MODEL ENGINEER

BRISTOL MODEL ENGINEERING AND HOBBIES EXHIBITION 2004
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EDITORIAL

Editor
Mike Chrisp (01442-269366)
Technical Editor
Neil Read (01604-833670)
Assistant Editor
Kelvin Barber (01525-850938)
Club News Editor
Malcolm Stride
Technical Consultants
John Haining, Stan Bray,
J. Malcolm Wild FBHI,
D. A. G. Brown
Editorial Administrator
Sarah Mead (01689-886677)

PRODUCTION

Design
Elizabeth Marfell
Production Manager
Colin Blake
Printed by
Polestar (Colchester)
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Atelier Data Services

SALES & MARKETING

Group Sales Manager
Colin Taylor (01689-886649)
Sales Manager
Tony Robertson (01689-886650)
Subscription Marketing Executive
Voula Browne (01689-887209)

CIRCULATION

Circulation Director
Andy Bone (01689-887244)
Non-newstrade Distribution
Mike Reynolds-Jones
(0121-788-3112)

MANAGEMENT

Publisher
Jez Walters
Divisional Publisher
Dawn Frosdick-Hopley

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IN THIS ISSUE

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On the cover …

The late Stuart Robinson at the regulator of his 5in. gauge NER Class T1 No. 2120 Netta *on the occasion of the 2003 LBSC Memorial Bowl Competition at the Rainsbrook Valley Railway, home to Rugby Model Engineering Society Ltd.*
Stuart, who sadly died some months after this photo was taken, went on to win the competition and was awarded the prestigious trophy.
A stalwart of Rugby MES for many years, Stuart worked on his Netta *between 1979 and 1988.*
Although built largely to published drawings, Stuart incorporated several modifications to improve the locomotive's running and reliability.
No castings were used in its construction, all parts being fabricated or machined from the solid.
Stuart's Netta *is a reliable performer, often in steam for seven hours at a time, and yet no replacements have so far been necessary.*

(Photograph by Mike Chrisp)

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BRISTOL MODEL ENGINEERING AND HOBBIES EXHIBITION

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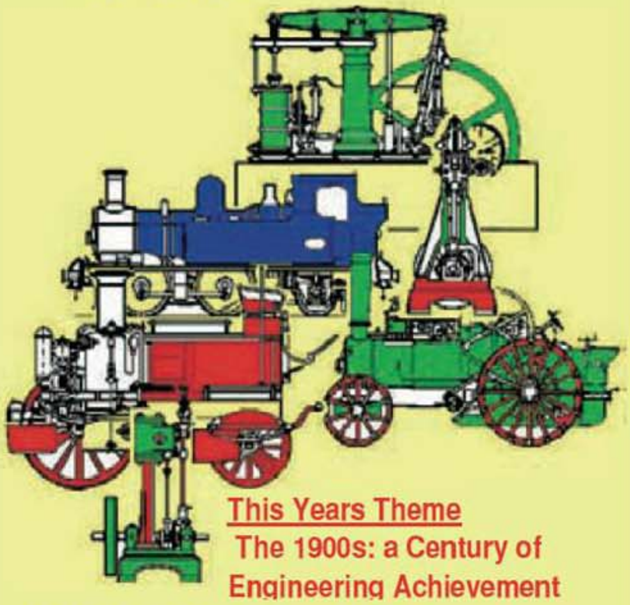

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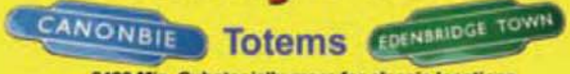

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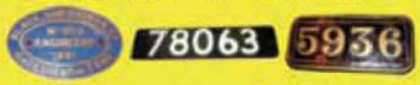

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SMOKE RINGS
With the Editors

IMLEC 2004

Our congratulations are due to Glyn Winsall, winner of the Martin Evans Challenge Cup with his remarkable performance in IMLEC 2004. Brian Remnant was a very worthy runner-up, and Dave Roberts made a commendable third place while Dave Mayall took the honours for Best 3 1/2in. gauge Locomotive. Lionel Flippance is also to be commended as Champion of the All-Winners Competition in the same event.

For the record, Glyn achieved some 3.25% efficiency with his LNER 01 2-8-0, Brian came in at 2.69% at the regulator of his *Sweet Pea* 0-4-2, Dave Roberts made it with 1.89% with his Black Five while Dave Mayall scored 0.99% at the controls of his 3 1/2in. gauge 4F. Lionel gave an impressive performance despite regulator problems and was measured in at 2.75% efficiency. Look out for a detailed report (to be published at the earliest possible opportunity) of all the thrills and spills of this exciting event in which 26 locomotives and drivers competed.

Our grateful thanks are due to the members, families, friends and supporters — commercial and private — of Kinver & West Midlands Society of Model Engineers Ltd. who worked hard to prepare and manage a splendid weekend. The altered format of the contest seems to have been successful in bringing it back to life.

We also thank all the competitors who gave us plenty to enjoy on the track, and the many visitors who supported the event on both days.

As previously announced in these columns, IMLEC 2005 will be hosted by Northampton SMEE Ltd. in early July. The date of this event will be announced just as soon as details are made available as to which weekend in early July 2005 will see the British Grand Prix at Silverstone. Watch this space.

Glyn Winsall on his winning run in IMLEC 2004.

LBSC Memorial Bowl Competition

We would like to remind readers that the 2004 LBSC Memorial Bowl Competition will be hosted by Worthing DSME at Field Place in Durrington-on-Sea, Worthing, West Sussex (OS grid reference TQ123036) on Saturday 4 September 2004.

Owners of steam locomotives in 2 1/2, 3 1/2 and 5in. gauge built to or based on LBSC's many designs, are invited to apply to the Model Engineer Editorial Office, PO Box 310, Hemel Hempstead, Hertfordshire HP3 8XL for an official entry form to participate in an enjoyable and far from stressful day at Field Place among friends celebrating the contribution to our hobby made by this noted designer and author whose gift with 'Words and Music' brought the wonderful hobby of model engineering to so many.

Anson Engine Museum

An exhibition to commemorate the 75th Anniversary of the Gardner 4L2 engine is currently in place at the Anson Engine Museum in Anson Road, Poynton, Cheshire SK12 1TD.

The exhibition opened 17/18 July and is scheduled to continue until 19 September 2004. On the old Anson Colliery site, the museum is dedicated to the internal combustion engine, houses the largest collection in Britain that is open to the public and has a unique collection of over 100 oil and gas engines, many impeccably restored to their former glory..

The Museum is open every Friday, Saturday and Sunday throughout the Gardner Exhibition and engines will be running every Sunday during this period, plus Monday 30 August and Saturday 18 September. Following the exhibition, the museum will remain open every Friday, Saturday and Sunday until 20 October but engines will only run 17, 23 and 24 October.

Further information may be had by visiting the museum website: **www.enginemuseum.org** or by calling 01625-874426.

Model engineering courses in Leicester and Swansea

Norman Smedley informs us that his Mechanical Engineering/Model Making course is to be held in the main workshops (B119) at **Leicester College,** Abbey Park Campus, Painter Street, Leicester on Wednesdays from 9.30am to 12.30pm.

The course begins on Wednesday 15 September and will run for three blocks each of 10 weeks duration. Enrolment will be on the date of the first class. Experienced model engineers and newcomers to the hobby are equally welcome and instruction will be given to course members as required.

Michael Wildin writes to say that the Model Engineers Club meets at **Gorseinon College,** Belgrave Road, Gorseinon, Swansea SA4 6RD under the auspicies of the City & County of Swansea on Thursday evenings 7.00-9.00pm. The course provides a friendly environment for a creative and enthusiastic group of people to make a wide range of projects. Full use of all the engineering workshop facilities is provided, with assistance given to those who are unfamiliar with the operation of any of the equipment.

Useful for those who wish to learn to weld for work or hobby purposes, the Welding for Beginners class meets on Wednesday evenings 6.00-9.00pm at **Gorseinon College.** The course teaches the beginner how to weld safely using gas, arc and MIG equipment. Welds are produced under supervised and controlled conditions in the workshop. Assessment is via a portfolio of evidence of skills acquired and a BTEC Award at Level 1 will be achieved on successful completion of the course.

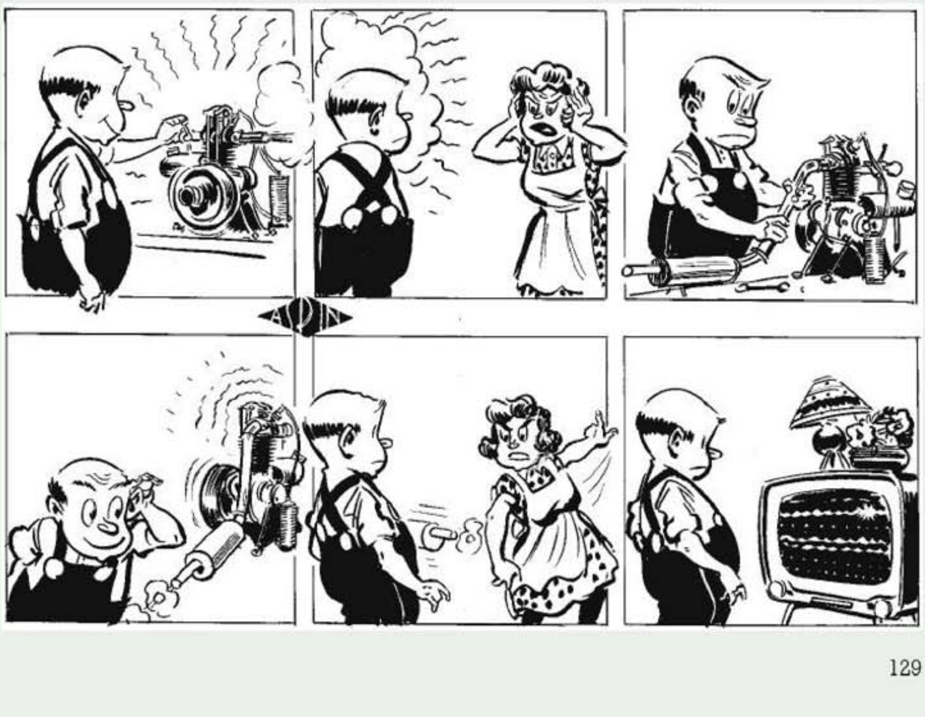
Further information concerning both courses at **Gorseinon College** may be had by calling 01792-893054 or 890754.

Bristol SMEE Model Engineering and Hobbies Exhibition

Readers are reminded that the next annual Bristol SMEE Exhibition will be at Thornbury Leisure Centre, Friday-Sunday 20-22 August when all are welcome to come along to enjoy a superb display of models, demonstrations and trade stands.

Further information may be had by 'phone (call: 0117-977-6956) or from the BSMEE website: **www.bristolmodelengineers.co.uk**

CHUCK the MUDDLE ENGINEER **by B. TERRY ASPIN**



POST BAG

CAD and pixels

SIRS, - My thanks go to Messrs Woollett, May and Bray whose informed help on the subject of incompatibility between computer program and printer was most useful. My assumption was that the problem was within the CAD program itself, and the way in which it addressed the printer, whereas the advice was that the printer has difficulty handling the line information that is thrown to it.

First let me say that I do use the very thinnest of lines possible for centre and dimension lines and increase line weight within the drawings themselves, as you will see if you look at them.

Secondly, I have recently changed my printer and from *Anna* Part V onwards, you should see a marked improvement. My new printer allows me to print A2 size as a maximum, so what the Editor now gets from me is A2 for printing as A3, A3 for printing as A4 and so on. The new printer is an Epson Stylus Colour 1520 which handles all aspects of line thickness perfectly. It has a setting for 'coarse dithering', of which I have made use and it seems the ideal unit for my purpose. Incidentally, I supply the Editor with a small 'doodle copy' at A4 size, which enables him to lay out the copy in the pages as you see them.

We live in interesting times. Any helpful comments about presentation would be well received.

D. A. G. Brown, Rutland.

Trevithic dredger

SIRS, - As my first serious model I am building a Trevithick Dredger Engine of 1806 as detailed in *M.E.* from September 1987. I commenced by using the drawings published with the articles, but having found several mistakes in them purchased a new 'official' set of drawings thinking this would solve my problems. Sadly the drawings are exactly the same, only larger.

Am I the only person ever to have built this model in the last 27 years? I have completed the boiler, flywheel, gearwheel and most of the ancillary items, (I am not using castings) but can anyone advise me regarding the all-important plug valve assembly? I can sort out the rest of the mistakes myself, but the valve gear is a mystery.

Thank you for any assistance which you may be able to provide in this matter.

Nic Ashmore, Dorset.

Engine indicators

SIRS, - I'm lucky enough to own a Dobbie McInnes Indicator, and what a beautiful instrument it is! I have the box, instruction book, chart, and all the bits except the cock and the range of interchangeable springs. I suspect that they may have been sold with only one spring where a particular engine was to be tested, and mine has a 100psig spring fitted. The shut-off cock would probably have been left on the engine, which would be why it is missing from its place in the box.

Dobbie McInnes indicators all have a female cone seat, which can be seen in the engraving Peter Spenlove-Spenlove provided (*M.E.* 4226, 23 July 2004). This mates with a male cone on the cock. He puzzles over the operation of the hand nut, and whether there is an error in the engraving. There isn't.

On mine, the hand nut to which he refers is in one piece, and there is a tube (which puzzled me considerably until I realised what it is for!) tommy bar spanner which fits over one of the lugs on the nut to enable it to be well tightened.

The hand nut works with a differential thread, as can be clearly seen in my photograph. The fine thread on the indicator end is 16tpi, whereas the thread for connection to the cock/engine is 10tpi. This gives the considerable mechanical advantage normally obtained by a rather smaller thread pitch when tightening the nut. One turn moves the nut 0.1in. on the engine, but 0.0625in. the other way on the indicator, so the net movement is 0.0375in., equivalent to a 26.67tpi thread, but it achieves a much quicker and easier thread engagement than would be the case with such a fine thread. The use of the coarser thread also makes the whole design much more robust, and would have helped to avoid problems due to casual damage to the mating threads on the engine connection.

I suspect that the two-piece nut on the indicator in the engraving was made that way because it would have been easier to produce the double threading on a simple cylindrical workpiece set up, and shrink or press on the lugged ring afterwards.

Tony Finn,
East Riding of Yorkshire.

Model spinning wheel

SIRS, - My brother who lives in Rio de Janeiro, Brasil, wants to make a spinning wheel.

I write in the hope that information about the construction of such a model may have been published in *Model Engineer* at some time in the past. It may be that a fellow reader can help. Any copying and postal costs incurred will be met with pleasure.

In the meantime, I have been trying to obtain a book which would give the necessary information but have been unsuccessful and am informed that suitable book(s) are out of print.

I look forward to any assistance which you may be able to provide.

Andrew Beattie, Inverness.

Mr. Tony Finn's Dobbie McInnes indicator.

Filled PTFE

SIRS, - Tom Collins of Bristol (*M.E.* 4224, 25 June 2004) may like to know that Fluorosint and other types of filled PTFE can be obtained from Elder Engineering (Herts) Ltd., The Norton Building, Bridge Road East, Welwyn Garden City, Hertfordshire AL7 1RU; tel: 01707-325513.

Fluorosint is not cheap; I purchased some recently and had to pay £33 plus carriage for 10in. of 1in. diameter rod. For a number of years now, I have been using it with a silicone under-ring for piston rings with complete success as Neville Evans has shown in his *Penrhos Grange* design (same issue).

I am also using Fluorosint successfully for piston valves in one of my locomotives. My son is using bronze filled PTFE for slide valves in his *Pansy* locomotive, again with great results.

As model engineers, I believe that we do not exploit modern materials nearly enough. I was able to get experience of Fluorosint in industry; a magic material for many applications, it seems to be difficult to wear it out.

Geoff King,
Colchester SMEE by e-mail.

Springs and so forth

SIRS, - My *Little Samson* engine as described by Martin Wallis has but one spring, over the front axle. Having found the required gauge and width of un-treated spring steel (from Reeves *resurgam*), I re-read *Tubal Cain* (several times) and doubted my competence. Then Norman Barber's most helpful dissertation was published in *M.E.* 4213, 23 January 2004 advising heating the individual leaves of the spring to red in copper tube and tempering them in molten lead; an excellent, simple procedure.

However, I wasn't too keen on a potful of hot liquid lead and then recalled my earlier experience with finding new springs or resetting existing springs for my much loved Bentleys. When the local company 'did' our lorry and tanker fleet springs, they also kindly sorted the springs for my type of lorry — as Mssr. Ettore Bugatti put it *"le camion le plus vite."*

They were still happy to oblige but said, if I had already made the spring, it would be cheaper if I went directly to their heat treatment people, which I did. They seemed not to be bothered that it was small and they would harden and temper it for me. They have, for £5, and I am pleased with the result.

The company is TTi Group Ltd. 39-43 Bilton Way, Luton, Bedfordshire LU1 1UU; tel: 01582-486644. There must be others. I asked if I might commend them in *M.E.* and they said *"Of course."*

John McIntyre, Cambridgeshire.

Scales and sizes

SIRS, - My model of an Otto Deutz gas engine is being made to a scale of 200mm to 1 metre (or in imperial 1:5 scale). As the original was built to metric dimensions, a multiple of 10 in the scale makes life as easy as fractionals do for imperial built engines. Quoting *"x inches to a foot"* means nothing to Joe Public and has to be translated to a fraction for use.

Going metric, somewhat against my inclination, reveals that metric sections are not offered by *M.E.* advertisers. That is where my Tom Senior planer comes into its own, in reducing $\frac{3}{4}$ x $\frac{3}{8}$in. to 18mm (0.709in.) x 9mm (0.354in.) It is also good exercise for the right arm, which makes me wonder if anybody ever made left-hand machine tools.

I know there are left handed hand tools and cutters.

John Day, by e-mail.

Tim Coles had successful runs with his GT3 gas turbine locomotive during the Guildford Golden Jubilee Steam Rally and Model Engineering Exhibition 17/18 July.

Gas turbine locomotive

SIRS, - I though readers might like to know that my GT3 locomotive is up and running again after a blown glowplug incident at Gilling East.

The photograph above was taken by our Editor at Guildford during the recent Rally weekend at which we enjoyed several fast laps and were able to return home with nothing to mend! The wiring and plumbing have been tidied up since Gilling, though some development remains to be completed.

I hope to start on the tender soon. Any volunteers to help with the bodywork?

Tim Coles, Cambridgeshire.

Model WW2 jeep

SIRS, - I have recently started a subscription to *Model Engineer* magazine in an attempt to kick-start a new hobby in model engineering.

For some time I have been planning to begin a project on which I am keen to make progress, but find myself at an impasse. I want to produce an accurate model of a Willys MB, or Ford GPW WWII Standardised Jeep 'engineered' to be as close as possible to the real thing.

A beginner in the world of model engineering, I am poised to book a place on a local model engineering course with an experienced tutor. We are lucky to have access to him and his skills, and the use of the workshop of a local school via the Kent County Council's Adult Education Service where a 10-week course costs just £50. The course runs for 2 hours, 1 evening a week during which I hope to gain experience with aspects of metal working, something which at the age of 40 I have not done since leaving school in 1979!

Unfortunately, although I have lots of resource material of jeeps in general, including workshop manuals, parts manuals, and a subscription to *Jeep World* magazine, I have been unable to locate any accurate engineering drawings of a WWII Jeep, with sufficient dimensions to even consider beginning my pet project.

Numerous Jeep books are available, and other resource material is not a problem. There are even web sites where you can make specific searches for individual jeeps (if you have the serial number) and can obtain information about colourings and insignia.

I have been to Military Vehicle Shows, spoken to parts suppliers, and others involved in this area, but have been unable to locate the drawings I need. I suspect that this may be due to the commercial aspect of the WWII Jeep. There are several suppliers of replacement parts for these vehicles, many of which are still running. I have heard it rumoured that one supplier of such components obtains parts from a Dutch company whose owner is said to have purchased a set of original blue prints for around £5000 on the open market, but I am somewhat sceptical about this!

I would be very grateful if anyone can help in any way at all. The alternatives with which I am faced are to abandon my pet project or buy a wreck of a WWII Jeep, strip it down and restore it myself, preparing drawings as I go. I am told this will cost at least £2500 excluding the cost of restoration and transportation of the wreck in the first place.

I am not keen to give up at this stage; a real Jeep restoration project would be an option, if a complex one, and I would probably enjoy doing it, but it is a drastic option, and it ought to be easier to locate a set of engineering drawings!

Michael Wright, Kent.

Precision levelling

SIRS, - Bristol Aircraft Company bought a very long milling machine in the '50s for wing spars, and the millwright gang used Mr Stride's kind of level in the installation. They had to change to a collimated light beam when they realised they were trying to bend the bed to the curvature of the earth.

So I was told.

My young colleagues are frequently bored to death by being told *"Don't guess — do the sums."* Before writing to you it seemed interesting to take my own advice and the result showed a 'dip' of 1.8 ten thousandths of an inch for a 50ft. bed.

Any comments?

David Matthias, Isle of Wight.

Finishing *Maisie*

SIRS, - I have recently obtained a part-built 3¹/2in. gauge locomotive to LBSC's *Maisie* design and seek someone in the Newmarket, Suffolk area who could help me finish this locomotive. I am not new to model engineering, but am a beginner as far as the building aspect of this hobby is concerned. I am looking to complete this locomotive and then build a *Washington* type locomotive in 5in. gauge or even the *Mallard* or *Flying Scotsman.*

I have met a few people who can help me but they all live too far distant and would therefore use a fair amount of time just getting to me. I have also attended the Cambridge Model Engineers open day but I was unable to find anyone nearby my home. I have a well-equipped workshop — is there anyone out there who would care to come and use it and help me to finish *Maisie*?

Roy Birch, Suffolk.
tel:01638-602436/07968-157572
e-mail zigmonde1@aol.com

Drummond lathes

SIRS, - In response to John Anning (*M.E.* 4222, 28 May 2004) I should add a little more to the Drummond molehill.

My 3¹/2in. machine, which is of the 1908-1912 pattern, is stamped Mch B No. 6647 at the tailstock end of the bed. This is clearly the serial number, as opposed to the assembly numbers (10 bed and 40 headstock) which are stamped on the gap end of the bed and on the individual parts of the respective assemblies. I feel the high serial number could indicate a manufacture date close to 1912, but would welcome advice to the contrary.

I would point out to Mr. Anning that the prefix on early 4in. (round bed) lathes was 'Mch A', changing to the letter 'O' when the split bearing headstock was introduced in 1919, evidenced on my circa-1931 machine O 5927 (see also *M.E.* 2569, 17 August 1950). As he would know, the round bed machine was introduced in 1908 and at the same time the 3¹/2in. machine was updated with a proper cross-slide/top-slide arrangement. The round bed, being a much cheaper machine, retained the previous fixed saddle/single slide. Perhaps this watershed of design also prompted the need for clarity in serial numbering to distinguish between models?

My theory is that the 'Mch' part of the prefix is no more than an abbreviation of 'machine' and that the designations A and B were introduced in 1908 to distinguish between the two designs — A being the first and cheaper of the two.

I admit to not having seen a pre-1908 3¹/2in. machine and cannot verify that the 'B' prefix did not appear before that date. However, I note Mr. Anning's comments on the paucity of prefixes and assume that he has been looking at the earlier machines. I would welcome his advice on this matter.

I would agree with Mr. Anning on his point that the whole matter may be somewhat academic, given that the designations A and B do not appear in contemporary Drummond literature and advertising. The M designation applied to the later 3¹/2in. machine appears to be Arthur Drummond's only public flirtation with the alphabet!

Tony Watson,
Australia, by e-mail.

Induction furnace

SIRS, - Ian A. Wright (*M.E.* 4223, 11 June 2004 and Noel Shelley, *M.E.* 4225, 9 July 2004) seek a constructional article for an induction furnace. One by A. J. Lewis was published in *M.E.W.* 91, July 2003 and a letter by Alan G. Furness commenting on it appeared in *M.E.W.* 93, November 2003.

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Chris Smith, Somerset.

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The well shaded steaming bays at the Rugby track are a good place to be on a warm and sunny day.

Mrs. Margaret Taylor rides behind the locomotive built by her late husband and is driven here by Mike Huddart, her son-in-law.

THE LBSC MEMORIAL BOWL COMPETITION 2003

Mike Chrisp and Neil Read report on this successful event.

The Curly Bowl competition for 2003 was held at the Rainsbrook Valley Railway, splendid home to Rugby Model Engineering Society Ltd. Everyone who visits this track comments on its superb location, its excellent riding characteristics and the high standards of maintenance lavished upon it. It is therefore pleasant to report that seven model engineers entered their locomotives in the competition and sampled the hospitality of the host society while admiring the beautiful views across the Rainsbrook valley. There was variety in the entries too, which added to the interest of the event for the spectators and competitors alike. The competition is a relaxed event designed to bring fans of Curly's designs together in friendly rivalry and have their locomotives checked by expert judges for quality of build, finish and general performance on the track.

Run 1 - *Virginia*

The owner of the first locomotive in the running order was Mrs. Margaret Taylor from Leicester who had brought along her son-in-law Mike Huddart and grandson David to prepare and drive her $3^1/2$in gauge *Virgina* 4-4-0. The story behind this locomotive is interesting and illustrates how an enthusiasm for model engineering runs in families. Mrs. Taylor's late husband Ron built the model because she had always admired the shape and detailed fittings on American style locomotives. After its completion in the early 1990s he named it *M. D. Claypole*, Mrs. Taylor's maiden name. The locomotive was used until Ron passed on and then stood idle for a few years until Mrs. Taylor decided she would like to see it run again. The necessary boiler tests were performed and the locomotive is now used regularly, as the builder intended. It generally follows the Curly design but the boiler is set higher in the frames and the springing is non-standard.

David Huddart follows on in the family tradition and as a practising model engineer is a member of both Leicester SME and G3 Society. He regularly runs a GWR 4-6-0 *Cleeve Grange* and is currently working on a $2^1/2$in. gauge S160.

The judges noted that this locomotive raised steam and was blowing off in fifteen minutes. They also commented favourably on the extra detail incorporated by the builder, which went beyond that shown on the designer's drawings. The locomotive performed as well as it looks and handled well on the track.

Run 2 - *Dairy Maid*

The next competitor to the 'starting line' was Bernard Clark of Northampton, a member of Northampton MES Ltd. Bernard had brought along his $3^1/2$in. Southern D15 *Dairy Maid, Keith* for the competition. The identity of the original builder of this locomotive is unknown, but it is believed to have been constructed some forty or so years ago. Bernard, a professional engineer, acquired it in a dismantled and distressed state and lovingly rebuilt it with new parts to replace those missing or worn out. Since August 1999 it has steamed over 240 miles and won the award for the best $3^1/2$in. gauge locomotive in IMLEC in 1999.

The locomotive steamed well, blowing off after fifteen minutes. It performed well in forward gear but was slightly offbeat in reverse. The judges reported no other problems on the track.

