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IN THIS ISSUE

● Vol. 189 No. 4173 12 July 2002 ●

On the cover ...

A hotly contested aspect of the National Model Engineering and Modelling Exhibition presented annually at Harrogate is for the NAMES Shield for the Best Club Stand. This year, the coveted award went to Urmston DMES whose members presented a fascinating 'diorama' of a Railway Works with workshop, sidings, signal box and platforms. Urmston DMES was formed in 1948 and currently has c150 members who have built a fine elevated track in Abbots Field Park, Flixton, Manchester. Our photograph features Geoff Johnson's 5in. gauge Gresley 2-8-0 under construction in the 'Works' and our report on Harrogate 2002 continues in this issue on page 17.

(Photograph by Mike Chrisp)

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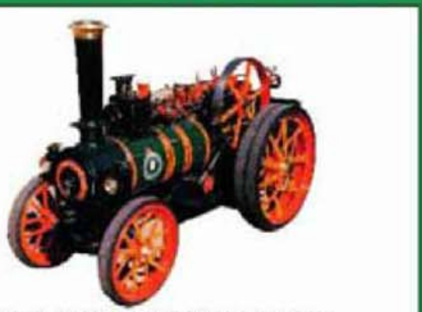

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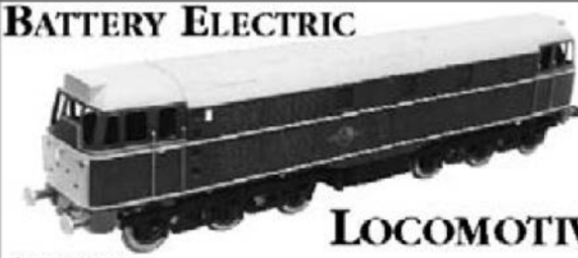

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5" 4-6-2 Duncaster Tender Loco
5" Passenger Car Bogies

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7.25" Passenger Car Bogies
7.25" Slate Waggons

12.25" LOCOMOTIVES
12.25" 0-4-0 Darjeeling & H'A Loco
12.25" 2-6-4 Leek & Manifold Loco

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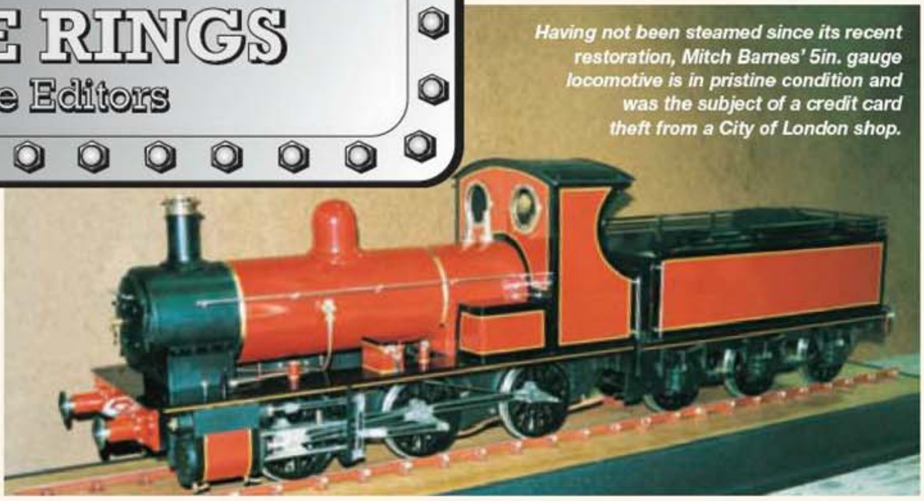
SMOKE RINGS
With the Editors


Having not been steamed since its recent restoration, Mitch Barnes' 5in. gauge locomotive is in pristine condition and was the subject of a credit card theft from a City of London shop.

New volume

Tradition has it that the first issues in January and July start a new volume of this journal. With recent production difficulties now behind us, it is appropriate to revert to routine. We regret that Volume 188 is light by a couple of issues, but the inconvenience of its delayed start caused more problems than it solved. Our usual detailed index will be published in the next issue.

Many readers have been taking the trouble to write to say that they find the current style and content of *Model Engineer* generally to their liking. This gratifying situation is borne out by rising circulation figures which, we were told at a recent meeting at Head Office, are up by some 20%.

Neil, Kelvin and I have prepared some questions for a Reader Survey, specific to *M.E.* which our Marketing team will include in a general questionnaire to be published soon. We shall be pleased to have your views and opinions with the aim of bringing the magazine even more in line with your requirements where practicable.

Welcome back, Chuck

It is with great pleasure that we are able to welcome the return to these pages of Chuck, the Muddle Engineer.

This delightful character, with whose trials and tribulations each and every one of us will be able to identify, is the creation of B. Terry Aspin whose contribution to these pages has been considerable. First introduced to our hero in January 1960, we are sure that there will be many who have not yet had the opportunity to enjoy Chuck's adventures and escapades. We hope that those who do remember Chuck will also enjoy his re-appearance and not begrudge the small amount of space taken up by this re-run, over forty years on.

Stolen locomotive

Mitch Barnes, in north London informs us that the locomotive which he restored to the condition shown in the photograph above has been stolen from the City of London shop where it had been offered for sale. The theft is the result of a credit card fraud, the thieves had apparently been haggling over the price for more than a week.

While not a scale model of any known locomotive, it is similar to a Polly design, and is unique. Painted in Midland red with yellow lining edged in black, this 5in. gauge loco is approximately 1350mm long, 250mm wide and 300mm high. It has black wheels and pillar box red buffer beams; the flutes in the connecting and coupling rods are filled with black paint.

The loco lacks brakes and reversing gear. Boiler fittings consist of a water gauge, pressure gauge and regulator only. The firebox door has no latch, there are two axlebox oilers and a pump is driven from the front axle. The cab is a bolted assembly which splits vertically on the front plate. Mechanical lubricators are located on the running boards and are driven by means of radio control mechanism operating rods. The dome is painted and the coupling hooks lack chains.

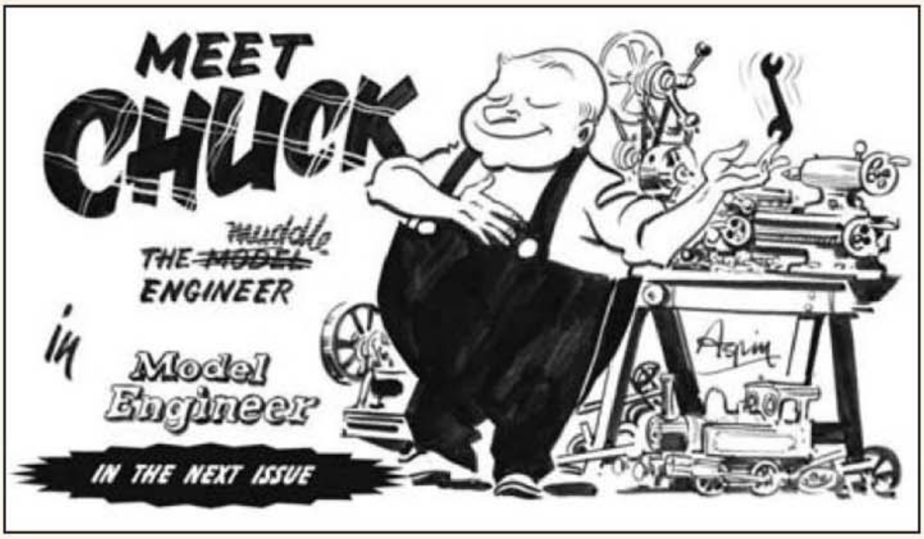
The display base consists of a plinth and baseplate, the former being 1550 x 374 x 60mm finished in marble effect shades of black. The base is 1600 x 450mm and is painted matt black. The base features aluminium alloy rail in chairs, all painted to give a realistic rust effect.

Any reader able to assist in the recovery of this model is asked to contact the Crime Prevention Officer at Snow Hill Police Station, 5 Snow Hill, London EC1A 2DP; tel: 0207-601-2406, quoting Crime Ref. No. 004513/02.

Boiler fittings

We have been alerted by Messrs B. Crayden and D. S. Busby MIED, boiler testers to the Rochford Live Steam Group, that when carrying out routine inspection of members' boilers, they came across a safety valve with only four threads of engagement in the bush into which it was intended to be screwed. The presence of a washer of jointing material between the mating surfaces would reduce this engagement and the fitting may then present a hazard.

We are sure that builders and users of models involving boilers will be aware that their fittings should be suitable for their intended purpose and in good condition. However, the warning is timely and we are happy to make space for its inclusion for the benefit of all concerned.



Problems

Model engineers tend to be good at solving problems. Embarking on a practical hobby like model engineering means that the person concerned enjoys translating ideas into something tangible, and solving problems is part of the fun. However, the approach adopted by individual model engineers to problem solving varies enormously. To some the solving of, say a machining problem is an end in itself and no effort is spared in achieving an elegant solution even if it means producing elaborate fixtures and tooling. To others it is an inconvenience best solved by welding together a couple of lengths of rusty angle iron and a handful of second hand bolts. From our point of view neither approach is wrong, just different. Long may such diversity continue in what is, after all, a hobby.

Commercially, of course, things are different. To be competitive, costs must be controlled and every effort made to optimise every stage of the production process from material selection through to final packaging. Designers have to continually ask themselves the question: *"Can we make it?"* and if not *"Can we buy the equipment to make it, and is it worth it?"* It is rare for novel ideas to achieve success without substantial development costs, and so the home worker is in good company when he makes a few 'scrappers' before achieving the desired result.

Sometimes, of course, the professionals get things wrong. We are reminded of a situation which developed a few years ago when US astronauts found that the ballpoint pens with which they were issued would not write in the weightless conditions of outer space. A massive research effort was mounted to address the problem. After expenditure amounting to many millions of US dollars, a pen was developed that pumped the ink to the ball. These pens enjoyed some popularity as a novelty item when sold on the open market but the research costs were never fully recovered.

Faced with the same problem, the Russian cosmonauts were issued with ... ordinary lead pencils. Perhaps there were some practically minded model engineers on the Russian team.

POST BAG

Fortuitous resources?

SIRS, - Some years ago I exchanged unpublished correspondence with the then editor about the frustration which arises when a *Model Engineer* project depends on a specialised component which the author has scrounged or found in his forty-year-old scrap-box. I know that we are an inventive lot and that many designs lend themselves to adaptation, particularly those for workshop equipment and items which I would loosely call 'gadgets'.

However, when it comes to more serious designs, then I believe it is incumbent on the author or the magazine to ensure that materials can be sourced. After finishing my latest stationary engine last Autumn I decided to look round for a project which did not involve a boiler and when I saw the opening article on Bailey's *Bee* I decided it was just what I was looking for. As the series progressed I discovered that the design relies on tubes which, although the author says are a standard size, appear to be unobtainable. The supplier of the castings does not want to know about supplies of tube, and the author himself hacked the required tube from a billet of stainless rod. I have not even tried to source the rod because the thought of spending ten hours (the author's figure) machining away 95% of the total volume does not appeal.

In a recent issue I noted the opening article on what is obviously a delightful and beautiful clock. Such a project would be totally beyond my skills, but I see that a further deterrent is the requirement for a piece of titanium for the escape wheel. The author recommends trying to scrounge a bit from your local RAF base! To be fair, he does offer to help if people really can't find it anywhere else.

I believe that all components and materials for such designs should be available from commercial outlets and should not depend on scrounging from the old-boy network or other fortuitous sources denied to most of the readership.

P. G. Upton, Cambridgeshire.

Units of measure

SIRS, - I noticed in *M.E.* 4170, 31 May 2002, an interesting letter about units of measure. I do feel that when making a replica, the units used should those employed by the original maker. However I personally worked a great deal of my career in a company founded in 1880 whose products were mainly for scientific research and so used mainly metric units. Unfortunately, materials were only available in imperial units, hence everybody working there became perfectly familiar with both systems. To compound matters, drawings could have components dimensioned as having a thread of 1/2in. dia. x 0.5mm pitch, for example!

As a result, I use whatever unit is convenient at the time, mixing them with complete abandon. The scales on my lathes are imperial but those on my milling machine are metric, so a component machined on both machines could have both units!

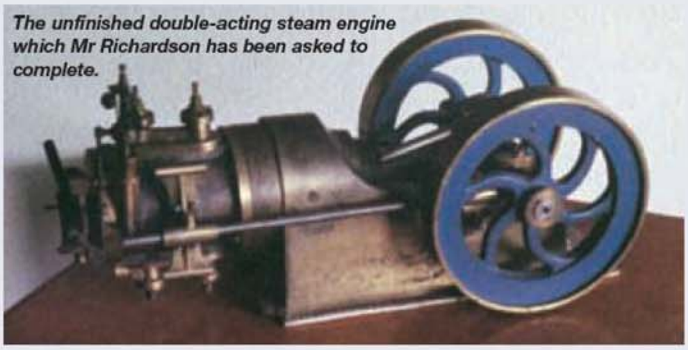
Don Unwin, Cambridgeshire.

Archaic originals

SIRS, - Peter King's letter entitled *Dimensions and Brickbats* in *M.E.* 4165, 22 March 2002 caught my attention, but most of all reminded me of something that happened to me in class about six years ago. First of all, in Canada only the metric system is taught in schools below university level; however, a great deal of industry, including aerospace, still works mostly or totally in the imperial system. Hence there is an education (de-brainwashing?) job to be done in engineering education. To remind his students that they had to be aware of different systems of measurement and of the relative 'physical' sizes of units in the two systems, our fourth year heat transfer professor brought in a long measuring stick and turned its back to the class. He asked for estimates of its length and answers varied from five feet to two metres. At the end, from the back of the class, I intoned more or less sepulchrally *"One fathom."* My reward was a dumbfounded silence from the class and a wintry smile from the professor. Thus passes the glory of the hydrographers of the Royal Navy.

In terms of material and tools, imperial still dominates on this continent. I would not dream of asking for metric materials at a medium or small supplier without expecting to be faced with a 'mill order'. I find it easier mentally to turn inch fractions into thous. than the other way around. If this is generally true, one might be able to account for a preference of marking drawings in fractions of inches. I doubt that any model engineer would look at something denominated in 1/64in. as demanding a tolerance of 1/10 of that. He would take the nearest thou. knowing that any finer tolerance requirement would be spelled out most specifically. I remember being told by the retired metrologist of the Kingston (Ontario) Locomotive Works that steam locomotives were built there with drawings and rules marked to 1/128 inch. In other words, using fractions denotes a different philosophy of work. Micrometers were only introduced there for general work when diesel production commenced. I would also honestly doubt that many would be put off model engineering because of 'archaic' units; model engineering deals with archaic originals and their drawings and with reasonable care, the modern calculator makes units conversion trivial. However, I am prepared to be yclept 'Offended of Manotick' for the foregoing remarks even though I updated my engineering education with a mechanical engineering degree not ten years ago.

John Bauer, Ontario, Canada.



The unfinished double-acting steam engine which Mr Richardson has been asked to complete.

What is it?

SIRS, - As a regular subscriber to *Model Engineer* I have many times been intrigued by the articles under the heading 'what is it?' and now enclose a photograph (above) of a partly constructed double-acting steam engine for your pundits to consider. The model was started in the early 1900s by a relative of the owner and then apparently abandoned. I have been asked whether I could complete the model. I said I could if I was able to determine what it was. I have shown the partly constructed model to Anthony Mount who was also mystified.

It has governor controlled poppet valves situated in an inlet manifold on top of the cylinder, and an exhaust manifold diametrically opposite on the underside of the cylinder. The governor is driven by 1:1 bevel gears from the crankshaft. I can imagine that the long shafting from these bevel gears could have incorporated some mechanism by which the valves were operated.

The only reference I can remember to a stationary steam engine incorporating poppet valves was a Corliss mill engine referred to in *Model Engineer* around the mid-seventies but alas I gave away all my back copies of *M.E.* to a preservation society sone time ago!

It may be that Messrs Reeves archives go back to the early 1900s, but somebody obviously made the castings and perhaps supplied drawings. So I feel fairly confident that among all those Fred Dibnahs out there, there will be one who can lighten my darkness. I must say, in conclusion, that I have in my possession a photograph of a Blackstone gas engine with a very similar outline, but would stress that the model concerned is not a gas engine.

H. H. Richardson, Surrey.

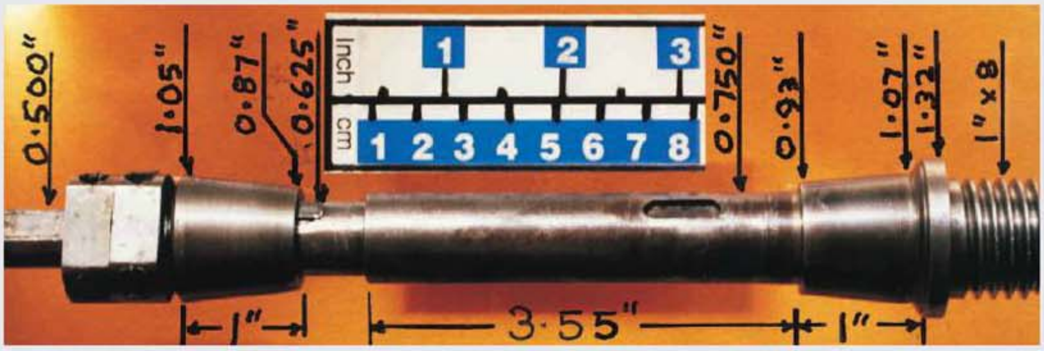
Old spindle to go

SIRS, - I write in case any reader is restoring an elderly lathe which needs a new spindle to replace one which is missing or damaged.

The spindle illustrated in the accompanying photograph probably came from a 3-3 1/2in. centre height lathe of c1900-1930s vintage. The front double cone was popular as the steep angle took axial thrust from drilling operations while the rear sliding cone permitted adjustment by using the two locknuts provided with spanner flats. This system was superior to the cheaper plain bearings found on so many home hobbyists lathes at the time.

While this actual spindle is badly worn, it could be used as a pattern when making a new spindle. The nose (1in. x 8TPI) is bored to accept a taper shank of a non-standard size somewhere between Morse tapers 1 and 2. It is drilled through but no 60deg. centre holes exist so it may not be easy to set up to machine true.

The overall length of this spindle is 8 1/2in. and the sliding rear cone is of cast iron which was a comon



The spindle which Mr. Spenlove-Spenlove seeks to give away.

feature on some early lathes. This bearing arrangement, if kept free of dust and swarf, and well oiled, was very satisfactory.

In the hope that it may be helpful, I have added a few salient (imperal) dimensions to the photograph. Note the two keys. Right through the spindle but not not visible in this photograph is a 5/16in. dia. hole.

It would be easier to start with a new piece of material and cut the spindle nose thread to suit any existing equipment. The gear, broken and useless had 18 teeth. This feature may help identify the lathe to which this spindle fitted.

Before I scrap it, if any reader has a use for it, I will be pleased to post it in a padded bag on receipt of a label bearing a name and address with stamps attached to suit 600 grams, which is £1.52 for second class UK mainland post, as at June 2002.

Peter Spenlove-Spenlove, Leicestershire.

Three-jaw chucks

SIRS, - I noticed in *M.E.* 4169, 17 May 2002 that the question of truing the jaws of worn 3-jaw chucks has been raised once more.

As your correspondents have shown, the jaws must be tensioned inwards by the scroll, as if the chuck jaws are under normal pressure from the workpiece. But the methods mentioned may be a little over-complex or even lead to slightly uneven holding of the work when the chuck is returned to normal use.

If pressure is applied to the outer edge of the jaws, it can rock the jaws in the worn slides and truing in this condition leaves the jaws apparently true but when closed onto a workpiece, results in the front of the jaws applying less pressure than the backs of the jaws. This can lead to vibration of the work when under pressure from the lathe tool and further wear to the chuck.

The best results seem to come from using a simple disc of about 1/16in. thickness and of a diameter similar to that of the normal work to be held in the chuck. This is placed in the chuck at the back of the jaws and pressure applied. The jaws are then ground or if soft, turned. The disc is then removed and the small area of contact which the grinder could not reach, removed with the grinder or a diamond sharpening plate.

The pressure on the workpiece should result in both a true chuck and an even pressure from the chuck jaws.

The method, from Ian Smith, with the blocks between the jaws is fine as long as the blocks are of identical thickness and parallel, and are placed at the back of the jaws. However the disc meets these conditions much better, automatically applying even pressure.

Tony Finn's method was often used in factories, especially with larger sized chucks, with the proviso that for best results the jaw slide surfaces were unworn. However, the technique can result in jaws which do not give even pressure contact.

It should be noted that the smaller the chuck the more accurate it needs to be. The point must also be made that the scroll must be unworn for any method to work over a fuller range of sizes. It should further be noted that even a worn chuck can be made completely accurate by the use of a split collet, made and used only in that chuck; this was a technique much favoured by LBSC for making small component parts.

Stephen Paul Wallin, Kent.

Twister

SIRS, - In *M.E.* 4167, 19 April 2002, Mr. Williams raised the question of why a lighter than air balloon tethered inside a bus, does not drift outward when the bus traverses a curve. I feel sure that the answer is that the balloon does in fact move outward, but since centrifugal force, (or should that be centripetal?) is proportional to mass, the force on a very light balloon is extremely small when compared to the much greater force of air resistance.

Mr. Williams then asks why sand moves to the centre of a bucket of water when the water is swirled into a vortex. In principle, I think the answer is the same. The centrifugal force on one grain of sand is minute when compared to the vortex force of the relatively dense medium of the water. The sand is therefore drawn into the centre of the vortex in true 'twister' fashion.

Bill Steer continued the discussion in *M.E.* 4170, 31 May 2002, observing that if the bucket is freely suspended on a string, the sand will indeed move out to edges of the bucket provided that both the bucket and water spin together. This clever test neatly separates vortex from centrifugal forces.

When the water and bucket spin together there is no vortex and the sand moves to the outside due to centrifugal force. When the bucket is stopped and the water rotated within, then the much more powerful vortex force dominates and the sand moves to the centre.

Bob Lewis, Hampshire.

Vortices

SIRS, - With reference to Mr. P. J. Williams' letter about sand grains in a bucket of swirling water (*M.E.* 4167, 19 April 2002), this phenomenon of heavy grains drifting towards the centre in defiance of centrifugal force is apparently caused by the formation of vortices in the rotating water.

When Einstein was a professor in Germany, he wrote a paper on the behaviour of the current in meandering rivers which, because of the formation of vortices, is more complex than simply the strongest current following the outside of a bend, as usually taught in geography classes at school. In the course of the paper he mentioned, as an aside, if I remember correctly, the fact that tea-leaves in a stirred tea cup congregate in the centre of the cup was similarly caused by a vortex.

I do not have the exact reference but clearly remember reading a translation of this paper in a biography of Einstein which included instances of his work on questions other than the well-known photoelectric effect and relativity.

P. W. Mercer, Berkshire.

Transport Statistics

SIRS, - I am extremely annoyed by the despicable practice of politicians and certain pressure-groups in the way that they will deliberately falsify facts and figures in order to con the public into contributing to their schemes. This practice is costing lives.

I have in mind a claim made in the late 1970s that "railways were fatality-free" in one particular year (1976). Feeling as curious as the proverbial cat, I checked up on the more precise official figures available in the average reference library. In the year concerned, no passengers were killed in train crashes — a record to be proud of. There have been several years since then when the same criterion existed — well done indeed!

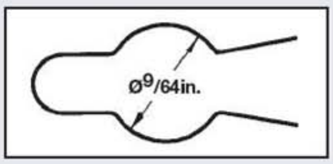
However, in that year 29 passengers were killed by trains, on trains, or on railway property; 46 members of staff killed (8 in train crashes); 21 official visitors (as distinct from passengers or staff) killed; and the euphemistically described 'miscellaneous trespassers and suicides' brought the total up to a mere 396. So much for fatality-free! Mathematically, it is of course an infinite exaggeration. The average number of deaths on railway at this time was a bit higher, the current annual average was 347 over the years 1991-2000.

When one remembers that there is more than 10 times the amount of traffic on roads, the current death-toll on roads (3409) assumes a very different significance from the usual lies. My point is: why is such deliberately false information needed? If railways are indeed safer than roads, then this propaganda is not only unnecessary, but deliberately deceitful. Since it is apparently necessary, then the relative safeties must be very closely questioned. In fact it is often customary to add in the 'seriously injured' on roads in order to make the figures more impressive. The figures may be verified in Transport Statistics published by the DTLR.

Keith Wilson, West Midlands.

Small spring clips

SIRS, - So far without success, I have been trying to locate a supplier of small spring clips of the type shown in the accompanying sketch. They are to fit into a groove on 3/16in. O/D round bar material in a similar way to that in which a 'C' clip fits. However the clips which I require are made of spring wire.



Aware that there is a wealth of knowledge 'out there' I would be most grateful if any fellow reader(s) could point me in the right direction.

My thanks, in anticipation.

R. G. Marden, North London.

A BRIGGS BOILERED BRITANNIA IN BRITISH COLUMBIA

Lindsay McDonnell in British Columbia, Canada, describes the design, construction and operation of a very effective and efficient boiler for his $1^{1}/_{2}$in. scale BR pacific locomotive.

I have always liked the look of the British Railway designs, particularly the Britannia class and the *Evening Star* 2-10-0s. I purchased my $7^{1}/_{4}$in. gauge BR Britannia 4-6-2 pacific locomotive in 1972 from Walter Kent, who had bought it in England and shipped it to Vancouver. I fell in love with it on first sight and later purchased it from Walter. I have since been informed that it was built about 1961 by Mr. Houile. The model is a very accurate reproduction of the Britannia class except for slide valve cylinders made from castings for a *Royal Scot,* which had been skilfully fashioned to look like piston valve cylinders. The slightly under-scale $2^{1}/_{4}$in. bore x $3^{1}/_{2}$in. stroke cylinders drive $9^{3}/_{8}$in. dia. wheels. After re-gauging the loco to $7^{1}/_{2}$in. by heat shrinking on steel tires, I ran it as a coal burner for about 14 years.

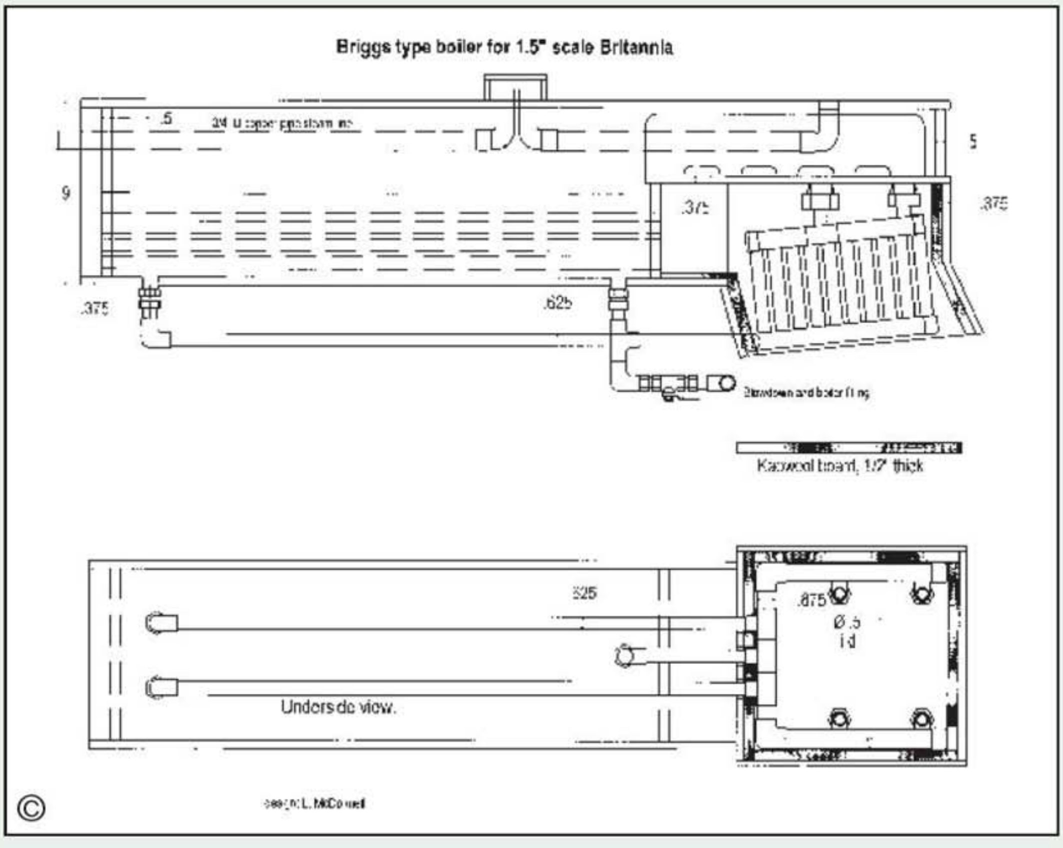
It was fitted with an unusual boiler for a model in that it had a steel outer shell with copper firebox, tube sheet and tubes just like full-size. It steamed very freely, like a copper boiler but eventually developed several leaks around the firebox stays. With corrosion and the differential expansion of the copper inner firebox, the stays began to weep badly. As luck would have it, my good friend and expert model engineer Dave Watt from Rotorua in New Zealand, paid off as a ship's engineer in Vancouver, BC and came to stay for a couple of weeks. He offered to help get my *Britannia* running again, an offer which I gladly accepted. He extended his stay!

