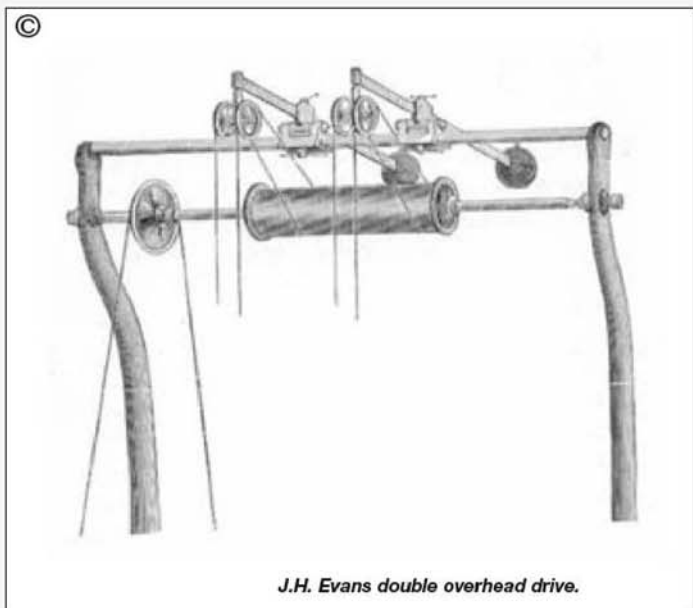
Early complex lathes had an overhead flywheel to drive the ornamental cutters but this was not popular in England where Holtzapffel introduced the 'Shepherd's Crook' type whereby



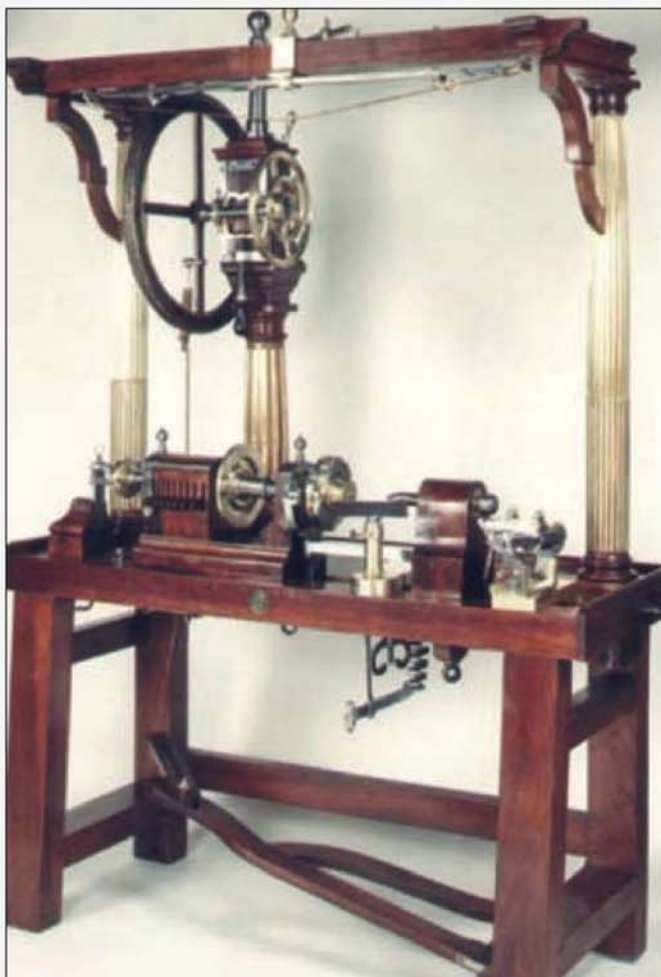
Bessons oval and swash turning lathe of 1578, an early forerunner of the ornamental turning lathes in use today.



Shepherd's crook overhead drive.



J.H. Evans double overhead drive.



Fine lathe by Bergeron, Paris, c1800

a band from the under-bed flywheel drives a drum from which a second band drives the ornamental cutting frame. J. H. Evans later introduced a double standard overhead having cranes with weights and jockey pulleys to give adequate tension to the drive band at all times. Several other methods were developed, one of the best of these is the single crane type often used by modern turners with an electric motor doubling as a counterbalance weight.

Illustrations show early lathe arrangements, and a typical high-class late model ornamental turning lathe by Holtzapffel with double mahogany frame, treadle, flywheel, shepherd's

crook overhead, screw-mandrel headstock, screw-barrel tailstock, ornamental slide-rest and mahogany backboard chest of tools.

Cutters and drills were supplied in mahogany chests. There are several sizes of cutters: long ones for use as fixed tools, called slide-rest cutters, short ones for use in the revolving cutting frames, small section ones for the eccentric cutting frame and usually two sizes of drills; the drills have tapered shanks made individually to fit each hand-made drilling spindle. Two drilling spindles are shown at the right-hand side of the chest, together with a pad handle for using slide-rest cutters as hand-tools. In front of the chest is a lever for ejecting drills and tweezers for extracting cutters.

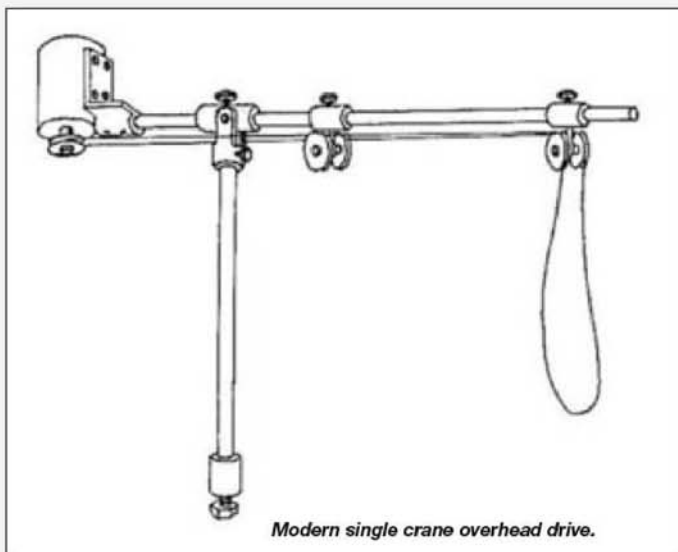
The drilling spindle is used to drills single holes, patterns of holes or, like a router, to cut flutes. Some drills have fancy profiles for cutting mouldings. Many modern turners use a small Jacobs chuck and straight shank drills.

The ornamentation on the Victorian style posyholder shown on the opposite page was done with the drilling spindle; the techniques used include: cutting pearls or beads, cutting flutes and drilling rings and holes.

● to be continued.



Mahogany chest of drills and cutting tools and two drilling spindles.



Modern single crane overhead drive.



High quality Holtzapffel lathe with mahogany frame and chest of tools.



Tufnol tumbler reverse gears in use on a Myford Super 7 lathe.

Peter Spenlove-Spenlove passes on his knowledge of this useful material and explains how to get the best from it.

If the newcomer to model engineering were to visit a typical home workshop of the 1930s he would find a very different environment to that which is common today. Many of the materials to be found in the stock rack of amateurs at that time would have come from scrap yards and from the scrap bins of local factories. Kennions, Bonds o' Euston Road and others stockists listed popular materials but models were smaller in those days and so bar sizes were smaller too.

The only machine tool would likely to be a simple lathe of relatively light construction and, more often than not, treadle driven.

Steel, brass, gunmetal as well as phosphor bronze and German silver were stocked in various sections. Aluminium alloys were starting to appear but the grade was rarely stated. One

could also buy cast iron stick and silver steel in round or square sections in 13in. lengths.

Non-metallic materials were quite different. Hardwoods such as lignum vitae, boxwood and rosewood were available and bone, ivory, Casein and Erinoid were their plastics. Bakelite and Ebonite rods were used in electrical devices. The vast range polymeric materials in sheet or bar form available today did not exist. However, two materials were available then and still are – these are Paxolin and Tufnol.

Paxolin consists of paper layers built up to form a sheet or tube and impregnated with phenol formaldehyde resin under pressure and heat. It has a glossy, brown appearance. As it is an insulator, this material was much used for electrical work.

Tufnol (also a trade name) looks similar to Paxolin but the laminations are woven cloth. Again thermosetting resins are used to bind the laminations together. By varying the type of weave and the fibres used a wide range of mechanical properties can be achieved and the material can be built up in a wide variety of different forms and sections. Most grades of Tufnol have, as well as a reference number, an animal name that is easy to remember. Carp brand is a popular choice and has a fine cotton weave and a mid-brown colour. Whale and Crow brands are also popular for general workshop use.

Because Tufnol is laminated it is important to consider the form of the material to use for different applications. For example, gears should be machined from thick sheet. Rod would be unsuitable, as the laminations would run the wrong way. Conversely, rod would be fine for a bush.

Tufnol machines readily but treat it with respect. The laminations can grab standard twist drills so 'break' the leading edge of the drill as you would for brass. 'Peck' drill deep holes to clear the dust. The material can be tapped and I find it best to use an industrial tap with a hard coating like titanium nitride. When turning, use a tool with a top rake of 20deg., side clearance of 5 to 10 deg. and a front clearance of 15 to 30 degrees. In the overhead

view the tip radius should be approximately 1/16 inch. For bonding Tufnol components together use a two-part epoxy adhesive such as Araldite but avoid exposing the joint to temperatures above 60deg. Celsius.

I should mention that there are other manufacturers of this material but, like the word 'Hoover' tends to refer to any vacuum cleaner, so engineers know that Tufnol refers to resin bonded laminates irrespective of the actual maker. Tufnol operate from two address in the UK:

Birmingham: PO Box 376
Perry Bar
Tel: 0121-356-9351

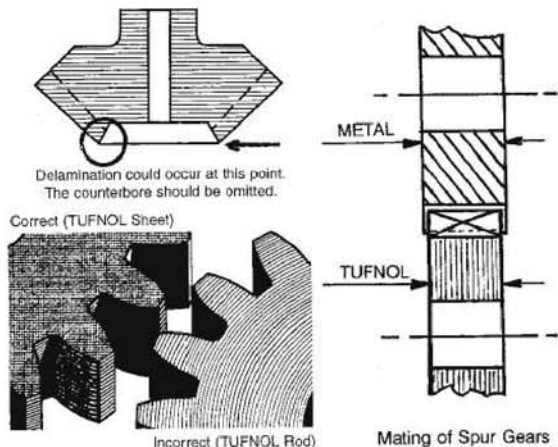
East Kilbride: 3 James Watt Place
East Kilbride
Glasgow
Tel: 013-552-33876

They also have a useful website at www.tufnol.co.uk

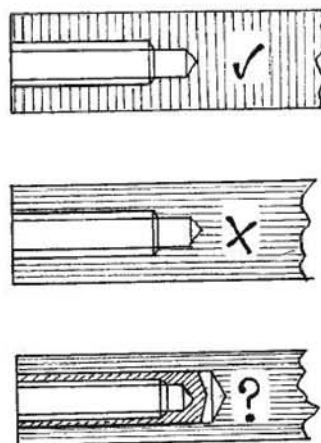
When machining these materials they create dust as they are machined dry. This dust can irritate the lungs, the skin and eyes so avoid unnecessary contact. Some old stock material may contain asbestos so treat with circumspection and reject if unsure.

When milling these materials it pays to use keen cutters and add an extra blank or some other form of backing to prevent fraying and local delamination when the cutter breaks through at the end of its cut. This is particularly important when milling gears, notches and slots. Bevel gears should usually be made without the counter bore favoured on steel gears. Where appropriate, try to devise a milling path that avoids putting the edge of the material under stress.

Tufnol can, in general, tolerate oils, mild acids and alkaline fluids and mild solvents. Some types are mildly hygroscopic, which may cause small dimensional changes. However, these are relatively small and unlikely to be of importance in our model work. Carp, Crow and Whale brands can tolerate temperatures up to approximately 120deg. Celsius. Special grades can be obtained that can tolerate temperatures up to 250deg. Celsius.



When making gears Tufnol should be selected that has the optimum laminated structure and is slightly narrower than the mating steel gear.



Items for drilling and tapping should also be designed with care to ensure the laminations are orientated the optimum way. In default a suitable bush may be glued into position with epoxy resin but this is suitable for light duty only.

Neville Evans

discusses oil pumps and some of the issues related to fitting them and getting them to work reliably.

● *Part XX continued from page 748*
(M.E. 4250, 24 June 2005)

A few days ago (time of writing), I decided to give the 1400 chassis a trip on the rolling road, to generally loosen it up and to test everything before fitting the boiler. I had fitted an oil pump that I must have had by me for at least 15 or so years. I bought it as a spare, put it in a little plastic box and simply forgot it. The ex-Winson kit that I am assembling at the present seemed to be an ideal place for it. It fitted neatly behind the front buffer plate and I arranged a drive from the left-hand eccentric rod as I described in a recent issue. The replacement was required because the equipment supplied with the kit consisted of an unusual pump mounted under the cab floor and driven at high speed from the trailing axle. The fact that the pump was driven at about 20 times optimum speed by the small trailing wheel was somewhat mitigated by the fact that the pump itself only delivered one twentieth of its theoretical capacity.

The chassis ran quite well on my little compressor, thanks to some hard work on the part of John Forrest, who had originally assembled it. Any shortcomings in performance were due to the eccentrics having been wrongly machined. They were supplied, nicely made, but with only half the necessary travel. This mistake was impossible to correct as the eccentrics and the driving axle were machined in one piece.

I have since acquired a second 1400, this time a black one, and when I get around to stripping it for painting and examination I shall measure the whole valve gear up, and recalculate the dimensions of the slide valve, alterations will then be confined to the slide valve faces and all should be, if not well, at least a lot better.

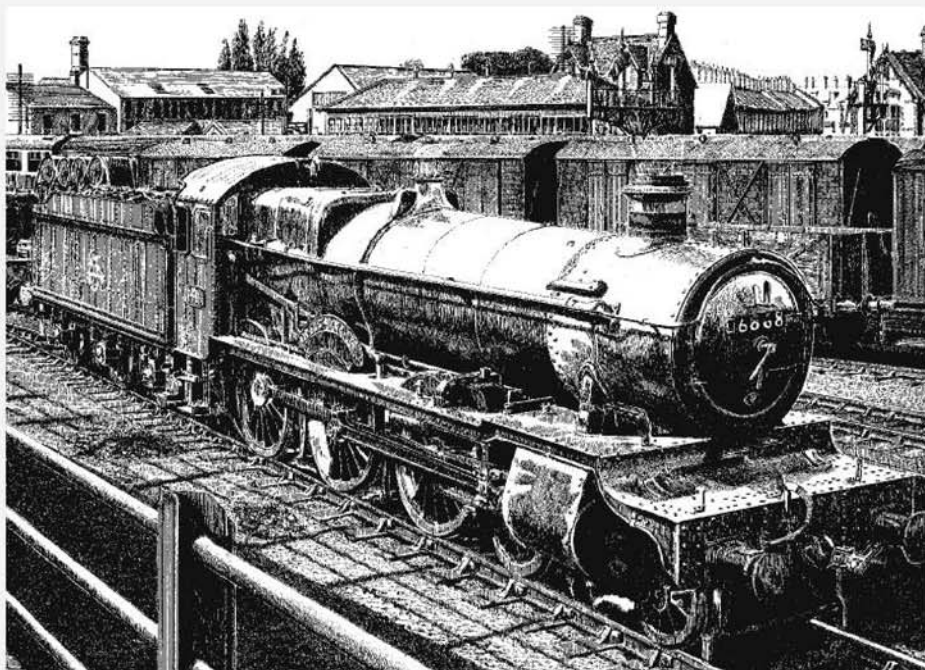
No feed

To business. The dismaying part of the operation was that there was a huge blow back through the pump at top and bottom centres. These oscillating instruments are designed to have a small overlap on the ports to facilitate the clearing of trapped air in the cylinder, the snag with this arrangement is of course that if the clack valve is leaking then at the top and bottom of the stroke the delivery line is blown clear of oil.

Result misery. No feed. On dismantling the offending object I noticed that the clack valve was a simple ball and spring, the sealing gland had never been packed and the port faces looked like miniature ploughed fields. This last defect was cured first.

Lapping

The steam tightness of a flat valve depends upon the care with which the two faces have been lapped together. It is essential to lap the faces of the ports against a lightly blued surface plate. If you do not possess a surface plate, the alternative



PENRHOS GRANGE

is a piece of plate glass. Round off the edges of the glass plate with some emery cloth first, to avoid cuts and such. Do not whatever you do try to lap the two pieces against one another.

Making a lap

A suitable lap can be made from a piece of aluminium alloy. Mine is about 4 x 4 x 2in., which I faced across in the lathe. An important feature is that a series of concentric grooves 0.015in. or so deep and the same width, were turned in the face of the lapping plate, at 1/4in. intervals, so as to hold a greater quantity of lapping paste. The face was re-turned smooth with a very light cut, and charged by rubbing paste into it with a piece of newspaper. I know that lathes are not supposed to face off perfectly accurately. All I can say is that it works for me.