Run 3 - *Hielan' Lassie*

Moving from the Southern to the London & North Eastern Region we come to the next entry, John Stone's $3^1/2$in. gauge 4-6-2 *Hielan' Lassie*. A member of Erewash Valley MES and a keen model engineer since the 1950s, John built this locomotive over a period of ten years, completing it in 1992. It has three cylinders with piston valves,

Prior to handing Keith, *his Southern D15 locomotive to LBSC's* Dairy Maid *design to the judges, Bernard Clark poses for a photo for our records.*

John Stone prepares his Hielan' Lassie *under the watchful eyes of judges Dennis Monk (centre) and Steve Eaton (left).*

Andrew Dick with his fine $2^1/2$in. gauge 4-6-4 New York Central Hudson Josie originally purchased in the 1940s in an incomplete state.

An active supporter of locomotive competitions, David Mayall entered his 5in. gauge Speedy.

those for the inside cylinder being operated by conjugated levers driven by Walschaerts gear. The boiler has a combustion chamber, screw down regulator and two water gauges. Every attempt has been made to make the locomotive look as much as possible like Thompson's rebuilt *Great Northern*. A number of additions have been fitted including a three-pump lubricator, a removable fire-grate, vertical reverser, sliding windows and roof ventilators. Much of this detail was derived from period photographs.

The judge's notes show that this locomotive also raised steam in fifteen minutes, its own blower being used from 15psi., and was a satisfactory performer on the track.

Run 4 - *Josie*

Continuing the variety that was the hallmark of this event, we come to Andrew Dick's $2^1/2$in gauge 4-6-4 anglicised New York Central Hudson *Josie*. This locomotive was largely built by the owner, a member of Cheltenham SME and the $2^1/2$in. Gauge Association.

The story of this locomotive begins in the 1940s. At that time Andrew was a member of Aldershot MES and heard from one of his fellow members that a friend of the latter was building a $2^1/2$in. gauge *Josie* of the type described by LBSC in 1933. He had lost interest in the project and would part with the bits and pieces for £5. In 1948, £5 was a lot of money for which Andrew received the bar frames, boiler, smokebox, cab and tender body but no wheels. Also included were the relevant pages from *Model Engineer* describing the locomotive.

Despite living away from home at that time, by 1954 the 26 wheels and axleboxes had been machined. However, marriage and the normal pressures of life prevented further work on the engine for forty years. Enthusiasm was rekindled in January 1995 and work restarted. It was clear that the boiler built all those years ago would not meet current regulations and a replacement was made by John Ellis. A number of changes were made to the published design including:

1: Anglicised appearance but retaining many North American features such as coupling sockets, pilot, cab, smokebox door, valve lap movement derived from the crosshead pin without a drop arm, high foot boards, twelve-wheeled tender, etc.

2: Fitting steam and hand brakes with the steam cylinder in the smokebox fed by a hollow stay.

3: Piston valve cylinders without lead.

4: Twin-ram feed pump operated by eccentrics on the leading coupled axle, which almost eliminates end thrust.

5: Twin-ram lubricator with gear driven crankshaft and two clutches and levers on the driving shaft arranged to give almost continuous oil flow. This is done by using crank discs set at 180deg. combined with the lever movement derived from the feed pump eccentrics, also set at 180 degrees.

6: Ash-pan slides out sideways.

7: Oil and water centrifugal separator instead of T-piece in the exhaust. The oil, water and a variable amount of steam are taken back to the 4-pass feed water heater situated between the tender trucks. The dirty condensate from this passes to a tank on the driving truck.

It was found that *Josie* raised steam in 10 minutes and, as may be imagined, the technical features of this engine gave rise to a good deal of debate among the judges.

Run 5 - *Speedy*

A well known entrant in *Model Engineer* sponsored events is David Mayall of Bracknell DMRS. David had brought his 5in gauge GWR 15xx *Speedy* to Rugby. This was acquired as a part-built chassis and a box of bits which looked as if it contained a complete set of parts. Most of the parts in the box, however, were eventually remade. All the boiler plates were in place except one. The original builder had planned to lag the boiler so it is smaller than standard and has one less tube. The boiler has been completed using the correct GWR type safety valves as described by Martin Evans for his Manor class locomotive. Many extra details have been added to the model to enhance its appearance. These were derived from photographs taken of the only remaining locomotive of this type, preserved on the Severn Valley Railway. David won the Curly Rose Bowl in 1990 with a $3^1/2$in. Standard Class 4. His *Speedy* was completed in 2001 and was placed fourth in the 2002 IMLEC hosted by Leeds SMEE at Eggborough. It also was entered for this year's event at Bristol being placed tenth despite the efficiency figure obtained being better than that for the previous year.

Overall the judges liked *Speedy* noting that steam was raised in seven minutes and that she was very handy on the track.

John Lewis and his young assistant raise steam in John's 2-6-2 LNER Bantam Cock *which was completed in 1976.*

Caught you! Stuart Robinson raises steam in his 5in. gauge Netta *under the supervisory gaze of John Groom, our host club judge.*

Run 6 - *Bantam Cock*

The sixth contestant was John Lewis of the host Society with his $3^1/2$in. gauge 2-6-2 LNER V4 *Bantam Cock*. Begun by John while still at school, construction of this locomotive closely follows the 'words and music' of the master and no 'frills' have been added. The locomotive was completed in 1976 since when it has run many miles on Romford, Coventry and the Rugby Society tracks. John has no formal engineering training and the locomotive took five years to build.

The judges felt that the model was a commendable effort for someone who, at the time, was an inexperienced youngster. Steam was raised in fifteen minutes and the engine steamed well on the track. The effective working leaf springs were also noted.

Run 7 - *Netta*

The final competitor in this year's contest was Stuart Robinson, also of the host society. His entry was a 5in. gauge 0-8-0 NER Class T1 *Netta* 2120. Stuart built the locomotive himself between the years 1979 and 1988 and it is mostly to the drawings except for the cab layout and fittings, the ash-pan and grate and the intermediate valve spindle bracket and spindles. These are $^1/4$in. longer than specified and have proper keys instead of a peg, and the jump links to the valve spindles are adjustable. The Nimonic 80 alloy grate slides in on two rails through the back damper and is locked by a single butterfly type fixing at the back. This allows the grate to be easily removed when dropping the fire. An adjustable damper at the rear and sliding door at the front are provided for easy ash removal. The only purchased items on the engine are the injectors, pressure gauge and number plates.

No commercial castings were used and apart from the wheels everything was fabricated or machined from the solid. The wheels were cast locally to a pattern made from a Reeves wheel machined to the required shape. Interesting features abound on this model. The cylinders are phosphor bronze fabrications and the valve chests are machined from the solid. The slide valves are made from Monel metal. Instead of the original mechanical lubricator, a hydrostatic type is fitted. The chimney, dome and valve cover were all machined from the solid on a homemade milling machine. The boiler is as designed by LBSC but all screws are blind bushed and do not enter the water space. The superheater is made from Kunifer (copper/nickel) brake pipe. Despite being used regularly and on several occasions, in steam for seven hours continuously, no mechanical failures have ever occurred and no replacements have been found necessary.

On this occasion, this model was found to raise stream in ten minutes and performed on the track every bit as well as she looked.

It was now time for the judges to do complete their final calculations. When the marks were added up it was found that the winner of first prize was Stuart Robinson with his *Netta*. Second was David Mayall with his *Speedy* and third was Margaret Taylor with her *Virginia*.

Our thanks go to the competitors, Rugby MES Ltd., the judges and visitors for making this event so memorable. We look forward to welcoming competitors and visitors to Field Place, Durrington-on-Sea, Worthing, West Sussex on Saturday 4 September when members of Worthing DSME will be hosting the 2004 LBSC Memorial Bowl Competition.

Officials and competitors line up for a group photograph as winner Stuart Robinson proudly holds the LBSC Memorial Bowl brought to the event by last year's winner Chris Smallwood (extreme left).

SILENCE IS GOLDEN

Len Walker
explains how to live peacefully with family and neighbours.

What follows was a desperate, 'do or die' exercise to allow a Myford ML10 lathe to be used in an upstairs box room. The criterion was that it must be virtually inaudible downstairs, and even more so to our next door neighbours. I eventually succeeded, but the amount of trial and error cost much blood, sweat and tears and very nearly a new stair carpet. I pass on the results of my efforts in the sincere hope that someone may benefit. As so often happens, some readers may develop and improve my ideas; if so please let us all know about your efforts. What is shown here worked for me.

Due to a factory closure, 'early retirement' (at 61) and a house move from West London to Torquay, I finished up in a house with a garage a short distance away but no electrical power therein. Looking back, I wish that it had all happened as easily as that. With the car sold and long gone we were viewing houses in Torquay, as and when they turned up, by hopping on an express coach. This proved to be difficult and tiring and I do not recommend it.

In passing, two images from this hectic period in 1982 stick in my mind. The first was watching some pigeons walking along an empty factory floor where once a huge assembly line and a host of busy workers had turned out 10,000 to 15,000 vacuum cleaners a week. After 36 years with the company, my feelings cannot be expressed in words. The second image is of the ever-diminishing pile on my London workshop floor as all my cherished bits and pieces, starting with my Myford ML 7 lathe, Fobco Star drill, and bench grinder, were sold on to new owners. Having teeth extracted was a sweet pleasure compared with disposing of that lot!

The situation in the new home looked pretty bleak as far as a workshop was concerned. It seemed like the end of a long road. There was a small L-shaped box room upstairs, but it did not offer much hope. Cash was limited, but gradually I built a bench for light jobs. Then, after a discussion with my wife (still a great team after 51 years), I used some of the money from the sale of my old workshop to buy a smaller lathe (a Myford ML10) and a small drilling machine.

My spirits rose again, only to be dashed when I found that the noise levels were unacceptable downstairs when the lathe was operated. Let me make it clear that it might be perfectly okay in roughly similar circumstances elsewhere, but it was not for my location.

By now, I was really desperate. I tried felt packing and everything else I could lay my hands on, which did not amount to much at this stage. No joy. There now followed a long sweaty period of thrashing about trying all manner of solutions to my problem. I will spare the reader my tribulations, and just list the final measures taken. Let us start with the motor and work logically through each area involved, all the way down to the floor.

Area 1

A resilient motor mounting is essential to isolate a good deal of the noise and vibration *at its source*. Vibration which is allowed into neighbouring structures is almost impossible to deal with. The motor supplied with the lathe satisfied this requirement.

Area 2

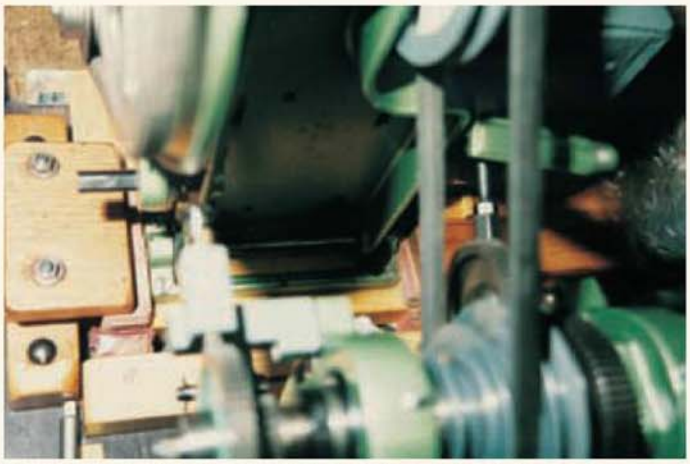
A thick ($^1/8$in.) rubber mat was fitted under the feet of the motor to provide further damping of vibration reaching the countershaft bracket.

Area 3

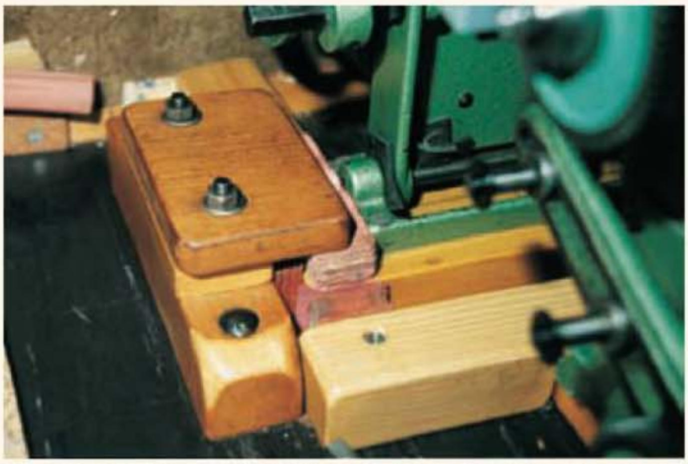
Rubber washers, slit to facilitate assembly, were fitted to both ends of the countershaft bracket hinge pin to prevent end movement. A rubber wedge was inserted between the centre portion of the pin and the adjacent casting. This damped out hinge movement completely.

Area 4

The motor and countershaft unit was securely mounted on a wooden block using No. 12 wood screws, with a $^1/16$in. thick rubber gasket between the casing and the block. Care was taken



A view of the modifications made to the lathe countershaft mounting arrangements now in rubber supported by timber to deaden any vibration escaping from the rubber mounted electric motor.



Close-up view of the countershaft mounts showing, in addition, the rubber washers fitted to the countershaft and the rubber wedge used to take up any residual clearance.

to keep the countershaft hinge pin parallel with the long edges of the block to facilitate alignment of the unit on assembly.

Area 5

I believe this modification to be responsible for the lion's share of the improvement achieved. The block sits on four small rubber pads (Group 'A' on Sheet 3), which were made from about ten layers of the rubber from an old hot water bottle. The block was held down at each end by full width rubber pads (Group 'C' on Sheet 3). These were compressed slightly by overlapping wooden 'keep' pieces. The 1/4in. thick wooden 'shim' can be adjusted to suit the assembly so that when the two 1/4in. BSF nuts are nipped up, the correct 'cushion' effect can be obtained.

To prevent the complete unit 'walking about', I added a further eight rubber pads (Group 'B' on Sheet 3), two to each vertical face of the main wooden block, restrained by more wooden blocks. By these means the motor countershaft assembly was totally insulated from the lathe bench.

Please note the importance of taking into consideration the height of the lathe raising blocks (as detailed on Sheet 2) with the thickness of the countershaft mounting block (plus the 1/16in. thick rubber gasket) and the Group 'A' rubbers to maintain the relative heights on assembly (i.e. the lathe is raised up the same amount as the countershaft assembly). This is indicated on the sectioned diagram (on Sheet 1) by the note *These faces are level.*

Useful tip: keep oil away from all rubber mounts. Oil and rubber never did agree and I used a plastic cover to keep the rubber parts protected. It works!

After many trials (and errors) I hit on a setting which was really quiet, in fact nearly inaudible downstairs. *Eureka!*

Area 6

The bench top was isolated from the bench, by fitting 1/8in. thick rubber strips under the top, all the way around. My big mistake was to use an odd piece of cheap chipboard only 7/8in. thick for the bench top. It was far too light and tended to magnify rather than damp out noise and vibration. I eventually tamed it by bolting large pieces of 3/4in. thick fibreboard on the underside to damp it out. This seems rather ridiculous, so if you can find 2in. thick material, go for it!

Area 7

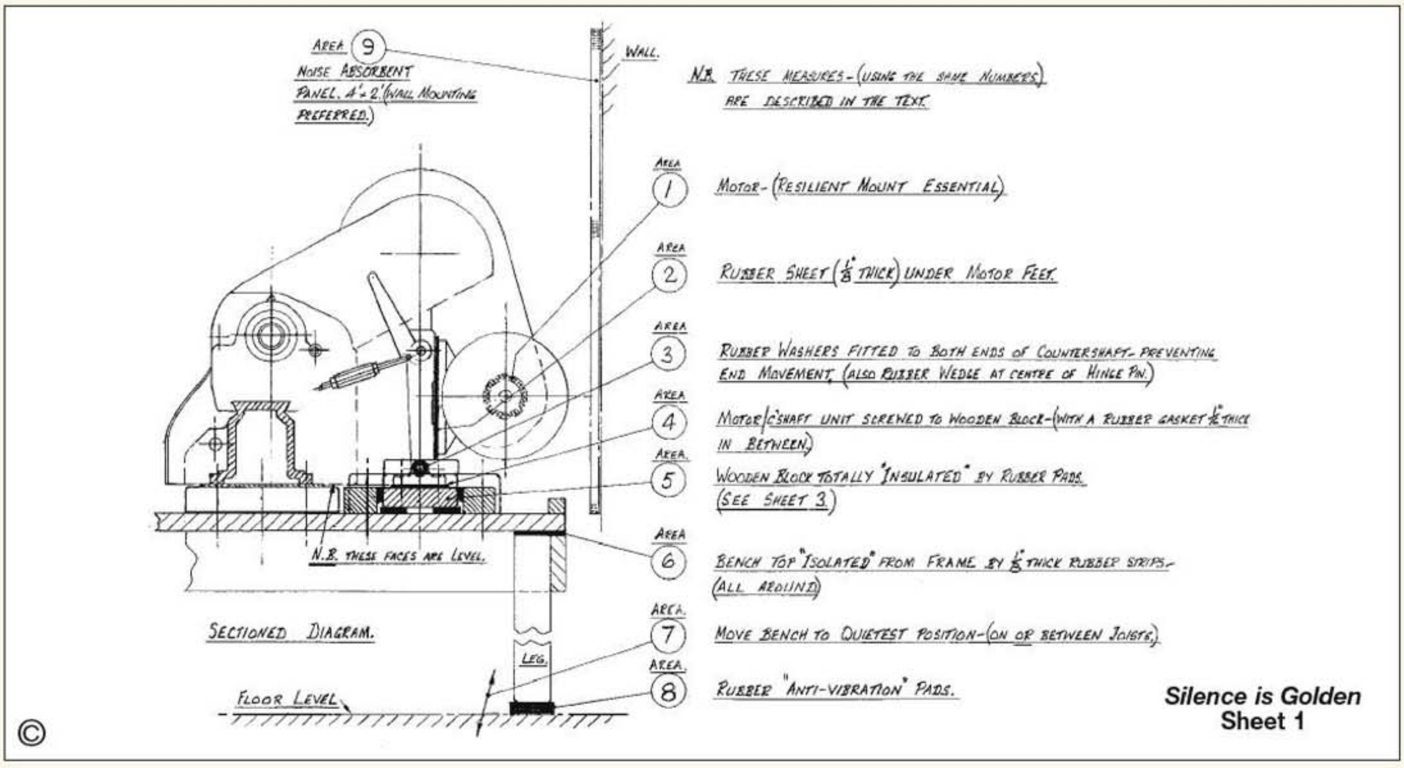
By moving the entire bench along the floor to a new position, I found that an improvement could be made. I am not sure if this was because I was moving the lathe to a position directly over a joist or maybe between joists. As is often the case with this homespun technology, you can only suck it and see. It can make a difference.

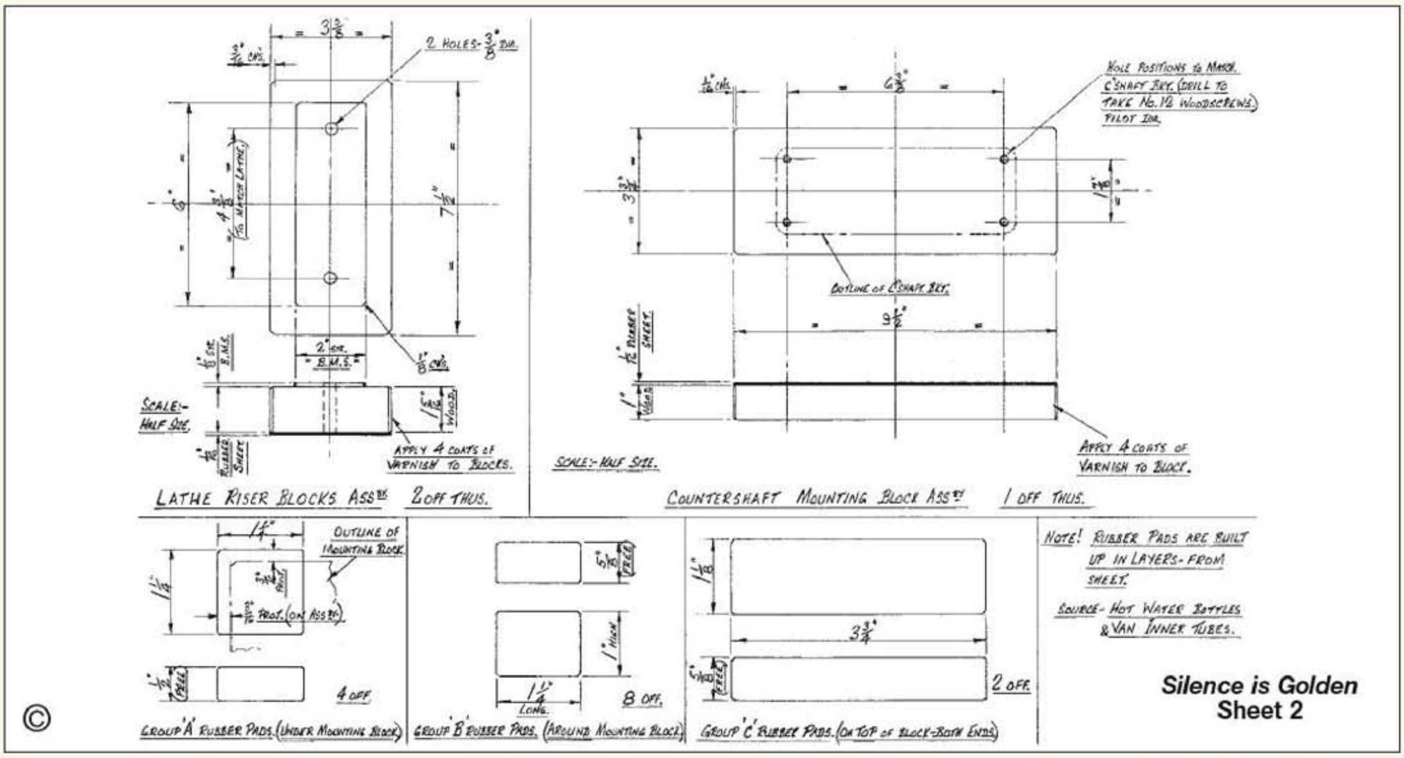
Area 8

Thick (3/4in.) rubber pads were placed under the bench feet as a final barrier to noise and vibration. These helped to prevent drumming on the wooden floor which, though carpeted, had a hollow space beneath (between floor and ceiling downstairs) and tended to act like a drum.

Area 9

I fitted a noise-absorbing panel at the back of the lathe. This consisted of a 4 x 2ft. hardboard panel covered on one side with a piece of foam-backed carpet. This prevents a lot of operating noise





being bounced directly off the wall.

Ideally, this panel would be mounted on the wall, or at least away from direct contact with the 'live' bench top. I did manage to support it on the rear of the bench, but had to thoroughly insulate it by sitting on foam rubber strips at each end, otherwise it broadcasts noise and vibration very effectively. Even leaning against a hardboard type interior house wall, to decouple the vibration it needed the soft foam rubber treatment where it touched, hence my preference (with hindsight) for an independent wall mounting.

My own bench mounted panel was stiffened with a few wooden battens, and a flap was arranged in the carpet to allow the motor leads (in their plastic trunking) to pass through from under the bench top.

Direct contact between the trunking and the hardboard panel has to be avoided or motor vibration will 'short circuit' directly to the panel and be magnified. There is no end to it; vibration tends to bite back given half a chance!

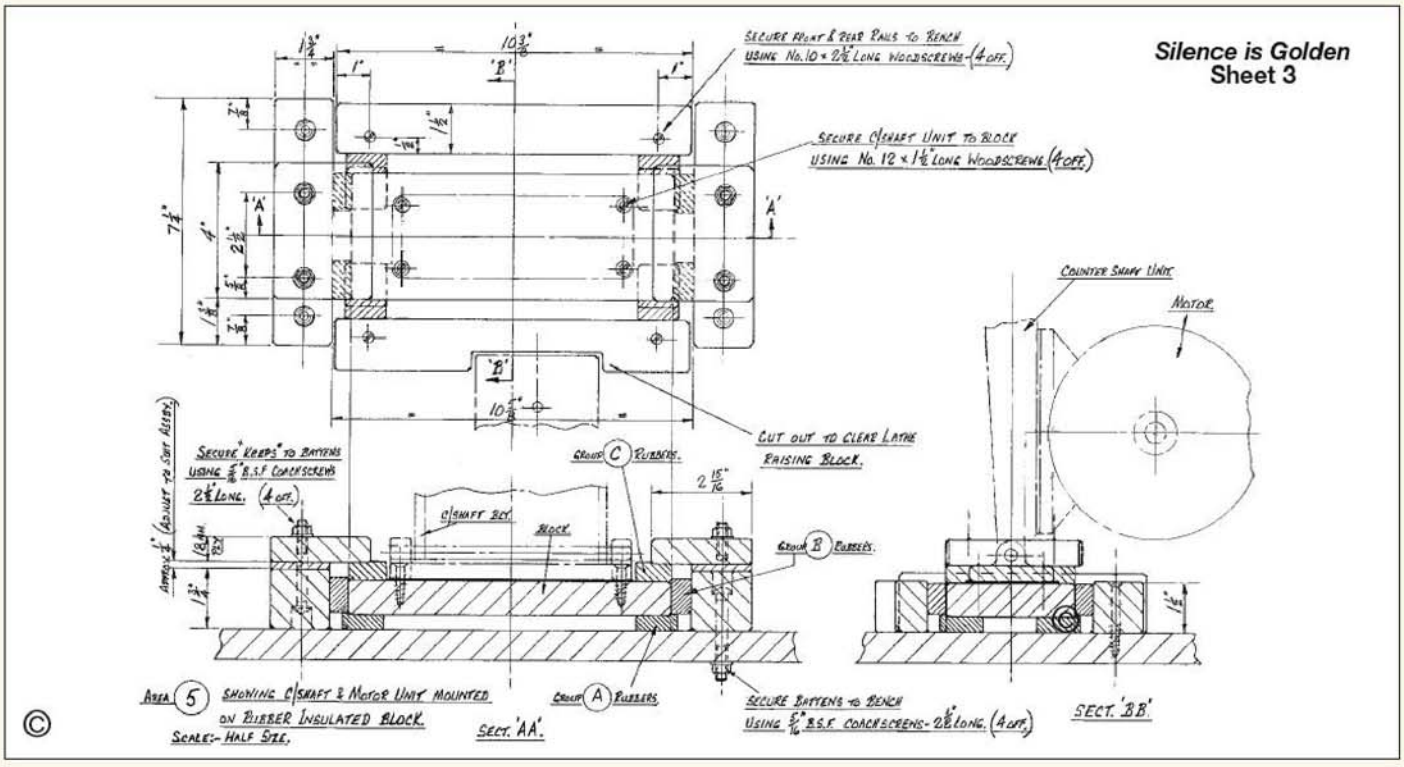
This set up ran satisfactorily for several years, until we finally moved to a flat with a 6ft. square brick 'cupboard' at the back of a downstairs carport, with a concrete floor and, oh joy! a power point.

