MODEL ENGINEER

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Taunton Model Engineers Exhibition

1-2 April

Heathfield Community School Monkton Heathfield

RICH ON BOILERS

TANGYES ENGINES

SHILDON MUSEUM

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EDITORIAL:
Editor David Carpenter (01689-899255)
Technical Editor Neil Read
(01604-833670)
Production Editor Kelvin Barber
Associate Editor Malcolm Stride
Technical Consultants Mike Chrisp, Stan Bray, J. Malcolm Wild FBHI,
Editorial Administrator (01689-899222)
PRODUCTION:
Design Carol Philpott
SALES & MARKETING:
Group Sales Manager Colin Taylor
(01689-889249)
CIRCULATION:
Non-newstrade Distribution
Mike Reynolds-Jones (0121-788-3112)
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Divisional Publisher Jez Walters
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On the cover ...

One of the show stealers at the 75th Model Engineer Exhibition at Sandown Park was the 1:3 scale model of his own 1934 Morgan Super Sports three-wheeler, made by Graham Dean of Wylye in Wiltshire. Judges were suitably impressed with the excellent sheet metalwork on the body, requiring top level craftsmanship. It has top notch paintwork to match. Detailing on the chassis components, plus good work on the dashboard and instruments all add to make this an outstanding model.

(Photograph by Neil Read)

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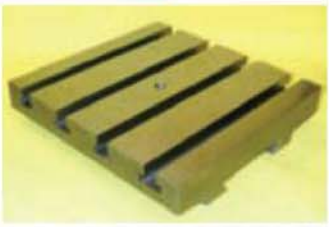

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SMOKE RINGS
With the Editors

Beginners, please

In response to our item about 'newcomers' in Vol. 196 No. 4267, 17 February 2006, Peter J Brown has written to remind us about the training provided by the Society of Model & Experimental Engineers. Peter is one of 16 students just completing the SMEE Basic Training for Model Engineers Part II course, '*Building an Engine and Boiler*', which has been running once a month since September.

This course is based on a project to build a Polly steam engine, designed by Tubal Cain. At each session, there are practical demonstrations of the various skills needed such as bending and folding brass and copper; silver brazing; soldering; milling BMS, painting and fault finding. After each session students can put the new skills to practice to complete the model.

Peter reports a relaxed atmosphere, with teaching taking place in an informal but structured manner, with useful inputs from students as well as instructors. Just the job for budding model engineers that never served an apprenticeship.

The next SMEE (Part I) course begins shortly, on April 15, which deals with basic training. Part II, building the model engine and boiler, begins in September.

All training sessions are held at the SMEE headquarters in London. For details and an application form please contact:

Society of Model & Experimental Engineers
28 Wanless Road
London SE24 0HW

Join the Greenwood celebration

This year, Greenwood Tools is celebrating its 20th birthday. To celebrate, the firm has 20 Dormer handbooks to give to readers of *Model Engineer*. And one lucky person will receive a Dormer drill set worth well over £100.

To win one of these prizes just answer the following tricky question correctly:

Greenwood Tools started up on July 1, 1986. What was the number one single in the UK charts that same day. Was it:

(a) *Papa's got a brand new lathe* – James Brown
(b) *Papa loved model engineering* – Garth Brooks
(c) *Papa don't preach* – Madonna

Email your details and your answer to greenwtool@aol.com with 'M.E. competition' as the subject, or post to:

M.E. Competition
Greenwood Tools Ltd,
Middlefield Road
Bromsgrove B60 2PW

Winning entries will be drawn on 28 April.

Start and finish

This issue sees the final part of John Edwards' series on ornamental turning. Not strictly model engineering, but always a source of fascination at the Model Engineer Exhibition, and looking at the work of ornamental turners is an inspiration for just what can be done with a lathe.

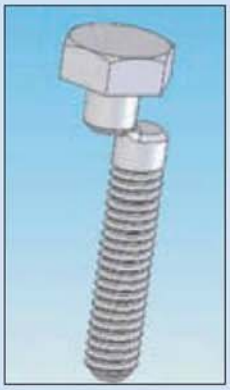
We also see the start of a short series on Tangyes Engines by David Piddington, well-known model engineer, formerly with Reeves & Co, and long time Tangyes fan.

And Peter Rich begins his short series on how to design and make locomotive boilers. Basis for his work is the Australian Code, and we hope to publish some extracts from that later.

Gorgon offset

Ian Hiscocks of Bordon has written to tell us that his interest in model engineering has been rekindled, and has been been eyeing various models and plans for an engine that shows what he describes as a *symphony of motion*. He started modelling *M.E.* drawings into 3D CAD to see the various parts, their interaction and movement. Most are aware that there is no such thing as the perfect drawing, and looking at the Gorgon Steam Ship Engine, which is currently being featured, he has begun to model it issue by issue, and has spotted a slight discrepancy between the mounting holes for the Ground Plate (28mmSQ) and the Base Plate (30mmSQ).

We hope that most who are building the engine will have spotted this, but if not, with fond memories of those cartoons that use to be circulated when we were apprentices, one came to into Ian's mind, *Bolts for all Shapes and Sizes*. With SLA and SLS it is now possible to produce these bolts with the skills sets of most model engineers. So for the adventurous, we reproduce Ian's illustrations for the offset bolt for use with mismatched holes (not easy to fit this one), and the offset stud (possible, fun, but possible).

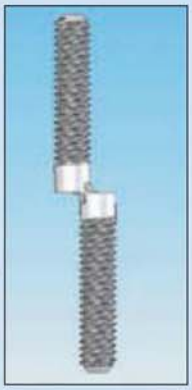


Offset bolt

For those that have made the parts and found the error too late, their options are:

1: Re-make the Ground Plate with dimensions adjusted to suit.
2: Fill and Re drill the holes in the Base Plate to suit.
3: Slot the holes in the Base Plate to fit.
4: produce four of the offset studs with an off set of 1.41mm and lengths to suit.

Meanwhile, to relieve the stress, perhaps Ian could dig out those old cartoons. Maybe someone else has them?



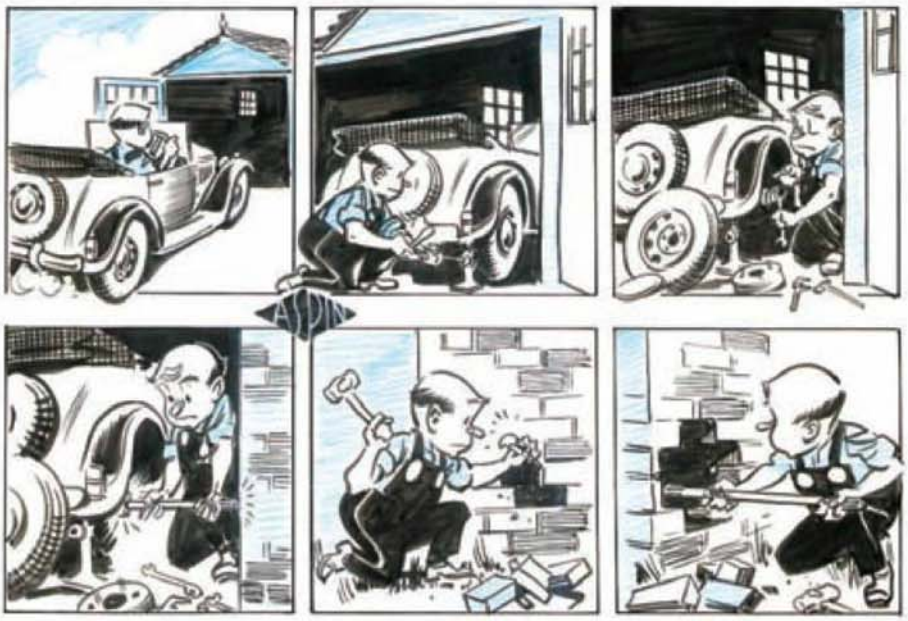
Offset stud

More nonsense

We thought that after *Model Engineer* had joined the Encanta Media stable, that we could look forward to a much quieter time, free from daft rumours. Not so. Some are continuing. Still wrong. Still daft.

Let's not waste space on them. However, we must point out that we are still looking forward to the Model Engineer Exhibition this year, and that it has never been in doubt.

CHUCK, the MUDDLE ENGINEER — by B. TERRY ASPIN



POST BAG

Printing lathe

SIRS, - In response to the request from Tony Webster (*M.E.* 4261, 25 November 2005) for information on printing techniques in the last century, I offer the following which may be of assistance.

Several years ago I purchased, from the editor of our local newspaper, an unusual lathe, which he had been using for wood turning. Fortunately, it came with the original instructions and parts manual, which was invaluable in fathoming out what its intended use was. As it turned out, I had purchased a 'Colour Photo Etching Lathe' built in The United States specifically for the printing trade.

The lathe is a substantial, metal turning type, with a bed approximately one metre long on a cabinet stand. The stand originally contained the V-belt electric drive motor and a standard 'Hi-Fi' valve type amplifier unit.

My understanding of the way it was set up is as follows:- The headstock spindle was connected to a shaft with two cylindrical drums mounted in tandem and rotated at centre height on central and end bearings fixed to the bed. The leadscrew is cut half with a left-hand thread and half right-hand, each half driving an apron saddle towards or away from each other along the bed. Each saddle has a cross-slide, one mounted with a photo electric cell reading head and the other with an electro magnetic etching or cutting head. These were positioned close to the rear of the cylinders on the shaft and connected to the input and output sides of the amplifier respectively.

In use, a paper master drawing or photograph was fixed facing outwards to one cylinder and the reading head positioned appropriately. To the other cylinder was fixed the printer's plate for etching with the cutter head again positioned. The lathe was set spinning and the light and dark areas on the picture, as detected by the photo cell, were amplified before being transmitted to the cutting head, which responded by moving out and in to the appropriate depth of cut, mimicking the hand etcher. The leadscrew advanced both heads simultaneously until the picture was copied in reverse, hence the opposite handed threads. An automatic stop switch was activated to prevent over run. On completion of the copying task the plate was removed and used by the printer in the same manner as a hand etched plate. For colour printing, a series of plates, one for each colour, would be prepared and printed off in primary colour passes as necessary.

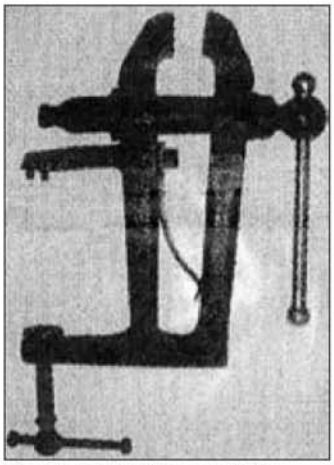
The speed of the leadscrew could be adjusted in the same way as for screw cutting and dictated the pitch and hence density of the engraving. On the coarser settings, vertical lines show on the finished printing. If you look carefully at the enclosed photocopies (*one shown, others not suitable for reproduction - Ed.*), this can be seen quite clearly on the photographs of the lathe. The copy is an extract from the manual. There is no indication of when it was first introduced or invented but the date on the bottom of other pages suggests 1961 for the manufacture of this equipment.

As you may have gathered, the example in my possession is incomplete but the missing bits could be made up from the illustrations in the parts manual. My intention was to use it for woodturning, but lack of spare time has left it untouched under wraps in the garage. I am sure this last statement is familiar to lots of your readers!

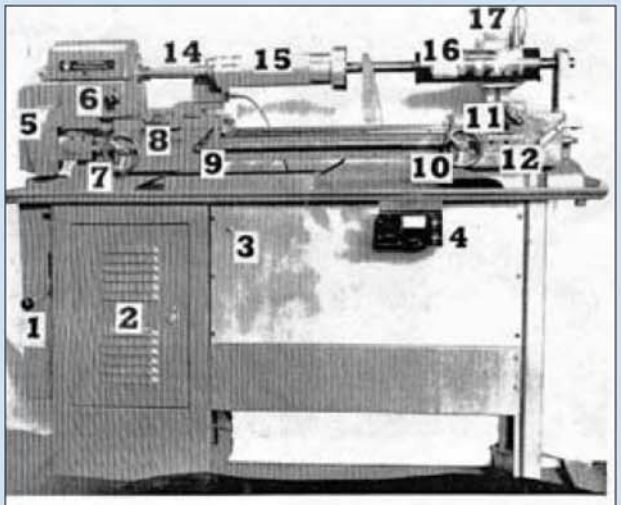
This process may be a little late for dating steam engine prints in books, but I am sure this unusual use of the lathe should interest those who are not familiar with it. Should Tony Webster, or anybody else, wish further information, or a copy of the manual, I would be only too pleased to oblige.

May I also take this opportunity to thank you and your team for producing the most enjoyable, interesting and varied magazine of its type.

Keith Blundell, Angus.



The type of leg vice sought by Mr. Wells.



Mr. Blundell's unusual etching lathe from the printing industry.

Do you have any vices?

SIRS, - The accompanying picture (below left) shows a leg type bench vice recently sold by G&M Tools. As such vices seem to be available to H.M. Armed Forces, does any reader know where I could purchase such a vice? All expenses would be refunded.

Please be patient for an answer as I am shortly due back in the Middle East.

James C. Wells, London.

Litter from the skies

SIRS, - I do hope that I am not alone in being appalled at the thought of P. Phipps (*M.E. 4264*, 6 January 2006) casting leaflets to the wind from a burst balloon at altitude. Is there not enough litter in our streets and countryside at the moment without adding to it? Surely a more environmentally responsible way could be found of distributing these leaflets.

David Hall, Warwick.

Time to count blessings

SIRS, - The end of the old year and the beginning of the new always provide me with an opportunity to reflect on the pleasant events I have experienced in the past year. 'Buggsie Price', my Biology teacher at Stow Hill School, instilled in me the importance of remembering the nice people who make life rewarding.

This year was no exception and as the warm glow of Christmas pudding, liberally covered in brandy butter, lubricated my little grey cells and my mind perambulated.

My regular reading of the *Model Engineer* featured in many of my thoughts. The manifold nature of the blessings I have received must begin with the editorial staff at *M.E.* the publishers and the continuum of high quality articles.

Closely coupled in my thoughts are the long suffering staff at W. H. Smith who always find the latest copy when my eyes fail me.

After 25 years of good service, I replaced my IXL lathe with a new machine from Engineers Tool Room, based in the Rhondda. Not only was the new lathe delivered to my home by Reg; but he placed it in my workshop ready to be assembled. The long, gravel drive down which the heavy machine had to be transported proved no obstacle. The whole operation was carried out with consummate skill and good heart!

The staff at Chronos Engineering Supplies provided me with my next 'glow of satisfaction'. The purchase and delivery of a new dividing head, to replace one stolen ten years ago, had to fit into the calendar of one of my research travels. They were marvellous! The equipment arrived on the day they promised and I was able to use it within hours of receipt.

The *M.E.* has provided me with many opportunities to make others

happy, over the years. Particularly when I was an apprentice fitter and turner at British Aluminium; I constructed many small stationary steam engines from the designs given in the magazine. Once tested, they were given to the younger members of the family and friends' children. One turned up in a saleroom in Cardiff recently and sold for £35, well done *M.E.*!

In July, in the opulence of the *QE2* and in the middle of the Bay of Biscay, I read, with a degree of nostalgia, Roger Backhouse's superb article on the Newport Transporter Bridge. During the War, my sister used to push the pram, with my brother and me in it, from our home in Lliswerry over the bridge to our grandparents in Baldwin Street. We had to pass the anti-aircraft gun batteries on both sides of the bridge. Many times our hands were filled with sweets by the 'Gunners' when my sister told them our dad was in the army in Italy.

Over the years I have never ceased to marvel at the excellence of Peter Rich's locomotive drawings. The detail in them is so clear and concise. Now that I am retired; I am determined that a GWR locomotive will steam in our back yard!

Peter has made many references to his old haunt, Ebbw Junction Sheds. I wonder if he remembers our school visit to the Eastleigh Railway Works in 1957. We travelled under the supervision of 'Geogger Reece' from Newport via Reading and onto the Eastleigh Works. There were no Health and Safety Officers around and we saw everything; casting, welding, spring forming, boiler making, wheel turning and the newly painted 4-4-0 standing outside ready to go back into service. The highlight, for me, was to have a quart mug of tea in the works canteen!

I count my blessings for marrying a girl who is just as mad about trains as I. September saw us riding on the Maine Narrow Gauge Railroad at Fore Street, Portland Maine, USA. We were treated royally by the Train Engineers: - Pete Sawyer, Ron Cole, Sam and George. The museum was full of top quality exhibits. Both inside and out there was so much to see. The staff had time for their visitors and their knowledge of the railway past and present was full of anecdotal references.

My year has ended on a high because of another advertiser in the *M.E.* The grey cells needed exercising and there is no finer way of achieving that than by reading a good book. Once again they had to be delivered within a space on my research programme. Angela, at Camden Miniature Steam Services achieved the impossible and my order arrived in time and before I departed on my travels.

Mr. Biology Price was right; it is good to count the blessing of being in the company of nice people. I hope it is not too late to wish a Happy New Year to you all!

Prof. Raymond Williams, Newport.

Grinder belts

SIRS, - In reply to N. Dakers' search for grinder belts (*M.E.* 4264 6 January 2006) the original Duplex business is now owned by Jena (tel: 01623-726010) who have some belts and need to know the age etc. Chester UK also have a grinder in their brochure and may have belts.

Failing the above Daval Stock Gears, Welham Green, Hatfield, Herts AL9 7JB. Tel: 01707-283131, also list metric flat belts.

F. Wetton, Derbyshire.

Chinese lathes

SIRS, - I am an intermittent buyer of *Model Engineer* (sorry) and have just read Anthony Mount's comments on the fact that there is no such thing as a perfect lathe and how right he is (*M.E.* 4264, 6 January 2006)

First, why is it that nearly every lathe in the current market has the saddle traverser handle on the left helping to fill your hand with sharp and possibly hot swarf. Is it cost or poor design or both?

Now we have electronic speed control, sounds good and I bought one only to find that in very cold conditions it would not work properly. I noticed later that on the front cover of the manual it actually stated in very small print that this could happen but no warning was given at time of sale. Does this apply to the milling machines also?

I have now discovered that electronic scales can suffer from the same fate. Why? Can a brain box out there explain why, my friendly electronic guru cannot understand why.

The other gripe I have is tailstocks and the primitive clamping system of spanner on a nut on the operator side where the lathe top slide and saddle are more often in the way, an alternative is easy enough and need not cost any more after all we are in 2006 not 1906.

D. R. Evans, Berkshire.

The unidentified lathe owned by Mr. Atkins.

More Chinese lathes

SIRS, - I have found the letters and articles about the merits and faults of cheap lathes from China very interesting, especially Anthony Mount's letter (*M.E.* 4264 6 January 2006). In the 1950s we all faced exactly the same dilemma as purchasers do now. The holy grail of small lathes was and apparently still is the Myford and many people believe that they have to acquire one or they will never produce good work.

In the 1950s there were many cheap lathes for sale such as Zyto, Gamage, Perfecto, Portass etc. They were all poor cousins of the ML7, however they cost a third of the price of a Myford and thus got people started. Many people, beginners, experienced and skilled, used such cheap lathes and produced wonderful work.

A similar situation applies nowadays with cheap lathes from China, they may not be quite as good as a Myford but they are considerably cheaper and certainly better than the cheap lathes available in the past.

There seems to be two problems with some Chinese lathes. The drive belts are often awkwardly arranged and thus discourage changing spindle speeds. The bottom speeds of around 100 - 150rpm preclude screw cutting to all but those having lightning sharp reactions. The importers frequently stress how they influence the design of these products; I find that hard to believe when simple things such as belt changing and low speeds have not been addressed over the past 20 years. Perhaps changes are now beginning to occur with many machines now being offered with variable speed controls.

Ian Castle, Suffolk.

Mystery lathe

SIRS, - I thought to write just a few lines and send a photograph of my lathe (seen above) which is the brother of the one owned by Mr. Johnson of Yorkshire (*M.E.* 4264, 6 January 2006). I am also mystified as to the origins of the lathe which has also been used to produce two engines.

B. F. Atkins, Northumberland.

Mystery solved

SIRS, - I read that Mick Johnson is trying to identify a lathe (*M.E.* 4264, 6 January 2006). My father owned a similar lathe in the late 1940s which was either a Gamage or a Buck and Ryan machine. The cover of *M.E.* 1917, 3 February 1938 shows the Gamage which at £6-10s was two weeks wages for my father who was a keen model engineer.

T. W. Bridgeland, Sussex.

The Gamage lathe advertisement sent in by Mr. Bridgeland.

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The Editor, *Model Engineer*,
Berwick House, 8-10 Knoll Rise, Orpington, Kent, BR6 0EL; fax: 01689-886666
or to **david.carpenter@encanta.co.uk**
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Brian Simpson's horse ambulance was modelled on a type used during World War I.

A delightful model of the Albion expanding horse hay rake from the workshop of Brian Young.

COMPETITION MODELS AT THE 75th MODEL ENGINEER EXHIBITION

Class G1: MODEL HORSE DRAWN VEHICLES

Reported by Neil Read

There were only two entries in this class this year but both were fine examples of the type. The first entry was of a Royal Army Veterinary Corps horse ambulance Mk.II by Brian Simpson. Horses were a valuable commodity in times of war as they provided transport for both supplies and troops. Also, during battles, horses did not fall down and get up again like they do in the cinema but were killed and wounded just like the men who rode them. The horse ambulance was designed to get sick or wounded animals back behind the lines for proper veterinary attention.

Mr. Simpson's 1:8 scale model was presented with a suitable model driver and also a model of a sick horse. The stance of the later had been carefully executed to represent an animal in distress. A more lively relative of the sick horse was shown between the shafts pulling the ambulance along and the whole model was mounted on a suitable base. The necessary fittings to support the sick horse during transit were provided and the whole was finished in the traditional matt khaki finish appropriate for a vehicle on active military service. The judges deemed Mr. Simpson's model worthy of a Silver Medal.

Regular exhibitor Brian Young can always be relied upon to present a model of an interesting agricultural implement and this year was no exception. The model presented was that of Albion expanding horse rake in 1:12 scale. Drawing on what little knowledge of agriculture I possess, I am not sure that the horse drawn rake has a modern day equivalent. These days hay is cut so that it falls into neat rows, turned periodically to aid the drying but kept in neat rows and finally baled up for transport and storage. Drawing the crop together for bulk transport is no longer an issue so the rake is no

Draughty and lacking in weather protection perhaps but the Morgan 3-wheeler of the 1930s did not lack style or a sporting pedigree.

The well detailed cockpit of Graham Dean's Morgan Super Sports.

longer required. Models of this type therefore evoke the practices of a past age. As is usual with Brian's models this one was well researched and executed and the judges awarded it a Bronze Medal.

Class K1
NON-WORKING VEHICLES
Reported by Geoff Sheppard

There was but one entry in this class this year, but it proved to be an outstanding item. Graham Dean of Wylye in Wiltshire owns a 1934 Morgan Super Sports 3-wheeler and decided that he would model it in 1:3 scale. The first feature of the miniature version to strike one is the high quality sheet metal work on the body, the large areas of which need a high degree of craftsmanship to get right. Combined with an excellent paint finish in the colour of the prototype, the result is entirely convincing. Finely detailed chassis and suspension components plus a good dash and instruments capture the atmosphere of the original and would help the model hold its own in a *Concours d'Elegance.*

Unfortunately, there are still a few items to be added, such as lights, the radiator badge and the windscreen wiper, so vital marks were lost during judging. Nevertheless, the quality of the model as presented was such that a Silver Medal was awarded.

Class L1
SCALE FLYING MODELS TO ANY SCALE FOR RADIO CONTROL
Reported by Neil Read

Two entries were received for this class both from the Hawker 'stable'. The first was of a Hawker *Fury* biplane to a scale of 1:6 by Kenneth Mills. This model was built to represent the aircraft flown by the 'C' flight commander of No.1 (F) squadron at Tangmere circa 1933. The main construction is of balsa wood and plywood with Nylon and Solatex covering. Power is provided by a Lazer 120 4-stoke engine. The model was awarded a Bronze Medal.

The second entry was of an EDF Hawker *Hunter* in 1:20 scale by Peter Morris. This was also of traditional balsa wood construction and utilises a kit built, electric ducted fan motor and bungee assisted launch. This model was deemed worthy of a Highly Commended Certificate by the judges.

Class L3
SCALE NON-FLYING MODELS IN ANY MATERIALS KIT OR SCRATCHBUILT
Reported by Neil Read

David Speed's Roland C.11 *Walfisch* of 1916 was the only entry in this class. This is a 1:48 scale model based on a commercially available kit (Eduard Profipack kit 8041) but with hand built detailing in various materials. Mr. Speed's aim was to recreate the machine portrayed in *Windsock Datafile No.49* and considerable modifications were made to the kit achieve this. The model now represents an aircraft from the second production batch and used in occupied France in 1916.

This well detailed little model was awarded a Bronze Medal.

This handsome 1:6 Hawker* Fury *biplane of circa 1933 was built by Kenneth Mills and was awarded a Bronze Medal.

The distinctive and elegant shape of the Hawker Hunter as modelled in 1:20 scale by Peter Morris. The model was Highly Commended.

Sharing display cabinet space with some of the smaller models was the Roland C.11* Walfisch *in 1:48 scale by David Speed.

PETE'S PAGE

SPINDLE MOUNTED MILLING CUTTERS

Peter Spenlove-Spenlove addresses some remarks to those new to the process of milling.

●*Part II continued from page 279 (M.E. 4268, 3 March 2006)*

All cutters of the type mentioned can be reground. This should be done as soon as the tool starts to lose its edge, as it is false economy to machine with a blunt cutter. Because of the precise geometric shape needed for efficient cutting, sharpening must be done on a special grinding machine known as a tool and cutter grinder. Some engineering works employ someone full time to carry out tool and cutter grinding work on site and be responsible for the upkeep of the tooling. Others will batch up the blunt cutters and send them out to a specialist company. If the cutters are ground on the flutes it will be obvious that they will come back slightly smaller and this must be allowed for in your machine set-ups.

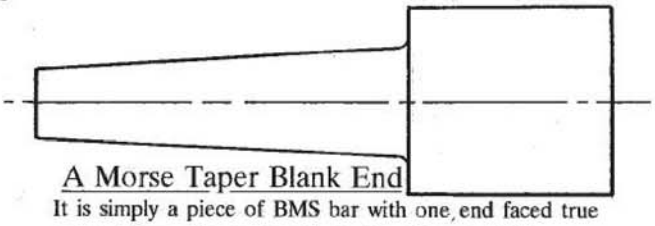
Regular readers of *Model Engineer* and *Model Engineer's Workshop* will often see references to home built cutter-grinding equipment. Most model exhibitions include several versions made by model engineers to their own designs or to one of the published ones. Before long, newcomers to model engineering will see the words 'Quorn' tool and cutter grinder. This machine was designed by the late Professor Chaddock who named the machine after the village where he made his home. The construction of this versatile piece of equipment was serialized in *Model Engineer* (commencing in the issue for 4 January 1974 and running to that for 14 August 1974) and drawings and castings are still available. The information has also been published in book form. A handbook, electric motor and the necessary grinding wheels are all available in the full kit of materials. While of lightweight construction it is perfectly capable of re-sharpening most of the cutters we are likely to use. Almost every Model Engineering Exhibition has one on show, often installed on a fine, fitted cabinet of varnished wood containing a full complement of accessories.