Over the years I've retouched the lap lightly, on a smooth finisher belt, and tested it against my posh, as opposed to my rough, surface plate, with satisfactory results. An important point is to get some proper lapping paste. This commodity is available at any engineer's

merchants. If you haven't got one near you (check in *Yellow Pages*), then your friendly neighbourhood hardware store will be pleased to obtain it for you. Buy a tin and share it with your friends. Practise a bit of lapping by trying the effect of smooth up and down strokes followed by a figure of eight movement.

Beware of perfection first time

When you are reasonably happy with your efforts, try the piece on your surface plate. Spread a thin film of engineers blue on the plate, and rub the job up and down on it. If you get a perfect blue covering first time, it means that you've used too much of the blue, so clean it off with a touch of white spirit and start again.

If you can't get engineers blue, then a blue or black marker pen will probably do just as well. Lap until a continuous light blue film appears on the piece. Clean off with white spirit. The test of any lapped surface is that you should be able to wring the surfaces together, without oil, and they should then stick together, held by vacuum pressure alone. Provided they aren't too heavy.

A non-leak clack

The lapping having been disposed of the next job was to modify the clack valve to bring it into the 21st century. Deryck and I have been using O-ringed shuttle valves for donkey's years and have always found them to give total satisfaction.

I enclose a small sketch and a photo of this particular little shuttle, which can be made in a few minutes. The three flats are simply put on with a file while the piece is still in the 3-jaw chuck. The size can obviously be changed to suit different circumstances.

The miniature shuttle is designed to fit into the space once occupied by the now redundant ball. If you think it is small, you should see Deryck's '0' gauge valves. By the way, a prolific source of tiny, high quality springs, O-rings, and small valves is the ubiquitous throw away lighter. ►



The clack valve shuttle fitted with its O-ring. Note the flats on the minor diameter.



A scraped surface plate is valuable in precision engineering. A piece of plate glass is a good substitute for the amateur.

Break an empty one open and you'll be amazed at what you find inside.

It must be emphasised that in a pump of this nature, which unlike the Ewins type has no internal seal, the integrity of the ram gland is of the utmost importance, as any leakage at this point will lead to failure of delivery. The gland was therefore carefully packed and the chassis rerun with a working lubricator pump. Result happens.

Jim Ewins type lubricating pump

I have been using the Jim Ewins pump for many years and can thoroughly recommend it, since I used two in line astern on my 'Princess Elizabeth'. They work with perfect reliability and don't splash too much oil around. What more can one ask, except that they are easily made, with accuracy, on the lathe. Points to note are.

1: The pump will deliver as much, or as little as you desire, simply by adjusting the length of the bottom spacer, which (obviously) governs the distance apart of the two O-rings. The bottom O-ring controls the seating of the ball valve and you feed the amount of oil trapped between the rings.

2: The unit is self-purging of air, as on the down stroke a small amount of oil leaks back, past the top spacer and takes any trapped air with it. In other words the cylinder is not sealed until the plunger reaches the top O-ring on the feed stroke.

3: The ram should nearly or just touch the ball valve at the bottom of its stroke. This also means that as there is no clearance volume, there is no

need for a separate clack valve in the delivery line. Jim Ewins used to claim that a feed rate of about 1/6th of that of an LBSC oscillator was obtained, but I suppose that a rate of far less than that could be achieved.

4: The spacers should be a push fit (not a press fit or you won't be able to get them out again) in the body and have about a 0.01in. clearance on the ram, which should be highly polished and possess a chamfered end.

5: There is no need to make the ram a tight sliding fit in the pump body, because the sealing is done by the top O-ring. For the same reason, there is no need for a gland at the top of the body. These two features alone ensure that the pump is easier to make than an oscillator or a fixed ram uniflow pump.

Problems with mechanical lubricators

The problems that are found with mechanical lubricators do not usually, in my experience, lie in the instrument itself. Rather they are caused by leaking clack valves and unequal feeds to the cylinders.

These faults can be mitigated, if not cured, by strict attention to the pipe work and that ratchet drive, of which there seem to be two types, those that have just missed a tooth, and those that are just about to miss a tooth.

In the past I have used the needle roller clutch, with complete satisfaction, the secret of success being the fit of the bearing on the shaft. Most needle rollers are contained in a pressed steel

tube with closed up ends, for want of a better description, and are supposed to be squeezed into a housing that compresses them about a 0.001in. or so. This squeezing action actually is allowed for at the design stage and is necessary to give the correct running clearance on the shaft. The problem with small needle rollers generally and roller clutches in particular, is that it may not be possible to mount them with accurately.

What I do is to take a piece or two of 1/8in. dia. silver steel bar along to the needle roller shop and to actually try the clutch on to see if it works. If it does, then use it with the minimum of interference fit. I've just tried a loose one on a piece of shaft that is exactly 0.125in., and it works perfectly.

If it doesn't you'll either have to select one that does, to squeeze it up a little more by using a tighter fit, or turn a bit of thicker bar down to 0.126 inch. Harden the shaft right through, don't temper, and don't polish too hard or you'll make it too small.

Two clutches

This sort of drive was pioneered by Dave Piddington, late of A. J. Reeves & Co. (Birmingham) Ltd. In Dave's original application, he used two clutches to give a positive drive, perhaps because the more usual ratchets use two pawls, one for drive and one for a stopper, so to speak. At the instigation of Deryck Goodall however, I started to use one only and relied on the tightness of the gland to stop the pump running back with the arm.

Once again, all I can say is that it works very well for me. To stop the driving arm working its way off the spindle, I have incorporated a circlip as detailed. This is a personal foible, please feel free to use a nut and washer or some-such if you prefer.

Twin pumps to feed each cylinder

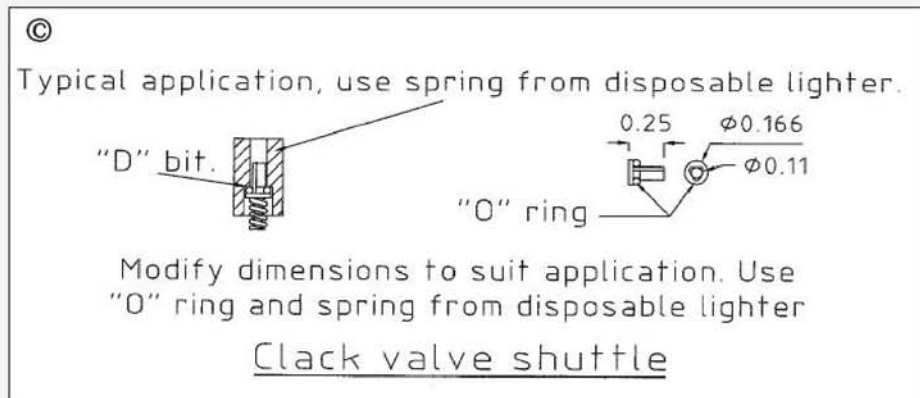
I have in the past preferred, where possible, to use a twin ram pump and to feed each cylinder separately, thus obviating the necessity for a bifurcated pipe which will probably feed far more oil to one cylinder, than to the other. On *Big Lizzie* as I mentioned, I used two pumps and one longish shaft in a large tank that I hacked out of a piece of brass.

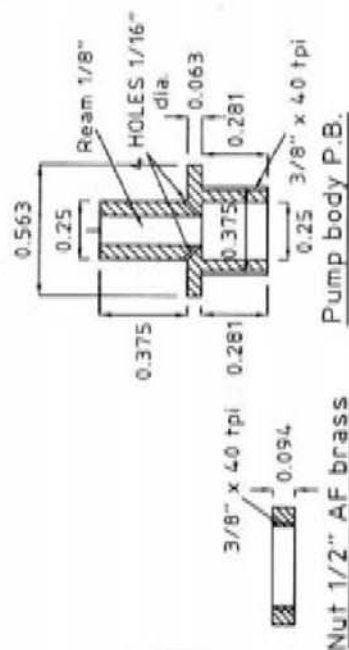
Over the last few weeks however I have been rethinking the whole oil pump situation with a view to simplification and to the cutting down on the excess oil that we seem to apply to ourselves.

I was chatting to my friend Ivor (the engine) a short while ago. He pointed out that the GWR had found the same problem when perfecting their sight feed system and had solved it by using a large diameter feed pipe, which ended in a jet. Quite obvious really (when somebody else shows you how to do it).

The finalised drawings will therefore show a double feed in 1/8in. copper tubing from one small capacity oil pump, which culminate in a No. 60 hole acting as a restrictor and evening out the flow. I am at the moment unable to detail the oil tank and oil line as Peter Thomas has not quite got round to that piece of the prototype. Watch this space.

●To be continued.





THE TALE OF A SHED

Stephen Wallin

describes how to acquire a custom-built workshop at a reasonable cost

You all know the scene, a warm, cosy, inviting old workshop, run by an enthusiastic handyman and model engineer, complete with that indefinable air of welcome, a hot steaming cup of tea, or perhaps even something a little stronger. The shelves are lined with rows of reference books and, of course, stacks of bound copies of *Model Engineer*. In one corner there is always the old comfy chair to relax in, after long sessions at the humming machinery, with maybe the sound of music from a radio in the background, or evenings where the fragrant smell of pine wood chips fills the air, as the latest woodcraft project nears its completion. A place of one's own, away from the cares of the world.

But then, with a jolt, reality comes back, as a neighbour of mine has taken the plunge and decided to start a new workshop from scratch. Rather than the cosy vision, my friend was faced with the cold empty carcass of a shed, with the prospect of fitting it all out. One of the problems that soon came up, was one that I was able to help out with, that of the design of safe and reliable electricity supply to the workshop.

I am not going to give a blow by blow account of the wiring, if you are not qualified you should get in an expert qualified electrician. However, lots of model engineers have dealt with electricity at work, and may be qualified enough safely to tackle the wiring.

The basics of the shed's construction were soon out of the way, fortunately it is in a well sheltered position, only just outside the kitchen, up against an old brick wall and standing on an existing brick paved yard. The 10 x 14ft. shed was all home produced, with pine frames, covered with outdoor quality plywood, and a felt covered roof over more sheet ply. It stands on beams cut from railway sleepers, with damp proof coursing laid over the beams, which bear on a frame below the main ply floor.

Because of the intended machinery's weight, the floor was then covered with a layer of sheet and off cuts of 13mm MDF, and then topped with ply sheeting and fitted with a tight texture finish carpet tile. This makes it very easy to relocate the carpet to fit around benches and machinery as more is added in future.

The recesses between the frames of the walls were filled in with sheet foam insulation, which was foil covered in our case. After filling, the lot was dry lined with ply or thin MDF off cuts. The roof was treated the same, any gaps were covered with adhesive paper strip designed for dry lining. Then a lot of extra cross beams were added, stretching between the sides of the shed to provide for overhead storage of wood and long metal stock. The interior was lined with extra wood battens on the wall, to provide extra strength, to areas where cabinets, or benches, were planned.

The inside was painted with a very tough primer, an undercoat, and then several coats of flexible smooth ceiling paint. After it was fully

dry, this was followed with a couple of coats of satin oil based paint, which is easy to clean and very wear resistant. The exterior was covered with tongue and groove pine, produced from recycled pallet wood, with the aid of a router.

For security, the door and its frame are heavily built, with rim bolts, and extra steel bars across the frames, locked on with padlocks. The windows were scrapped domestic frames, refitted with new glass. They are covered with shutters, made from framed tongue and groove, hinged from the top, that are held open by struts. When shut, all access to the hinge screws is covered. There is an alarm system as well, with contacts on all access points, plus interior motion detectors. This is all powered by Ni-Cads in case of power failure or deliberate shut off of the mains.

In all, making the shed this way, took us only 2-3 days and the cost was low, as the materials, which ranged from new to salvaged sheets of ply from works sites, came in at under £250.

Fortunately the shed, being fairly close to the wall of the house, helped with the proposed supply of power. The feed system chosen was from the main household distribution block via a new MCB and a dedicated RCD for the shed supply. It was designed like this to prevent failures in the shed line being able to bring down the house feeds, such as freezers etc. In this particular case the main requirements in the shed were: a feed for light machinery, power points for powered hand tools, the lighting, and a separate feed for light electrical heating.

Checking the machinery

The proposed new lathe and mill were checked and both demanded a mains connection of approximate 1100 watts, well within the capacity of normal domestic ring mains supply. The whole shed was treated as a new spur from the house distribution and the cable from the distribution box and consumer unit was wired through the house to an exit hole in the wall. A fully isolating switch was fitted inside the house at this point.

The gap between the house and the shed was only about 5ft., so a wall mounted conduit system, designed for outdoor use was chosen which is fully sealed against water. A top quality steel armoured cable was chosen for the run, despite it being contained in the plastic conduit, it being far better to be safe, than sorry.

It was fitted through the brick house wall, then on, via the conduit which was firmly screwed with fasteners to a batten added to the wall between the house and shed. The entry to the shed is through a seal, with added protection from the elements provided by a wooden box over the entry point. The cable was led down the interior via further sealed plastic conduit to a power distribution panel, fitted onto the wall along side the shed door. This panel was fitted to battens on the wall to keep the board away from the wall surface to prevent damp getting at it and to allow the conduit to run behind it.

It was decided to fit five basic power outlets, one on each wall of the shed, plus an extra for the lathe. A further switched power feed was dedicated to supply power for an 800 watt fan heater unit.

A single feed was led upwards to one end of the apex of the roof, for the lighting feed. It splits off to feed each side of the shed over the benches as well. Again this is in sealed plastic conduit, right up to the central fluorescent lighting fittings. The on/off switch is in a junction box, at hand height, on the conduit system. The parts for the conduit are easily available electrical wholesalers.

All the fittings and power points were mounted on wooden plates fitted to battens, secured to the wall or roof structure, to ensure absolutely no contact with metal foil in the cavity insulated walls or any possibility of contact with damp wood.

The wall outlets were fitted 6in. higher than the proposed bench height. As the expected loads were low, further distribution of power is by extension cables, with 4 way blocks. The ones we chose were fitted with built in RCD protection, and had a power on light fitted, they were fitted with screw holes for further attachment to the wall should this be needed. With this type of system the heavier units should only be plugged into the wall outlet direct, not on the extension leads, which are reserved for the light power hand tools, which were all well under 1000 watts.

Extra lighting

For extra lighting, my friend purchased a couple of bench anglepoise lamps, which are plugged in to the extensions or wall sockets as needed. For his new lathe, I have fitted out a low voltage Iodine Quartz lamp, converted from a small desktop lamp unit. The power in these lamps, is usually fed via the telescopic legs to the head, but as there might be a risk of swarf shorting the legs out, this is cured by by-passing the legs with a length of suitable cable. The voltage in these units is transformer isolated from the mains, and it is quite safe to rewire the low voltage supply from the transformer to the bulb. Again, if in doubt, consult an expert, or buy a dedicated lamp for the lathe.

Modern lathes, drills, and mills all come with approved no-volt switches and nothing must be done to the equipment to bypass any of this. Under current UK regulations it should be fitted with plugs by the supplier already.

A handy accessory to have in the workshop is a test plug which indicates, by lights, whether the live and neutral lines are correctly connected and if the earth is present. If plug in RCD units are used these usually have this feature built in.

The shed workshop is now in use, and has stood up well to the rigours of the first winter. The extra insulation on the walls was worthwhile, and the only addition to the system was a second-hand greenhouse heater of the tubular low wattage type that can be left on to keep frost at bay. The shed is now so well sealed that it might need the addition of a small extractor fan for the heat of the summer!

Anyway, as the shed matures, a small single cylinder steam engine and marine boiler has been completed, and the call of a 3¹/₂in. locomotive has been heard, with an ever growing collection of accessories and tooling, presided over by a greatly pleased and newly inspired, budding model engineer.



Stan Nipper and Martin Wallis commence the description of the three distinct types of boiler that can be used with this wagon, starting with the vertical type.

● *Part XI continued from page 632*
(M.E. 4248, 27 May 2005)

Three distinct types of boiler were fitted by Savages to their wagons, which gives the model engineer plenty of latitude to follow their own preferences.

Horizontal, or locomotive boilers were used on what were broadly called their 'contractors wagons', the balance of which were exported. The locomotive boilers were comfortably the heaviest but were more forgiving to inexperienced drivers. The water tube boiler was sold in by far the largest number; they were light in weight and steamed very well. Only one wagon with a vertical boiler seems to have been made and an illustration of it is reproduced in photo 109. Photograph 109 plus a single works drawing of the boiler are all that have been turned up in several fairly extensive searches of surviving Savage archives. I appreciate this picture has been included in these pages before but I have no other.