Heat exchanger

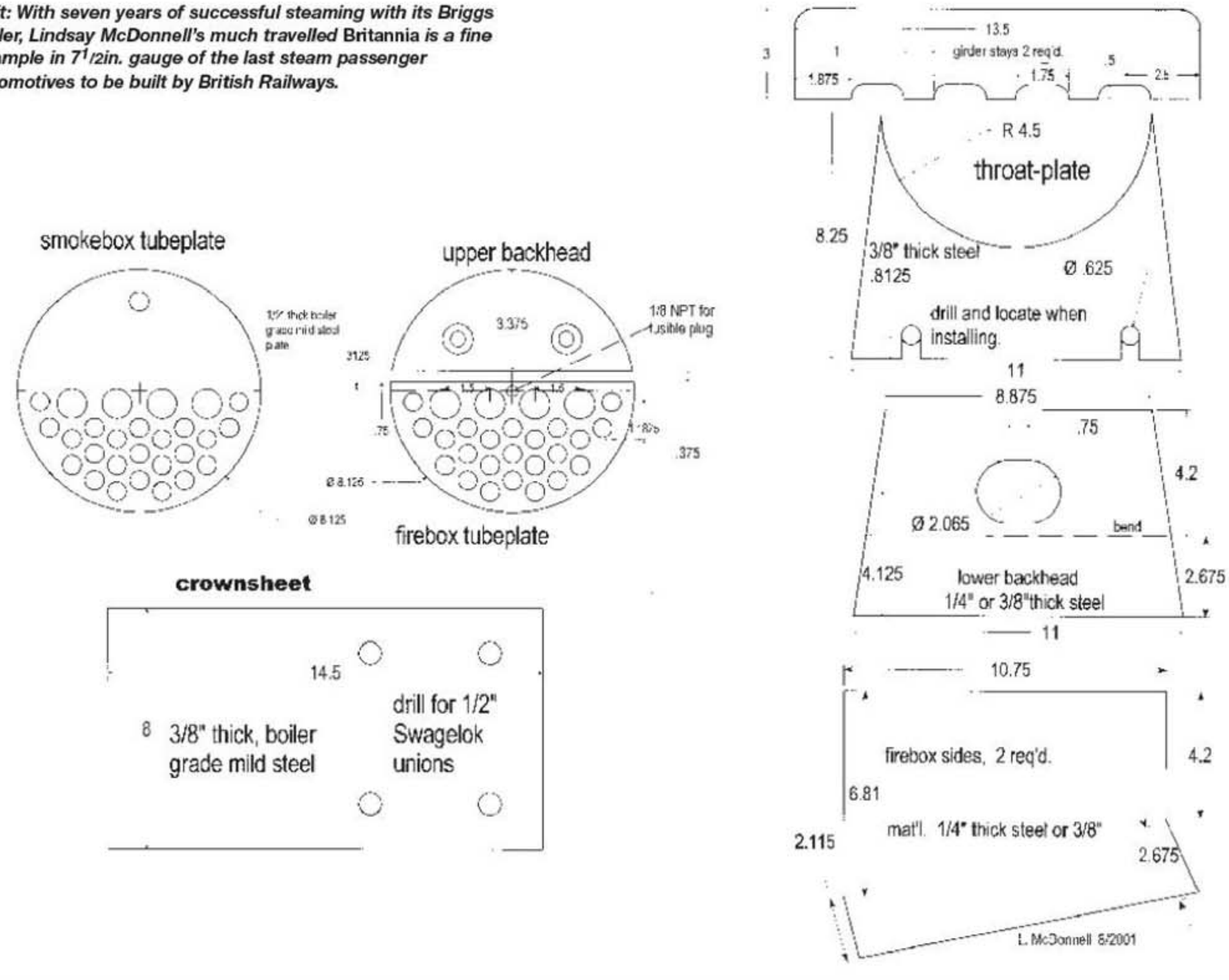
I had seen how well club member Ernie Allen's Briggs type boiler steamed on his Canadian Pacific *Jubilee* 4-4-4 with the same cylinder size and wheel diameter as my *Britannia*, and it appeared as efficient as a copper boiler. Constructed from 316 stainless steel with copper tubes swaged in, it had a 4in. long combustion chamber and stainless steel superheaters. Since stainless steel is a poor conductor of heat, I figured that the copper tubes and heat exchanger must have been working very efficiently.

When we found that $^{1}/_{8}$in. thick steel had been used for my *Britannia* boiler which, while perfectly strong, isn't considered thick enough these days to allow for the corrosion factor, Dave and I decided the original boiler wasn't worth repairing. We were both interested in trying out a Briggs design with some of my ideas to tweak its performance. I decided that I would go with a steel boiler as I had been told that stainless steel might suffer from chloride stress of the welds. Ernie's boiler was still fine after nine years of intensive operation, but I couldn't see the need for stainless steel when using $^{3}/_{8}$in. thick steel with no stays to rot and copper tubes in the boiler.

One improvement I wanted to incorporate was to run two pipes for the copper heat exchangers from near the smokebox tube sheet instead of beside the firebox tube sheet, right down to the back of the firebox to get full circulation of the water. The *Britannia's* plate frames would allow me to drop these pipes right down to just above the axles and remain unseen. Readers may be familiar with the copper coil in the firebox which was part of the early Briggs designs published,



***Left:** With seven years of successful steaming with its Briggs boiler, Lindsay McDonnell's much travelled* **Britannia** *is a fine example in 7$^1/_2$in. gauge of the last steam passenger locomotives to be built by British Railways.*



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mainly from Australia. These are not recommended as there is insufficient rise for good water circulation, and they often cavitated and burnt out. Many owners then plugged the fittings and ran without the heat exchanger which, although less efficient, did make steam, but later the boilers would have such a high build up of scale in the backhead corners due to lack of circulation that the steel would warp, stress and even crack. So the latest thinking is that vertical heat exchanger tubes are required, even if fuel consumption is of little concern.

My heat exchanger is made from standard $^1/_2$in. ($^5/_8$in. O/D) and $^3/_4$in. ($^7/_8$in. O/D) heavy wall copper pipe. Three $^1/_2$in. pipes feed from the boiler barrel to a manifold of $^3/_4$in. pipe which goes down each side of the firebox, spaced $^1/_2$in. out from the wall to accommodate the Kaowool thermal insulation board. Then $^1/_2$in. pipes at $^7/_8$in. centres go vertically up to another $^3/_4$in. pipe manifold and by way of elbows into Swagelok fittings into the crownsheet. The whole assembly is silver-soldered with 45% Easyflo. The lowest point of the heat exchanger is at the front of the firebox, and the base manifold then rises at least at 6deg. which will permit the loco to climb a 1 in 20 grade with no water flow problem — the water has to flow uphill at all times! The configuration at the top manifold can be more horizontal as the fierce upward flow will force the water into the boiler. By employing screw-in fittings, it is easy to remove the heat exchanger if the need arises; I haven't had to, and don't expect to. A Teflon ball valve is taken off the middle feed by means of a Tee; this is the blowdown which also serves as the filling point for water. In another loco I have fitted two separate heat exchangers with $^3/_4$in. legs from the barrel, an arrangement which works just as well.

Barrel and plates

The other change I wanted for my boiler was to cover all surfaces inside the firebox that had no water behind them, with $^1/_2$in. thick Kaowool board. This, I figured, would improve the efficiency of the boiler, extend its life, and keep the cab cool. With these ideas in mind, and with a copy of the latest edition of the Australian Society of Model Engineers code for Briggs type boilers, Dave drew up on card the parts to be flame cut from steel for a replacement boiler for my *Britannia*. The drawings shown here were to replace the boiler I had, and may not be exactly what a new scale boiler for a model today would be, but it will be pretty close and they give prospective builders an idea of what's involved. Narrow firebox locos are slightly more difficult.

We wanted to retain the brass cladding from the old boiler which covered a slightly tapered and Belpaired firebox so we had to maximise the diameter of a straight steel tube for a Briggs type boiler, and decided to pack out to the cladding with Kaowool blanket type insulation.

We decided to use 9in. O/D $^3/_8$in. thick walled tube and found a piece of seamless certified tube at a local supplier where it was cut exactly 42in. long. Dave then used my Skil saw with an abrasive cutting disk to cut out the side for the firebox and crownsheet.

The crownsheet, firebox sides and throatplate were drawn actual size on some white card stock and taken to a local shop specialising in flame cutting of steel. These were scanned into their computer and the pieces CNC flame cut from $^3/_8$in. plate. The tube plates and backhead were drawn out on card $^1/_{16}$in. undersize on the diameter. If I were repeating the exercise today, I would use a CAD program and supply the drawing on disc. When the steel was returned all cut out, all we had to do was to grind a chamfer on the edges for welding and drill the holes for the copper tubes.

The latest update of the Australian Boiler Code now calls for the tubeplates and backhead to be made of $^1/_2$in. thick steel. This gives additional strength, there is more thickness into which tubes can be swaged, and the extra weight is useful. The backhead has no longitudinal stays so this beefs that up. Some may argue this thickness is overkill, but the extra cost is negligible, there would be no perceptible difference in steaming, and all the extra weight is useful for traction, so this is what I have shown in the drawing — not that I have any problem whatsoever with what I have.

Silver-soldered and welded

The tubes are made from standard $^1/_2$in. ($^5/_8$in O/D) thick walled hard drawn copper pipe cut to 26in. length, and the superheater flues are 1in. O/D x $^7/_8$in. I/D. The tube length was determined by the 1:50 formula for tube I/D:length. The tubeplates were drilled such that there was only a thou (0.001in.) of clearance for the copper tubes. They were then coated liberally with flux and two ▶

coils of 1/16in. dia. 45% Easyflo silver-solder wire wound around each tube. The tubes were assembled in the tubeplates, stood on end and then Dave and I put large propane torches to a tubeplate, one of us heating the underside while the other played the flame on top. When the whole plate got to near red heat, the 45% silver-solder ran nicely around each tube.

In hindsight, we could have used just one ring per tube, but it is always better to be sure than sorry, and we wanted a good fillet on both sides of the tubesheet. All the boiler plates were then commercially TIG welded together. Our advice to anyone proposing to follow suit is that when laying out the tube nest, be sure to keep just the flue and tube holes some 5/16in. away from the edge of the tubesheet to avoid silver-solder contamination of the TIG weld. I deviated from the ASME boiler code by silver-soldering the flues, and perhaps next time I would swage them in after the tubesheets had been welded. A swaged tube can be easily removed later, if need be.

It works well either way. A model 2-8-0 in Oregon has had 20 years of hard steaming with silver-soldered tubes in a conventional steel boiler, and that was good enough for me.

A 4in. long combustion chamber was designed so that more complete combustion of the fuel would take place. The sides of the firebox are from 1/4in. plate; with hindsight, 3/8in. is better for extra weight for better traction. These sides were screwed into the front and rear plates, but next time I would just weld them. It is easy to remove if and when necessary.

All the surfaces inside the firebox were lined with 1/2in. thick Kaowool board. Owing to the difficulty and expense of obtaining any reasonable quantity of good steam coal in Canada, I chose to make and fit a propane burner. Oil burners are too dirty and noisy for me. There is no protective lining over the Kaowool board; if I were to return to coal firing I would fit 316 stainless steel sheet over it to stop abrasion by the coal.

A 1/8in. thick 316 stainless steel arch was fitted above the burner with 1/2in. clearance on the sides and 1 1/2in. clearance at the backhead. It works well, the entire area glows orange so the blue propane flame turns into the infrared part of the spectrum which transfers the energy through the steel and copper better.

A commercial 600psi 1/2in. (I/D) pipe Teflon ball valve was fitted in the smokebox as a throttle, and was insulated by wrapping Kaowool around it, tying it with stainless steel wire to keep hot flames from impinging on it. It works just fine and gives a beautifully progressive opening that enables the driver to ease out of the station by taking up coupler slack and starting imperceptibly for the passengers, in the tradition of the finest of steam locos. The throttle is connected to four 3/8in. O/D, 316 stainless steel superheater tubes with TIG welded spear point ends.

The Author's **Britannia** *at Tom Miller's track, Oregon, with Dan Paritages at the regulator.*

Operational characteristics

On the first steam-up everything went fine except that the boiler primed easily, but a new boiler will foam, and the old gauge glasses — it has two as per prototype — go closer to the top of the new boiler than the old and tempt filling of the boiler more than necessary. Climbing 1 in 40 grades caused it to prime with a three-quarters full glass. Fortunately, the automatic steam operated drain cocks I designed relieve the pressure nicely so I didn't blow the cylinder covers off. I quickly learned not to overfill the boiler, finding that half a glass on level track becomes a full glass when operating on steep hilly tracks.

Full-sized Britannias had this problem, I understand, and the collector steam pipes were extended up into a higher modified dome, which is something I may do one day. One thing, with the copper heat exchangers pouring water up onto the crownsheet it is almost impossible to run it uncovered unless all the water is run dry; in this respect it's like a coffee percolator. If a fusible plug is to be fitted to protect the boiler against low water, it should be located in the middle of the firebox tubesheet just above the top row of tubes. It is the top row of tubes that can be damaged, as I have seen from two incidents on other boilers over the years. The copper heat exchangers were not damaged, and are readily unscrewed anyway should such a mishap occur. There's no point in putting the fusible plug in the crownsheet as the copper heat exchangers keep pouring water over the crownsheet. A 1/8in. hole to blow out is enough to put the fire out.

My boiler was tested hydrostatically to 300psi, twice its 150psi designed working pressure. The safety valves are set to 125psi and boiler-feed is by means of two 130psi injectors. There is a tremendous increase in power and reserve energy by bringing the boiler up to 125psi instead of 100psi, thanks to the increased water temperature and stored BTUs. The boiler barrel is good for 8000psi which provides a safety factor of 62. Since there are no stays to rot out, and because the water is circulating fiercely in the corners of the crownsheet next to the backhead, I feel that unlike so many steel boilers, this Briggs type will not crud up quickly and then overheat the metal.

We gave my *Britannia* its first run with a new boiler on 29 January 1994 at the then new track of the British Columbia SME in Burnaby, BC, Canada, site of the IBLS 2000 Meet of The Millennium. The Briggs boiler steamed very well, taking 7 minutes to boil and 5 more minutes to get to 125psi using compressed air fed into the loco's blower ring.

The boiler is fitted with stainless steel superheaters which protrude about 3in. into the combustion chamber. With the propane fire, which is cooler than coal or oil, I think perhaps I could have run them right back to the backhead, but I didn't want to get too much superheat temperature in view of the Viton O-rings in the balanced slide valves that Dave had fitted, to take 60% of the load off the bearings on the scale valve gear; the prototype had piston valves. So the steam isn't extremely hot and dry but quite a bit better and much more efficient than the wet steamers so prevalent in USA. Driving a wet steamer on a cold day you can hardly see ahead as the steam condenses right by the chimney, whereas with superheated steam, it is clear for a couple of feet.

We had an excellent first run. The modified balanced slide valves worked very well and the loco was nice and square. Dave had done his usual excellent job on building and setting the valves. The 'Kaowool' lagging inside the firebox keeps the cab cooler than a wet-backed unlagged copper or steel boiler, and it is possible to put your hand on the backhead without burning yourself. The smokebox temperature is quite cool which means it doesn't burn the paint, showing that we are extracting a good proportion of the heat from the fire.

Since that time, I have run my Britannia for 7 years, including most major tracks on the west coast of North America, including Tom Miller's superbly smooth steel-railed track near Portland, Oregon, which has long grades, one of them 1 in 35 for 2000 feet. I have no trouble maintaining steam with a good load up that hill. Last year I ran it on all the tracks of the IBLS 2000 tour, including Train Mountain RR with long grades, sometimes over two miles long. This is the ultimate test on whether the boiler steams well.

Steaming efficiency is great. This is shown by a propane consumption which is about the same as for the club's all copper-boilered, superheated Mogul CNR 2-6-0 with its 2 3/8in. bore cylinders. It uses about 20lb. (a tankful) for a four hour run with an average of 14 passengers on hilly tracks, and much less on flat tracks.

To be sure that the boiler is quite dry inside when storing it, I blow it down completely from 90psi at the end of a day's run. By starting at too low a pressure, you don't get the drying at the end. I feel this boiler should last almost as well as a silver-soldered copper boiler and it has the steaming ability of a copper boiler. With no stays to rot, after seven years all is fine. Cost and construction time are well in its favour. I have no hesitation in recommending this type of Briggs stayless boiler to anyone.

1

Proud winners with their Trophies and Certificates line up in the sunshine. (Photo: Peter Bull)

HARROGATE 2002
THE NATIONAL MODEL ENGINEERING & MODELLING EXHIBITION

Neil Read
reports on the clubs attending the 9th National Model Engineering & Modelling Exhibition.

●*Part II continued from page 494 (M.E. 4172, 28 June 2002)*

Over forty clubs exhibited at this year's event and the range of work on display was staggering. For obvious geographical reasons, most of the clubs were from the north, but fortunately the natives were friendly and we midlands folk (my wife and I) and even southerners (your Editor) were made very welcome. Indeed, friendly, knowledgeable stewards, who were only too happy to talk to the visitors, manned all the stands I approached. This is not always the case and at some exhibitions I have attended, the stewards seem keener on chatting among themselves than to the visitors.

As I toured the club stands, it made me realise that, although the building and steaming of miniature railway locomotives may still be one of the main branches of the hobby, there are enormous numbers of model engineers who engage in modelling other forms of prototype. Others get their satisfaction from building special tooling or experimental devices. It is very pleasing to report that such diversity is alive and well in the model making world.

It seems almost churlish to pick out one or two items for special attention, but a complete catalogue of the exhibits would fill several issues of *Model Engineer* and so I will mention just a few of the many things that caught my eye. John Britten of the Grimsby & Cleethorpes MES was so pleased with his Warco VMC milling machine that he made a model of it (**photo 2**). His 1:4 scale representation of this popular machine tool worked just like its big sister and could remove metal from the work piece in the vice. Even the electrical push buttons worked exactly as they should.

Alan Hopwood of York City DSME obviously has great admiration for the work of the late George Thomas and had prepared a display of all the attachments he has made to the designs of his hero (**photo 3**). As a fellow admirer of George Thomas I was immediately drawn to the display and congratulate Mr. Hopwood on his workmanship and tenacity.

A very fine James Booth Rectilinear engine made by J. Cogdon (**photo 4**) was exhibited on the City of Sunderland MES stand. Mr. Cogdon would appear to be an enthusiast for engines of this type and several more examples of his work were on display.

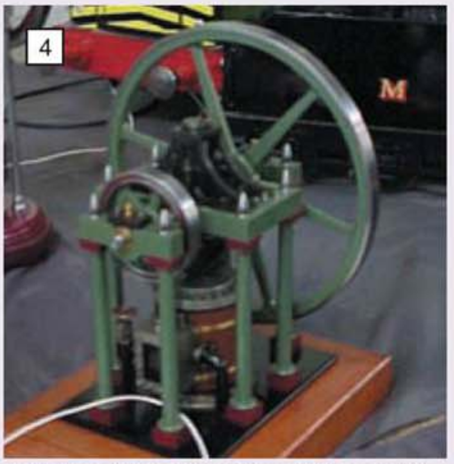
Among a number of interesting exhibits on the Cleveland Ass'n ME was a model of a Kitson ploughing engine (**photo 7**) made by D. Forstor. I have always considered this to be one of the most elegant designs of ploughing engine, mainly because of the position of the front axle in relation to the boiler, together with the angled drive shaft from the crankshaft to the cable drum. ▶

2

The miniature Warco VMC milling machine made by John Britten of Grimsby & Cleethorpes MES.

3

Alan Hopwood of York City DSME is obviously a George Thomas fan.



4

J. Cogdon of City of Sunderland MES made this James Booth Rectilinear engine.

National Model Engineering and Modelling Exhibition
Harrogate 2002
Results and Awards

Section 42 – Locomotives

1st	42/4	5in. gauge Johnson's J Class 2F 0-6-0 MR engine of 1897	G. Wainwright
2nd	42/7	5in. gauge *Dholpur* Hunslet engine	D. Thorpe
3rd	42/8	$7\frac{1}{4}$in. gauge GWR 14XX 0-4-2T Dart	R. Gibbon
HC	42/1	0-gauge NER B1 tank engine of 1888	S. Greenwood
HC	42/2	Gauge 1 LNER A4 *Silver Fox*	G. Dixon
C	42/3	5in. gauge *Lion*	D. Wainwright

Section 45 – Workshop Equipment

1st	45/16	3in. scale Elliot Victoria milling machine type MO	M. Leafe
2nd	45/2	Gear hobbing machine	J. Bentham
3rd	45/5	Tool holder carousel	B. Jordan

Section 46 – Road Vehicles

1st	46/4	2in. scale Burrell Showman's Engine *Dragon*	W. Renwick

Section 47 – Road Vehicles In Steam

1st	47/12	4in. scale Case 65HP traction engine	R. Morris
2nd	47/11	4in. scale Burrell single crank steam wagon	C. Richardson
3rd	47/3	3in scale Burrell traction engine	P. Nixon
4th	47/4	3in scale Burrell single crank traction engine	C. Halliday

Section 48 – Stationary Engines

1st	48/15	1:15 scale steam powered workshop of 1923	S. Kastner
2nd	48/16	18cc, 6-cylinder aero engine	D. Bramwell
3rd	48/6	1in. scale triple expansion marine engine	D. Lidster
3rd	48/8	1:6 scale, 18cc, aero engine *Cirrus* Mk. 1	P. Dekker
C	48/1	1:4 scale Atkinson differential engine	P. Dekker

Section 49 – Miscellaneous

1st)	49/7	1:12 scale McKay Sunshine harvester	B. Young
1st)	49/9	1:12 scale King Tiger tank	D. Bowie
2nd	49/3	1:8 scale section of a mews	J. Cartledge
3rd)	49/6	1:8 scale Norfolk waggon	J. Castle
3rd)	49/10	1:12 scale Ruston Bucyrus 22RB crane	W. Auty
HC	49/2	1:8 scale Victoria carriage	J. Cartledge

Section 50 - Fairground

1st	50/6	1:16 scale Model fairground	B. Rathmell
2nd	50/8	American carousel with carved animals	D. Scott
C	50/1	1:24 scale Fairground models	R Whatmore
C	50/2	1:24 scale Burger bus and stalls	M. Slater
C	50/3	1:24 scale Foden 8-wheel lorry	M. Slater
C	50/4	1:24 scale Showmans living van	M. Slater
C	50/5	1:24 scale Fairgound big wheel	M. Slater

Section 51 – Model Boats (Kit Built)

1st	51/1	1:96 scale Liberty ship *James Blair*	S. Reffin
VHC	51/3	1:96 scale Fletcher class destroyer	S. Reffin

Section 52 – Model Boats (Scratch Built)

1st	52/1	1:96 scale battleship HMS Nelson	B. Chambers
2nd	52/2	1:48 scale fleet auxiliary oil r/vessel	B. Young
3rd	52/5	5:96 scale Vosper Thornycroft launch	R. McMahon
VHC	52/14	Fishing boat	A. N. Brant

Barry Jordan Trophy for Best in Show

48/15	1:15 scale steam powered workshop of 1923	S. Kastner

Precision Paints award for the Best Finished Model

48/15	1:15 steam powered workshop of 1923	S. Kastner

Raymond McMahon Trophy for Best Road Vehicle

47/11	4in. scale Burrell single crank steam wagon	C. Richardson

Myford Shield for the Best Locomotive

42/4	5in. gauge Johnson's J Class 2F 0-6-0 M.R. engine of 1897	G. Wainwright

Chester Shield for Workshop Equipment

45/16	3in. scale Elliot Victoria milling machine type MO	M. Leafe

Evertex U.K. Shield for Best Boat

52/1	1:96 scale, battleship HMS *Nelson*	B. Chambers

Warco Trophy for the Best Stationary Engine

48/16	18cc 6-cylinder aero engine	D. Bramwell

Northern Association of Model Engineers Shield for Best Club Stand
Urmston & District Model Engineering Society Ltd.

Stephan Kastner with the Barry Jordan Trophy for the Best Model in Show. (Photo: Peter Bull)

Mr. Forstor's engine was a fine example of this unusual prototype.

Having constructed a rocking horse for his grand-daughter, Ken Hopper of Pickering EEMS needed to make something for his grandson. The chosen project should make the young man very happy, as he will shortly be the owner of a miniature Bugatti type 35 racing car (**photo 8**). Approximately $\frac{2}{3}$ full size the model is based on the 1927 version of this famous car. The prototype was fitted with a 2,262cc, straight eight, OHC engine developing 135BHP at 5,300rpm. The model will be fitted with an electric motor of the type used to drive the electric buggies used by invalids. On the same stand was a 1:5 scale Hodgson 9-cylinder radial aero engine made by David Snell (**photo 9**). I had not seen a model of this prototype before and perhaps Mr. Snell could be persuaded to tell us a little more about it.

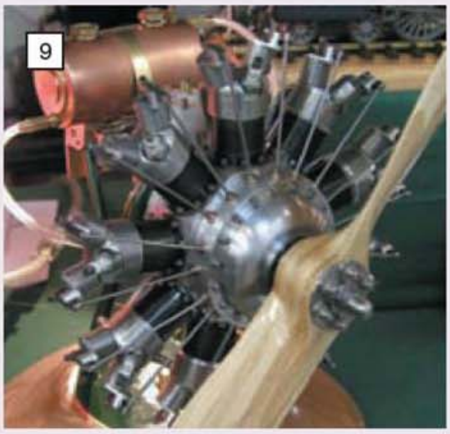
It was good to see the SMEE at the Exhibition and have a chat with some of my fellow members. I was pleased to see Ivan Law and Dennis Monk who are, of course, judges at the Highbury Nexus Model Engineer Exhibition at Sandown. Ivan showed me a most interesting engine on the SMEE stand made by fellow member, Cedric Mell (**photo 10**). This model was of a Buckett engine which was one of a type known collectively as caloric engines. These engines became popular during the 19th century and were, for a time, rivals of the steam engine.

They worked by drawing a fresh charge of air into an enclosed and usually pressurised coal-fired

Neville Wilkinson amusing himself and the visitors with his model of a Liebherr excavator.

The Kitson ploughing engine seen on the Cleveland AME stand and made by D. Forstor was a most elegant engine.

The model Bugatti racing car under construction by Ken Hopper of Pickering EEMS. A fabulous present for his grandson.



The 1:5 scale Hodgson engine radial aero engine made by David Snell of Pickering EEMS.

Cedric Mell's caloric engine made to the design of Buckett and seen on the SMEE stand.

Brian Young of the Guild of Model Wheelwrights is a prolific modeller. This charming model of a garden shed has many delightful details.

A superb model of a World War I Foster Mk. 4 tank built by Ian Douglas of Lincoln DMES.

furnace chamber. This air was heated and mixed with combustion products from the fire, and then passed through a cylinder where it did work. It was then exhausted and the cycle repeated. The main disadvantage of these engines was the rapid wear in the cylinders caused by the ash and cinders from the fire. For the same reason, models do not usually work very well, as it is impossible to scale down the size of the products of combustion. Apparently, Mr. Mell has experienced these problems and is still working on a solution. In the meantime he has christened the engine *Hyacinth* after the TV character Hyacinth Bucket!