In essence, a cutter grinder is a device to hold a cutter and move its teeth past a revolving grinding wheel in a carefully controlled manner. By careful setting and manipulation of relative positions and movements, it is possible to restore the cutting angles and edges. It is also possible to make alterations to a cutter for a special application. For example, a parallel end mill could be tapered slightly to permit the milling of the upright surfaces of an engine bed with cast on crankshaft bearing pedestals. These surfaces look better if they do not form a right angle to the horizontal surfaces of the base. The gradual accumulation of a variety of reground cutters is an asset as the reduced diameters may prove useful when a standard cutter is either too big and the next lower size is too small.

I have examples of all the cutters shown and they came from the sales trays of surplus tooling at the annual Model Engineer Exhibitions. Assuming that the condition is good, they are just as useful as new cutters and cost a good deal less. When selecting secondhand cutters look for well-known brand names. Measure the shanks to ensure that it is a standard cutter and will fit your chuck collets or cutter holders. Some cutters are produced for special machine set ups and are nonstandard. They may be useful to you but could need special adapters making before they will fit your machine. Such cutters often have number sequences etched on them that will only mean something to the original user. Avoid cutters that are chipped or otherwise damaged unless you have the skill and equipment to sharpen them. As your skill levels increase then you may decide to acquire or make a tool and cutter grinder. This will enable you to sharpen and modify your own cutters. That is why the Quorn tool and cutter grinder was originally designed. The designer needed some special cutters in order to execute a particular task and made a tool to do the job. Hundreds now exist all over the model world.

In Part I of this article I mentioned the Arrand pattern cutter holders with a tapered shank and a single axial hole to take cutters of one particular shank size (fig 1). A grub screw is used to clamp the cutter and sometimes cutter shanks will have a flat ground on them to give a location for the screw. I have drawn a typical flat on a plain shank, die sinker's cutter (fig 4) although such cutters do not usually have flats. Flats are more often found on the production, throwaway after use, cutters. To be successful the hole in these holders must be truly concentric to the tapered shank and the cutter must be a very good fit. A good quality holder will be made of tough steel and hardened and ground. This is so that the cutter does not enlarge the hole during heavy machining operations. If your milling machine spindle taper is the same as that in your lathe then it is possible to make your own cutter holders by boring a true hole in a blank taper shank. The model trade sells Morse taper blanks for this and other purposes (**fig 5**). Before use, the tapered end of the shank will need drilling and tapping to take the draw bar of your choice. Now, fit it up in the lathe and drill an undersize pilot hole. The drill may run out slightly so this should be corrected and the hole brought to size by using a single point boring tool. Continue boring until the cutter is a nice location fit. After boring, drill a hole (smaller in diameter than the cutter shank) all the way through the shank until it breaks through into the draw bar hole. This will prove useful if a cutter sticks and you need to drive it out with a piece of rod. Use a generous sized grub screw with a fine thread for clamping the cutter. Turn the end flat and as large as the flat on the cutter. A fine thread is less likely to work loose. A hexagon socket grub screw is ideal but choose a pattern that has a flat end (or turn the end flat) such that it just fits the flat and locates the cutter axially. Milling cutters have an annoying tendency to 'work out' of their holders under heavy cutting loads and this tip should help prevent that. The geometry of the flats on cutters is usually standard but you may come across one with a nonstandard flat. If so, make another grub

Figure 5



A Morse Taper Blank End

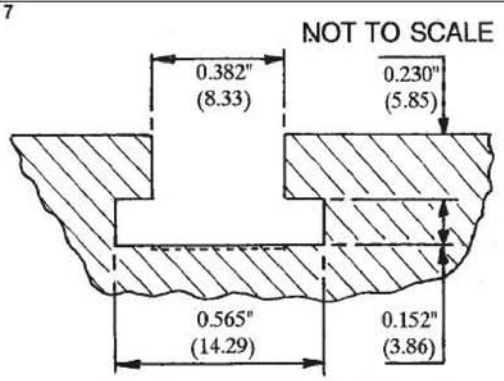
It is simply a piece of BMS bar with one end faced true and a Morse Taper turned on the other end. The user chucks the plain end to drill & tap a drawbar hole if needed. With the taper in the lathe spindle, the plain end is machined true with the taper to hold a cutter.

Figure 6

A ROUGHING END MILL

An End Mill for Heavy Duty Stock Removal on a Rigid Miller with Plenty of Coolant.
The notched flutes break up the swarf into small pieces for the coolant to flush clear of the cutter.

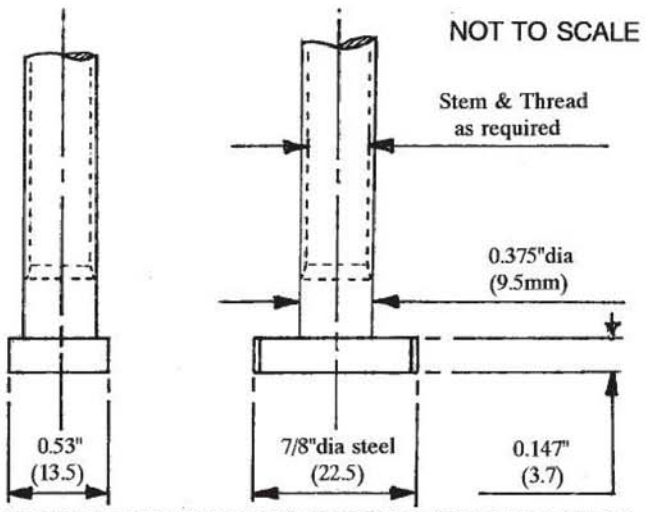
Figure 7



AN ACTUAL MYFORD 7 TEE SLOT
(Compare dimentions with tee bolt)

As toolmakers improve their products, you should measure your tee slots and make tee bolt heads and nuts to suit. If you mill your own tee slots, mill the bolt shank slot about 0.03"(1mm)deeper to dotted line. This will allow the tee slot milling cutter to cut more freely. During use, the nuts and bolts will slide into position easily as any fine swarf etc: will drop into the dotted space.

Figure 8



TEE BOLT HEAD FOR MYFORD 7 LATHE TEE SLOT

screw to suit. Flatted shanks can be held in a collet but try to line up the flat with one of the 'slits' in the collet. Also, grip the whole length of the shank to avoid possible damage.

If you decide to use collets on your milling machine, buy the best you can afford. A well-made collet is hardened right through and will, with care, last a lifetime. Cheaper ones are case hardened and may distort under load.

If your milling machine is of an industrial pattern it is probably quite rigid and able to take heavy cuts. One type of cutter worth considering for heavy stock removal is the roughing end mill (**fig 6**). This is like an ordinary end mill but with notches machined in the side cutting edges rather as if the makers had cut a rounded bottle screw thread along the cutter before machining the flutes. These are designed to break up the swarf and they do cut more freely than the standard types but the surface finish they leave is poor. You are intended to finish the cut with a standard cutter.

Earlier we mentioned briefly the cutting of standard keyways with a slot drill. Cutters are also supplied in the shape of small diameter, thick circular saws specifically for cutting keyways of the standard or Woodruff (shaped like a half moon) type (fig 3). Such cutters are available in a range of standard sizes and can be fed axially along the work to form a long keyway or plunged into a shaft to provide a seat for a Woodruff key. Often the standard size of keys and keyway cutters are too large for model work and the model engineer is constrained to make his own. A keyway cutter only has cutting teeth on the periphery of the blade and cannot cut on the sides. This endures that standard keys are a snug fit in keyways cut with the standard keyway cutters.

T-slot cutters (fig 3) are designed to cut the T-slots found in machine tool tables. They tend to be stouter than key way cutters and have cutting teeth formed on their faces as well as their periphery. They are also made in standard sizes but often those sizes are too large for our small machines and makers, like Myford, over the years have had to derive their own designs. The drawing shows a T-slot cutter fitted with a tapered shank but it is more common in the smaller sizes for them to have a parallel shank for mounting in a chuck. These cutters can also be made to suit nonstandard or special requirements.

Readers may be interested in the relationship between T-slots and T-slot bolts. The dimensions given in the drawing are taken from actual Myford products and are not toleranced to Myford works standards. Note that the bolts are 3/8in. dia. but if you make T-nuts do not tap them for a 3/8in. dia. thread. This will weaken the nut and potentially damage the cast iron slot. Bolts with 1/4in. or 5/16in. dia. (M6 or M8) should be more than adequate for most clamping work on something the size of a Myford Series 7 lathe.

I trust more advanced readers will forgive the above description of what must seem a very basic matter but many new to the hobby of model engineering will not have been inside an engineering works. My aim is to encourage non-engineers to become model engineers and practical training is, these days, hard to come by particularly as so many public authority evening classes are closing down.

I will end on an important safety issue. You may see people using brushes to apply cutting oil to a milling cutter. This is dangerous as the rotating teeth can pick the brush up and drag it into the cutting zone taking your hand with it before you can let go. It is safer to use a pumped supply or a jet from an old washing up liquid bottle. The jet also helps to disperse the swarf from the cutting area. If you *must* use a brush hold it by the tip of its handle between the first finger and thumb. That way it does get snatched by the cutter it will be pulled away without risk of injury to you.

The trigger, pump action spray bottles sold in garden centres can be useful for safe coolant application and have an adjustable jet. The coolant tends to degrade the plastic but they are cheap and disposable. Many different types of coolant are in use ranging from neat oils with high-pressure additives to standard water-soluble oil. The neat oils are used for heavy work where tool cooling is not a priority. The water-soluble types are better at cooling the cutter and dispersing heat. If you use soluble oil in a pumped system then keep an eye on it as it will eventually down grade and become useless. Soluble oil is bought as a concentrate. It is diluted by adding clean water, preferably 'soft' and free from lime and salts, to the oil. Follow the maker's instructions but a typical mix ratio is 1 part of oil to 10 parts of water. I sometimes increase the amount of oil, as a more concentrated mix is less likely to cause rust if the machine is unused for a few days. In any case it is a good plan to clean the machine down thoroughly after use and liberally re-oil the slides to expel any coolant trapped therein.

BREAKFAST RECIPE

Peter Parks
writes with further culinary advice.

SIRS - Further to my article *A miniature breakfast* (*M.E.* 4266, 3 February 2006) it has been brought to my notice that here in the West Country there is a traditional omelette recipe, which may be cooked in the firebox of a 5in. gauge locomotive.

Remove the beak and claws of a quail and crush to a coarse powder. This is mixed with a beaten quail egg and cooked on the shovel. I can vouch for the fact that this makes the most delicious omelette. The beak and claws are best crushed using a little stone crusher driven by one of Anthony Mount's delightful, miniature steam engines. Anthony will, I am sure, be pleased to design a crusher for this purpose.

In view of the fact that it might attract the unwelcome attention of animal rights activists in the area, it is recommended that you kill the bird before removing the beak and claws. This is best achieved by tying the quail across the rails of your club railway and driving your locomotive over it. However, it is rather a challenge to remove all of the feathers from the inside motion of your locomotive afterwards should you choose to do this. Happy breakfast!

A GWR 1400 CLASS LOCOMOTIVE IN GAUGE 1

G. R. Thornber

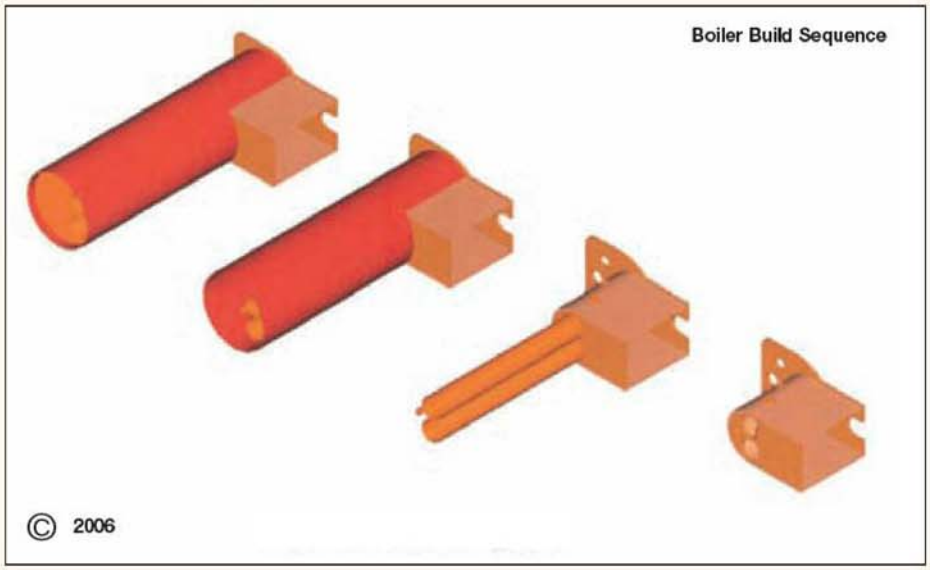
describes building the boiler.

●*Part VII continued from page 264 (M.E. 4268, 3 March 2006)*

The previous article gave the rationale behind the boiler as drawn. A closed flue system with cross tubes in the firebox and two flues. There is also a small tube that carries the steam pipe, which goes through the top of the firebox and acts as a superheater.

I usually start by cutting out the firebox tube plate and bending the firebox wrapper round it. Providing that it is a good fit this assembly can be silver-soldered (at this scale there is no need for flanges). Note that there is not much left when the holes for the two flues are cut out, so I drilled them undersize and opened up to the right size after silver-soldering. This assembly is then butted up to the backhead - make this slightly oversize and again cut to size later. Holes are drilled for the cross tubes which are fitted next. Make sure that there is a good fillet of silver solder both inside and outside the firebox.

The flues and the tube for the steam pipe are next. Again a good fillet inside and outside. The main boiler tube is now cut to length and a rectangular piece cut out so that it slides onto the firebox assembly. Make sure that this is a good fit before silver-soldering. If there are any gaps fill with small scraps of copper. The smokebox tube plate comes next.

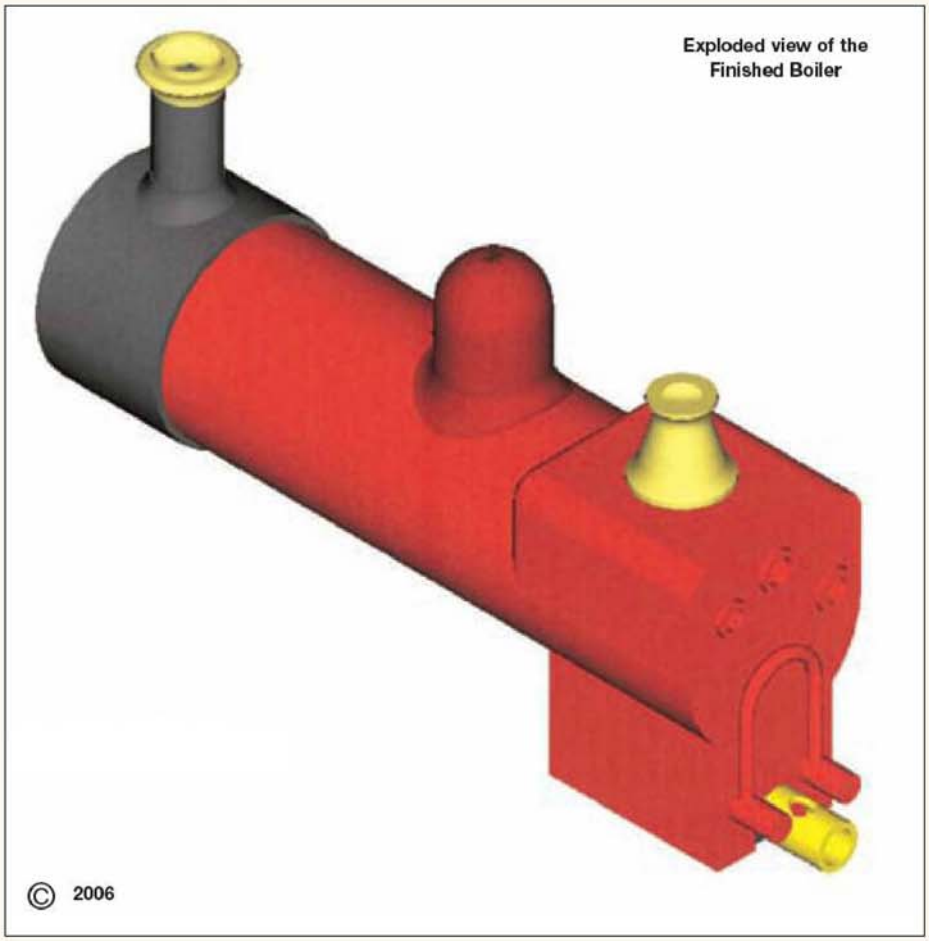


All that remains is to fit the various bushes. These should be from bronze. I prefer to start the tap off before silver-soldering and finish afterwards. Note that with the large dome bush this should be done before the steam collector pipe is fitted! I know from bitter experience.

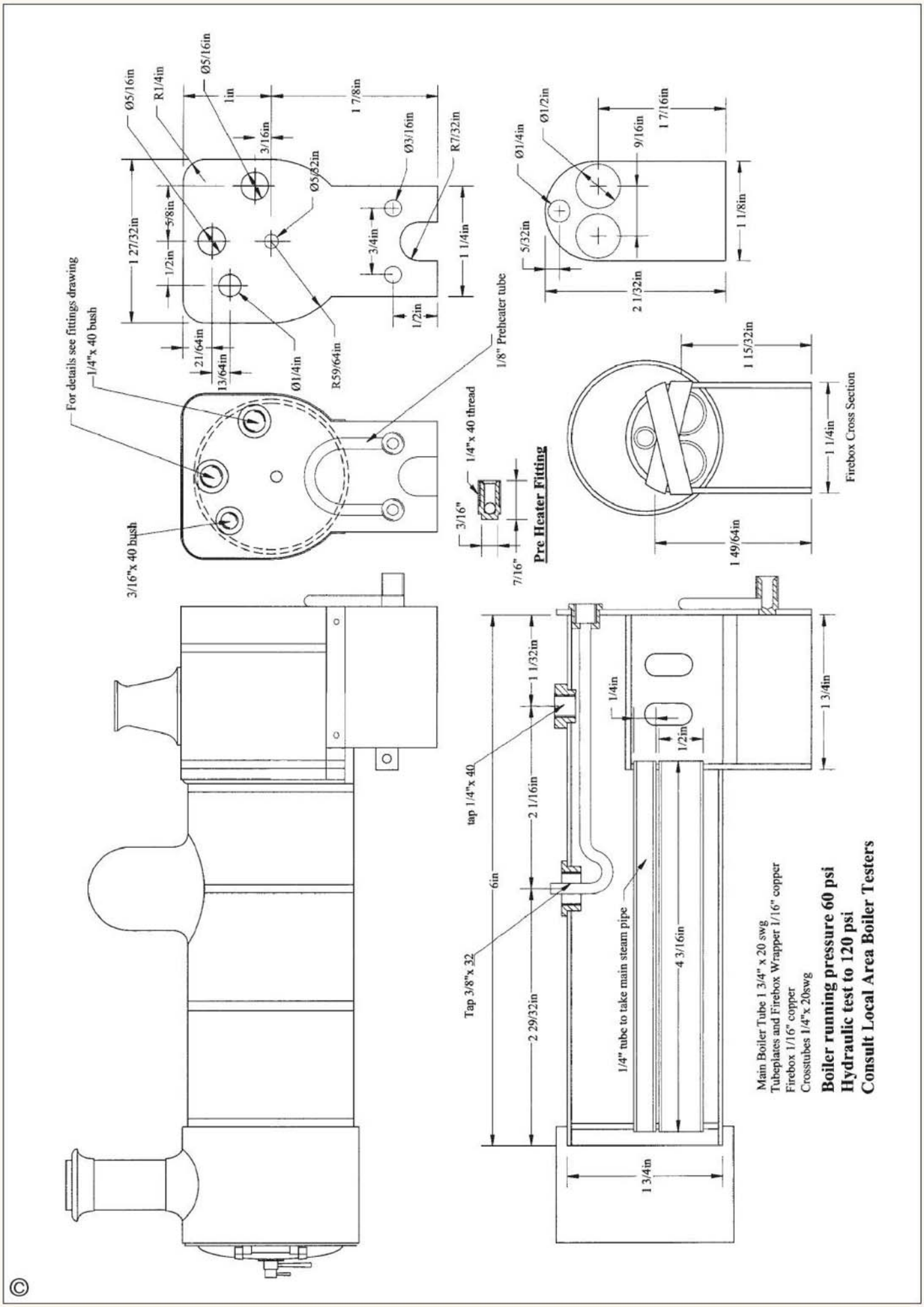
There now follows a plug for G1MRA. The boiler needs testing to their rules if there is any thought of running in public. I will not go into all the details of this so please talk to the local nominated boiler tester. The boiler runs at 60psi so has to be tested to 120psi. Hopefully there should be no leaks and it should hold pressure for 20 minutes.

The boiler now needs cladding. A small former should be made to form the front of the firebox to the same shape as the backhead. This can be held in place with soft solder. The space in between can be filled with any suitable filler - I use one of the many car body fillers. The firebox wrapper (28 gauge) is bent round and soft-soldered to the former and the backhead. It may be fastened at the bottom to the firebox with a couple of 10BA screws. The barrel is covered with 1/16in. balsa wood before 28 gauge cladding is wrapped round. Note that if you intend fitting handrails, the knobs should be fitted to the wrapper before the wrapper is fixed. Boiler bands are from the same material (about 3/32in. wide), with 10BA nuts silver-soldered to each end. One end is then opened up to clearance size.

The drawing shows the position of the 1/4in. square cross piece at the top of the frames behind the driving wheels. The boiler can be attached to this with two 8BA screws. This, coupled with the various pipework, is enough to hold the boiler in place.



●*To be continued.*

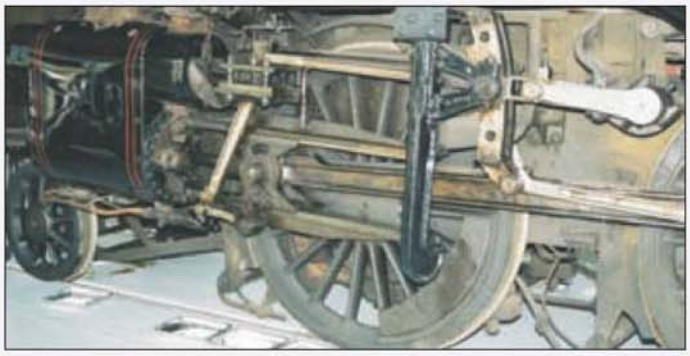

For details see fittings drawing
1/4"x 40 bush
3/16"x 40 bush
Ø5/16in
R1/4in
Ø5/16in
1in
3/16in
1 7/8in
Ø3/16in
R7/32in
Ø5/32in
1 27/32in
5/8in
1/2in
3/4in
1 1/4in
1/2in
21/64in
13/64in
Ø1/4in
R59/64in
1/8" Preheater tube
1/4"x 40 thread
3/16"
7/16"
Pre Heater Fitting
Ø1/4in
Ø1/2in
9/16in
1 7/16in
5/32in
1 1/8in
2 1/32in
1 15/32in
1 1/4in
1 49/64in
Firebox Cross Section
tap 1/4"x 40
1 1/32in
2 1/16in
6in
Tap 3/8"x 32
2 29/32in
1/4" tube to take main steam pipe
1/4in
1/2in
4 3/16in
1 3/4in
1 3/4in
Main Boiler Tube 1 3/4" x 20 swg
Tubeplates and Firebox Wrapper 1/16" copper
Firebox 1/16" copper
Crosstubes 1/4"x 20swg
Boiler running pressure 60 psi
Hydraulic test to 120 psi
Consult Local Area Boiler Testers
©

AN ENGINEER'S DAY OUT

THE NATIONAL RAILWAY MUSEUM AT SHILDON

Roger Backhouse visits the Locomotion Museum in County Durham where he encounters the National Rail Museum's overspill collection.

Britain's National Railway Museum must now have the world's largest collection of railway relics. Many model engineers will have enjoyed visiting the main displays at York. Yet they have more material than can be displayed there requiring the development of new premises. The NRM opened an outpost at Shildon, County Durham, in late 2004. Shildon claims to be the birthplace of railways and it was here that the Stockton and Darlington began the locomotive haulage of coal brought over inclined planes from West Auckland and Witton Park. The new museum is located near the site of the wagon works that flourished here for nearly 150 years.



British Rail Standard class 2-6-4 motion detail.

Building No. 2 at Shildon is Timothy Hackworth's house.

Displayed in the main building, a replica of Timothy Hackworth's Sans Pareil.

The original Sans Pareil of 1825 forms the centre piece of a special display.

Diesel Shunter and North Eastern Railway 0-6-0 basking in the sun at Shildon.

When an NRM outpost was first mooted some thought it would be a place for York's cast offs. While Shildon is smaller than the York collection this does not appear to be the case. In three visits I have found that several locomotive exhibits have been changed with York, varying the collection. There is nothing cast off about *City of Truro*, the LNWR *Cornwall* or the prototype *Deltic*.

The museum is spread between several buildings. Timothy Hackworth's house is a key part of the museum. The previous Timothy Hackworth Museum was featured in an article in this series in *Model Engineer 4106* (5 November 1999). Hackworth was the first manager of the Stockton and Darlington and a successful engineer in his own right though rather overshadowed by George Stephenson. He designed the *Sans Pareil* which failed at the Rainhill Trials but then designed the world's first six coupled engine, the Royal George of 1827. ▶

A 'Santa Special' being run at The Locomotion Museum, Shildon.

Works plates from Shildon-made wagons on display.

Early chaudron wagon for coal traffic in Soho works building.

Former coal drops at Shildon - the original traffic for the S&D.

The ill-fated Prototype Advanced Passenger Train of 1973 alongside the Prototype Deltic of 1955.

The original *Sans Pareil* is, rightly, the centre piece of a display in a former institute building, close by the Soho building which is probably the oldest railway works buildings in the world. Here you can see an early Hackworth six coupled engine *Braddyll* in a ruinous state. A replica of the *Sans Pareil* as it looked at Rainhill is in the main building.

The former Shildon goods shed has a display on the types of traffic once handled by railways. A short walk or train ride goes past the former coal drops towards the main museum building where most of the collection is housed. This lacks the range of smaller exhibits on show at York Museum. Instead the collection concentrates on the locomotives, coaching stock and wagons.

As might be expected from Shildon's history some of the best exhibits are wagons. They include an early example of the HAA coal hoppers. Shildon works built over 10,000 for merry-go-round coal traffic, though the museum example was made in Darlington. There is a North Eastern sand wagon typical of the sort of specialist stock for every kind of traffic including supplies for locomotive sheds. Another specialist wagon was built for cement traffic of a kind which once used the nearby line from works in upper Weardale.

Railways used ancillary vehicles of all sorts. The 1850 4-ton crane from the Great Northern Railway is a remarkable survivor. Not far away is a North Eastern Railway snowplough, of a type once in regular use on the line over Staindrop.

There is coaching stock too. The LNER coaches are superbly restored but not all exhibits are restored to the same standard. The museum rightly seeks a balance between trying to conserve items in their found state to prevent further deterioration and radically restoring them to an original condition which they may have had for only a few years. The museum does a good job of explaining the dilemmas faced by conservators.

The locomotive collection gives a fair spread of examples from across the years. There is an understandable north eastern bias but it does not dominate. The North Eastern Railway electric locomotive used on Tyneside is a reminder that Shildon was once the end of a stretch of line electrified by that company to take coal to Middlesbrough. Another engine with north east links is the 1933 diesel shunter built by Armstrong Whitworth.