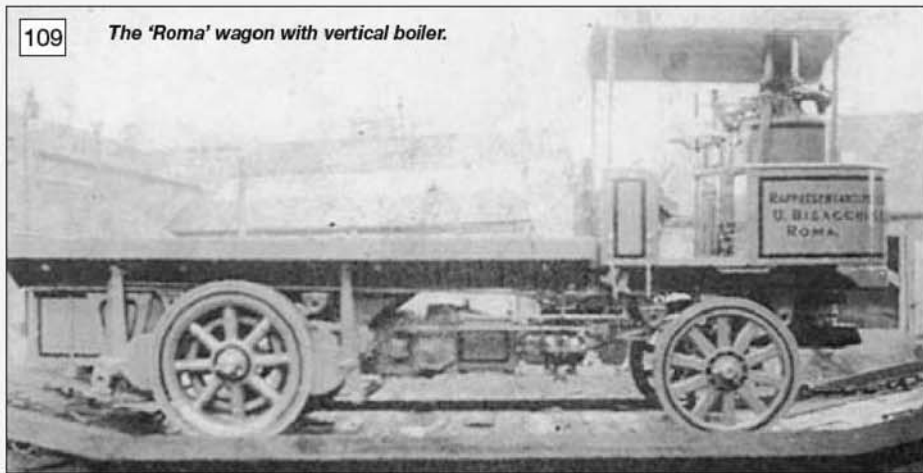
The Savage vertical boiler drawing I have is copied from an original dated January 1908. The boiler has 63ft.² of heating surface and a grate area of 3.6 square feet. The top portion of the firebox was pressed square and 64 cross tubes were fitted each 1 1/2in. dia. (16 were threaded as stay tubes). A ring of fastenings and stout angle rings about a third of the way up the boiler barrel and a further pair of rings at the top allowed the boiler shell to be split for major overhauls and water tube replacement.

The working pressure was no less than 210 pounds per square inch. The drawing in fig 53 is from a surviving Savage publication and corresponds closely to the works drawing I have.

Most popular

While the vertical boiler was the least popular for the prototype it has proved quite the reverse with model engineers, so we shall start with that one. The main advantage of a vertical boiler is that they are among the most straightforward to build; the main disadvantage is that they need a much closer eye kept on the water level. The

109 The 'Roma' wagon with vertical boiler.



SAVAGE'S UNIVERSAL CARRIER

reason has been explained in these pages before but it is probably worth repeating again. A quick glance at fig 54 - which compares a standard locomotive boiler and its vertical relation - shows that a much greater quantity of water may be evaporated in a locomotive boiler for any given fall in water level. In consequence the water level in a vertical boiler will fall much more rapidly and a short spell with the injector/feed pump will be needed more frequently to fill it back up again. In contrast a locomotive boiler will 'look after itself' for longer periods.

The Savage design of vertical boiler has horizontal water tubes, in a similar way to the well-known Sentinel Wagon. The virtue is that the whole length of the water tubes is below water level and, being full of water throughout, should not overheat. Vertical fire tubes, as drawn in fig 54, inevitably have a portion above the water level and, naturally, will suffer accordingly.

The diameter of our vertical boiler in 1:4 scale is 8 inches. A higher pressure than is usual has been adopted so the steam is hot enough to avoid premature condensation in the compound cylinders, which if it occurs will be detrimental to performance.

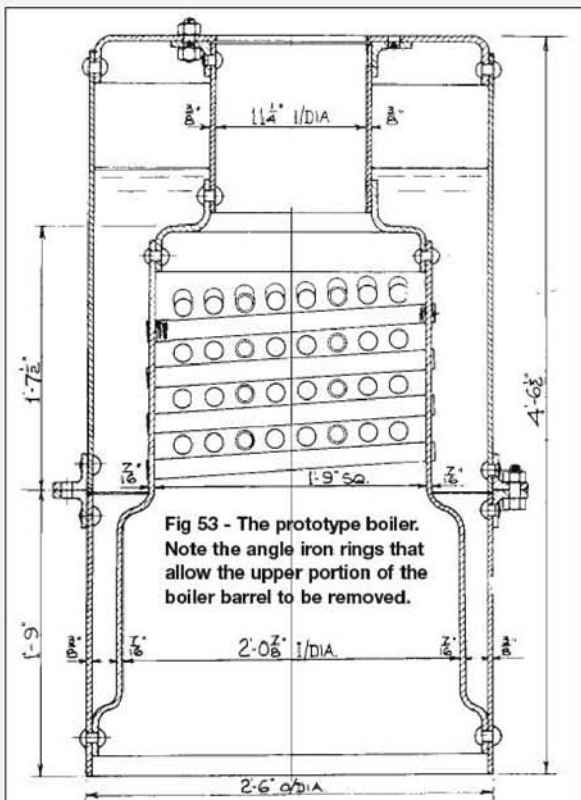


Fig 53 - The prototype boiler. Note the angle iron rings that allow the upper portion of the boiler barrel to be removed.

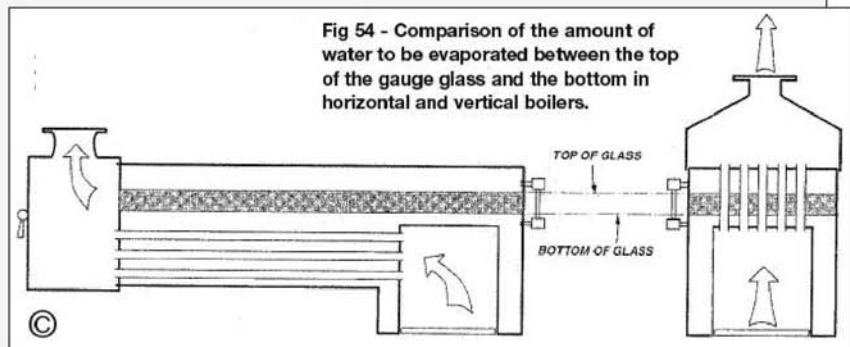
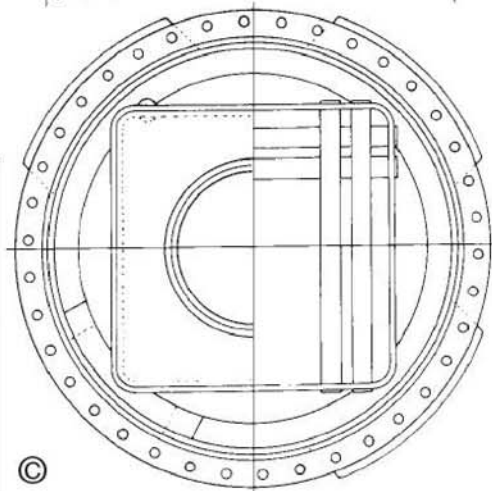


Fig 54 - Comparison of the amount of water to be evaporated between the top of the gauge glass and the bottom in horizontal and vertical boilers.







Barrel and firebox assemblies for the Universal Carrier (photo: Bell Boilers).



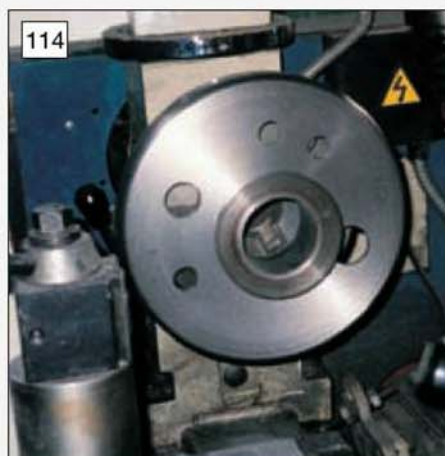
Nest of water tubes viewed from below (photo: John Thompson).



Boiler top plate. Note the inspection hole (photo: John Thompson)



The boiler offered up to the chassis (photo: John Thompson).



Cast cap being machined on the lathe (photo: John Thompson).

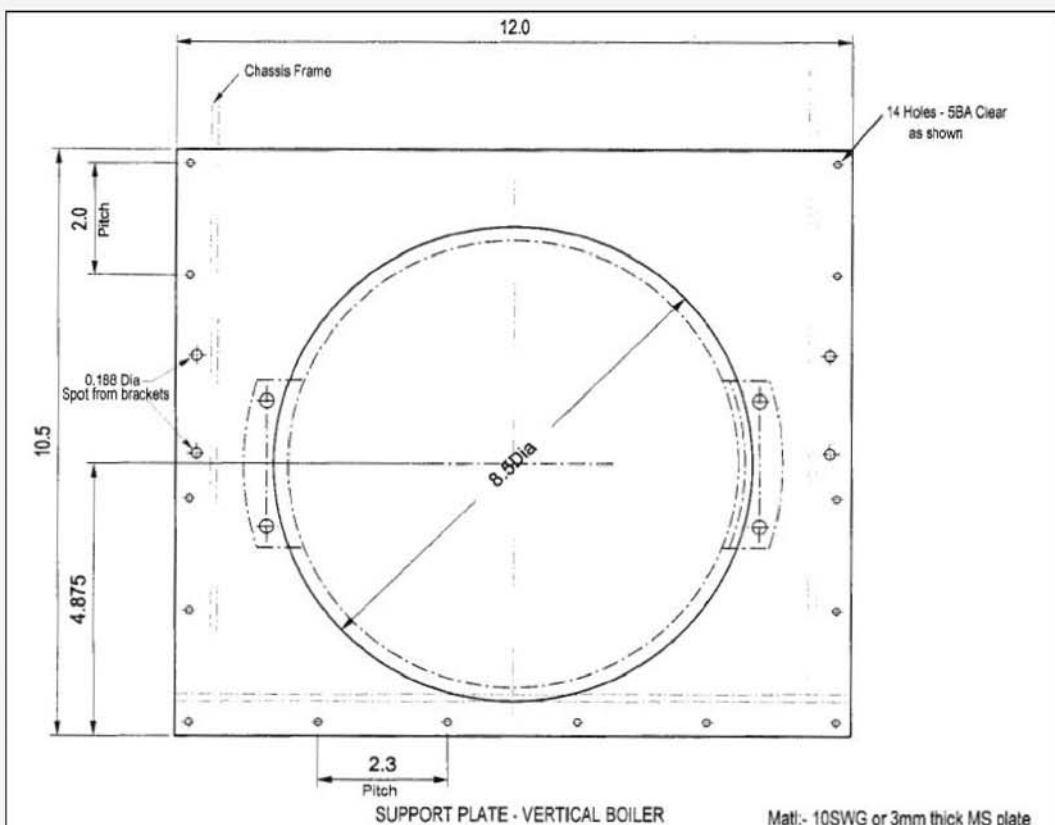


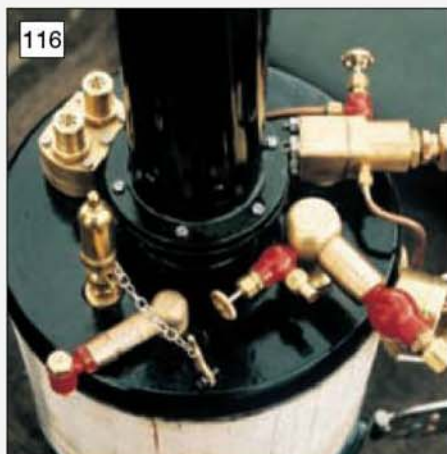
Finished, painted cap in position on the lagged boiler (photo: Martin Wallis).

To avoid, or at least minimise, any condensation it is usual to either increase the pressure or to superheat the steam, or in some cases both. Since our wagon has a compound engine which is remote from the boiler hot steam is doubly important, as quite apart from possible poor performance the result could be a 'wet' engine and the driver might require an umbrella!

To get good hot steam a pressure of 150psi is recommended which necessitates a steel boiler. Such a pressure in an 8in. dia. copper barrel, remembering the test pressure is then 300psi, was not considered advisable by your authors.

If copper is the preferred medium that would be fine, running at a reduced pressure. However, a superheater would be required to dry the steam. Copper boilers certainly do have their merits and the locomotive boiler to be described next time is offered in both copper and steel, as one of the advanced party building the wagon preferred copper. The maximum working pressure in copper is 100psi compared to the steel boiler at 150 pounds per square inch. The copper boiler was, eventually, not constructed as it proved to be substantially more expensive than the steel one; a consequence of the





116
View of the top of the boiler and the boiler fittings (photo: Martin Wallis).



117
View of the nearly finished boiler in the chassis (photo: John Thompson).



118
Ash pan and damper door (photo: John Thompson).



119
Stainless steel circular grate (photo: John Thompson).

material being more expensive and the boiler being more complex (including the crown stays, there are 76 stays in the copper firebox compared to just 20 in the steel boiler).

Three parts

The prototype firebox was made from steel pressings, see fig 53, but in the model the inner or the firebox assembly is in three parts. At the bottom is a round firebox accessed by a hinged door, above that a fabricated square section. Above the tube banks the firebox assembly again reverts to a round section, 3in. internal diameter, and it is here that a super heater may be fitted to dry the steam further. There are 12 cross tubes, each one rising 1/4in. across the square box to promote water circulation. The inner and outer assemblies are shown in **photo 110**.

The boiler is topped with a round casting the purpose of which is to form a boiler cap with rounded corners to hide the welds and provide a flange onto which the chimney may be attached. The cap will require various holes drilling in it to access the assorted bosses for the manifold, safety valves, filler/inspection plug and so on.

Welded in tubes

On a steel locomotive boiler where the tube ends may be accessed it is normal to expand the tubes into their tube plates, and, in due course, these tubes may be replaced and fresh ones expanded in. On this design of vertical boiler once the inner firebox assembly is welded into the barrel the tube ends are quite inaccessible making expanding impossible. It is therefore safer to

weld in the tubes before assembly, guaranteeing their water tightness.

It is however still possible to fit new tubes, the method being to grind out the welds and remove the inner firebox. A big job granted, but perfectly possible, Wayne Bell has explained that he had done this sort of job before and was confident, in the fullness of time, that he would be called on to do it again (Bell boilers may be contacted on tel: 01452-722211).

Not a DIY job

Building a steel boiler is not a DIY job and I have no intention of suggesting it is. The pedigree of the boiler plate must be substantiated and recorded, the weld preparations and sub-assemblies have to be inspected by a qualified person (boiler inspector), the welding undertaken by an individual with the relevant skills and certificates thereof, and the boiler inspected and hydraulically tested by same qualified person. This is quite enough to put most folk off.

The purchase of a boiler is a major expense, for the majority of us certainly the cause of some delicate domestic negotiating. In one case I know the situation was "yes, if I get a new kitchen" and in another the said purchase was linked to a visit to a long lost relation in Australia. All that said I can think of two individuals who had their boilers bought for them as a Christmas present - so we do get encouragement sometimes!

An aside worth noting is that in the unlikely event of wanting to sell your much-loved model a professionally built boiler is a great asset. A model with a professional and fully documented boiler is much more likely to sell quickly and achieve a good price. Conversely a self-built boiler, however clever the builder, will always be treated with a degree of suspicion if the relevant paperwork is not forthcoming.

Boiler cap

The boiler is topped off with a cast iron cap with an integral chimney base. The casting supplied is robust with ample metal in it so it can be safely machined all over.

Room should be left between the underneath of the casting and the top of the boiler for a layer of insulating material, although there is a sound argument for just leaving an air gap as insulation can harbour the damp and rust the boiler.

A copper or brass spinning was considered but it proved more expensive than a casting and hot brass or copper surfaces are not well known for retaining their paint.

If a brass top is considered do not be tempted



120
View of the hinged fire hole door (photo: Martin Wallis).

to leave it bright, not only is it not prototypical but polishing it will be a pain with all the pipes and fittings in the way.

Boiler fittings

An assortment of threaded bosses is needed to receive the boiler fittings and a larger threaded boss is sensible for internal access. As far as your authors are aware there are no mandatory requirements regarding appropriate access for internal inspection for model boilers. However, boiler inspectors' are increasingly requesting/insisting that sufficient access is available for them to take a look at the internal state of the boiler, which seems fair enough. A 3/4in. BSP threaded boss has been drawn which is convenient for internal access and ideal for boiler filling purposes.

The difficulty of ascertaining the exact layout of the pressure gauge, regulator, manifold, steam feeds and so on from photo 109 may readily be appreciated. The layout of bushes on the boiler top plate is intended to follow prototypical practice but, providing all the fittings required are present, their exact location is not critical. **Photograph 116** is John's interpretation and is probably as good an arrangement as any.

Ash pan and grate

At the time of writing drawings for the grate, ash pan and damper have not been prepared but John's pictures, **photos 118 and 119**, will provide ample information for the potential builder. Remember to allow at least a 1/4in. gap between the fire bars to avoid clogging with ash.

● To be continued



The tailstock spindle handwheel and the handwheels for the saddle and cross-slide actuation.



Three locking levers are used on the machine, one on the saddle, one on the tailstock barrel and one on the tool post.

BUILDING A STUART MODELS' LATHE

Anthony Mount

continues his description starting with the cross-slide gib strip.

●Part III continued from page 739 (M.E. 4250, 24 June 2005)

The saddle where it fits over the lathe bed is supplied with a gib strip. This is cut down from a piece of $\frac{1}{16}$ in. thick strip of bright mild steel supplied with the set. The bevells can be filed on rather than try and mill them.

The gib strip is adjusted against the lathe bed by three screws. On my own lathe I found the strip liable to move and quite difficult to put dimples in the strip to receive the screws. So I did an additional job and added two $\frac{1}{16}$ in. dia. pins centrally positioned between the screws.