This provided me with a smaller workshop but of course there are no noise problems. In due course it was cleaned and painted white throughout and fitted out with a workbench sited opposite the original 'quiet' lathe bench. The rubber-mounted outfit is still in place though it is no longer essential in the new 'solid' environment.

As a matter of interest, my Micro Mill attachment for the ML 10 was primarily designed and made in this little workshop. I was also greatly helped by a session at the local technical college before escalating fees closed everything down, which was a great pity. This attachment was awarded a Silver Medal at the 63rd Model Engineer Exhibition (1993/94) and serialised in *Model Engineer* from *M.E.* 3178, 7 October 1994.

As previously mentioned, I pass on my experiences in the hope that someone out there may benefit. I would advise readers never to give up. Most difficulties can be overcome with a little thought and effort. Remember the words of the sage: *Nil illegitimo carborundum*. I am sure one of the 'old sweats' will be happy to translate this for our younger readers.

Good luck, and work safely.



The prototype machine seen here in use in the Author's workshop. At this stage the machine is still under development and a pistol drill is in use to drive the work head until an improved drive can be developed.

A close view of the working area of the machine set up in milling mode. A model internal combustion engine camshaft is being milled to the required profile using the end cutting face of a standard slot drill.

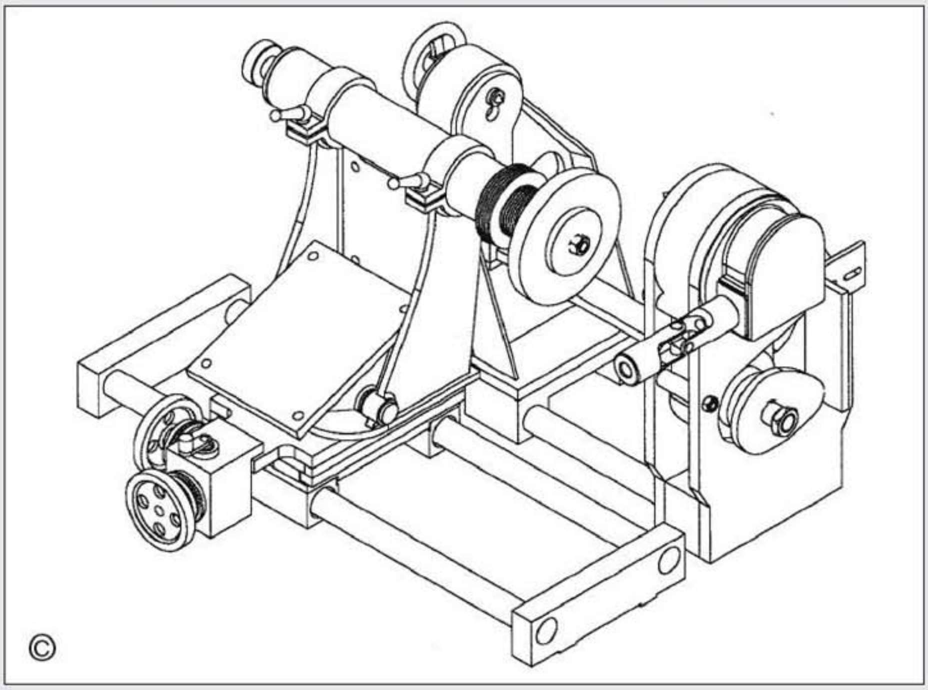
CAMCUTTER

A. J. Aldridge in South Africa, discusses the problems of making camshafts for i.c. engines in this introduction to his novel machine designed for use in the home workshop to machine and grind such camshafts.

●*Part I*

Newcomers to the world of model engineering are often advised to begin on the construction of something relatively small and easy before tackling anything complicated, even though the latter is really what they want to do. For those who favour the petrol engine, this would generally mean the classic single cylinder unit — probably a two-stroke. A few months down the line the engine will be complete and another decision will have to be made. If petrol engines still hold their interest, then possibly a multi-cylinder type will be uppermost in the mind of the constructor. However, if the original engine had been a four- stroke then already there would be some misgivings about making really big engines with, say, more than four cylinders. One of the more sobering aspects about manufacture of petrol engines, other than very basic ones, is the amount of repetitious work that they involve and the amount of careful and very precise measuring that each of those many components demand. There are valves and tappets, pistons and rods but the worst of the lot must be the camshaft.

L. C. Mason, who did much to popularise the model petrol engine in his articles and books, was well aware of the difficulties that a camshaft presents to the builder. In his book on making the *Mastiff* some 11% of the text is devoted to a piece of metal that is 150mm long and 13mm in diameter. As engines increase in size, so the difficulties in making adequate camshafts also multiply for the amateur. The cam in any engine leads a fairly arduous life and, because the tappet that bears on it is relatively heavily sprung to maintain contact, the wear and tear on an unhardened part would be intolerable even in a engine designed for very occasional use.

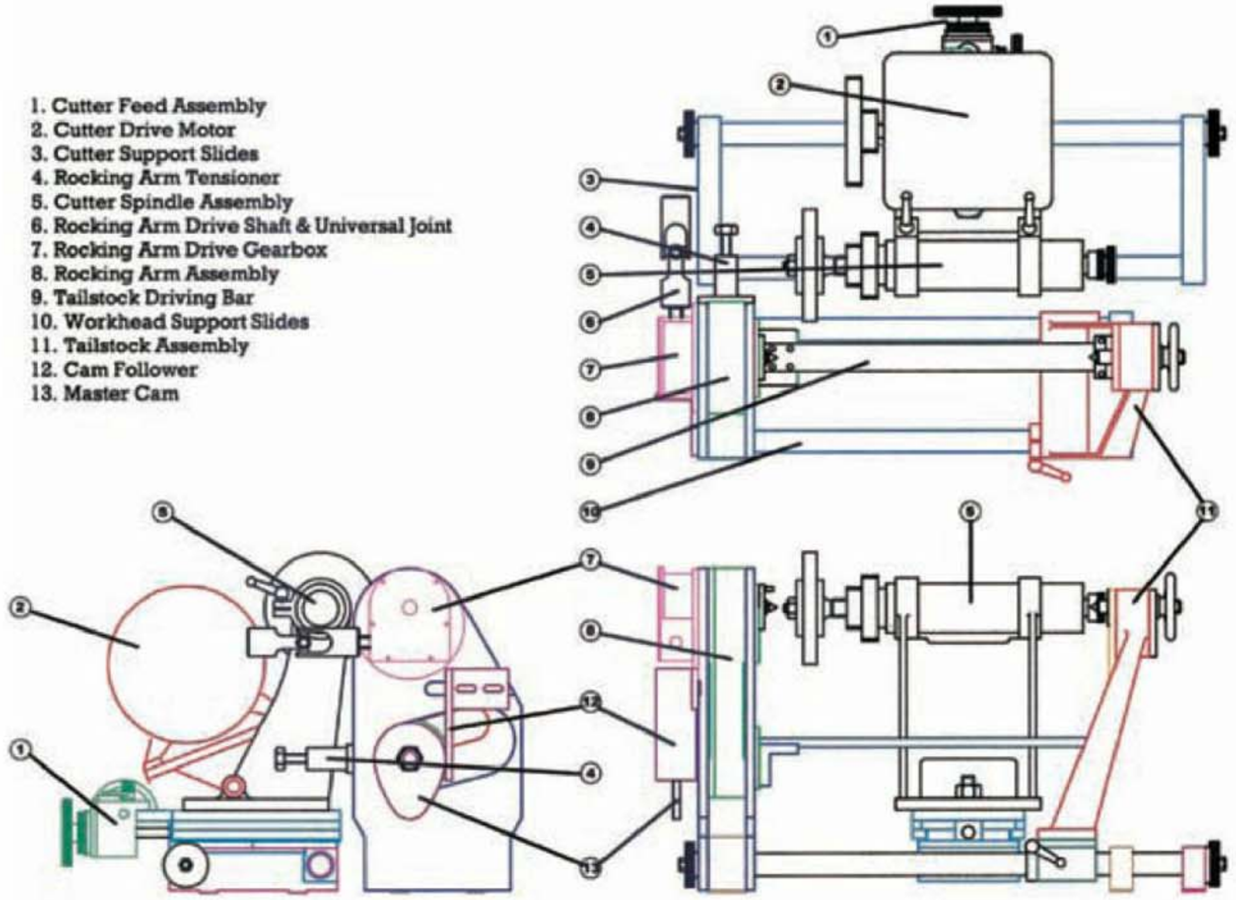


If the camshaft is in one piece and the engine is relatively large, so the shaft is approximately 150mm in length or more. The likelihood of bending the shaft is commensurately high. It is an unfortunate fact that hardened shafts can rarely be straightened. Bent shafts wreck bearings and Mr. Mason chose to make his camshaft as a series of separate cams all of which would be turned and hardened separately, threaded onto the shaft and carefully aligned to give the correct orientation using some form of jig or template. In this way he also got around the other enormous bugbear of solid shafts, namely, one mistake, which Sod's law decrees will be the last operation in the process, will consign weeks of hard, patient and often frustrating work to the scrap bin. With separate cams, at least the damage is limited.

However, one can imagine that with the simplifications made by Mr. Mason there still remained an enormous amount of careful work to make the shaft — as implied by the amount of book space allocated to the subject. It should come as no surprise that that the 11% of book space converts to a similar proportion of the time taken, which really means this one small object is probably going to take a couple of months to make, if you can get it right first time. I could not.

On a technical level, the shapes of cams produced by the two common methods of cam manufacture used by model engineers leave much to be desired. The simplest way to form a cam, and probably the one used more for the smallest of engines, is to mill the side flanks of a cam straight and then have some process to round the base (probably milling again) and then to blend in the tip or nose of the cam and the transitions to the straight sides. **Figure 1** shows that this is technically not good practice and leads to several undesirable features.

The alternative method involves building an eccentric turning jig which allows the constructor to turn the very shallow circular arcs that will constitute the flanks, nibble away the base circle as best one is able and then by filing, smooth out all the transitions. The problem is plainly that with both systems handwork is involved in delicate production stages where there is a very real chance of varying the point where transitions occur and thus disturbing the valve events. Cam manufacturers have long recognised these ▶

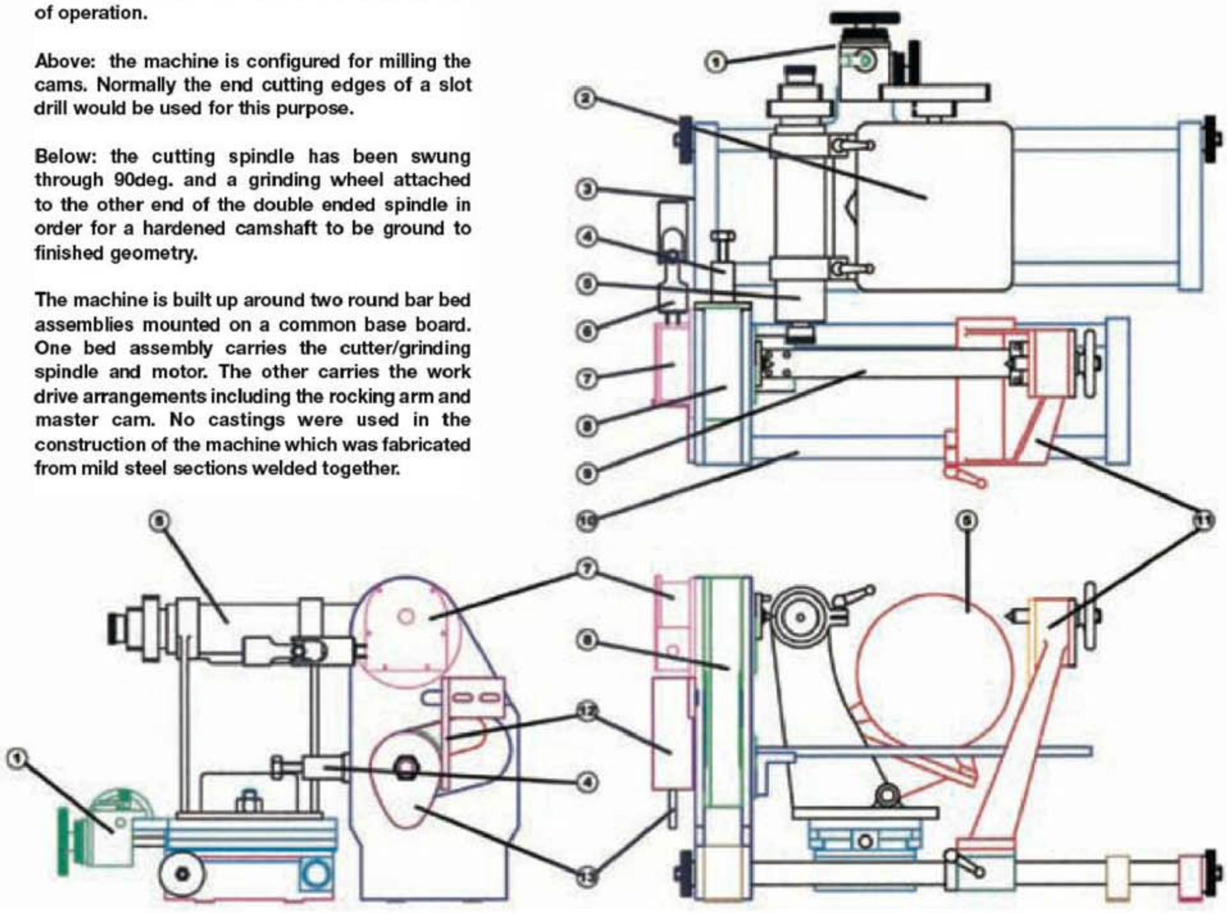


These two general arrangement drawings show the Camcutter machine in its two main modes of operation.

Above: the machine is configured for milling the cams. Normally the end cutting edges of a slot drill would be used for this purpose.

Below: the cutting spindle has been swung through 90deg. and a grinding wheel attached to the other end of the double ended spindle in order for a hardened camshaft to be ground to finished geometry.

The machine is built up around two round bar bed assemblies mounted on a common base board. One bed assembly carries the cutter/grinding spindle and motor. The other carries the work drive arrangements including the rocking arm and master cam. No castings were used in the construction of the machine which was fabricated from mild steel sections welded together.



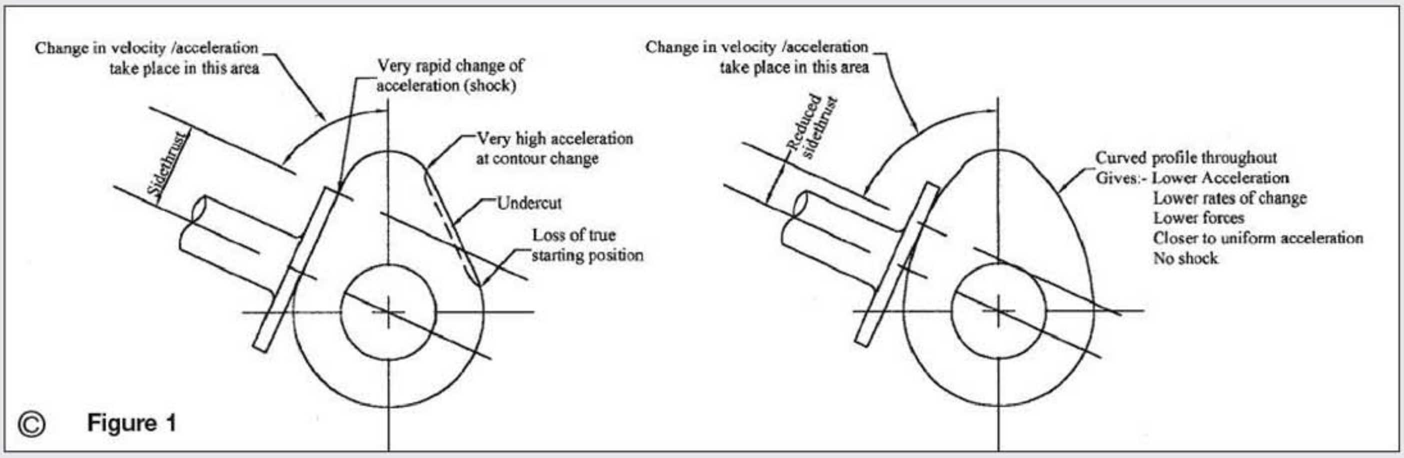
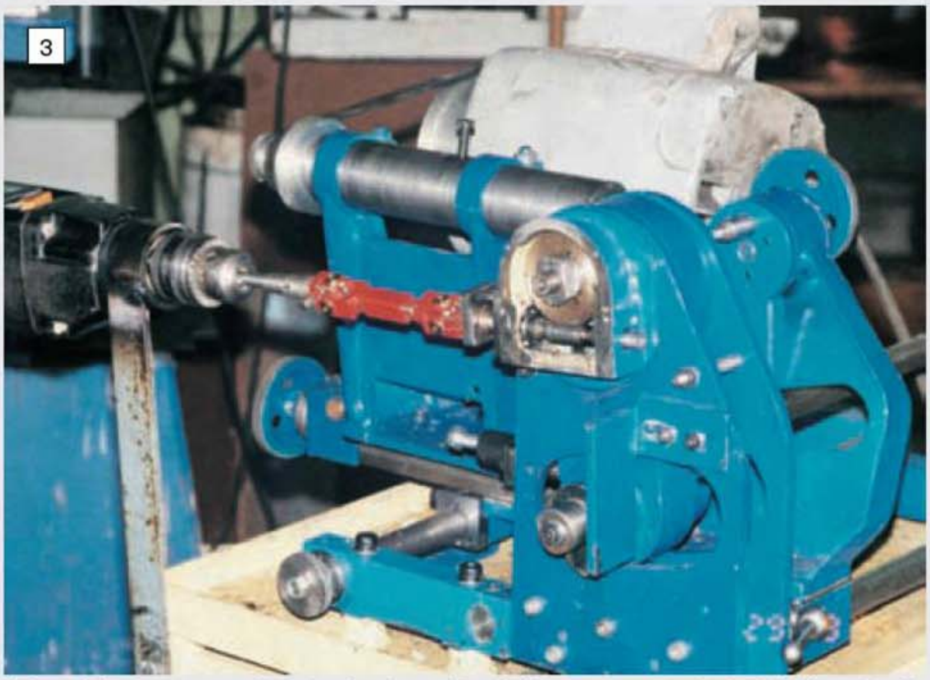


Figure 1

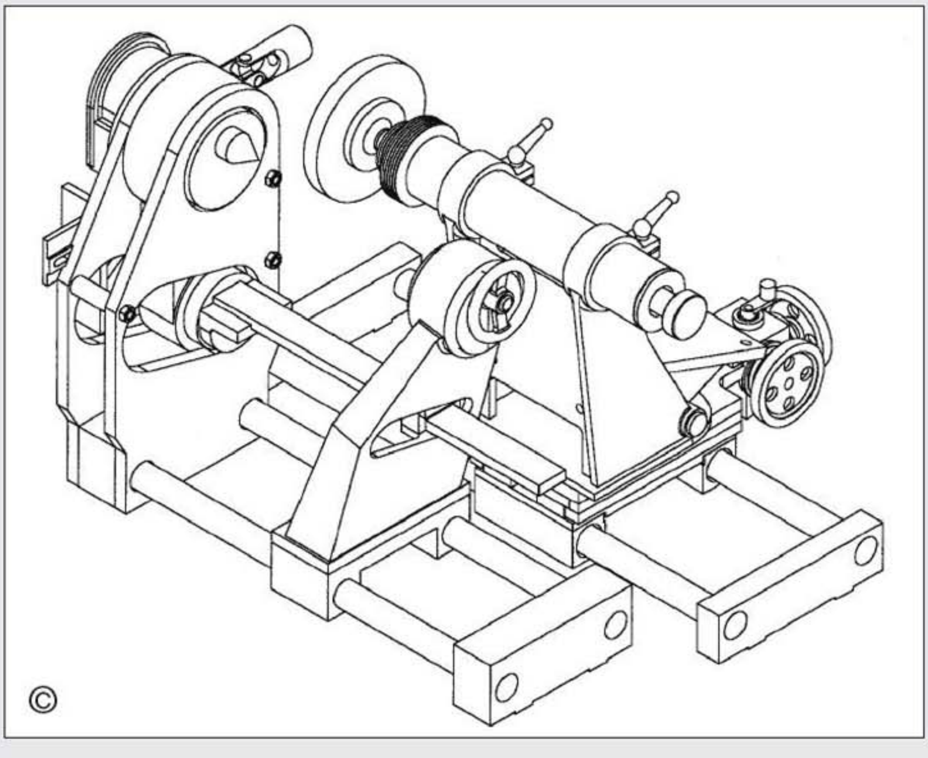
shortcomings and have developed special machines for the purpose of overcoming them.

Reviewing work on three shafts made by myself and all consigned to the scrap bin, one can see with a glass that there are many imperfections which may well end up as stress-raisers either in heat treatment or subsequently in service, causing catastrophic failure. On a shadowgraph machine a sectioned camshaft illustrated the point even more alarmingly as the angles of opening and closing were, in eight cams on one shaft, only correct in one place. That is an error rate of 15 out of 16. It also showed that even with a filing rest there was plenty of scope to run the file crookedly so the tappet would bear on a point and not a line. It was suspected but could not be proven, that the true line across the cam lay not parallel to the shaft but at an angle to it, which constitutes, for the follower, a point contact. Finally, the one shaft that appeared promising failed at heat treatment when it took a bend, which was only about 0.18mm but could not be straightened, which is my usual experience with hardened camshafts.

As one who is intrigued and interested in internal combustion engines in general and model engines in particular, it was apparent that the camshaft presented a huge stumbling block to my endeavours which could only be removed by improved methods, or building only two-strokes. Sad to say none of the easy options were seen as capable of any worthwhile development. All my work indicated that the only viable alternative was towards the design and development of a special purpose machine. Along with most model engineers I tend to resist that kind of thinking, but if one takes the long view that petrol engines do not take a lifetime to build as might be the case with a steam locomotive, that there will be more and they will be progressively more complicated, maybe bigger, then a special machine does not look so bad a proposition.



A view of the prototype machine showing the work head drive arrangements. A pistol drill is used until a reliable alternative has been decided upon. The master cam can just be seen partly hidden by the striker plate. The machine is set in the milling mode of operation.

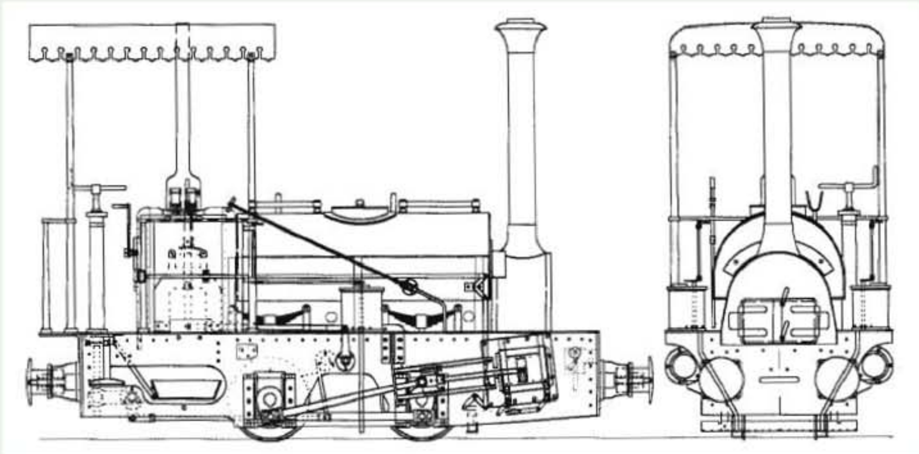


Exclusive of design, which was a late night occupation, manufacture of the machine took seven months of concentrated effort. That also included going down the wrong avenue and up the garden path, which is inevitable with a new design and without someone else's guidance. Seven months is a long time but it approximates to the time taken to build up and throw away three shafts for the same engine. A full eight station camshaft will now take me about a week to produce the turned blank, and two days to machine by milling the cams themselves, a further three to five days for heat treatment and one day to grind to finish size; it is this latter operation that really sets the machine in a niche of its own.

● *To be continued.*

D. A. G. Brown and Mark Smithers
continue work on their new design based on an early Manning Wardle locomotive, by completing the bearing brasses for the side rods and describing the cylinders and associated parts.

●*Part V continued from page 25 (M.E. 4225, 9 July 2004)*



ANNA
A MANNING WARDLE LOCOMOTIVE FOR $7^1/4$in. GAUGE

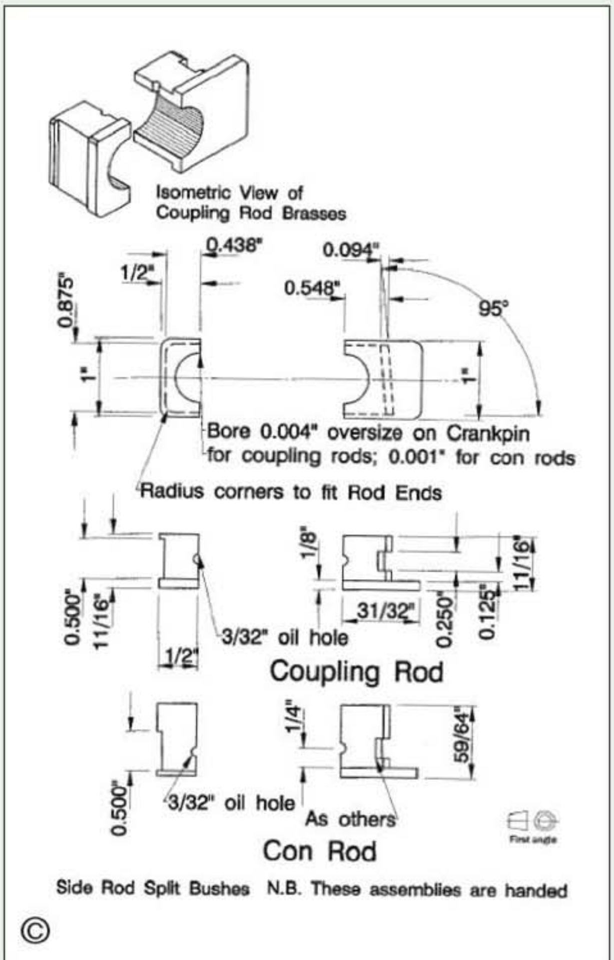
The Bearing Brasses form an interesting story on their own. I had certainly misinterpreted their shape and *modus operandi* but Mark came to the rescue with documentary evidence from Manning Wardle sources, so what you now see before you is a faithful interpretation of the original items. As has already been stated, these locomotives were intended for simple maintenance at their place of work without the luxury of visits to main workshops for anything but a really major repair. So the side rod bearings could be stripped with nothing but a Birmingham Screwdriver and an Adjustable Spanner — that would send shivers down the spine of some of my old ICI colleagues!