A Great Northern Railway Atlantic has a key place here but so does another GNR engine of radically different type, a Sharp Stewart saddle tank used for shunting. Other engines from further afield have been placed here. The London and South Western T3 is a fine example of a late 19th century express locomotive. The London and North Western's express engine *Cornwall* is a good example from the middle of the century. On different visits I have seen the pioneer *Deltic*, an LMS 'Crab', *City of Truro* and the replica *Rocket* so there is variety-making repeat visits worthwhile. A more modern exhibit is the ill-fated tilting Advanced Passenger Train prototype of 1973 with the bogie and coach on display. Had

The excellent Sans Pareil-themed children's playground at Shildon.

National Benzole oil tank wagon bringing back memories of Hornby!

this succeeded it would have given British Railways a 150mph service from London to Glasgow. Alas, the technology proved unreliable and the project ended, perhaps prematurely.

Summary

The museum has successes: there are great historical connections; the main building is of excellent modern architecture; there is a delightful railway-themed children's play area and a good footpath between the buildings with a live train service most weekends along the track nearby. However, there are some disappointments: although it has information about the growth of Shildon as a railway town and the disgraceful closure of the wagon works it does not seem like a museum that has roots in Shildon. There is also little impression of the lives of the people who depended on the works. Despite some machine tools in a corner there is no feel of what made Shildon such an engineering centre that once employed over 3,000 people from many different skills, like the forge that continued railway engineering even after the closure of the main works. Maybe it is the style of modern museums but there is a slightly sterile feel to the collection. It does not give the personal cameos that the Steam Museum of the GWR at Swindon offers. Nor does it have so many of the smaller exhibits that add life to the NRM at York. Perhaps this will change in time.

Yet it is by any standards a major railway museum and is recommended for a visit. It is easy to reach by public transport with the main building adjacent to Shildon station offering a trip along some of the original Stockton and Darlington route.

Other attractions

County Durham is under-rated area for tourists and is well worth exploring. The former coal inclines around Shildon can now be explored on foot. Along the line at Darlington is North Road station museum and the works where a replica Peppercorn A1 Pacific, *Tornado* is being built (see *M.E.* 4240, 4 February 2005). Preserved railways in Durham include the Tanfield Railway, Weardale Railway, and the Bowes Railway rope worked incline though the operating status of the last two is uncertain at the time of writing. The excellent open-air museum at Beamish is not too far away.

London & South Western Railway T3 4-4-0 of 1893 - a fine example of a late-19th century express loco.

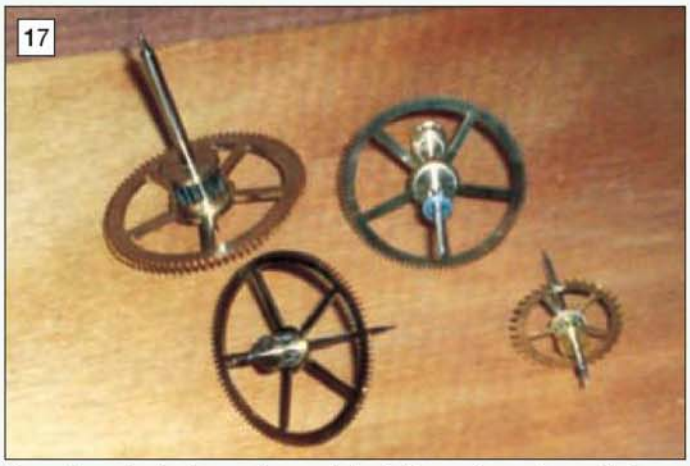
North Eastern Railway No. 1 Electric Locomotive made by BTH Rugby.

About the museum

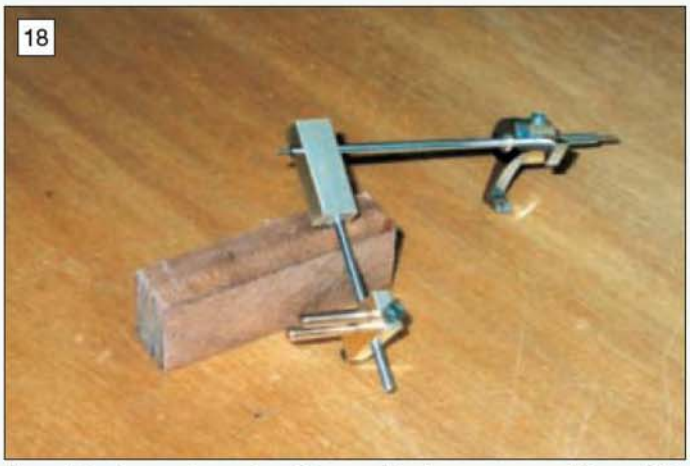
Locomotion's main building is adjacent to Shildon station with services from Bishop Auckland, Darlington and Saltburn. Several bus routes go nearby. Amenities include a café, picnic area and a good souvenir/book shop. The museum has holiday activities for children. School parties are welcome. Admission is free. Telephone:**01388-777999**.
Website: **www.nrm.org.uk** E-mail: **sjoyce@locomotion.uk.com**

Waterloo & City Line Siemens Electric Shunter of 1898.

HAA coal wagon for 'merry-go-round' trains; 10,000 were built at Shildon.



The various wheels shown after careful polishing and mounting on their respective arbors



The pallet arbor, anchor and crutch assembly shown as a complete, ready to fit unit.

SIXTEEN DAY PEDESTAL CLOCK

Peter Heimann

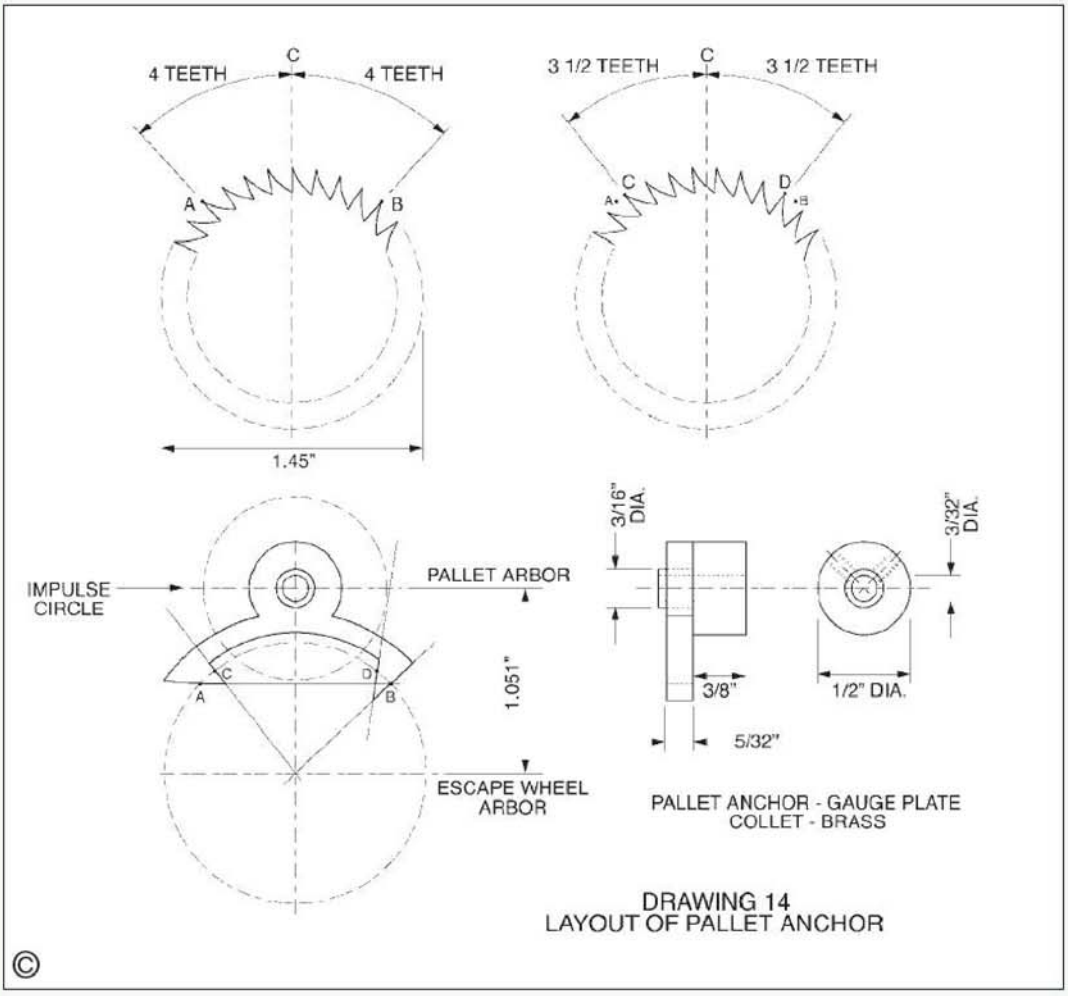
continues the construction of this relatively simple but elegant clock.

●*Part V continued from page 262 (M.E. 4268, 3 March 2006)*

All wheels, after polishing with wet and dry and cleaning in methylated spirit, can now be fitted to their respective seats using Loctite. It is best to press them home in the lathe, which ensures that they sit completely true and snug to the shoulder. Next the complete units, see **photo 17**, can be assembled on their arbors. The latter may need easing on the lathe with wet and dry paper. The aim is a fairly tight slide fit. Drawing 9 shows the final objective quite clearly with all components in place. Do not fix anything permanently until certain that all components mesh as planned. The clearance between plate and shoulders of the pivots must be equal on both sides when wheels and pinions mesh at their mid-points.

When all criteria have been met, mark positions with a narrow strip of masking tape, dismantle and fix finally with Loctite. The ball races should preferably be a light press fit on the arbor. If too slack a spot of bearing adhesive, another Loctite product, will do the job. The races on the great wheel barrel assembly should allow a few thousandths of an inch end-play before tightening the retaining screws. This will take care of any possible expansion. The centre arbor bearing should be fitted so that at the other end there is approximately 1/32in. clearance between the shoulder and the plate surface. I suggest that you make the centre arbor and wheel your starting point. There should be say 3/16in. between the shoulder and the outer flange of the lantern pinion. All other positions will then follow naturally as per drawing 9. All wheels and pinions must revolve freely with no tight spots, under finger pressure on the great wheel. When satisfied that all is well fit the pallet arbor and anchor to see if it will work. Adjust as required and finally harden the points and polish. Relish the moment. Your creation is beginning to look the part!

Drawing 15 shows the 'crutch', which fits on to the pallet arbor and will transmit impulse to the pendulum. The top block is locked to the arbor by grub screws. This enables adjustment of beat. Do not tighten these screws too much until later when the right position has been established. The bottom block is also locked by a



grub screw to allow height adjustment for amplitude. Finally the two fingers, which will embrace the pendulum rod, are made eccentric, so that these too can be adjusted for optimum action. Phosphor bronze (gun metal) of 1/8in. diameter is the best material here. If you are unable to procure this material use hard brass instead. The 3/32in. diameter silver steel rod must be set rigid in the top-block to prevent it turning. Length from the pallet arbor to the bottom of this rod should be in the region of 2 1/2in. so as to clear the pendulum pivot spindle by at least a 1/4 inch. The pallet arbor, anchor and crutch as a complete unit, see **photo 18**, can be fitted and dismantled from the clock by removing the pallet arbor cock, and by judicious threading through the 'keyhole' opening in the rear plate.

Our next task is to tackle the compound pendulum assembly shown on **drawing 16**, also on **photo 19**. It is crucial that the top and bottom 1/8in. rods are dead in line with one another. In addition these must pass absolutely through the centre line of the bearing hub. Finally they must fit into the bobs on the exact centre line. I believe that the best way to tackle these demands is as follows:

1: Prepare a length of 3/4in. brass rod and drill one end 3/32in. by say 1in. deep. Do not part off yet.

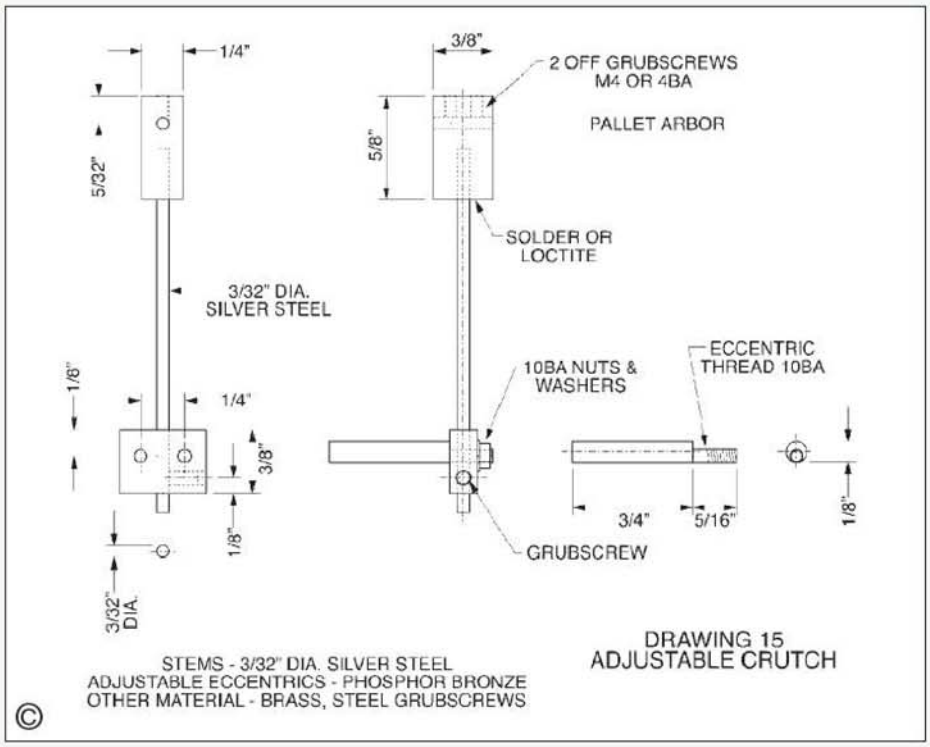
2: The rod will be long enough to hold in an accurate drill vice. Drill and ream the 1/8in. hole for the pendulum rods right through on the centre line.

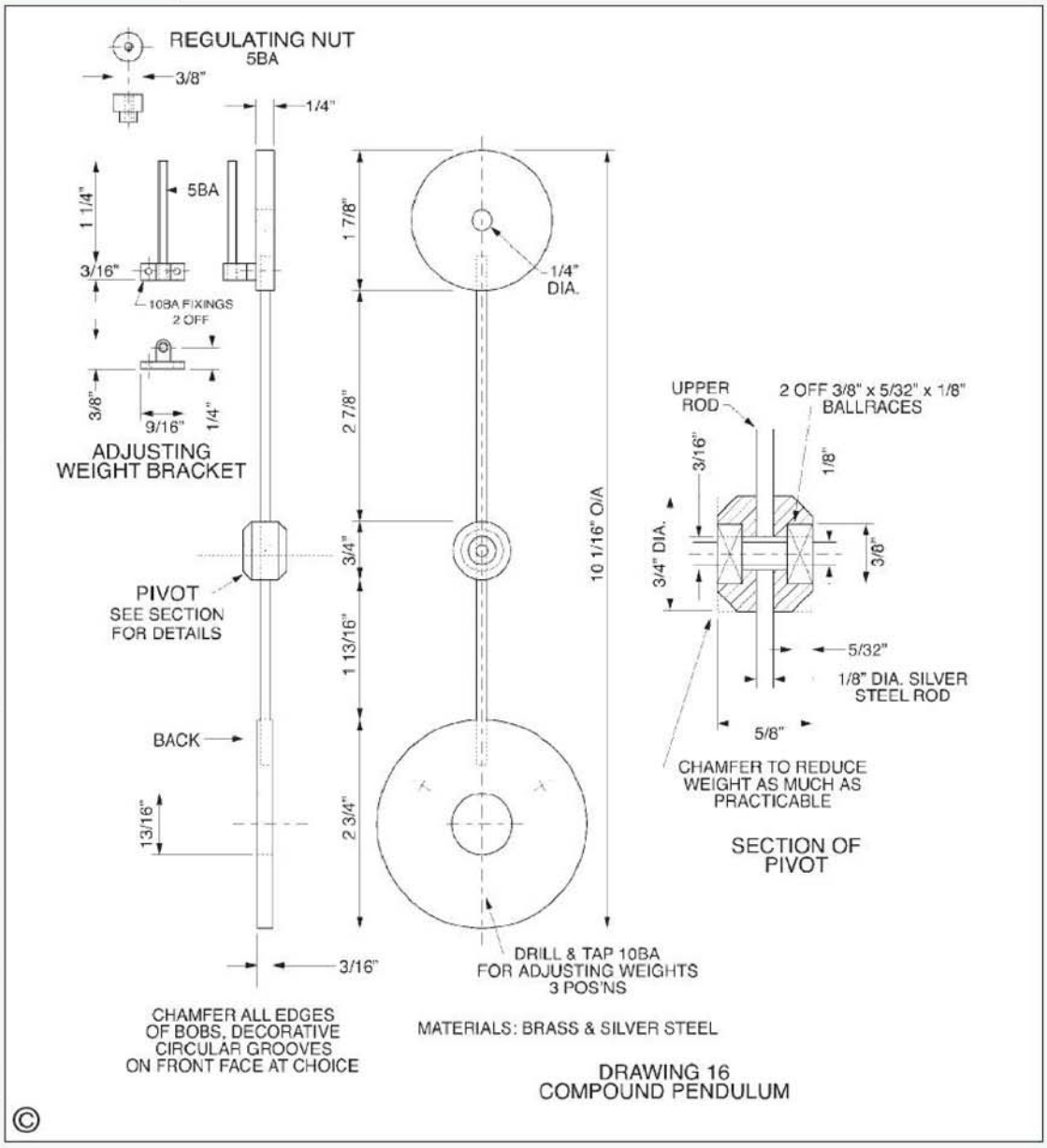
3: Part off and machine the 3/8in. ball race recesses at both ends. The fit for the races should be tight enough to retain these without need of additional help.

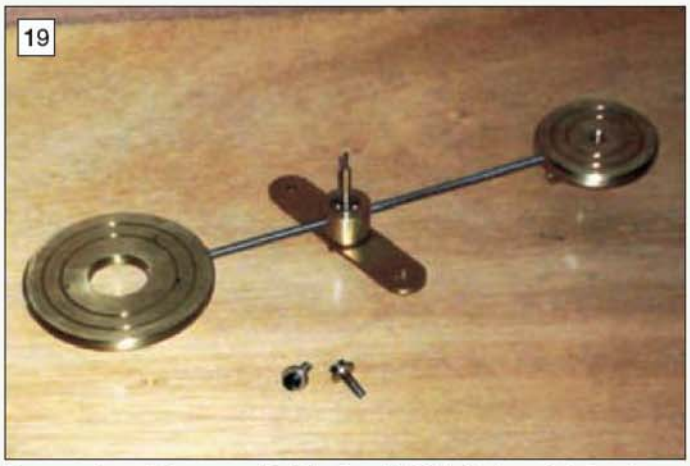
4: Insert the previously prepared pendulum rod in *one* length right through and soft solder.

5: On the lathe or the drilling machine open out the 3/32in. hole in small increments to 3/16 inch. This will of course cut the rod in two, but it will be in true alignment. The 3/16in. hole is not too critical.

The rod ends are best tightly screwed 5BA into the edges of the bobs. If the 13/16in. opening in the lower bob is not convenient, make this 3/4 inch. It simply means a reduction in adjusting weights later on. The complete assembly is supported on a length of 1/8in. silver steel passing through the ball races. It is retained by the grub screw in the back of the cock plate. At the other







Compound pendulum assembly. The size of hole in the large bob is not critical and can be varied to suit your tooling.

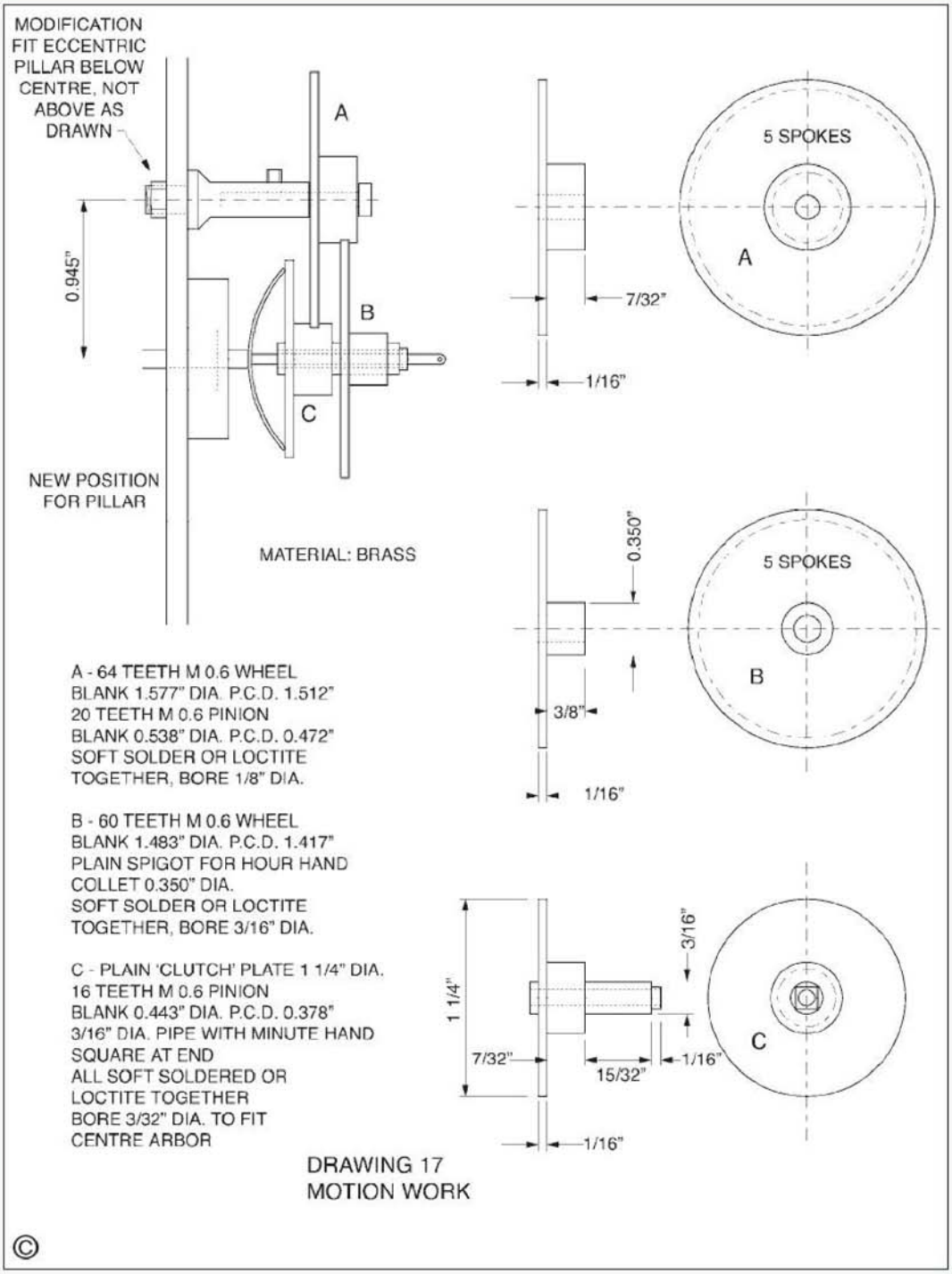
Motion work components laid out for inspection. Note the neat crossing out and, on the left, the hammered brass clutch spring.

end it rests in the hole in the back plate. Slightly round and polish the ends. See how the pendulum swings. If all is as accurate as it should be, it will come to rest in a dead upright position. If there is a problem experiment with a light counter weight in one of the 10BA positions on one side or the other of the back of the lower bob.

Now is a good time to apply some finger pressure to the movement to see how the escapement reacts. No doubt the position of the crutch relative to the pallet anchor will need a little adjustment to achieve an even beat. The two eccentric fingers will also need to be adjusted so as to embrace the upper pendulum rod without unnecessary play. This would waste energy. Initially set the finger height to 15/16in. above the pendulum hub centre. Although it will interrupt further progress for a while, I suggest that you now rig up a temporary stand for the movement, so that some weight can be suspended on a length of string to check reaction under power. There will of course be many other adjustments later to set the rate, etc. but it will be useful to know what weight is required. Generally one adds 10% to the bare figure to give a safety margin. Eventually the weight will have a 'double fall', which will require twice the present single fall figure. Hopefully all will be well. I repeat - the adjustments which can usefully be carried out now are first the beat, second the height of the fingers above the hub, and third the distance apart for the fingers. The amplitude to aim for is that about half of the 1/4in. hole in the top bob should appear either side of the A-frame edge at each swing.

The motion work is next on the agenda. **Photograph 20** shows the components and these are detailed on **drawings 17** and **18**. Drawing 17 is shown opposite and drawing 18 will appear next time.

●*To be continued.*



HOW TO DESIGN AND ASSEMBLE MODEL LOCOMOTIVE BOILERS

By Peter Rich

Boiler design has remained largely unaltered for many years, but the author argues that there is scope for improvement when designing new ones.

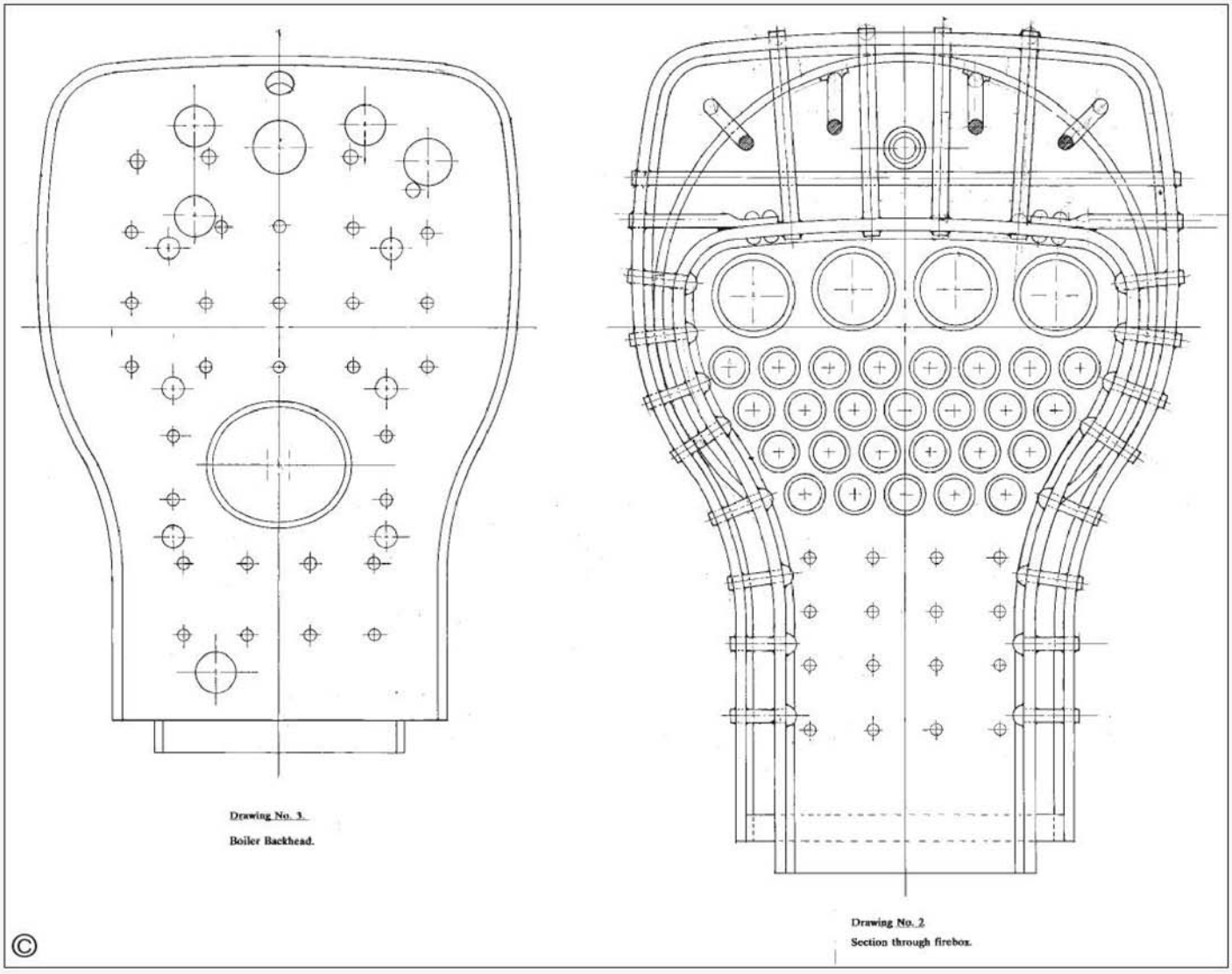
● *Part 1*

I was up on Caerphilly Mountain the other day having a quiet blast on the pipes and was practicing the retreat tune *The Road to Sham-Shui Po* (P. M. A. McKintosh), which I am sure readers are familiar with, when it occurred to me that the basic design and construction of model locomotive boilers has not changed appreciably since the days of LBSC. Indeed it is difficult to see how any radical change can take place. However, I believe there is some latitude for improvement, and all of what follows I have actually put into practice.