Centre pop marks were first made to locate the drill. Then the gib strip was placed in position in the saddle and held in place with a pair of folding wooden wedges with bevelled edges to fit into the dovetails. The wood only needs to be $\frac{5}{32}$ in. thick. An additional tool makers clamp was

positioned along the length of the strip clamping it along the edge to stop it sliding down under the force of the drill coming against it at an angle.

The two pins were made long enough to stand proud of the back edge of the saddle so that they could be removed with pliers if need be. The ends were domed to finish them off.

The strip now stays in place and the adjustment screws were coned on the end to match the bevel of the gib strip.

Handles (parts 21, 24, 32, 35, 43, 47)

Six little handles are required in different positions all to the same detail. They are made from $\frac{1}{8}$ in. bright mild steel rod. Hold the material in the self-centring chuck, turn down the end to $\frac{3}{32}$ in. dia., a press fit into their respective homes. Set over the top slide and turn the taper then part off.

Handwheels (parts 22 and 33)

Two handwheels are required, they have different numbers but are identical. Made from $\frac{7}{8}$ in. dia. bright mild steel, the rod can be held in the 3-jaw self-centring chuck and after facing off the spigot can be turned down. Turn the underside recess

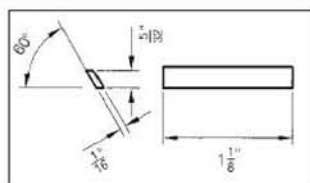
with a cranked tool or a tool shaped like a D-bit but with the end square rather than oblique.

Partially part off and radius the edge. A small form tool will be handy here. This can be made from a piece of gauge plate hardened and tempered. A drilled hole can form the basis of the curved front edge of the tool. Cut off the end to expose the radii and use a round Swiss file to put on the cutting angle. The top can be left flat. The better the finish of the tool the better the finish on the job.

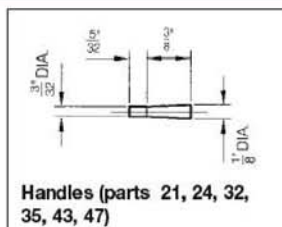
Drill down and tap 5BA, complete the parting off. Reverse, and hold by the rear spigot while the front recess is machined. Mount in a chuck by the spigot in the dividing head to drill the four holes and a fifth smaller hole for the handle. The completed handwheels along with the tailstock handwheel can be seen in photo 19.

Locking handles (parts 25, 36 and 48)

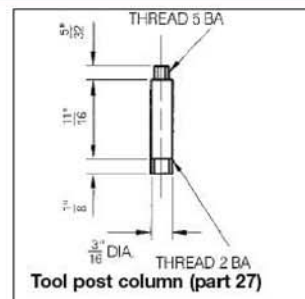
The locking handles are short lengths of $\frac{3}{16}$ in. dia. bright mild steel, and the drawing shows them with the tops cut off at an angle, threaded on the underside and cross-drilled at an angle for the pin handles. This can be seen detailed in



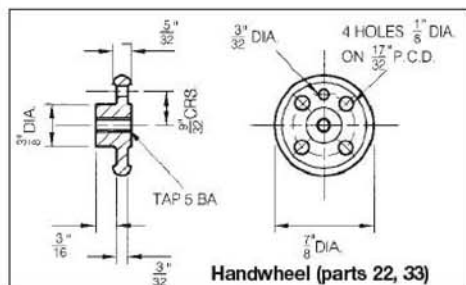
Cross-slide gib strip (part 19)



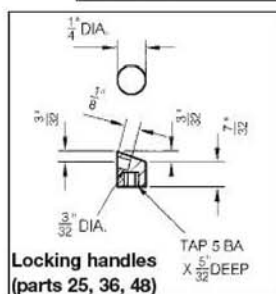
Handles (parts 21, 24, 32, 35, 43, 47)



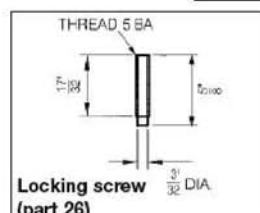
Tool post column (part 27)



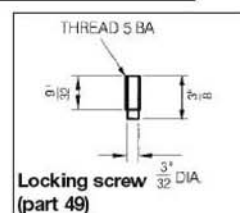
Handwheel (parts 22, 33)



Locking handles (parts 25, 36, 48)



Locking screw (part 26)



Locking screw (part 49)

photo 20. I did digress from the drawing in drilling and threading right the way through, allowing the brass screw section to also pass through and then dressing it down to the top angle. The brass, threaded portion was fixed to the head with Loctite.

Locking screws (parts 26 and 49)

The locking screws are made from brass rod $\frac{1}{8}$ in. diameter. This was turned down at the end to the root diameter of the thread. Threaded all the way up and parted off. As just mentioned, it was fixed to the heads with Loctite.

Tool post column (part 27)

The tool post is a length of $\frac{3}{16}$ in. diameter bright mild steel rod threaded one end 2BA and turned down and threaded the other end 5BA.

Cross-slide (part 28)

The cross-slide is another job requiring a dovetail cutter and $\frac{7}{8}$ in. x $\frac{1}{4}$ in. bright mild steel bar is supplied for this component. Hold in the machine vice of the vertical milling machine and square off the ends with the side of an end mill bringing the part to finished overall length.

Now, with a slot drill mill away the waste material to form the slot along the length of the slide. Change to a dovetail cutter to form the angled edges of the slot. Check carefully to keep the slot central in the material and aim for a close fit on the dovetail on the saddle. Drill and tap for the tool post.

Reverse and, with a tiny cutter, put in the cross slots that represent the T-slots on full size cross-slides. Rather than make up a tiny cutter I used the point of a countersink to put in a V-slot.

Up end the cross-slide and drill and tap 7BA for the front plate fixing screws, locating the position of the holes by using coordinates, the edges being picked up with an edge finder before the dials are zeroed.

Front plate (part 29)

Supplied as $\frac{1}{2}$ in. x $\frac{1}{8}$ in. bright mild steel bar the front plate can be milled to length. Set up flat in the machine vice of the vertical milling machine and by using coordinates spot and drill the three holes for the fixing screws and the spindle. The hole for the spindle would benefit by being reamed to size.

Cross-slide leadscrew (part 31)

The cross-slide leadscrew starts off life as a length of $\frac{1}{4}$ in. dia. bright mild steel. Hold in the self-centring chuck and, after centring the end, give tailstock support and turn down to $\frac{3}{16}$ in. dia. up to a shoulder, thread 2BA with a tailstock die holder.

Part off and reverse by holding in a brass, threaded and split collet. Turn down to fit in the front plate, and reduce further to be threaded 5BA.

Tool post (part 37)

The material supplied for the tool post is $\frac{5}{8}$ in. square bright mild steel bar. Hold in the 4-jaw chuck, a self centring one if you have it, and face off the end. Then drill down $\frac{3}{16}$ in. diameter. Saw off reverse, and face off to length.

The tool post can then be held upright in the machine vice of the vertical mill and a Woodruff cutter can be used to put the slot in all round the four faces. At the same setting two faces can be picked up by edge finder and the dial zeroed at a corner. Then coordinates can be used to spot, drill and tap for the tool fixing screws.

Tool (part 38)

The cutting tool is represented by a short length of $\frac{1}{8}$ in. square bright mild steel bar. It can be filed up to look like a knife tool.

Tailstock T-bolt (part 41)

To make the tailstock bolt a length of $\frac{5}{8}$ in. square bright mild steel is supplied. This is where a self-centring 4-jaw chuck comes in very useful. Hold the bar in the chuck and turn down to $\frac{3}{16}$ in. diameter for threading 2BA. Here I deviated from the drawing and reduced it to 0.141in. dia. and threaded it 4BA, which I think looks neater.

Parting off square stock, especially the larger sizes, produces heavy chattering in a light lathe and you may prefer to saw off the bolt from the parent metal. Reverse, holding in the chuck by the spindle and face off the sawn surface bringing to thickness.

Tailstock spindle handwheel (part 44)

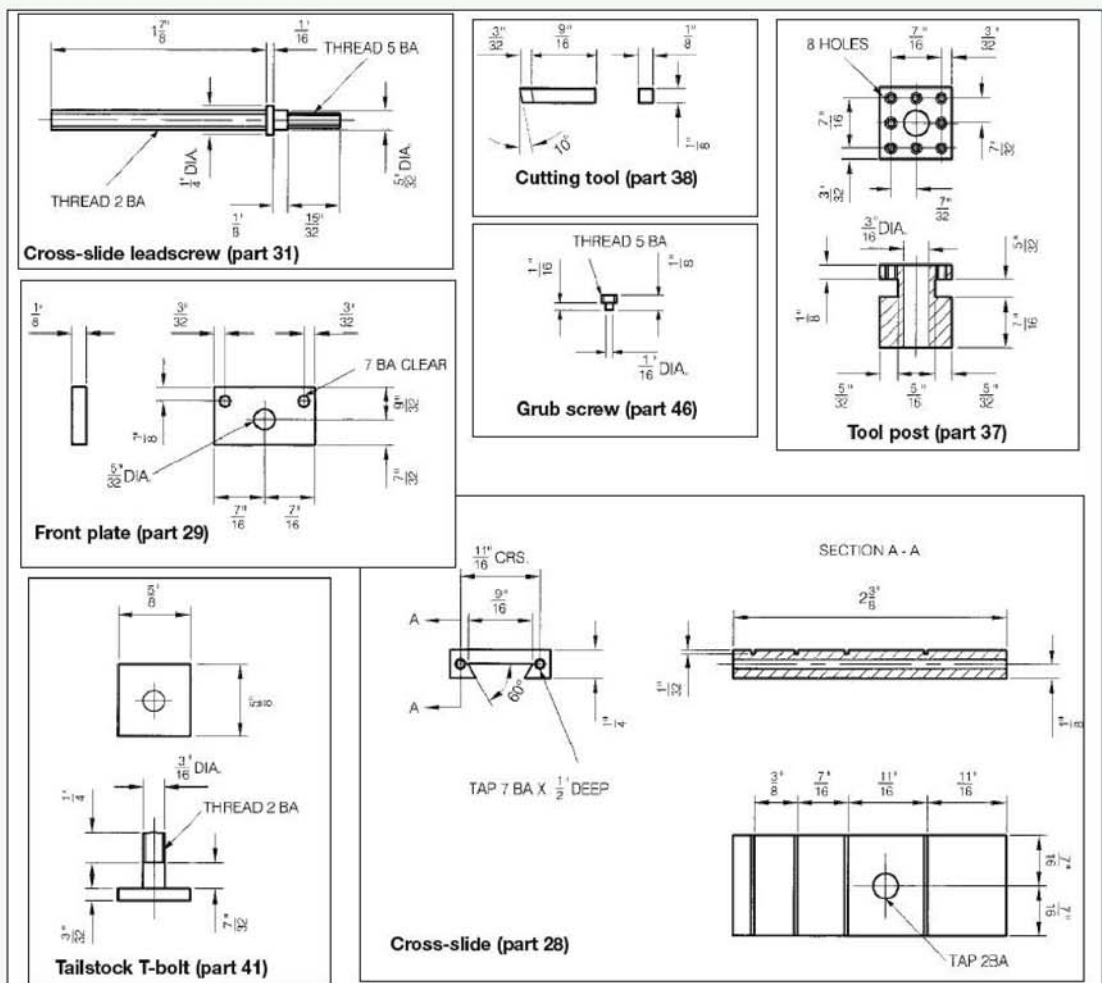
One tailstock spindle handle is required. This is also made from $\frac{7}{8}$ in. dia. bright mild steel. The same procedure as for parts 22 and 33 can be followed, with the addition of a longer spigot with a groove and a bore threaded the larger size of $\frac{1}{4}$ in. x 32 threads per inch.

Though this is a model and not intended for real metal cutting, it would be advantageous for this thread to be left-hand, then on turning the handwheel clockwise the barrel will move forwards, which is normal practice.

Tailstock barrel (part 45)

The tailstock barrel is machined from $\frac{1}{4}$ in. diameter bright mild steel. Set up in the 3-jaw self-centring chuck in the lathe and after facing off, centre, and drill partway down $\frac{3}{32}$ in. diameter.

Thread to a depth of $\frac{11}{16}$ in. at $\frac{1}{4}$ in. x 32 threads per inch. As for the handwheel, a left-hand thread would be useful here. Part off and reverse. Face off to length and, after centring, drill through at $\frac{3}{32}$ in. dia. to meet the hole from the other end.





Under cutting the slots in the solid version of the chuck using a home made T-slot cutter.



Turning the steps in the jaws of the miniature chuck using a small boring tool. The work is held in a self-centring 4-jaw chuck.

Grub screw (part 46)

The tailstock handwheel is held in place by a 5BA grub screw, this is supplied, but it needs to be turned down on the end to form a pin to fit into the groove in the handwheel. Make up a threaded brass split collet to hold the grub screw for turning.

Tailstock centre (part 50)

The centre for the tailstock is turned from $\frac{5}{16}$ in. dia. bright mild steel. First of all turn the 60 deg. included angle taper by setting over the top slide to 30 degrees. Turn down behind the taper to $\frac{3}{32}$ in. dia. and part off.

Chuck (parts 51, 52, 55 and 56)

Details are given on the drawing for a 4-jaw independent chuck. The construction consists of a chuck body, four sectors, four screws and four jaws. The separate sectors are screwed and pinned on, being done this way to allow all the machining for the tongues to fit the jaws being done with an end mill. However, this does give extra work in fitting the screws and pins.

I decided to try and make the body in one piece as for full size chucks and it worked out all right. You will however need to make up your own tiny T-slot cutter. I include a drawing of a one piece body chuck and a suitable cutter for those who wish to adopt this approach.

To start with the body, hold the piece of 1in. dia. bright mild steel supplied with the kit in the self-centring chuck, face off and drill through and tap $\frac{3}{8}$ in. x 26 threads per inch.

Turn down the back of the chuck to $\frac{5}{8}$ in. dia. but instead of the $\frac{1}{8}$ in. depth shown on drawing 51, make it to a $\frac{1}{4}$ in. depth. This is for extra clearance of the spindle nose. Part off, reverse in the chuck and face off to length.

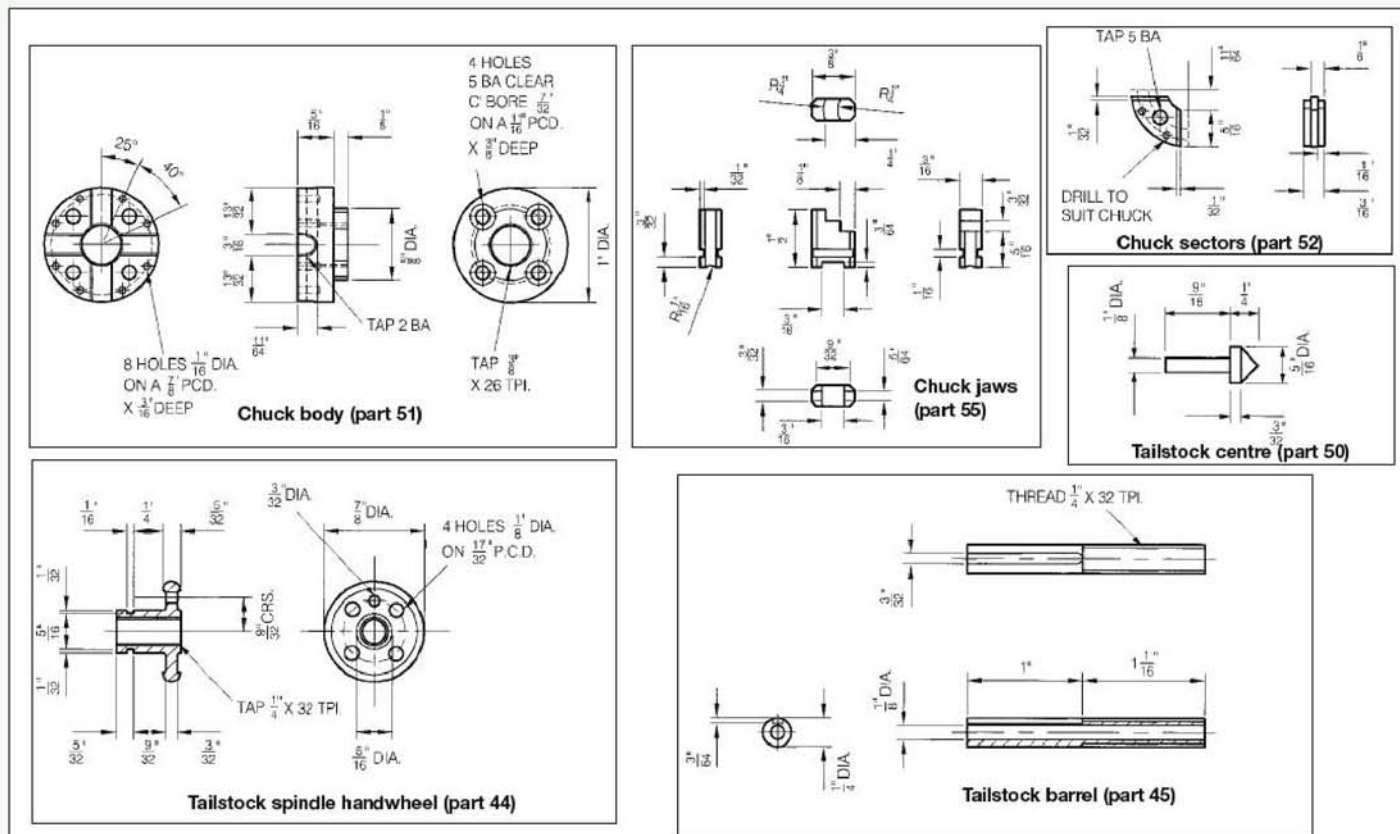
On a stub arbor make up a dummy spindle nose and screw on the embryo chuck. Place the dividing head on the cross-slide and mount the model chuck on the dividing head at right angles to the lathe cross-slide. Drill and tap 2BA for the jaw screws.