The Guild of Model Wheelwrights always manages to find plenty of unusual exhibits for their exhibition stands. Not many people would consider modelling their garden shed (not mine anyway) but the idea obviously appealed to Brian Young who produced a lovely little 1:12 scale model packed with detail (**photo 11**). The lawn roller and mower have been reproduced in miniature and the display even included a tiny croquet set.

The well stocked Lincoln DMES stand included a most interesting model of a WWI Mk. 4 tank (**photo 12**). The prototype was produced by Fosters, perhaps better known for their road locomotives. The model was built by Ian Douglas who used 16swg steel as the main construction material, together with an awful lot of rivets.

Urmston DMES had put together a spectacular display portraying a locomotive repair facility and main line station scene (**photo 13**). Urmston members are to be congratulated on the time and trouble they have put in to achieving this display. Indeed, I found several visits were necessary to start to take in the detail. Every time I returned I noticed something that I had previously missed. It is gratifying to record that this society was awarded the Northern Association Shield for the Best Club Stand.

The $7^{1}/4$in. Gauge Society had a large and impressive stand with a fine display of finished and part finished (**photo 14**) locomotives with some associated rolling stock and track fixtures and fittings. When working with models of this size one is faced with some substantial engineering problems and I am left debating the size of the workshop equipment necessary to handle such large lumps. I doubt if the typical model engineer's $3^{1}/2$in. lathe would be much use except on the smaller components.

Tucked away among the club stands was a display of models built by Neville Wilkinson who appears to have made a study of earth moving equipment and had several examples of his work on display. To show they worked as well as they looked he could regularly be seen transferring dried peas from one tub to another or demonstrating his 1:12 scale model of a Liebherr 984 excavator (**photo 5**)

So, what did I think of my first visit to Harrogate? I'd say that anyone who didn't find something of interest at this exhibition must be extremely difficult to please. It was first class!

Winner of the Northern Association Shield for the Best Club Stand was Urmston and District MES Ltd. with this finely detailed display.

Seen on the $7^{1}/4$in.Gauge Society stand was this chassis for a LSWR 2-4-0 WT Beattie tank locomotive by Chris Rayward.

STEAM TUG *KERNE*

George Barrett

introduces a very fine example of marine model engineering which first caught the Editor's eye at the Harrogate Show in 2000. Much of its construction involves material cut from the same sort of aluminium alloy offset litho plate as used by the printers during the production of this magazine.

Built in 1913 by the Montrose Ship Building Co. Ltd. of Montrose on the South Esk River, the 'Dog' class tug which is the prototype for my model was due to be named *Viking*. However, while under construction, the Admiralty took her over for general dockyard duties in Chatham on the River Medway and renamed her *Terrier*. The launching and steam trials took place in March 1913 and *Terrier* sailed from the River Esk to Chatham where she worked for 35 years. It is believed there were to be six of these Dog class tugs.

With the builder's number 397, the main engine was constructed by W. V. V. Lidgerwood of the Speedwell Ironworks in Coatbridge, a company of American origin.

Terrier's original boiler was constructed by A. & W. Dalglish. In 1935 a new boiler was built to the original drawings by boilermaker Mr. R. W. Wright at HM Dockyard Chatham. It was six months in construction and *Terrier* was subsequently re-boilered in 1936.

In 1948 *Terrier* was sold to Messrs. J. P. Knight Ltd. of London for use on the river Thames. She still had her counterbalanced folding funnel and open wheelhouse. Coming out of Admiralty useage, *Terrier* was first registered in London on 28 July 1948 when she received her new name, *Kerne*. All of J. P. Knight's fleet of tugs had names beginning with the letter 'K'. In this case, *Kerne* is gaelic for 'Foot Soldier' or 'Warrior'.

On 13 September 1948, *Kerne* changed hands to the Straits Steamship Co. Ltd. of 5 Chapel Street, Liverpool, this being a subsidiary company of the Liverpool Lighterage Company.

During 1949 she was modified with a non-folding funnel of increased height, an enclosed wheelhouse, a new mast, washports were cut in

Built in 1913, the prototype for the Author's model was originally named Terrier *and used for general dockyard duties in Chatham. After 1948, when transferred to private ownership, she was renamed* Kerne *and is now owned and cared for by the North Western Steamship Co. Ltd.*

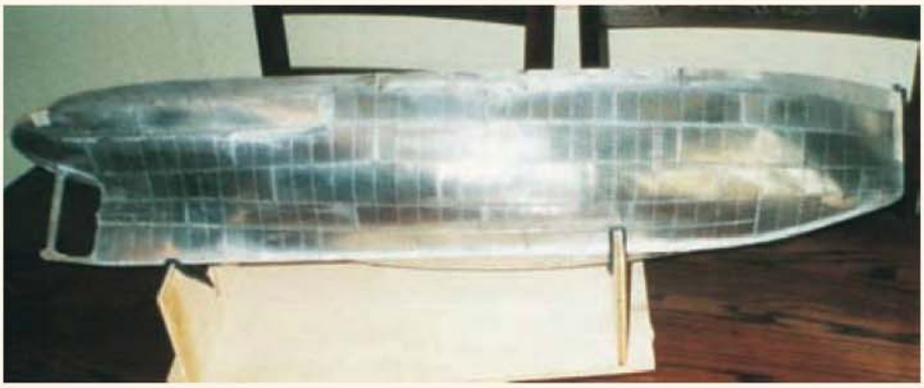
These images of the Author's model under construction reveal the superb workmanship and attention to detail. The hull was plated on the wooden former shown and much use has been made of aluminium alloy sheet material.

the after bulwarks and a small whaleback compartment on deck houses the water closet.

In this guise, *Kerne* towed barges, operating on the River Mersey, the Manchester Ship Canal and River Weaver systems for the next 22 years. On 30 April 1965 her ownership passed to the Liverpool Lighterage Co. Ltd. which also operated the steam tugs *Bonita* and *Langbourne*. In April 1971, due to the arrival of a replacement motor tug, *Kerne*, the last Lighterage tug, was laid up for disposal.

After 58 years of working life, *Kerne* was sold on 10 September 1971, not to the breakers, but to the present owners who, some two years later, formed the North Western Steam Ship Co. Ltd. as a non-profit making organisation to fund and operate the vessel.

Kerne is usually based at the Merseyside Maritime Museum at Liverpool or at the Boat Museum at Ellesmere Port. She has made voyages to the Isle of Man, North Wales ports, Porthmadog and regularly cruises on the River Weaver and ship canal systems. She has also had roles in four films and in 1990 was awarded the 'Steam Heritage Award - Marine Section' when the owners were presented with suitable vellum, cheque and trophy at the York Railway Museum.



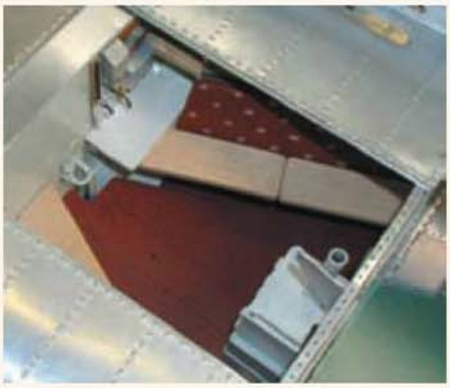
The model

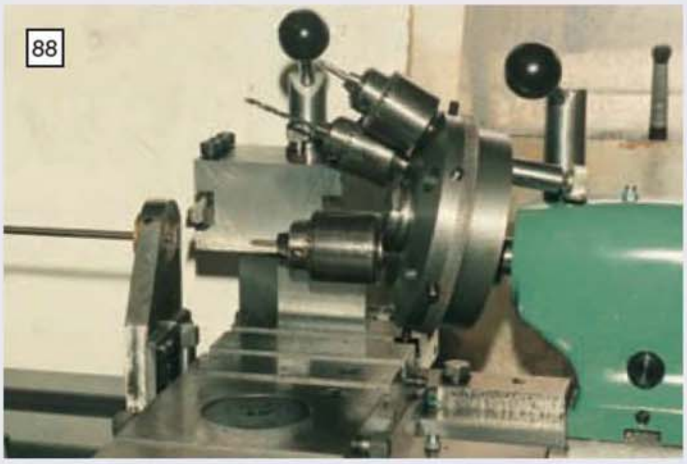
The hull of the model was built by using the plank-on-frame (formers) method. After the mould was completed, the outside of the hull was plated with aluminium alloy plates cut using dimensions derived by examination of the original ship's drawings and dry dock photographs. Once the outside shell had been plated, the wooden mould was removed and the inside plating was added, thus forming a shell of litho-plate four layers thick. Next to be added were the angle iron frames.

The boiler and engine casings are made from 1mm thick aluminium alloy plate with litho-plate cover plates showing the rivet detail. The deck is constructed in a similar manner. The funnel is rolled up from litho-plate and the funnel stays are wound from thin wire. The boiler is made from 1mm thick aluminium alloy rolled to the same scale dimensions as the prototype ship. It contains the electric motor and control gear for the model.

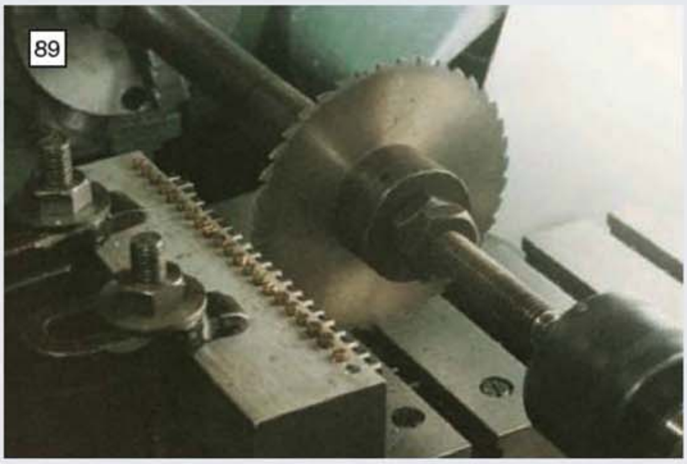
Built in steel and brass, the engine is a direct copy of the full size ship's triple-expansion steam engine and will be powered by the motor in the ship's boiler which will in turn rotate the propeller.

The model is completely scratchbuilt, there being no commercial parts whatsoever. All dimensions have been derived from the full-size ship in the form of sketches and photographs. At the time of writing these notes, it is hoped to have the project completed around 12-14 months hence, most of the outstanding work which remains is required on the very complex engine room.





The set-up used by the Author to speed the production of the tappet rods. Note the use of a tailstock turret and the previously described bush steady.



The block used for the relatively heavy slotting opeartion needed on the tappet rods is much stiffer than an angle plate.

BUILDING A 1:5 SCALE GNOME ROTARY ENGINE

Rowland Lowe
begins work on the valve gear for this 9-cylinder engine.

●*Part VII continued from page 459 (M.E. 4171, 14 June 2002)*

Making the valve gear will once more involve you in volume production. If you prefer the luxury approach, make the tailstock turret shown in **photo 88** and described in L. H. Sparey's book *The Amateur's Lathe* (£8.95 + £2.95 p&p UK from Specialist Model Books Ltd. tel: 01202-649930). Otherwise, keep tool changing!

The tappet rod production sequence is as follows:

1: Centre.
2: Drill.
3: Tap.
4: Part off to length.

The other end of the rod has then to be slotted to take the roller, item 41 in the parts list. Prepare the fixture shown in **fig 10**. Use a spare tappet guide nut to act as a lock nut on the distance screw. The 1/16in. reamed holes can be used to align the items for slotting as shown in **photo 89** by passing a 1/16in. rod through the holes before they are pushed home and clamped. Note that the bracket method is hardly rigid enough for this slotting operation; I found a block with individual clamping screws much better.

Rollers (item 41)

The blanks are made by setting a length of suitable diameter mild steel to run true in a chuck or collet, drilling the 1/16in. dia. central hole and parting off the blanks. These are finished to thickness by holding them in a split bush and facing off as shown in **photo 90**. These were then case hardened for me by a small local heat treatment works.

Guide end (item 44)

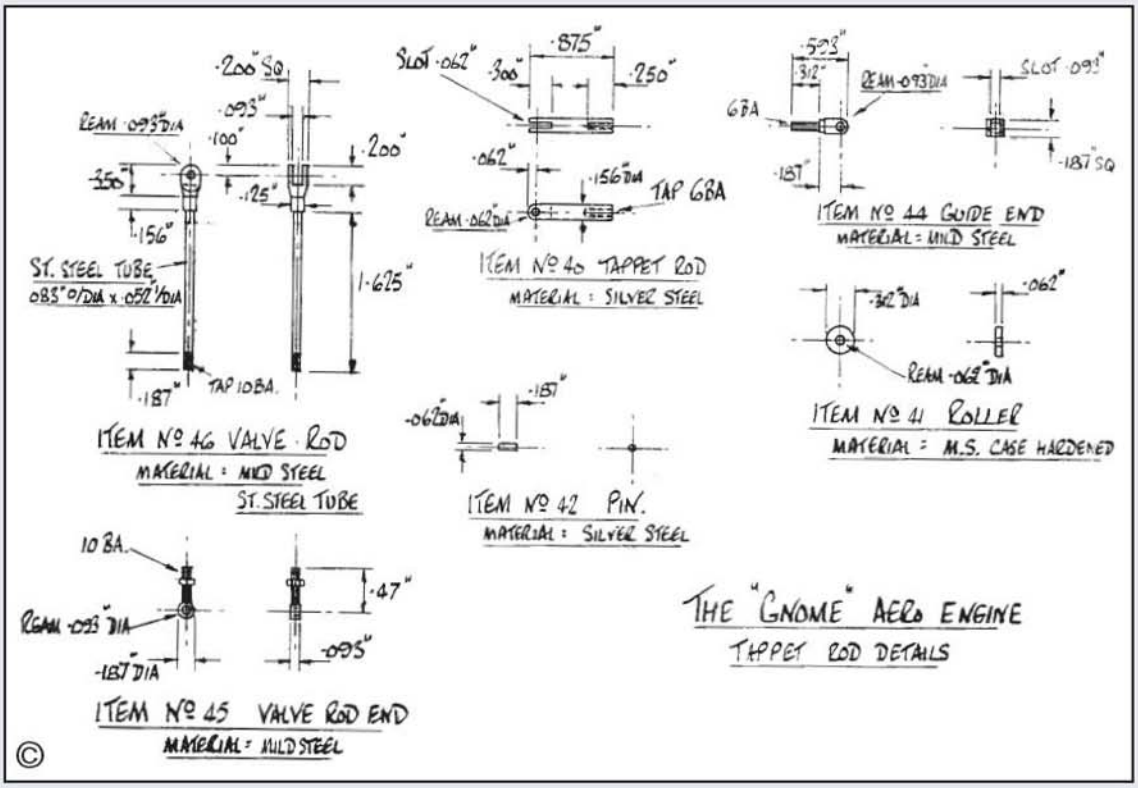
The forked end provoked some thought but, with planning, presented no great difficulty. The method is:

1: Cut blanks about 1 3/8in. long for two ends from square stock.
2: Drill and ream holes for pins at each end.
3: Using a drill shank in the pinhole and against a chuck jaw, skim back the ends until the pinhole is at the correct distance from the end (**photo 91**).
4: Cut the workpiece in two and prepare a length stop to plug into the mandrel. Reduce the portion projecting between the jaws to allow them to grip. The stop should project to within 1/2in. of the front of the jaws. Machine all workpieces to 0.593in. long.
5: Reverse workpieces in the chuck, turn to shape and thread.
6: Slot.
7: Round ends.

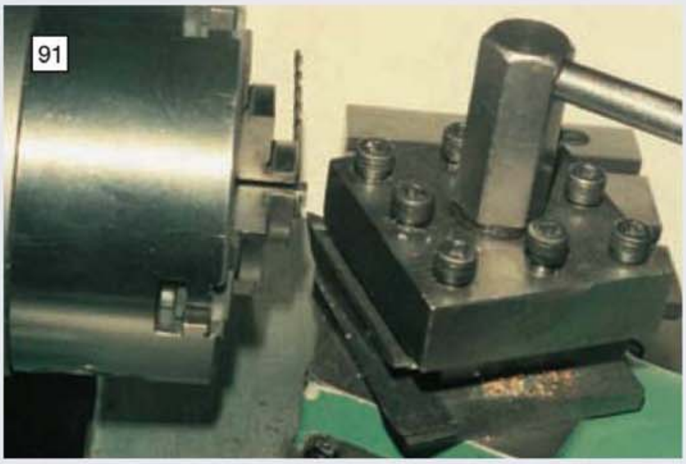
Now to the valve operating rockers.

The valve rockers (Item 36)

Before starting, make up a test rocker from a scrap of steel plate to check that the dimensions shown will allow the rocker to bear truly on the valve stems.

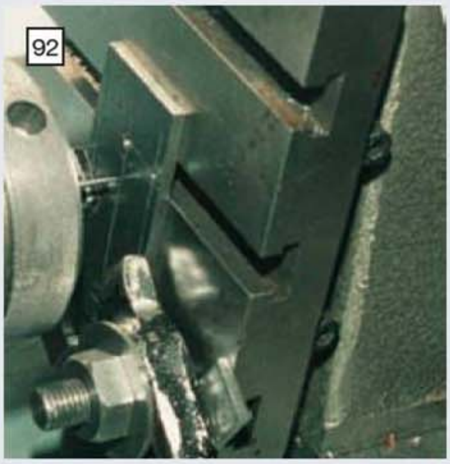


Facing off the rollers to thickness. The parts are supported in a fixed bush mounted in the 3-jaw chuck.

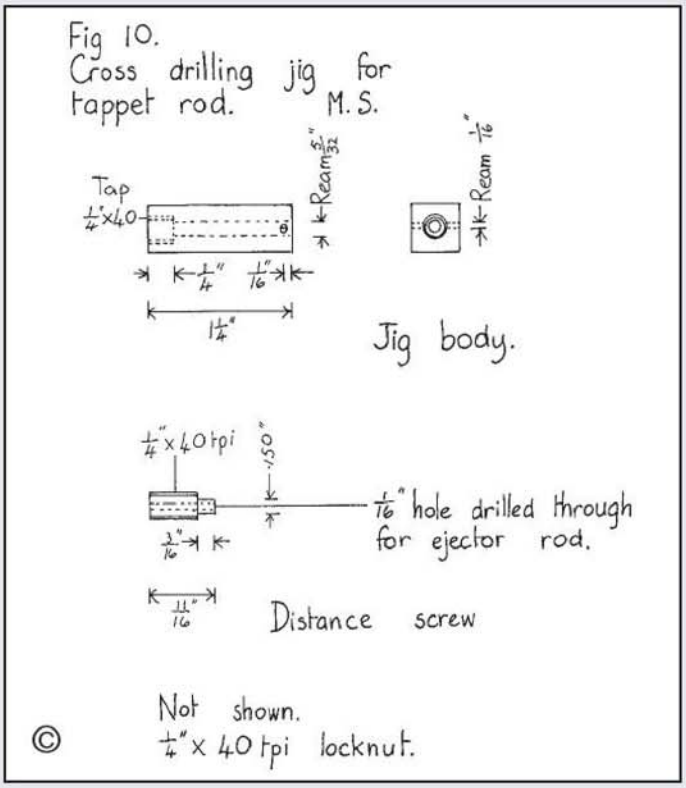


Cutting the guide ends to correct the pivot distance from the end. Note the use of the drill shank bearing on one of the chuck jaws.

Next, make a template to the revised size ensuring that the distance each side of the central pivot is the same. This ensures each rocker will be identical. Marking out is shown in **photo 92**.



Marking out the template for the rockers using the vertical slide.



A piece of plate $1^1/4$ x 2in. minimum is mounted on the vertical slide. Mark a vertical line $^1/8$in. in from the rear edge, note the cross-slide index reading and mark two further vertical lines at intervals of 0.468in. (or the revised distance).

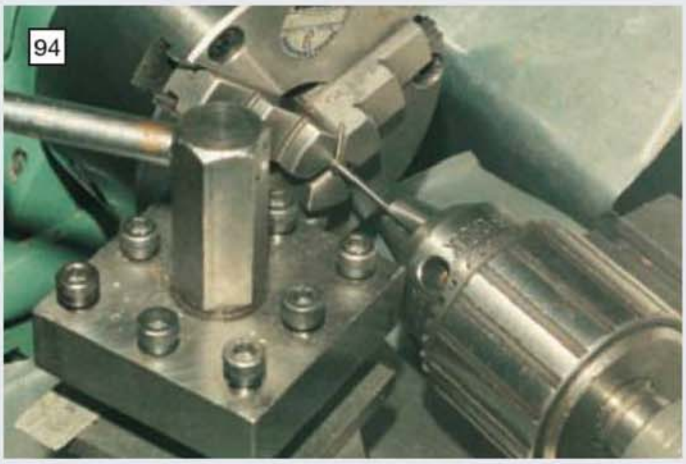
Now mark a horizontal line over a T-slot near the top of the plate. Note the vertical-slide index reading. Raise the plate 0.03in. and mark a horizontal line across the nearest vertical line. Note the index readings. Now raise the slide a further 0.06in. and mark a line across the far vertical line for the lower face of the rocker. Drill the centre position nearest to you and that in the centre of the workpiece No. 50. The plate may now be removed from the slide, the top radius marked with dividers, and the rest of the outline.

Make up two pins, one of 0.158in. dia., the other 0.093in. dia., with spigots to press into the No. 50 holes. Also drill a $^1/16$in. hole (by eye will do) in the centre of the other end. This will be used when making up the thicker portion that contacts the valve. Cut and finish the template to shape.

The value of a vertical slide for jig drilling now becomes apparent. A piece of $^3/32$in. gauge plate is clamped with backing spacers to avoid drill damage, and holes for all the rockers are drilled 0.093in. dia. and 0.158in. dia. by use of the vertical- and cross-slide index dials. The pegs in the template locate in these holes so that a series of rockers may be marked as in **photo 93**.

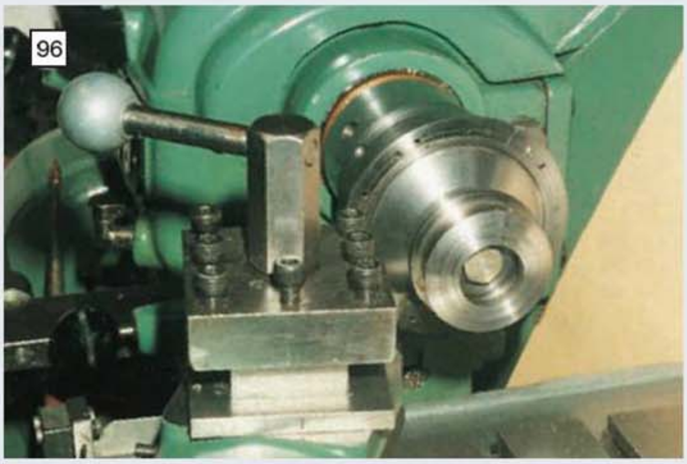
The valve end of the rocker is shown as 0.125in. thick. I made this up by making $^1/16$in. flat headed rivets from silver-steel, with a ▶

After co-ordinate drilling their holes, the rocker arms can be marked out using the template made previously.

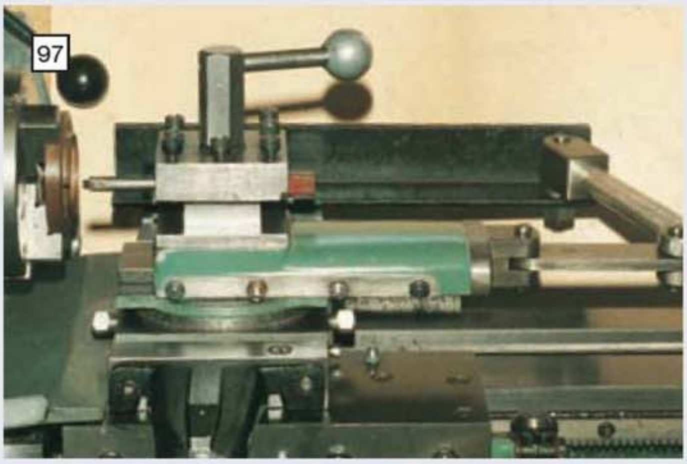


The method used to face off the valve rod ends to thickness; the parts are located by a length of $^3/32$in. dia. rod mounted in the drill chuck.

The set-up for drilling and slotting the valve rod ends using a special angle bracket with tailstock support



Finish machining the locking ring which is mounted on the ball bearing housing (item 3) in turn mounted on its slave chuck.



Cutting the keyway in the commutator ring using a home-made slotting attachment based on the lathe top-slide.

Drilling and boring the commutator ring with the workpiece mounted in the dividing head bolted to the lathe saddle.

countersunk washer on the other side. These are finished by filing, but leave them rather oversize for final adjustments on assembly.

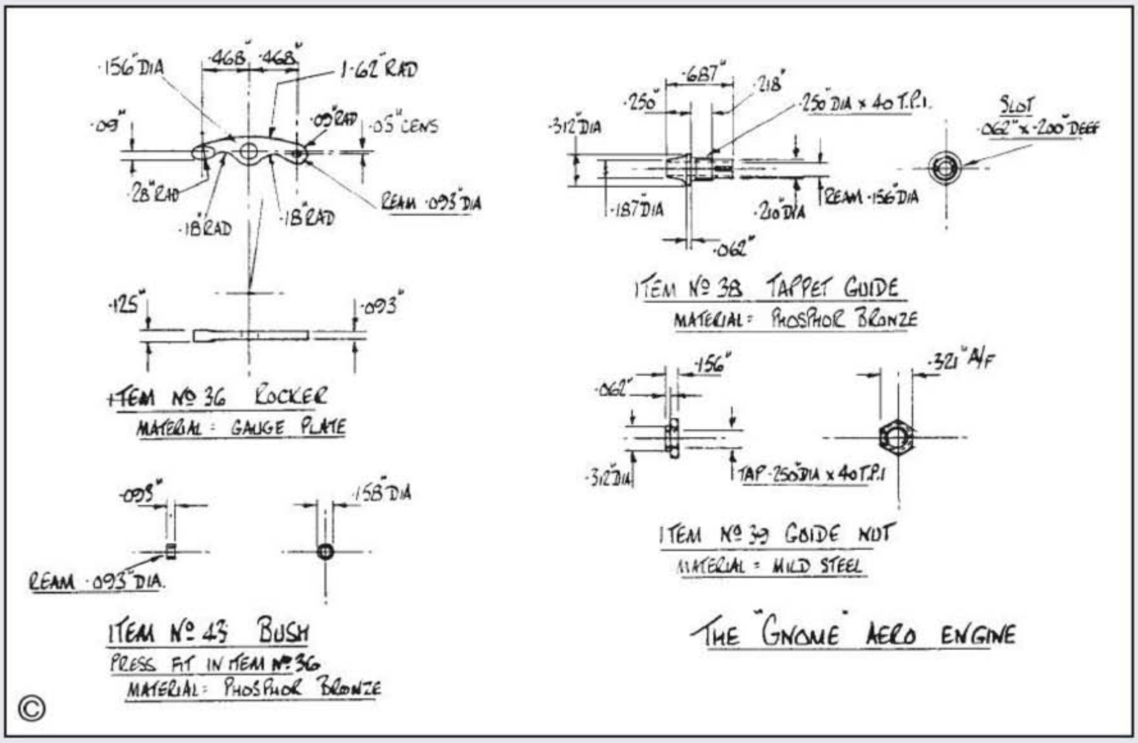
Manufacture of valve gear pins, various small screws, etc. need hardly be detailed, but aim for the best possible fit and finish.

Valve rod end (item 45)

Refer back to fig. 10 for the construction of a cross-drilling jig and make up one for 3/16in. dia. rod with a No. 54 (10BA tapping size) cross-hole. No length stop is required.

Drill a length of 3/16in. rod and ream 3/32in. to the maximum depth possible. Put the rod in the jig, and cross-drill a series of No. 54 holes spaced to allow for parting off pieces a little over 3/32in. thick.