Firstly may I say that I am a little surprised that in this day and age the various British Model Engineering Clubs and their Federations, although they have one under consideration, have not yet produced any kind of standardised code of practice for the design and construction of model boilers which, in view of the points often made about safety, I feel we in Britain are rather lacking. The only recommendation of standards I have seen over the past 45 years for designing and construction of model boilers are found in the Code for the Inspection and Testing of Miniature Boilers, issued by the Australian Miniature Boiler Safety Committee, which in my opinion is brilliant.

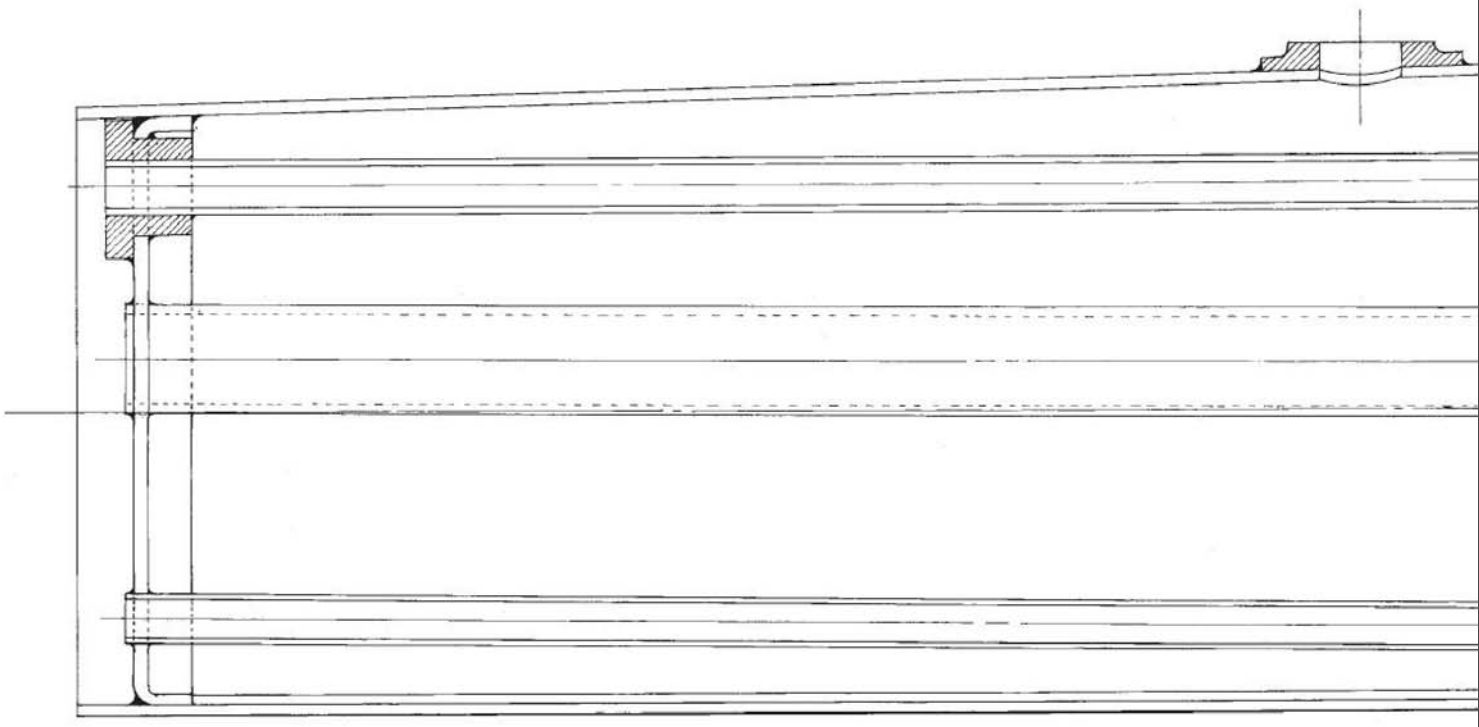
This code gives recommendations for stay spacing, tube sizes, plate thickness, etc., and just about everything needed to design and construct a very safe copper model boiler up to 5in. gauge and up to 100psi, working pressure. I have to say that for the past 30 years all of the boilers I have designed and built have complied with this code which even provides a formula for working out stay spacing at various pressures and plate thicknesses, if your particular requirements are not catered for in the code's tables. This Code of practice seems to me to be a very safe guide to follow and I would recommend it to anyone wishing to design and construct their own boilers.

These articles were originally written three years ago when I only possessed a copy of the original Code. Recently I have been in touch with Dave Merrifield, Secretary of the Australian ▶



Drawing No. 3.
Boiler Backhead.

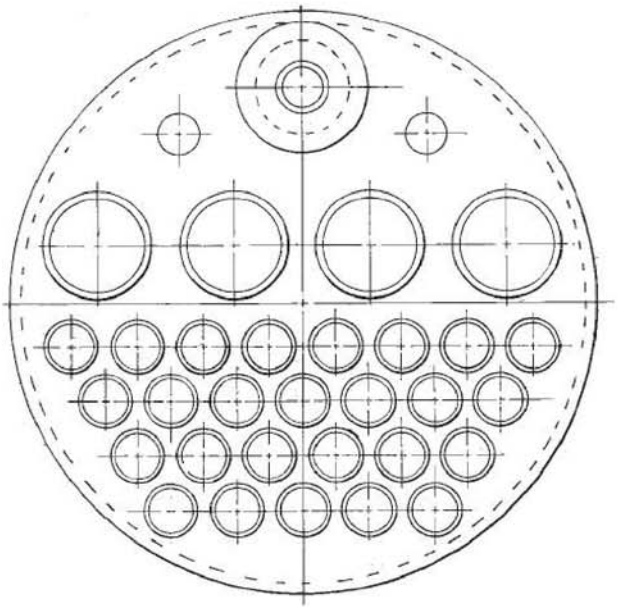
Drawing No. 2
Section through firebox.



Drawing No. 1.

Boiler for 5" gauge G. W. R.
"County" class 4-6-0 locomotive.

Designed for a maximum working
pressure of 100 lbs per sq. in.

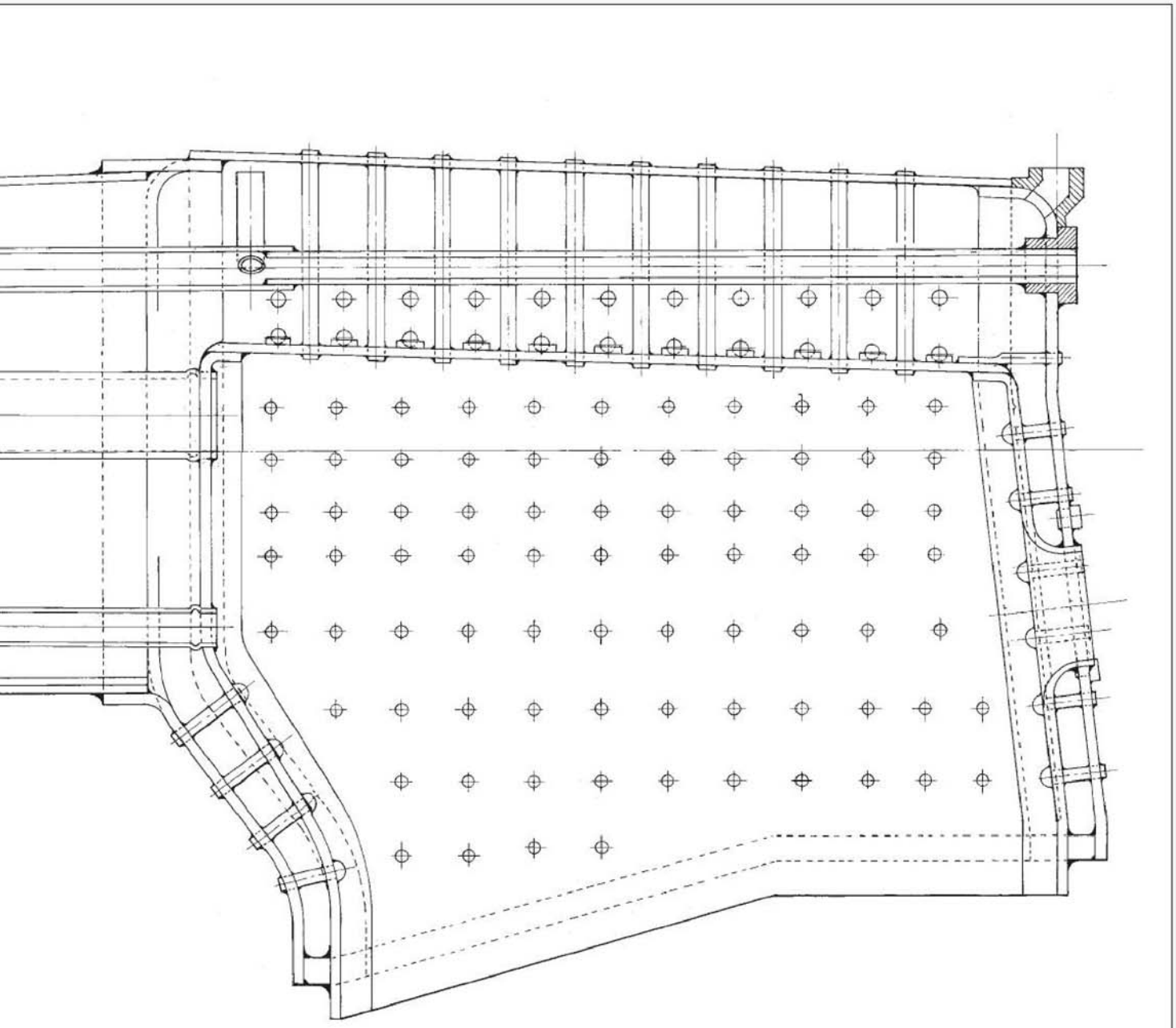


Miniature Boiler Safety Committee and he has been kind enough to let me have a copy of the latest code. I see that there have now been no less than seven updates and reprints, greatly improving the original. While what follows has largely been written to comply with the original code, as far as I can see it also complies with the latest code except perhaps for one or two small points. If there are any major departures to be found I'm sure Dave and his Australian friends will quickly jump on me. If our Editor publishes these articles and Dave or anyone has any constructive comments or criticisms to make I will ensure the matters are brought to readers attention. (*This paragraph was inserted in Jan 2006*).

Having got the above off my chest let us now have a look at boiler design and construction to see if, and how, we can improve matters. Boiler designs, which are published in *Model Engineer* and in other places, are usually accepted without question and, being one whose background is in marine engineering, I have to say that sometimes some of what I see makes me a little uneasy, and would certainly not fit within the realms of the Australian Code of Practice.

In what follows I am going to assume that you want to be a 'model engineer' rather than a builder of a small steam engines which 'look' like a full size engine, in other words you, like me, want to become a 'rivet counter' as we are so disparagingly referred to by some people who have no wish to produce, or are incapable of producing, accurate and authentic results.

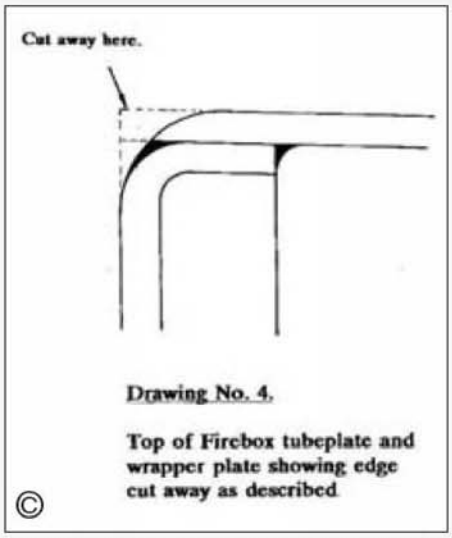
I have included my G.A. section boiler drawing, No. 1, for my 5in. gauge GWR 4-6-0 County design which I shall be referring to throughout these articles. This, together with the Manor class boiler, is probably among the most difficult to make because of the sloping throat plate. It is fairly common knowledge that the full size County boiler made use of the LMS Stanier



8F flanging blocks during construction. Because of this, to the trained eye, they looked like LMS boilers even though they carried all standard Western fittings. Unlike the LMS engines the GW boiler had a fully tapered boiler barrel as shown whereas the LM boiler carried a short parallel section at the front end. However, there are certain differences from the GW type boilers that definitely make it an LMS design, the firebox section and boiler backhead drawings Nos 2 and 3, showing that the curvature of the outer firebox wrapper being more sharp while the sides of the backhead are more rounded than the usual Western type. The firehole is oval shaped rather than round and the drivers brake valve occupies the place where the Western engines normally carry the blower valve while the blower valve itself occupies the position where the LMS engines carried the upper flange for the right hand water gauge. Western engines only having one water gauge carried that on the left of the backhead.

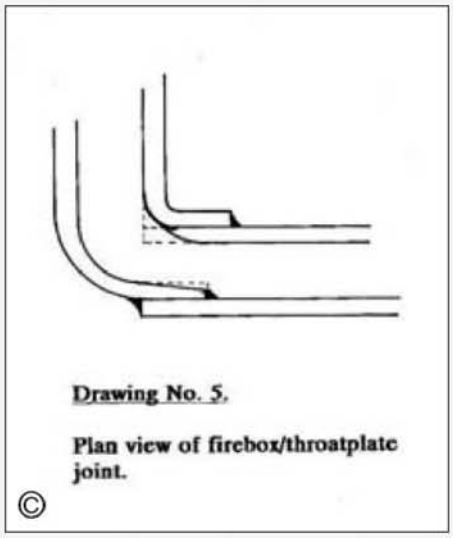
At first glance my boiler looks little different from any other model loco boiler in this size. However, have a look at the inner firebox where you will see that I have shown the firebox wrapper as cut away (see drawing No. 4) and curved down onto the tubeplate and backplate. After brazing, the plate is intended to be cut away as shown from just above the foundation ring right around the joint to the same point on the other side of the wrapper plate. It will also be seen that on my small section drawing (No. 5) that the throatplate flange has also been shown as cut back, and it is intended that the backhead plate be similarly treated. The idea behind this aspect of the design is to improve the circulation of water around the firebox, particularly at the lower part, which will also reflect in better steaming qualities.

I have carried out this procedure on several boilers all of which have steamed better than ▶



Drawing No. 4.

Top of Firebox tubeplate and wrapper plate showing edge cut away as described.



Drawing No. 5.

Plan view of firebox/throatplate joint.

expected. In fact on my last loco I was sure that because of its small scale size the boiler would not steam against the cylinders and yet when it was track tested steaming was the least of my concerns and I'm sure it was due to the free circulation of the boiler water around the firebox. The cutting back of these plates is easily achieved with a rotary sander in the hand drill chuck after the plates have been brazed and only takes minutes but does not weaken the joint by any amount to worry about. In fact they are probably still much stronger than the 'butt' joints employed in some boilers for the same purpose.

Now cast your eye up to the throatplate on drawing No. 1 where you will see that this plate is flanged forward onto the boiler barrel an aspect that I introduced to my Castle Class design of the early 1970s. I won't, for one moment claim that this is my idea in models, but I cannot recall any other design with this feature before my design. Until then most (in fact all) designers were recommending a plain hole butt joint at this point but I always felt uneasy about that especially when it is not too difficult to produce a proper flanged joint which is obviously much stronger. Producing it also enhances the amateur model engineer's skills.

Now let me lead you back to the inner firebox backplate where you will see that I have flanged the plate back to form the firehole ring which is a very easy operation to carry out provided you keep the plate well annealed while forming it. If you intend forming a firehole in this manner I would recommend that you make this the first part to be formed and when finished then carry out the side flanging. If you form the firehole last you will find that the metal will 'pull' at the side flanges and you need to allow for this.

About annealing, perhaps I should say here that a good 'rule of thumb guide' is that if in doubt then anneal. Annealing is really the answer to forming this firehole because if you work the metal too much and make it hard, the metal will start to split at its edges (take my word, I've been there). One of the advantages of forming a firehole in this way is that you are cutting out a joint in the firebox. Any joint in a boiler is a potential source of a leak, but from experience I can say that a leak on the inner firebox joint of a firehole ring is a very difficult joint to re-seal.

I have been constructing fireholes by the above method for the past 30 years and would recommend the method to anyone. In fact, I believe anyone who recommends a tube for this purpose these days, is still back in the dark ages. Forming the firehole in this way takes about the same amount of time as turning a copper ring for the purpose while another advantage is that the internal shape of the firehole automatically provides a guide out of the box for your shovel and other firing tools, an aspect I feel would be appreciated by those of us who like to compete at I.M.L.E.C. where you could have other things on your mind than trying to guide a shovel out of a firebox. Making the firehole by this method was very much a full size practice and making the formers for it is a straightforward turning job.

Having persuaded you to re-think your firebox construction practice let me lead you up to the top of the outer backhead where it will be seen that I have formed the flange on this plate through a very large radius compared to normal model boiler design practice. By normal practice I mean that the flange on these plates are usually formed through 90deg. over a very small radius on the former plate. Very much from experience I can tell you that forming the plate over a large radius former is far easier than normal and makes just as good a job, if not better, and certainly contributes to the free circulation of water around the inner firebox. Moreover, the copper does not thicken up so much at the top corners, needing less cutting or grinding back.

A small advantage gained from this is that there is no need to cut the outer wrapper plate quite so wide which could make the difference, in some instances, between purchasing a larger or smaller sheet of copper, a point which could be important to those of us who are on a limited income. Not only this but it is also authentic full size practice. While on this aspect I should point out that the throatplate is treated in the same way.

You will see that I have used rod stays for the crown stays, not because I think there is anything wrong with girder stays, but rod stays are my preference. I feel they are easier to fit and allow a better circulation of water over the firebox crown. The stays for the firebox side and the front and rear plates are snap head copper rivets with the heads on the inside of the firebox.

In most boiler designs examination of the smokebox tubeplate will show that it is the most well stayed part of the boiler. When you consider the very close spacing of the tubes and the main steam pipe with its large bush, and if blower and lubricator pipes are included then it seems to me that in most cases there is no need to put in additional long rod stays. To compensate for the loss of these stays being attached to the backhead, on most of my boilers I have replaced them with palm stays off the firebox (see also next article).

As far as design of your boiler is concerned it really depends on whether you are building a freelance type, in which case you have no worries, or are building a model of a full size engine but are not too worried about scale, in which case again you have no worries. However, if you are building to scale and want to be accurate and authentic then you really have to first design the outer cladding ('cladding', 'cleading', or 'cleating', I'm never sure about the correct description) plates to their correct shape and size and your boiler should then be designed to fit inside the cladding. If you simply take the full size dimensions from a boiler and scale them down you can guarantee that when you come to make the cladding plates the boiler may well be over scale at the firebox due to the over scale thicknesses of the copper plate involved. All of my boilers have been slightly under scale for this reason and I have never had any problems steaming them, or fitting close scale cladding plates.

On the matter of designing the boiler to scale, authenticity, the correct scale positions of all of the backhead fittings and other external fittings, have to be allowed for. Except for the basic design of the complete boiler these should be located before any stays or other items. Stays can always be positioned to avoid such fittings and their bushes.

A lot of designs show thicker material for the tubeplates, throat plate and backhead etc., and I have never understood why that is so. Perhaps someone can explain. I know that full size designs called for thicker plates for these parts but here we are only talking about an extra sixteenth of an inch on a $^{5}/_{8}$in. thick plate. The only plate regularly appreciably thicker was the firebox tube plate but usually only at the tubes where I believe it was thicker to provide a wider landing for the expanded tube.

I believe that in model engineering this may be a throw back to the days of LBSC when he used to recommend drilling and tapping direct into the capper plate for the various boiler fittings. These days we fit bushes for these purposes so I therefore cannot see why the material in these parts should need to be thicker. Having said that I must mention that the Australian Code does recommend thicker plate for the backhead and S/Box tubeplate and in fact, except for these two plates, for the past 20 years all of my boiler plates have been of the same thickness, usually 12 gauge copper. The answer to this is, of course, properly stayed plates to the Australian Code formula.

For those of you who are building to scale authentically, the use of thicker plates could allow you to have wider stay spacings allowing you to move a stay to provide a scale position for a bush or fitting. However, you must not exceed the spacing for the thinner plate if such be the case.

● *To be continued.*

ROAD STEAM

SAVAGE'S *UNIVERSAL CARRIER*

Stan Nipper and Martin Wallis start machining the substantial, high tensile aluminium alloy crankcase casting.

●*Part XVIII continued from page 272 (M.E. 4268, 3 March 2006)*

On the advice of the foundry, the crankcase was cast in LM25TF, a high tensile aluminium, and heat-treated post casting. The covers are also in high tensile aluminium alloy but were not heat treated as we were advised the risk of distortion was too high.

The heat treatment involves heating and quenching, a process the foundry sub-contract. This makes the LM25TF alloy approximately 75% stronger compared to the 'as cast' state. With regard to hardness (resistance to scratching or more scientifically the resistance to indentation by a ball or pyramid); we understand the 'Brinell' hardness as cast is 55 to 65 and post treatment is 90 to 110. We were also advised that heat treatment would 'improve the machining qualities' and 'artificially age' the material. However in practice builders have reported that there does not seem to be a great deal of difference between machining the crankcase (heat-treated) and the covers (not heat-treated) - but no doubt heat treating the crankcase is worthwhile as the material will be rendered both stronger and harder; as much as anything the threads ought to be more robust and less likely to strip out.

Rough machine first

The usual advice with a complex casting such as a crankcase is run a rule over it first to check it is dimensionally as expected and then to rough machine it all over with an eye on cleaning it up and creating a few datum faces to work on. It is also likely that this type of casting might have all sorts of internal stresses within it, which may cause it to 'move' or 'settle' during machining. I hope however, in this case, that much less movement may be expected as the crankcase has been heat-treated.

Your authors understand that lathe beds used to be rough machined and then left in the yard for a year or more to 'settle' before final machining was undertaken, perhaps still the case. Maybe a reader might be able to comment further on 'aging' and 'settling' and if this practice is still undertaken.

Five of the six faces will need to be machined, the exception being the back, which is heavily radiused and simply needs a rub or two with a file. Just enough metal should be removed to clean the back face up.

It is important that the opposite faces are truly parallel with each other and that each face is exactly at 90deg. to those adjacent. If all is as it should be the cylinder, bearings, crankshaft and all the other bits will assemble perfectly first time.

Centres for shafts

The centres for the crankshaft, second shaft and final drive shaft may now be marked out. If the builder's milling machine is large enough the centres need only be marked on one side, the hole being carried through the crankcase for the other hole. For most builders the marking out will need to be repeated on the other side, the crankcase being turned over to put the holes in the other side. **Photograph 163** shows the marking out being done with a height gauge, an expensive tool - but hopefully someone in the club will have one that might be borrowed.

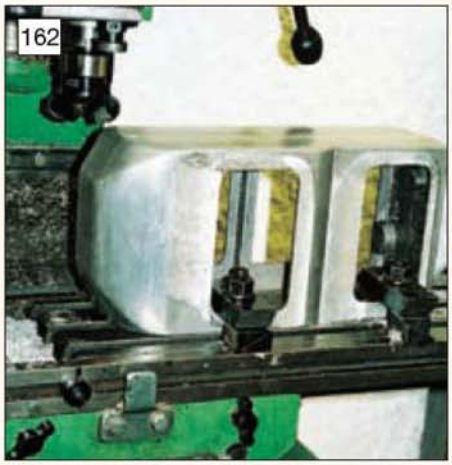
160

A view of the high tensile, aluminium alloy crankcase and top cover castings (photo: M. Wallis).

161

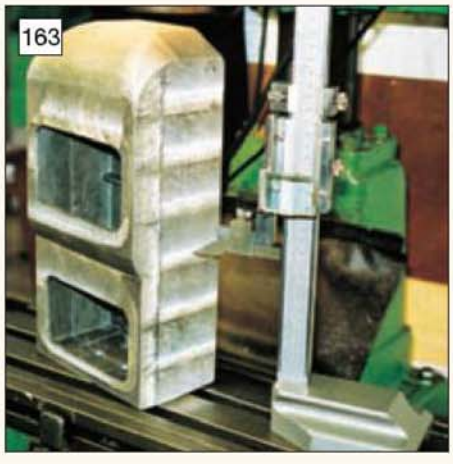
Inside view of the complex crankcase casting and the four covers (photo: M. Wallis).

162



The flat faces can be machined on the milling machine using a face mill.