Turn the dividing head to face the lathe spindle and machine in the two jaw slots with an $\frac{1}{8}$ in. slot drill. These will run right into the 2BA

threaded holes. Change to a $\frac{3}{16}$ in. dia. slot drill and put in the rebates in the face of the model chuck. Now with your previously made T-slot cutter (you will notice that my slot cutter has a thinner head than the one drawn, I had made it for a previous job, so used it by making three passes instead of one), put in the undercuts behind the tongues **photo 21**. This will cut into the 2BA threads leaving them at half diameter. Remove from the dividing head and clean off any burrs.

The chuck jaws are quite difficult to make as there are many operations and they are so small. Start by squaring off one end of the strip material supplied, then with a $\frac{1}{8}$ in. end mill put in the seating that sits on the screw. Repeat four times cutting off the four pieces and milling to length. Place upright in the machine vice on the vertical milling machine and with a $\frac{1}{16}$ in. thick slitting saw or Woodruff cutter put in the two slots.

Then with a slot drill machine the groove that saddles the screw. Reposition sideways so that a 45deg. cutter such as a countersink can be used to bevel the edges of the jaws.



The four jaws can now be fitted to the chuck body, and the screws machined to length to fit between the ears at the bottom of the jaws. Screw in the jaws making sure they fit both ways.

Position the jaws so that the outer edge of the model jaws are flush with the body of the model chuck. Place the model chuck in the full size self-centring 4-jaw chuck in the lathe, with the whole item inside the chuck jaws so that the outer edges of the model chuck jaws are supported by the full size chuck jaws, see photo 22. With a small boring tool carefully machine in the steps in the jaws. Quite an interesting job and it adds considerably to the allure of the model.

Painting

I suppose you can narrow down painting to three major methods, brush, airbrush and aerosol. Personally I have never had much success with a paintbrush, I can achieve a good impression of treacle but that is about all. Also brushing paints seem to take ages to dry between coats.

An airbrush can give a superb surface finish, but you need a compressor, spray booth and you have to clean all the equipment afterwards.

An aerosol paint spray gives an excellent finish, is easy to obtain, and there is nothing to clean up afterwards, and it dries very quickly. However, you are limited to automotive colours unless you are prepared to pay three to four times the cost for specially mixed aerosol paints rather than off the shelf colours.

I do use a spray booth of sorts. It is a large

cardboard box with the workshop vacuum hose pushed in through the back. Do check that your vacuum can cope with this sort of work. Also use a mask to stop inhaling fumes and over-spray. As to which colour to spray the lathe is up to you. Standard colours of the period were black and green.

To prepare for painting clean all the painted surfaces with emery cloth, filling any holes or blemishes and rub down. Mask any machined surfaces with masking tape, and arrange for each item to be carried on a stick of some sort, so that it can be sprayed all round without having to touch the item.

Start with a couple of coats of red primer, then one of grey, then a coat of colour. Allow to dry right out, preferably overnight. You can now see if there are any poorly finished areas, and these can be rubbed down with very fine wet and dry abrasive paper.

By having three different colours you can see how far you have rubbed down when you rub through the different colours. Very carefully clean and dry each item, then give a

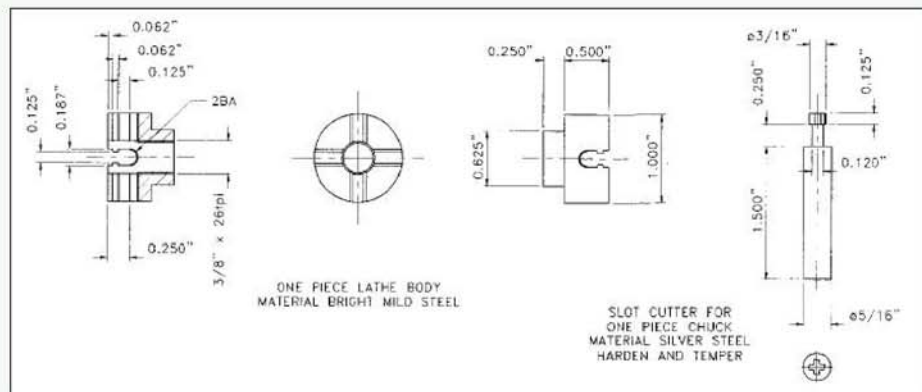
couple of finishing coats and the painting job is done.

Assembly

Assembly is quite straightforward and pretty obvious. First fix the rack to the lathe bed. This is quite fiddly. Fix the pedestal, headstock and leg to the lathe bed. Slide in the spindle, passing through the cone pulley and fasten with the two lock nuts. You will probably need to file up a couple of slim spanners for the lock nuts.

Screw on the faceplate or chuck. Assemble the saddle and cross-slide with the gears and slide onto the lathe bed. Slip in the gib strip and adjust for a smooth movement along the bed.

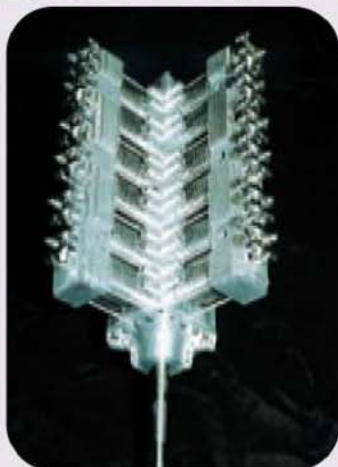
Assemble the tailstock and place in position, and that is it, the model is complete. Unless you intend to mount it as a separate model on an individual wooden base, or to build up a complete workshop with overhead line shafting powered by a steam engine to drive the line shafting. Altogether this is an interesting job and a bit different from the majority of model engineering projects.



IN THE NEXT ISSUE

NAMES

A review of the recent North American show



HOT AIR ENGINES FOR KIDS
Just the things to keep children
(and grown-ups) occupied

ON SALE 5 AUGUST 2005

(Contents may be subject change)

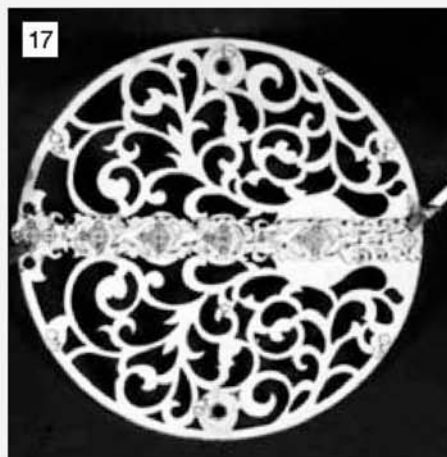
ACROBAT

Time before Christmas to build this fascinating and entertaining item for kids of all ages

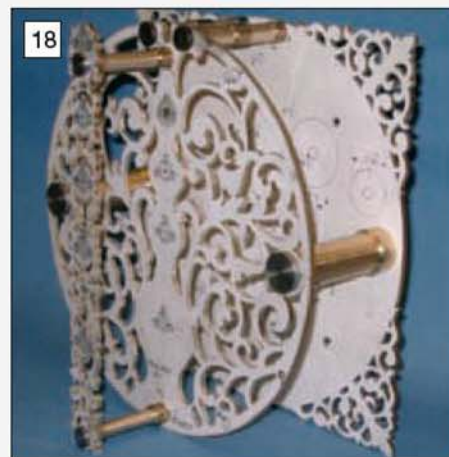




Both back plates are clamped together for drilling the four pillar holes common to both.



The two movement plates are clamped together for drilling the two pillar holes.



General view of the partially finished movement frame assembly.

AN UPDATED CLAUDE REEVE EIGHT-DAY REGULATOR CLOCK

John Wilding FBHI

continues the construction starting with a description of how to drill the plates for the pillars.

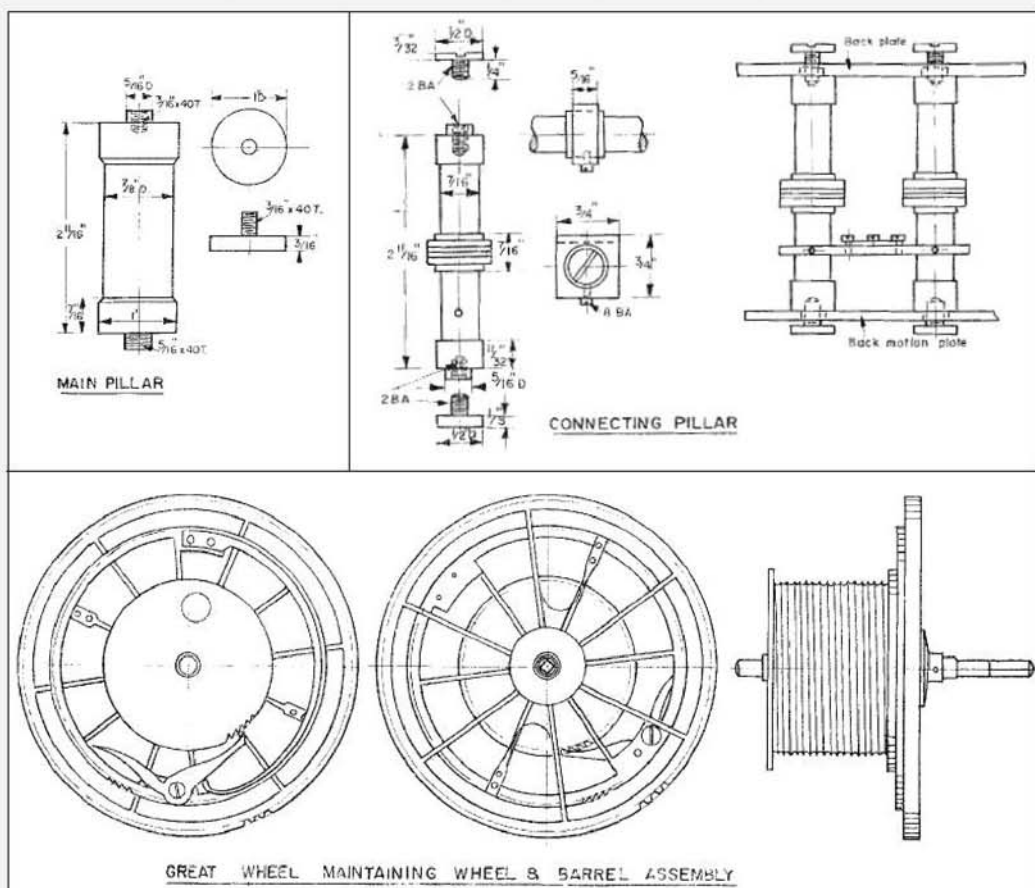
●Part III continued from page 737
(M.E. 4250, 24 June 2005)

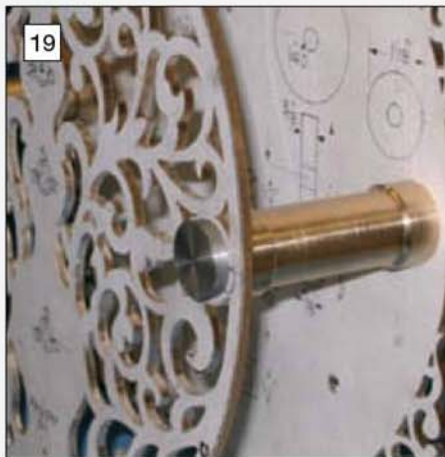
Starting with the backboard mounting plate and the rear movement plate; the latter is placed on top of the square plate and carefully lined up so that the horizontal and vertical lines match and then the two plates are clamped together as shown in **photo 16**. There are four pillar holes to be drilled in these plates and it will be seen that Claude Reeve specifies fine threads to obtain as many threads as possible in the $\frac{1}{8}$ in. thickness of brass. The $\frac{5}{16}$ in. and $\frac{1}{4}$ in. x 40tpi are special model engineer threads and should be used if possible otherwise use the next finest threads you can obtain. In my set of M.E. threads the $\frac{5}{16}$ in. size is 32 threads per inch. In each case the holes are drilled to the tapping size. A suitable tapping size drill for $\frac{5}{16}$ in. x 32tpi is letter K and for $\frac{1}{4}$ in. x 40tpi a No. 2 gauge drill is satisfactory. The plates are then separated and the holes in the circular plate opened to their respective clearance sizes. At the same time the four $\frac{1}{4}$ in. dia. holes in the backboard plate can be drilled. They will accommodate wood screws for securing this plate to the backboard of the case. The four brass washers which will be used in conjunction with the wood screws are shown on the drawing of the square plate.

A similar procedure is adopted for the pillar holes on the back and front movement plates. The vertical strip is carefully aligned on the circular plate

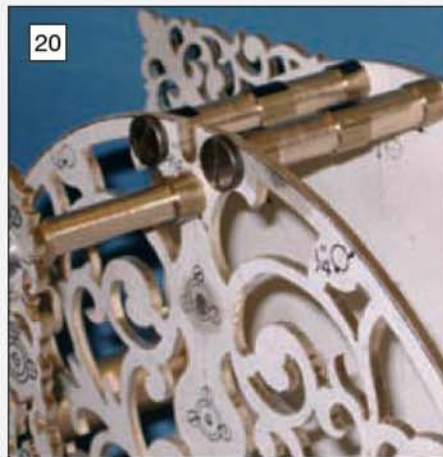
and again secured with toolmaker's clamps (**photo 17**). In addition to drilling the two pillar holes, the two steady or register pin holes can be drilled as marked on the drawing. A convenient size for these holes is No. 55. Before the plates are separated the steady pin holes should be lightly broached with a tapered cutting broach (ref 1). In each case the pillars screw into their plates at the back and are secured at the front with large headed steel screws which will later be polished and blued. Claude Reeve is not specific

about materials used but it is a general rule in clock making that screws are in steel. An exception here might be the large 1in. dia. screws, which are used in conjunction with the two 1in. dia. pillars. These could be made from brass. In either case a slot is not formed in these screws, instead a radial hole is drilled in the head of the screw for tightening with a tommy bar. In **photo 18** I show this stage of the construction and in **photo 19** a close-up of one of the large pillars with its steel, retaining screw. Details of

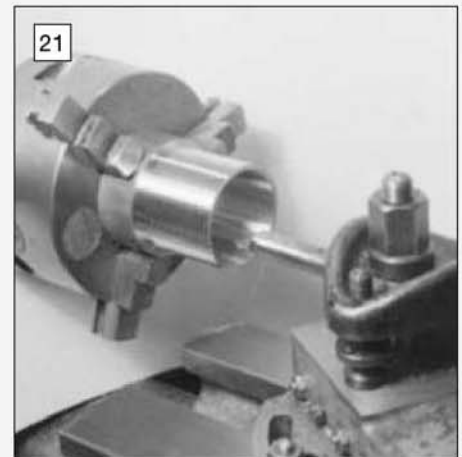




Close-up of one of the large, turned pillars with its steel screw.



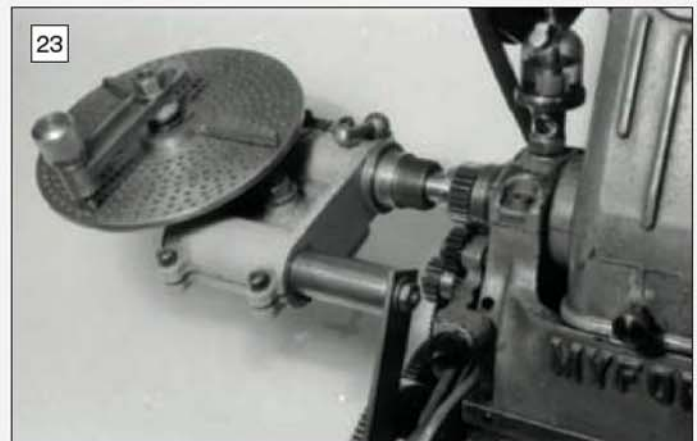
A close-up of the upper part of the frame with top pillars.



Boring the barrel tube in the lathe. Note the outer diameter has already been screw cut.



Forming the barrel square using the lathe filing rest. Note the slight taper produced on the square section.