In the drawings included with part IV (*M.E.* 4225, 9 July 2004) the cotters were detailed, just cut from mild steel material and hammered into place, thereby holding the brasses in their proper positions. Two screws fitted in the tapped holes in the side rods stop the cotters from moving. The isometric view of the brasses should make plain their shape; apart from the depth, all six brasses are the same shape so let us look at how they are constructed.

The best material is leaded bronze which should be available in suitable stick section and is easily machineable. Starting with a piece of 1in. square material some 11in. long clamped to the milling machine table, reduce the height of $7^1/2$in. of it to $^{11}/16$in., taking the rest down to $^{59}/64$in. for the connecting rod pieces. Now imagine the embryo bearings lying face down, the next operation is to mill all but the last $^1/8$in. down by $^1/16$in. so as to produce the finished width of 0.875in. to fit the large slots in the side rods snugly. Make marks along the strip of metal representing the divisions where you will eventually have to saw it into 12 pieces, alternately $^1/2$in. and 1in long. At the marks where the ends of the longer pieces fall, use a $^3/8$in. slot-drill to the same depths as before to rough out the shield sections which are drawn at the right-hand side of all the views. You can now saw into the 12 bits required and finish machine the ends flat and to precisely the correct lengths. Machine the $^1/2$in. wide slot $^1/16$in. deep in the left-hand ends of the smaller parts to make a good fit over the slots in the rods.

Stick together in pairs, using Superglue and making sure that each pair is accurately aligned. You can use this pairing to form the bearing holes, holding the components in the 4-jaw chuck and aligning truly as already described so as to put the hole exactly on the centre-line. Note that since the height between machined faces is 0.875in. and the effective width of the smaller piece is just half of this value, using the dial gauge trick requires exactly the same reading on all three of the machined faces as you bring the dial gauge up to touch each surface in turn. Note the sizes for the holes specified to allow for axlebox movement in the coupling rods. If you cannot touch the surfaces beneath the chuck jaws with the dial gauge, touch the *outside* edges of the jaws themselves to achieve the result.

Machining the pressure faces at 5deg. to the vertical is another job for the $^1/2$in. slot-drill and in each case this should be followed up with a $^1/4$in. wide slot for the tapered cotter in the position shown. Don't forget that these parts are handed to fit each side of the locomotive. Before breaking the bonds between parts, drill the $^3/32$in. dia. oil holes to line up with the larger holes in the tops of the rod ends. Finish with a file by applying clearance radii to the corners.



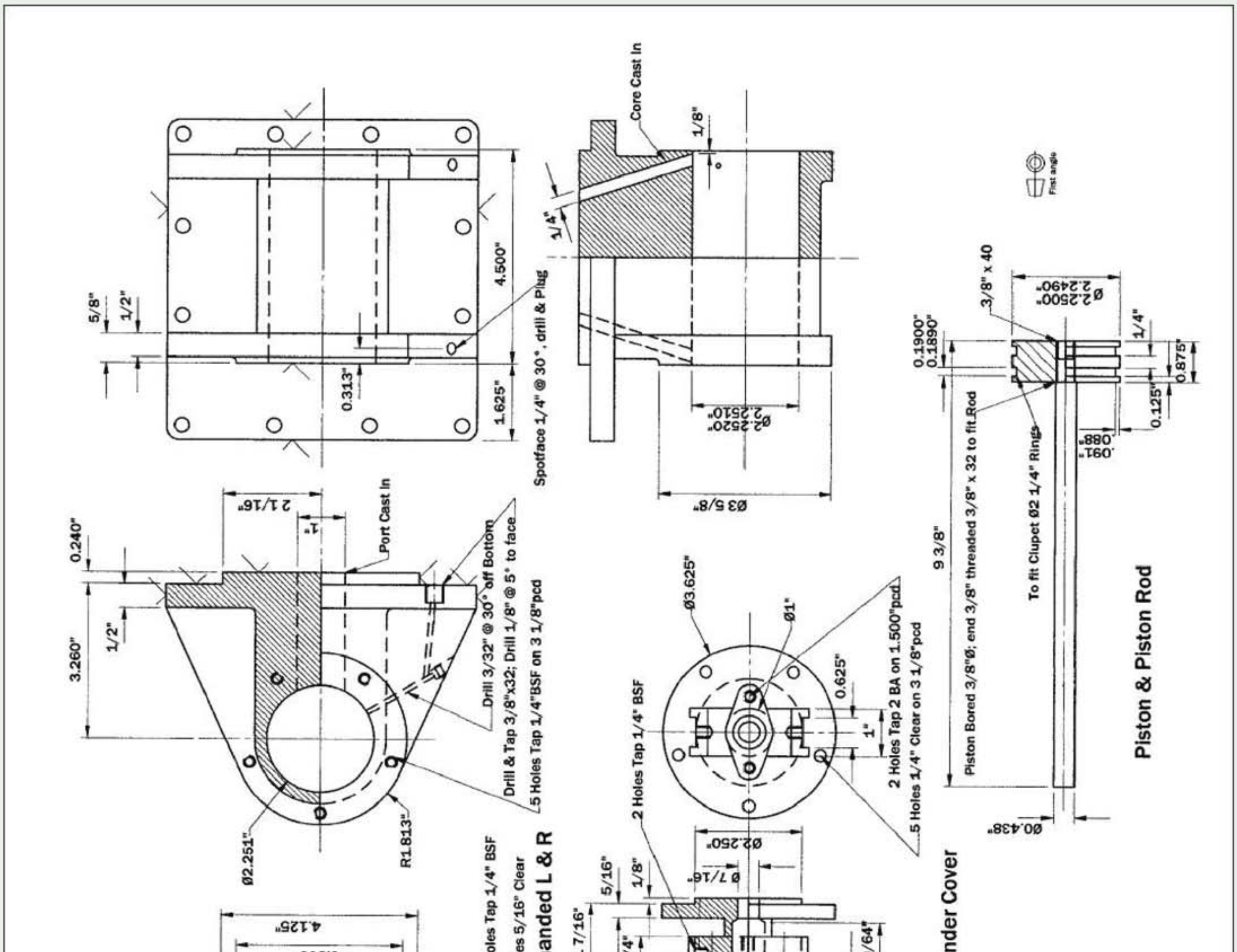
Side Rod Split Bushes N.B. These assemblies are handed

Cylinders

Two iron castings are available, with ports cast in. The drawing states that the cylinders are handed, but this refers only to the positioning of the drain cock assemblies relative to the large flange on each casting facing the rear of the locomotive. If you offer up the two castings back to back, this should become obvious.

The first job on the cylinders should be the main bore and for this it may be best to push a wooden dowel into the cored hole with sufficient sticking out of the hole to gauge how the casting is running in the lathe. Set to run as truly as possible in the 4-jaw chuck, but before starting on metal removal check the lie of the bolting flange that mates with the main frames to make sure that it is reasonably parallel with the lathe bed. You should be able to handle the cylinders if you have a large lathe with at least a 10in. chuck. Bore to the tolerance given and face the flange for the cylinder cover. The tight tolerance is to enable the fitting of Clupet piston rings, as discussed in the section on the pistons. To face the bore to length, either hold the casting the other way round on a stub mandrel, or alternatively on the outside surfaces of the jaws of the 3-jaw chuck, being careful not to take too deep a cut!

Having established the bore, bolt the casting to an angle plate on the table of the milling machine with the bore aligned true to the X-axis. It is now important that



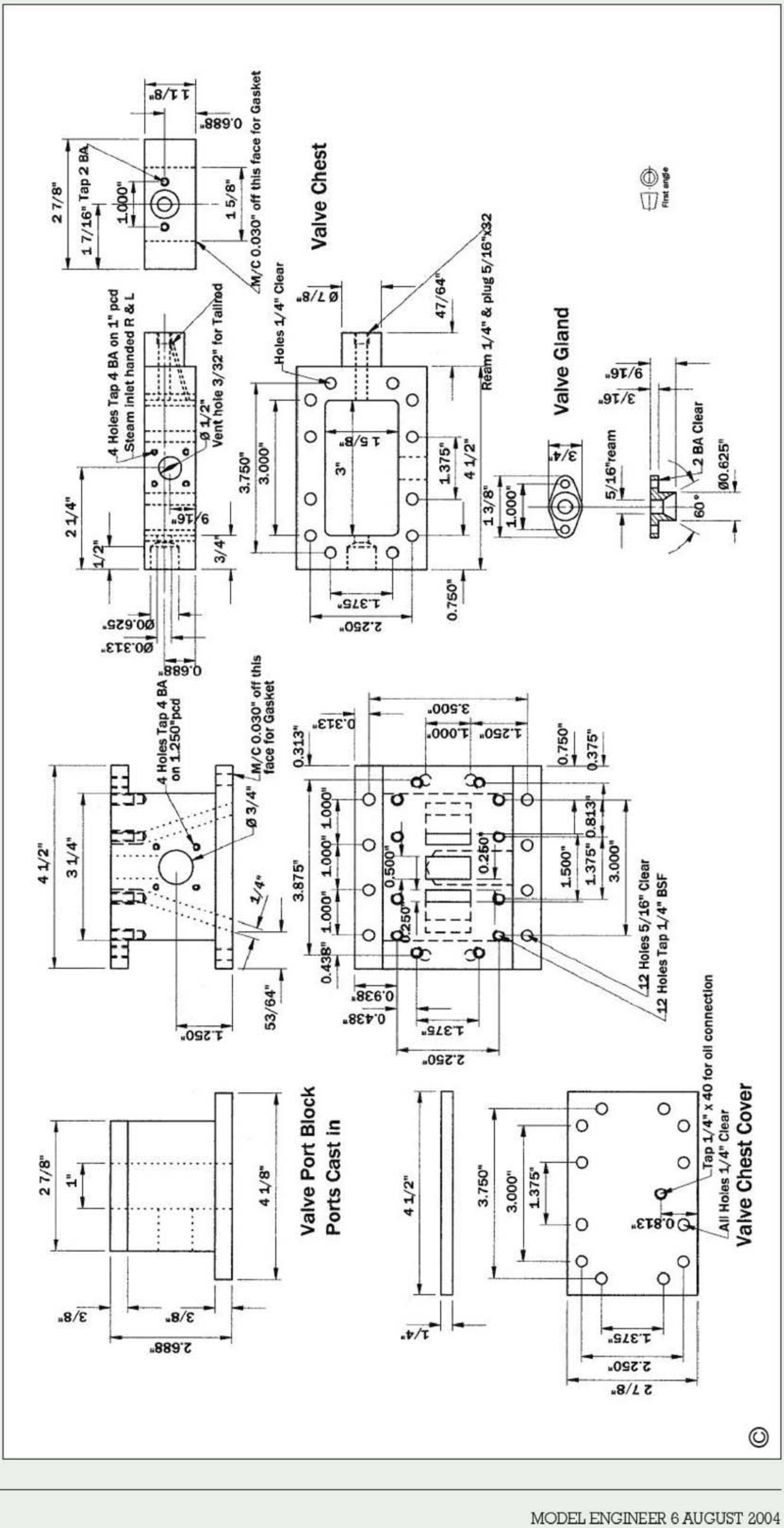
the main flat surface is machined exactly 3.500in. from the centre line of the bore, as well as finishing 2.063in. on each side of the centre-line. You therefore need to define as a datum the bore centre-line — not an easy task if you cannot see the machined surface from above it. So, before bolting the casting to the angle plate, turn up a 3/8in. length of bar to be a good fit in the bore and clamp it on the surface of the angle plate, using a long fixing that will eventually restrain the casting in place (see figure on p 143).

Having clocked the angle plate true to the Y-axis, find the centre of the stub which you have just placed, either optically or by touching both ends of its horizontal diameter with a short test bar held in the drill chuck. Halve the difference between the two end readings and reset the Y-axis index dial or digital readout to zero. With a vernier or depth micrometer measure and record how far the top of the angle plate is above the cylinder centre-line. When the cylinder casting is fixed over the end of the stub bar, its centre line will be immediately registered. A piece of 80gsm paper (normal typing stuff) placed between the casting and angle plate will prevent any unwanted movement.

When you are satisfied that metal will come off reasonably evenly from both sides of the centre-line, take light cuts over the main flat surface until, making use of the depth figure recorded in the last paragraph, the height of the flat surface above the centre-line is 3.500in. Similar treatment to the flange areas around the main flat surface must bring them also to the correct dimensions. If your machine travel is big enough, you can finish around the perimeter of the casting at the same set-up; my Y-axis travel is certainly not enough, but it is sufficient to cover all the hole centres. Since you have requisite datum positions, plant all 26 holes while the casting is on the angle plate; drill and tap the drain-cock holes to a depth of 7/16in., but do not start the 1/8in. dia. extensions just yet. Note: the drain-cock holes must be drilled two as drawn and t'others at the top of the piece, so as to effect the handing of the cylinders on assembly.

You can now take advantage of the centre datum which is still there, to position the two pairs of holes for the cylinder drain cocks. For the smaller of the two, tilt the casting by 60deg., move X to 0.313in. in from the flange face and sink deeply, first with an 11/32in. slot-drill, then with a 3/32in. dia. drill and finally with a 3/8in. slot-drill to enable the tap to cut truly. Repeat at the other end of the cylinder. Now rotate the cylinder so that it is 5deg. off the original level and drill 1/8in. dia. from the 3/8in. x 32tpi tapped holes into the other ones which you have just made. You now have the correct positions for the drain cocks. During the design process Mark pointed out that this is the correct position for the cocks, not directly underneath the cylinders, and it will certainly avoid the problem of getting them knocked, a fate which befalls so many miniature drain cocks.

The final sets of holes in the cylinders are the five 1/4in. dia. BSF holes for each end cover. I realise that not everybody has a rotary table, and furthermore its positioning beneath a 6 1/2in. lump



of metal may impossibly restrict the headroom to the spindle, so why not clamp the cylinder block to the table with a flange uppermost and clock the flat machined surface, on which you have just been working, parallel to the Y-axis? Find the centre of the bore and then move the table to the five positions in the table to arrive at the centres of the five holes to be drilled and tapped; this procedure ensures that the end covers can be aligned truly with the slidebars in their correct positions.

X(in.)	Y(in.)
1.563	0
0.483	1.487
0.483	-1.487
-1.264	0.919
-1.264	-0.919

Cylinder covers

The front covers are made from slices of cast iron and are simple turning jobs, finishing with their holes as described above. The centre hole enables sighting of the piston during valve setting if required, as well as access for possible pressure measurement later on, and forms an anchor for the cladding material.

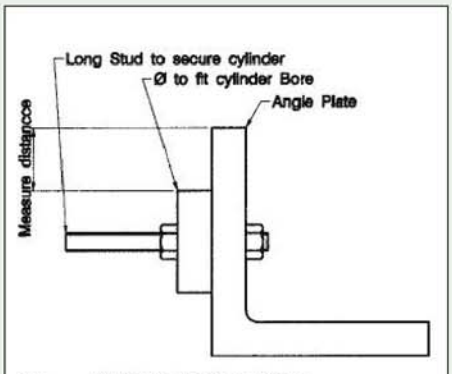
The back covers are from tricky little castings and must be made to the same precision as described for the cylinders themselves, particularly regarding the positioning of the holes in the bolting flanges. Hold in the 4-jaw chuck and get the main flange running as true as the metal will allow, to machine the face and register which fits the cylinder bore. Aim to get a good fit in the bore and, before disturbing from the chuck, drill right through 3/8in. dia., bore and ream as necessary to 7/16in. diameter. The far end of this bore will be picked up at the next operation for enlarging to fit the packing. Finish by skimming the outside diameter to finished size.

Mount the casting with the face just machined in the chuck jaws, running within 0.001in. TIR (total indicator reading), bore out to fit the packing and skim the face to size. Now drill the five bolting holes as described above, only align the casting by eye so that the two flanges sticking up appear to be the best fits to the Y- and X-axes of the machine. Then drill and tap the other two holes for the gland.

The other major operation is to form the grooves for the slidebars, which must be exactly above and below the centre-line of the stuffing box. If you mount the casting in a machine vice, holding it between the flange face and the stuffing box face, you can use a 1/4in. dia. rod in each of two of the flange holes set to touch a side of the jaws, in order to align the cover ready for milling the slidebar slots. If the jaws are unsuitable, then use a set-square against the rods for the same purpose. Now pick up the centre-line of the casting and mill with a 5/8in. dia. slot-drill to the required depth. Finally, drill and tap 1/4in. BSF the fixing holes.

Piston and Rod

Each Piston Rod is a 9 3/8in. length of stainless steel, which is normally straight and to a good finish. Hold in a collet or support by means of a fixed steady and reduce the end 3/8in. to finish as a 3/8in. x 40tpi thread. The pistons are slices of cast iron stick, which must be concentric outside and inside, therefore all machining must be done



Cylinder holding fixture

at the same setting. Face off to clean up, drill for screwcutting and bore 1/2in. depth to a diameter of 7/16in. to a good fit on the rod. Place the grooves for the piston rings as drawn; the outside diameter of the groove bottoms is not critical, hence a generous 0.003in. allowance.

The side clearance however, is important to enable the ring to be forced out onto its bore by steam pressure underneath. The late Tom Walshaw was very interesting on the subject of fitting piston rings and I would commend for your reading the series he published in *Model Engineer* a short time before his death. I once had a piston ring seize in its slot, through being made too close a fit, and his advice was sound: to make sure that there is a little shake before slipping the rings into place. You may be interested to know that the piston rings specified are the very pattern used on Morris 8 motor cars.

Valve Chests and Blocks

I have separated the valve port blocks from the cylinders to make them easier to cast, since the ports would have been very difficult to construct in the foundry. We have, therefore, a significant hunk of cast iron as a valve port block, which is fixed to the cylinder by means of the 12 bolts as already indicated. The important machining job is that on the top and bottom faces, which should be flat and parallel to each other. It is obviously a task for the 4-jaw chuck, to be followed by drilling and tapping the holes as drawn. Make sure that you start off by attacking the top (smaller) face, picking up as a datum the dead centre, as defined by the positions of the steam ports. Trim the ports by end milling, making sure first that the foundry have not left you a present of some sand within the port orifices!

While the casting is the right way up on the milling table, take a facing cut over the whole of its 4 1/2in. length at bottom flange level, to enable you to drill the first eight 5/16in. dia. holes. Reverse the casting and treat the bottom face in a similar manner, picking up the holes already drilled as the datum for the remaining four. The part needs now to go on its sides for finishing the remaining sections of the bottom face, as well as reducing the perimeter to taste. On one face there needs to be at least a large spot-face, in the area around the exhaust port so that the exhaust pipe can be seated without a leak. The four 4BA holes will respond to X and Y co-ordinates of (1/2 of 1.125) cos 45deg. = 0.398in. in each direction.

Note what has been written about gasketing: in fitting these components and the valve chests, I have drawn them on the assumption that there is no gasket. I strongly recommend the fitting of such a material, so whatever is to be used, the equivalent of its thickness needs to be removed from the underside of both sets of castings.

On a design point: you will notice that the steam has to negotiate quite a long passage between the valve chest and the cylinder, not the ideal arrangement for a fast locomotive; but remember these machines were designed for trundling duties in the workshops areas and their design was adequate for the purpose. In model size this is probably of less significance than in full size.

The Valve Chests can be treated in a similar way to the Valve Port Blocks, insofar that machining of their tops and bottoms, and positioning of the holes is straightforward. It is however, prudent to take a lick over the outside 4 1/2in. long edges so that they may be supported in the 4-jaw chuck for centring truly parallel to the lathe bed. The rear end boss is offset vertically from the centre of the casting and, unless you have access to a horizontal boring machine, the two ends must be treated separately for placing the holes. Make sure that the valve rod is a very easy fit in the tail end hole; nevertheless, I have drawn a relief channel to avoid hydraulic locking especially if the steam is wet!

When it comes to drilling the 1/2in. dia. hole for the steam entry, note that the two chests are handed, so that the entry is on the top edge of both. As before, the 1in. PCD for 4BA tapped holes is mapped out by co-ordinates of 0.354in. in all four quadrants. Finally, don't forget the removal of the 1/32in. gasket thickness.

Covers and bits!

The Valve Chest covers are simple. We do have castings available, since it may be difficult to source suitable slab material. If you make a tapped hole on the centre-line at the position shown, that will be ideal for connecting the lubricator feeds which will be described.

The other component on the current drawing is the valve gland, ideally of brass, since it does not form a wearing surface and is not in contact with steam. The countersunk hole tends to compress the soft packing material. Some years ago I was given a small quantity of carbon fibre packing, which is ideal. In use on my Hunslet it has never had to be pulled up, neither on the valve spindles nor on the piston rods. It is mucky old stuff to install, but once in place, you can forget about it.

One final point about assembly: do use studs of suitable length, along with washers and nuts. Such details make a great deal of difference aesthetically and help with positioning machined castings and their gaskets.

Next time we shall do some tidying up in the areas which we have already tackled.

Mea culpa!

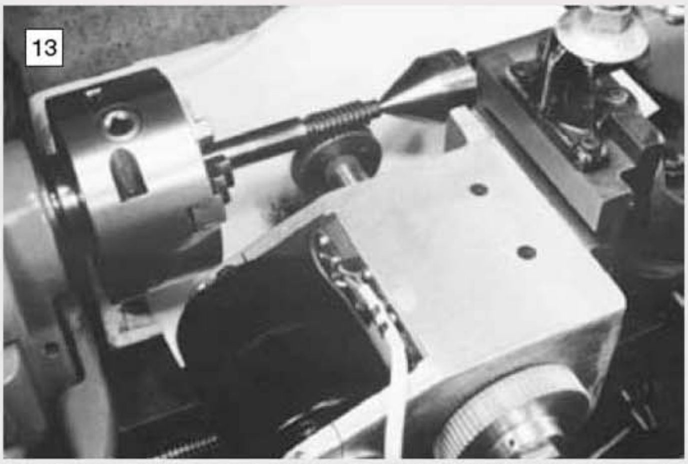
I am grateful to Mr. Eric Parker of Wakefield for pointing out an error in the penultimate middle paragraph in Part II of this series, on page 679 (*M.E.* 4223, 11 June 2004). The eight spring hangers require material 1 1/2 x 3/4in. section.

Suppliers

Drawings, castings and laser cut frames and other components, etc. are available from the designers. Contact D. A. G. Brown tel: 01780-753162; e-mail **dag.brown@btopenworld.com** or Mark Smithers tel: 01609-773734; email **marks_northall.yorks@tiscali.co.uk**

●*To be continued.*

Gashing the gear teeth in one of the wormwheels. The teeth were taken to two-thirds of finished depth.



Hobbing one of the wormwheels with the previously finished hob. The work is mounted in the Author's mill/drill attachment with the drive belt removed.

MICRO-CULTIVATOR

Frank Taylor

continues his description of a handy implement for use in small gardens.

●*Part II continued from page 21 (M.E. 4225, 9 July 2004)*

Shown here in **photo 12** is a set up similar to that in photo 11 (see *M.E.* 4225, 9 July 2004) but the blank has been set over to the helix angle of the worm. There has also been a change of cutter to a 20deg. tooth form and the dividing plate fingers set to cut 44 teeth. To the best of my recollection, the teeth were cut to approximately two-thirds of the required depth.

Hobbing the wheels

As the set up shown in **photo 13** was being assembled I have to admit that I was nervous. Was I about to ruin the work previously done? My home-built mill/ drill was used to support the wheel, as it has over-large ball races and provides good support. The drive belt has been removed to take away the loading of the motor. After bringing the gear on centre line, the teeth were meshed with the hob. On starting, the gear revolved obediently and the cutting turned out to be very free and a joy to do. However, when I disengaged the gear, before taking the full cut, I noticed that the cut was not on centre line. It was about 0.01in. off which I corrected by moving the cross-slide the appropriate amount and thinking I must be more careful with the next wheel.

The enjoyment continued to the full depth and the result was pleasing. The next wheel was set up with great care but the result was the same with the same correction being applied. It appears to me that the gear is not driven by the cutting edge, which is not surprising, but by the flanks of the teeth which follow it. This raises the question — does this alter the shape or spacing of the teeth or the final centre distance of the gears? As far as I could tell, the worm wheel seemed to be okay, but as a precaution the cast iron wheel shaft bearings were made with 0.012in. eccentricity (TIR) and could be rotated and locked as required to provide adjustment.

A closer look at the worm gears, worm, and a wormshaft bearing (in cast iron) is shown in **photo 14.** The worm has a reamed hole through it and is pressed on and pinned to the shaft. Inserted into the right hand end of the shaft and just visible, a hardened steel ball takes the thrust of the shaft.

Tine shafts

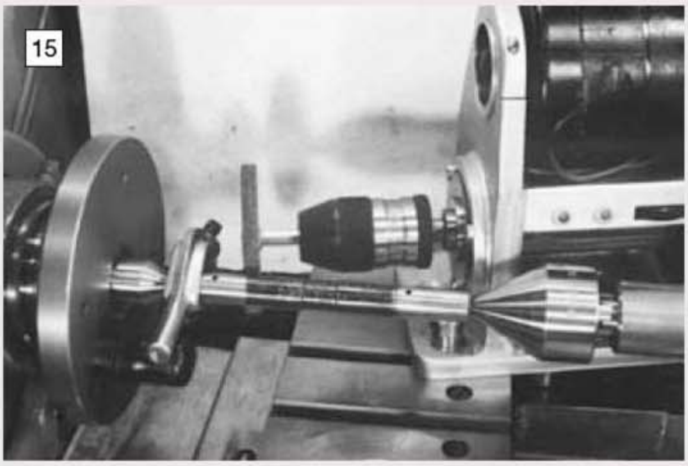
These were made from hardened and tempered silver-steel. The shafts are fairly long and it was expected that they would be bent after hardening. I usually heat such items rotating them vertically fixed to a length of small diameter stainless steel rod in my old drilling machine (which is believed to have come over from the USA during the war on Lease/Lend and it is still going strong). The machine is tall and the heated end of the rotating rod can be quenched by lifting the tin of quenchant up from below while still rotating. There is need to watch that the flame of the torch only heats the job. While I have found that this method minimises distortion, it does not eliminate it. One shaft turned out to be straight, the other had about 0.004in. (TIR) at its end when rotated so there was a need to grind them true.

Grinding the shafts

My grinding operation could best be described as a hazardous adventure as I do not have proper equipment for the job. This meant improvising and taking a few calculated risks so the following photographs are to show how I did it and *not* how to do it.