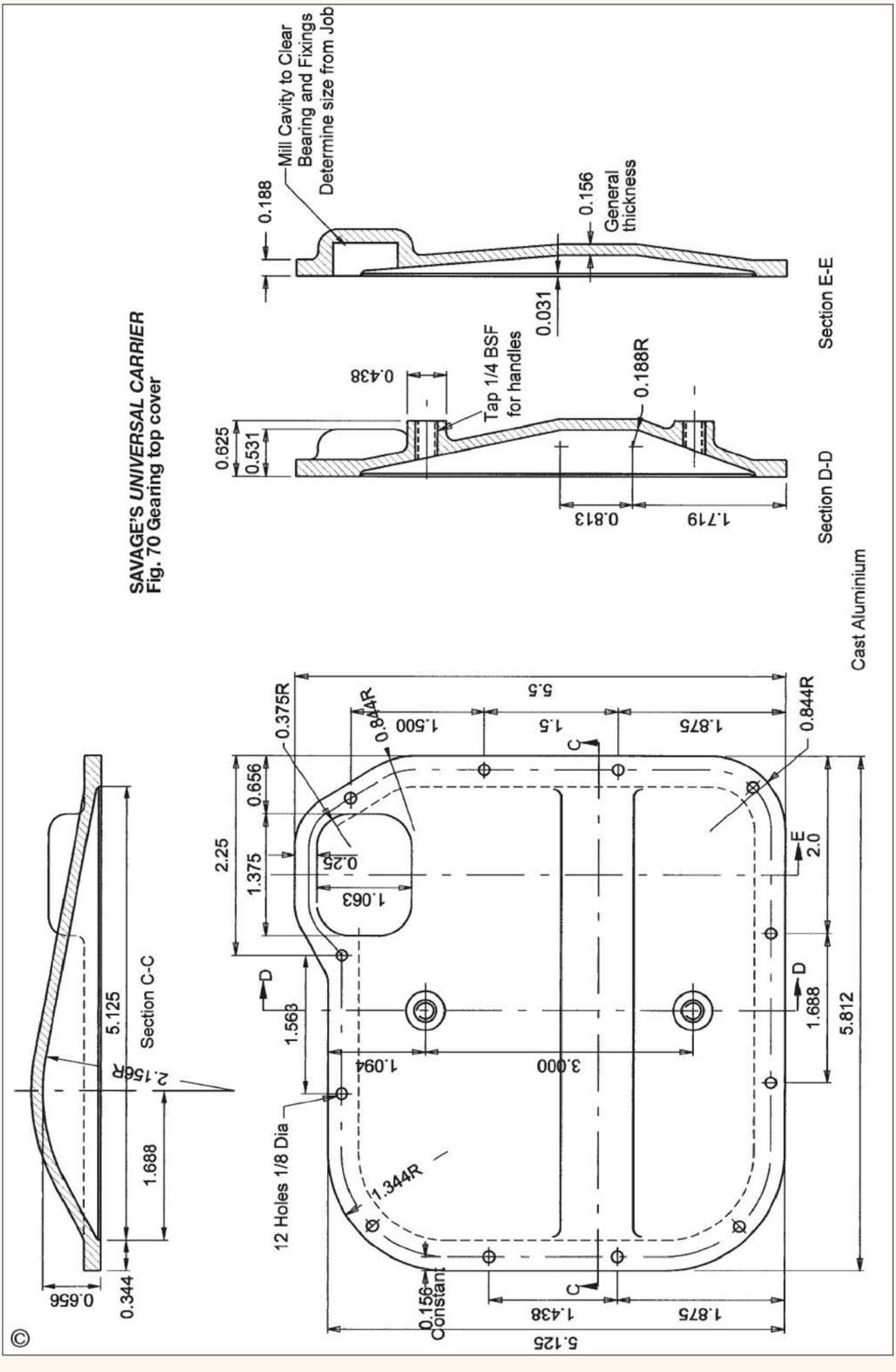
163

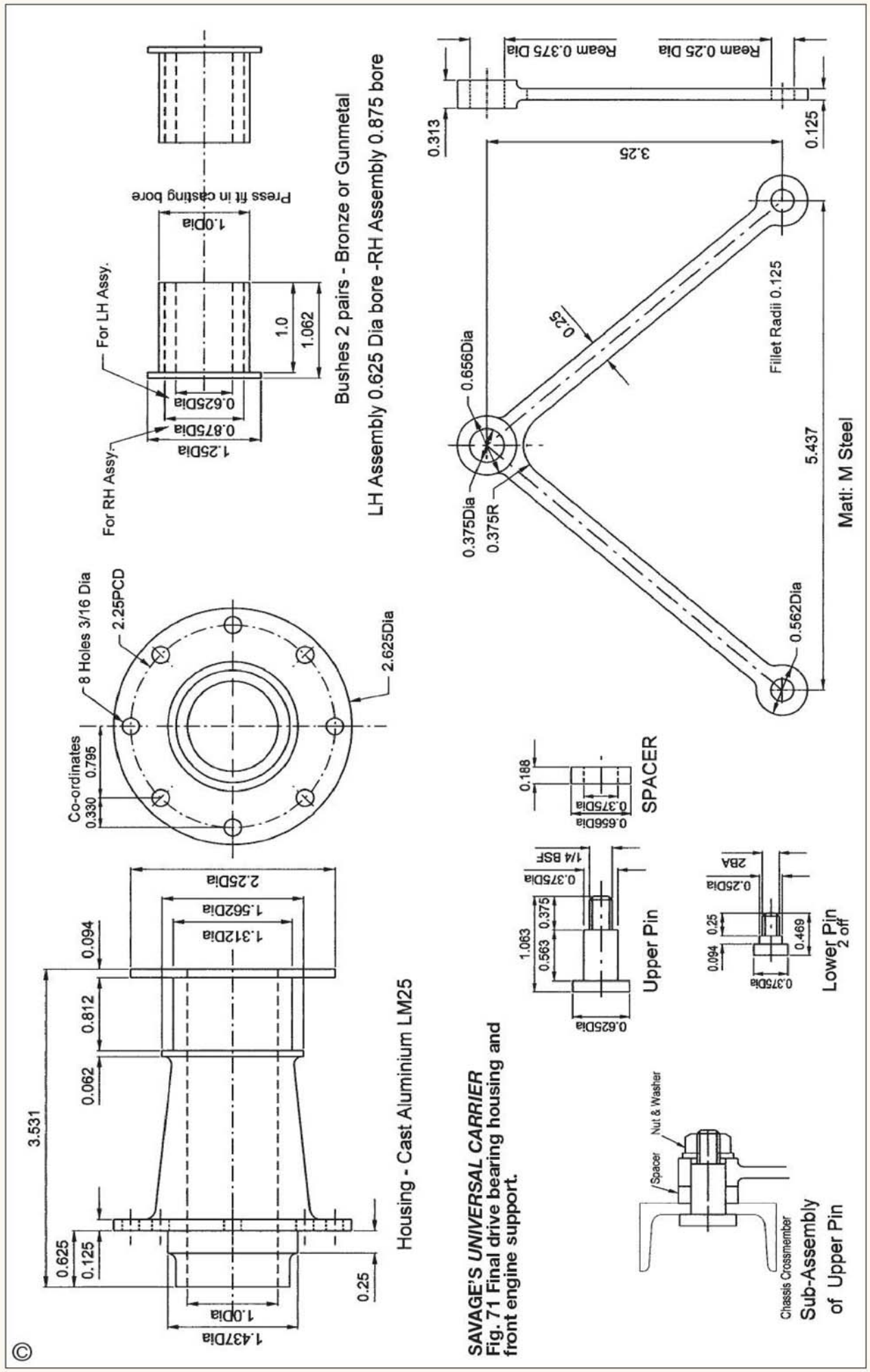


Mark the shaft centres. The centre positions determine the correct meshing of the gears.

164

The mating surfaces of the covers may be machined on a milling machine.

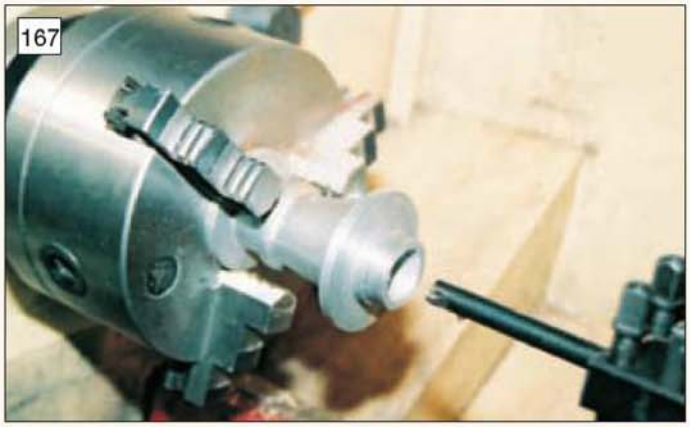

SAVAGE'S UNIVERSAL CARRIER
Fig. 70 Gearing top cover
Mill Cavity to Clear Bearing and Fixings Determine size from Job
0.188
0.156 General thickness
0.031
Section E-E
Tap 1/4 BSF for handles
0.438
0.188R
0.625
0.531
0.813
1.719
Section D-D
Cast Aluminium
5.5
0.375R
0.844R
1.500
1.5
1.875
0.656
2.25
1.375
0.25
1.063
E
2.0
D
1.563
1.094
3.000
1.688
5.812
12 Holes 1/8 Dia
1.344R
0.156 Constant
1.438
5.125
5.125
Section C-C
2.156R
1.688
0.344
0.656
©



SAVAGE'S *UNIVERSAL CARRIER*
Fig. 71 Final drive bearing housing and front engine support.

Alternatively the covers can be machined on the lathe. Do not over tighten the chuck as this may distort the relatively light casting.

The final drive bearing housings are machined from high tensile aluminium alloy castings.



Lightly grip the casting in the chuck to avoid marking it and remember to take light cuts.

A small round dot punch may be prepared to transfer the centres of the stud holes in the bearing housing to the crankcase.

The shaft centres should be carefully dot punched and once satisfied the casting may be moved to the milling machine to bore the holes. An accurate way to pick up a centre dot is to first drill a small hole, no more than a 1/16in. and preferably a bit smaller. A small drill is much more likely to pick up the dot punch. A short piece of steel or brass stock has the end turned down to exactly match the size of the drill; it is then popped in a collet and the table moved around until the little spigot on the piece of stock will smoothly enter the hole.

If a digital read-out is fitted to your machine the shaft holes may be co-ordinate drilled and bored, but if the crankcase is to be turned over it is vital the same datum or reference point is used.

Wall thickness

Once the shaft holes are machined in the sides of the crankcase, the wall thickness may be measured and the sides of the crankcase, finish machined as required. The overall width of the crankcase is drawn at 6.438in., a dimension taken straight from the works drawings. Some builders might prefer a nice round 6 1/2in., figuring that if the chain sprockets ended up that tiny bit further apart it would hardly matter, however 6 7/16in. (i.e. 6.438in.) is just as easy to measure as 6 1/2 so the builder might as well get it 'right' in the first place. Given fine feeds and a little cutting oil a good finish is assured. A fine grit wet and dry paper, used wet, will quickly remove any remaining tooling marks leaving a smooth mat finish, see **photo 168**.

Covers

The mating faces of the covers need to be machined flat so that, with a minimum of gasket material, an oil tight seal may be achieved. This may be done on either the milling machine or in the lathe; but in both cases care should be taken when gripping the castings as, with their relatively thin sections, they may be twisted easily. If they are distorted by the clamps, or an over tightened chuck, they will of course machine flat, but when released will spring back negating the whole purpose of the exercise.

The holes for the studs that secure the covers may be drilled the tapping size and then spotted through into the crankcase. The holes are subsequently opened out to a respectable clearance size over the studs. Some builders may wish to spot face the seatings for the nuts.

The single point chassis mounting for the front of the engine.

Final drive bearing housings

The final drive bearing housings may either be machined from a piece of Duralumin bar or machined from the castings supplied. The only useful comment is probably to beware of over tightening the chuck, as the flanges are quite fragile.

Two bearing bushes are required, identical in all respects other than the bore. Individual oiling arrangements for these bearings are probably not required as the inside face will receive plenty of oil from the crankcase; however an oil way may usefully be cut in the bore to more actively feed oil into the bearing. The works drawings do not specify any oilers for these bushes although the works illustration previously published does show a small raised boss on each extension; presumably for this purpose. It may be seen in photo 157 that John did decide to fit a pair of grease nipples, not entirely prototypical but certainly functional.

Three point suspension

The crankcase is secured firmly in the chassis in three places. Each bearing housing is firmly gripped at its extremity by the rear engine support brackets, the forces associated with the pair of chain drives to the back wheels thus not stressing the main engine unit.

The third support is a single fastening on the chassis from the front of the engine, see **photo 169**. The advantage of a three-point suspension is that when driven any flexing of the chassis will not result in a twist at the engine. The front engine support bracket may either be fabricated or made from the laser cut blank supplied.

●*To be continued.*

David Piddington

introduces us to the output of the Cornwall Works.

● *Part 1*

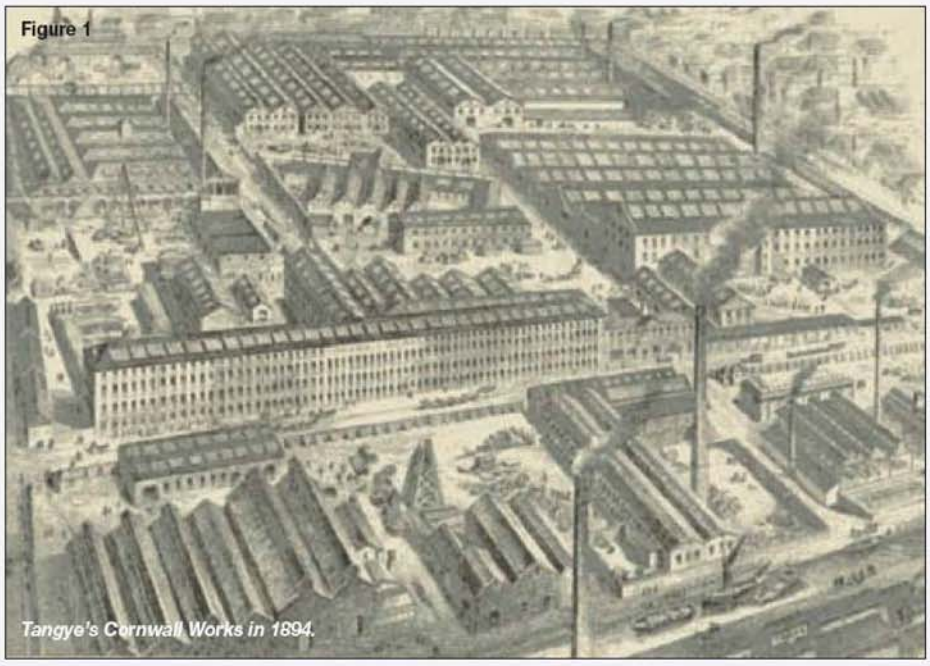


Figure 1

Tangye's Cornwall Works in 1894.

THE PRODUCTS OF TANGYES OF BIRMINGHAM 1891

This manuscript was first a talk with slide presentation that I gave to many model engineering clubs over a period of 15 or more years and which, due to changes of circumstance, I feel unable to continue. However, from the interest aroused at those meetings I believe that a wider audience would benefit from the contents, and demonstrate to model engineers that almost all artefacts from our industrial heritage can be an excellent subject for a working engineering miniature, provided that dimensional information is also available. I count myself extremely fortunate that I had access to three bound volumes of the Tangye catalogues for 1891 owned by the Birmingham Society of Model Engineers Ltd. of which I have been a member since 1968. A certain amount of further research may be required (even guess-work for finer details?), but the information contained in the catalogues should be a good starting point.

I fear that to some, if it didn't run on rails, was painted in the Great Western, (or another Railway Company's livery?) then items of our engineering heritage may not be worthy of consideration. With this selection of Tangye products I hope to dispel that notion coupled with my hope that with information supplied it is possible to reproduce some/many of these world-renowned products as working scale models in our amateur workshops.

I have given all of the original dimensions, weights, costs etc. without any attempt to correspond to modern nomenclature. I put it to you that by using the data of that time I am living up to 'standards' of historical research and accuracy. The older Imperial system had its idiosyncrasies as does metric, or the Biblical cubits and spans. Never having used metric in my working life up to that time, how could I do otherwise? However, they are all 'systems' and work well for those trained in them. Your author was a 1950s engineering apprentice using the Imperial inch system and, with one exception, I have used it in all my designs. That one exception - a launch engine which many of you will have seen in 'Reeves 2000' catalogue - was given metric dimensions but later one builder said, quite correctly, that *"This designer was thinking Imperial but writing metric dimensions"*.

Obviously it will not be possible to reproduce or describe every item in the catalogues of this world-famous engineering establishment that reached its zenith at the close of the Victorian era and which extended through the Edwardian and Georgian to the early part of the Elizabethan period of the early 1960s. Tangye jacks - the original Tangye product - are still in production, now under the trading rights of Allspeeds Ltd., of Accrington, Lancashire, who I believed held copyright of some of the Tangye records and did not wish to infringe their rights. I duly contacted them and I am grateful for their encouragement to offer this series for publication. A close friend, who is a general engineer, told me that he had recently (May 2003) overhauled a Tangye hydraulic jack and he believed that these items were still being made. He was right.

For the purposes of these pages I have done no research whatever outside the period of 1891 but I hope that the selection that follows will give much food for thought. Neither will I attempt to cover the history of the company in detail but some initial notes will not go amiss.

Company synopsis

The firm was founded by two Cornish brothers, Richard and George Tangye who both had had engineering experience in Cornwall and other centres. Their first workshop was set up at number 40½ Mount Street, off The Parade, near central Birmingham. It seems that 'A', and 'B' etc., were not in regular use in those far off days and split dwelling addresses seem to have been fractionalised. There at number 40½ they produced hydraulic jacks, an item which remained one of the firm's staple products. The Mount Street workshop was, in fact, set up by a third brother, James. A fourth brother, Joseph, brought with him an Holzapffel style lathe. Power for the lathe came from the engine in the next-door premises when that other firm was at work. Heating came from the oven in an adjacent baker's shop. A fifth brother joined them and in 1857 the Company was formed under the name 'James Tangye and Brothers'.

In late 1857 Tangye Brothers received a visit from the agent of a certain Mr. Brunel whose leviathan ship the *Great Eastern* was then stuck firmly half way down the launching slipway. Tangye's hydraulic jacks came to the rescue and it was said that 'Whilst Tangye's jacks had launched the *Great Eastern*, the *Great Eastern* had launched Tangyes' for work came in to such an extent that larger premises in nearby Clement Street were built. Mount Street has disappeared but Clement Street is still there north of, and in the shadow of, Birmingham's National Indoor Arena. A photograph of Richard Tangye, in tall hat, overseeing one of the hydraulic rams on that great ship may be found on the Internet under 'Brunel - Richard Tangye'

Tangye's jacks were used again on a notable occasion when 'Cleopatra's Needle' was erected on the Embankment in London. Thotmes II must have employed thousands of labourers to raise it originally in Egypt. In the late middle ages Fontana raised an obelisk in Rome with 40 capstans, 960 men and 75 horses. The French engineer Le Bas similarly raised the Luxor obelisk in Paris with ten capstans and 480 men. In 1878 Mr. John Dixon positioned 'Cleopatra's Needle' with four Tangye jacks, one man to each. In the early 21st century the same job could be done with one mobile crane, driver and his mate, and still working on hydraulic principles.

By 1864 Tangye's work had increased so greatly that the Cornwall Works was established on the Birmingham/Smethwick boundary at Soho, though the Clement Street works was retained for a number of years after that. The engraving (**fig 1**) shows a vastly expanded enterprise. It had no direct rail communication though the Great Western and the London and North Western railways were close by. The works did have its own horse-drawn internal railway system. The canal was very adjacent and two canal arms came within the works boundary as can be seen in the picture, though the wide sailing barges are a figment of the engraver's imagination, such craft being unable to navigate the city's narrow waterway locks, tunnels and over-bridges.

Further study of this engraving reveals a long building across the centre comprising the two parts of the engine shop immediately in front of which is Cornwall Road. The engine shop building was a very Victorian structure being ▶

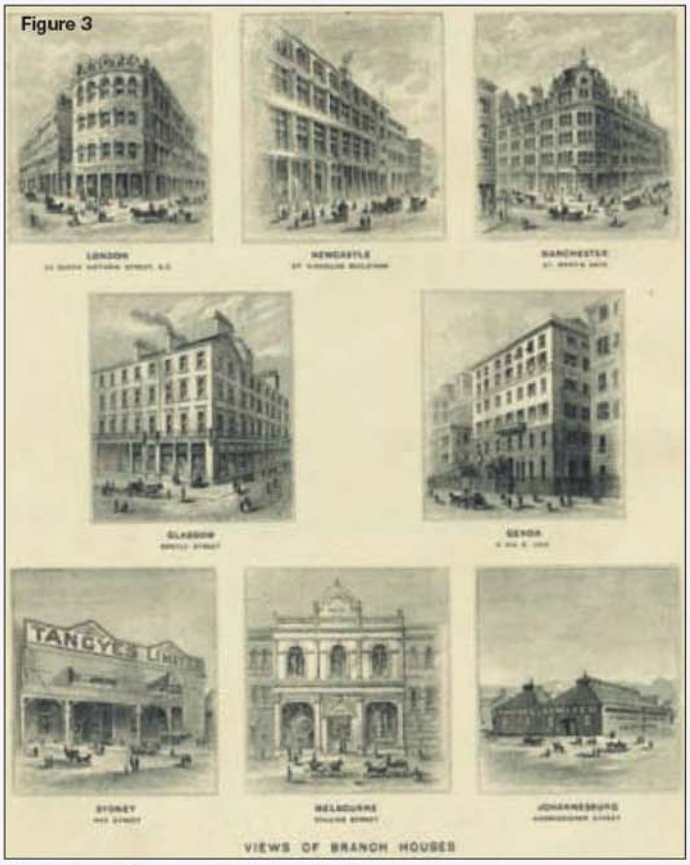
Figure 2

TELEGRAPHIC CODE

Wire how soon you can dispatch the following ——, I will pay cost of cable reply	SABOULE
Write how soon you can dispatch the following ——	SABRENAUD
Wire your present net price for the following ——, I will pay cost of cable reply	SABUESO
Write your present net price for the following ——	SABULICOLE
Wire how soon you can dispatch, and your present net price for the following ——, I will pay cost of cable reply	SABURRARIS
Write how soon you can dispatch, and your present net price for the following ——	SABURRAMOS
Wire your present discount off——, I will pay cost of cable reply	SABURRAREM
Write your present discount off——	SABURRAVAM
Wire how soon you can dispatch, and your present discount off——, I will pay cost of cable reply	SABURROR
Write how soon you can dispatch, and your present discount off——	SACABUXAS
I hereby order as per your quotation of ——	SACAMOTEL
do. as per your quotation of ——, forward per Mail Steamer	SACARINOS
do. as per your quotation of ——, forward per Ordinary Steamer	SACCADATES
do. as per your quotation of ——, forward per Sailing Vessel	SACCANTIS
do. as per your quotation of ——, wait consignment instructions	SACCARERE
I hereby order the following ——	SACCELLI
do. the following ——, forward per Mail Steamer	SACCER
do. the following ——, forward per Ordinary Steamer	SACCHEGGIO
do. the following ——, forward per Sailing Vessel	SACCOLEVA
do. the following ——, wait consignment instructions	SACCONCINO
Shall we send your order —— by Mail Steamer?	SACCULINE
do. do. —— by Ordinary Steamer?	SACERGOCE
do. do. —— by Sailing Vessel?	SACERRIMOS
do. do. —— by ——?	SACHANDA
Dispatch my order —— per Mail instead of Ordinary Steamer	SACHASEMOS
do. —— per Mail Steamer instead of Sailing Vessel	SACIARSE
do. —— per Mail Steamer	SACOLEJAVA
do. —— per Ordinary instead of Mail Steamer	SACOMATUM
do. —— per Ordinary Steamer instead of Sailing Vessel	SACRABARIS
do. —— per Ordinary Steamer	SACRARIO
do. —— per Sailing Vessel instead of Mail Steamer	SACRAVERAT
do. —— per Sailing Vessel instead of Ordinary Steamer	SACRICOLAM
do. —— per Sailing Vessel	SACRIFIERA
Your order —— has been forwarded per Mail Steamer ——	SACRIMORUM
do. —— do. per Ordinary Steamer ——	SACUDERE

The first page of 'standard' sentences with telegraphic codes.

Figure 3



A selection of Tangyes Offices worldwide.

some 3½ft. thick at the base and thinning out towards the top. Buildings at lower left corner are the light and heavy foundries and the smaller building between these and the roadway is the dressing shop. The right lower corner buildings with chimneys comprise the steel works. Continuing right from the engine shops were, in turn, the general offices, mess room and kitchen and, just out of picture, were the stables. To the left and rear of the engine shop were the timber yard, carpenters' shop, and retort shop. Continuing right were testing and erecting shops also the pattern stores. The three-storey building is the crane shop and behind them the lower roofs indicate the special shop where, presumably, almost anything might be made not erected elsewhere on site. To the left at top of picture the major building is the boiler shop and to its immediate right is one arm of the canal. To the right of this is the old foundry and to the rear of this the fitting shop, block shop and other sheds. Buildings to the far top right are the various smithies and forges the latter indicated by the row of chimneys.

The whole site was cleared some years ago to make way for more modern ventures and is now titled 'Cornwall Industrial Park'. The Cornwall Road still exists and when I recently visited the area and found what may be the frontage of the later Tangye works.

There were three main catalogues of Tangye products and much of the data may seem repetitive for which I apologise in advance. If one of you should desire to make a miniature of 'x-Tangye' for your next project then application of the data text will undoubtedly be appreciated. If you are reading these notes for research, or simply for pleasure, please do not attempt to memorise but, instead, consider the scale and scope of an enterprise that could produce to order, often from stock, such a vast array of products. Consider the size and scope of design and planning departments, the colossal pattern stores and the number of specialist joiner craftsmen in such a woodworking shop. As Tangyes had their own foundries there must have been an army of moulders backed up by craftsmen machinists, fitters and assemblers, and a not inconsiderable number of clerical staff dealing with accounts, orders, invoices, etc., etc. In later years another sales slogan, perhaps unofficial, was *"If we can get it through the main gate, we'll make it!"*

There would also have been a large telegraphy office for in those far off days before a certain Mr. Bell invented the telephone, the quickest method of sending messages was by Morse code telegraph. Obviously a long letter would take quite a time to write up in code, transmit, decode at receipt, and the process reversed for the reply. Many industrial companies had their own individual code system where simple words, longer phrases, and standard complex sentences were reduced to a single set of letters, mostly looking like words though few, if any, ever finding their way into the Concise Oxford Dictionary. The present day equivalent is the transmission of text messages by mobile telephone.

From a Tangye code page (**fig 2**) shown here it is clear that complex sentences can be reduced to a few letters only. It would seem from these examples that here originated familiar wagon names used on the Great Western Railway, e.g. 'Toad', 'Syphon', 'Crocodile' and others. It is also assumed that 'Toad' being a freight brake van was given its name because it was *"Toad along at the back of the train"* (pun intended - think about it!) The greatest years of the Tangye Company coincided with those of the British Empire, so it will be recognised that any major undertaking here in the British Isles had its representative offices worldwide and (**fig 3**) shows some of the offices set up in Genoa, Sydney, Melbourne, Johannesburg and others in the United Kingdom in 1891.

There are a total of 65 whole pages entirely devoted to the Telegraphic Code. Though a list of the contents is lengthy, for the sake of completeness in an attempt to give some idea of what was involved, a synopsis of contents is as follows. Firstly there is a page of how to use it. Then follow five pages of phrases and sentences (see fig 3). Then a page devoted to time in two columns one headed *"On receipt of order (if wired to us immediately) we could dispatch in..."* and the other *"We can forward your order in..."* both columns having 43 lines each entry with its individual code 'word'. Alongside in a third column are time periods from "*immediately up to 20 days inclusive"*, then *"3 weeks up to 16 weeks inclusive"*, and finally *"4 months to 12 months inclusive"*. Then follow pages of (a) percentage increase of prices from 1 to 50 in half per cent units and 51 to 100 in whole per cent units.

(b) A page of price reductions but only up to 50 per cent in half units. Then come

(c) Discounts,

(d) Our present net price - 17 pages of prices individually coded from 1 penny to 20 shillings in 1-penny increments which totals 240 separate individual code 'words'. Then £1. 0s. 6d followed by £1. 1s. 0d increasing to £10. 0s. 0d in 1s. (1 shilling) increments; thence by 5 shillings up to £25. 0s. 0d; by 10 shillings up to £50. 0s. 0d; whole £1's up to £1000. 0s. 0d.; and lastly by £5. 0s.0d up to the large sum of £5000. 0s. 0d.

(e) We do not understand your telegram e.g. 'Fifth word in the body of the message' —- *seminantis*.