Remove from the jig and tap the cross-holes 10BA. Part off slices and fit 10BA studding, fixing them with Loctite 601. Check that the reamed hole is clear. Mount the valve rod end on a piece of 3/32in. rod and hold in the chuck as shown in **photo 94**. Screw on a 10BA lock nut, tap one end of the valve rod tube 10BA and assemble.



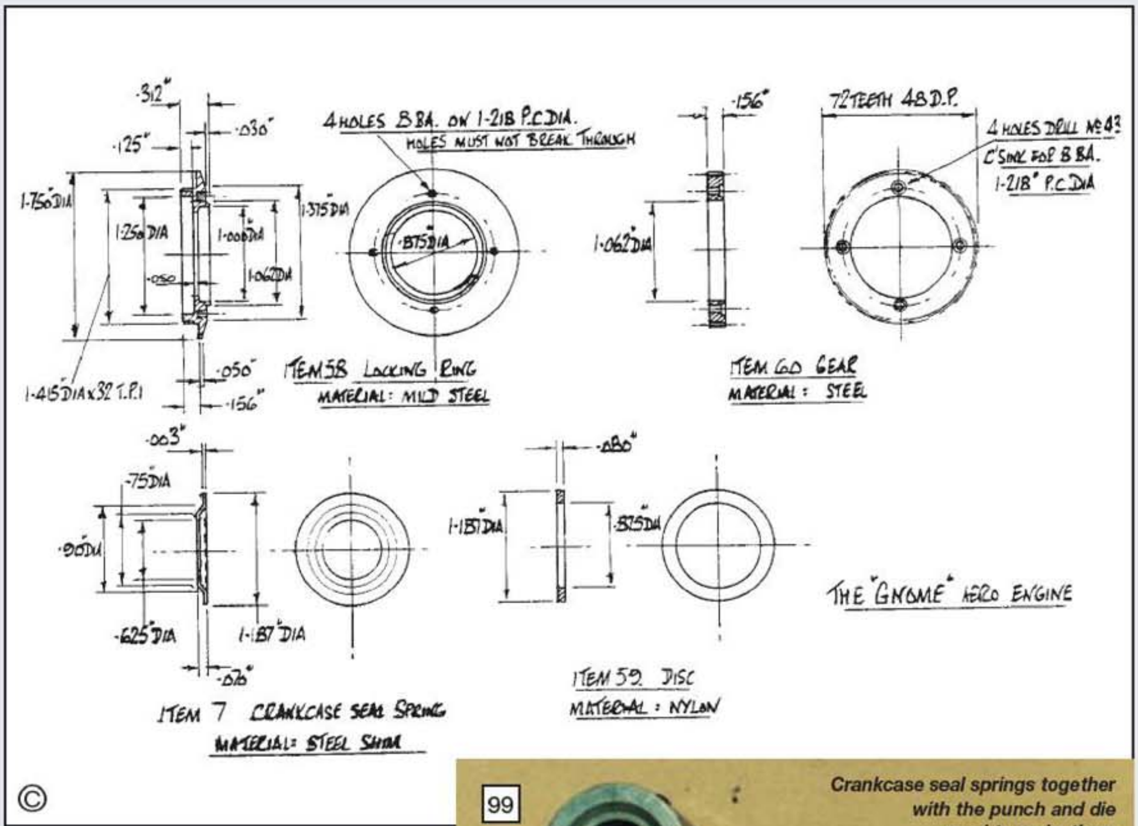
Valve rod (item 46)

The top end of the valve rod tubing will just take an 8BA thread onto which the forked end can be screwed and fixed with Loctite. To make the ends, cut 1^1/8in. lengths from square section stock. Chuck in the 4-jaw independent chuck, drill and tap each end 8BA, and turn the lower profile of the fork on each end.

Before drilling the pinholes, study **photo 95** which shows a fixture that allows all pinholes to be drilled in the same position and gives a secure mounting for slotting. On top of the fixture a pair of forks that have not been separated can be seen.

The fixture is similar in principle to the brackets used for screw slotting, but this bracket (a home-made angle plate) is thicker. Holes are drilled through for a running fit to the lower part of the fork, and counterbored to allow enough of the fork to project for slotting, the tapered portion bedding on the edge of the counterbore. The workpiece is drawn in by an 8BA screw from the back. Several forks can be drilled and later slotted at once.

There are a number of other small parts that are straightforward lathe work, and as such are not described in detail.



Locking ring (Item 58)

Secure a length of steel in the 3-jaw chuck and, at one setting, turn and bore the forward face (that nearest the engine). Screw cut to fit item 3, the ball bearing housing, and part off. To finish the rear face, see **photo 96**. Item 3 is secured on its slave mandrel in the master chuck, and item 58 mounted on it.

Commutator ring (Item 56)

The workpiece is turned in the 3-jaw chuck, leaving the outside diameter oversize. Cut the keyway using your own favourite method or the home-made attachment shown in **photo 97**. The outside diameter is finished to size using the set up shown in photo 96 again. This done, the set-up is transferred to the dividing head and drilled and counterbored as shown in **photo 98**, starting 20deg. from top dead centre position.

Crankcase seal spring (Item 7)

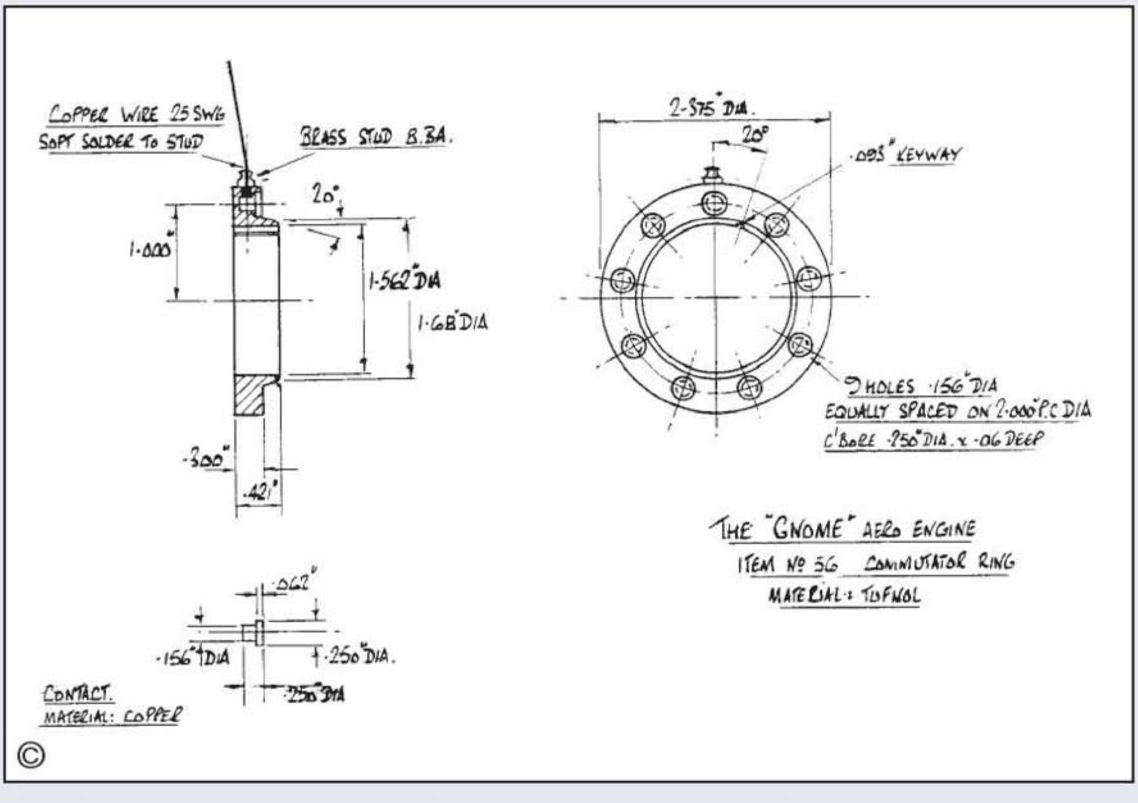
Shim steel is specified for this item. However, my attempts to make the spring using various annealing techniques did not give satisfactory results. I found it better to use annealed shim brass of a slightly heavier gauge, relying on work hardening to restore the required springiness.

The punch and die are quite simple, with a reamed 1/4in. hole through both for alignment. **Photograph 99** shows punch and die, with work examples in steel and brass. Experience to date has shown the brass seals to be quite adequate in service.

●*To be continued.*

99

Crankcase seal springs together with the punch and die used to make them



A WEIGHT DRIVEN CLOCK

Robert Graham Boyes in Zimbabwe, South Africa, cuts and assembles the plates and pillars before setting the wheels for his 'no frills' bracket clock.

●*Part II continued from page 447 (M.E. 4171, 14 June 2002)*

Components for the Author's own weight driven bracket clock.

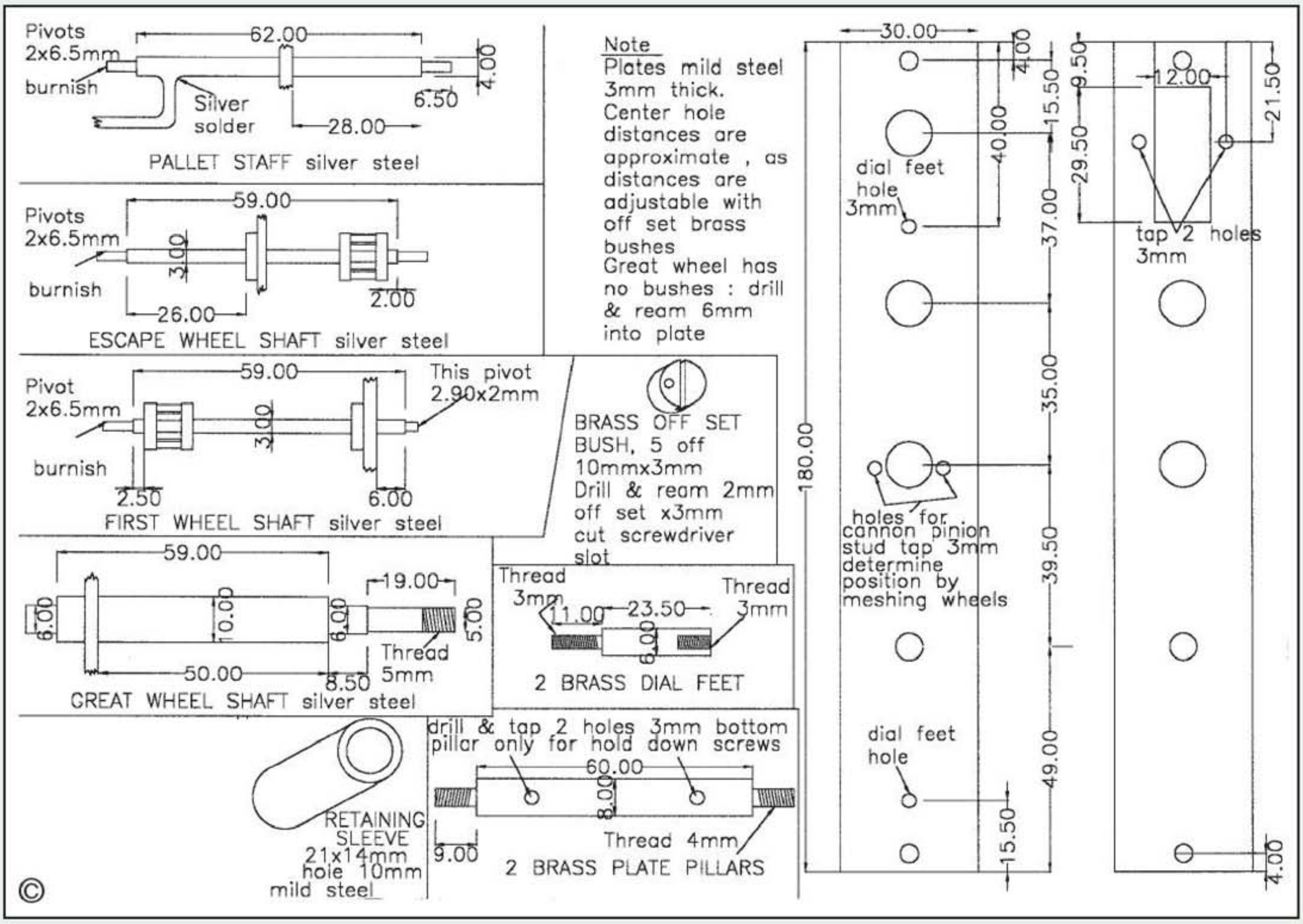
I cut my plates from 3mm mild steel plate but I expect most builders will prefer to use brass plate here. I had no suitable brass plate to hand at the time and, anxious to get on with the job, I settled for mild steel. With hindsight, I now think that brass would have been the better material to use, and should have waited until I bought a piece of 3mm brass plate. Two pieces approximately the size of the plates were cut with the hacksaw. The two holes for the pillars were drilled in both plates. The two pieces were then bolted together through these holes, and machined as one in the 4-jaw chuck. When they were to the correct dimensions and still held together as one, the positions for the great wheel and bushes were marked out and drilled.

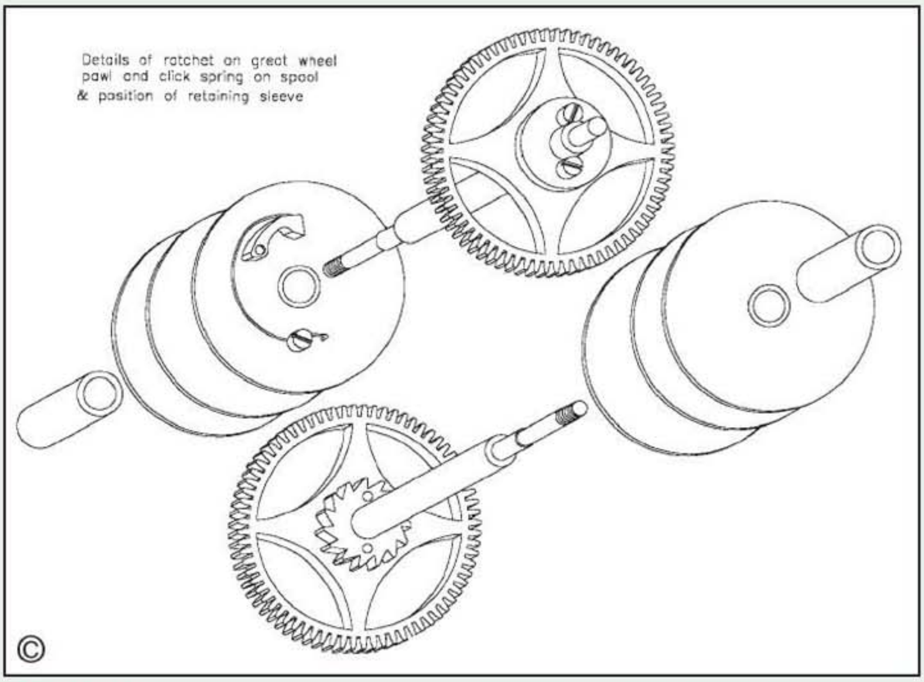
These holes were positioned as accurately as possible, even though, the distance between the centres of the wheels is adjustable using the offset bushes. Once drilled, the two plates were then separated and the holes for the dial feet marked and drilled in one plate only. The aperture for the pallet leg was marked on the other plate and cut out with a piercing saw. The two holes for the pallet cock screws were then drilled and tapped. The holes for the cannon pinion stud were *not* drilled at this stage, these were drilled later when meshing the dial side wheels.

The two brass pillars were very simple turning and threading jobs. The two holes for the holding down screws were cross-drilled and tapped on the bottom pillar only. It was important that the 60mm lengths of the pillars were machined accurately so that the plates were spaced exactly 60mm apart at both ends.

When the pillars were finished, the plates were assembled with the pillars between, using 4mm nuts to hold it all together. At this point the assembly was checked with an accurate square to ensure that the plates were all square.

By this time I was keen to see if my wheels and pinions would mesh properly, so the next job had to be the offset bushes.





Offset bushes

There were no problems here; a brass rod was turned down to a fraction over 10mm dia. to provide a friction fit in the 10mm bush holes. Five 3mm slices were parted off, a point 3mm from the centre was marked on each and centre-popped. All bushes were then drilled and reamed 2mm.

The screwdriver slots were cut using a needle file. The bushes were set into the plates, making sure that they were a good friction fit but capable of being turned using moderate pressure with a screwdriver. It was important to avoid pushing them through the plate with the screwdriver; they had to remain flush with the plates.

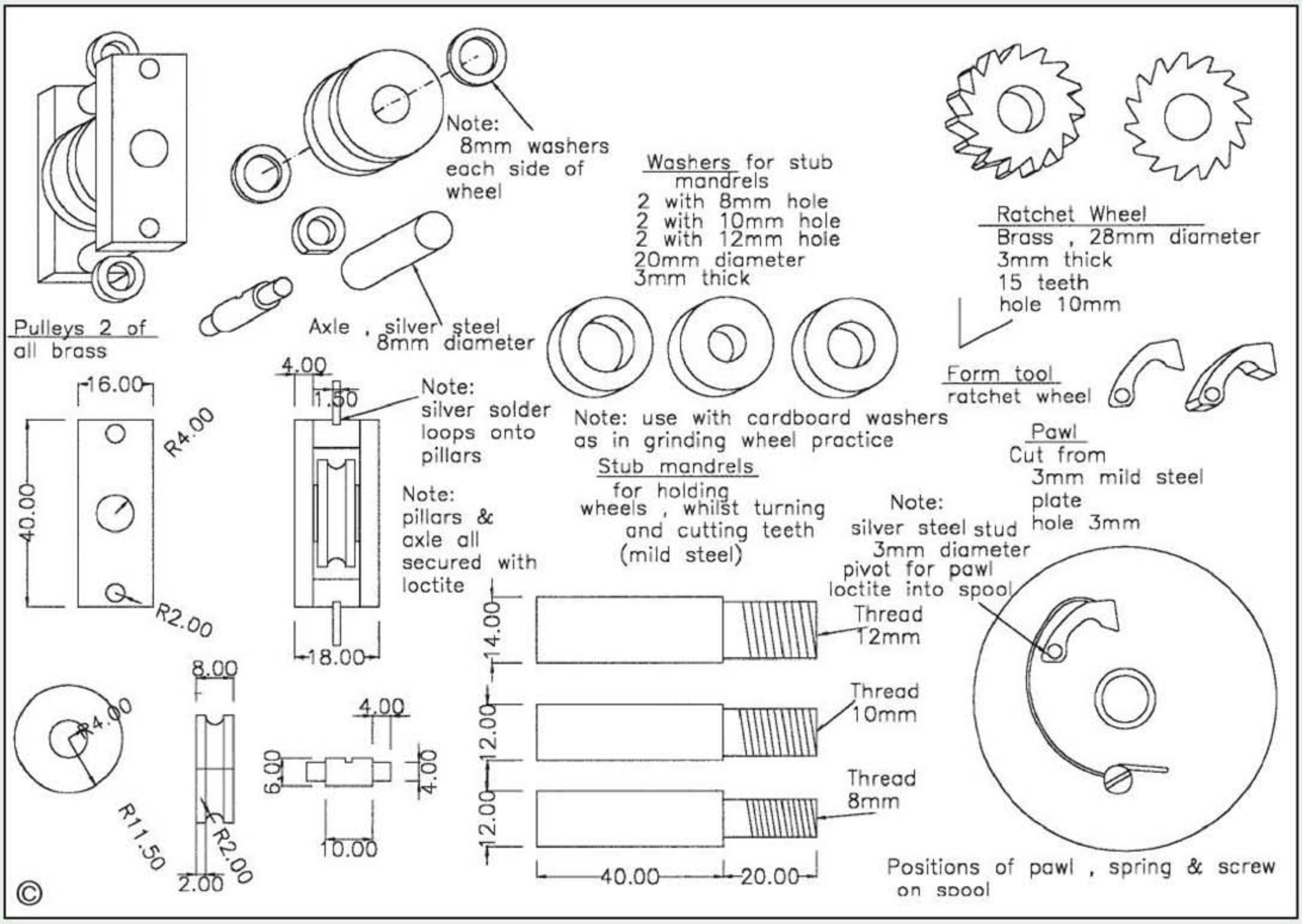
There was little point in trying to to mesh all the wheels at once. First the great wheel was meshed with the first wheel pinion, ensuring that the bushes on both front and back plates were turned in the same direction, and then only in small increments, until the wheel and pinion were in perfect mesh. Prospective builders should note that turning the bushes in opposite directions or making large incremental adjustments are likely to take the shaft off-square, possibly bending or breaking the pivot.

When I was satisfied that these two wheels were meshing properly, the same procedure was adopted to mesh the escape wheel pinion with the first wheel without moving the bushes on the first wheel again. I must say that I was very much relieved when the train was turning merrily around with a nice soft 'burr'. I sat for about half an hour just pushing the great wheel around with my finger, listening to the 'sweet sound of the soft burr'.

At that stage I wondered whether I should glue or rivet the bushes in their working positions but decided that neither would be necessary as they were all fairly tight when turned with a screwdriver. It is obviously up to the individual constructor to decide whether or not the fit is sufficiently tight.

Meshing the dial side wheels

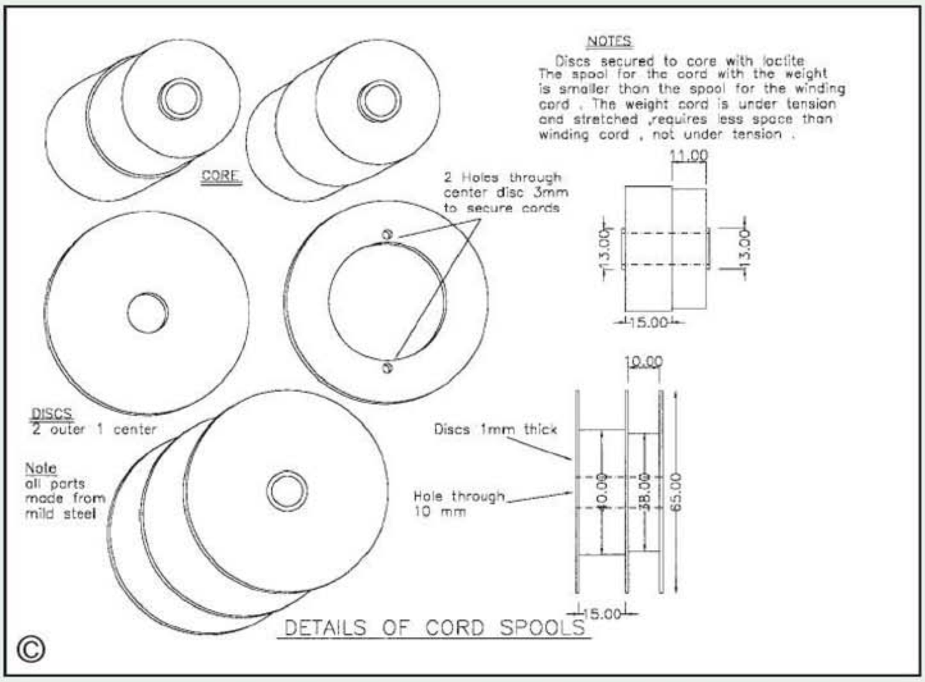
The minute wheel was fitted to the threaded end of the great wheel shaft with a friction fit. This wheel carries the hands and must be tight enough to do so but not so tight that the clock cannot be set to time by turning the hands with a finger. The friction is provided by the tension spring which is held in place with a 5mm nut. I filed small notches on the top of my pinion to give the spring some grip, but I don't think these are really necessary and have not shown them in the drawings — see drawings for details.



The cannon pinion and hour wheel are fitted onto the cannon pinion stud. Two washers were cut from 0.35mm shim stock, one was placed between the cannon pinion and base block, the other between the cannon pinion and hour wheel. This assembly then had to be meshed with the minute wheel; there are two points of mesh here. The minute wheel must mesh with the cannon pinion while at the same time the hour wheel must mesh with the minute wheel pinion.

I used a very small pair of vice grip pliers to hold the base block in position while I tested the mesh. When satisfied that I had the best mesh between the two points of contact, I carefully scribed a line around the base block. The cannon pinion assembly was removed and the holes drilled and tapped in the appropriate positions within the scribed outline of the block.

It was at this stage that I had the urge to see the hands going around the dial in synchronism. I realise that this was not a logical sequence of events, but … that's what I did next.



Dial and hands

I used a computer print out as a template for the hands. The template was stuck onto a sheet of 3mm mild steel plate using contact adhesive. The hands were then cut out using a piercing saw. The 12mm centre hole in the hour hand was cut slightly undersize and then, using a needle file, opened up to a nice tight fit on the hour wheel tube. The square of the minute hand was treated in a similar manner to give a snug fit on the cannon pinion square.

After bringing them to a good finish using emery paper, I painted them matt black.

The dial is also a computer print out which was plastic laminated after cutting out the centre hole. The baseboard is 2mm plywood and the dial feet were attached using countersunk screws. A 14mm hole was drilled at the point opposite the nut holding the tension spring on the minute wheel pinion as a precaution to ensure that the nut was not fouled by the baseboard. The dial lamination was mounted on this board with contact adhesive.

The nuts to secure the hour hand and cannon pinion were then made. These too were just plain turning, threading and knurling jobs. Now, at last, I could see the hands moving around the dial in synchronism as I turned the great wheel with my fingers.

I realise that builders without access to a computer will find it difficult to design and print their own templates for the hands or dial. However, there is nothing to prevent anyone from drawing them using a traditional drawing board and instruments. At least, that way builders who don't like the look of mine (the drawings for which will be published next time) can design their own!

●*To be continued.*

LETTERS TO A GRANDSON

M. J. H. Ellis

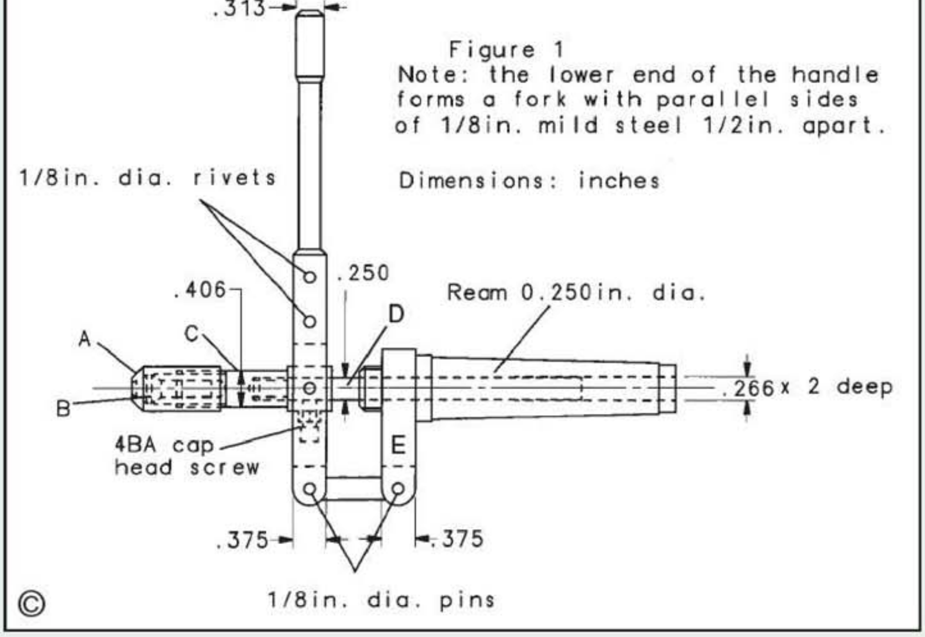
describes a brace of tailstock drill chucks, discusses the use of brass and gunmetal for injector cones, and examines designs for a lathe tool height setting gauge.