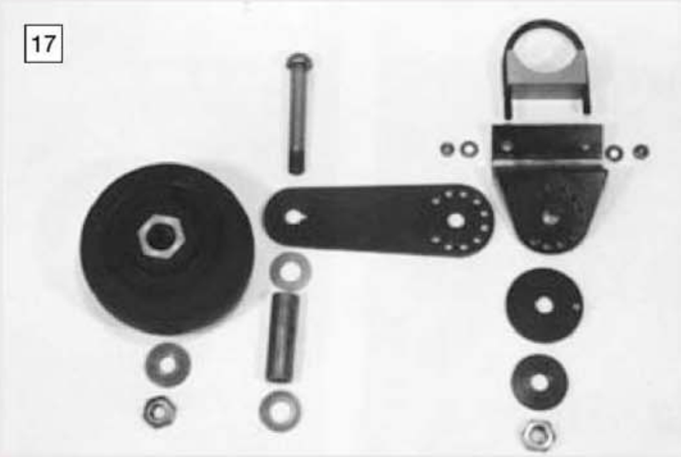
Photograph 15 shows the set up. The lathe is arranged to run in reverse at top speed so that the grinding surface speed adds to that of the mill/drill. However, the surface speed is still much on the low side. One has to be mindful that the grindings is upwards — not an ideal situation. Unscrewing of the driving plate was a worry. It was firmly screwed on and the friction proved adequate for the small amount of drive needed. The next thing was to protect my precious and much loved lathe before covering myself and the rest of the workshop.

The finished wormwheels and worm. The latter item is hardened and polished to reduce wear in service.



The method used to correct the distortion in one of the wormshafts. The lathe was well protected before grinding began.

The grinding operation under way. Newspaper was used to prevent the grinding debris getting into the slides or bearings of the machine.



One of the undercarriage assemblies in component form. Two are required, one each side.

With all this accomplished we now move to **photo 16**. Here the lathe is in its 'desert warfare kit' and the job is being done. I am not in the picture but am controlling things down at the end of the leadscrew. Each pass was arranged to take off 0.00025in. to 0.0005in. with which everything seemed to be happy. It was an uneventful operation which produced an accurate shaft with a surprisingly good finish. An amount of 0.00025in. was left for hand finishing which produced a mirror finish. After very carefully undressing the lathe and seeing it still smiling I felt happier about this dodgy operation. The finished shafts have already been shown in photo 2 (see *M.E.* 4225, 9 July 2004).

The rest of the mechanics

There is not a great deal to say about these parts; perhaps we can browse through a few photographs and see what comes up.

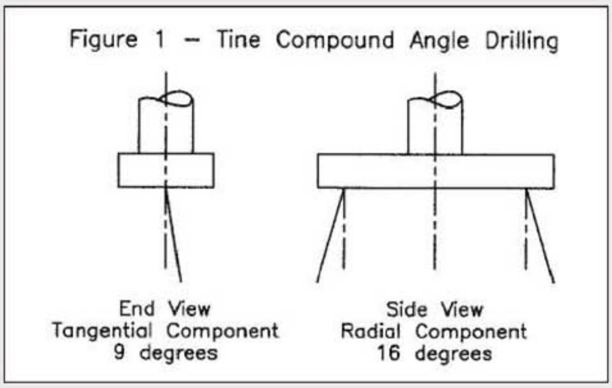
Photograph 17 shows the component parts of the undercarriage laid out prior to assembly. The ring of holes visible in the components in the right hand corner are spaced so that they were like a vernier. When the thick washer with a peg, seen underneath these components, is assembled it may be placed in any of the holes and provides a very fine adjustment.

Photograph 18 shows the undercarriage after assembly of the components. The method used to produce the two sharp bends in the bracket were learned from John Wilding through his $^{3}/_{4}$ second pendulum electric clock article which began in *M.E.* 4076, 11 September 1998. The method is worth repeating. The metal is cut about seven-eighths of the way through (I did mine by using a slitting saw in the lathe). Using a 3-square (triangular) file, the inside of the cut is filed out and the metal bent by hand. More filing and bending follows, and so on, until you get the required angle. The cut was then brazed.

An assembled undercarriage or road wheel assembly.

Photograph 19 shows the gearbox top cover together with another small casting with flat sides. These fix a chrome plated tube forming part of the handle. The two parts are bolted together and the friction is sufficient to lock the handle in the desired position.

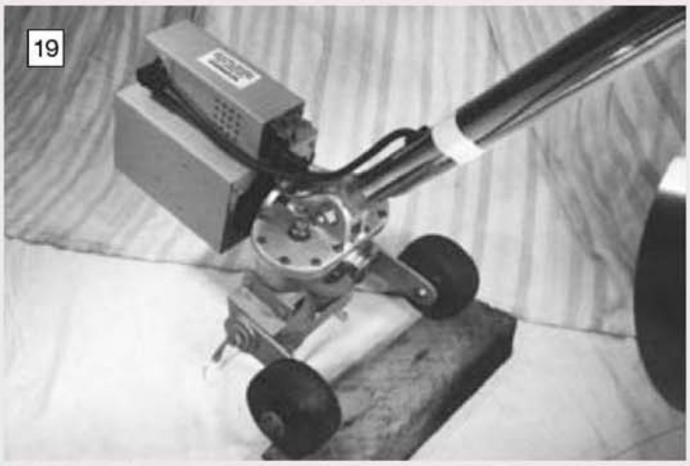
Photograph 20 shows the other end of the chrome tube which terminates in another casting and is fixed to the handle bar. Also, just visible, are the handlebar controls. On the underside of the right is a switch which operates when the bar is gripped. On the inner part of the left handle is a self-restoring press button which forms the start switch. These will be referred to later.



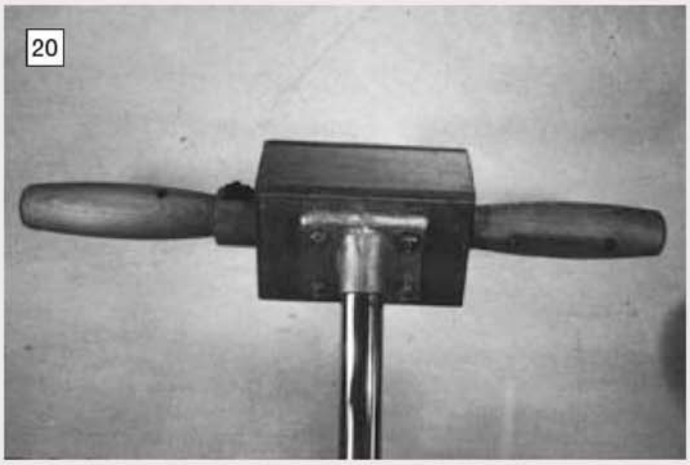
Tines

These are best seen in photo 1 (see *M.E.* 4225, 9 July 2004) and **fig 1**. I am sure that there is much science in earth treatment/moving and it was expected that the tine shape would go through many mark numbers before satisfaction would be reached. However, for some reason I seem to be blessed with considerable beginner's luck and these tines were okay first go. The shape is a little difficult to define but I can but try and will do so in the next instalment of this series of articles.

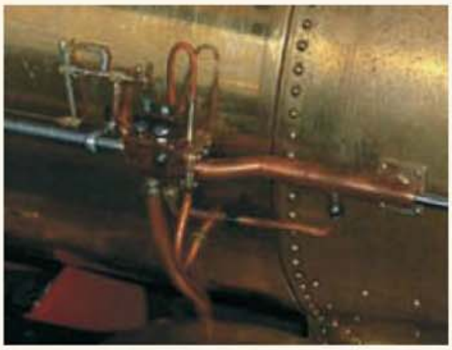
●*To be continued.*



This photograph shows the top cover and pivoted handle mount. The main handle shaft is a chrome plated tube.



The casting made for mounting the handlebars. Note the sturdy turned wooden handles.



The dummy ejector fitted to the Author's model of a Midland class 3F.

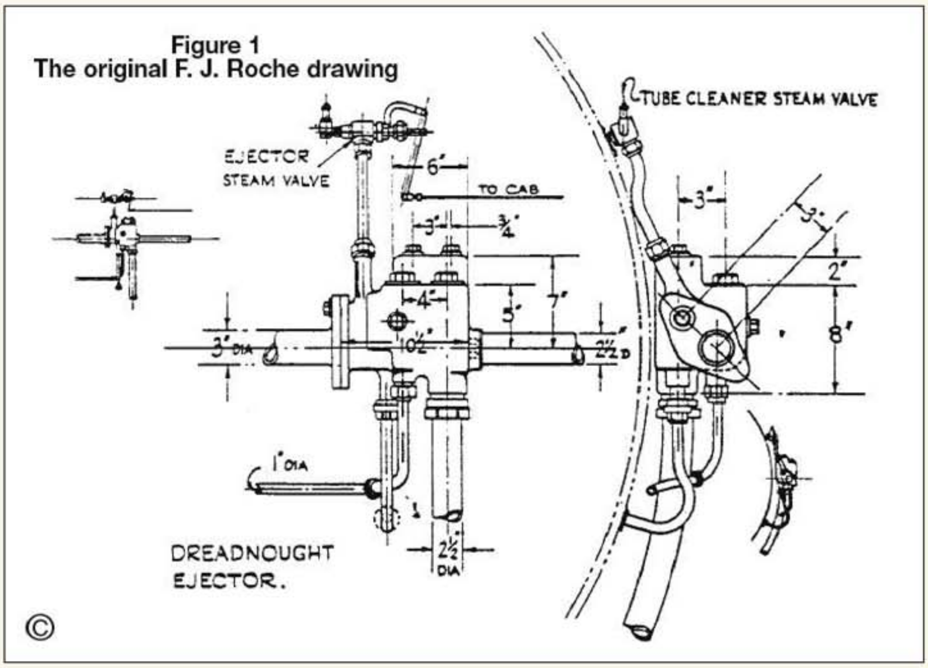


Figure 1
The original F. J. Roche drawing

DUMMY EJECTOR
FOR A MIDLAND RAILWAY CLASS 3 LOCOMOTIVE

Geoff Dowden
describes how he constructed this convincing feature for his model.
●*Part I*

During the latter stages of construction of my Midland 3F locomotive, the occasion arose when I needed to provide the dummy ejector assembly which is positioned in a very prominent location on the right-hand side of the engine just to the rear of the smokebox. The main body of the unit is situated a little above the boiler longitudinal centre line. Unaware of any suitable sample being offered through the usual trade outlets there seemed to be no alternative but to attempt to 'knock-up' my own. A decision I have to say, that was made with a general feeling of apprehension as I firmly believe that it must be of some help on these occasions if there is some understanding by the builder of how the prototype works. I must confess that at the outset I had little knowledge of the purpose of the ejector and knew even less of its *modus operandi*!

Nevertheless the production process began and, relatively early on I contemplated the idea of recording my experience for the benefit of other model engineers. However, I initially dismissed the idea as, on reflection I considered that such an essay would have an extremely limited appeal. After all, the world of model or miniature engineering is not exactly overrun with Midland class 3 locomotives. However, as my search for information extended I came to realise that the equipment, as depicted in **figs 1** and **2**, or indeed something very similar, embellished a multitude of locomotive classes. These include the Midland Fowler and the LMS Stanier class 2, 3 and 4 0-6-0s, 2-6-4Ts, 0-6-0Ts, un-rebuilt Patriots, Scots, the Somerset and Dorset 2-8-0s and the Hughes 2-6-0 Crabs. There may well be more and so I reversed my original decision and trust that these notes may be of interest to a wide number of readers.

The following articles therefore reflect my approach to the problem and the manner in which the finished item was produced. This was with only the aid of an F. J. Roche LMS Standard Detail/L1 drawing shown here as fig 1, and by reference to as many contemporary photographs as I could lay my hands on.

Although none of this versatile and numerous class survived the cutter's torch, I was well aware that in the worst case scenario, I did have the option of seeing the real thing on any number of locos of Midland or LMS ancestry. These include the 4Fs that fortunately have survived into preservation. As it turned out, I did not have to make a trip to the Keighley and Worth Valley or the Midland Railway Centre at Butterley, as I think I have managed to fabricate an assembly which reasonably resembles the photographic images but would probably not fool for one moment any self-respecting locomotive fitter or knowledgeable buff.

However, first things first. A suitable drawing from which I could work would be of some advantage and the obvious starting point was the Roche drawing, albeit that this had been prepared for a left hand drive engine and only detailed a number of the principal dimensions. In order to avoid irritating complications it seemed logical to amend and re-draw a mirror image of the Roche drawing that would suit my purposes much better. The amendment mentioned concerned the position of the item labelled 'tube cleaner steam valve' which is shown on top of a short length of vertical pipe above the main ejector body unit. On the class 3s, appraisal of photographs indicate that this valve is at the end of a loop which doubles back behind the ejector body towards the cab and is then located on top of a short length of pipe. Now equipped with a suitable drawing, shown as fig 2, I decided that the task could be achieved by treating the job as four elements: the main body, the three lower connecting unions, the front flange and exhaust pipe and the tube cleaner steam valve assembly. So I began operations with the main body component shown as **fig 3**.

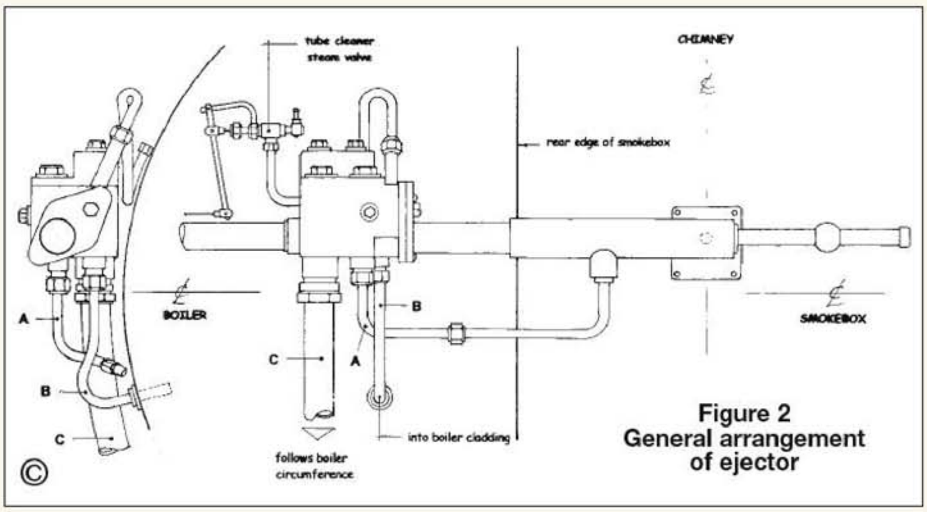


Figure 2
General arrangement of ejector

Main body unit

A suitably sized chunk of brass was salvaged from the stock box and clamped in the vertical slide for a straightforward milling job to produce the appropriate dimensions before transferring to the drill press for drilling and tapping as indicated. The only slight difficulty was to produce the tapped hole for the offset pipe which leans some 25deg. or so towards the boiler casing. Rather than tilt the table of the bench drill I opted to scribe the

Figure 3 - Main Body Block

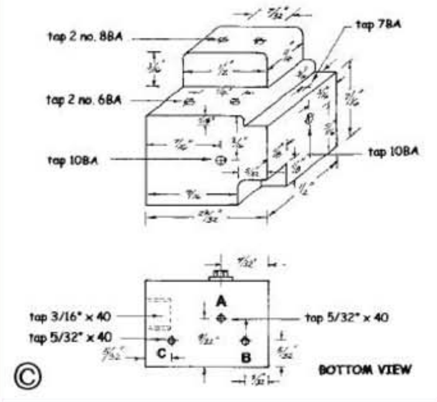
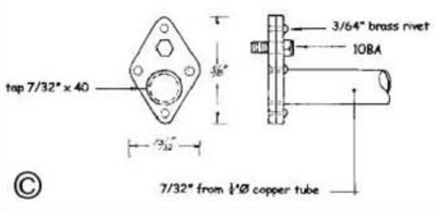
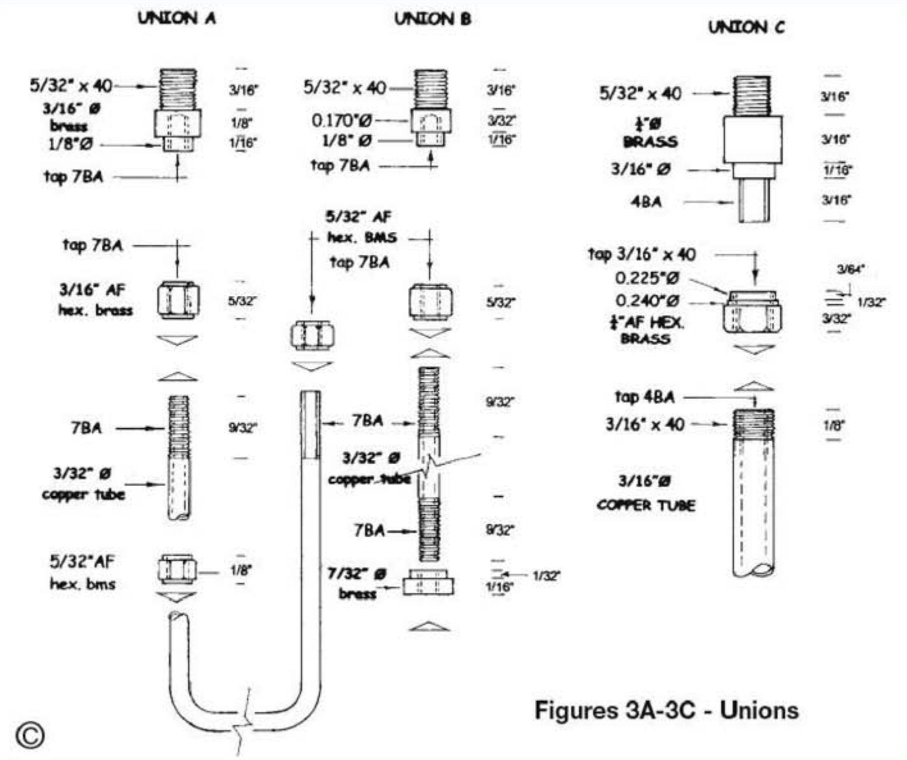


Figure 4 - Flange Plate





Figures 3A-3C - Unions

body and clamp it at the appropriate angle in the vice under the drill. It was then levelled off with a 3/32in. end mill prior to the use of a centre drill and No. 47 drill for a 7BA tap. After drilling and tapping the body for the other various BA sized holes where shown in fig 3, the body was set aside while the lower connection fittings were prepared.

Lower connecting unions

I set off to produce union A with the intention of copying normal practice and utilising the familiar method of nipple and union nut connections. This first attempt was soon abandoned when I realised that the smallest sized components would be much too large for this little job. It also occurred to me at this stage that it did not matter a hoot how the unions were produced as long as they looked okay on the loco and so it was temporarily back to the drawing board.

Very early in my landscape design career I recall one of my tutors emphasising that *"if a design looked right on the drawing, the odds are that it would be fine in practice."* So with this theory in mind I produced **figs 3A-C** and manufactured the various bits and pieces from brass bar and hexagon as shown. The bottom of the body was then marked out, drilled and tapped 5/32in. x 40tpi three times, and the various unions screwed in, although at this stage of course, short pieces of tube substituted for the actual lengths of piping which ultimately will be fitted. It was now time to move on and think about the front flange assembly.

Front flange assembly

The Roche drawing shows that the diamond shaped flange plate assembly at the smokebox end of the body supports the rear of the exhaust pipe. I am calling it an exhaust pipe as I now understand that this would be appropriate terminology. In practical terms, the flange could be secured to the main body by means of a 10BA hexagon headed bolt in the position shown in **fig 4**.

Accordingly, two pieces of 3/64in. thick brass sheet were sweated together with soft-solder and marked out for drilling, once by 3/16in. dia. and tapping 7/32in. x 40tpi for the exhaust pipe, once by No. 50 clearance for the fixing bolt and four times for a 3/64in. rivet in each point of the diamond. I considered that it would be prudent to carry out these operations comfortably at this stage rather than perhaps struggle to hold the job securely under the drill after producing the rather awkward diamond shape. This way the diamond shape could be undertaken later as a simple sawing and filing exercise.

A 3in. length of 1/4in. diameter copper pipe was then held in the lathe chuck and reduced to 7/32in. diameter for a length of 1/4in. or so and then given approximately 1/8in. of 7/32in. x 40tpi thread. The pipe was then removed from the chuck, screwed tightly into the flange and returned to the lathe so that the spare thread protruding through the back of the flange could be faced off. In this way there was then something to hold in order that the position of the 10BA fixing bolt could be spotted through the flange onto the body. After tapping the body to suit, the two plates were separated and the four inside edges of each plate given a noticeable rounding off with a fine file so that when finally fixed in position it would clearly indicate that the flange union consisted of two plates.

Four 3/64in. rivets were then fixed in position using Loctite and the spare ends snipped off and filed flush after setting. The short piece of 1/4in. dia. copper pipe will be replaced later with an appropriate length after actual measurement when the final position of the assembly on the locomotive is established. Further bits and pieces for this element at the front end are also required, about which there is more later. For the meantime the flange portion can be set aside while attention now focuses on the ejector and steam tube valve assembly.

Ejector and steam tube valve assembly

At first sight, construction of this assembly appeared to be a little daunting, but after careful study I decided that the task could be separated into small units as shown in **fig 5** and commenced operations with the production of the central body unit.

●*To be continued.*

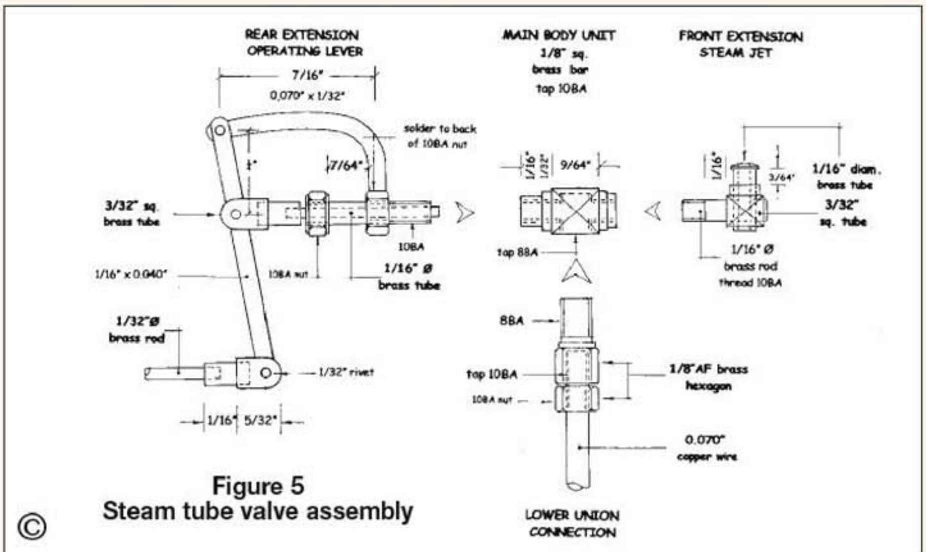


Figure 5
Steam tube valve assembly

The partially dismantled differential assembly showing one of the 30 tooth bevel gears and the two 15 tooth bevel gears mounted on their shaft.

The set of bevel gears required for the differential assembly. These were bought in from an industrial gear supplier.

FOWLER STEAM WAGON

Tony Webster
begins work on the rear axle.
●*Part VIII continued from page 36 (M.E. 4225, 9 July 2004)*

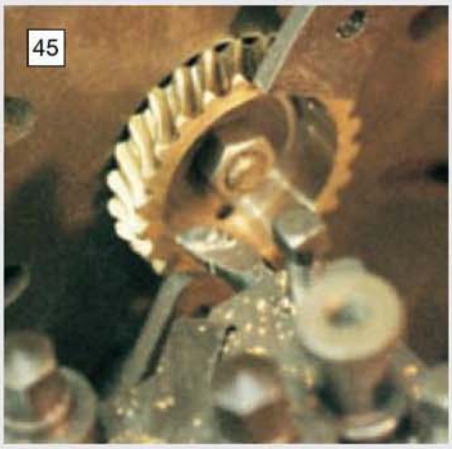
To start at the innermost part and work our way outwards we must begin with the differential. This consists of two 30 tooth and two 15 tooth bevel gears from a proprietary gear maker. The most convenient size is 2.5 module and the gears come with a central 10mm dia. hole (2.5 module is approximately the same as 16DP). The 30 tooth gears will run on the outside boss so first check that it runs true. Turn up a 10mm dia. stub mandrel and push a gear onto it to check the boss with a dial test indicator. If it is not true, turn off a few thousandths of an inch from the boss. Reduce both gears to the same diameter and bore them out to 3/4in. diameter. Remove the boss from the 15 tooth gears and face them up on the same mandrel before it is removed from the chuck.

Returning to the 30 tooth gears, turn up a piece of 1in. or 25mm dia. steel until it will just enter the 7/8in. bore ball race.

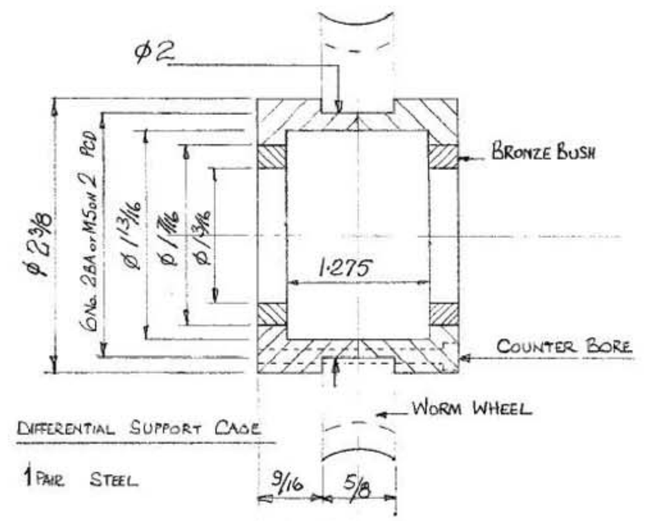
Take extra care as you turn the end of the bar down to 3/4in. dia. to accept the bevel gear; use one of the bevel gears as a gauge. Use a permanent retainer to secure the gear in place and give the adhesive time to cure. When you are confident that the retainer has cured — perhaps after lunch — bore out the centre to 1/2in. dia. and plane two keyways into the bore.

Reduce the outer end of the boss to the ball race size to match the extension to the boss. Leave part of the original boss at its full diameter (which has been corrected above) to match the length of the bush in which it will run, allowing 0.005in. clearance. Repeat for the other bevel gear.

The differential cage is in two halves. The ball thrust races support the 30 tooth gears via their extended boss on each side, the boss of which runs in a bronze bush that supports the differential cage. This in turn supports the two 15 tooth pinions and the worm wheel. The shaft for the pinions (or planet gears) must be exactly across the centre of the whole unit and is located half in each cage half. The outside diameter of the cage locates in the bore of the worm wheel and the cap head screws which hold the two halves of the cage together also act as splines to drive the worm wheel — yes, the worm wheel drives the differential cage. The cage is kept central by the bevel gear bosses, but the wedging effect of the pinions against the bevel gears pushes them outward. This thrust is taken by the ball races via the shoulder on the bosses. The bevel gears only rotate in their bronze bushes when the vehicle travels around a corner or when one wheel slips and spins.



Boring the worm wheel to accept the differential cage on the lathe faceplate.



Worm: steel, 5 start, 1.25in. O/D x 1.5in. long
Worm wheel: gunmetal, 24 teeth, 2.75in. O/D, 2.5in. PCD, 2in. bore, 0.625in. wide
Shaft centres 1.75in.