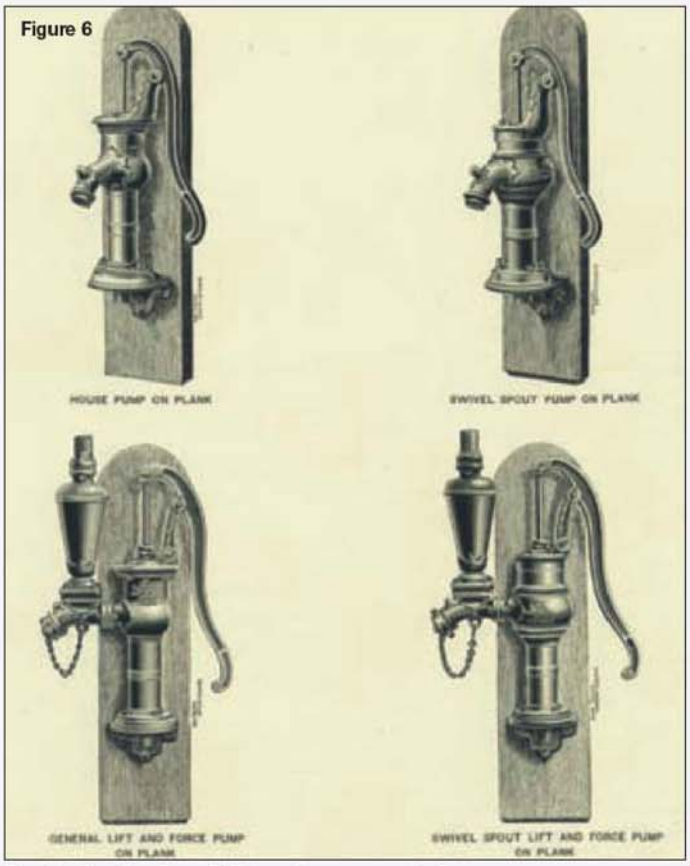
(f) Repetition of telegrams e.g., 'The thirteenth word in the body of our telegram should be — *semovetur*.

(g) Table of reference to date sub-headed in seven columns date only, letter of, telegram of,

Figure 4

Title page of the General Section of the Tangyes catalogues.

Figure 6



New Design (Registered) House Pumps - on plank.

enquiry of, quotation of, order of and invoice of. Under each sub-heading there is another individual code 'word' each indicating just one day of each calendar month - all 366 entries.

(h) A credit of £..... has been opened in followed by a list of 24 world banks.

(j) Tables of dimensions in half inches up to 36 (1 yard), whole inches up to 144 (12 feet), half feet (6 inches) up to 100 feet, whole feet up to 200, 5 feet increments up to 500 and in 10 feet bits up to 1000 feet.

(k) Cubic feet from 1 to 50,000.

(l) Weights in pounds up to 112 (1 cwt), in hundredweights (cwt) up to 20 cwt (1 ton), and in tons up to 300.

(m) Steam pressures in lbs per square inch at cylinder sub-headed into maximum, working, and minimum from 15 to 200.

(n) Hydraulic pressures per square inch from 1 to 2240 in lbs. (pounds) (1 ton) and then in cwts. per square inch from 21 to 60.

I must stress that each one of these of bits of data, approximately 8850, had an individually chosen and differently spelled code 'word'. A telegraph clerk was a highly skilled, quick-thinking person. He had to be to remember approximately where in the codebooks a particular word might be. The quicker a letter could be 'translated' the quicker business could be transacted. From a railway book I read - Adrian Vaughan's excellent *Grub, Water and Relief - Tales of the Great Western 1835-1892*, I quote *"Only the most energetic and quick witted lads could become (telegraph) clerks and it is not surprising that several chief officers of the Company began their careers in the telegraph office"*.

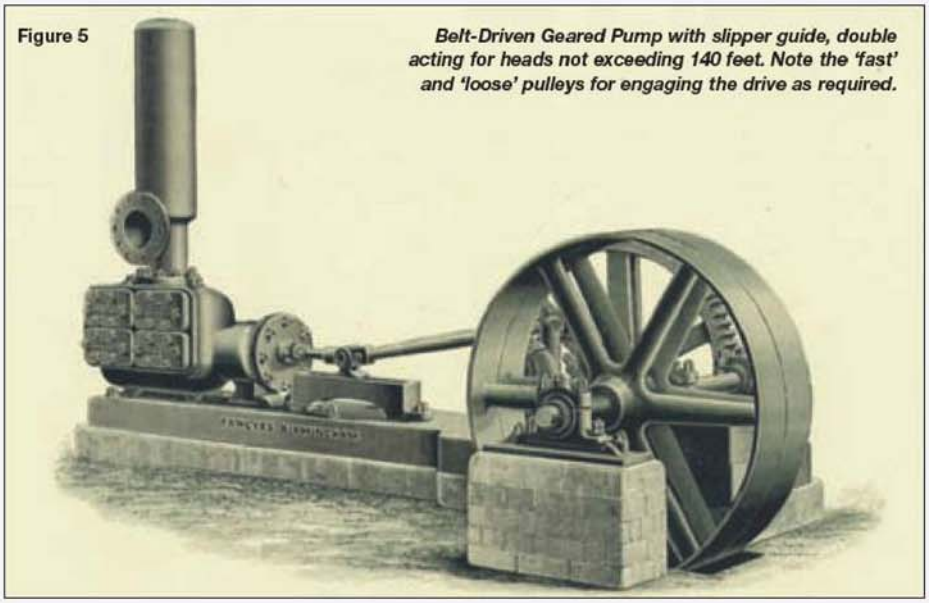
So let us commence our tour of Tangye's output over a century ago with the title page **(fig 4)** of the Cornwall works General Section. As can be read this section deals with machinery for lifting and moving objects, also some pumps which we will look at first.

The major portion of our planet is covered in water and it is said that if spread around evenly it would cover the land to a depth of two miles. It is therefore necessary in an industrial society to be able to move it around in quantity and so pumps formed a large part of Tangye's output. **Figure 5** is a good example of a belt-driven geared pump with slipper guide and made in four sizes with 8, 9, 10 and 12in. dia. rams. The pump was double acting and suitable for heads up to 140 feet. It would be driven from a steam engine of which Tangyes could provide many suitable and differing types. Valves on the pump were of brass, rods of Muntz metal - an alloy 60% copper and 40% zinc, and a cast iron bucket (piston) with leather packing. The remainder of the construction materials followed a familiar pattern of the times, i.e. use what was available. An alternative to the fast and loose pulleys was a single pulley for wire rope drive. Valves and bucket were normally supplied for use with cold water but materials suitable for other liquids (not stated which) could be fitted on request. Based on a piston speed of 80 feet per minute the 8in. pump could deliver 10,240 gallons per hour and the 12in. pump 23,040 gallons in the same time.

Similar pumps were produced in sizes from 3 to 12in. and with gear or direct drive, although beam engines were then - 1891 - no longer in quantity production, eight sizes of vertical pump were offered from 3 to 10in. barrel diameters.

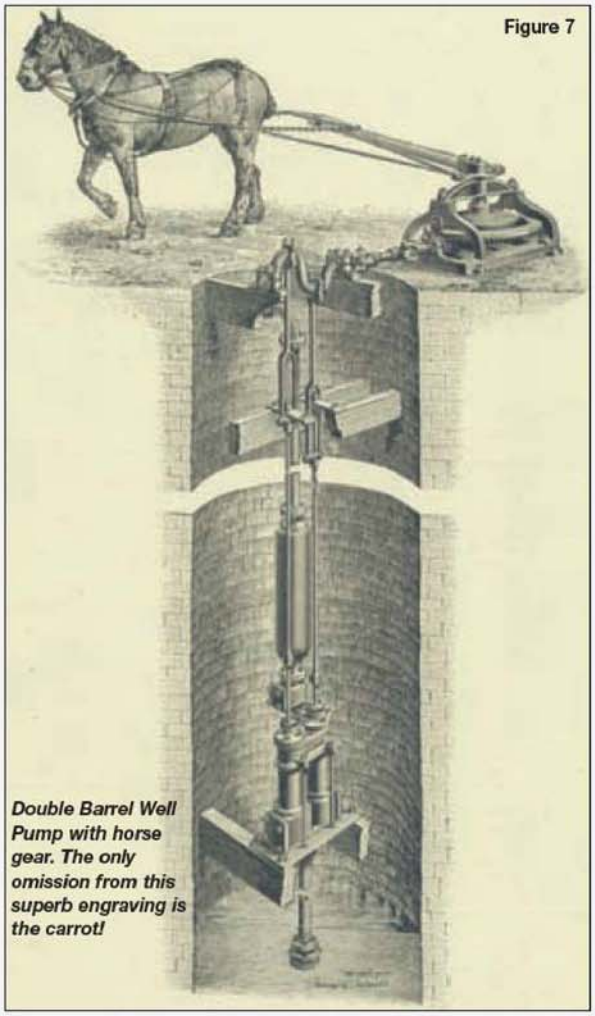
Pumps were very much in demand for domestic and small business outlets and the once familiar wash house pumps (**fig 6**) were made in four rather ornate types, free standing or ▶

Figure 5



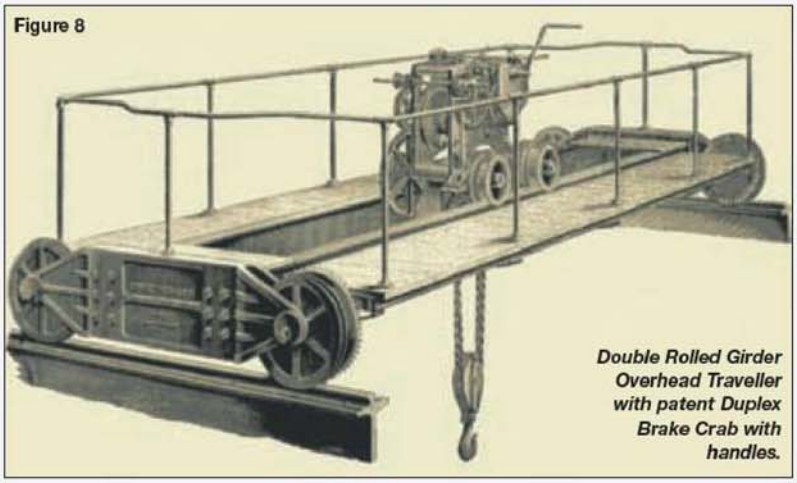
Belt-Driven Geared Pump with slipper guide, double acting for heads not exceeding 140 feet. Note the 'fast' and 'loose' pulleys for engaging the drive as required.

Figure 7



Double Barrel Well Pump with horse gear. The only omission from this superb engraving is the carrot!

Figure 8



Double Rolled Girder Overhead Traveller with patent Duplex Brake Crab with handles.

mounted on a plank as shown in these illustrations. The heading of the specifications pages of the catalogue states that 'these pumps combine whatever is useful in the old and ugly style of house pump, with gracefulness of outline'. Barrels were of cast iron and bored true, the pump rod was screwed into the bucket making the latter impossible to tip over (and jam?) and was mounted by a neat iron bracket to the plank. The swivel types would be set either for left or right-hand operation by loosening two nuts on the top cover. All were made in three sizes, 2 1/2, 3 and 3 1/2in. barrel diameters and with 1 1/4, 1 1/2 and 1 3/4in. dia. suction inlets. The smallest house pump weighed 38lbs (pounds Avoirdupois) and cost 18s 0d; the largest swivel spout force pump weighed 122lbs and cost £2.12s.0d. Incidentally this is one of the very few places in any of the Tangye catalogues showing a sale price other than in the telegraphic code pages. If you wished to know the price of almost anything else you either telegraphed, or wrote a letter to be sent by post.

Other pumps included two types and three sizes of hydraulic boiler provers, kitchen and yard pumps both hand and crank operated, hand well pumps, hand portable pumps, California pumps, London pumps, ships' pumps, small wheeled fire engines, contractors' pumps, single, double and treble barrel pumps, well pumps with horse-gear operation (**fig 7**) and many, many more.

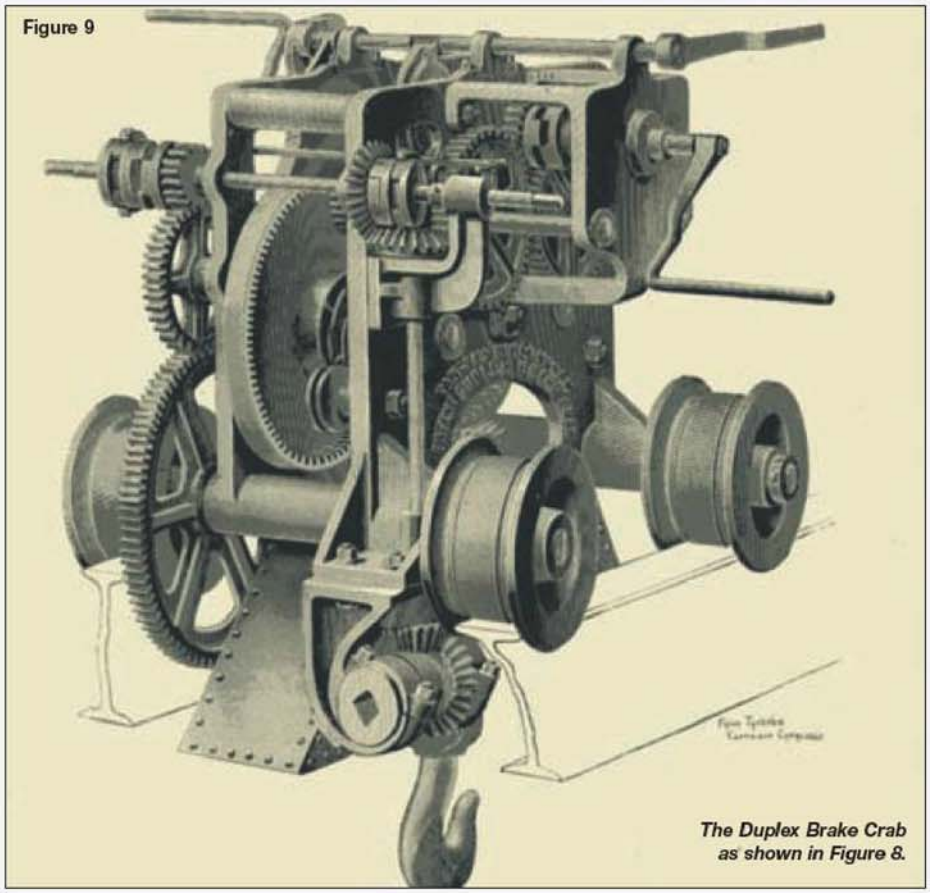
It will be appreciated that with the relative sizes of machinery and components under manufacture that these would require lifting aids in abundance and so Tangyes were able to offer a considerable range of cranes, pulley blocks, hoists and jacks and other devices. Space precludes giving other than a few examples though a more extensive research into this one facet of engineering history would prove very interesting. Let us first consider the overhead lifting crane (**fig 8**) or, as it was called in the late 19th century, a traveller.

There were several types of traveller with single, double or multiple girder crossbeams with a suitable lifting mechanism known as a crab. The double rolled girder overhead traveller shown here was fitted with a patent duplex brake crab unit. The traveller had English rolled steel girders, cast iron end carriages and wheels, timber platforms with handrails supported on wrought iron brackets. The longitudinal movement was effected from the crab through a wrought iron cross shaft and gearing driving the travelling wheels at each end. Three sizes were made of 6, 8 and 10 tons lift capacity and each for 14, 15, 16, 17, 18, 19 and 20ft. spans. The smallest weighed 4 tons, the largest nearly 8.

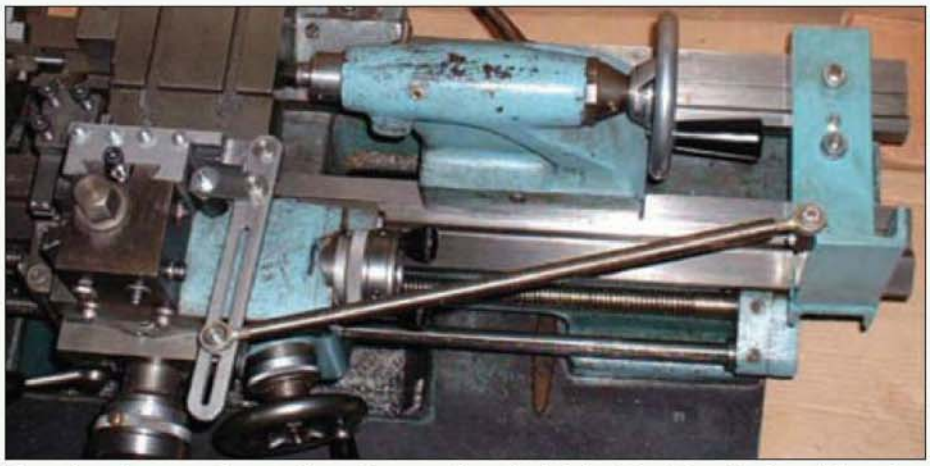
The patent brake crab shown (**fig 9**) is quite sophisticated and was operated by two men who walked or stood, one on each side, on the aforementioned foot boarding. The frame was cast in one piece, and fitted with iron wheels. Lifting was effected by two pitch-chain wheels each of which took one end of the lifting chain moved by either single or double purchase gearing from the handles. The chain was taken around a bottom block and over a compensating pulley thus giving four strands of chain to carry the load and ensuring a vertical lift. Lowering was effected by the reversing of the handles or by a brake and, if by the latter, the handles did not move. If the handles did move they could injure or dislodge the two operators. It was worked in double gear and two men for heavy loads, but one man and single gear could be dispensed with for lighter lifts. A system of dog clutches can be seen in the engraving.

● *To be continued.*

Figure 9



The Duplex Brake Crab as shown in Figure 8.



The universal screw cutting attachment in use on the author's lathe. It is designed to be quickly and easily set up and does not interfere with normal turning operations.

UNIVERSAL SCREW CUTTING ATTACHMENT

Jacques Maurel
of France explains a novel approach to screw cutting non-standard threads on the lathe.

The machining of non-standard screw threads with a lathe is always a problem. For a continental like me, these are mainly the imperial ones and the multiples of π used to make worm gears. In these cases it is necessary to alter the change wheel train driving the leadscrew and this takes 15 minutes to set up and 15 minutes to take down afterwards.

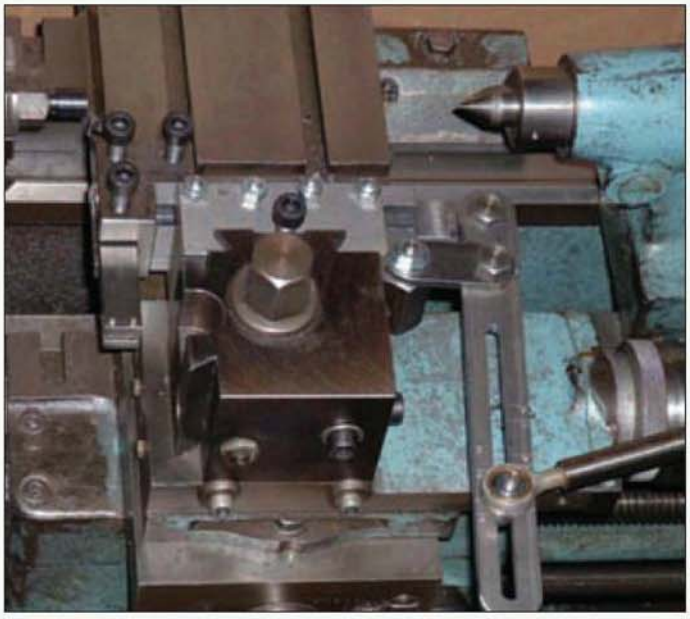
I was very much impressed by the attachment proposed by Mr. McDuffie in one of the first issues of *Model Engineer's Workshop (issue No.2, Autumn 1990 - Ed.)* and wanted to make one, but I realised that it would take me the same setting up time as for gear changing because I couldn't let this attachment remain in place due to the fact that it raises the top-slide thus interfering with normal tool setting. So I decided to make an attachment almost entirely contained in a tool holder set on my tool post, the aim being to have minimal set up time, and the ability to cut threads for a length of approximately 50 millimetres.

Principle

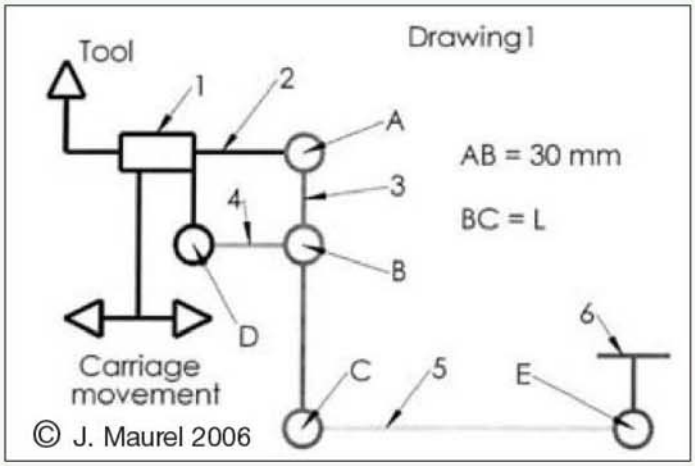
The principle of operation of the device is shown in **drawing 1** and this is drawn looking down on the tool from above.

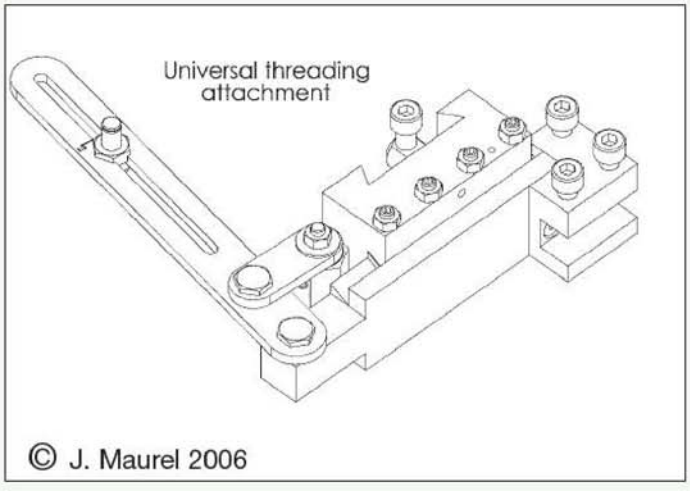
Item 1 is moved by the carriage giving the lead (p) from the standard lathe gearbox.

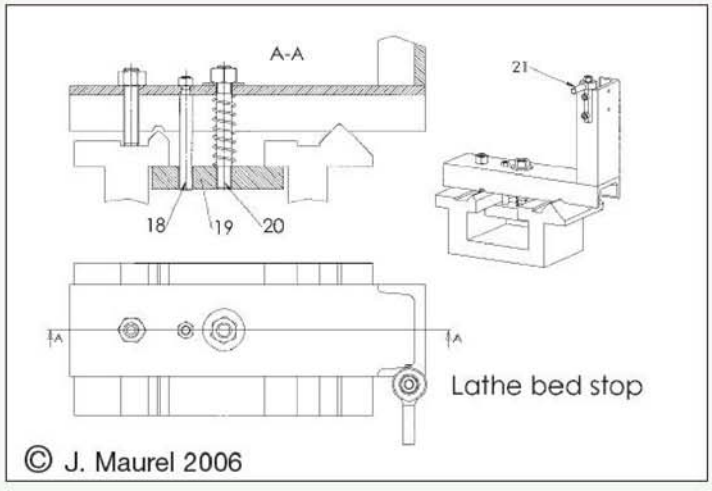
Item 2 (the tool) receives this movement plus an additive one given by the lever (item

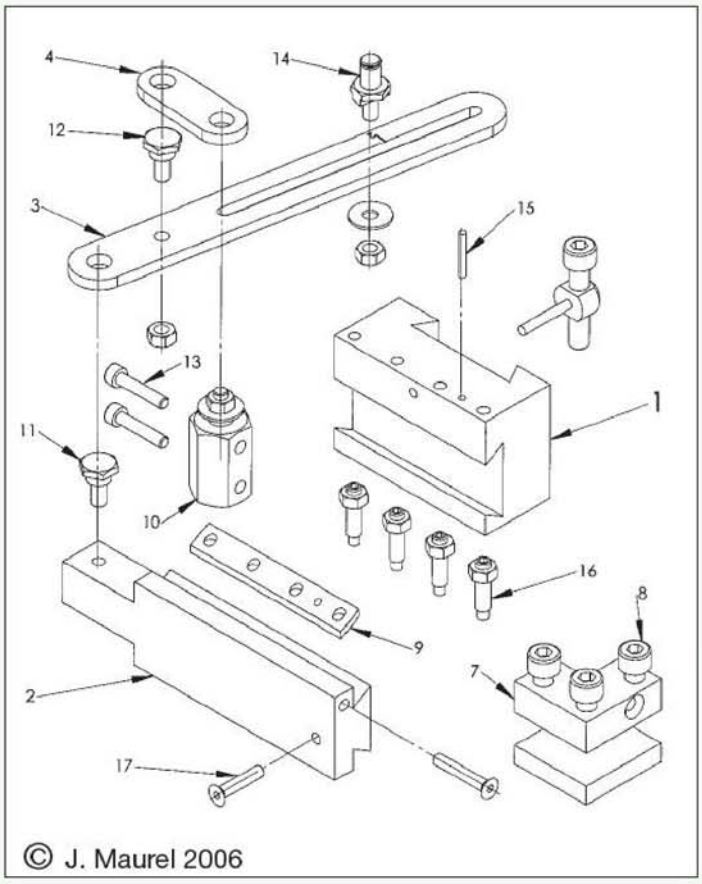


A close up view of the attachment in the lathe tool post. Note the graduations on the combination lever.



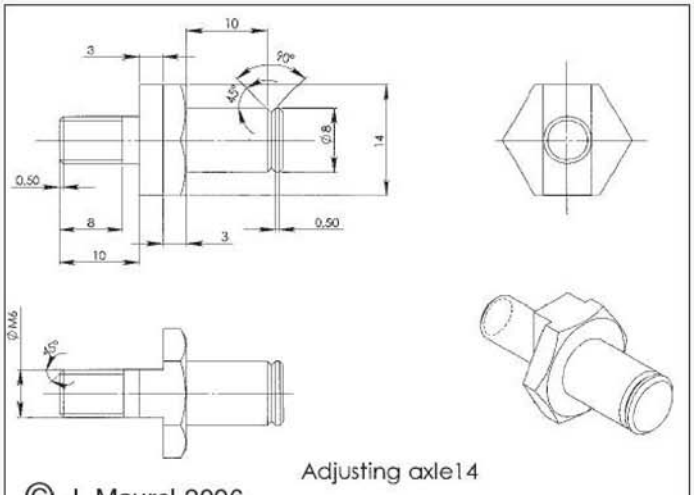






Main parts list

Ref.No.		Name	Material	Remarks
1	1	Body	FCMS	
2	1	Slider	FCMS	
3	1	Combination lever	FCMS	5x25mm cold rolled
4	1	Link lever	FCMS	5x25mm cold rolled
5	1	Ball ended stop rod		
6	1	Lathe bed stop		
7	1	Tool holder	FCMS	
8	3	Socket screw M8 x 30 mm	Steel	Harden
9	1	Gib	FCMS	3x12mm cold rolled
10	1	Pivot	FCMS	Hex 22mm cold rolled
11	1	Slider axle	FCMS	Hex 14mm cold rolled
12	1	Lever axle	FCMS	Hex 14mm cold rolled
13	2	Socket screw M5 x 25	MS	
14	1	Adjusting axle	FCMS	Hex 14mm cold rolled
15	1	Dowel 3mm dia.	FCMS	Cold rolled
16	6	Gib grub screws M6 x 25mm	MS	
17	2	Flat head screw M6 x 2mm	MS	
18	1	Guiding pin	FCMS	8mm cold rolled
19	1	Clamp	FCMS	15x25mm cold rolled
20	1	Stud M10	Steel	Harden
21	2	Ball joint, bore 8mm shank M8		



Adjusting axle14

3). It is a combination lever, the point B being linked to item 1 by the rod (item 4), the point C being retained by the rod (item 5) whose point E is fixed to the lathe bed via item 6. The lead obtained (p') can be adjusted by changing the distance BC.