Myford dividing head fitted to the rear of the lathe headstock mandrel to provide a mandrel indexing facility.

the top pillars are shown in **photo 20**. In the smaller pillars a tommy bar hole of some $\frac{3}{32}$ in. dia. should be drilled diametrically through the back shoulders of the pillars so that these items can be screwed in tightly. I am not giving details of the machining of the pillars, but a general procedure would be to hold the stock initially in the 3-jaw chuck for facing the ends, machining the shoulder, forming a countersink with a $\frac{3}{16}$ in. centre drill and finally drilling and tapping for the securing screw. The work can then be mounted between centres for machining the body of the pillar. Beginners needing further information should obtain my book on the 8-day wall clock which is the most comprehensive of all my books on all aspects of the making of a clock.

It can be seen from the illustrations that the paper pattern is still intact at this stage but it can now be removed. If Spray Mount was used as the adhesive, the paper can be dissolved by immersing the plates in paraffin. With the paper removed the final shaping of the decoration can be tidied up with files. This is done entirely by eye. The completion of this stage in the construction must represent nearly half of the total work.

The Barrel

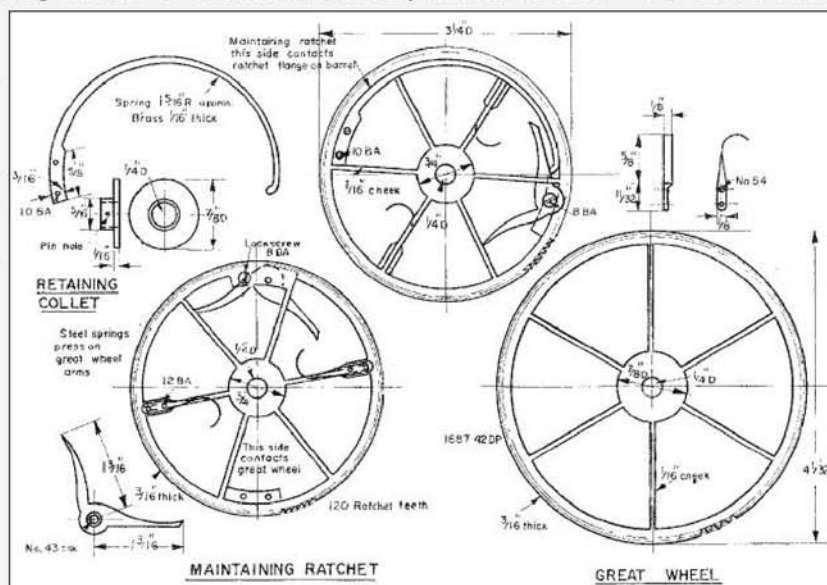
The constructor can now pick up the construction from Claude

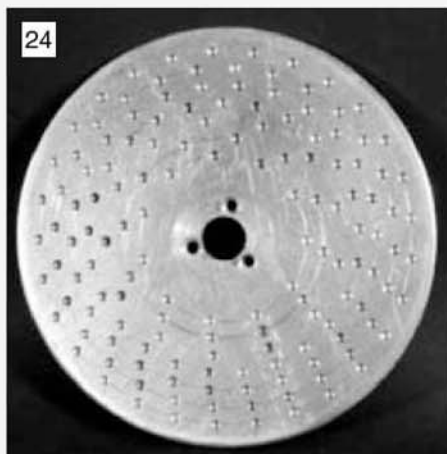
Reeve's articles. His description of fabricating the barrel is perfectly satisfactory. It is easier to screw cut the barrel before the flanges are fitted and in my case I didn't have the right size of tube and made my barrel from the solid. In **photo 21** I am boring out the centre and the screw cutting has already been carried out. Remember to make this 14tpi instead of the originally stated 12 threads per inch.

It should be noticed that the barrel assembly is placed the opposite way round to normal. Usually the main wheel and maintaining ratchet is at the back but here they are at the front. It is

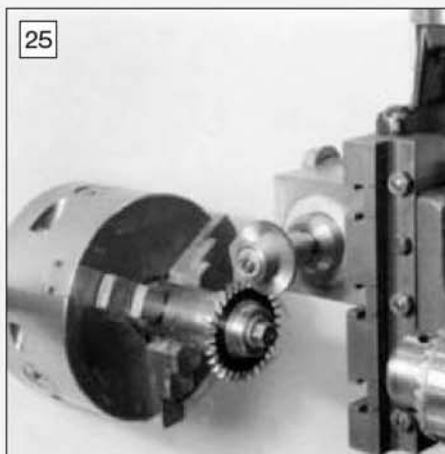
not necessary to form the square at the moment but I am showing an illustration of the procedure using the lathe filing rest (see ref 2 and **photo 22**). The wheel blank is mounted on a screwed mandrel in the lathe chuck and the milling spindle containing the cutter is mounted on the vertical slide and driven by a motor and plastic belt from a motor situated at the end of the lathe bed. It takes about five minutes to set the system up (**photo 23**). By using the Myford dividing head every number up to 100 is available with the standard plates, and many more numbers over 100 can be obtained as well. It so happens

that in this clock the centre wheel requires 112 teeth and this number is not available with the standard plates; you need a hole circle of 28 and you index every 15 holes. It is not difficult to make a special plate on the lathe itself and I show this in **photo 24**. This one is made in light alloy but for occasional use it is perfectly satisfactory to make a plate from hardboard! I have done this and it works well. Claude Reeve describes a cutter frame which again is satisfactory but today with the availability of several substantial





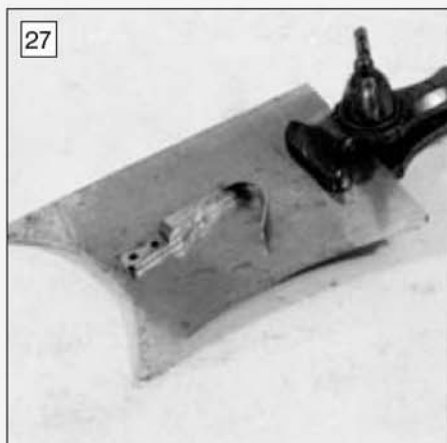
24
A home made division plate made from aluminium alloy.



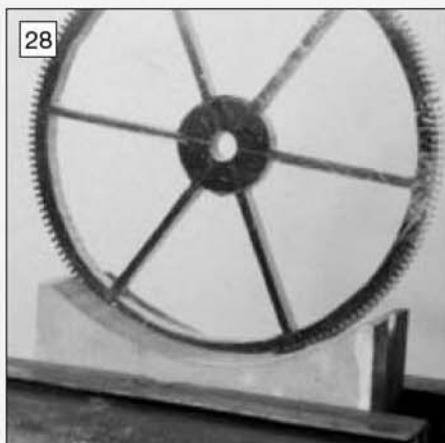
25
Cutting the escape wheel on the lathe with a Thornton cutter.



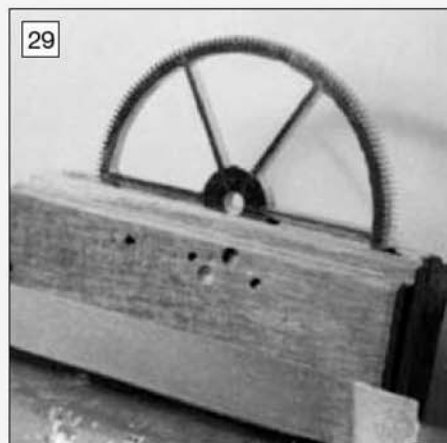
26
Using the sawing board and clock pins to locate the barrel ratchet for filing to width.



27
Tempering the maintaining springs on a piece of brass to spread the heat.



28
Using curved vice chops to clamp a wheel firmly whilst filing up.



29
Straight vice chops were used to give maximum support when filing the spokes.

milling spindles on the market, it is unlikely that anyone would use a cutter frame with its primitive bearings. While the lathe is set up for wheel cutting it is sensible to cut all the train wheels at one session. In **photo 25** you can see the escape wheel being cut. I am using a Thornton multi-tooth cutter in this illustration. When cutting the maintaining ratchet make sure that the teeth are cut radially i.e. no undercut. Claude Reeve mentions this, he also talks about going round the wheel twice, but with a modern milling spindle this is not necessary. You can cut the teeth at the full depth in one cut.

Claude suggests that the barrel ratchet is cut from 3/16in. mild steel, which I did, but I found that the ratchet then fouled the line so I reduced the thickness to 1/8 inch. The method of doing is illustrated in **photo 26**. Drill some small holes in the sawing board and hammer in brass clock pins. One should go through the centre hole and two others to embrace the click. The thickness was quickly reduced to 1/8in. with a large, 12in. file.

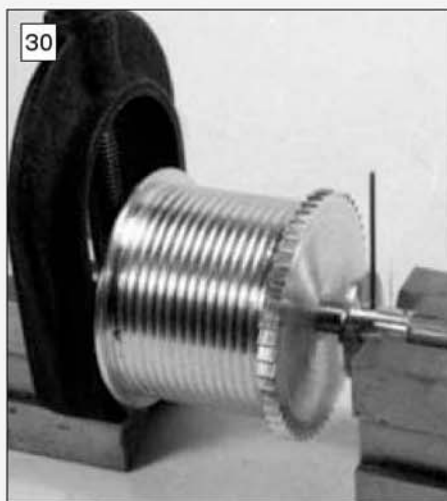
Maintaining clicks are made exactly as Claude describes. When they are tempered they can be placed on a scrap piece of thin brass sheet and held over a low flame to watch the colour changes (**photo 27**). The temper should be let down to blue and possibly a bit further as Claude suggests.

Crossing out

I have dealt with this subject on many previous occasions and the reader who has managed to fret out the plates will have no difficulty in crossing out the wheels. After the sawing out, the wheel should be held in curved vice chops to give maximum support when filing the inner curves using the No. 2 cut 6in. crossing file (**photo 28**). Flat top chops are used to grip the wheel when filing straight parts of the crossings (**photo 29**). Note the 6in. file in use here. I find it is much easier to get the spoke straight with a file like this rather than using a needle file.

The whole barrel assembly is held together by a brass collet, which is cross-drilled for a pin right through the arbor. **Photograph 30** illustrates the drilling set-up I used.

An illustration of the finished barrel assembly is shown in **photo 31**.



30
A suitable set up for the machining of the cross drilled hole through the barrel arbor.



31
The completed barrel assembly viewed from the front.

References

1: There is a proper procedure for fitting steady pins and this is fully described in my book *Hints & Tips for the Clockmaker*, available from RiteTime Publishing, 18 Woolmer Way, Bordon, Hants GU35 9QF; tel: 01420-487747

2: The filing rest shown here is available from J. M. Wild FBHI or full details for the construction of this useful tool can be found in my book *Tools for the Clockmaker* available from RiteTime Publishing.

●To be continued.



The author's 5in. gauge LMS Class 1200 'Ivatt' tank engine. It was built to Don Young's and the LMS works drawings and was completed in 1995.



Friend John's 5in. gauge Pansy built to the design of LBSC. It was this locomotive which suffered from injector problems.

IS YOUR PLUMBING IN GOOD ORDER?

Paul Mann

passes on the results of some research into injectors and asks after the health of your model's plumbing.

Live steam injectors seem to inhabit that mysterious no-man's land between understanding and black magic. One hears tales of woe by model engineers who say they once made six injectors of which only one worked - and they vowed never to make another! No wonder injector making has been regarded as a 'black art'. Even today, some model locomotives still rely on axle and hand pumps and I doubt if the situation has changed much in 50 years.

Over the years, many articles have been published in model engineering journals giving meticulous instructions on the making of injectors. There can be no mystery today for anyone wishing to make and use injectors successfully on their model locomotives. In addition, good, reliable commercial injectors are readily available at a price that makes it seem unattractive to make them! With the right plumbing, modern injectors are virtually idiot and bomb proof. Yet some model engineers still have problems with their 'waterworks', even with such good commercial injectors. The injector is always blamed, but never the plumbing! Is your plumbing in good order?

With the help of that well-known Yorkshire model engineer, Geoff Haythornthwaite, I discovered a little more about "*these wee timorous beasties*". Geoff's injectors are superb, and have been used on winning IMLEC locomotives. I have studied injectors, measured them, and tested them. It has been said that injectors need to be made with more precision than any other part of a model steam locomotive, because they will not work if they aren't! I have found them frustrating and often unpredictable little things. However, I finally made a batch of injectors for myself, and after a bit of fine tuning they all work well even with the steam on first; they also lift water.

This article is not about making injectors; the published articles give all the guidance we will ever need. This is about some of the wrinkles that I, as an average model engineer, have experienced using injectors, and a few of the problems I have found in plumbing. I examine four critical areas:

- 1: Water supply.
- 2: Steam supply.
- 3: Feed to the boiler.
- 4: Overflow.

I ought to add that what I am saying is, I am sure, perfectly well known to every experienced model engineer and injector maker, so please forgive me if it all seems so obvious to you. Not everyone who reads *Model Engineer* is a professional engineer, or has 40 years experience in model engineering. I have written about things that seem most significant to me, as a relative novice, after playing about with injectors, and trying to solve a few problems for myself.

Problems with plumbing

I recently visited my neighbouring society, after my friend John, whom I know well, had phoned me to say that he was having problems with his injector. Knowing of my particular interest in injectors, he asked me along to have a look. John had recently finished an LBSC *Pansy* - a fine, well made engine - but his injector was temperamental and would not feed reliably.

When I arrived he was already in steam and, sure enough, was fighting for water and doing the usual things like pouring cold water on the injector. It was spitting steam and water out of the overflow and only with the most careful regulation of the water would it pick up at all, and then only for a second or so. When it did pick up there was a strong blow of water from the overflow. I had taken the precaution of taking along a couple of injectors, which I had tested only the day before on my 5in. gauge LMS 'Ivatt' tank engine and I knew they were excellent performers. We tried one of them on John's *Pansy*, and it was temperamental like his own injector. This proved immediately that the problem lay not in the injector but in the plumbing.

First we checked the water supply. The water feed from the driving truck to the injector was through clear plastic piping. Looking closely, we observed tiny air bubbles being drawn along to the injector. These, clearly, contributed to the spitting. If it is drawing air, even the best injector in the world will not feed without knocking off and trying to re-start. In this case, air was being drawn down the spindle of the water valve - a common problem. Re-packing the gland would probably cure it. I noticed that there was a rather complicated water junction fitting just below the injector, which might restrict the water supply. However, the vacuum developed at the water inlet by a good injector will probably pull water through quite a tortuous network of filters and pipes, providing there is no air in it.

Now for a look at the steam. All the indications were of low steam pressure at the injector (again, a not unusual problem, although we do not always realise it), and yet *Pansy* was blowing off at 80 pounds per square inch (psi), and the gauge had recently been calibrated as part of the hydraulic test. I took John's offending injector home, and without cleaning it out, I put 'Ivatt' into steam and tried it.

Nothing wrong with the injector! It did everything a good injector should do. It picked up beautifully, it started when hot with the steam left on first for 10 seconds, and lifted water from a jug at ground level (36in). I let the boiler pressure drop gradually through 70psi to 60psi and, as expected, the injector dribbled a little but regulating the water stopped this. At 50psi, there was a faster dribble of water which, again, I could regulate. When the pressure dropped to 35-40psi there was a flow of water from the overflow similar to that we experienced on *Pansy*. It was just possible to regulate the water, but the injector was not happy. This test on 'Ivatt' suggested that on *Pansy* the injector was probably only getting about 35-40psi steam pressure - but why?

Now, on *Pansy* steam for the injector is normally taken from a pipe on the backhead, which curls up inside the Belpaire firebox into a corner of the steam space above the crown. John had used standard 5/32in. dia. copper pipe, and also for the pipe from the steam valve to the

injector. Thin wall $\frac{5}{32}$ in. tube rather than standard would have placed less restriction. A standard wall $\frac{5}{32}$ in. dia. copper pipe will barely pass enough steam for a decent 5in. gauge locomotive injector. It is amazing how much steam is required to kick off a modern injector. When LBSC designed *Pansy*, his *Pee Wee* injectors were significantly smaller than modern ones, and a standard $\frac{5}{32}$ in. dia. copper pipe was probably adequate.

Anyhow, by carefully drilling the backhead fitting, John was able to get a $\frac{3}{16}$ in. dia. thin walled copper pipe into the boiler. He also replaced, with $\frac{5}{32}$ in. dia. thin wall, the pipe from the steam valve to the injector. John steamed *Pansy* in his garage shortly afterwards, and rang me excitedly to tell me that the injector was now working fine. It even lifted water from a jug on the floor. These simple modifications to the plumbing proved to be effective, and John now has the satisfaction of knowing that even under really tricky conditions, his injector will do its stuff.

Wet steam

My first model engineering project five years ago was to rebuild a $1\frac{1}{2}$ in. scale traction engine. I recall that the injector never picked up, it simply blew steam and water through the overflow in large quantities. Having studied injectors a little more closely since then, I thought I would steam the traction engine again and try to find out why. When she was gently 'tick-tocking' on the stand, I tried the injector. Things were exactly the same as five years before and copious volumes of steam and water emerged from the overflow. Now, it had a vertical injector awkwardly placed behind the main left rear wheel. I modified the pipe work to take a standard horizontal injector placed where it was easy to play about with it.