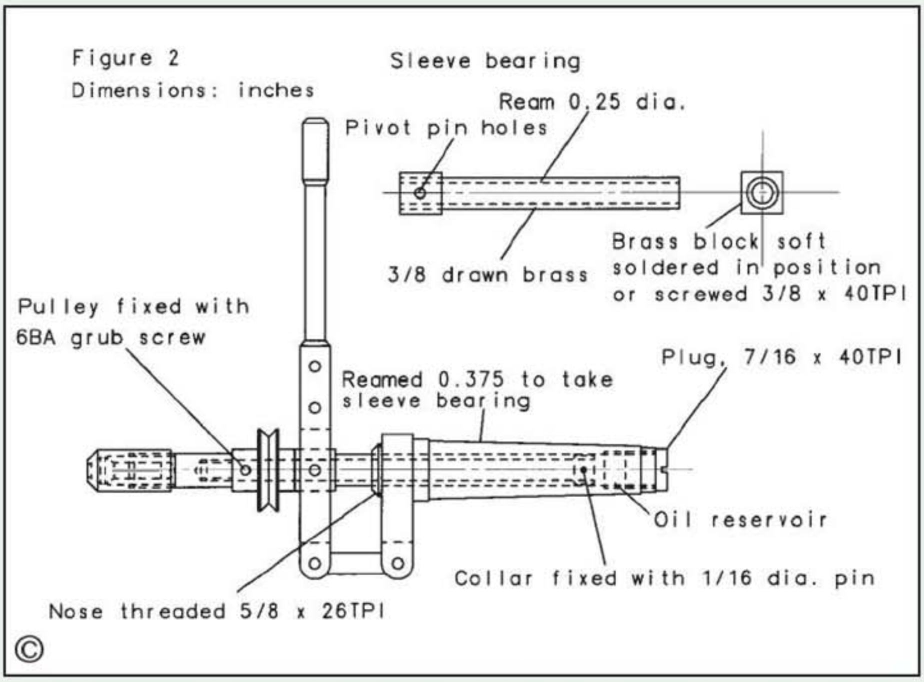
●*Part XL continued from page 453 (M.E. 4171, 14 June 2002)*

Dear Adrian, in my last letter I said I would conclude my description of the two tailstock chucks for small drills, but I will do better by enclosing sketches as well. These should give you the general idea as there is no need to adhere to the precise dimensions.

I was obliged to use one part, the jaws, from a commercial (Eclipse) article, because I was quite unable to make a good job of this component, which consists of a bunch of four fingers made in one piece from spring-steel. As I had to buy the lot, there was every reason to use as much of it as I could, but of the three components, I could use only the thimble in addition to the jaws, as I could see no convenient way of making use of the main body.

Referring to my sketch (**fig 1**), the thimble **A** screws down the body **C**, so compressing the jaws **B** to hold the drill. The body is machined to the same internal dimensions as the one supplied by the makers, and has the same outside thread (0.402in., nominal $^{13}/_{32}$in. x 40TPI). At the rear end it is tapped $^{7}/_{32}$in. x 40TPI for a full $^{3}/_{8}$in. to take the tail-rod **D**, which is $^{1}/_{4}$in. dia. silver-steel.





The lug **E** screws onto the end of the No. 2 Morse taper centre, threaded $^{1}/_{2}$in. x 26TPI, but you could use another thread, depending on what taps you have available. The rod **D** fits a reamed bore in the No. 2 Morse taper centre.

In the case of the Mk. II (deluxe) model, the arrangement is much the same, but the spindle **D** is longer and runs in a 3in. long brass sleeve bearing; it is moved to-and-fro by the handle in the reamed bore of the No. 2 Morse taper centre. In this version too, the lug screws onto a larger thread, $^{5}/_{8}$in. x 26TPI.

I don't think I need say any more about the construction of these chucks, because I hardly think you will find the need for one or the other for some time to come. I have little doubt that the Mk. II is the better of the two, but I have an awful confession to make; poor weak Grandpa falls prey to the detestable sin of sloth! When I have had injector cones to make, it has seemed too much trouble to fix up the overhead drive, and so I settled for Mk. I. It may have taken a little longer, but it did the job perfectly well.

Incidentally, I wish I knew how the manufacturers sharpen these tiny drills so precisely that they drill a hole so accurately that a drill only a single thou. larger will not go into the hole. I can't remember any of the drills ever breaking, and I have eventually had to discard them merely because they had become blunt. I always make a point of trying to keep them cutting because I have taken to making my cones from gunmetal, which, as we know, is prone to work-hardening.

Gunmetal or brass?

It might be contended that by using gunmetal I was inviting trouble since the great Mentor LBSC, whose instructions I follow, at least in principle, specified brass for the whole of his injector design. But I did not depart from his guidance without reason. An injector would operate satisfactorily for a while, and then pack up. Re-seating the ball-valve cured the trouble, but I noticed that the metal was always covered by a grey film, and my supposition was that this was produced by the chemical action of the steam on the zinc contained in the brass.

I have not observed this film in the case of injectors made from gunmetal, but neither are they immune to failure, and I have been experimenting with a view to finding a better substitute for the ball valve. This is a subject which I might well discuss in a future letter. For the present, however, I will content myself by observing that, having read the excellent biography of LBSC by Brian Hollingsworth *(now regrettably long out of print—Ed.)* several times through, I could only marvel at his genius for patient experimentation, from which he distilled sound conclusions, sometimes contrary to the beliefs of the pundits of the day. This ability was a gift which he shared with Sir Joseph Whitworth, and I think that in their different ways both men deserve our deep respect. This is not to say that in matters of detail LBSC cannot sometimes be improved upon, but then that sort of thing is comparatively easy, once someone else has blazed the trail.

A tool height gauge

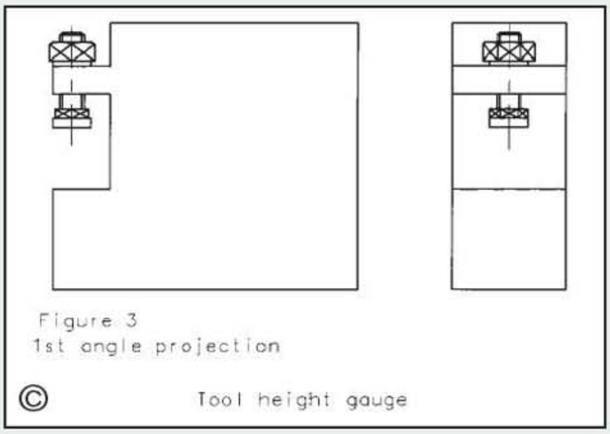
Hitherto, the Grandpa's Specialities about which I have told you were ideas which I had developed over the years, but I shall now describe a simple appliance which I have only just finished making. For years past, I have been irritated by the fiddling adjustment needed to bring a lathe tool to exact centre height, even using the 'pillar and block' type of tool-post, which facilitates the process most. So now I have made a height gauge for the purpose. Once it has been set correctly, toolsetting is simply a matter of sliding the block up the pillar until the cutting edge of the tool comes into contact with the gauge, and then tightening the pinch-bolt.

In principle, the idea is so simple that it surprises me that I have never seen it proposed in some form or another before, although there have been proposals which amounted to attaching appropriate packing beneath each individual tool, so that when it was clamped in a tool-holder of fixed height, it would automatically be at the correct centre height. As you must have perceived, I am not merely concerned with telling you how to perform various operations, but also to illustrate processes of thought, with the object of showing how an unfamiliar problem may be tackled. So I will give you a brief account of why I decided on this particular design.

In the first place, the desired objective is to be able to set the cutting edge easily and simply at centre height, irrespective of whether or not its shape has been altered by sharpening. So the gauge must present a horizontal flat surface, facing downwards, against which the point or edge of the tool can be set. The gauge could stand on the flat bed of the lathe, but seeing that it is provided with a table, it would be better for it to stand on that. I considered that if I was setting a boring tool, it would overhang the edge of the table, but I did not think that to be very important, since I usually set a boring tool a little on the high side, on the grounds that if it is on the springy side, it will spring away from the work instead of digging in.

I rather fancied a flat magnetic base, and bethought me that I could get one, at a price, as part of a surface gauge. Then I thought of a tripod base, using three cylindrical magnets, if I knew where to get them. Or I could have an L-shaped gauge, like a section cut off an angle-plate, with a hole in the bottom, whereby I could bolt it to a Tee-slot in the table. Eventually, and this was after several weeks of intermittent pondering my eye lit on a hefty lump of bright mild steel section, $3^{1}/_{2}$ x $1^{1}/_{2}$in., and it dawned on me that here was sufficient weight that it would make a gauge which would require no other means of holding it down.

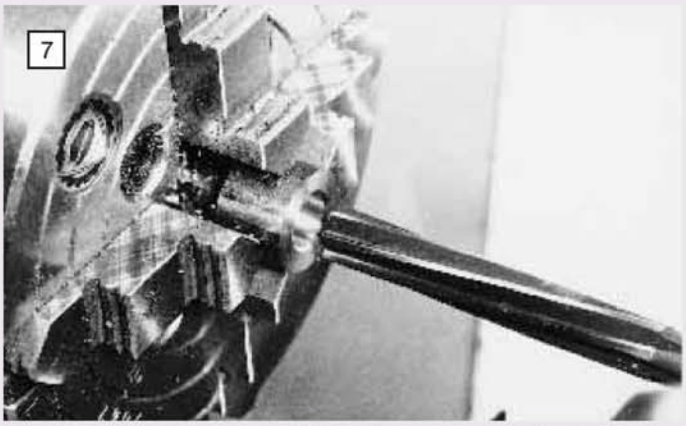
You will see from my sketch that I milled a slot out of the end of the block, leaving a projecting tongue $^{3}/_{8}$in. thick. This is tapped $^{5}/_{16}$in. x 40TPI to take a mushroom-headed screw made from $^{1}/_{2}$in. dia. silver-steel This I hardened and then let down the shank by heating it until the head just began to show yellow. Then I quenched it. The flat head of the mushroom screw is the gauging surface which has to be set once and for all by setting it to a tool known to be at exact centre height. The bottom surface of the block I scraped flat to the surface plate.



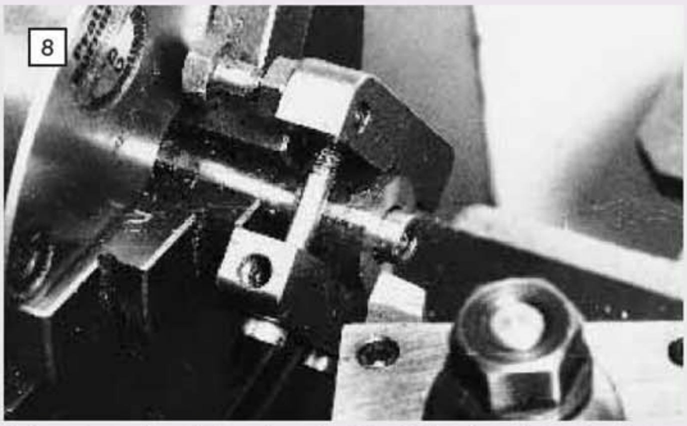
I may have a few other observations to make about this sort of gauge in my next letter, for the same end could have been achieved just as well by alternative means, and if you ever think of making one, you can take your choice. Not that I am doing you any great favour. A German proverb declares *"Wer die Wahl hat, hat die Qual"*. *"He who has choice, has anguish."* See why married men look happy?

Your affectionate Grandpa.

●*To be continued.*



The main bearing brasses are made from brass or gunmetal bar, split and re-assembled by soft-soldering, the bore being finished to size by reaming.



A clamp is used to reinforce the soft-soldered joint when the bearing bush is pressed onto a mandrel for facing the other end face

THE CROFT MILL ENGINE
Mk II VERSION

John Bertinat

continues the construction of a more prototypical version of his horizontal mill engine with details of the main bearings, base plate, trunk guide and crosshead.

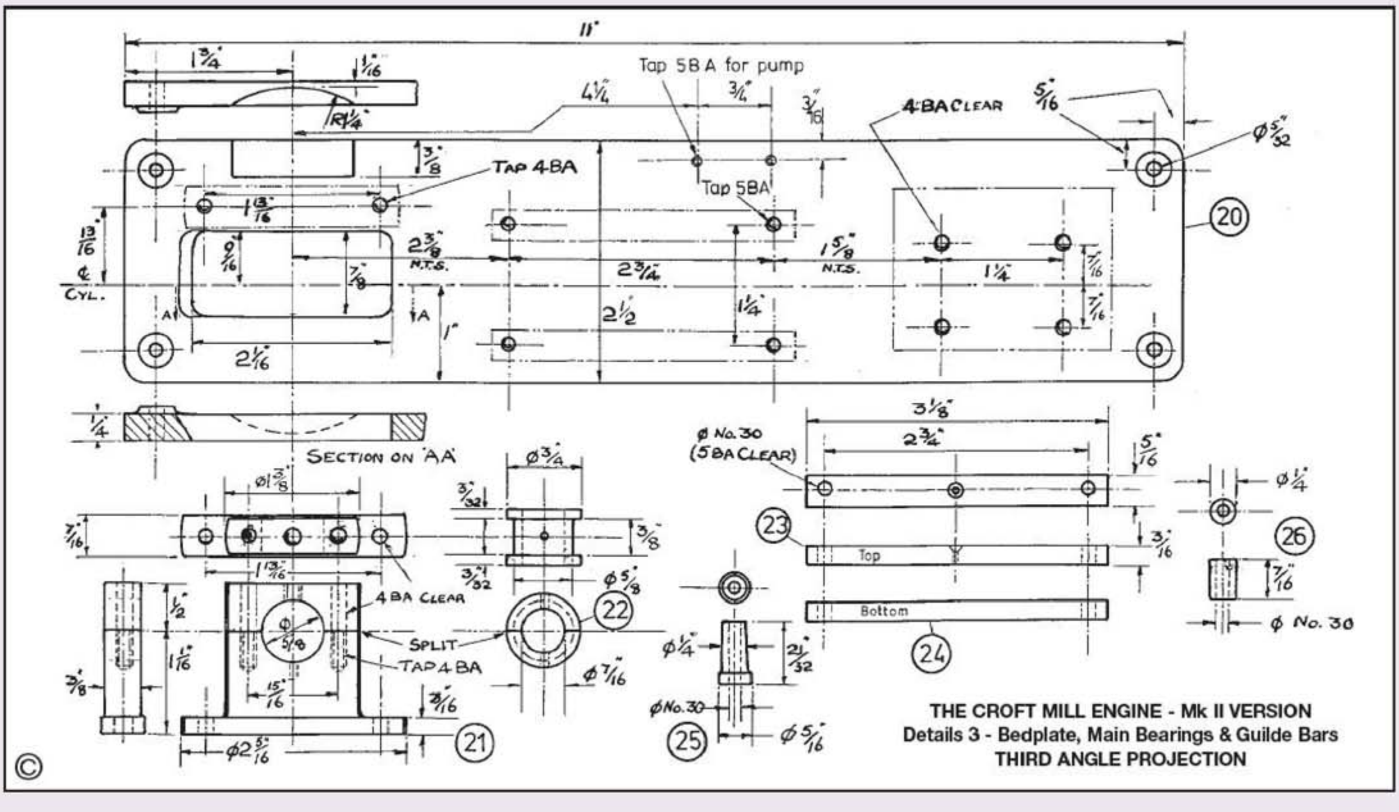
●*Part II continued from page 452 (M.E. 4171, 14 June 2002)*

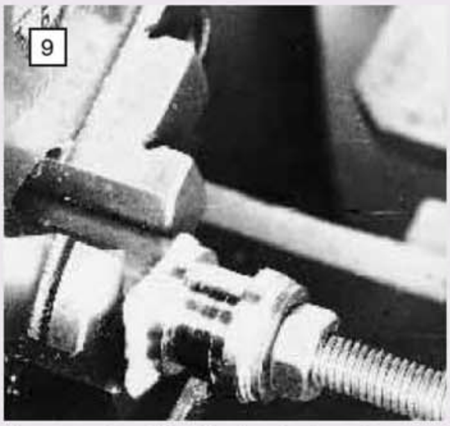
The main bearing housings (Part 21, Details 3) are built up from steel sections: 1/2 x 3/16in. for the base, 1 x 3/8in. for the body and 1/2 x 3/8in. for the caps. Two 2 3/8in. lengths of 1/2 x 3/16in. are first reduced to 7/16in. wide by flycutting, milling or, as in my case, shaping and a 4BA hole is drilled and countersunk in the centre of each to take the screw that will hold the base to the body for the later silver-soldering operation. The fixing holes in the base at 1 13/16in. pitch may also be drilled at this stage.

Next, the material for the bodies is reduced to 5/16in. wide and separated into two 1 1/2in. lengths. The base of each is drilled and tapped centrally to receive the screws which will ultimately hold the parts together for silver-soldering but will first serve another purpose. The caps are likewise cut to length, drilled for the clamping studs and centre drilled for what will ultimately be the oil hole. Caps and bodies are then clamped together, the bodies drilled and tapped for the studs and the parts firmly bolted together.

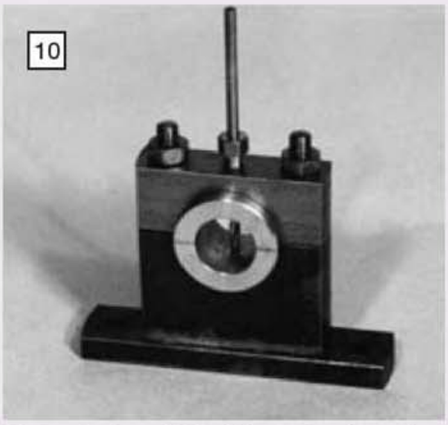
Next, a piece of, say 1/2 dia. material is mounted in a 4-jaw chuck and its end faced and drilled and tapped to receive a short length of 4BA studding. A bearing body with its cap is screwed onto this mandrel and the tailstock centre brought up to support the work in the centre already drilled in the cap. It is unlikely that the centre hole will run quite truly and adjustments can be made via the 4-jaw chuck. This set-up enables the bodies and caps to be machined to their 1 3/8in. dia. as shown on the drawing.

The bodies are then secured to their respective base plates, the caps removed (after receiving identity marks) and we are ready for silver-soldering. Note that the parts to be joined should be well cleaned and fluxed before clamping them together. After cleaning off, the bodies and caps are re-united and the ends of the bases machined by holding the parts base outwards in a 4-jaw chuck. For providing the 5/8in. dia. bores for the bearing brasses, the housings may receive the

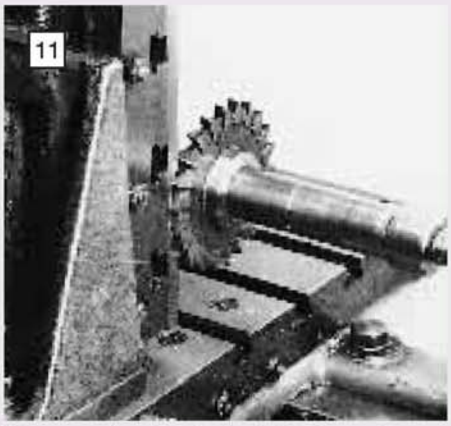




The external profile of the bearing brass is carefully machined using a keen parting-off tool.



The bearing brass is fitted into its housing and the oil hole drilled $^{1}/_{16}$in. dia. using a drill bush.



The eccentric well in the bedplate is cut using a suitable side and face cutter and vertical slide.

angle plate/faceplate treatment or be mounted on the lathe cross-slide with appropriate packing.

For each of the bearing brasses, I started with a piece of $^{7}/_{8}$in. dia. brass or gunmetal bar about $^{11}/_{16}$in. long, sawn in half through a diameter, the sawn faces being trued flat, tinned, and soldered together again. During this latter operation, the parts were squeezed together while the solder was setting, to ensure a thin joint. The embryo bearing bush was then mounted as truly as possible in a 4-jaw chuck and drilled, bored and reamed $^{7}/_{16}$in. dia., and the outer end carefully faced off as shown in **photo 7**.

It is essential for the final operation that the other end of the bush is faced off square, and for this purpose the bush will be pressed on to a truly running stub mandrel held in the lathe chuck, but only after a clamp has been placed around it to relieve the soft-soldered joint of any stress (**photo 8**).

We have ended up with a bush having a bore and end faces finished, but the outside has still to be machined.

My solution here was to employ a shouldered and nutted mandrel to which the bearing could be fitted freely but be clamped firmly by pressure on its ends. This set up is shown in **photo 9** where paper washers have been interposed between work and flanges to improve the grip. Careful use of a parting tool allows the work to be completed safely. The centre holes in the bearing caps may now be opened out and tapped $^{3}/_{16}$in. x 40TPI for the oil cups. Using a drill bush as shown in **photo 10**, a $^{1}/_{16}$in. hole is drilled in the bearing bush, continued through to the lower side of the bush and extended about $^{1}/_{8}$in. into the lower part of the bearing housing. This latter drilling is to receive a $^{1}/_{16}$in. dia. brass anti-rotation pin.

Main base or bedplate

The guide bars and supports (Parts 23-26) are similar to those in the Mk. I engine and the same proviso holds: viz. the true lengths of the lower supports (Part 25) should be checked from the job.

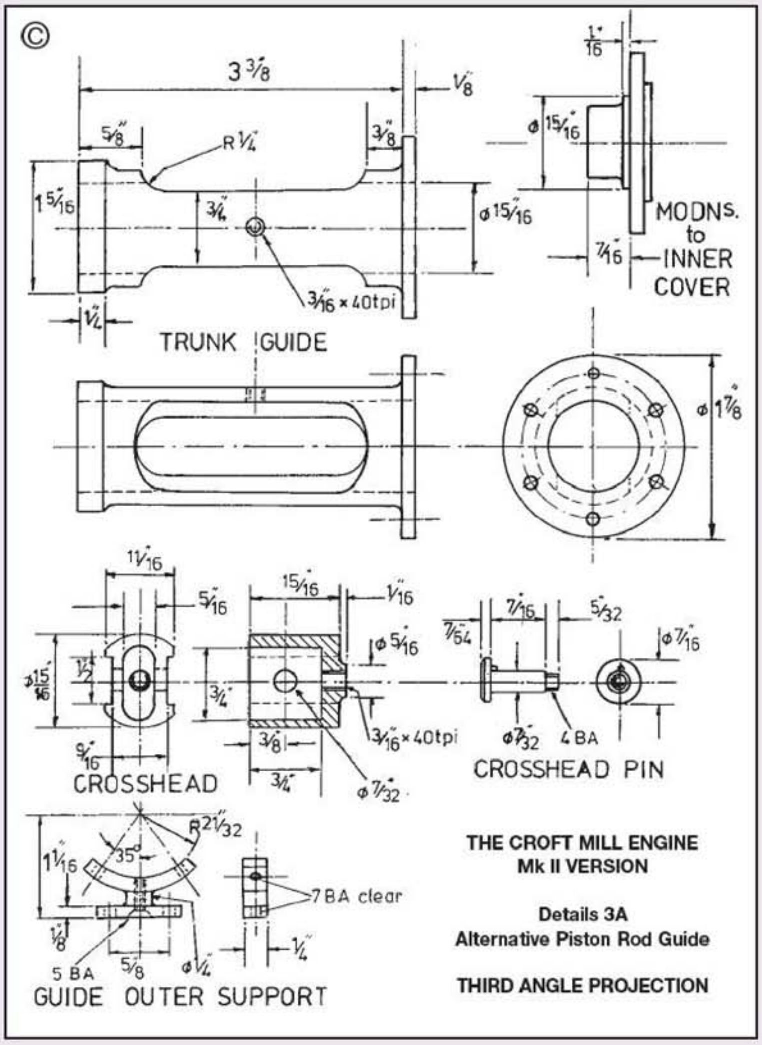
The main bed or baseplate is of simpler shape than that of the Mk. I engine since it only supports one of the crankshaft bearings and it is conveniently made from an 11in. length of $2^{1}/_{2}$ x $^{1}/_{4}$in. bright steel flat; if the use of aluminium alloy is contemplated, it is advisable to increase the thickness to at least $^{5}/_{16}$in. to allow for the lesser stiffness of this material. Since there are no raised pads onto which components are bolted, eccentric and crank clearances are smaller and cavities in the bed are necessary.

For the crankshaft, a clearance hole of $2^{1}/_{16}$ x $^{7}/_{8}$in. is required, and the outer end of this slot is bevelled to give additional clearance. I removed the bulk of the material by chain drilling a row of holes with a 5mm drill (0.1968in.) at 0.2in. pitch (one turn of my milling machine table feed handle). The edges were then cleaned up and the bevel cut using a $^{3}/_{8}$in. end mill.

The eccentric well was cut out using a $2^{1}/_{2}$in. dia. side and face cutter mounted on a mandrel in the lathe, the work being secured to a vertical slide (**photo 11**). In the absence of a milling cutter, a fly cutter mounted in a boring bar would serve equally well. This is one of the rare occasions when it is quicker to do a milling job in the lathe than to set up a milling machine to perform the operation.

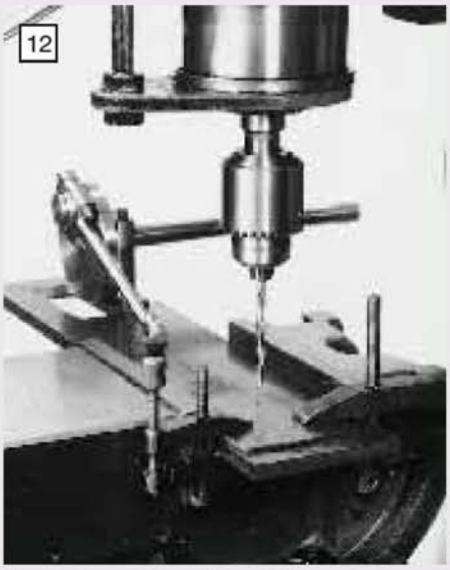
For builders wishing to fit the feed pump, the tapped holes for its fixing bracket have been included on the drawing; these holes would normally be spotted through from the fixing bracket itself, but with careful marking out they could be drilled at this stage.

The bedplate is given slightly less of a 'flat plate' appearance if washers are soldered or Araldited to the four corner holes by which the bedplate will be fixed to its 'wooden' foundation; in addition to giving the appearance of raised bosses, the washers will localise possible paint damage during assembly. The notes for lining up the cylinder and guide bars on the bedplate (after the connecting rod and crankshaft have been made) are as for the Mk. I engine (**photo 12**).

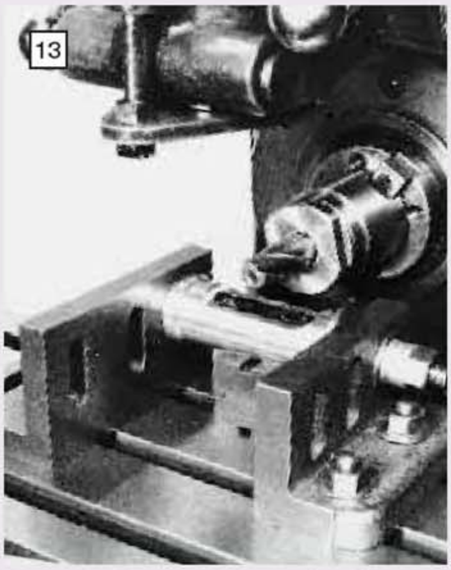


Alternative trunk guide
(Details 3a)

If machined from the solid, this part will generate quite a volume of swarf! The starting point will be a $3^{5}/_{8}$in. length of 2in. dia. steel bar which is gripped firmly in the lathe chuck, 4-jaw for preference since the grip is more positive, and the end faced and the centre drilled out by stages, finishing with the nearest drill to $^{7}/_{8}$in. available. Final sizing is accomplished by the use of a stiff boring bar, the tool bit being carefully ground and honed to a fine edge for the finishing cut. The finished bore should be a snug fit on the spigot of the modified inner cylinder cover and, to ensure firm bedding ▶



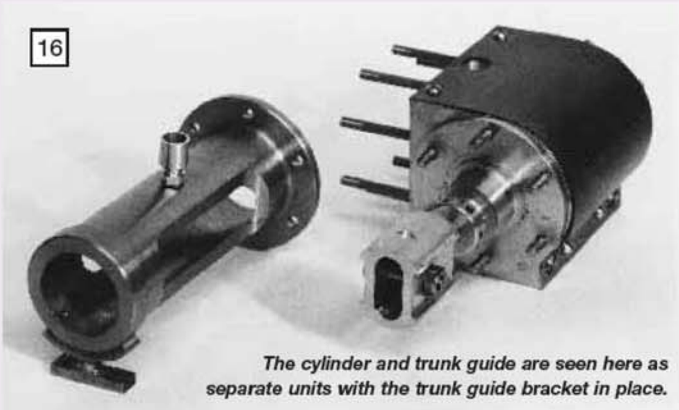
The positions of the cylinder fixing studs are located in the baseplate as for the Mk. I engine.