Do not turn the outside diameter of the cage tapered as it exposes the cap screw heads and threads.

Rear axle casing

Start with the top cover, upon which everything is carried. Grip the rounded top and end flanges in the 4-jaw chuck and set up the outside diameter to run true. Face up the main fixing flange and face the projections that form the bearing housings to be exactly 5/8in. from the main flange.

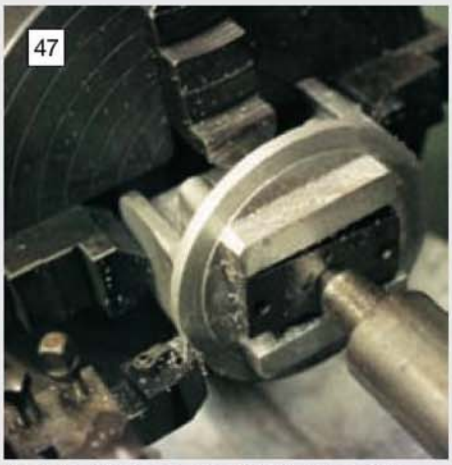
From the centre distance between the two shafts of the worm and wheel, determine the position of the worm in its housing, which is the top cover.

The pads for the bearing housings form the centre-line of the worm wheel, axle casing, half shafts, differential, etc. Place these pads on a surface plate and scribe a line exactly at a height equal to the centre distance between worm and wheel shafts.

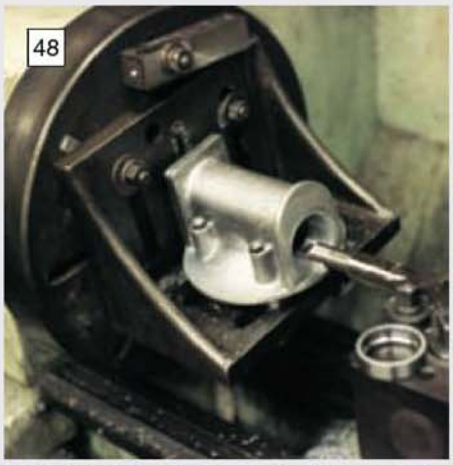
Mount this newly machined surface (actually, they will become four pads) on an angle plate, which in turn is mounted on the faceplate (it may have to go inside the angle plate). Set the centre-line of the rounded top square with the faceplate and the centre dot on the round-topped flange exactly on the lathe centre-line. Face, drill and bore for the worm axial bearings. The rear bearing housing is bored by using a long, stout boring bar.

Machine the face that makes the joint line of the bearing housing on the cap casting. Cut into two pieces and drill for the M6 studs or bolts

Another view of the differential assembly with the parts arranged to show further details.



Machining the face and outer diameter of the flange on the top cover.



Boring the drive worm bearing seats in the rear axle top cover.

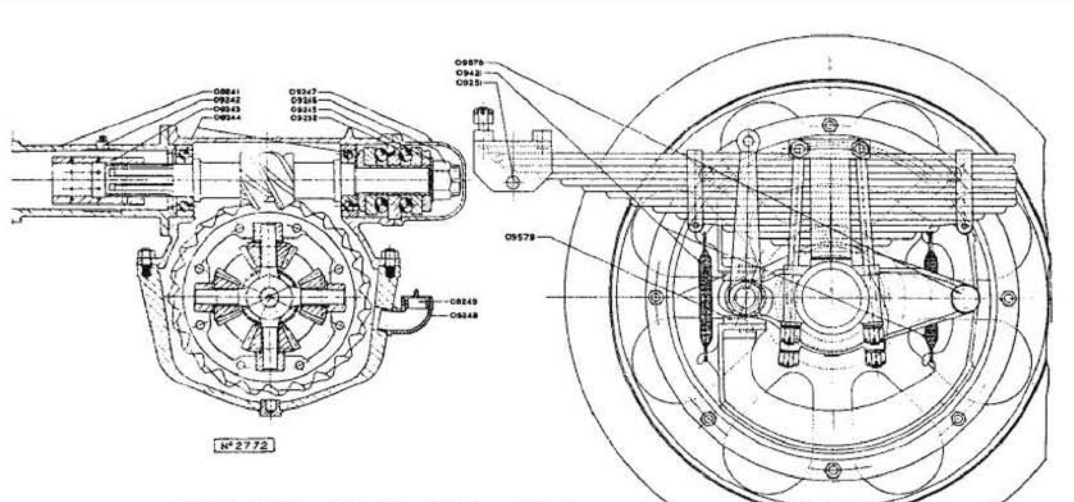


PLATE 13—Worm Drive, Rear Wheels, and Brakes.
(See also PLATE 8)

through both the cap and top cover casting. The centres of these studs are located from the turrets on the outside. The casual viewer will notice that the studs and self-locking nuts are not central to the turrets, so take care when marking them out. The caps need deep recesses for the nuts to clear the axle casing. Assemble the caps to the cover.

Unfortunately, it needs to be returned to the chuck to turn the outside corners off the bearing housings complete with caps to ensure clearance inside the axle casing. This should be done after the casing has been machined.

Remove the cover casting from the angle plate and secure the round topped flange (front) flat against the faceplate by way of a parallel spacer. If separate thrust bearings are to be used, as on the original wagon, the bearing housing needs to be centralised. Face the square topped flange and counterbore for the bearing thrust plate. The outside diameter of this thrust plate should be clear in the counterbore as the shaft centralises the bearing and radial thrust is taken by other bearings.

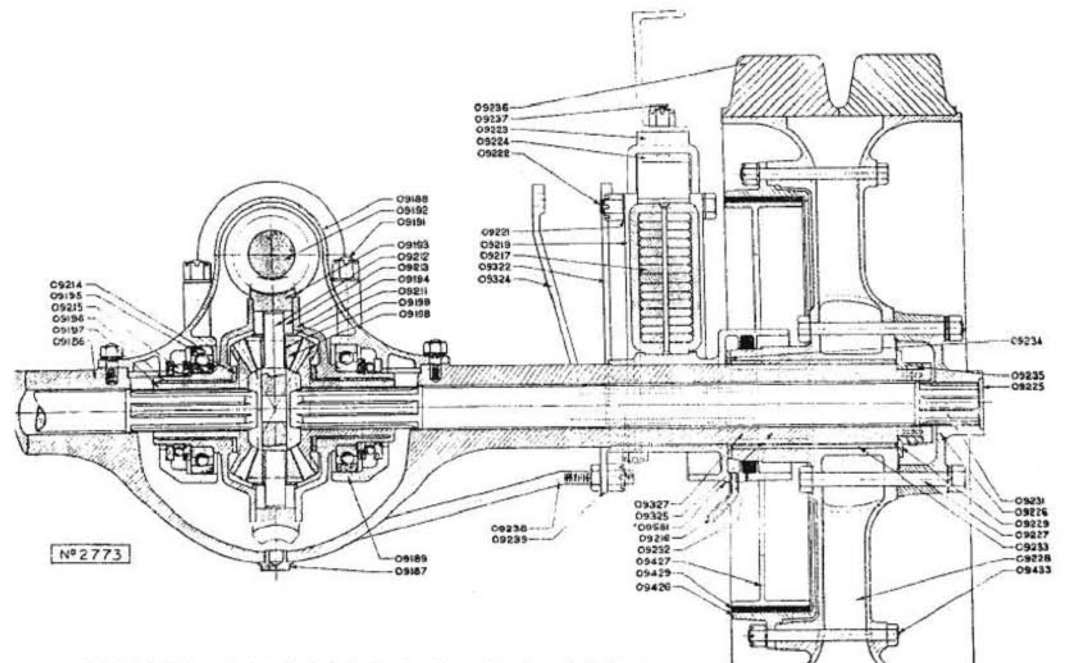


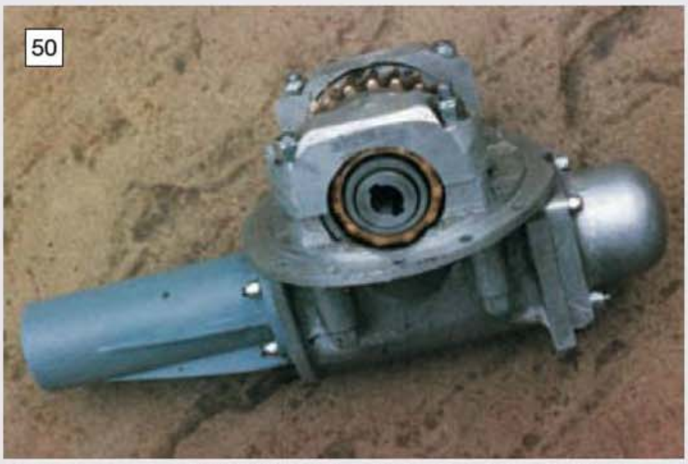
PLATE 8—Worm Drive, Back Axle, Brakes, Rear Wheels, and Springs.

If ball thrust bearings are used, the flange is not counterbored and it may be better to mount the cover casting off-centre to enable more of the flange to be faced — it could be faced in the milling machine. The ball thrust races will require steel spacer tubes to take up the distance between the bearing outer race and flange surface against which the caps will be secured.

Bolt through the worm housing to secure the round topped flange, via a parallel spacer, to the inside of an angle plate on the faceplate, with the joint line centre exactly on the lathe centre-line. Bore both bearing housings out to take the ball thrust races. If the near one is completed first and the dial settings noted, there will be room to bore out the far housing.


49

Boring the bearing seats for the differential cage. Note the complex lathe set up involving an angle plate, faceplate and balance weight.


50

The top cover assembled with the differential cage and front and rear covers. The front cover is a steel fabrication.

The inside surfaces between the bearing housings must be faced clear and the outer ends of the housing bore takes the outward thrust of the differential. Check this dimension on the differential, bearing in mind that the bearings must be in their outermost position.

The rear cap for the worm housing has its square flange faced (and counterbored if a thrust race is used) and drilled for four studs. Drill the top cover deeply and tap as far as possible to provide as secure a fixing as possible for the studs. Use a thread lock on the studs as there is little worse, when removing nuts, than the stud coming out with the nut.


51

A top view of the assembled top cover. The four nuts hold the differential cage bearing caps. Note the holes for attachment to the axle casing.

The front cover takes all the strain of the torque tube and keeps the rear axle square to the chassis. Thus, the front cover is fabricated from steel. This can be a tube welded to a disc with the strengthening gussets silver-soldered in place afterwards. After fabrication, face the disc flat and bore the other end to take the 1¼in. O/D, 16swg tube for the torque tube. The flange should have six studs and gussets, but if you have a smaller worm wheel there will be no space for the lowest stud. Screw the studs well into the aluminium alloy casting as for the rear cap. Indeed one can be 'nutted' on the inside.

Axle casing

A large gap-bed lathe will be required to face and turn the differential box in the centre of the axle casing. An alternative is to mount the casing on the cross-slide with the top flange of the differential box facing the chuck. A right-hand lathe tool is held in the 4-jaw chuck to fly-cut the flange. The same tool can be adjusted to bore the inside of the flange to form a locating spigot for the top cover. Some metal may need to be removed from the inside of the differential box. Drill and tap the bottom of the oil bath for a drain plug, not forgetting to face the outside end.

The ends of the axle casing can turned by holding it in a 4-jaw chuck and supporting it on a tailstock centre. The diameter should match the bore of the spring mount/brake backplate which should be made first.

The chuck and fixed steady should be used to drill the ⅝in. dia. hole through each half of the casing. A long-series drill is helpful for this operation and if only a smaller diameter long-series drill is available, the diameter could be increased to ⅝in. with a boring-bar where the tool is ⅝in. long and cuts at both ends. Great accuracy of diameter is not needed, as this is a clearance hole for the ½in. dia. half-shafts, but the two holes should be in line.

The axle spring mount is built-up from twelve pieces of steel. The whole thing is at one end of a length of 1in. nominal bore, medium wall pipe.


Transmission Gear and Hind Axle.

THE transmission gear on the "Fowler" Steam Wagon, which embodies the patent worm drive, is totally enclosed, giving complete protection from dust, dirt and mud, and providing **efficient lubrication** as the parts **run in an oil bath.**

This makes a more expensive design, but the many practical advantages secured are well worth the extra trouble and cost involved.

The transmission gear has **no backlash,** so that the wagon will start and stop without jerking, causing **less wear and tear** to the working parts, and helping to prolong the life of the tyres.

©

This is made to BS 1387, which is commonly known as 'Gas List'. After fabrication this pipe is bored out just to make a good finish to bear on the axle casing. One end of the outside is turned to 1¼in. for the bushes in the rear road wheels to run on. Get this surface as smooth as you can.

Around the turned part is a larger tube which houses a 2¼in. O/D oil seal. Bore this out first, including the clearance diameter at the front, and this will give you sufficient room to get a tool inside to turn the 1¼inch diameter. It is important that the inside of the outer tube, and oil-seal housing are all machined at one setting.

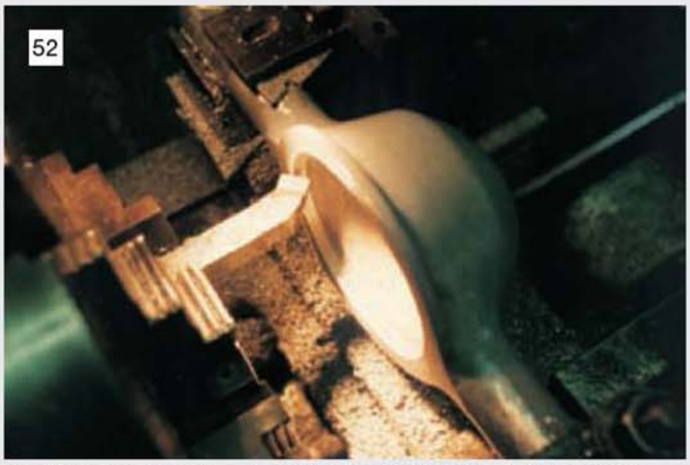
The oil seal housing is brazed to the brake back-plate. A ⅝in. bore tube is brazed to one end of the backplate and the opposite end carries a boss threaded 5/16in. x 32tpi for the brake shoe pivot pin (make the plain and threaded parts of this pin eccentric to each other). Strengthening flanges reinforce this assembly. The top flange incorporates a pad for the spring mounting and the two long tubes pass through the lower flange. The shorter tubes support a cut down angle, which is the mounting for the tie-rod. These small diameter tubes carry the eyebolts, which secure the spring to the pad.

The spring mount is free to oscillate on the axle which moves up and down with the spring, whereas the axle moves in an arc.

The torque tube is secured at both ends with retaining compound, the front end to the ball joint and the rear end to the flanged and gussetted tube which is fixed to the rear axle top cover. The length of the 1¼in. x 16swg tube is determined by assembling the axle, complete with springs, onto the slipper blocks under the chassis. Assuming that the engine/gearbox unit is also mounted in the chassis, assemble the universal joint and prop. shaft to the rear axle worm-shaft. There should be ⅛in. or so clearance.

Make a rigid coupling complete with keyways. This joint should be free to slide if there is any change in length due to axle movement or expansion of components. The distance between the tubular part of the ball and the wormshaft tube can be measured and the lengths of the two bored sockets added.

These components are now dismantled and stuck together, not forgetting the ball-socket retainer ring.



Machining the rear axle casing with the workpiece attached to the lathe cross-slide and boring and facing taking place from the lathe chuck.

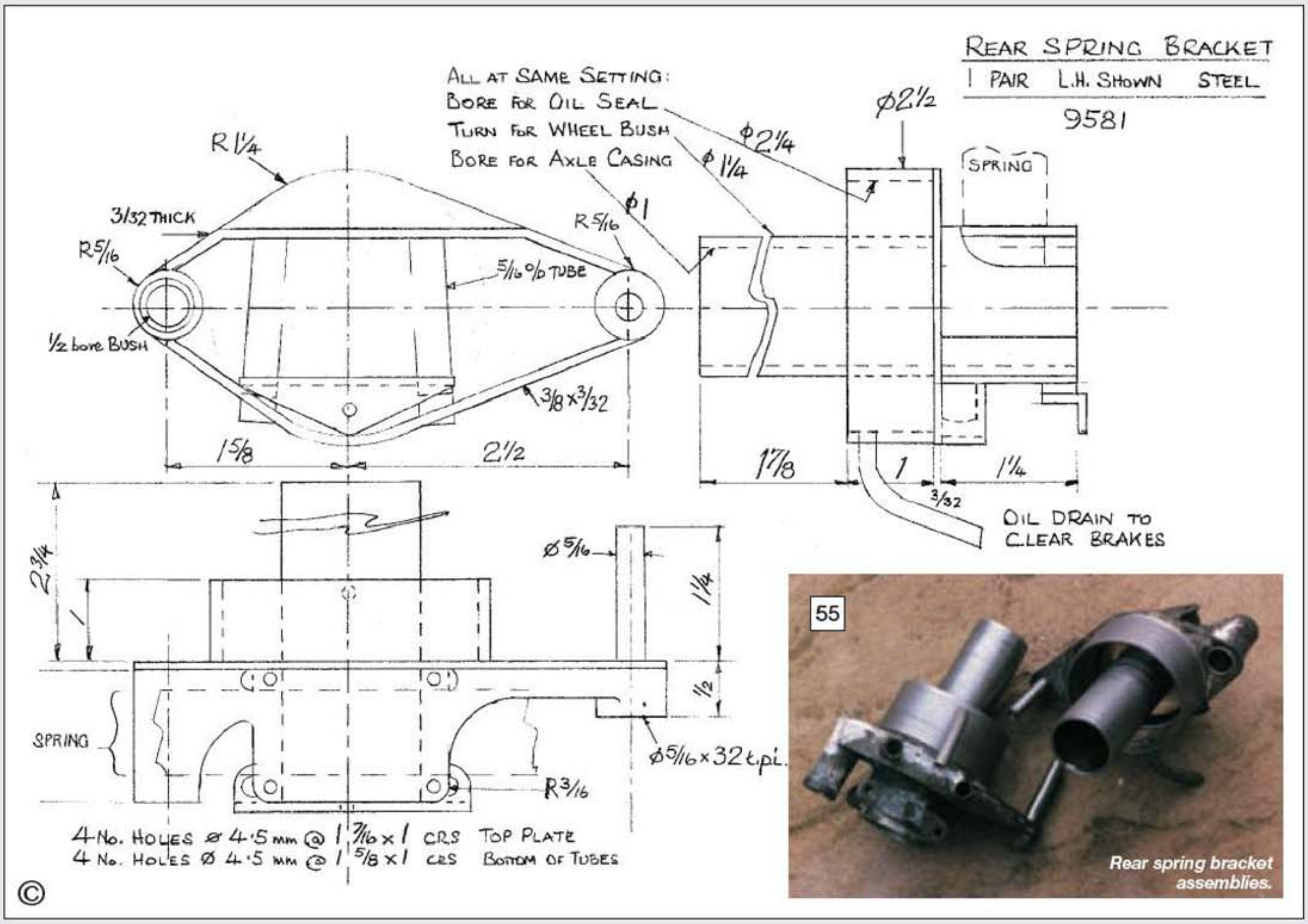
Further details of the machining of the rear axle casing. Note the method of attachment to the lathe cross-slide.

On final assembly the easiest way to assemble the universal joint is to thread a 4in. length of studding through the outer gunmetal ring of the universal joint and screw it into the appropriate hole in the inner ring having taken note of any location marks. A couple of nuts locked together at the outer end of the studding will help you screw it in with your fingers. Assemble the inner ring to the inner fork journals and offer up the outer fork of the prop. shaft. Slide up the outer ring and fit a screw or run up a loose nut on the studding to hold it all together while the screws are inserted. There is no need to mention replacing the studding with a screw.

The finish machined rear axle casing. Some internal machining has been carried out to provide clearance for the differential cage and bearings.

Assemble the coupling to the shaft, pass the torque tube over the prop. shaft and secure the ball-socket cap after greasing both halves of the socket. Slide the rear coupling onto the end of the prop. shaft and enter the worm shaft into the coupling, not forgetting the keys. Some grease here will make sure that it will keep sliding in the future. Secure the rear flange to the worm housing using self-locking nuts. M4 is a little larger than 4BA. The alternative would be 2BA. There will be a lot of strain on this joint keeping the axle square with the chassis.

●*To be continued.*



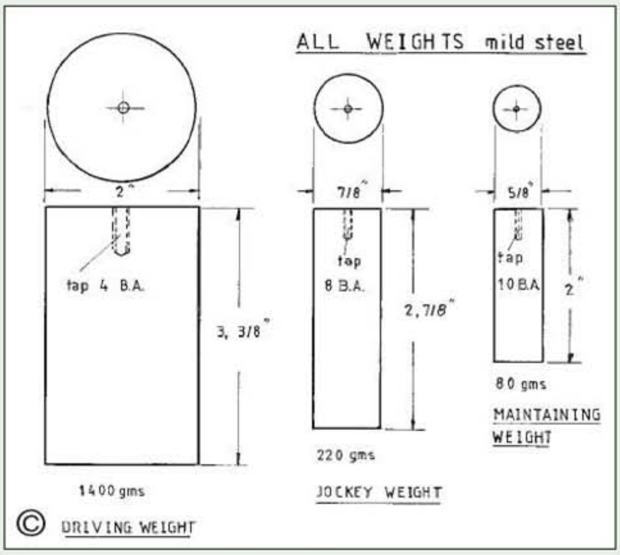
Rear spring bracket assemblies.

WOODWARD'S GEARLESS MECHANICAL CLOCK

John Wilding FBHI
describes the weights and explains how to set up for a trial run.

●*Part VI continued from page 41 (M.E. 4225, 9 July 2004)*

There are three weights in this clock, the driving weight, jockey weight and maintaining weight. Their dimensions are shown on **fig 14**. All are prepared from standard stock sizes in mild steel. The only work required is facing the ends and forming the tapped holes at the top of each one. The finish on these is up to the constructor. I set up each one in the lathe and use wet and dry papers of about 220 grit to produce a fine-grained finish. A simple decorative groove can be machined at the top end on the jockey weight as shown in **photo 54**.




54

The jockey and maintaining weights.

Each weight should be lacquered, and one way to mount the weights so that all surfaces are available is illustrated in **photo 55** where the driving weight is shown being supported with the aid of a square centre located in one end, the other being supported on an ordinary centre in the tailstock. The work is rotated slowly with the lathe in backgear and the lacquer applied with a soft brush or cotton wool ball. Other finishes include chemical blacking. Kits for carrying out this procedure are obtainable from Pixel-Plus (tel:01758-730356). Painting is another option.

The pulley for the driving weight has already been described. The other two weights have simple wire hooks as illustrated in photo 54. If 14 gauge 'coat hanger' wire is used for the hook on the jockey weight this can be threaded 8BA; 1/16in. mild steel rod is used for the hook on the maintaining weight.

I give the approximate weights on fig 14, Dr. Woodward suggests that the jockey weight should be about 60% of the driving weight to prevent slippage. The actual driving force in my clock is in fact 700g, remembering that a pulley is used and 60% of this is 420g which is considerably more than I am using for my jockey weight.

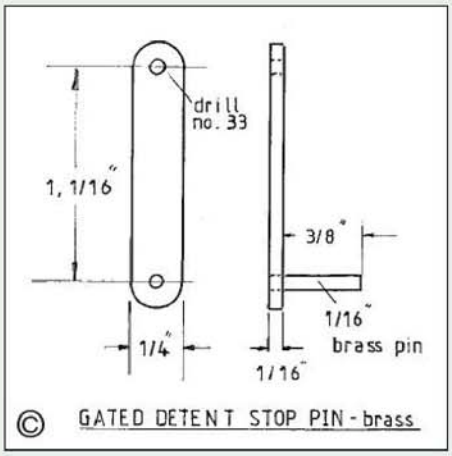
The reader must appreciate that several factors affect the driving weight; the thickness of the line is one. If a thin line is used it will operate further down the groove of the pulley with a lesser leverage. The included angle of the vee in the pulley has the same effect. It would be sensible to carry out trials with an adjustable weight such as a can with scrap metal pieces in it.

Gated detent stop pin

This pin can be observed beneath the tail of this detent in fig 1 (*M.E.* 4217, 19 March 2004). At the time I didn't consider it necessary. It wasn't until I had the clock in action that I realised how important it is. Without the pin it is possible for the gated detent to become completely detached from the pin wheel if, for instance, the driving weight is lifted without the maintaining gear being operated. The pin wheel will then rotate at speed. The stop can be 1/16in. mild steel rod threaded 10BA and screwed into the back plate. However, I opted for a short strip shown on **fig 15**, one end of which is captured under the right-hand securing screw of the count wheel bridge (**photo 56**). This pin is located some 1/16in. below the tail of the detent. It is adjusted by bending.


55

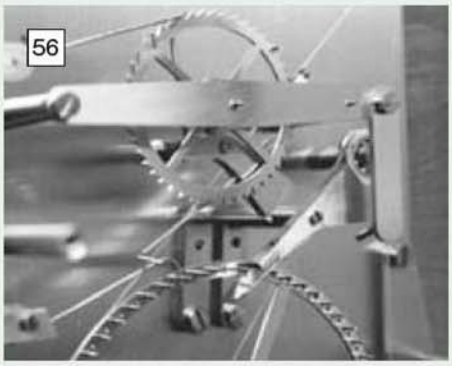
A method of rotating the weight to give access to the complete area for lacquering.



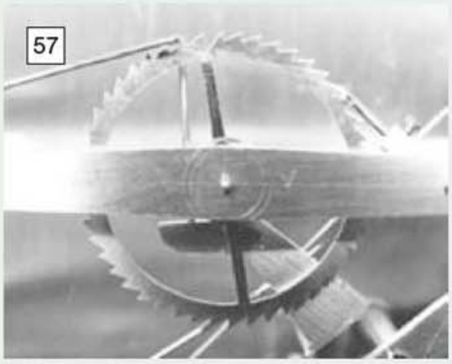
Setting up

Sufficient of the clock has now been made to have a trial run. I am giving an order of procedure for the various adjustments which I hope will assist constructors. Initial trials should be carried out without the weights. However, a very light weight on a length of line can be wrapped around the drive pulley and secured with a blob of Blu-Tack to keep the escape wheel in engagement with the gated detent.

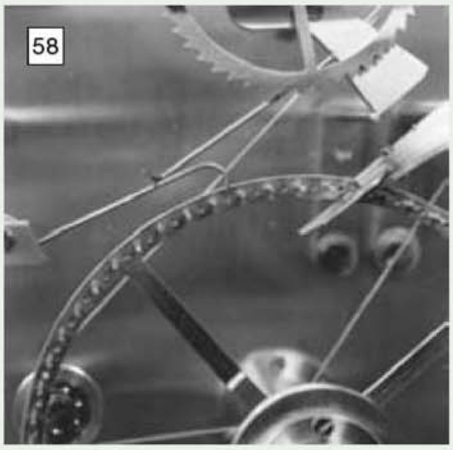
1: With the pendulum suspension centrally disposed between the side plates, and the backstop engaged with a tooth of the count wheel, the gathering pawl should rest halfway up the back slope of its tooth (**photo 57**). The adjustment can be achieved by altering the projection of the backstop pawl, or to a limited extent by raising or lowering the upper pendulum bracket.