The horizontal injector showed the same symptoms - lots of water and steam from the overflow. Firstly, I took off the water pipe, and there was a good flow of water from the bunker. Secondly, I took off the steam pipe and examined the jet of steam from the boiler. Here was the problem. It was 50% hot water - no chance of an injector working on that! I traced the steam pipe ($\frac{5}{32}$ in. dia.) back to the manifold. Here I noticed that the top feed for the water gauge was also taken from this same common manifold. Whenever I turned the injector steam valve on, I had noticed that the water shot up the gauge glass out of sight. Obviously, the steam valve was drawing water through the gauge glass from below the water line. I turned off the cocks on the water gauge. This helped, but for some reason the steam was still very wet.

In fact the problem was more complex. Being a round-top boiler, there was only a small gap between the water level and the top of the boiler. The depression created by the flow of steam to the injector was also sucking water into the steam manifold. Short of a major re-design, I could see no easy solution to this. Then I recalled that North Eastern Railway engines with round-top

boilers took their injector steam from a long pipe leading from the backhead inside the boiler to the top of the steam dome. The solution on my traction engine seemed to be to take a steam pipe from the top of the cylinder block where it was about 3in. above the water level. This could go round the outside of the boiler down to the injector. Not very elegant, but at least the injector would be fed with dry steam. That injector could never have worked with the original plumbing.

Boiler clacks and the overflow

Keeping an injector's bowels open can be as important as feeding it! We probably underestimate the amount of steam and water which go through an injector. Firstly, the boiler-clack needs to be large enough, and the pipe work adequate. The clack needs to be steam tight (have you tried O-ring boiler clacks and steam valves?). Secondly, an injector will not pick up until it has

blown out any cold condensed steam through the overflow. The overflow passages need to be large and unrestricted. A long overflow pipe creates a restriction on an injector, and can prevent it working at all. In my experiments an overflow pipe only 1in. long, in standard thickness $\frac{5}{32}$ in. dia. copper pipe caused measurable back pressure, and a restriction on the rapid clearance of the overflow chamber. An injector that was reluctant to pick up when the steam was turned on first, did so with the overflow pipe removed. The difference between $\frac{5}{32}$ in. dia. standard and thin wall piping was measurable - $\frac{3}{16}$ in. dia. thin wall tube is even better.

Free-exhaust-to-air test

A good modern injector picks up and runs without any noise. One should not be able to tell it is working. Also, contrary to what you hear people saying, it should not 'chirp'. If it does 'chirp', it is drawing air and, unlike budgie, it is not happy! If there are problems with an injector, either failing to pick up, or with water or steam blown from the overflow, then a 'free-exhaust-to-air' test (pointing away from the loco!), without the delivery cone, can often identify the cause of a problem. There should be a fine, pencil-lead-thin jet of hot water from the end of the forcing cone, projected totally cleanly and silently for at least a foot before it starts to feather even slightly. This should project at least 5 yards! A broken, noisy jet of water will never hit the centre of the delivery cone. Likewise, if the jet veers slightly to the side, one can be certain that the draught cone and forcing cones veer off centre or are out of line with each other. I made one set of draught cones and forcing cones which always produced a wet overflow.

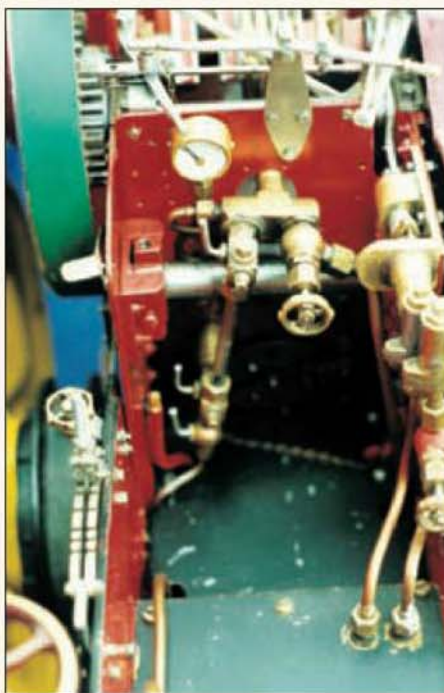
A free-exhaust-to-air test showed immediately a 'lop-sided' jet of condensed steam. It might have been a drilling error of only a few thousandths of an inch.

Conclusion

This has all been said many times before. It is worth remembering the simple little guide, 'steam out of the overflow - not enough water; water out of the overflow - not enough steam'. Pipe work should have unrestricted bends. Water should be filtered going into and coming out of the water tank - through a large-capacity, finest-gauze filter. Ideally, water should be stored in a tank insulated from direct sun or the heat of the boiler. An insulated tank within a tank is ideal. Steam should be fed from the highest and driest point in the boiler, through steam valves and piping of more than adequate size. The hotter the steam (within reason) and the cooler the water, the more efficient the injector will be. Whether we venture into the 'black art' of injector making, there is no doubt that injectors offer the most efficient means of getting water into a boiler. The pipe work to-and-from an injector is as important as the injector itself. If you have an injector problem, do not automatically blame the injector but take a look at the plumbing. Is your plumbing in good order?



The author's $1\frac{1}{2}$ in. to the foot Fowler 'Big Lion' showman's engine built from Bill Hughes' drawings.



The steam manifold on the Fowler. The water gauge and steam valve share the same manifold.



UK News

Bradford MES has had permission from the local council to continue with its proposals for a model boating pond at its Northcliff site. At a recent meeting member Ian Collins produced a water jet boat he is building in anticipation of the pool being finished. Andrew Wild, a pupil from the local Guisely School attended a committee meeting recently to demonstrate the alarm system he has developed for use on the society exhibition stand. Andrew was congratulated on his achievement which will stand him in good stead for his final year project. The society has acquired six 3ft. diameter concrete pipes which will be used as carriage storage when installed behind the signalbox. The Editor comments "that weighing a ton each they will take some moving into position."

Canterbury DMES has redesigned the layout of its platforms over the winter period after a very busy open day which highlighted the need for better control of passengers. The concrete was delivered one week before Christmas to be met by a party of several members armed with wheel barrows and shovels. After 40 minutes work the concrete was laid, smoothed and ready for dressing.

The society suffered from a vandalism attack in February with approximately 100ft. of track being removed and dumped in a ditch. The track was replaced in a concerted effort by members in time for Easter running. All this of course is at considerable cost to the club. Member Barry Lorraine has started the "I'm Not Smutty" break-away group for those who don't wish to build and operate steam locomotives. This is as a result of his being constantly asked when he is going to get a steam locomotive. I have to say that my own club has suddenly sprouted a crop of electric locomotives, so perhaps the disease is catching?

The front cover of the *Cardiff Messenger* carries a picture of **Cardiff MES** member Steve Hanson with his 5in. gauge petrol engine powered Canadian Pacific locomotive. Since acquiring the locomotive Steve has refurbished the engine and is in the process of reassembling the locomotive ready for running. The big tram track is now in operation after refurbishment and trams were running for the first open days of the season. A new tram shed and approach track is also now completed which has released space for further alterations to the workshop area and club room. At the February talk, John Underwood gave a well presented talk on

enamelling. It is reported that "John managed to avoid setting fire to anything, including himself, when demonstrating the small furnace". The Editor comments that those in the front row remained very wide awake during the talk.

The newsletter also carries some details on the correct lubrication of steam engines. The information can be found on the Morris Lubricants website at www.morrislubricants.co.uk which gives detailed information which will be of great interest to readers of this column.

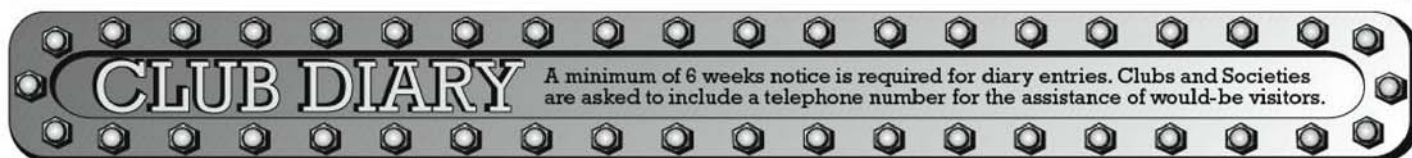
Following complaints of rough riding passenger trolleys at **Crawley Model Engineers** it was discovered that the 20 year-old needle roller bearings were in a bad way so the bogies were removed by John Wilkes who will repair them. The society *Pansy* locomotive has been loaned to the local museum for six months. The locomotive will be displayed with a board with photographs and details of the society's activities.

We welcome another new society to this exclusive fold this time in the form of the **Cornish Miniature Steam Vehicle Club**. Editor Dave Marston reports that the season is well under way and that the boiler test day was later in the year than last year so the winds were less icy than usual. He also reports the case of a traction engine that would not

turn corners. After much investigation and "a dubious and delicate operation involving extra ballast persons and hot chimneys" it was found that the short wheel driving pin was just long enough to lock the differential thus preventing the engine turning.

This year sees the 10th anniversary of the founding of the **Gas Turbine Builders Association** by Chairman Tom Wilkinson. Since that time the association has gone from strength to strength. Readers will be familiar with Tim Coles GT3 locomotive but may not be aware that there are now four other gas turbine powered locomotives under construction. These include two more GT3s by Chris Tebbutt and Jack Derby, a Metropolitan-Vickers 18,100 by Jerry Buchall and a Brown-Boveri 18,000 by John Bond. We look forward to reporting on all these efforts in due course. Tim is currently developing a control system which will eliminate the need to use radio control. Among the many technical articles in the newsletter is one on the proposed development of a compound gas turbine.

The clubhouse at **Ickenham DMES** is celebrating its Golden Jubilee but I am not sure what the protocol is for congratulating club houses! The original building has grown in size over the 50 years but is still serving the club well and was refurbished last year.



JULY		AUGUST	
23	Chesterfield MES. Running Day. Contact Mike Rhodes: 01623-648676.	28	Wimborne DSME. Club Barbecue. Contact Eric Basire: 01202-897158.
23	Leyland SME. Members' & Guests afternoon driving session. Contact A. P. Bibby: 01254-812049.	28	Worthing DSME. Neil Gough: Spare Time Restoration. Contact Bob Phillips: 01903-243018.
23/24	Claymills Pumping Engines. Non Steaming Open Days. Contact B. Eastough: 01283-812501.	29	Chichester DSME. OGM. Contact Brian Bird: 01243-536468.
23	Hornsby ME. Family Day - Boiler Inspection. Contact Ted Gray: 9484-7583.	30/31	Furness MRC. Lytham Exhibition. Contact Fred Firth: 01229-821192 or Colin Burns 01229 837079.
23/24	Kew Bridge Steam Museum. Festival of Model Tramways. Information: 020-8568-4757.	30	Norwich DSME. Visit by Ipswich Society of Model Engineers. Contact Paul Reed: 01603-462925.
23/24	Oxford (City of) SME. Dreaming Spires 2005. Contact Chris Kelland: 01235-770836.	30	Romney Marsh MES. Public Running. Contact John Wimble: 01797-362295.
23	Westland & Yeovil DMES. Track Running Day. Contact Gerald Martyn: 01935-434126.	31	Bristol SMEE. Public Running. Contact Trevor Chambers: 0145-441-5085.
24	Amnerfield Miniature Railway. Public Running. Contact David Jerome: 0118-9700274.	31	Chichester DSME. Steam on Sunday. Contact Brian Bird: 01243-536468.
24	Bournemouth DSME. Charity Day Chrones & Colitis Association. Contact Dave Fynn: 01202-474599.	31	Elmdon MES. Midland Reds. Contact Chris Giles: 0121-458-1291.
24	Bristol SMEE. Public Running. Contact Trevor Chambers: 0145-441-5085.	31	Guildford MES. Members' Running Day. Contact Dave Longhurst: 01428-605424.
24	Cardiff MES. Open Day. Contact Trevor Jenkins: 029-2075-5568.	31	High Wycombe MEC. Public Running. Contact Eric Stevens: 01494-438761.
24	Frimley & Ascot LC. Club Running. Contact Bob Dowman: 01252-835042.	31	Oxford (City of) SME. Public Running. Contact Chris Kelland: 01235-770836.
24	Guildford MES. Driver Training Day. Contact Dave Longhurst: 01428-605424.		
24	Harlington LS. Public Running. Contact Peter Tarrant: 01895-851168.		
24	Leicester SME. NAME Diamond Jubilee Celebration. Contact Raymond Wallis: 0116-285-8824.		
24	Rugby MES. Visit to Kinner Society. Contact David Eadon: 01788-576956.		
24	York City & DSME. Running Day. Contact Pat Martindale: 01262-676291.		
25	Bedford MES. The Bubbly Bottle Challenge. Contact Ted Jolliffe: 01234-327791.		
25	Hornsby ME. Meeting. Contact Ted Gray: 9484-7583.		
26	Romney Marsh MES. Public Running. Contact John Wimble: 01797-362295.		
28	Sutton MEC. Evening Steam-Up. Contact Bob Wood: 0208-641-6258.		
28-31	Canvey R&MEC. Open Days. Contact Brian Baker: 01702-512752.		
		1	Peterborough SME. Bits & Pieces. Contact Tony Meek: 01778-345142.
		2	South Durham SME. Meeting. Contact B. Owens: 01325-721503.
		2	Stafford DMES. Track & Social Evening. Contact Chris Dobbs: 01889-270533.
		2	Taunton ME. Steam-Up. Contact Don Martin: 01460-63162.
		3	Bradford MES. Meeting. Contact John Mills: 01943-467844.
		3	Frimley & Ascot LC. Public Running. Contact Bob Dowman: 01252-835042.
		3	Leyland SME. Road Vehicles Night. Contact A. P. Bibby: 01254-812049.
		3	Romney Marsh MES. Track Meeting. Contact John Wimble: 01797-362295.
		4	West Wiltshire SME. Steam-Up. Contact R. Nev. Boulton: 01380-828101.
		4	Bedford MES. School Holiday Running. Contact Ted Jolliffe: 01234-327791.
		4	South Lakeland MES. Meeting. Contact Adrian Dixon: 01229-869915.
		4	Sutton MEC. Bits & Pieces. Contact Bob Wood: 0208-641-6258.
		5	Aylesbury (Vale of) MES. Track Night. Contact Andy Rapley: 01296-420750.
		5-7	British Columbia SME. Trainfest Meet. Contact Sean Laurence: (604) 931-1547.

Following some details about events at the Isle of Wight MES in this column recently, I have received some photographs from Richard Deal of Watford who visited the Isle of Wight. I have included a rather sad photograph of the paddle steamer *Ryde* which can be found on the island.

Members of King's Lynn DMES have been busy shortening the riding trolleys, thus making them easier to handle. New springs have also been fitted. The Wednesday Gang have been busy working on the new club house and the library is now in the rest room at the back. The next project is to install a running loop past the turntable which will allow drivers to take a break when they want one. Life must be good in King's Lynn with "rest rooms" and "breaks when they want one". Are they allowing the drivers to become soft in their old age?

The journal of the National 2 1/2" Gauge Association carries an article entitled "Some Thoughts on Metrication" by Des Adeley which includes some comments on the difficulties encountered in building imperial designs using metric materials. As Des points out this is much easier than it used to be because of the availability of digital vernier callipers which can convert sizes automatically. The team doing the revival of LBSC's *Ayesha*



The rather sad paddle steamer *Ryde* on the Isle of Wight (Photo: Richard Deal).

design decided to use imperial units because that was what the original drawings used. No doubt many readers will have their own views.

North Norfolk MEC has sent photographs of their new station canopy which looks very fine indeed.

The newsletter of Nottingham SME has the address of a website which will be of interest to many readers. The site is aimed at those with mini lathes but will be of interest to others. It can be found at www.gadgetbuilder.com/index.html and contains details for the construction of a multitude of gadgets for use with lathes.

The lawnmower at Reading SME has been given a new lease of life with the donation of a replacement engine by Dave Cole

which was installed by John Withers. In the club house, the water heaters in the lobby and toilet have been replaced. Work on the smaller gauge layouts is continuing with point motors being installed on the small '00' gauge layout and remedial work taking place on the '0' gauge layout "Lydford Road".

Ron Leach of the Romney Marsh MES must be the envy of many after his family arranged a

cab ride on the *Eurostar* through the channel tunnel to Paris. This was in honour of his 80th birthday and in addition Ron was able to record the trip with the digital camera he received as a birthday present (he had spent the previous evening reading the instructions). May we add our congratulations to Ron on this milestone.

Derek Brown, Chairman of Stamford MES, has a useful

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.