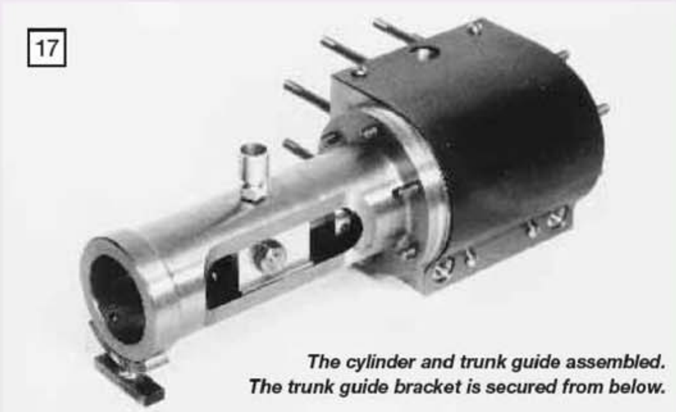
The trunk guide recess is best cut by milling; note the use of angle plates for work holding.

The trunk guide (right) was cut from a ring (left) machined to the appropriate dimensions.

The trunk guide bracket is clamped in place to locate the position of the fixing holes.



The cylinder and trunk guide are seen here as separate units with the trunk guide bracket in place.



The cylinder and trunk guide assembled. The trunk guide bracket is secured from below.

down of the two parts, the mouth of the bore should be very slightly chamfered.

To machine the outside of the trunk, the work may be mounted on a mandrel between centres which is itself fashioned from a length of 1in. dia. bar. The recessing of the sides of the trunk is carried out using a $^{1}/_{2}$in. dia. end mill either in the lathe or in a milling machine. In my case, the miller was used in its more rigid horizontal mode as shown in **photo 13**. Note the use of two angle plates to secure the workpiece.

The general stiffness of the engine is improved if the outer end of the trunk guide is anchored to the engine bedplate and, as what might be considered as an optional feature, a support bracket locating on the outer flange of the trunk is shown. This bracket, although small, took a time to make and fit totally disproportionate to its size! It was fabricated from three parts, viz. the saddle, the circular stem and the base, silver-soldered together and held together for this latter operation by means of a central 5BA screw.

To ensure that the saddle fitted the trunk guide closely, it was initially made as a ring of which only a part was used (**photo 14**) which shows the finished bracket, together with the 'bit left-over'. **Photograph 15** shows the embryo bracket set up to enable the fixing holes to be spotted through into the trunk; note that the 'bit left-over' has not yet been removed but is here deployed as a clamping strip!

The correct height of the bracket, as dictated by the length of the central stem, is best determined by measurement from the surface of the engine base to the underside of the trunk guide flange. **Photograph 16** shows the bracket assembled on the cylinder unit. When it comes to final assembly on the engine base; it will not be possible to spot through the holes fixing the bracket to the base. I overcame this problem in the following way: with the cylinder components firmly assembled and the cylinder firmly bolted to the bedplate, a

The cavity for the connecting rod little end is milled into the crosshead using a slot drill.

sharp scriber was used to locate the outline of the foot of the bracket and, by careful measurement, the fixing hole centres were then marked out and drilled clearance for 7BA. Final assembly was by the use of 7BA bolts inserted from the underside of the bedplate (**photo 17**).

The crosshead for the trunk guide engine is much simpler than that for the 4-bar guide and is turned from a length of brass or gunmetal bar, the hole for the piston rod and the $^{15}/_{16}$in. outside diameter being dealt with at the same setting. Next the $^{7}/_{32}$in. diametral hole for the crosshead pin is drilled and reamed. The inner cavity for the connecting rod end is dealt with by means of a $^{5}/_{16}$in. dia. slot drill as shown in **photo 18**. The side relief flats are readily produced using a $^{1}/_{2}$in. dia. or smaller end mill or slot drill.

The crosshead bolt is a plain turning job from $^{7}/_{16}$in. dia. bright mild steel. As an alternative to a hexagon headed bolt, a round headed bolt fitted with an anti-rotation 'snug' has been employed. This snug is fitted by first assembling the bolt firmly in the crosshead and then drilling an axial hole $^{1}/_{16}$in. dia. x $^{3}/_{16}$in. deep from the head end and at a radius of $^{7}/_{64}$ inch. A pin is then turned to a loose fit in the hole for the first $^{3}/_{32}$in. of its length, followed by a length which is a drive fit in the bolt head. The small end is then rounded to ease its entry into the crosshead/pin cavity.

The pin is then driven into the bolt head and faced flush. Ideally the bolt should be case hardened, an operation which should be carried out after the bolt head has been drilled, but before the pin is driven home.

●*To be continued.*

Dieter Steindl's Suffolk dredging tractor is one of a pair built with Robert Freisleben, scaled-up and based on John Haining's original design.

Although externally similar to the original Yorkshire boiler configuration, the casing hides a regular vertical boiler with three cross tubes.

ENGLISH STEAM IN RURAL GERMANY

Ken Archer

describes a scaled-up and modified version of John Haining's original 3in. scale Suffolk dredging tractor.

One of the many attractions at the International Steam Rally held in Sinsheim every year is the great variety of steam road vehicles weaving their way through the crowds in the exhibition halls. Traction engines form the bulk of this traffic, in all sizes from the very small up to full-size, with steam cars and other vehicles adding innovation and variety. One of the more unusual vehicles at a recent rally was a giant size version of John Haining's Suffolk Dredging Tractor.

In its time, this design was a complete departure from normal traction engine construction practice, bearing no resemblance to the conventional engines of the period. However, it was designed for a specific purpose and, in many ways, was the forerunner of the miniature general purpose IC engine tractor units which have become so popular with smallholders and gardeners.

Dieter Steindl with his 4 1/2in. scale Suffolk dredging tractor.

John Haining's model was in 3in. scale, but Robert Freisleben and Dieter Steindl set out to build a pair of engines to a larger scale, multiplying everything by 1.5. They also freely adapted the design, adding features of their own, to produce a free-steaming vehicle which runs happily at around 10kph. Commercial rubber tyred wheels replace the original iron specification, with the front wheels having a diameter of 280mm and rear wheels 400mm. Suspension is via leaf springs, with a padded driver's seat attached to the top of the water tank. What appears to be a Yorkshire boiler is, in fact, a casing containing a standard vertical boiler with three cross tubes. It contains 9.8 litres of water and steam can br raised very quickly from cold. There is no superheater, but a long venturi in the tall chimney makes for very good steaming. Water feed is by means of an engine operated pump, steam pump and hand pump.

Robert and Dieter have become familiar figures with their engines at rallies and events throughout Germany and have fitted American style steam sirens to clear the way through the crowds when they are running. They found the conventional steam whistle ineffective among all the other whistles and general noise at rallies, but the siren is loud and distinctive, ensuring free and safe passage through the crowds. Cable winches are fitted, as well as pulleys providing power take off for belt driven ancillary equipment.

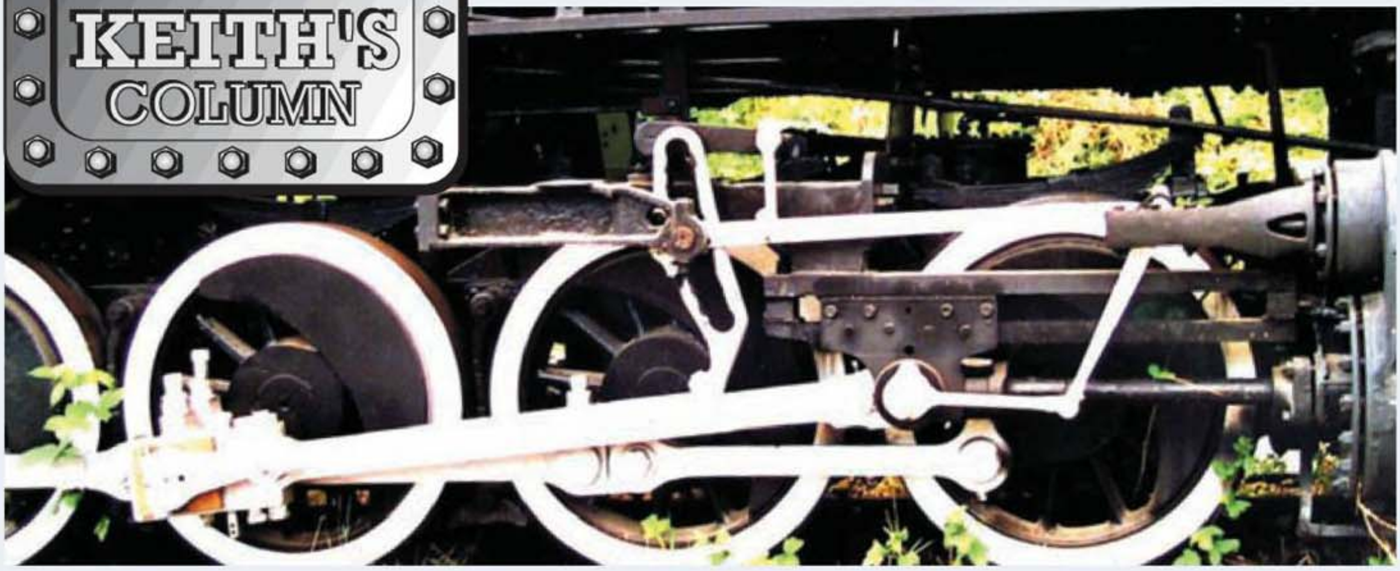
A generator is provided, supplying electrical power via a set of terminals at the rear of the tractor. Another interesting feature is the loading motor used for pulling the vehicle onto its trailer for transportation. This is a 24 volt electric motor that can be engaged when required, to take the strain out of loading and unloading operations. The tractor has a conventional twin cylinder engine with Stephenson link valve gear and has an all up weight of 250kg.

The two engines always ran as pair, but Robert has now sadly died, leaving Dieter to maintain the Suffolk steam tradition in rural Germany. Roberts's engine has unfortunately to be sold and Dieter is anxious that it should go to a good home, perhaps back in Suffolk where such engines were once a common sight.

The boiler is a good steamer, a feature which may be due to the internal chimney venturi profile.

Audible warning of approach is given by means of a steam siren to clear a path through the crowds.

KEITH'S COLUMN



LOGGER

AN AMERICAN TYPE 2-8-2 LOCOMOTIVE

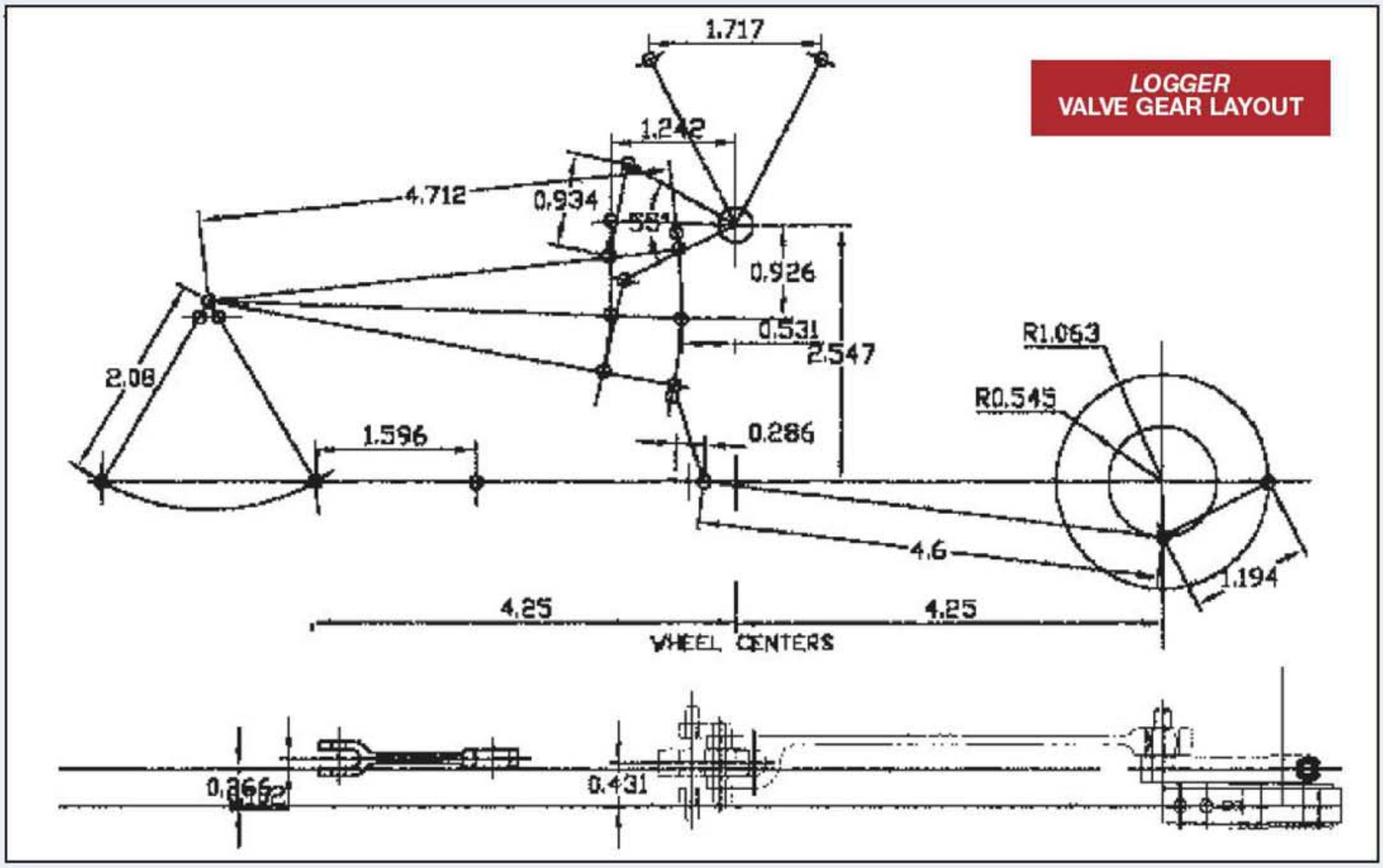
for 5in. and 7 1/4in. gauges

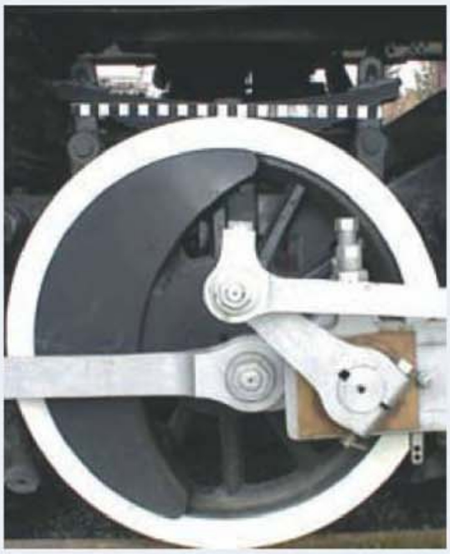
Keith Wilson
describes the valve gear layout and provides some useful hints and tips as to how to make the required components.

●*Part VI continued from page 464 (M.E. 4171, 14 June 2002)*

Due to such trivial details as a paucity of space, some of my drawings and photos had to be held over from Part V. It may therefore have confused my fan(s) to see that no drawings of the valve gear layouts appeared, so 'here they is'. I've used this one before, but there are lots of new readers, so 'at first sight this may seem complicated, but with a little examination it becomes hopelessly confusing!'

With reference to the *Slogger* layout and ignoring the bottom picture, which of course is the plan view, at the left-hand side we have some lines which form a capital letter A or inverted V, depending on your point of view. In mid gear or on front or back dead centres (or both for that matter) the top of this A is in a 'neutral' position — in mid gear the dead centre bit is irrelevant. The sloping sides of this A represent the





The return crank is keyed and clamped on the full size engine; the key will be omitted in the model.

A PTFE die block is fitted to Bob Shaw's Britannia as described in last month's instalment.

The full size expansion link together with a stick of inches against which to judge dimensions.

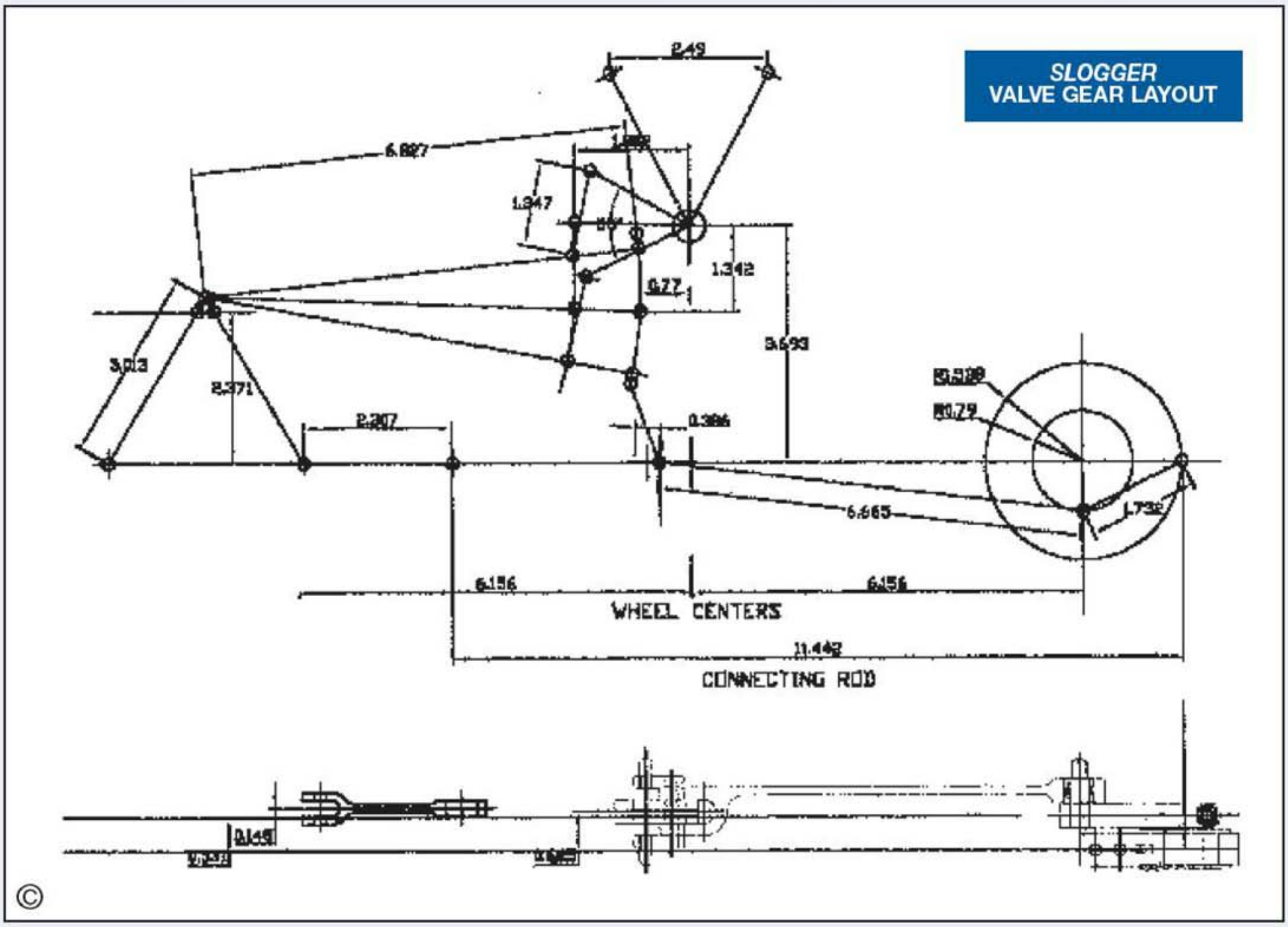
Combination Lever, the bottom is connected to the Anchor Link. T'other end of t'anchor link is on the crosshead pin, it follows that the bottom of the link travels exactly the same distance as the piston stroke, dead in phase therewith.

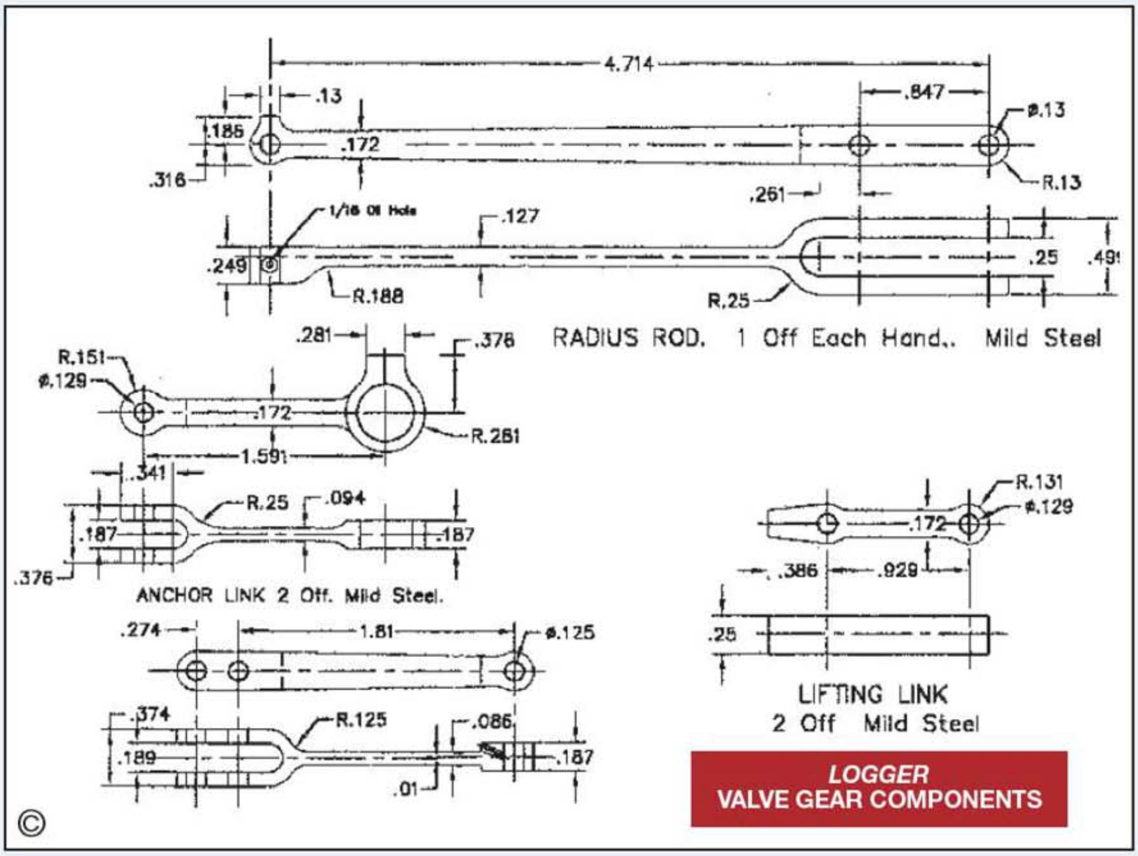
The top of this combination lever being fixed, it follows that at the second-to-top pivot point the motion will be dead in phase with the piston, but of a much smaller amplitude in proportion to the proportions of said combination lever. This produces the smaller of the two simple harmonic motions mentioned last time, which takes care of lap and lead travel, and should be the *total* valve lap plus total lead. Or if you prefer it: 2 x (lap + lead).

Going now to the right-hand side, there is a circle of 1.538in. radius. This is the locus of the main or driving crankpin. A locus is the path traced out by a point on a moving body relative to a stationary one (in the simplest case). It is of course possible to define a locus relative to another moving object. Thus, if the vehicle is stationary, the locus of the tip of an operating windscreen wiper blade is an arc, but if the vehicle is moving then the tip locus relative to the road is quite a different matter. Think about it.

Attached to the crankpin is the Return Crank; it will be seen that the 'inner' end of this describes a much smaller circle of just 0.79in. radius. Having one end pivoted to this and the other end to the bottom of the Expansion Link, it follows that the Eccentric Rod will oscillate to and fro in step with the main crankpin, but almost exactly 90deg. out of phase. It follows that anything coupled to the expansion link will move in step with the crank pin. If below the central pivot, then it will be 90deg. after the crankpin; if above it will be 90deg. before it.

The reason I used the word 'almost' above is due to the fact that the diagonal of a rectangle





LOGGER VALVE GEAR COMPONENTS

is perforce longer than either side, so the motion of the link is not exactly sinusoidal (following a sine curve). Due to the angular position of the connecting rod, except at front and back dead centres, the same applies to the movement of the piston and crosshead. These points are almost entirely irrelevant to us, and we cannot do much about them anyway,

The Radius Rod connects the top of the combination lever to the Die Block, which slides upwards and downwards under the control of the Lifting Link and Weighshaft Levers.

Now we have the two SHMs referred to in my last episode, one in phase with the piston, one at 90 degrees. The combination lever adds these two together giving us the valve motion. An interesting point at this stage is that the top end of the combination lever shews the type of valve; thus for inside admission (most piston valves), the connections are as shown, for outside admission (slide valves) the radius rod comes below the top and the valve rod is then at the top. Thus the type of admission can be determined at a mere glance. There are several cases of slide valves being disguised as piston valves in models. Another point is that for forward travel, with inside admission the return crank is in advance of the crankpin (leads it); for outside admission, it is in retard (follows it).

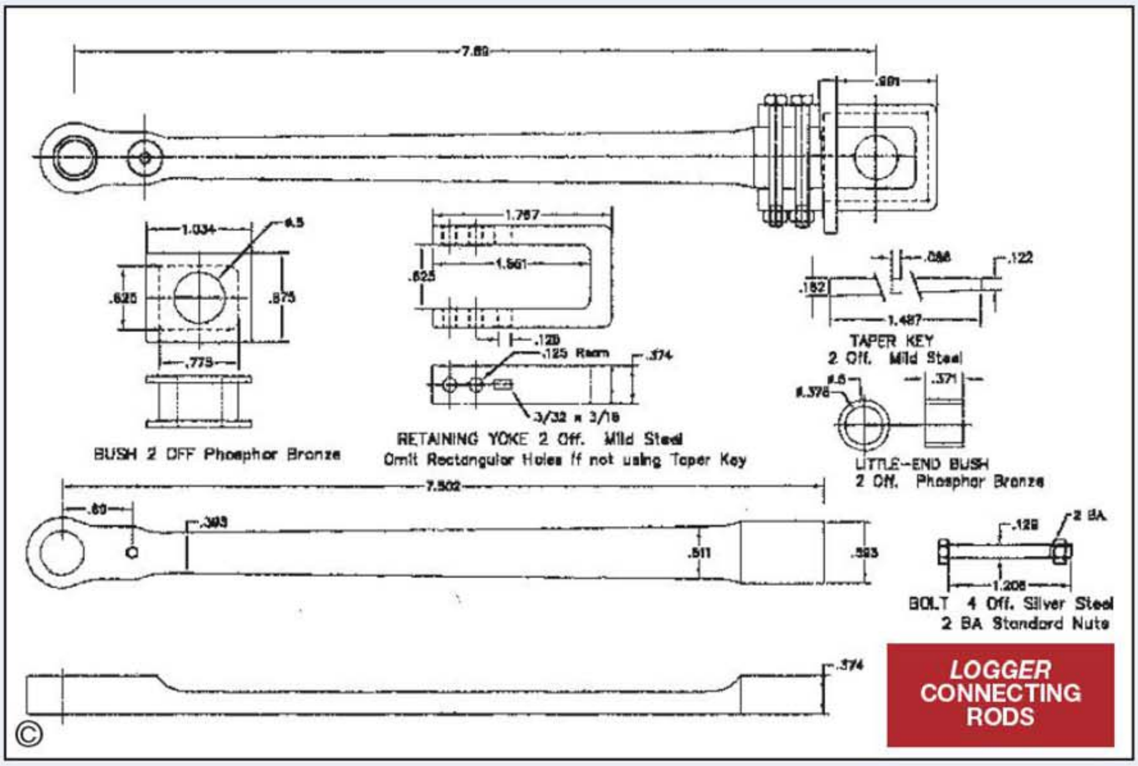
In most locomotives (but not quite all) the die block is below the expansion link pivot point for forward travel, and above it for backwards.

This explanation is fairly expansive, for there are always newcomers to our hobby and a simplistic explanation is often of interest even to more experienced readers. I have myself learned an odd fact or two from such explanations. You never know, you know, because you know you never know!