56

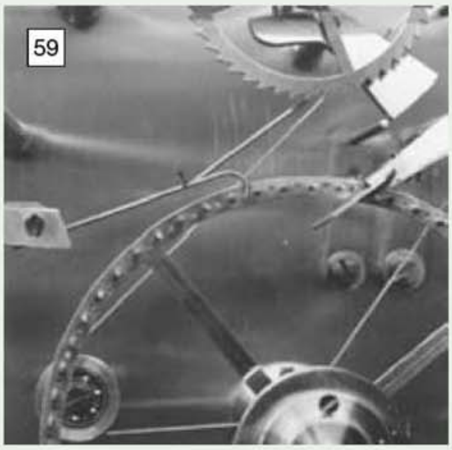
Showing the gated detent stop pin.


57

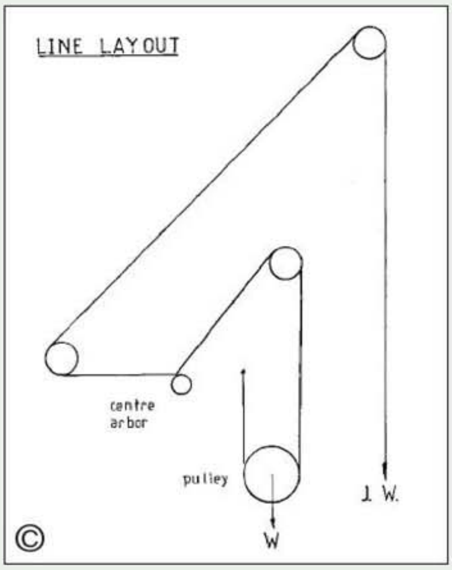
Showing the positions of the count wheel pawls.



The position of the impulse pawl in the 'at rest' position.



This shows the deflector arm bringing the impulse hook into the path of the escape wheel pins.



A useful tool for threading the line round the pulleys.

2: The deflector piece is adjusted by moving its stop pin mounted on the pivoted arm. This has a hole at its upper end (see fig 10, *M.E.* 4225, 9 July 2004) so that a piece of wire bent over at right angles at the end can be inserted from the side and the arm moved left and right. The vertical wire in this piece is of such a length that the gathering pawl misses it during the normal gathering action but catches the tip when the deep tooth comes into operation.

3: Attention is now turned to the escape wheel. With a pin on this wheel captured by the lower shelf of the gated detent, the impulse hook on the lower pendulum bracket should be halfway between two pins of the escape wheel (**photos** 57 and **58**). This can be achieved by moving the pendulum left or right, which will of course upset the previous adjustments to the count wheel, or by moving the gated detent itself on its adjustable arm. When the pendulum is in motion, the impulse hook should span the two pins either side of the rest position reaching to the centre locations between the next two pins. In other words, the impulse hook spans two pins and a further half space either side. This will result in a lateral pendulum movement of some 2in. measured at the rating thread. There should be a small gap between the impulse hook and the lower arm of the deflector piece. This can be accomplished by either raising or lowering the pendulum bracket or bending the wire.

4: At this stage a slow motion hand operated run of the action can be tried out. With the gathering wire in the count wheel tooth prior to the deep tooth, move the pendulum to the right so that the wire drops into the deep tooth; on the return path to the left it should catch the tip of the vertical wire on the deflector piece, rotating the assembly anti-clockwise. The lower arm in this assembly should bear down on the impulse hook and this stage is shown in **photo 59**. As the pendulum continues to the left the impulse hook will move the escape wheel backwards releasing the pin locked against the lower shelf of the gated detent. As the pendulum returns to the right, impulse is given to the pendulum by the escape wheel until the next pin slides down the upper shelf of the gated detent, slips through the slot and locks against the lower shelf. Further movement of the pendulum to the right with the escape wheel locked allows the impulse hook to pop up out of engagement with its pin. The pendulum will pull the escape wheel backwards half the distance between two pins, the wheel will then advance $1\frac{1}{2}$ spaces so that the impulse is equal to the distance between two pins.

When the action seems satisfactory, the line can be threaded round the various pulleys and the weights hung for a proper test. I provide **fig 16** which shows the path of the line. It is quite tricky to thread this around the pulleys because of the wiry nature of the monofilament line. For a 30 hour run some 4ft. of line is needed with a loop formed at each end. I found that a large paper clip attached to one end helps to keep the line under control while it is threaded around the pulleys. The line from the pulley is tied off to a hook hung on the right-hand pillar of the centre arbor cock.

I show above a little tool which someone gave me years ago (**photo 60**). It is for manipulating arbors in an American clock when trying to locate the pivots in their holes during assembly. I found it very useful in this application. The clock should now run under its own power. If the clock is to run for eight days then it will be necessary for the jockey weight also to be fitted with a pulley similar to the driving weight. With the clock running, the daisy wheel motion work can be constructed and the dial pillars made.

Addendum

Since writing this instalment I have increased the driving weight to approximately 1700g; the length of this weight is now 4 inches. The other weights are unaltered. This modification gives an increased margin of safety in the action of the clock.

●*To be continued.*

SOUTHERN VALVE GEAR

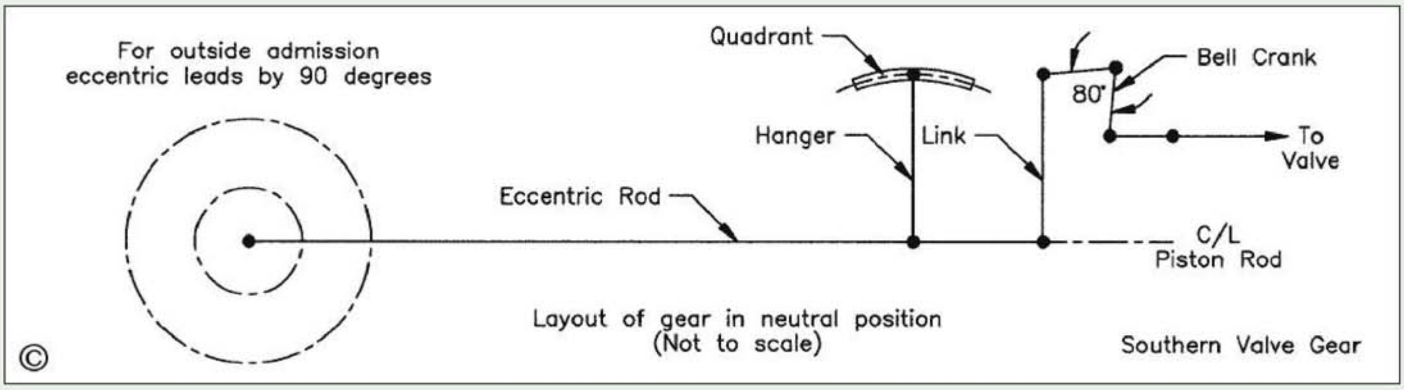
Arthur Blue

discusses an uncommon valve gear likely to appeal to builders seeking a talking point and with a penchant to experiment.

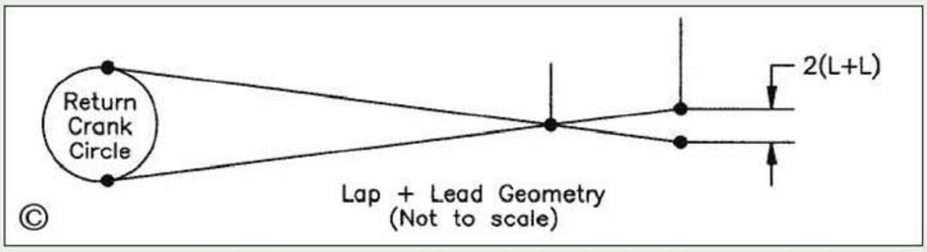
A few years ago I acquired a partly-built freelance locomotive from Bob Smith of the Comrie Railway, where it had lain at the back of the workshop for about 20 years, overtaken by other and more ambitious projects. It had started from a loco-type boiler originally intended for a steamboat, a pair of *Lucky Seven* cylinders, and some large tender or wagon wheels. The absence of crankpin bosses on the wheels, and the width of the grate, determined that it should be an outside-frame engine, and the large dome over the firebox pointed in the direction of the 19th century and American style. A rather lanky bar-framed narrow-gauge 2-6-0 with suspension equalising levers fore and aft then evolved, for which the inspiration (or so Bob claimed) was a Brazilian plantation locomotive featured on a long-lost postcard.

Comrie has a large and impressive Rio Grande 2-8-2, so the cover story for this one would be the Dalriada and Rio Poco M, an impoverished backwoods outfit owned by an expatriate Scot, the sole locomotive a home-made NG job built around 1890 using bits from an older standard-gauge engine. This sort of thing was not uncommon out in the wild-and-woolly, and some startling unorthodox locomotives resulted, using launch engines, donkey boilers, converted flatcars, and the like. Some even ran on wooden rails, and gauges ranged from 2ft. to 10 feet.

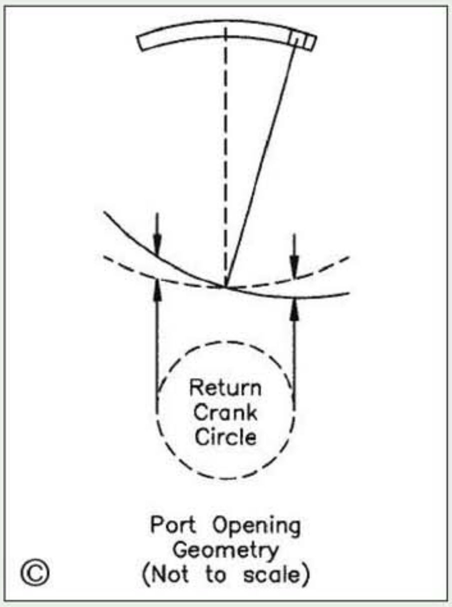
Anyway, this was quite convenient as far as the valve gear was concerned, for there were going to be problems in fitting the inside Stephenson's gear which would have been usual for the period. The wheels were already fitted and the axles had their centre portion reduced, any eccentrics would have to be split. There was also little space inside for links and their appurtenances. *"What*



Layout of gear in neutral position
(Not to scale)



Lap + Lead Geometry
(Not to scale)



Port Opening
Geometry
(Not to scale)

valve gear were you thinking of?" I asked. *"Southern"* said Bob. *"Hmmm"* I replied. And as soon as I got home I looked it up in the books.

Southern is a radial valve gear using swinging links, in principle not unlike Marshall's, but with a bell-crank lever added to change the direction of the valve drive. It can be used with inside or outside admission and can be arranged for valves in a variety of positions, though the simplest layout is valves on top and all-square.

Around 1900, the Southern Railway (of the US) had a number of large engines with both slide and piston valves using this gear, apparently quite successfully, though in later years it was superseded by Baker and Walschaerts. When rebuilt a few years ago, the Ravenglass and Eskdale engine *Bonnie Dundee* was fitted with Southern gear with some modifications to reduce the space taken up, and reportedly it works very well. For modellers, the advantages are simple construction, easily renewed pin joints, and no die slip when working. Furthermore, if the gear is arranged American-style, on a separate sub-frame, the whole thing can be lifted off and onto the bench whenever it needs attention.

My own edition uses ordinary silver-steel for the pins, running in bushes secured in place using Loctite, and should wear take place a complete new set of pins and bushes could be made and fitted quite easily in a couple of hours. More sophisticated arrangements are possible, but until the necessity for these is proven I'll stick with the crude and simple. The quadrant slot was chain-drilled using a faceplate as a rotary table. The slot was then filed to shape, which has to be done carefully, but since the die-block stays put at any one running position, the tolerances are rather more forgiving than in some other gears.

In its standard layout, the whole thing is quite roomy and easy to work on and although computer design programmes have been produced, my own edition was laid out using nothing more a sheet of paper, a rule, and a pair of compasses. It seems to work quite well.

Drawbacks?

Well yes, it's obviously not much use if you're a Churchward or Gresley enthusiast, and the counter to being nice to work on is that it needs space, unless you do a *Bonnie Dundee* and put the bell-crank behind the gear, but perhaps the most important point to make is that all the various dimensions and movements are interdependent, so that if you try to alter, say the valve opening, by giving the return crank a different throw, then the lap and lead will change with it. You have to go back to square one and set it all out again, on paper. I learned this by making several bell-cranks and links, after looking inside the valve chest on initial assembly, and thinking that the events could be improved.

However, every 'improvement' brought an accompanying 'dis-improvement' somewhere else until eventually, after the expenditure of much sweat and many hacksaw blades, the original items (as per drawing) were refitted and when air was applied, the wheels revolved quite satisfactorily.

How does it work?

The gear is driven by an eccentric or return crank; in the case of outside admission, this will lead the main crank by 90deg., having a throw rather greater than for Walschaerts gear. The forward end of the eccentric rod swings on the lower end of the radius hanger, the upper end of which is attached at a die-block located in the quadrant which is horizontal and fixed. The forward end of the eccentric rod projects a short distance beyond the radius hanger attachment, and a link, similar in length to the radius hanger, connects this extremity to the horizontal arm of a bell crank situated above, which converts the rise and fall of the link into the horizontal movement for the valve rod. The bell-crank can have unequal arms, to give a slight amplification of the movement, and is usually set at 80 degrees.

The latter angle has a corrective purpose, but you can lie awake all night thinking of variously intersecting arcs, or waste an awful lot of paper trying to figure it out, so just take it on trust that all the photographs of the Southern Railway locomotives show their bell-cranks at 80deg., and that the inventor, Mr. William S. Brown, knew what he was doing. In action, the vertical movement of the after end of the eccentric rod, in phase with the horizontal movement of the crosshead and piston, causes the forward end of the rod to fall and rise in proportion to its lengths before and behind the radius hanger attachment, and this gives lap and lead movement to the valve. Lap and lead are thus constant at all positions of working.

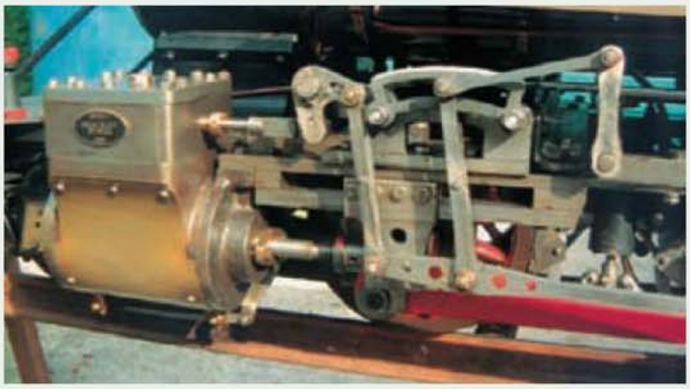
The fore-and-aft movement of the eccentric rod (phased at right angles to the main crank) causes the radius hanger and the bell-crank link to swing. If the die-block is in its neutral position at the centre of the quadrant, then both of these will swing in parallel and no movement (from this source) will be transmitted to the bell-crank and the valve. If however the die-block is moved away from its mid position, then the arc through which the lower end of the radius hanger swings will be tilted and travel given to the valve in proportion to the distance off-centre.

Visualise the two arcs through which the lower ends of the radius hanger and the bell-crank link swing as superimposed; they follow each other in mid-gear but diverge when one is tilted, and it is this divergence which produces the port opening. Lap and lead movement, the other component of total valve events, is added to the port opening, and by moving the die-block appropriately the engine can thus be reversed and linked out or in. Left and right-hand die-blocks are of course moved simultaneously by the reach rods and reversing mechanism.

Setting out

Consider an all-square layout, i.e. with horizontal piston rod and the valve spindle above and parallel. Inclinations can in fact be quite easily worked in, and athwartships displacement of the valve spindle can be handled by separating the arms of the bell-crank and interposing a short rocking shaft. But, for the time being keep it straightforward and simple and let's say it's outside admission (slide valve).

Obtain a large sheet of paper and a sharp pencil, and chase the cat off the kitchen table. Work in full



Southern (USA) valve gear as fitted to the Author's locomotive.

"An impoverished backwoods railroad owned by an ex-patriate Scot."

scale, or double scale if the size of the paper permits. Ascertain the lap of the valves to be used and the maximum port opening; if using standard cylinders and valves, these will already have been determined, but if not refer to the books and work out suitable values. Maximum full-gear cut-off is determined by the relationship between lap and full valve travel, and for 85% cut-off the full-gear travel should be five times the lap. Unless it's a high-speed engine which you are planning (not likely if it has slide valves on top, though some quite lively ones have been known) lead should be line-and-line. The technical term, when I served my time, was 'jist cracked'.

Draw the main crank circle, the piston-rod and valve spindle centrelines, and the rear face of the valve spindle gland. Set the gear out, first in the 'neutral position' which is a notional one with the after end of the eccentric rod on the axle centre or very slightly beyond it (in practice, of course, the rod is attached to the return crank). Leaving space for a short link between the valve spindle and the lower arm of the bell-crank, set out a tentative position for the latter, and don't make its arms too short or its swing will be excessive (try for no more than about 30 degrees).

The quadrant will be positioned with the mid-point of its arc just below the horizontal centreline of the bell-crank fulcrum (since there is a 5deg. droop in the neutral position on the bell-crank rear arm) and the same distance behind the rear pin of the bell-crank as the forward projection of the eccentric rod to work out this distance (see below). The hanger and the link will be parallel in the neutral position, and their lower ends on the same horizontal centreline which, in an all-square layout, is the centreline of the piston rod, so if a longer hanger turns out to be required then the bell-crank fulcrum may have to be raised too, and the crank given longer arms.

The fulcrum can actually be set at the same height as the quadrant mid-point and the link shortened slightly without significant adverse effects; this simplifies setting out, but purists may prefer to have the hanger and link exactly the same length. The same purists can also have the lower centre of the bell-crank slightly below the valve spindle centreline, on account of its arcuate movement. Devotees of simplicity, on the other hand, could just make a right-angled bell-crank, and all centres in line.

Draw in an eccentric or return-crank circle of, say, half the main one. Drop a perpendicular from the rear centre of the bell-crank, and plot points on this 2 x (lap + lead) apart and equidistant above and below the piston-rod centre line. Draw a tangent from the lower of these points to the top of the return-crank circle, and another tangent from the upper point to the bottom of the circle. The centre of the quadrant arc will be situated vertically above the point where these tangents cross and at the same height as the rear centre of the bell-crank when in its neutral position. This, remember, is with the valve in mid-travel, and the bell-crank arms at 5 and 85deg. behind the vertical.

Unequal arms on the bell-crank can increase total valve movement which can be useful, but should not be overdone (say no greater ratio than 5:4) and remember that any repositioning of the bell-crank fulcrum may require an adjustment to the quadrant height; bear in mind too that lap and lead movement will also be increased. Start with the simplest layout, which is equal link and hanger lengths and equal lever arms.

On a fresh space on the paper draw an arc to represent the quadrant, and from its mid-point subtend another similar but inverted arc for the swing of the hanger; this latter arc also represents the swing of the link, superimposed on that of the hanger.

Provided that the hanger and link are not too short, their length does not appear to be critical, but if excessively short for a given eccentric throw, they will swing much nearer to the horizontal, with a disadvantageous angle of attack at the extremes of the swing. About 30deg. swing seems to work well, so now shift to a centre on the quadrant arc and about 15deg. from its mid-point, and subtend another hanger arc which will be inclined to, and cross the first.

Draw two verticals equidistant from the centreline, to represent the horizontal swing of the eccentric rod, and the divergence between the two arcs where they are crossed by the verticals gives the port opening at either end. (There is also a slight gain from the leverage of the eccentric rod extension, but consider this as compensation for any lost motion, and ignore it in the calculations.) This opening will probably be ample, and remember that wide ports don't need a great depth of opening, but if it is not then you can either increase the return crank throw, the offset of the die-block, or give the bell-crank unequal arms. In each case you will have to go around the whole circle of laying-out again, as the lap and lead functions will be affected; but don't worry, it doesn't take that long.

You may by this stage be looking for more precise instructions than *"not too"* or *"sufficient."* How far is too far? Well, unless you build an engine with a scotch crank and cam-operated valve gear you are going to have angularity effects. Like most adverse effects, these increase on a curve however, and while you probably can't get entirely off the curve you can at least keep away from the steep bit by making all swinging components as long as possible, and reducing their angle of swing. Which doesn't require higher mathematics. Short of the scotch cranks, etc., you will never get absolutely equal leads together with equal port openings at all cut-offs including reverse, but an achievable aim is reliable starting and smooth running. If you had an indicator you would be looking for diagrams, at normal operating settings, of equal area from both ends and both sides.

Constructional points

The gear as above is more or less all in the one vertical plane, with any horizontal offset being at the bell-crank. The lower ends of the quadrant hanger and bell-crank link ought to clear the crosshead if care is taken to keep projections to a minimum. Fore gear will be with the die-block forward. Valve events, though still satisfactory, seem not quite so good with the die-block at the end nearest the crank (angularity effects again) so that's better for reverse. If inclined cylinders are to be used then the layout is exactly the same but it will probably be easier to design it as if it were horizontal and then swing the whole thing upwards. If the valve spindle is inclined to the piston rod then design about an imaginary parallel piston rod and put the return crank at right angles to that. (Where horizontal room is limited the bell-crank can be situated behind the quadrant, as in *Bonnie Dundee*, but this means an offset or joggle to allow the valve spindle to clear the radius hanger, and the repositioning of the return crank to trail by 90deg., as lap and lead will be taken from behind the hanger.) You could also use forked links and radius hangers but double plain ones are easier to make. Get it to work first, fluted parts can be substituted later if you like such things. And remember that the eccentric rod carries bending loads as it levers the links up and down, so arrange its deepest section at the quadrant hanger attachment.

The quadrant and the bell-crank fulcrum pin (which should be substantial) can be mounted on a sub-frame with the latter attached to the main frame or the slidebars and quickly removable. The gear can thus be easily taken to the bench as a unit when required, simply sliding the eccentric rod off the return crank pin and disconnecting at the valve spindle link.

In short, set it all up with the crank at one of the dead centres and the return crank leading it by 90 degrees. With the after end of the eccentric rod over the axle centre (or just fractionally behind it) the valve should be at mid-travel, the bell-crank at neutral, the die-block in mid-position and the hanger and link both vertical.

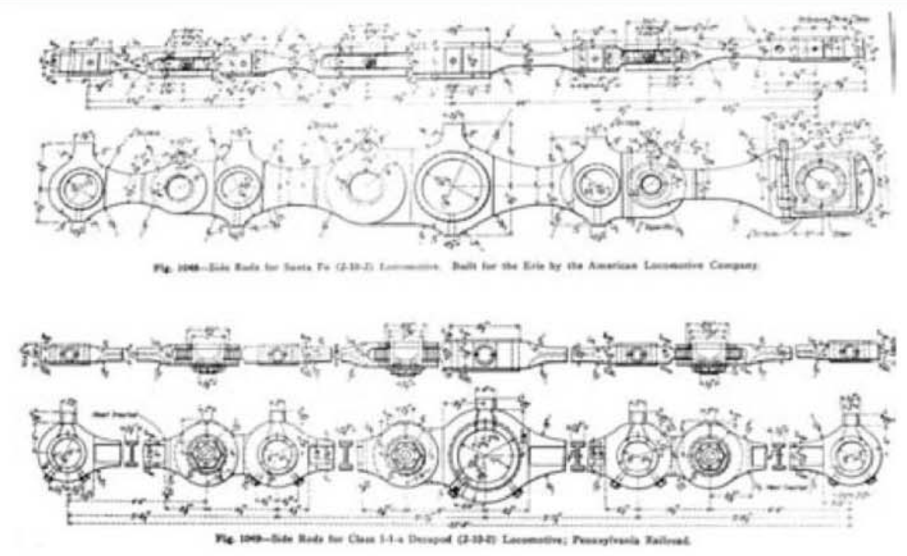
As with all arrangements using swinging rods there are various angularity effects and ways of mitigating these, most of which introduce their own complications. However, with Southern Gear using a reasonable length of links inequalities are small and don't seem to make noticeable effect on practical performance. My engine makes quite satisfactory puffing noises, anyway. So, have a try at a Southern gear, it's a good conversation piece.

KEITH'S COLUMN

Keith Wilson

reports finding a wealth of detailed information, makes progress with the tenders, and regales us with some reminiscences.

●*Part XXXII continued from page 698 (M.E. 4223, 11 June 2004)*



LOGGER & SLOGGER

AMERICAN TYPE 2-8-2 LOCOMOTIVES

for 5in. and 7¼in. gauges

It never seems to rain but it pours! I had of course heard — or rather read — of the existence of the American book *1919 Locomotive Cyclopedia*, but understood it was incredibly rare and unlikely to be obtainable. Once again I was wrong, for much of it has been re-published in 64-page booklets.

A search of the Internet has revealed **www.ABEbooks.com** to be an extraordinary and comprehensively valuable website. Booksellers and dealers all over the world are 'members' — if they wish — and author, title or some other criteria can be used to locate books. They are listed in reverse order of price — if that's the way you want them, in American dollars — no real handicap of course. Once located, they can be ordered; payment by credit card is acceptable and once you are 'in' records are kept of address, etc. so that delivery is straightforward. I discovered one of Kipling's books, a special autographed edition, at a mere $1,100,000, and thousands of other books at $1 plus postage. I also discovered that in my own collection I had more than one book that was nowhere for sale world-wide!

So I am gradually building up a collection of the parts of the *Locomotive Cyclopedia* — and talk about value for money! They are well illustrated with numerous drawings, and while I cannot see any that specially apply to our particular locomotive, at least forthcoming designs from me on *Slogger/Logger* will be more 'Americanised'. As an example, I include a typical drawing for a coupling rod assembly — note the attention to dimensions and details.

As you will have imagined, I am of course transferring much of the information to computer for eventual inclusion in the regular construction series — but it takes time, lots of it.

To work

This time we have a drawing of the tender which while not yet complete, is reasonably accurate. Compared with the photographs, there is a difference in colouring but that's about all. The dimensions in brackets are for our 5in. *Logger*.

The other drawings, of the Pilot Assembly, omit the central 'buckeye' coupling, because I have no information (as yet) on its dimensions. Although this pilot resembles a cowcatcher, it is more of a platform for railway workers to ride on. I don't know what the HSE would make of this if it were common this side of the pond, but with a little care (and some experience!) the danger was probably only potential.

Since it is likely to be the first item damaged in a derailment in our sizes, I show it a bit stouter than 'scale'. In this country, on the GWR at least, shunting was almost exclusively carried out by a 57xx with a 'match truck' between it and the wagons being shunted. As far as I recall, this match truck was fitted each side with footrests just above rail level, and with handrails to boot. I cannot recall actually seeing these facilities in use, but I have no doubt that they were.