Calculation:
BC = L = 30/((p'/p)-1) mm

I wanted length L to be approximately 100mm (approximately 3x length AB), so I must choose p to be approximately (p'/1.3).

Example:
p' = 1.27mm (20 TPI)
p = 1.27/1.3 = 0.976

So the standard lead choice on the Norton gearbox makes p = 1 mm

Hence:
L = 30/((1.27/1) - 1)
= 30/0.27
= 111.1mm

I have made a charts that can be used with any 'metric' or 'imperial' lathe, the different 'L' values being numbered and stamped on the lever (item 3) for the usual imperial and module leads.

Length of thread possible

If 'n' is the number of threads possible to be cut, and the throw of item 2 being 20 mm.

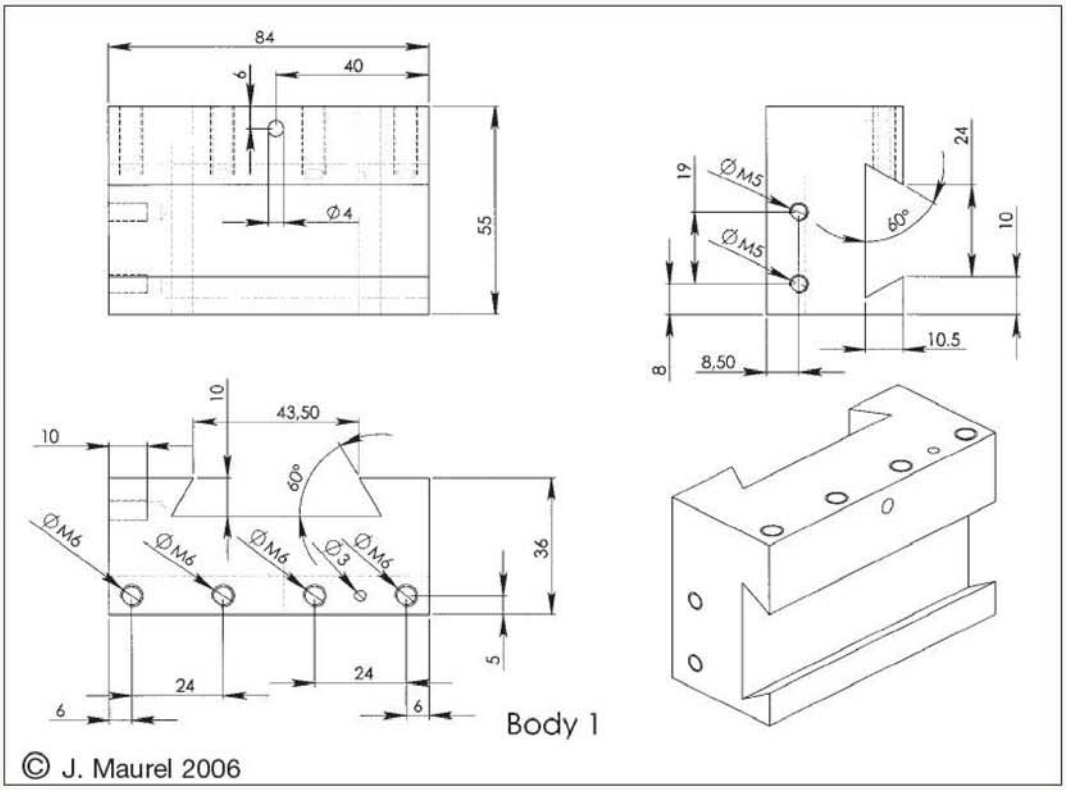
n = 20/(p'-p)

for the previous example: n = 74 threads and so 74x1.27 = 94mm can be cut.

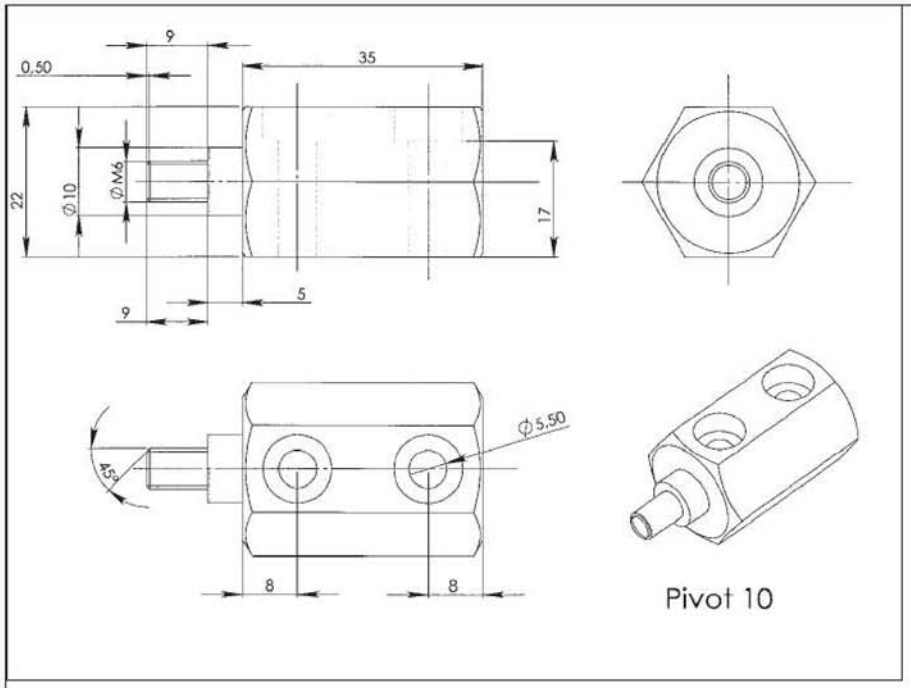
Please note:

If I had chosen p = 0.75mm, I would have found L = 43.27mm, so, n = 38.46 threads, thus only 48mm could be cut and a small error for 'L' will have a greater influence on the lead obtained.

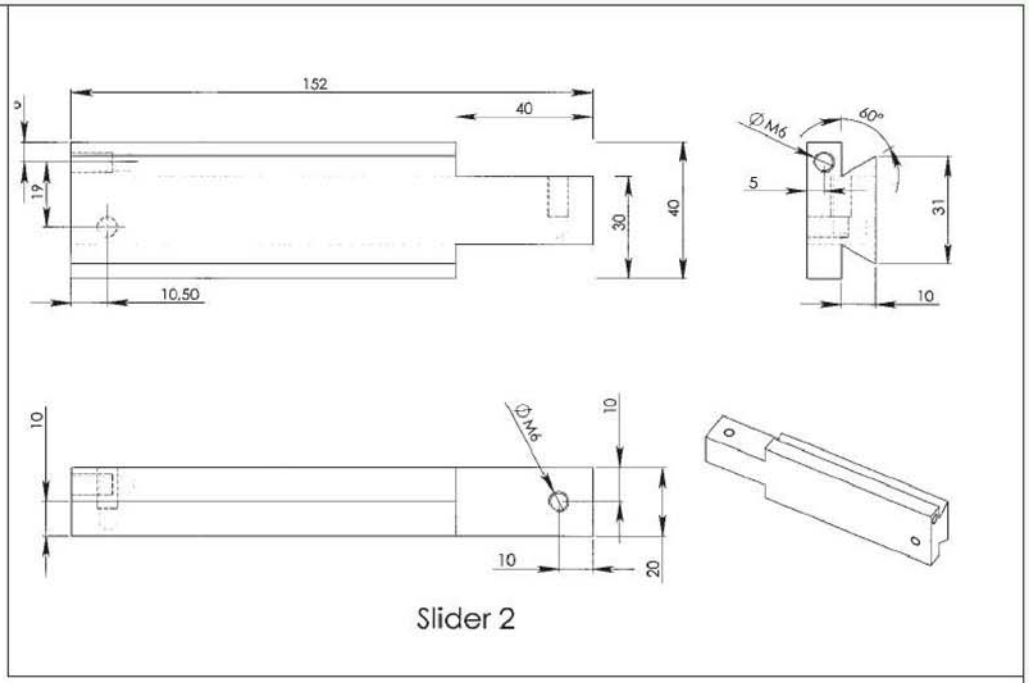
This explains the compromise I've made



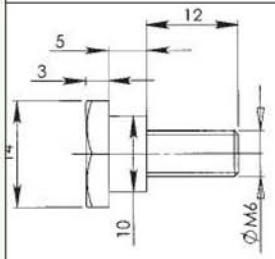
Body 1

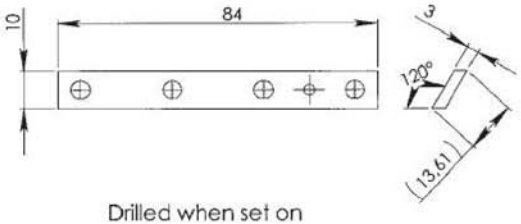


Pivot 10

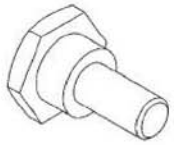


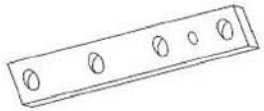
Slider 2





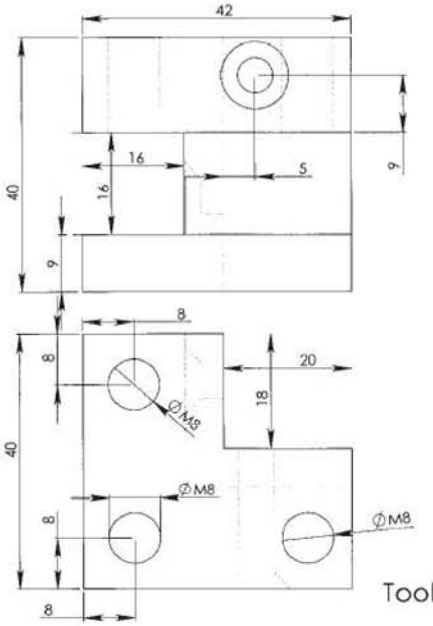
Drilled when set on

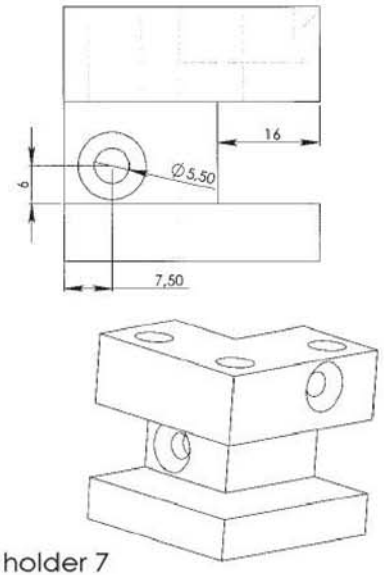




Slider axle 11
Lever axle 12

Gib





Tool holder 7

Threading chart 1 (metric lead screw, imperial leads) :

Lead (TPI)	Lead (mm)	Nearest gear box lead (mm)	L (mm)	N° Stamped on lever 3 (right side)
40	0.635	0.5	111.1	2
32	0.7937	0.5	51.07	8
28	0.907	0.75	143.3	1
26	0.9769	0.75	99.16	3
24	1.0583	0.75	72.98	6
22	1.154	0.75	55.69	7
20	1.27	1	111.1	2
19	1.3368	1	89.07	5
18	1.4111	1	72.97	6
16	1.5875	1.25	111.1	2
14	1.814	1.5	143.3	1
13	1.9538	1.5	99.15	3
12	2.1166	1.5	72.98	6
11	2.309	1.75	93.91	4
10	2.54	2	111.1	2
9	2.8222	2	72.97	6
8	3.175	2.5	111.1	2
7	3.628	3	143.3	1
6	4.233	3.5	143.3	1
5	5.08	4	111.1	2
4	6.35	5	111.1	2

Threading chart 2 (metric lead screw, module leads for one thread worm screw):

Lead = m x π (m = module)

Module (mm)	Lead (mm)	Nearest gear box lead (mm)	L (mm)	N° Stamped on lever 3 (left side)
0.5	1.57	1.25	116.89	1
0.75	2.356	1.75	86.6	3
1	3.141	2.5	116.89	1
1.25	3.926	3	97.08	2
1.5	4.712	3.5	86.6	3
1.75	5.497	4	80.11	4
2	6.283	5	116.89	1

Threading chart 3 (imperial leadscrew, metric threads)

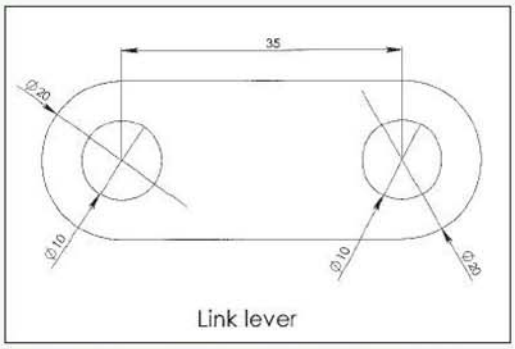
Lead (mm)	Nearest gear box lead (mm)	Nearest gear box lead (TPI)	L (mm)	N° Stamped on lever 3 (right side)
0.5	0.3968	64	115.45	2
0.75	0.529	48	71.8	6
1	0.7937	32	115.41	2
1.25	0.9769	26	107.3	3
1.5	1.154	22	100.5	4
2	1.587	16	11545	2
2.5	1.9538	13	107.3	3
3	2.309	11	100.24	4
3.5	2.8222	9	124.91	1
4	3.175	8	115.45	2
4.5	3.628	7	124.8	1
5	3.628	7	79.32	5
5.5	4.233	6	100.22	4
6	4.233	6	71.86	6
6.5	5.08	5	107.32	3
7	5.08	5	79.37	5

Threading chart 4: (imperial lead screw, diametral pitch lead for one thread worm screw.)

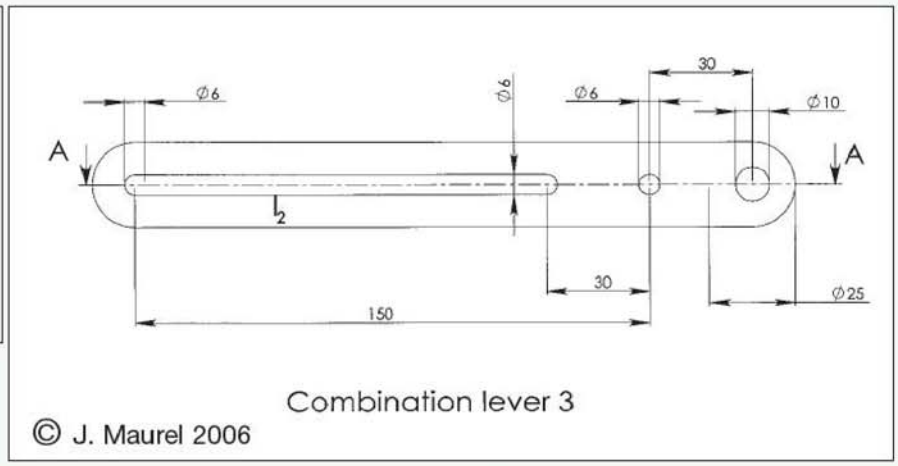
Lead = (25.4/DP) x π (mm)

Diametral pitch	Lead (mm)	Nearest gear box lead (TPI)	L (mm)	N° Stamped on lever 3 (left side)
48	1.6624	20	97.08	4
40	1.9949	16	116.89	2
32	2.4936	13	108.57	3
20	3.9898	8	116.89	2
18	4.4331	7	135.18	1
16	4.9872	7	80.07	6
14	5.6997	6	86.57	5
12	6.6497	5	97.08	4

For absolutely odd leads, you will have to make the calculations and adjust the length L with a graduated rule.



Link lever



Combination lever 3


The method used by the author to locate the gib strip for drilling the clamp screw seats.

(L approximately = 3 x AB) so remember:

* If p is close to the value of p', L will be long (room problem) and the thread length great.

* If p is far from the value of p', L will be short (with a bad influence on the lead accuracy) and the thread length short.

Use of the attachment

Put the attachment in the tool post, place a screw cutting tool in to the holder and adjust for tool height. Select the standard lead (p), put the lever (item 3) perpendicular to the lathe axis and move the carriage until the tool bit is in the middle of the thread length to be cut (for the best linearity) and shut the half nuts on the lead screw (they must be kept shut until completion of the thread). Adjust the length 'L' according to lead required (p'). Adjust now the stop position (for the ball ended rod (item 5) and clamp it on the lathe bed. You are now ready for screw cutting.

Removing

1: Take out the ball-ended rod (withdraw it away on the stop). The stop can be removed or stay in place if it doesn't interfere with anything.

2: Take out the attachment from the tool post.

The lathe is now ready for any further operations.

Making

Item 1: The rear part must suit your tool rest, the front part carries the dovetail slide.

The method I used for gib adjustment is shown in the photograph. Clamp the parts 1, 2 and 9 together using small wedges (flatten small nails by hammering) set in the clearance (about 0.5 mm) between items 1 and 2 on the side opposite the gib.

You can now drill the 3mm dia. for the dowel, and the 5mm dia. holes (the tapping dimension for M6 thread) with a standard drill, and finish the bottom (which will be in the gib) with a flat end one made by off hand grinding.

The other parts give no problem, the numbering of the lever 3 has been already explained.

Lathe bed stop: This must be made to suit your lathe bed. I used two pieces of 60x30mm channel iron welded together. The stud 20 and clamp 19 are kept in place by a spring and a guide pin (item 18), for a quick and easy set up.

IN SEARCH OF PERFECTION

A. B. Lyre

explains how to add that finishing touch to your model.

As most judges at exhibitions will confirm, it is attention to detail that sets the exceptional models apart from the less well-made items. However, one detail that seems to receive scant attention is the subject of scale cushions. *"What?"* I hear you cry. *"What have cushions to do with model engineering? You will be putting a cushion on the front cover of the magazine next."* Well, cushions turn up in all sorts of models and typical examples would be the seats in miniature steam wagons, model cars and fire engines and even in model rolling stock. The vast range of material available at your local haberdashery means that getting suitable material to cover your cushions is not a problem - the difficulties start when selecting the stuffing.

In the past horsehair was much used as a material for stuffing full size cushions. Careful research by the author has revealed that a good substitute for horsehair for models of around 1:8 scale is hamster fur; the preferred pelt being that from the golden hamster (Mesocricetus auratus).

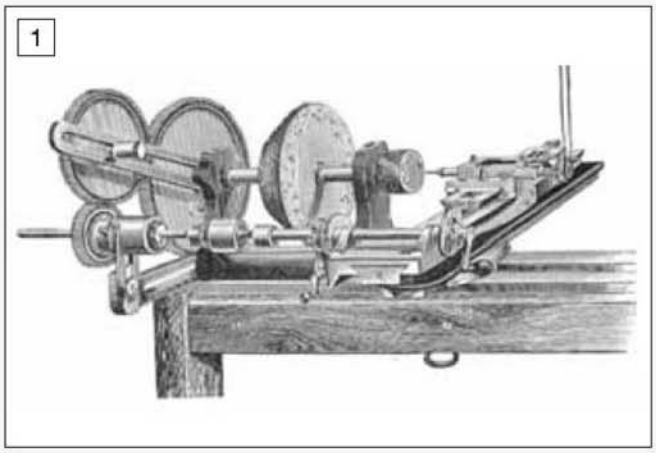
Now, recognising what you need and getting it can be two very different things. It is rumoured that one model engineer went out and bought a hamster with the intention of slaughtering the little animal for its fur. He ended up divorced, estranged from his children (who regarded him as a potential murderer) and under investigation by the RSPCA for cruelty to animals. This approach is not recommended.

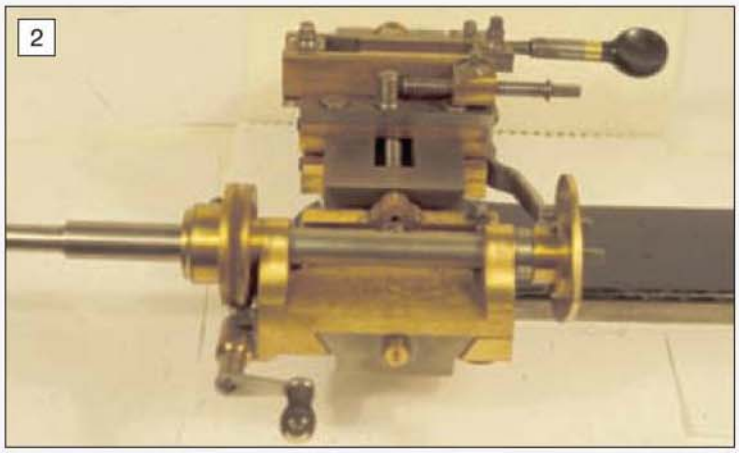
A better approach is to buy the little mammal as a family pet and take very good care of it. As the creature goes through its normal, periodic moults the hair can be carefully harvested and put to one side. The hamster should thus be bought at the same time as the rest of the materials for the model and, by the time the main structure is finished, you should have enough hair to stuff the cushions you require. Since the life expectancy of a golden hamster is, on average, 1.8 years that gives you a reasonable time frame in which to plan and execute the build of the model. Plucking an animal that has died of natural causes could top up the supply; but even the most heartless is likely to shy away from desecrating the body of what will have probably become a well-loved pet.

Larger models require larger animals. My research suggests that a quarter scale model will need hair from a Jack Russell terrier. If my experience is typical, the average smooth-haired Jack Russell sheds enough hair in its lifetime to stuff several duvets let alone the odd model cushion. If you do not own a dog and do not wish to then it is best to befriend a local dog owner and visit often. Periodically allowing their pride and joy to sit on your lap should provide you with sufficient hair over a period of time although pulling the stuff off your clothes with tweezers can be tedious.

Larger models than quarter scale require larger dogs. Here I must report that my research has hit a snag. The local owner of an Irish wolfhound was co-operative but the dog wasn't and since dog bites can be painful and take a long time to heal I decided that discretion was the better part of valour. Allowing the beast to sit on my lap did not seem to be a sensible option either. Another possibility for the larger model is goat hair but chasing my neighbour's goat around its enclosure with my 0-1in. micrometer in hand has resulted in some unwelcome attention by the local constabulary and activity in that area has been suspended. If any readers have dimensional data on goat hair perhaps they would write to the Editor and share their knowledge with us all.

Another obvious source of stuffing for cushions on the larger model is human hair. This is an attractive option as you can grow your own supply. However, since model engineers tend to be male and getting on in years that may be a problem for the 'follicularly challenged'. An alternative, which will not appeal to everyone, is to grow a beard and 'harvest' that. It gives a new meaning to the term 'putting something of yourself into your model' although female model engineers might be at something of a disadvantage.





PLAIN MAN'S GUIDE TO ORNAMENTAL TURNING

by John Edwards

In this concluding article the author examines some more methods of Rose-turning culminating with the magnificent Rose Engines which were the crowning achievement of the Holtzapffel Company.

●*Part 10 continued from page 283 (M.E.4268, 3 March 2006)*

Geometric Slide-Rest (or sliding slide-rest): another way of cutting wavy lines on surfaces under the control of a rosette. The main slide of the rest has a spring in place of the usual leadscrew and this forces a rubber against a template.

The template is mounted on a spindle connected by a gear train to the lathe spindle so that when the template is rotated the slide oscillates and the gear train turns the lathe spindle. The profile of the template is repeated several times around the work according to the ratio of the gear train. **Figure 1** shows an engraving of a geometric slide rest, and **Figure 2** a version produced by Evans.

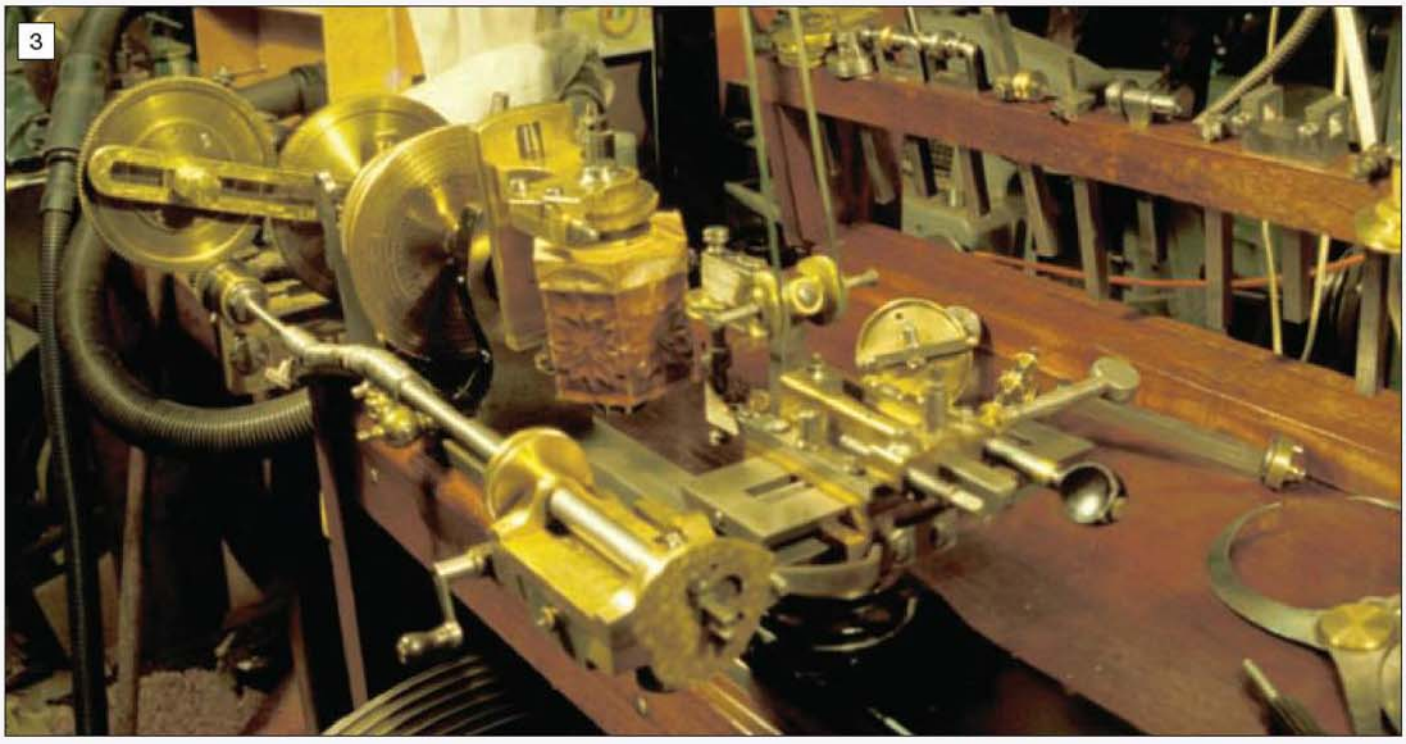
The Rose Engine and Ornamental Turning Lathe is a light form of Rose Engine, almost identical to an Ornamental Turning lathe but with a rocking headstock that carries a single rosette carrier mounted on the tail of the lathe spindle (**Figure 4**).