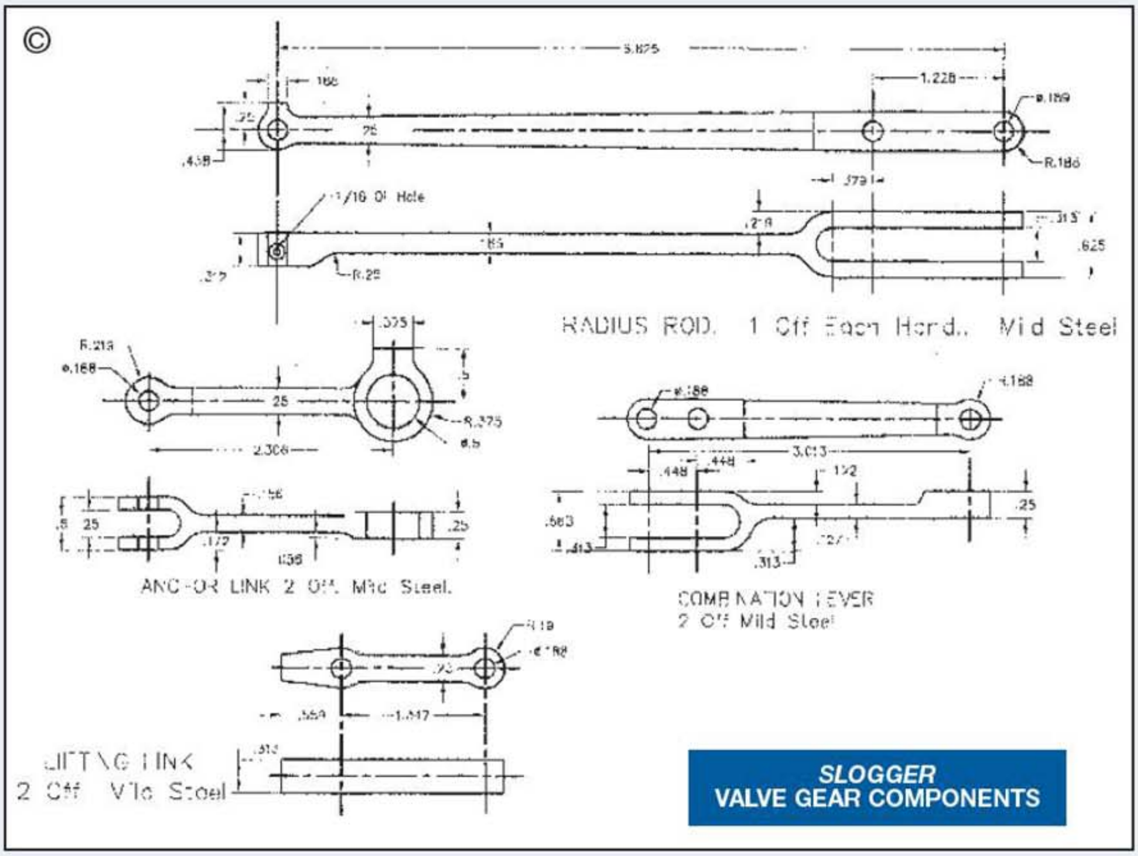
The Radius Rod is a bit long and thin, so it will take some careful milling. Set out the hole centres by the jig-boring method as described last instalment (highly recommended). It is probably best to cut the slot first. Even if you have a large enough side-and-face cutter it will have to be by using a slot drill; the overhang would be far too much to be safe. Be sure to get the inner end of the slot rounded — it looks grotty otherwise. There is not much else to detail about this item, but note that clamping is greatly facilitated (phew!) with a piece of steel fitting in the slot. The same remarks apply to the other bits on this drawing.

The Weighshaft levers are similar, but until the G/A arrives (it is in the post, but surface snailmail is not renowned for its velocity) so I cannot yet give full details. The valve gear layouts, however, are pretty accurate, for many parts have been measured on the actual loco by certain friends living sufficiently near. A certain amount of 'poetic license' has perforce been used; for example, it is pointles prescribing non-standard sizes where bearings are concerned. This also refers to nuts and bolts, cylinder and valve bores, etc. Despite many magnificent detailed photographs from the above-mentioned friends, many with 'measuring sticks' boldly displayed, getting precise dimensions has proved far more difficult than I had anticipated.

Measuring stick? A piece of wood just about 'so long' painted with 1in. long black and white



LOGGER CONNECTING RODS



SLOGGER
VALVE GEAR COMPONENTS

rings. Suitably placed, it is a valuable aid indeed but perforce not prezactly precise. For even over short ranges of the object from the camera lens, both parallax and distance-proportion rear their ugly heads.

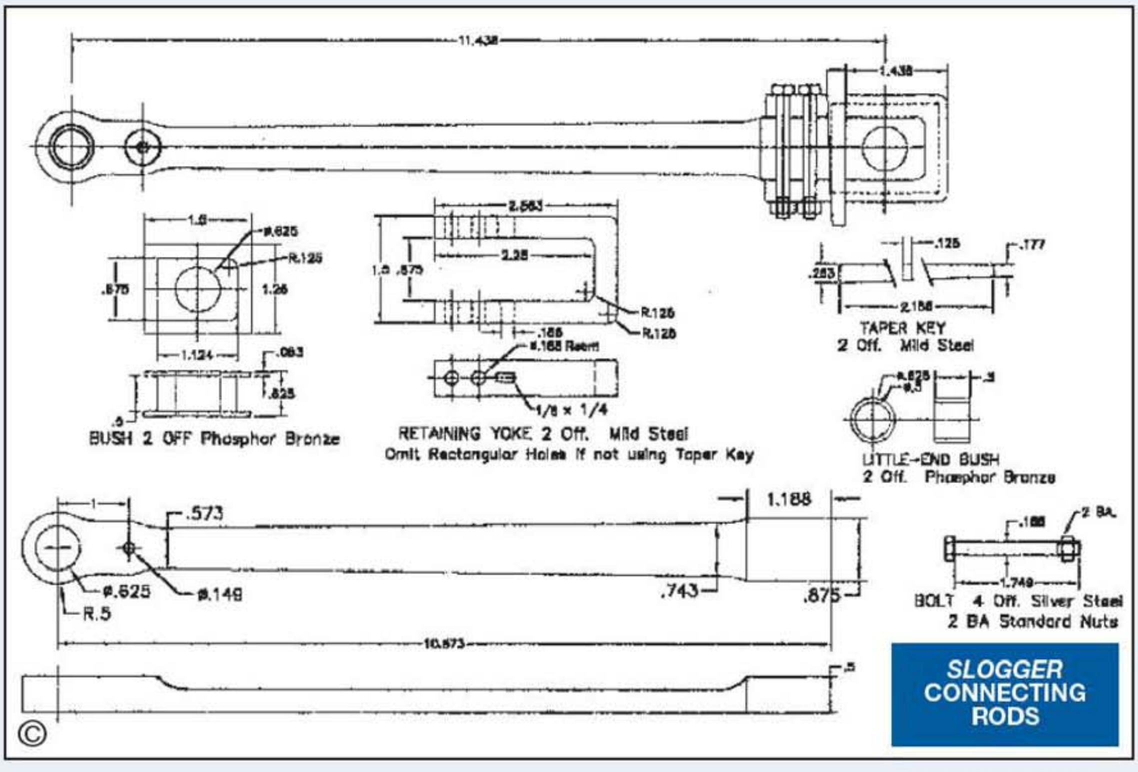
Connecting rods

I have done the best that I can from photographs, plus the length from the friends above. I hope it isn't too far out. The main body is plain milling from a chunk of mild steel. If you use bright, it is slightly easier to machine; on the other hand, the milling will release internal stresses and the bar will distort. If you choose black mild steel, it is cheaper, a bit tougher to machine, but being rolled hot it is far less liable to distort. 'Tis up to you, but I reckon the easiest way is a flame-profiled 'blank' or possibly laser or plasma cut. 'Normalised' bright might be available, this is stress-relieved and should not distort when machined.

The yoke is a pain to make: I had a batch of these a year or so ago made by laser-cutting which made life easier. They were for inside cylinder locomotives and there were two smaller yokes for the little-ends as well, four locomotives, 24 yokes in all. The yokes should be snug fits on the ends of the rods and the big-end bushes. I think the original bushes were split along a diameter of the bore, but we have no need for this; it would only be an unnecessary complication.

To get the bolt-holes for the yokes right, clamp the yoke complete with bush to the big-end, drill *one* hole right through and ream it to 'bolt' size; fit one bolt. Then do the other bolt-hole. The wedge is optional in our sizes and is also somewhat tricky to make, or at least the correct holes for it are. I used taper wedges in 1982 using LBSC's old 'Wolf-Jahn' vertical mill for the 10 1/4in. 47xxs. A cute little mill, but the largest collet was too small for a 1/4in. cutter, I had to make a new one. The owner of the mill at that time wanted it to come to me, but he died in 1985 and his wife gave all his machinery away to its original owners and so it is probably now lost; an historic machine it was too. It took a deuce of a long time to cut the holes in the crossheads, for it was perforce a job for a long-series slot-drill only 3/16in. diameter. A bit delicate.

The little-end bushes need to be a force fit into the rods after which they will probably need re-reaming. I no idea why there is a nut/bolt just behind the little-end, it may have been something to do with lubrication; no doubt I will be told in due course!



SLOGGER
CONNECTING
RODS

Note that a round bush should have a small hexagon headed set-screw (bolt) screwed into it at the bottom through the rod to prevent rotation. It doesn't seem to show up on any of the photographs, but I strongly advise its use. The GWR used these bolts, and Swindon was not run by fools. For inside little-ends at least the bushes were keyed; it is clearly advisable that such bushes should not rotate, for if they do the oil supply is cut off. Fatal for the bush.

There is a good write-up of this in K. J. Cook's book *Swindon Steam - 1921/51*. We never met or corresponded directly, but he knew of many of my GWR locomotives via another old Swindon man, who had some of my photographs, and lived about 400 yards away!

●*To be continued.*

BUILDING A MINIATURE UNIVERSAL LATHE

Colin Barter
deals with a problem encountered when fitting the dividing head and decides to make a new headstock.
●*Part VIII continued from page 461 (M.E. 4171, 14 June 2002)*

A check was made to see if the worm wheel and dividing mechanism could be fitted on the little lathe headstock and surprise, surprise, it was so compact that the division plate fouled the headstock pulley. An extension piece and a new worm spindle had to be made. Some careful turning was required to modify the worm frame to ensure the extension fitted in alignment. However, this enabled me to clear another error which involved the large head of the worm spindle that was too big to pass through the bore of the division plate. I resolved this by fitting a loose head on a taper that fits tightly when the index arm screw is tightened. These modifications are shown in fig 14 (see *M.E.* 4171, 14 June 2002).

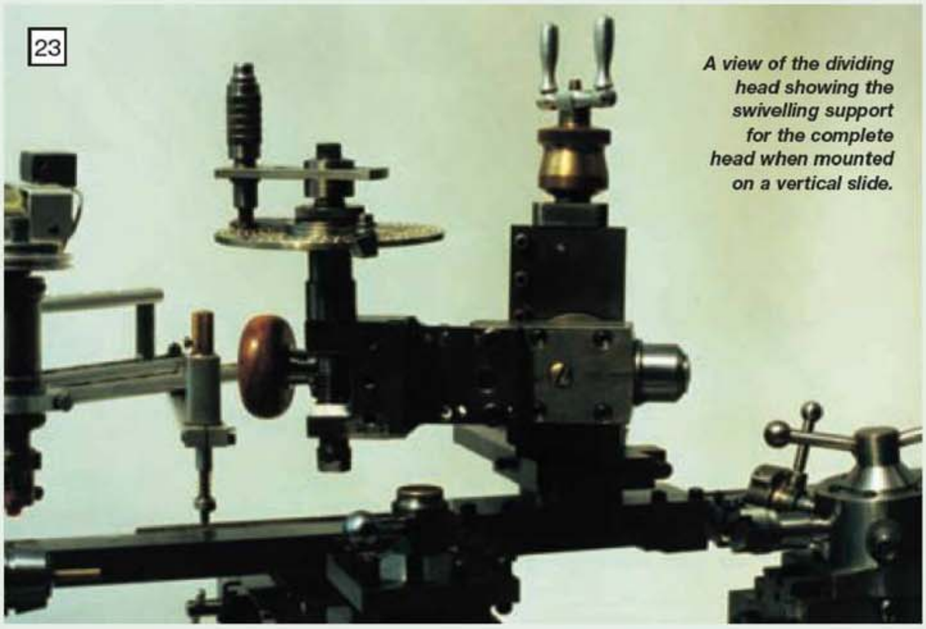
A final item was the making of a swivelling support for the complete head when mounted on a vertical slide (**photo 23**). The head is secured to the mounting by four 4BA socket head screws, which is a satisfactory arrangement, but the swivelling mounting relies on a single 1/4in. BSF socket head screw which may not be satisfactory when vibration occurs, for example, when milling. If the screw is in steel it is satisfactory but in cast iron it is easy to strip the thread (**fig 13B**).

The operation of the spindle when drilling the division plates was quite satisfactory. Oiling is into the cavity between the two bearings and since there are no breaks in the bearing surfaces oil loss has been minimal. A subsequent strip down for checking revealed that hardly any contact had occurred on the bearings and I was pleased to see only a light marking, barely more than had occurred during initial assembly. The thrust face was polished and no noticeable wear had occurred.

New headstock (fig 15)

Having made the dividing head/milling spindle and noted how well it stood up to use I decided to make a new headstock for the little lathe to the same basic design.

This would need a completely new base to secure it to the bed so I thought about what other features could be added. I considered mounting the headstock on a swivelling base so that tapered work could be turned. There was little advantage in this as the compound slide rest would provide this facility. The possibilities afforded by having a headstock that could be quickly removed or reinstated appeared attractive. I was impressed by the



A view of the dividing head showing the swivelling support for the complete head when mounted on a vertical slide.

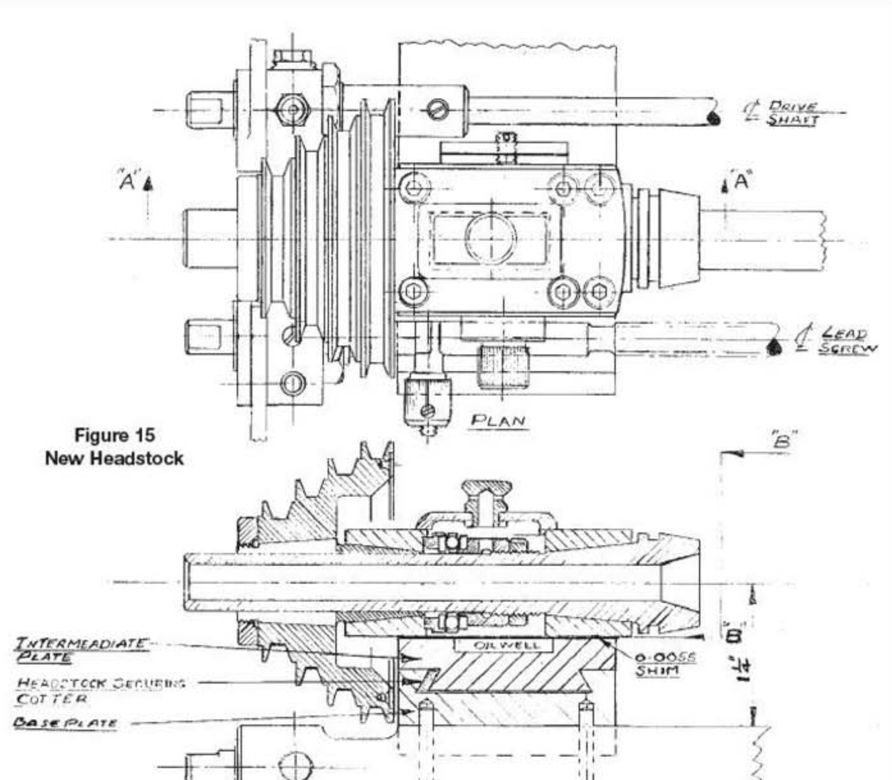


Figure 15
New Headstock

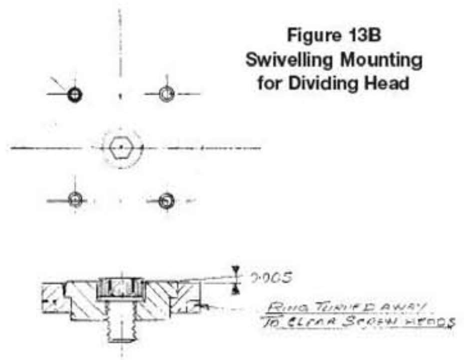
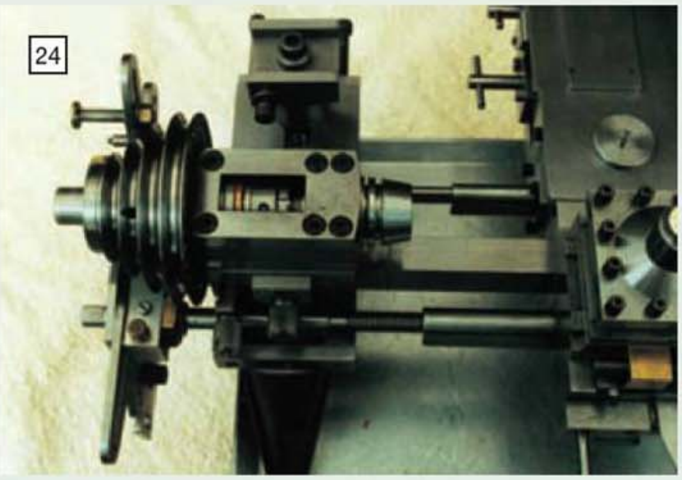


Figure 13B
Swivelling Mounting for Dividing Head



The assembled headstock shown mounted on the lathe with the cover plate removed to reveal the thrust race and ring nuts.

Components of new headstock. Top row: dovetailed base, headstock body and shim. Centre row: bearing sleeve, mandrel and cover plate. Bottom row: sleeve nut, pulley, tapered cotter, thrust bearing, spacer ring and lock nut.

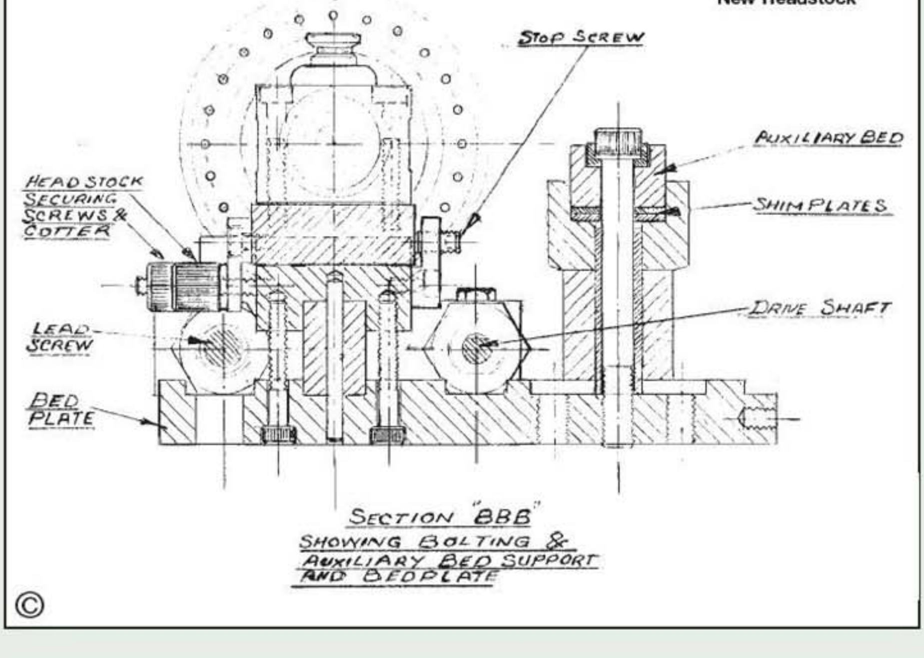
holding power of properly fitted Vee ways and the incorporation of a Vee slide in the headstock mounting would give me the quick release feature I wanted. I schemed out a mounting whereby the withdrawal of a tapered key or cotter and release of a second screw allowed the headstock to be easily removed. It would also give me the opportunity to incorporate some modified headstock features in the future. The headstock design would be similar to that of the dividing head but would include a ball thrust race.

The design of the major components was similar to that used for the dividing head. The new mandrel was turned from a piece of Volkswagen drive shaft, softened in a furnace constructed from lightweight building blocks cut to suit. I found this to be a better material to turn than silver-steel. I hardened and tempered the mandrel to a blue colour; it could not be too hard otherwise I could not finish turn it. I was concerned that it may distort but was pleased to find that there was negligible distortion. I finished the outer surfaces and then proceeded to cut the thread for the ball thrust race adjusting nuts. It proved a little too hard for this and the tool tip kept breaking. The thread was only 32TPI and of no great depth. In the end I turned the lathe by hand quite slowly and successfully cut the thread. One advantage of this approach was the ability to immediately feel if the tool had failed.

The body of the headstock was next machined using another piece of the old iron railing which once more proved to be satisfactory material. The next trick was determining how to assemble the thrust bearing and its retaining nuts into the space between the two bearings. A point to which I should draw attention is that the parts of the thrust race must be assembled so that the race components are exactly at right angles to the centre of rotation of the mandrel, otherwise slight axial oscillations will occur which will show up as lines or patterns when turning flat faces. To eliminate errors, the face against which the thrust race assembly was to bear when under load was machined at the same time as the front tapered bearing was bored. The cylindrical cavity behind the front bearing was also bored at the same time.

All this necessitated making a detail drawing to ensure that the cavity in the headstock housing was the correct size but also to set out the dimensions of the thrust race and its associated components. I did not want to make the hole through which these race components were to be inserted any larger than was necessary as it would cut away too much metal. The way I chose was to insert them sideways then turn them through 90deg. into their working position. Once they were all in place the mandrel would be threaded through them and the two ring nuts screwed onto the mandrel. Two slots were cut in the headstock body, one in the bottom face through which the thrust race components are inserted and a much narrower one in the top face which allows final adjustment to be made and also serves as an oiling point. **Photograph 24** shows the new headstock mounted on the lathe and **photo 25** the finished components.

Figure 15
New Headstock



Ball thrust race and rear bearing sleeve

The ball thrust race is a standard 3/8in. I/D race modified to suit my requirements. The outside diameters of the races were satisfactory but the bores were too small. I mounted each race in a recess bored in the end of a split bush and secured in the 3-jaw chuck and bored them out using a carbide-tipped tool.

A new cage was made to carry the balls because it was not possible to bore the original cages out to the required diameter. Drawing **fig 15** shows the thrust race assembled in the headstock. The stationary race is held in a seat previously machined when boring the front bearing. The diameter of the seat had to be estimated by use of the cross-slide index. Once the slots were cut in the body, the diameter could be measured and the race retaining ring made to suit. The rotating race is fixed in the assembly by its bore. It is located on a collar machined on the face of the long adjusting ring nut. I took great care when machining these items, as it was essential that when in place the races ran perfectly true and flat.

The rear headstock bearing is a loose tapered sleeve and follows the same design as used in the dividing head. The four-step pulley from the original headstock was bored to fit the tapered sleeve and, with the machining of the pulley retaining nut, a trial assembly was made and found to be satisfactory. Adjustment of the bearings and the ball thrust race was straightforward and a very close fit of the bearings was possible.

The finishing of the collet seating, the tapered nose for the chucks and the central hole through the mandrel were left until this could be done with the new headstock assembled on the little lathe.

● *To be continued.*

CLUB CHAT

With Stan Bray

UK News

In response to several requests, **Bedford MES** are re-instating their popular Miniature Traction Engine Rally as a two-day event this year. Saturday 17 August is to be a free-and-easy day, with engines free to roam at will over the extensive grounds and newly covered farm roadway at Summerfield Fruit Farm. In conjuction with the railways, Sunday will be a traditional rally with arena events, games and tests of driving skill in the arena for the traction engine crews. The normal Grand Parade will take place, but only on Sunday. There is ample room for campers and caravanners and members will be on hand to ensure that visitors receive every assistance. Entries are invited; please call Richard Shepherd (01767-313164) or Ted Jolliffe (01234-327791). The club grounds are located on the A600 Bedford to Shefford road near Haynes Turn, behind the Pine Barn and Second-hand Alley.

After 12 years as Editor of the **Cambridge MES** newsletter, Andrew Clarke was looking for a break; Ian Lygo took over at the AGM at which all other serving members were re-elected *nem. con.* It was reported that considerable progress had been made with the numerous projects currently in hand, and the local authority had awarded the society rate relief, considering it to be a civic amenity. Just 10 days after this meeting 200 tonnes of hardcore were delivered to the club and, in order to be seen lead from the front, President Arthur Flack and Chairman Ian Morris went along to help move it as it was unloaded. The help appears to have been mutual — they turned out to be the only two there, and seeing two pensioners struggling with shovels and wheelbarrows, the contractor took pity and returned with a mini-digger which he demonstrated and left with them, returning at frequent intervals to unload yet more hardcore on which they could practise their newly acquired skills. This kind gesture was much appreciated because the contractor made no charge for the loan of the digger and the hardcore was already a freebie. Since the society hosted this year's *Sweet Pea* Rally which preceded their own proposed annual rally by only two weeks, it was decided to postpone the latter to 28/29 September. This later date will provide the opportunity for a night run as part of the proceedings at which all the usual arrangements, including refreshments, will be available and visitors will have the opportunity to see and use the new facilities.

Contractors have started work at the new **Bournemouth DSME** track site and are busy clearing away old tree stumps and thinning out some of the woodland. By the time this is published, tenancy of the site should be settled and track building possibly under way. For some time now, and compounding the problems created by the loss of their track, members have also been seeking a new venue at which to hold their monthly meetings. Four different locations were tried, each being used several times to enable a fair assessment to be made. On being put to the vote, members chose the Gallery Room at Littledown Centre, the venue at which all future meetings will be held.

In mid-May **Crawley ME** were host to a party of members of the **Locomotive Club of Great Britain**, whose aim is to organise visits to sites of interest to transport enthusiasts. On this occasion they visited the full sized signal box at Crawley and combined it with attendance at the model engineering society. Like many other clubs these days, there appears to be a shortage of volunteers for public running and we wonder to what extent this is associated with current visitors' attitudes.

With the aim of improving safety, hazard warning lights believed to be vandal proof and wired for automatic operation have been installed at the level crossing on the **Reading SME** track. Following the efforts of vandals the roof of a garage used by the club for storage has been strengthened with 2mm thick steel sheet in order to deter any recurrence of a previous attempt to gain entry by rolling back the roofing sheets. Racking has been installed in the container which also is used for storage, this will be particularly useful in improving the organisation of the club's metal stocks. A Locomotive Efficiency Competition is to become a regular part of the future club programme, the prize being be a trophy to honour the memory of the late Geoff Downs.

This year marks the 40th anniversary of the **North London SME** move to their site at Colney Heath after having had to vacate the original Arkley plot. The then new track took 2 years to build and, even after all these years, it still forms a major part of the club's amenities. It is regarded with affection by those surviving older members who spent much of their time in its building. Many years passed before additional running facilities were introduced, mainly in the form of a track designed specially for small gauge locomotives and partly conceived because when LBSC (their Patron for many years) died, several members were able to purchase from his estate models made by him. There is now a fully functional ground level track with two turntables and plans for future extension.. Add to that a boating pond, a ground level railway and additional recreational facilities, and it is clear that those 40 years have not been wasted. One thing missing from the old set up is an ancient wooden hut fitted with a toilet and high level cistern, on flushing which unwary visitors would find that they had rung a very loud bell, much to the visitor's embarrassment and bystanders' amusement. A new battery electric Class 31 locomotive has been acquired as a club engine which means that their other electric locomotive, a Class 47 can now benefit from a major overhaul. Both locomotives were purchased using funds from a bequest by the late Cyril Rylatt. There has been a recent and pleasing influx of new members with 7 applications in recent months.