Len Baines
Red Garlough
Bob Savory

St. Albans DMES
Bay Area Engine Modellers
West Wilts SME

- 5 Canvey R&MEC. Evening Running. Contact Brian Baker: 01702-512752.
- 5 Maidstone MES (UK). Evening Run & Barbecue. Contact Martin Parham: 01622-630298.
- 5 North London SME. Locomotive Section Entertains at Colney Heath plus Barbecue. Contact David Harris: 01707-326518.
- 5 Portsmouth MES. General Meeting. Contact John Warren: 023-9259-5354.
- 5 Rochdale SMEE. Meeting. Contact Mike Foster: 01706-360849.
- 5 Romford MEC. Competition Night. Contact Colin Hunt: 01708-709302.
- 6/7 Dockland & E. London MES. Public Running. Contact P. M. Jonas: 01708-228510.
- 6 Guernsey Model Engineering Society. Track Day. Contact Dave Simon: 01481-251017.
- 6 Ickenham DSME. Public Running. Contact David Sexton: 01895-630125.
- 6/7 Leeds SMEE. August Rally. Contact Colin Abrey: 01132-649630.
- 6 Romford MEC. Trackside Afternoon. Contact Colin Hunt: 01708-709302.
- 6 Sutton MEC. Hosts to Gauge 1 Association. Contact Bob Wood: 0208-641-6258.
- 7 Bournemouth DSME. Nicki Merrifield: Hardanger demo. Contact Dave Fynn: 01202-474599.
- 7 Bristol SMEE. Public Running. Contact Trevor Chambers: 0145-441-5085.
- 7 Canterbury DMES (UK). Public Running Day. Contact Mrs P. Barker: 01227-273357.
- 7 Cardiff MES. Steam-Up and Family Day. Contact Trevor Jenkins: 029-2075-5568.
- 7 Frimley & Ascot LC. Public Running. Contact Bob Dowman: 01252-835042.
- 7 Guildford MES. Driver Training Day. Contact Dave Longhurst: 01428-605424.
- 7 Hull DSME. Dove House Running Day. Contact Tony Finn: 01482-898434.
- 7 Leighton Buzzard NG Rly. Family Fun Day. Enquiries: 01525-373888.
- 7 Malden DSME. Public Running. Contact John Mottram: 01483-473786.
- 7 National 2 1/2in. Gauge Ass'n. Locomotive Rally at Fyde SME. Contact Clive Young: 01233-628455.
- 7 Northampton SME. Public Running Day. Contact Pete Jarman: 01234-708501 (eve).
- 7 Oxford (City of) SME. Public Running. Contact Chris Kelland: 01235-770836.
- 7 Plymouth MSLs. Public Running. Contact John Brooker: 01752-671722.
- 7 South Durham SME. Running Day. Contact B. Owens: 01325-721503.
- 7 Taunton ME. Public Running. Contact Don Martin: 01460-63162.
- 7 Guild of Model Wheelwrights. Bewdley Horse Event. Contact Biddy Hepper: 01492-623274.
- 7 Westland & Yeovil DMES. Public Running. Contact Gerald Martyn: 01935-434126.

- 7 Wimborne DSME. Public Running. Contact Eric Basire: 01202-897158.
- 8 Bedford MES. Bits & Pieces. Contact Ted Jolliffe: 01234-327791.
- 8 Melton Mowbray DMES. Evening Steam-Up. Contact Phil Tansley: 0116-2673646.
- 8 Saffron Walden DSME. Club Night. Contact Jack Setterfield: 01843-596822.
- 10 Frimley & Ascot LC. Public Running. Contact Bob Dowman: 01252-835042.
- 10 High Wycombe MEC. Evening at Track. Contact Eric Stevens: 01494-438761.
- 10 Norwich DSME. Barbecue at Eaton Park. Contact Paul Reed: 01603-462925.
- 10 St. Albans DMES. Club Night. Contact Roy Verden: 01923-220590.
- 11 N. W. Leicester SME. Fish & Chip Supper. Contact John Elliott: 01455-847040.
- 11 Rugby MES. Visit to Lutterworth Railway Society. Contact David Eadon: 01788-576956.
- 11 Sutton MEC. Unfinished Projects. Contact Bob Wood: 0208-641-6258.
- 11 Wimborne DSME. Hamfest Day. Contact Eric Basire: 01202-897158.
- 11 Worthing DSME. Bits & Pieces. Contact Bob Phillips: 01903-243018.
- 12/13 Frimley & Ascot LC. Open Days. Contact Bob Dowman: 01252-835042.
- 13 Bromsgrove SME. Open Day. Contact Brian Mould: 0121-453-5733.
- 13/14 Guildford MES. OMLEC. Contact Dave Longhurst: 01428-605424.
- 13 Portsmouth MES. Efficiency & Concours d'Elegance. Contact John Warren: 023-9259-5354.
- 13 Reading SME. Public Running. Contact Brian Joslyn: 01491-873393.
- 14 Bedford MES. Public Running. Contact Ted Jolliffe: 01234-327791.
- 14 Harlington LS. Public Running. Contact Peter Tarrant: 01895-851168.
- 14 Hereford SME. Public Running. Contact Richard Donovan: 01432-760881.
- 14 Hollycombe Steam & Woodland Garden Society. Children's Day. Enquiries: 01428-724900.
- 14 Hornsby ME. Running Day. Contact Ted Gray: 9484-7583.
- 14 Plymouth MSLs. Members' Day. Contact John Brooker: 01752-671722.
- 14 Saffron Walden DSME. Running Day (public running after 2pm). Contact Jack Setterfield: 01843-596822.
- 14 St. Albans DMES. Club Running. Contact Roy Verden: 01923-220590.
- 14 Sutton MEC. Track Day. Contact Bob Wood: 0208-641-6258.
- 14 Westland & Yeovil DMES. Track Running Day. Contact Gerald Martyn: 01935-434126.
- 14 York City & DSME. Running Day. Contact Pat Martindale: 01262-676291.
- 15 Model Steam Road Vehicle Soc. Roy McLellan: Full size Engine Owning. Contact Geoff Miles: 01869-247602.
- 15 Peterborough SME. Barbecue & Social Evening. Contact Tony Meek: 01778-345142.



North Norfolk MEC's new station canopy.

notation when recording readings from the feed dials of lathes or milling machines. The notation takes the form 2 + 42 indicating two turns of the handwheel plus a final reading of 42 on the dial. Two unusual items were presented at the April meeting. The first was Mike Smith's variable speed constant torque mechanism which operates on the same principle as a car differential. Two windscreen wiper motors drive the equivalent of the car axles whilst the output is from what would be the propeller shaft. By controlling the speed of the drive motors, the direction and speed of the output can be varied. The second item was John Sharp's compound V-twin steam engine. The cylinder proportions of this own design engine are based on a Fowler engine in the normal configuration. The engine has run on steam and John is now looking into triple expansion engines as his next project.

At the 'Easter Egg Regatta' organised by the St. Albans DMES Malcolm Beak took the prize for the fastest lap, Jim Isaac gained the award for consistency over two laps with Jeff Carter being the runner-up in that category. Congratulations to all three! Jeff Carter has also been wading about with a ruler measuring the water and silt depth in the lake. His conclusion is that if you are building a boat then "provided the distance from the waterline to the base of the keel is no more than twelve inches you should have enough water to float it." Jeff also suggests that the alternative is to bring your own very large bucket of water to top up the lake!

In their latest issue of the journal, the Society of Model & Experimental Engineers has republished its table of wheel standards. With the ever growing number of ground level tracks with point systems it has become more important that those building locomotives follow these standards to ensure that their locomotives will run on such tracks without causing damage to the track or the locomotive.

Vale of Aylesbury MES has completed work on its new steaming bays. Construction on the new bays involved the complete replacement of the concrete covering the area. After trials showed that removing the old slab was more than a Kango hammer job, a hydraulic breaker was hired. Even with this the concrete, which was 12in. thick in places took four weeks to break up. The hydraulic breaker was 5ft. tall which meant that when the shorter (should that be vertically challenged?) members took the tool, the handles appeared to be just under their chin. The new concrete was brought in ready mixed and it took four loads to complete the job. After this it was time for clearing up (several tons of concrete) and bolting down the refurbished steaming bay rails. The society has a new website at www.vames.co.uk which provides full details about the society and its operations.

Member Bill Adams of the West Wilts SME describes his latest clock movement which is for a long case clock. The movement is slightly unconventional in that it is month going (rather than eight day)

and incorporates a perpetual calendar mechanism between the movement and the dial. In Bill's words "So far, to my relief, clock and calendar mechanism have been working reliably for about a couple of months. So now I have to think about making a case for it!!!". The other 'model engineering' project described in the newsletter is the "2Bs Trike" being built by Bryan Banfield using parts from a Ford Sierra Sapphire mounted in a homemade chassis constructed from box section steel.

World News

The Steam Locomotive Society of Victoria garden team have been working hard keeping the grounds looking good in spite of the dry weather. Progress has also been

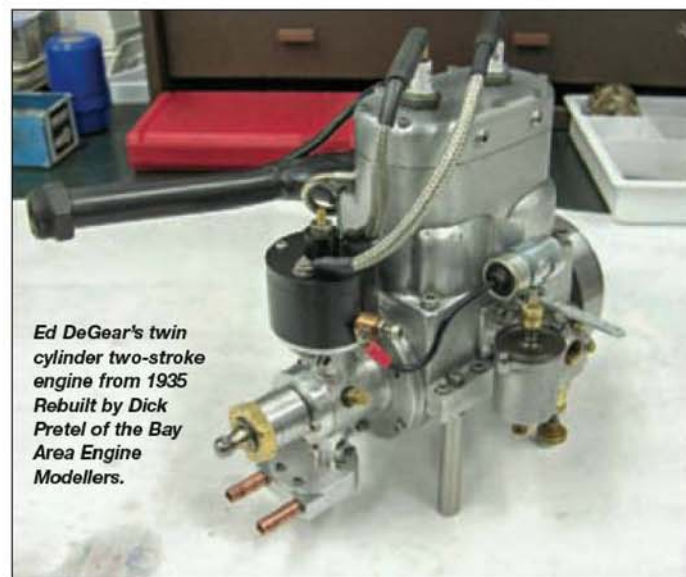
made on the electric locomotive shed and rolling stock maintenance.

Canada

In the latest issue of *The Whistle* the newsletter of the British Columbia SME, Lindsay McDonnell discusses the various types of coal available in Canada for firing locomotives. In Lindsay's view Australian Char is best followed by Welsh anthracite. He is not in favour of oil firing describing it as "noisy, finicky, dirty to breathe and tricky to set up". Propane seems to be the preferred method of firing for society members. The working parties have been busy with progress made on the work shop renovations, the north portal of the tunnel and the passenger loading canopy.

United States

The elder statesman of Bay Area Engine Modellers is Ed DeGear, 89. In 1935 Ed built a twin cylinder two-stroke engine for a tethered hydroplane that achieved speeds in the high 60s (mph). The engine is water-cooled, 1 1/4in. bore and 1 1/8in. stroke, with a displacement of 50cc. Ed carried out the design work, patterns, castings, and machining. He later fitted the engine to a 5ft. long cabin cruiser named *Margie* that ran above its scale speed. The engine and hull are being restored as a historical project for the San Francisco Model Yacht Club. BAEM member Dick Pretel is restoring the engine so it can be reinstalled in *Margie*. Ed's magneto no longer worked so Dick has changed to battery-coil ignition and made a distributor which incorporates an adjustment for the point dwell.



Ed DeGear's twin cylinder two-stroke engine from 1935
Rebuilt by Dick Pretel of the Bay Area Engine Modellers.

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3 Harrison LSA lathes and 2 Boffords plus workshop tooling coming in soon, Ex Grammar School	
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Wadkin Universal Cutter Grinder Type N.H. with lots of tooling	£1,500
Harrison LS Lathe Gap Bed with Tooling	£800
2 x Viceroy Sharp Edge Grinders 1 as new	£250
3 x Harrison LS lathes tooled	£700 each
Orimston drill floor stand with tapping plus x-y compound table.	£850
Colchester chipmaster single phase 6"x20".	£500
Colchester master straight bed lathe with clutch. Has electrical fault.	£600

MISCELLANEOUS

Abwood vert-spindle surface grinder 18"x6" mag chuck, hand operated, little used	£500
Bridgeport milling head, 2 speed motor R8 power quill (fits most mills, ie Adcock & Shipley 1E5)	£850
Edipex magnetic chuck 19" x 12"	£300
Colchester Chipmaster lathe (breaking)	£350
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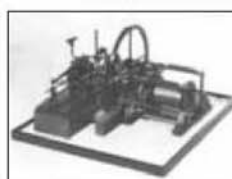


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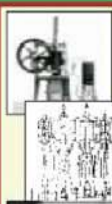
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Myford Super 7B lathe complete with gearbox, power cross feed, 3 jaw chuck and tooling, cabinet stand, almost spotless!



We have a good selection of bench vices from £12.50 including the Record No.23 at £75 each



£1225

BCA Jig borer/milling/drilling machine complete with collets & cabinet stand



£2250

Colchester Chipmaster 5" x 20", a very nice example with dual dials



£625

RJH 4" lisher complete on dust extractor cabinet



£375

Wellsaw 4" hacksaw (240 volts)



£499

Harrison M250 / late bantam only capstan attachment as new



£345

Rishton buffer (The best buffer in its class)



£345

Rishton quality bench grinder



£3950 Now special £2950

Asquith 14-54 001 Mk.2 5MT radial drilling machine



A selection of lathe steadies we currently have from £30



£1650

Harrison milling machine complete with vertical 30 INT & powered table



£1225

Henry Mills 6 1/2" x 48" geared head, gearbox and gap bed + tooling just in off the lorry



Choice £2950-£3450

Tom Senior 'E' Type vertical milling machine



£2450

Boxford 1130, 5 1/2" x 30"



£1250

Boxford CUD Mk III centre lathe 5" x 22" in very nice order



£2250

Ajax turret milling machine in very good order with powered table just in



£1725

Tom Senior M1 milling machine in very nice order



£2950

Colchester Student 1500rpm gap bed precision lathe complete with taper turning, 3 & 4 jaw chucks, full screwcutting gearbox



Harrison M250 lathe complete with 3 and 4 jaw chucks, extra gears, with the high 2000rpm top speed almost as new



£3950



£150 Each

Crompton Parkinson Motors NEW 3/4HP Ideal for Myford & Boxfords etc.



£475

RJH Swordfish universal saw complete with dust extractor



£345

Flamefast DS130 ceramic chip force, 240 volts, natural gas



£645

Lorch precision lathe complete with collets



£345

Mikron 79 gear cutter



£425

Barber and Coleman (USA) gear cutter



£1400

Raglan 5" x 24" lathe complete with gearbox, variable speed & power cross feed



£425

Houser multi spindle cutter



£345

Safag gear cutter



PLEASE PHONE 020 8300 9070 TO CHECK AVAILABILITY OR TO OBTAIN OUR LIST
DISTANCE NO PROBLEM!! DEFINITELY WORTH A VISIT ALL PRICES EXCLUSIVE OF V.A.T.

We also have a massive range of small tooling far too much to list!!

Just A Small Selection Of Our Current Stock Photographed!!

626 TURRET MILL | SUPER LUX MILLING MACHINE | 836 TURRET MILL

"WE'VE GOT YOUR WORKSHOP COVERED"

626 TURRET MILL

PRICE: £1299.00 INC VAT (WITH OPTIONAL POWERFEED: £1425.00 INC VAT)

FREE DELIVERY UK MAINLAND

FEATURES

METRIC AND IMPERIAL MACHINES
MT3 OR R8 SPINDLE
HEAD SWIVELS 90 DEGREES
HEAD TILTS 45 DEGREES
ONE SHOT LUBRICATION SYSTEM
INTERLOCKED SPINDLE GUARD

STANDARD ACCESSORIES

MACHINE WORK LIGHT
MACHINE STAND
GUARD
DRAWBAR
MANUAL & PARTS LIST

SPECIFICATIONS

DRILLING CAPACITY	32MM
END MILLING CAPACITY	25MM
FACE MILLING CAPACITY	75MM
TABLE SIZE	156X745MM
MOTOR	1 1/2 HP
SUPPLY	240V OR 415V
NET WEIGHT	410KGS

SUPER LUX MILLING MACHINE

PRICE: £1500.00 INC VAT

FREE DELIVERY UK MAINLAND

FEATURES

POWERED HEAD ELEVATION
CAST IRON STAND
ANGLE TILTING HEAD
WIDE SPEED RANGE

STANDARD ACCESSORIES

DRILL CHUCK & ARBOR
MILLING DRAWBAR
GUARD
MANUAL & PARTS LIST
CAST IRON STAND

SPECIFICATIONS

DRILLING CAPACITY	32MM
END MILLING CAPACITY	25MM
FACE MILLING CAPACITY	75MM
TABLE SIZE	240X800MM
MOTOR	1 1/2 HP
POWER	240V
NET WEIGHT	600KGS



626



SUPER
LUX

836 TURRET MILLING MACHINE

PRICE: £2995.00 INC VAT (DELIVERY COST BY QUOTATION)

STANDARD ACCESSORIES

HALOGEN WORKLIGHT
ONE SHOT LUBRICATION
COOLANT SYSTEM
TOOL KIT
MANUAL & PARTS LIST
MACHINE TRAY
LONGITUDINAL POWER FEED

SPECIFICATIONS

SPINDLE TAPER	R8
SIZE OF TABLE	200X910MM
'T' SLOT SIZE	16MM
MOTOR	1 1/2 HP
POWER SUPPLY	415V OR 240V
NET WEIGHT	670KGS



836

CONTACT DETAILS

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