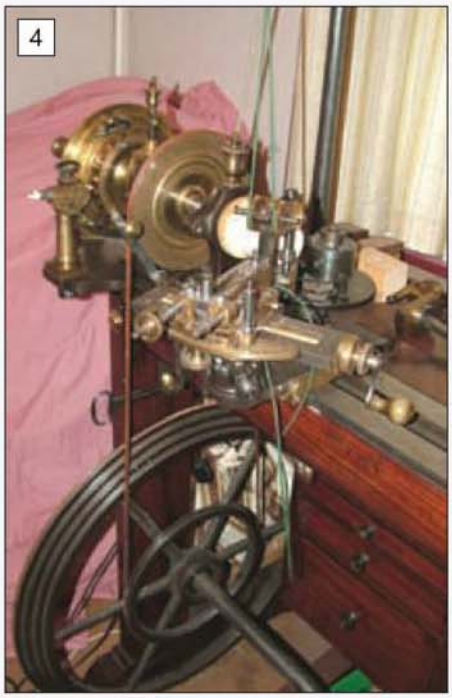
Figure 3 shows the Geometric Slide-rest in action ornamenting one side of a hexagonal box held on the Dome Chuck.

In **figures 5, 6 and 7** are some rose-turned pieces: a ring stand in lignum vitae, a Tazza in Mopane and a box in African Blackwood and Pink Ivory wood. All were turned with the horizontal cutting frame; the Tazza on Eccentric and Oblique chucks combined and the box lid was made from four separate pieces.

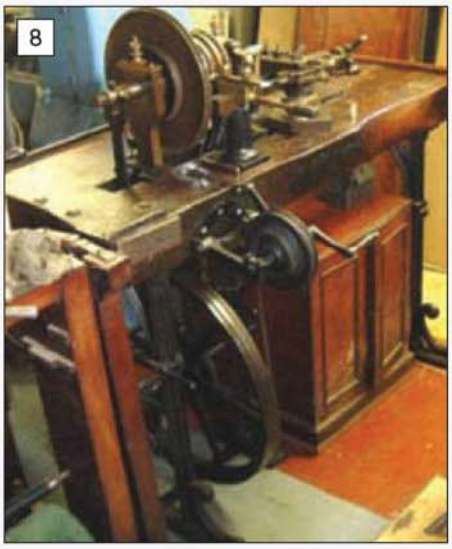
A fixed cutter is sometimes used, usually a narrow pointed tool to cut quite fine line cuts. However, very skilful turners sometimes use a broad moulded edge cutter but it needs to be controlled very carefully and, because of the slow speed of rotation, it can take only the thinnest of cuts and the cutter must be extremely sharp. Rose Engines are also used in the jewellery trade for cutting fine patterns in silver and gold using a fixed cutter. **Figure 8** shows a trade rose engine by G. J. Fieldhouse dating from 1863.

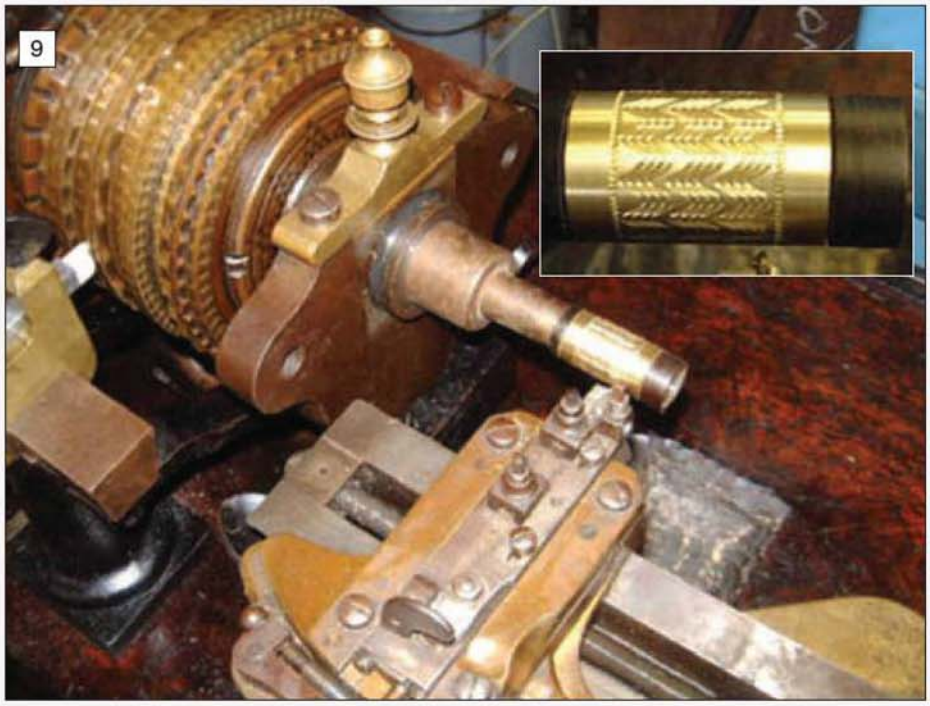
The full Rose Engine lathe has a massive rocking headstock and a barrel of rosettes surrounding the lathe spindle – see **figure 9.** It





has the advantage that its great weight gives it more stability than the lighter types; this results in smooth operation that imparts a fine finish to the work. There are very few of these magnificent machines. The most complete and expensive one ever made was sold by Holtzapffel





in 1836 for the princely sum of £1850, an amount sufficient at that time to buy a small country estate. The one illustrated in **figure 10** was first sold in 1816 for the lesser but still very significant sum of £367.10.0.

This concludes the series. If any reader wishes to know about the Society of Ornamental Turners or, indeed, anything about O T equipment and techniques not covered in this series, the author can be contacted by telephone on 01732 355 479 or by email at johnf.edwards@virgin.net

CLUB CHAT
With Malcolm Stride

Can I remind readers that we are still looking for club profiles to put in the magazine? If you want some free publicity for your club then just send a profile in and wait for the new members to turn up!

Also please remember to direct all correspondence whether it is letters, newsletters or notices of events to the Editor, David Carpenter. That way all information will get to the right person in a timely manner. Remember that the editorial team is spread around the country, only the Editor is based in Orpington.

Having said all that, let's get on with the business of this issue. We start with a notice from **Southampton SME** which informs us that due to a conflict of events at the park it has had to cancel the open weekend planned for 15/16 April this year. The event will be rescheduled for later in the year.

UK News

Des Adeley, secretary of the National 2½in. Gauge Association has moved into a new house after several abortive attempts and can now be contacted at Cawdon Cottage, Stratford Tony, Salisbury, Wilts. SP5 4AT. The telephone number is 01722 718463, e-mail **des@maynardsgate.freeserve.co.uk**

Des has sent news of the latest projects being carried out by members of the association. These include updated building instructions for LBSC's *Annie Boddie*, a Lynton and Barnstaple locomotive and a Swiss Crocodile locomotive. We look forward to seeing these during the year.

Ascot Locomotive Society has a new secretary in the person of Lee Porteus. Lee can be contacted at 37 New Road, Ascot, Berkshire SL5 8QB, tel: 01344-884385. We wish Lee success in this demanding role and I look forward to receiving news from him in the future. Good progress has been made with the new facilities with the buildings complete, fencing round the west track loop and the track area defined by concrete walls. Members have decided on the programme of work to complete before the first race meeting in June to maximise the impact of the new site.

Following the successful event last year, **Bedford MES** is to hold another 'Bubbly Bottle Challenge' The competition entails building a locomotive powered by a 2 litre fizzy drink bottle pumped up to 100psi. Later in the year the society will stage the 'Great Mouse Trap Challenge' in which contestants aim to come up with the most innovative and ingenious use of a mouse trap. They can make it move, throw a missile or any other idea that comes to mind. I think catching mice is not an option!

I have reported progress on the petrol hydraulic locomotive being built by James from the **Brighton & Hove Society of Model Locomotive Engineers**. I am pleased to report that the locomotive chassis has now been run on the track and after a few adjustments runs well but needs a different carburettor because the existing one is governor controlled and tends to stall under acceleration.

Some comments from *The Blower*, the newsletter of the **Cornish Miniature Steam Vehicle Club** will no doubt appeal to many readers; *"Can a pizza get to your house faster than an ambulance?"* and *"Do we leave cars worth thousands of pounds on the drive and put our junk and cheap lawnmowers in the garage?"*

Following the problems with the club steam raising blowers (due to old age) **Crawley Model Engineers** invested in some new modern commercial ones and have fitted them with different sized chimney adaptors with colour coding to indicate the size. The local Parks Department have suggested that the society run on more days to *"improve the Goff's Park image in the borough"*. Is this a sign that we model engineers are being appreciated at last?

Hereford SME has produced a very nice glossy brochure advertising its steaming days. The brochure provides some details of the society history and current activities including steaming dates. Pete Fenn has carried out a *"casual examination of scales and gauges"* and has come up with some interesting facts. The first is that the error in scale of the 00 gauge is 12.39 percent with the locomotives and rolling stock modelled at 4mm to the foot and the rail gauge at 3.5mm to the foot. Gauges 2½in. and 5in. at ½in. and 1in. to the foot respectively are also not good with errors of 6.19 percent. The most accurate combination is using a 1 1/16in. to the foot on 5in. gauge which gives an error in gauge of 0.0004 inch. So next time someone says their 5in. gauge locomotive built to a scale of one inch to the foot is accurate, you can dissuade them of the idea! Tony Marris has done some investigation on the acoustics of steam whistles in order to produce a realistic whistle tone for his Tasmanian Garratt locomotive. He notes that the speed of sound in steam is higher than that in air so the note for a given length of pipe is higher with steam. Also the power of the whistle is related to the bell diameter and mouth size and for maximum efficiency the mouth size should equal the cross sectional area of the bell. The other fact that Tony has obtained is that the correct air slot width is very small, on his whistle it is 0.03in. All the above relate to an organ pipe type whistle with a 90deg. mouth. Tony recommends the Yahoo group

CLUB DIARY

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

APRIL

1/2 **Taunton Model Engineers Exhibition.** Heathfield Community School, Monkton Heathfield.
1/2 **Dockland & E. London MES.** *Public Running.* Contact P. M. Jonas: 01708-228510.
1 **Glasgow & S.W. Rly Ass'n.** *Modelling Matters.* Contact Bruce Steven: 0141-810-3871.
1 **Isle of Wight MES.** *Track & Pond.* Contact Les Morgan: 01983-875118.
1 **New Jersey Live Steamers, Inc.** *Work Day.* Contact Karl Pickles: 718-494-7263.
1 **York City & DSME.** *Bits & Pieces.* Contact Pat Martindale: 01262-676291.
2 **Bedford MES.** *Boiler Testing.* Contact Ted Jolliffe: 01234-327791.
2 **Bristol SMEE.** *Public Running.* Contact Trevor Chambers: 0145-441-5085.
2 **Canvey R&MEC.** *Public Running.* Contact Brian Baker: 01702-512752.
2 **Cardiff MES.** *Open Day.* Contact Don Norman: 01656-784530.
2 **Frimley & Ascot LC.** *Public Running.* Contact Bob Dowman: 01252-835042.
2 **Guildford MES.** *Maintenance Weekend.* Contact Dave Longhurst: 01428-605424.
2 **Plymouth MSLS.** *Start of Running Season.* Contact John Brooker: 01752-671722.
2 **South Durham SME.** *Running Day.* Contact B. Owens: 01325-721503.
2 **Steam LS of Victoria.** *Public Running.* Contact Graham Plaskett: (03) 9750-5022.
3 **Peterborough SME.** *Chris Donaldson: East Anglian Air Ambulance.* Contact Ted Smith: 01775-640719.
4 **North Cornwall MES.** *Meeting & Maintenance Evening.* Contact Ray Reed: 01237-424254.
4 **Romney Marsh MES.** *George Barlow: Miniature Railways.* Contact John Wimble: 01797-362295.
4 **South Durham SME.** *Meeting.* Contact B. Owens: 01325-721503.
4 **West Wiltshire SME.** *AGM.* Contact R. Nev. Boulton: 01380-828101.
5 **Bradford MES.** *Derek Coates: Tramcars & Trolleybuses of Bradford City Transport.* Contact John Mills: 01943-467844.
5 **Bristol SMEE.** *George Eycott: Claverton Pumping Station.* Contact Trevor Chambers: 0145-441-5085.
5 **Guildford MES.** *Talk.* Contact Dave Longhurst: 01428-605424.
5 **Leeds SMEE.** *President's Night.* Contact Colin Abrey: 01132-649630.
5 **Tyneside SMEE.** *Bits & Pieces.* Contact Ian Spencer, 0191-2843438.
6 **Cardiff MES.** *Chris Rayward: LSWR Beattie Tank.* Contact Don Norman: 01656-784530.
6 **National 2½in. Gauge Ass'n.** *Spring Get-Together.* Contact Clive Young: 01233-626455.
6 **South Lakeland MES.** *Meeting.* Contact Adrian Dixon: 01229-869915.
6 **Sutton MEC.** *Bits & Pieces.* Contact Bob Wood: 0208-641-6258.
6 **Westland & Yeovil DMES.** *AGM.* Contact Gerald Martyn: 01935-434126.
7 **Aylesbury (Vale of) MES.** *Photo Competition.* Contact Andy Rapley: 01296-420750.
7 **Brighton & Hove SMLE.** *Clive Groome: My Life in Steam.* Contact Mick Funnell: 01323-892042.
7 **Canvey R&MEC.** *M. Leahy: The Boiler Regulations explained.* Contact Brian Baker: 01702-512752.
7 **Maidstone MES (UK).** *Bring & Buy and Crumpet Night.* Contact Martin Parham: 01622-630298.
7 **North London SME.** *Mike Foreman: A Holiday on the Footplate.* Contact David Harris: 01707-326518.
7 **North Norfolk MEC.** *Bits & Pieces.* Contact Gordon Ford: 01263-512350.
7 **Portsmouth MES.** *Derek Lock: Pharmaceuticals.* Contact John Warren: 023-9259-5354.
7 **Rochdale SMEE.** *Bits and Pieces Meeting.* Contact Mike Foster: 01706-360849.
7 **Romford MEC.** *Competition Night.* Contact Colin Hunt: 01708-709302.
8/9 **Guildford MES.** *Boiler Testing.* Contact Dave Longhurst: 01428-605424.

steam whistle site and *Flue Pipe Acoustics* by Richard Wiesenberger, both on the internet.

The renewal of the signalling system at the **Frimley and Ascot Locomotive Club** track is well under way with the signal box stripped out and redundant cable removed from the ducting. Many readers will have seen the demonstration of the new signalling system at the Sandown exhibition.

Ickenham DSME held its 25th annual December slide show last year and over the years it has become a full multimedia presentation rather than a simple slide show. I think this is true of many such shows since the advent of laptop computers and digital projectors. The following appeared under the heading *Defining Engineers* and is attributed to Sir Walter Puckey, President of the Institution of Production Engineers; *"Many varieties of engineers seem to be in existence these days and some people may like to know how to tell them apart. There is one fairly simple formula: An Electrical Engineer always tightens a nut with pliers. A Mechanical Engineer tightens it the proper way with hammer and chisel. A Production Engineer makes all this effort necessary, as he has forgotten to mill the flats on the nut. A Chemical Engineer takes the simplest approach of all. He just lets the whole thing rust solid."*

John de Bank, President of the **Isle of Wight MES** presented his 30th 'Nostalgia Nite' in December showing films of society activities from the 1960s onwards. The show also included a *Charlie Chaplin* film because it reminded John of the activities of the club on the Wednesday working days. After 30 years John is now taking a break from these nights so that others can provide the entertainment.

Kings Lynn DSME has now got a new off loading ramp which has reduced the effort involved in lifting of locomotives out of cars and vans onto the track. A small shelter has also been installed on the platform to protect the waiting passengers from any inclement weather. David Dew read my review of the Kempton Engines (*M.E.* 4249, 10 June 2005) and decided to pay a visit when they were steamed late last year. He described his visit as *"a brilliant afternoon"*. Details of the steaming dates for this year can be found on the website at **www.kemptonsteam.org**

Mike Rees from the 3M Company made a return visit to the **Model Engineers Society (NI)** to give a presentation on the adhesives and tapes produced by the company. The society are looking into the feasibility of several new projects for this year including an extension to the 7¼in. gauge track, a model boating pool, re-roofing the 3½ and 5in. gauge shed and more storage for rolling stock.

Following a successful trial, work has been taking place with the manufacture of track panels for the renewal of the main running track at the **North Wilts MES**. The panels have been made using a jig which can hold two 10ft. sections side by side. The sections are then welded together three at a time before laying. The steaming bay is also being restored. When the cement mixer failed recently a new one was acquired and the Editor reports that *"it took five members to assemble it, one assembling, one reading the instructions and the other three looking on and giving advice"*. This seems to be a very high number of workers compared with the supervisors to me!

The first of the new 7¼in. gauge passenger cars at **Norwich DSME** has been tested and has proved successful so more can be built to the same pattern. Other work has included new 7¼in. storage sidings, improvements to the turntable and bolting the locomotive lift to its concrete base. On 6 January, members gathered at the track with no less than six locomotives running on the ground level track plus one on the raised track.

Three 'Locomotive Superintendents' have been appointed to look after the three club locomotives at **Nottingham SMEE**. Their duties are to look after and manage the locomotives as if they were their own. The work on the track extension was ahead of plans at the time of writing with the foundations for the turntable laid and also a point is laid into the main line ready for the extension.

I have reported about tins of 'Dubbin' turning up at club auctions in the past and the trend continues at **Peterborough SME** where two tins turned up in what is described as *"a pristine Brierly's bag"*. Apparently it is over 30 years since Briely's store closed down so the buyer may well have bought a valuable collectors item. The newsletter contains a useful tip for keeping cast iron swarf under control on the lathe. If a large magnet is wrapped in a plastic bag and secured to the cross slide, the swarf will be attracted to the magnet and can be removed easily. This principle was extended by Doug Crampton who placed a magnet inside a margarine tub and then 'wiped' the combination over his lathe. The swarf (ferrous) becomes attracted to the outside of the tub and if the magnet is removed with the tub held over the waste bin, the swarf drops into the bin. Doug is now looking for a brass magnet! The society will be holding the Sacrewell Miniature Traction Engine Rally over the weekend of 15/16 July 2006. I recently published *(Club Chat, M.E.* 4268, 3 March 2006*)* contact details for Ted Smith the new secretary at Peterborough and have now received an e-mail address from Ted who can be reached at **smithtedron@aol.com**

8	**National 2½in. Gauge Ass'n (Southern Region).** *Spring Get-Together.* Contact John Cook: 0208-397-3932.
8/9	**Worthing DSME.** *Biannual Exhibition.* Contact Bob Phillips: 01903-243018.
9	**Canterbury DMES (UK).** *Public Running.* Contact Mrs P. Barker: 01227-273357.
9	**Leeds SMEE.** *Running Day.* Contact Colin Abrey: 01132-649630.
9	**Sutton MEC.** *Track Day.* Contact Bob Wood: 0208-641-6258.
10	**Bedford MES.** *Mechanical Music.* Contact Ted Jolliffe: 01234-327791.
10	**North Staffordshire MES.** *David Bradbury: Steam in Staffordshire.* Contact Stuart J. Daw: 17 Bedford Crescent, Clayton, Newcastle-under-Lyme, Staffs ST5 3EH.
10	**Melton Mowbray DMES.** *Ladies Night.* Contact Phil Tansley: 0116-2673646.
10	**Saffron Walden DSME.** *Club Night.* Contact Jack Setterfield: 01843-596822.
11	**Dockland & E. London MES.** *Bits & Pieces.* Contact P. M. Jonas: 01708-228510.
11	**Romney Marsh MES.** *Track Meeting.* Contact John Wimble: 01797-362295.
12	**Hull DSME.** *Ten Minute Talks by Members.* Contact Tony Finn: 01482-898434.
12	**Norwich DSME.** *Annual Auction.* Contact Paul Reed: 01603-462925.
12	**St. Albans DMES.** *AGM and Models in Progress.* Contact Roy Verden: 01923-220590.
13	**Cardiff MES.** *Club Chat.* Contact Don Norman: 01656-784530.
13	**Sutton MEC.** *AGM.* Contact Bob Wood: 0208-641-6258.
14-17	**British Columbia SME.** *Easter Meet.* Contact Sean Laurence: (604) 931-1547.
14-16	**Furness MRC.** *FRMC Easter Exhibition.* Contact Colin Burns: 01229 837079.
14-17	**Leighton Buzzard NG Rly.** *Easter Fun.* Enquiries: 01525-373888.
15	**Bedford MES.** *Club Running Day.* Contact Ted Jolliffe: 01234-327791.
16	**Amnerfield Miniature Railway.** *Public Running.* Contact David Jerome: 0118-9700274.
16/17	**Bedford MES.** *Public Running.* Contact Ted Jolliffe: 01234-327791.
16/17	**Bristol SMEE.** *Public Running.* Contact Trevor Chambers: 0145-441-5085.
16/17	**Cardiff MES.** *Easter Open Days.* Contact Don Norman: 01656-784530.
16/17	**Claymills Pumping Engines.** *Open Days.* Contact B. Eastough: 01283-812501.
16	**Birmingham SME.** *Easter Loco Parade.* Contact John Walker: 01789-266065.
16	**Frimley & Ascot LC.** *Club Running.* Contact Bob Dowman: 01252-835042.
16	**MELSA.** *Easter Sunday Run for Life Line.* Contact Graham Chadbone: 07-4121-4341.
16/17	**Papplewick Pumping Station.** *Steaming Days.* Enquiries: 0115-963-2938.
16	**Peterborough SME.** *Start of Running Season.* Contact Ted Smith: 01775-640719.
16	**Romney Marsh MES.** *'G' Scale Get-together.* Contact John Wimble: 01797-362295.
16	**Rugby MES.** *Public Running.* Contact David Eadon: 01788-576956.
16	**Saffron Walden DSME.** *Running Day (public running after 2pm).* Contact Jack Setterfield: 01843-596822.
16	**St. Albans DMES.** *Puffing Field Morning.* Contact Roy Verden: 01923-220590.
16	**York City & DSME.** *Easter Steaming.* Contact Pat Martindale: 01262-676291.
17	**Frimley & Ascot LC.** *Easter Charity Run.* Contact Bob Dowman: 01252-835042.
18	**Chesterfield MES.** *Ivan Turner: What is!?* Contact Mike Rhodes: 01623-648676.
18	**Nottingham SMEE.** *Prof. Pete Thomas: The Grange; Design for Manufacture.* Contact Graham Davenport: 0115-8496703.
18	**South Durham SME.** *Afternoon Steam-Up.* Contact B. Owens: 01325-721503.
18	**Peterborough SME.** *Bits & Pieces.* Contact Ted Smith: 01775-640719.
18	**West Wiltshire SME.** *Exhibition Evening.* Contact R. Nev. Boulton: 01380-828101.
19	**Bournemouth DSME.** *Bits & Pieces.* Contact Dave Fynn: 01202-474599.
19	**Bristol SMEE.** *Bob Wade: Ornamental Turners.* Contact Trevor Chambers: 0145-441-5085.
19	**Leeds SMEE.** *Video Evening.* Contact Colin Abrey: 01132-649630.
19	**Maidstone MES (UK).** *Members' Playtime Run.* Contact Martin Parham: 01622-630298.
20	**Isle of Wight MES.** *Meeting.* Contact Les Morgan: 01983-875118.
20	**Rugby MES.** *Doug Hewson: Track & Point Construction.* Contact David Eadon: 01788-576956.
20	**Sutton MEC.** *Chat Night.* Contact Bob Wood: 0208-641-6258.
21	**Canvey R&MEC.** *Quiz Night.* Contact Brian Baker: 01702-512752
21	**North London SME.** *Work in Progress.* Contact David Harris: 01707-326518.
21	**Rochdale SMEE.** *Special Auction: Bert Ashton's Tools.* Contact Mike Foster: 01706-360849.
21	**Romford MEC.** *Wilf Skinner: Gears.* Contact Colin Hunt: 01708-709302.
21	**Steam LS of Victoria.** *Gathering.* Contact Graham Plaskett: (03) 9750-5022.
22	**Canvey R&MEC.** *Members' Running Day.* Contact Brian Baker: 01702-512752.
22	**Chesterfield MES.** *Public Running Day.* Contact Mike Rhodes: 01623-648676.
22	**Steam LS of Victoria.** *Club Run.* Contact Graham Plaskett: (03) 9750-5022.
23	**Guildford MES.** *First Members' Running Day.* Contact Dave Longhurst: 01428-605424.

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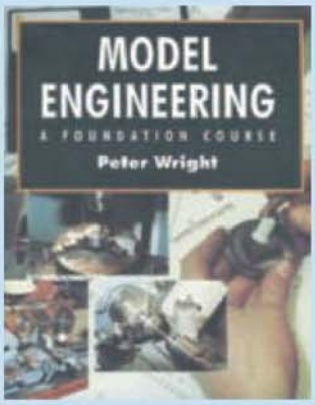

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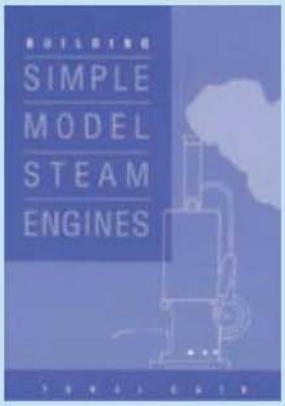

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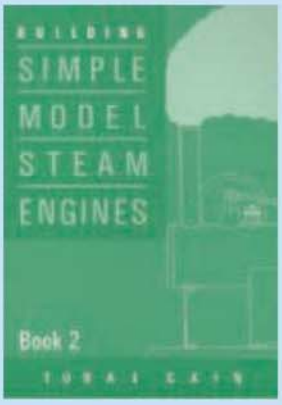

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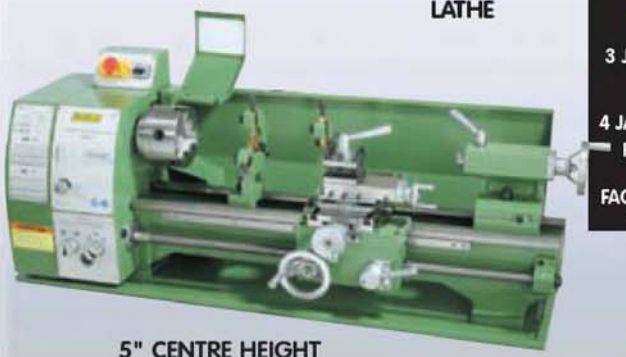

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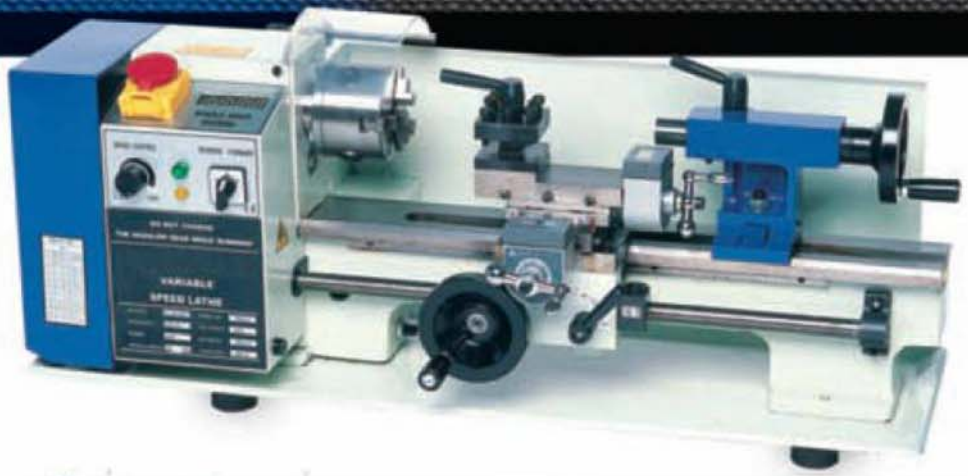

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