Members of **Erewash Valley MES** have been digging out a long cutting and lining it with brickwork, a major effort which they are relieved has at last been completed. It has been estimated that this has taken about 60-70% of the total time and effort involved in building two complete track circuits. Some idea of its depth can be gauged by the fact that a bridge has been built across the top of it and yet there is still plenty of headroom.

A very practical idea from **Malden DSME** involves anyone who leaves private property at the club being required to complete a Loan Form. In the event of any claim following the death or departure of the original owner, it will be possible to verify what if any items that person had loaned to the club. Any property which cannot be associated with a Loan Form will be regarded as society property. Needless to say plenty of maintenance was required before the start of the running season but, despite the best efforts of those concerned the signalling system failed on the first day — and why shouldn't it? Signals fail on full size railways when they, like the club members, have to resort to hand signalling systems, but at least the society trains aren't doing 100mph or more — we hope. In recognition of many years of hard work on behalf of the club, honorary life membership has been bestowed on Jack Rowlands who will be known to many readers.

Good news for members of **Ryedale SME** who now believe that at long last they will be able to proceed with their proposed track extension, plans previously having been delayed due to uncertainty concerning the use of the land it will occupy. The club has arranged a social family gathering in August when it proposed that in memory of her late husband Peter, recently widowed Mrs Smallwood will dedicate a seat which has been financed by subscriptions collected from members. The popularity of the club's Main Line Rallies continues to increase to the extent of overstretching the facilities for caravanning, a matter which the club committee is to investigate and attempt to resolve.

A steady increase in membership is reported by **Stamford MES** which, although not one of the larger societies, can certainly be considered as one of the more friendly with a homely atmosphere at meetings. Having now completed its first 20 years, the club is to organise a special nostalgia meeting later this year to include slides, videos and photographs as well as personal anecdotes from founder members.

Despite being extra busy with organising IMLEC again this year, members of **Leeds SMEE** have still found time for a varied and interesting programme of meetings. Particularly fascinating were talks on steam rollers in Switzerland, steam railways in India and the rebuilding of a steam motor car. A useful tip in the latest newsletter suggests the lubrication of working parts such as axle boxes and valve gear with oil formulated for use on chain saws and sold under the trade name CROMA 30.

A decision was taken at the **Colchester SME** AGM to cease society attendance at functions with their portable track which, as with many other clubs, has become less popular as the years roll by. The decision is not surprising; there has been a noticeable change of attitude among the organisers of events to which the track is likely to be taken, and much of the fun has gone out of attending them. There will be plenty to keep those who normally take the track out busy, with a new ground level track under construction, several coach trips to places of interest, and a Locomotive Efficiency Trial planned for the early autumn. The annual Models Night was a great

In Memoriam

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

'Pop' Anderson	*Leeds SMEE*
Derrick Dant	*North London SME*
Geoff Down	*Reading SME*
Cyril Drayson	*North London SME*
Reg. Gale	*Malden DSME*
Peter Smallwood	*Ryedale SME*
Dave Thompson	*Erewash Valley MES*

success, the winners being George Rowles for a clock; Mike Gibson for a 5in. gauge wagon; Richard Wood for a Wren boiler; Don Pettican for a traction engine; John Wilkins for a traction engine; Mick Wadmore for a gauge-1 locomotive; Mick Steel for a 5in. gauge locomotive and Bob Miller for a steam launch.

Ron Horn, Secretary of **Avondale MES** recently wrote suggesting that we may not have heard of the society; in this he was correct, but he was kind enough to give us all the necessary details. The club, originally known as **Badsley DMES** had a track and other facilities in their local sports and recreational centre. On the first day of the school summer holidays 2000 some of the local youth decided that 'recreation' in fact meant 'wreckreation' and set about completely destroying the track and damaging other club facilities as well as those of the centre itself. The effect on the members was such that it was decided that they would not rebuild but would seek a new and more secure site. After much searching they located and were offered a suitable one at a nursery at Alcester and, as soon as it was practical to do so, work started on building a new track, which is to be ground level in 5 and 7¹/4in. gauges with a 50ft. minimum radius to accommodate large locomotives. All the heavy earth moving work has been completed and rapid progress is being made. The club would be pleased to welcome anyone who would like to see how they are progressing or to hear from prospective members who are asked to contact Ron Horn at 'Willows', Park View Road, Newbold on Stour, Stratford Upon Avon, Warwickshire CV37 8TQ; tel: 01789-450500; e-mail **ronanh@globalnet.co.uk**

Many of us are well aware of the fact that disabled people frequently visit club tracks and although they would love to ride on a train, are not often able to do so. This applies less to children than to adults as it is often possible to support disabled youngsters to give them a ride, but it is rarely practicable to do so with adults. Earlier this year members of **Saffron Walden DSME** decided to try to resolve the situation and set about designing a suitable vehicle. The difficulty of doing so in 7¹/4in. gauge soon became apparent, but the idea would not go away. It was therefore decided to approach their landlord, Lord Braybrook with a view to the club making such a vehicle for use on the 10¹/4in. gauge Estate railway. Lord Braybrook readily agreed and work on a suitable design commenced with the following criteria: the vehicle must be very stable, it should be warm and have a light which would automatically come on when the train entered a tunnel. Ramp access, seating for a helper, and a means of communicating with the driver in the event of an emergency were also necessary. Construction commenced using two fully tested spare bogies from the Estate railway for the chassis which, needing to be wider than the normal rolling stock, had to be taken round the track to check for clearance. When this was deemed satisfactory, consideration was given to the body, following which the only outstanding obstacle was financial. Letters seeking assistance were sent to local businesses, all of which were enthusiastic about the idea, most offering donations. If all goes according to plan, disabled people will have the opportunity to ride on a steam hauled train before the end of the running season on what could be a unique 10¹/4in. gauge passenger vehicle.

World News

Holland

The latest copy of *De Model Bouwer* unfortunately arrived too late for us to be able to pass on details of the many events held by societies in Holland; as with our own *Club Diary* there are so many functions that only events due within a week or two after publication can be included. The result is that with a few occasional exceptions notification is invariably too late. Good news for those readers who like to visit the continent to see and take part in events is that there is now a web site at **www.modelbouwers.nl** from which such information can be obtained. The magazine itself contains the usual mouth-watering selection of interesting articles, including detailed instructions for building a WWII American army maintenance truck and an attractive small vertical steam engine. Instructions also continue on building a 1:25 scale live steam locomotive; in this issue the boiler is featured.

South Africa

Following a burglary at their headquarters, **Durban SME** have fitted razor wire to the roof where the culprits had obtained access, something that may be illegal in Britain where care must be taken not to do anything which might cause harm to trespassers. Unfortunately, the razor wire was not effective at Durban, the felons again gaining access through the roof of the building to steal a very expensive petrol driven weed eating garden implement. The costs incurred by these incidents together with essential maintenance are causing a considerable drain on club funds and it is beginning to look like a case of all work and no play for the members. An idea to make new members feel more welcome and to integrate more quickly with the existing membership has been proposed. Previously, newcomers' names have been announced at meetings, they have been invited to stand so that everyone could recognise them, and business then carried on as normal. They will now be invited to the front of the meeting to introduce themselves, giving details of their particular interests and any other relevant details.

A popular event attended by members of **Rand SME** is a miniature stationary engine rally for the model internal combustion engine enthusiast at which 36 such models were present this year. A small display of stationary steam engines included some which were small commercially made types. Although there is considerable interest in stationary internal combustion engines in the society, and the club has a large collection of full sized engines, there is also a considerable interest in building and running model live steam locomotives. The club's spring weekend will be held at the track in Len Rutter Park from 30 August to 1 September, further information about which can be obtained from Secretary Colin Retief, tel: (011) 763-6813.

New Zealand

Southland SME has received a collection of engineering drawings made c1912 for New Zealand Railways, which they propose to keep in their library for the benefit of members. There was a good turnout for the AGM, at which the committee was re-elected largely unaltered and during which the *President's Trophy* was awarded to Eric Fordyce in recognition of his work in caring for the club grounds.

Canada

A new electric locomotive for club use is being constructed by **British Columbia SME** to use as a back-up for their 25 year old loco which was out of service for a while earlier this year. This meant that there was a shortage of club motive power and although members willingly used their own locomotives, the decision to build another for the club was agreed. Electrically driven, it will be based on the General Motors F7 class, one of the most popular locomotives on Canadian Railways. The body is to be of fibreglass, completely waterproof, and will pivot up from the back to allow access to the battery and other electrical components.

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.

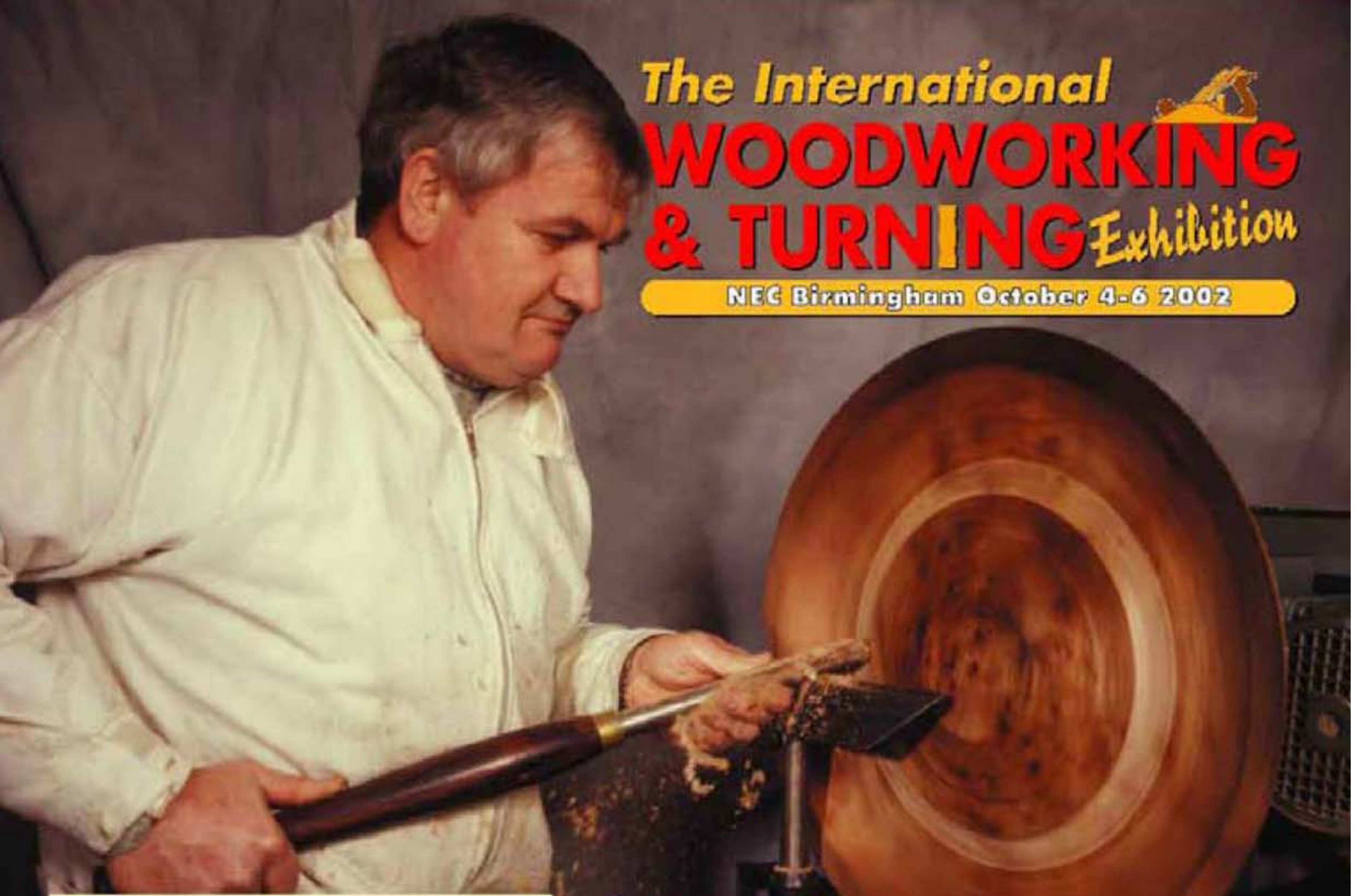
JULY

To 14 July Talyllyn Railway. *Talyllyn Vintage Train.* Enquiries: 01654-710472.
13 **Historical MRS (Essex Area).** Outing to the Amberley Working Museum. Contact Jem Harrison, 27 Colne Place, Basildon, Essex SS16 5UZ.
13 **Reading SME.** *Club Running.* Contact Graham Bustin: 01189-615450.
13 **STEAM – Museum of the GWR.** *Meet the Railway Workers.* Info: 01793-466646.
13 **West Riding SLS.** *Garden Party.* Contact Margery Bradley: 01977-685782.
13/14 **Amberley Museum.** *Railway Gala Weekend.* Contact Derek Kilburn: 01798-831370.
13/14 **Vale of Aylesbury MES.** *Thomas the Tank W/E.* Contact Clive Ellam: 01296-623433.
13/14 **Barrow Hill Engine Shed Soc.** *Gala Open W/E.* Contact Kate York: 01246-472450.
13/14 **Chesterfield MES.** *Steaming at Papplewick.* Contact Mike Rhodes: 01623-648676.
13/14 **Erewash Valley MES.** *Steaming W/E.* Contact Jim Matthews: 01332-705259.

13/14 **Plymouth MSLS.** *Model Exhibition.* Contact John Brooker: 01752-671722.
14 **Birmingham SME.** *Muscular Dystrophy Charity Day.* Contact: 01789-266065.
14 **Cardiff MES.** *Chernobyl Childrens' Visit.* Contact Trevor Jenkins: 029-20755568.
14 **Durban SME.** *Ian Sutherland: Public Access.* Contact David Martin: 031-5635755.
14 **Frimley & Ascot LC.** *Club Run.* Contact Bob Dowman: 01252-835042.
14 **GW Soc.** (Didcot) *Steamday.* Contact Jeanette Howse: 01235-817200.
14 **Leeds SMEE.** *Steaming Day.* Contact Edwin Hughes: 01757-707454.
14 **Leighton Buzzard NG Rly.** *French Day.* Enquiries: 01525-373888.
14 **Malden DSME.** *Visit by Wimbourne ME.* Contact John Mottram: 01483-473786.
14 **Nottingham SMEE.** *Visitors & Members Rally.* Contact Gerry Chester: 0115-9259096.
14 **Plymouth MSLS.** *Running at Plym Valley Rly.* Contact J. Brooker: 01752-671722.
14 **Saffron Walden DSME.** *Running Day.* Contact Ken Archer: 01763-852911.
14 **Surrey SME.** *Members' Steam-Up.* Contact John Cook: 020-8397-3932.
14 **Sutton MEC.** *Track Day.* Contact Mike Dean: 0208-657-5401.
14 **Woking MRS.** *Open Day.* Contact Ronald Dewar: 01932-343331.
15 **Lancaster and Morecambe MES.** *N. Thompson: Journey through Lancashire 30 Years Ago.* Contact Harry Carr: 01524-411956.
16 **Chesterfield MES.** *P. Richards: Quiz.* Contact Mike Rhodes: 01623-648676.
16 **Northampton SME.** *Running Night.* Contact Pete Jarman: 01234-708501.
16 **Nottingham SMEE.** *Ladies' Evening.* Contact Graham Davenport: 0115-8496703.
16 **Romney Marsh MES.** *Track Meeting.* Contact John Wimble: 01797-362295.
16 **South Durham SME.** *Evening Steam-Up.* Contact B. Owens: 01325-721503.
16 **Taunton ME.** *Meeting.* Contact Don Martin: 01460-63162.
17 **Bristol SMEE.** *Evening at Ashton.* Contact Trevor Chambers: 01454-415085.
17 **Chingford DMEC.** *Club Evening.* Contact Martin Masterson: 0208-989-5552.
17 **GW Soc.** (Didcot) *Steamday.* Contact Jeanette Howse: 01235-817200.
17 **Historical MRS (NW Area).** *Edgar Richards: The Bidston – Wrexham Line; A Slide Show.* Contact David Goodwin: 01224-880018.
17 **Leeds SMEE.** *R. Evans: Humber Bridge Bridgemaster.* Contact: 01757-707454.
17 **Maidstone MES.** *Afternoon Playtime Run.* Contact Martin Parham: 01622-630298.
17 **MELSA.** *Meeting.* Contact Graham Chadbone: 07-4121-4341.
17 **West Wiltshire SME.** *Steam-Up.* Contact R. Nev. Boulton: 01380-828101.
18 **East Somerset SMEE.** *Track Meeting.* Contact Cliff Almond: 01749-344735.
18 **Isle of Wight MES.** *Meeting.* Contact Ken Stratton: 01983-760762.
18 **Leyland SME.** *Meeting.* Contact Alan Wilson: 01942-715072.
19 **Rochdale SMEE.** *Visit to E. Lancs. Rly.* Contact Mike Foster: 01706-360849.
19 **Ryedale SME.** *Visit by Scarborough RS.* Contact Michael Burch: 01439-788033.
19 **Steam LS of Victoria.** *Gathering.* Contact Graham Plaskett: (03) 9750-5022.
20 **Chesterfield MES.** *Running Day.* Contact Mike Rhodes: 01623-648676.
20 **Maidstone MES.** *Visit to Beechurst.* Contact Martin Parham: 01622-630298.
20 **Midland Federation ME.** *Meeting.* Contact P. Humphries: 01902-661275.
20 **Romford MEC.** *Trackside Afternoon.* Contact Colin Hunt: 01708-709302.
20 **Steam LS of Victoria.** *Club Run.* Contact Graham Plaskett: (03) 9750-5022.
20 **STEAM – Museum of the GWR.** *Storehouse: Unlocking STEAM's Hidden Treasures.* Information: 01793-466646.
20/21 **Barrow Hill Engine Shed Soc.** *Model Engineering Exhibition and Steam Gala.* Contact Kate York: 01246-472450.
20/21 **Chesterfield MES.** *At Barrow Hill.* Contact Mike Rhodes: 01623-648676.
20/21 **Fylde SME.** *Club Stand at Milton St. Exhibition.* Contact Alan Reid: 01253-882872.
20/21 **Guildford MES.** *Model Steam Rally & Exhibition.* Contact Dave Longhurst: 01428-605424.
20/21 **Peterborough SME.** *Rally Weekend.* Contact Tony Meek: 01778-345142.
20/21 **Guild of Model Wheelwrights** *at Belvoir Castle Country Fair,* Grantham, Lincolnshire. Contact Biddy Hepper: 01492-623274.
20 – 3 September **STEAM – Museum of the GWR.** *All Aboard the Holiday Express.* Information: 01793-466646.
21 *Model Mania 2002* at Cholsey Primary School, near Wallingford in Oxfordshire with a Large Exhibition of Models: Cars, Trains, Boats, Planes, Dolls Houses, Meccano, Military and Science Fiction Figures, Steam Engines and Lego Creations. With Trade Stands, Model Railway Layouts, Plastic Kit Aircraft, Bring & Buy and much more. **10.00-17.00. Adults: £2, Concessions £1.** Contact Ian Wheeler: 01491-652295.
21 **GW Soc.** (Didcot) *Steam & Railcar Day.* Contact Jeanette Howse: 01235-817200.
21 **N. W. Leicester SME.** *Running Sunday.* Contact John Elliott: 01455-847040.
21 **Ottawa Valley Live Steamers.** *Steaming Day.* Contact John Bryant: 761-1109.
21 **Oxford (City of) SME.** *Running.* Contact Chris Kelland: 01235-770836.
21 **Rugby MES.** *Running.* Contact David Eadon: 01788-576956.
21 **The Society of Ornamental Turners.** *Summer Outing.* Contact: 01234-359392.
21 **Woking MRS.** *Open Day.* Contact Ronald Dewar: 01932-343331.
21 **York City & DSME.** *Running Day.* Contact Ken Bateman: 01904-421445.
22 **Bedford MES.** *Rocketeers' Evening.* Contact Ted Jolliffe: 01234-327791.
22 **Hornsby ME.** *Meeting.* Contact Ted Gray: 9484-7583.
23 **Basingstoke DMES.** *Meeting.* Contact Ian Shanks: 01420-561741.
23 **Romney Marsh MES.** *Track Meeting.* Contact John Wimble: 01797-362295.
24 **Chingford DMEC.** *24th Battery Loco Evening.* Contact: 0208-989-5552.
24 **GW Soc.** (Didcot) *Steamday.* Contact Jeanette Howse: 01235-817200.
24 **Hull DSME.** *Shep, Watson & Wilson Trophy Competition.* Contact Brian Rylance: 01482-647032.
25 **High Wycombe MEC.** *Track Evening.* Contact David Savage: 01494-527402.
25 **Sutton MEC.** *Evening Steam-Up.* Contact Mike Dean: 0208-657-5401.
25 **Sutton Coldfield MES.** *Sutton Coldfield RS Running at Meeting.* Contact Roger Timings: 0121-308-5875.
26 **Chichester DSME.** *Meeting.* Contact Brian Bird: 01243-542266.
27 **Erewash Valley MES.** *!0th Anniversary Day.* Contact Jim Matthews: 01332-705259.
27 **Hornsby ME.** *Family Day.* Contact Ted Gray: 9484-7583.
27 **Leyland SME.** *LEYLEC.* Contact Alan Wilson: 01942-715072.
27 **STEAM – Museum of the GWR.** *Meet the Railway Workers.* Info: 01793-466646.
27/28 **Luscombe Valley Rly.** *Grand Charity W/E.* Contact Richard Knott: 01202-709833.
27/28 **Oxford (City of) SME.** *Dreaming Spires Rally.* Contact Chris Kelland: 01235-770836.
27/28 **Guild of Model Wheelwrights** *at Wroughton Nostalgia Show,* Wroughton Airfield, Swindon, Wiltshire. Contact Biddy Hepper: 01492-623274.
28 **Aldergrove Model Engineers.** *Summer Meet.* Contact: (604) 856-9420.
28 **Chichester DSME.** *Steam on Sunday.* Contact Brian Bird: 01243-542266.
28 **Colchester SMEE.** *Visit to Chelmsford SME.* Contact: 01376-511686.
28 **Elmdon MES.** *Running* at Museum of Transport, Wythall. Contact Chris Giles: 0121-458-1291.
28 **GW Soc.** (Didcot) *Steamday.* Contact Jeanette Howse: 01235-817200.
28 **MELSA.** *Sunday in the Park.* Contact Graham Chadbone: 07-4121-4341.
28 **Plymouth MSLS.** *Running at Plym Valley Rly.* Contact John Brooker: 01752-671722.
28 **Ryedale SME.** *Passenger Day.* Contact Michael Burch: 01439-788033.
28 **Surrey SME.** *Members' Steam-Up.* Contact John Cook: 020-8397-3932.
28 **Sutton MEC.** *Barbecue & Family Day.* Contact Mike Dean: 0208-657-5401.
28 **Wigan DMES.** *Open Day.* Contact John Chamberlain: 01744-882255.
28 **Woking MRS.** *Open Day.* Contact Ronald Dewar: 01932-343331.
28 - 3 August **Talyllyn Railway.** *Victorian Week.* Enquiries: 01654-710472.
29 **Canterbury DMES.** *Meeting.* Contact Granville Askham: 01227-463295.
30 **Chelmsford SME.** *Brian Bourn: Ramblings of an Old Traction Engine Driver.* Contact D. Blake: 01376-324205.
30 **Romney Marsh MES.** *Track Meeting.* Contact John Wimble: 01797-362295.
30 **Wigan DMES.** *John Gore: Building a Robot for Techno Games.* Contact John Chamberlain: 01744-882255.
31 **GW Soc.** (Didcot) *Steam & Railcar Day.* Contact Jeanette Howse: 01235-817200.
31 **Nottingham SMEE.** *Lark in the Park.* Contact Gerry Chester: 0115-9259096.

AUGUST

1 **Leyland SME.** *Paul Pavier: Silk Screen Printing.* Contact Alan Wilson: 01942-715072.
1 **South Lakeland MES.** *Meeting.* Contact Adrian Dixon: 01229-869915.
1 **Sutton MEC.** *Bits & Pieces.* Contact Mike Dean: 0208-657-5401.
2 **Vale of Aylesbury MES.** *Track Night.* Contact Clive Ellam: 01296-623433.
2 **Maidstone MES.** *Evening Run & Barbecue.* Contact Martin Parham: 01622-630298.
2 **Portsmouth MES.** *Family Fun Night.* Contact Bob Aldred: 023-92-523366.
2 **Rochdale SMEE.** *Meeting.* Contact Mike Foster: 01706-360849.
2 **Romford MEC.** *Competition Night.* Contact Colin Hunt: 01708-709302.
3 **Amnerfield Miniature Railway.** *Diesel & Electric Open Day.* Contact David Jerome: 0118-9700274.
3 **Gas Turbine Builders' Ass'n.** *Fly In* at Church Fenton, Yorkshire. Contact: Tom Wilkinson: 01508-570977.
3 **GW Soc.** (Didcot) *Steamday.* Contact Jeanette Howse: 01235-817200.
3 **West Wiltshire SME.** *Steam-Up at the Great Bulkington Railway.* Contact R. Nev. Boulton: 01380-828101.
3 **York City & DSME.** *Summer Meeting.* Contact Ken Bateman: 01904-421445.
4 **Ascot LS.** *10th Anniversary Celebration Steam-Up.* Contact Tony Alderman: 01932-854393.
4 **Erewash Valley MES.** *Invitation to Peterborough.* Contact Jim Matthews: 01332-705259.
4 **Gas Turbine Builders' Ass'n.** *Fly In* at RAF Honington, Suffolk. Contact: Tom Wilkinson: 01508-570977.
4 **GW Soc.** (Didcot) *Steam & Railcar Day.* Contact Jeanette Howse: 01235-817200.
4 **Guildford MES.** *Running Day.* Contact Dave Longhurst: 01428-605424.
4 **Hull DSME.** *Dove House Running Day.* Contact Brian Rylance: 01482-647032.
4 **Malden DSME.** *Open Day.* Contact John Mottram: 01483-473786.
4 **Melton Mowbray DMES.** *Track Running Day.* Contact Phil Tansley: 0116-2673646.
4 **Ottawa Valley Live Steamers.** *Steaming Day.* Contact John Bryant: 761-1109.
4 **Oxford (City of) SME.** *Running.* Contact Chris Kelland: 01235-770836.
4 **Reading SME.** *Running.* Contact Graham Bustin: 01189-615450.
4 **Rugby MES.** *Members' Running Day.* Contact David Eadon: 01788-576956.
4 **South Durham SME.** *Running Day.* Contact B. Owens: 01325-721503.
4 **Surrey SME.** *MaxiTrack Owners Day.* Contact John Cook: 020-8397-3932.
4 **Sutton Coldfield MES.** *2½in. Gauge Rally.* Contact Roger Timings: 0121-308-5875.
4 **Guild of Model Wheelwrights** *at Walsall Leather Museum,* Walsall. Contact Biddy Hepper: 01492-623274.
4 **Woking MRS.** *Open Day.* Contact Ronald Dewar: 01932-343331.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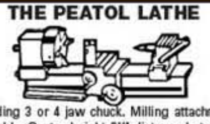

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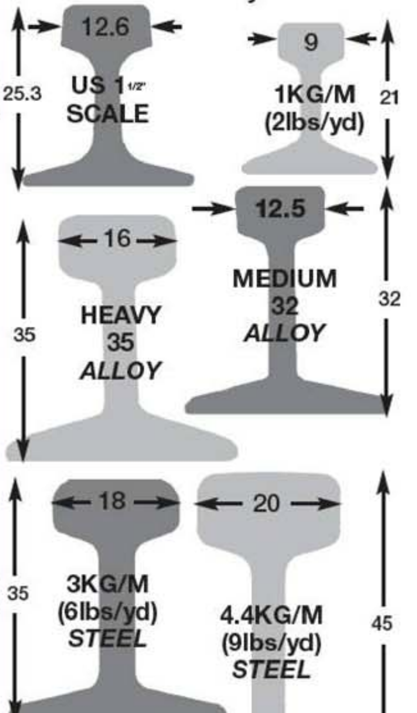

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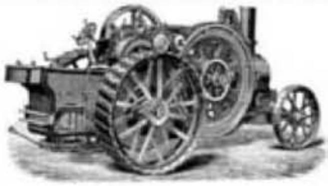

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