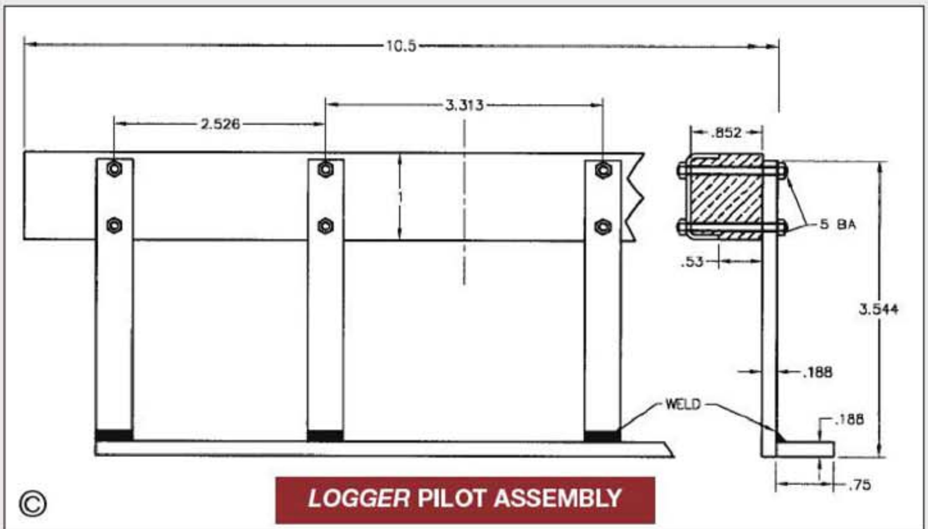
As mentioned last time, the pilot beams are of wood— preferably a hard wood. Incidentally, in case you didn't know although Balsa is very soft and light, it is a hardwood! I do not, however, recommend it for this application. It is easy enough to shape the wood to a snug fit in the channel sections which form the ends of the frame, and fix it with studding and nuts — unless of course you feel like machining some bolts that long! In any case, I strongly recommend the use of washers.

The rear coupling is also held by studs passing right through as for the pilot beam. I understand that there are two main types of Buckeye couplings, one that goes right through the beam and is fixed from the 'inside' and t'other that bolts directly onto the pilot beam concerned as for this tender and visible in previous photographs.

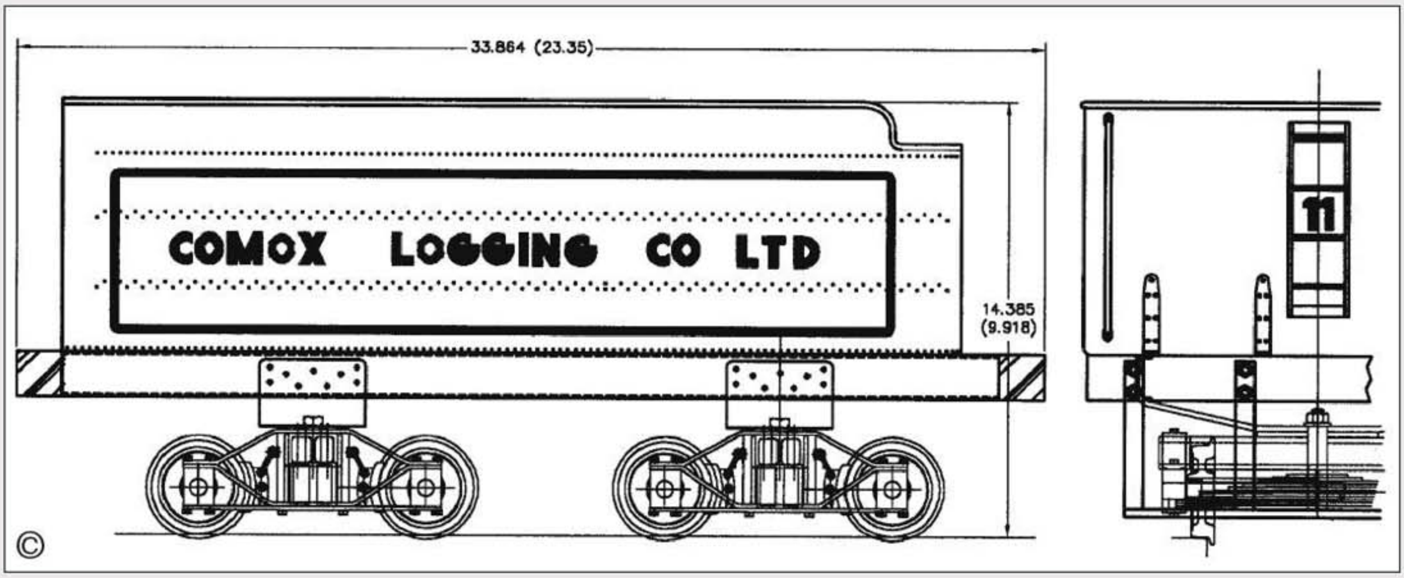
For sharp-eyed readers who notice that CO LTD (instead of 'INC.') appears on an American locomotive, it was built by Baldwin in America but changed hands once or twice and ended up on Vancouver Island in Canada; hence the 'Company Limited'.

I am told that the bright red object on the right-hand side of the tender is a re-railing aid. I'm not certain how it was used, but logging track in the wilds is seldom up to 100mph main-line standard.

Shunting (as we call it) or switching (over the pond) is a surprisingly interesting matter, I do not



LOGGER PILOT ASSEMBLY



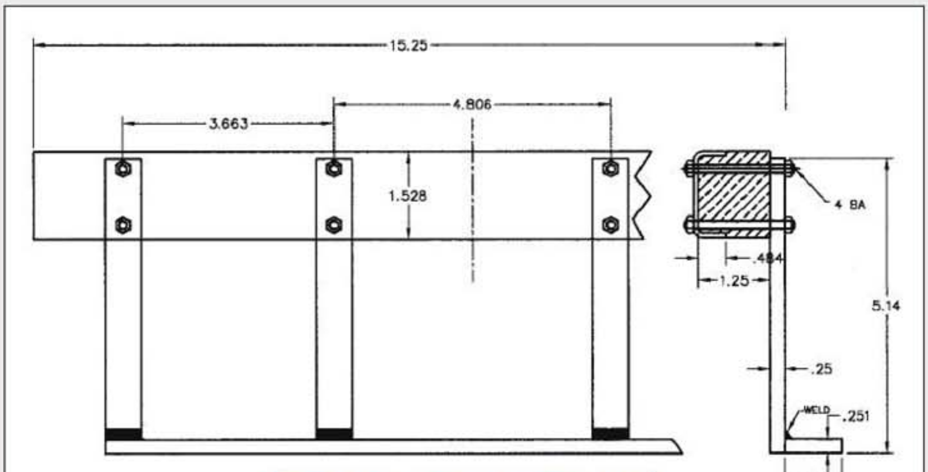
recall reading more than a few minor mentions in various pamphlets. It was quite a tough task for footplate crews as very frequent reversals of direction (somewhat trying!) can cause quite a bit of arm-ache. The fireman's task was not much easier, because 'notching-up' was not worth the effort, there not being really enough time in any one direction so to do. A sharp look out was vital, especially after dark, for staff frequently walked across tracks (perforce) although said staff rapidly gained experience. If they didn't, they wouldn't have survived very long.

It was often quite a problem to decide shunting procedures; in fact I understand that the *GWR Railway Magazine* set shunting problems in its pages (rather like today's crossword puzzles) but I am not aware of any prizes being offered. The idea was to solve the puzzles with the fewest number of moves — an obvious advantage to all parties concerned.

Even with 'hump' marshalling yards, it was not always a solution to distribute trucks merely on the order of their destinations, for frequently the order of trucks in any one train was important. Should it be needful say, to drop off three trucks at station A and pick up three at the same time, then drop off two at B, picking up five; followed by 10 at Junction X, clearly quite a problem arises. It takes a certain amount of time for even the simplest manoeuvre. Recollect that for main-line working, the Toad (guard's van, caboose, etc.) always has to be at the end of the train, so you should immediately realise that shunting is no light matter. Also, of course, the driver must be aware of how much track is available in each siding so as not to over- or under-do the 'escape velocity', for few wagons were less than about 10 tons tare and if propelled too fast there is a risk of kerrunch!! while if too slow, coupling up to the rest of the train becomes impossible.

To illustrate this, let us deal with the operation at Station A. The Toad must be uncoupled and left on the line while the three wagons are uncoupled and shunted off. Then the three pick-ups must be collected and shunted back to the waiting Toad. Note that the pick-ups would have to be on a different siding, if not then some more juggling would be necessary. The train would have to cut off the Toad, couple to the pick-ups, shunt these back onto the Toad, then park the drop-offs onto the siding, go back to the Toad, re-couple, then on to Station B where more juggling takes place.

Assuming 1 minute per operation, then Station A has taken up 6 minutes at least, or possibly more (if sidings are limited in number) requiring further operations. In fact, there were races (in one sense) to determine which driver could run a certain pick-up train fastest. Thus if you were ever around some sheds in the early hours, you might well hear the rude whistle-code blown as the run was completed a bit sooner than the last time. A friendly procedure, clearly to the advantage of all concerned — no unnecessary risks being taken.



***SLOGGER* PILOT ASSEMBLY**

Those were the days!

In the days of steam, nice runs were to be made, of which the newspaper train was one. As far as I recall, this train was heavy, was headed by a King, was loaded in Platform 1 at about 2am, and had the same schedule as the Cornish Riviera. Other good trips included the 47 that left Southall early evening, picked up a train of empties at Park Royal and ran them in a leisurely fashion out to Banbury. With about an hour to waste, fish and chips were consumed by the crew, followed by a fast run back to Park Royal. As is well known, even with 4ft. $7^1/2$in. wheels, 47s could show a tidy pair of heels when needed.

I believe I mentioned some time ago that for one week a Mogul (same size wheels, oil-fired) worked the Bristolian; it would be hard to find a tougher schedule. On one occasion, *the* City took over this train due to the King having indigestion; I don't know how well it fared, but it was seen running like the proverbial bat out of hell. It is amazing in the old days as to how a smallish steam locomotive could take over and exert itself to complete a run, sometimes exceeding the 'normal' locomotive in performance. Much, of course, depended on the fireman's spirit and his willingness to shovel coal.

I was on the famous 9 May 1964 high-speed run when *Pendennis Castle* 'ceased to function'. We were all worried that only a Hall (*Capel Dewi Hall*, now scrapped) was available. Smaller than a

Young enthusiasts at Ivan Smith's Stockholes Farm Miniature Railway.

Castle but as events soon proved, 'small but doughty'. And how! The time from passing Fairwood junction (just after Westbury) to stop in Taunton took just 10 seconds longer than the pass-to-pass schedule of the Castle. The top speed recorded was about 84mph. Considering that the Castle was running on a very tight schedule and would have been doing somewhere in the region of 80-90mph at both points, it speaks for itself. The driver was Alf Perfect of Old Oak Common shed; he was looking to set a new record for the Paddington-Plymouth run and was terribly upset — and I don't blame him. As it happened, the running time was a new record, but not non-stop.

> ***Wilson's Words of Wisdom:***
> *Those who like to think that it is only women whose work is never done should try their hands at running a railway.*

For the curious, the Castle had just touched 97mph (several minutes early to schedule) and was still accelerating through Lavington when the cord was pulled by the inspector/guard who had seen flames and sparks where they shouldn't have been. So one record was lost, but another lesser one was gained.

What of things to come?

A matter of some concern to all of us is the future of model engineering. There seem not to be as many youngsters coming into the fold as we might wish. Every encouragement should be given to youngsters, and I am glad to state that some railways are in fact giving encouragement. I have photographs showing examples. I do not know their names, but I have one of two lads from the Leyland area just visible over the top of a Prairie, and another of two lads from the Scunthorpe area on a platform with a battery-powered locomotive.

The railway concerned (Stockholes Farm) had a nice supply of Duchesses on shed, but alas my visit took place in the afternoon, the sun (very bright) was behind the shed and my photos are not worth trying to print — 'tis a pity, but such is life.

● *To be continued.*

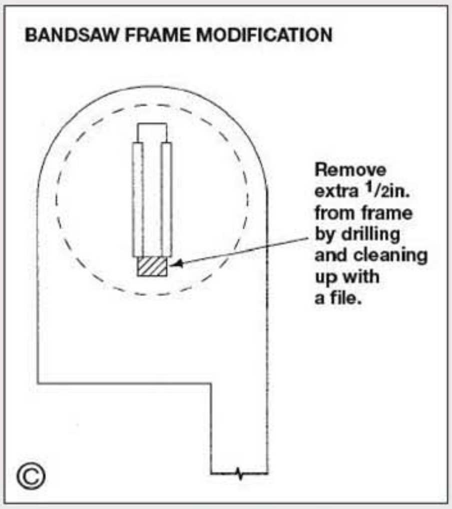
BANDSAW MODIFICATION
TO FIT A SHORTENED BLADE

Malcolm Leafe
describes a simple modification that could save money.

The low-cost Taiwanese cut-off bandsaws (originally I believe of US design) seem to have been a hit with amateurs of all persuasions. I have had one for over 10 years and despite its faults it still soldiers on, a 'rattling good' device with the accent on the 'rattling'.

The faults are apparent to all users and some have specified neat improvements to this very useful machine. I too have had trouble with blade tracking, instability of the sheet metal stand, etc., and above all, a terrible rattling due apparently to a badly welded seam in the stand. Incidentally, if you are concerned with blade tracking, do not overlook the point that a worn blade can have a gritty determination to run off to one side due to unequal set of the teeth.

Like many other users, I fitted a jack screw to the moving vice jaw to help with cutting short lengths of bar. I also cut screwdriver slots across the face of the eccentric adjusters for the blade guides to make adjustment easier and Sifbronze welded two stiffeners underneath the flimsy table, which is provided for use when the saw is used in



the upright position. A few tacks of weld were also applied to the stand. The saws are capable of sterling work — all I expect of it is that unattended, it cuts through whatever I require and, with the vice removed, it is remarkable just what can be clamped to the saw bed.

Last week I broke a venerable blade after much good service and the only spare was a blade which had been re-welded by the supplier a couple of years ago as it was faulty, and had never been used since. Of course, when it was re-welded it was shortened and now would not fit the wheels even at maximum adjustment. Not liking the idea of getting the brazing gear out at midnight I modified the saw.

By undoing one bolt and with recourse to a bit of 'faffling about' I soon removed the upper wheel and the blade tension screw. A few minutes work with a $^1/4$in. drill in the Black and Decker followed by some slog with a narrow 'millenicut' file served to extend the adjusting slot for the upper wheel guide block after which it was reassembled. The upper wheel now had a further $^1/2$in. of adjustment, the short blade was slipped on and work continued after a 15 minute stoppage. Fortunately, the tension adjusting screw in my saw was sufficiently long to permit this but in other cases it may be necessary to fit a longer screw

As far as I can see, the lengthened slot does not appreciably weaken the saw frame, the steel plate guides for the upper wheel guide block still fully engage their slots, and I can use repaired blades up to 1in. shorter than before. The modification could be done 'properly' on a milling machine but this way saves any dismantling — and my file work is to at least as good a degree of precision as the original.

LETTERS TO A GRANDSON

M. J. H. Ellis

records the results of his researches into the history of cylinder boring and discusses the use of a boring bar and allied tooling.

●*Part LXVI continued from page 32 (M.E. 4225, 9 July 2004)*

Dear Adrian, it occurs to me that although I may have mentioned in passing the uses of a boring-bar, I did not cover the subject in any depth. So I think that we could well hold a session on the subject which it is worth your while to know about.

By diligent inquiry, I have discovered that the idea of using a boring-bar originated with a British ironfounder named John Wilkinson who, in 1774 invented *"a machine which carried a cutting tool on a rotating bar through the middle of the rough-cast work-piece."* It seems that Wilkinson's intention was to produce a true bore in the cast-iron cannon used in those days with such devilish effect, but you only have to visit the warship HMS *Victory* which is preserved in Portsmouth Dockyard to see that her ordnance were all muzzle-loaders; how, then, could the boring-bar have passed right through the casting? However that may be, *"his patent coincided with the need of Boulton and Watt* (I am sure you must have heard of these pioneers of the steam engine) *to improve the quality of the cylinders for their steam engine, so that they were able to take advantage of Wilkinson's invention, which set the pattern for subsequent boring machines."* Incidentally, the early cylinders certainly needed improving, as witness the legend that the piston of one engine fitted so badly that James Watt was driven to stuffing his hat around it.

To begin with then, the purpose of a boring-bar is to machine the bore of a cylinder. In the workshop we would use it in conjunction with the lathe, with the work bolted down on the table and the boring bar running between centres. I should mention that there are also devices called 'boring heads.' These are a kind of overhung boring-bar which fits into the taper of the headstock mandrel. Obviously, the length of cylinder which they are capable of machining is restricted by the amount of overhang. They do offer the advantage however, that the radius of gyration of the tool can be finely adjusted, as it is carried on a miniature slide which can be moved in or out radially by a feed-screw.

No doubt, such an accessory could find a use where a blind hole had to be bored out, and the work was too bulky to be swung in the lathe but personally, I have never found the need for such a thing and have no experience of one to draw on. It is an easy matter to make something which will do the same job from a piece of say 1in. dia. round bright mild steel, but without the facility for fine radial adjustment of the tool. In that case, any fitting required would have to be done on the diameter of the piston component — another example of inversion.

A boring-bar is not difficult to make, and I have two of them, one 7/16in. and the other 1in. diameter. Bear in mind that its length has to be about twice that of the cylinder which it has to bore. At the one end, it has to accommodate a lathe-dog, (or it could be held in the 3-jaw chuck), but by way of compensation, at the tailstock end the centre, and also perhaps the end of the tailstock barrel, will be able to enter the bore of the work. Because of this, the cross-hole for the tool should not be half-way along the bar, but nearer to one end than the other by 1in. or so in the case of a 1in. diameter bar. What I have done was to drill a 1/8in. dia. hole through the bar to take a 1/8in. round HSS bit in the case of the small bar, and made a 3/16in. square hole by the process which I have previously described in the larger one. The HSS bit was held in place by an Allen grub screw at the side, which would have been No. 6 or 5BA in the one bar, and 2BA in the other.

Boring a 5in. gauge* Lion *cylinder block using a between-centres boring bar. The cutting tool edge is ground to a large radius to produce a good finish in the bore, and the tool is gripped by means of a tapered cotter pin. Note the substantial work holding arrangement and the cover plate to prevent swarf ingress to the vacant top-slide mounting position.

I found that with a bit of fiddling, it was quite possible to adjust the tool to an accuracy of no more than one thou., provided that the heel of the bit did not project from the bar. Suppose that the bore of the cylinder is 6 thous. undersize. You would make this measurement with spring calipers, adjusting them to an easy push fit in the bore, and then measuring across the end in the converse way with your micrometer. You now need to reset the cutter to project a theoretical 6/2, = 3 thous, further, but if the size of the finished bore is critical, I would make it no more than 2 thous. at the most to be on the safe side, and finish the bore by lapping.

The thing to do now is to measure with the mike across the bar to the tip of the tool and note the reading. Now loosen the grub-screw, tap the cutter a little further out and screw in the grub-screw to grip it gently. Set your mike to say two thous. more than it read before, and use it to press the tool-bit back in, after which the grub screw is tightened and a final check made that the bit projects as far as it should do.

According to my invaluable *Mechanics' and Machinists' Pocket Book*, *"Boring cutters stand well for most work at 15 to 20ft. per minute with carbon steel tools and a feed of 40 per inch roughing, 90 per inch finishing".* I expect that those figures referred to cast iron. If a cylinder was to be bored to 2in. diameter, 15ft. per minute works out to 30rpm, which would require use of the back-gear. That sounds about right to me.

Of course, the use of a boring-bar is not confined to boring cylinders. The bar or, for that matter, a boring head, or its poor relation, a flycutter mounted on a stalk bolted to the face-plate can be used for machining a surface which is only part of a cylinder. For example, I have used one or the other for machining a smokebox saddle, and the bottom of a traction cylinder. Those made in Britain nearly all bolted directly onto the boiler barrel, unlike American engines which, as you will know, had them mounted on a separate frame bolted onto the boiler.

The British arrangement might appear to entail a joint which would be difficult to make, but I have never seen one leaking, or even heard of such a thing happening. It did have the advantage of helping to keep the cylinder hot, besides which, I very much doubt whether it was ever necessary to break and re-make the joint during the entire life of the engine. But it seems to me, that in the US nobody cares much about how much fuel they waste. Perhaps I am too hard on your Dad, and I have to admit he has his good points, as when he brought me a most richly illustrated book about Case tractors which I have just consulted in order to be sure of my facts. One fact which I wanted to verify was that for the most part, even the boilers of these engines were not lagged at all. Anyway, to be fair, Case did at least lag their cylinders. By the way, it has always seemed to me that the American design of wheel, with its round spokes and rim rolled from flat plate was more sensible than the British pattern with its Tee-rings.

Now there is an important moral lesson here. You should never think that because you believe something to be right, that means that anyone who disagrees with you must be wrong. You can both be right, according to your own basic values. There were good technical reasons for British design following one road, and American design another. To take an extreme example, we might not agree with a cannibal's taste in meat, yet according to his culture and customs, he would say (and, I must admit, not without reason) that it was better to eat his dead enemy than to bury him. That way, he would acquire his valour. I dare say, some of our customs and taboos would seem odd to a visitor from another planet!

Because the boring-bar is the inversion of normal turning, you might think that the result would be identical. But actually, you do not need to ponder for very long to see that that is far from being so. I don't have space in this letter to enlarge on the subject, but I intend to expatiate on it in my next. In the meanwhile, you might care to dwell on the thought that there are old ladies about, who, unlike you and me think motorbikes are the invention of the Devil. And, according to their lights, they are justified.

Your affectionate Grandpa.

●*To be continued.*

How the professionals clean up spillages. A display by the Maritime and Coastguard Agency Counter Pollution and Response Team.

Up, up and away! In addition to cash prizes the winners were given a trip in a Navy helicopter.

OPERATION CLEAN-UP

Gerry Collins
reports on the Young Engineers Challenge 2004

Each year during National Science Week the Young Engineers for Britain organise a national competition involving young people aged from 10 to 18. There are Young Engineers clubs in schools and colleges throughout the UK. The Royal Navy is one of the organisation's national sponsors alongside a number of the UK's largest engineering based companies including BAA, BT Exact, and Lloyds Register. Young Engineers at national and regional levels work closely with the Royal Academy of Engineering and other professional bodies to promote engineering skills among the younger generation.

The challenge laid down by the Royal Navy this year was explained by Lieutenant Commander Charlie Field. Operation clean-up presented a fictional but highly realistic scenario. The Royal Navy type 23 frigate HMS *Marlborough* was patrolling the South China Seas on the lookout for drug smugglers. The frigate was in hot pursuit of a trafficker's ship when its target enters a lagoon and runs aground leaking hundreds of tonnes of oil. This was a potential ecological disaster with which the local authorities were unable to deal. The task set to the students was to design and build a craft capable of reaching the stricken vessel and collecting the oil before low tide. The students were operating under the constraint that the only access to the polluted lagoon was via a narrow and shallow reef only navigable at high tide. Lt. Cdr. Field added that the Young Engineers had to design and build a scale model craft capable of performing the job for real under these difficult conditions and demonstrate them in specially designed tanks.

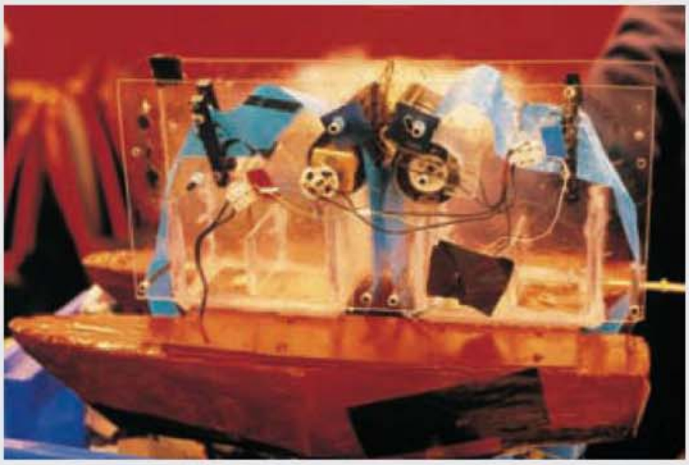
Forty teams (over 150 students in all, aged between 10 and 18) competed in three age groups for a series of generous cash prizes and visits to Royal Navy ships. The Royal Navy's School of Marine and Air Engineering, HMS *Sultan* situated at Gosport in Hampshire acted as host. The day started for the teams when they were each asked to make a three minute presentation to Naval officers outlining the results of their research, describing their work and explaining how they reached their final design. The team of each age group judged to have given the best presentation not only received a prize of £200 but were treated to a flight in a Lynx helicopter. This was an extra award given on the day and the look of surprise on the recipient's faces was a joy to see. Following the team's presentations they were each given the chance to put their craft into action in specially designed water tanks.

While all this was going on many of the training facilities at HMS *Sultan* were on view and open to other invited school and college students to enable them to find out more about engineering careers in the Royal Navy. Among the displays was one staged by the Maritime and Coastguard Agency, Counter Pollution and Response team showing some of the equipment available to the professionals in the event of an oil spillage around the coast of Britain.

A further attraction available to the students was the Fujitsu Challenge. The company had installed a number of consoles and visual display units so that teams and individuals could compete in a car racing game designed to show good dexterity and reaction times. The winners in the best schools average times and the best individual times each received a prize of a Fujitsu console.

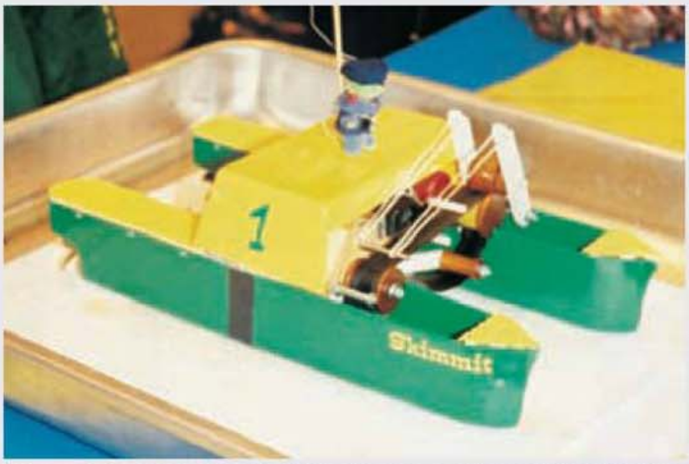
All present were all able to examine the students' designs during the afternoon testing sessions. It was fascinating to see how each group had studied the design brief and had come up with a number of ideas to solve the same problem. Several designs featured a roller mop or belt to absorb or lift the oil on board, cooking oil being used in the actual tests. This required some form of roller to squeeze the oil into the onboard container. All this required power, as did the craft with some form of suction to remove the oil from the surface of the water. The winning design, from the City of Stoke Sixth Form College in Staffordshire featured a plate that could be lowered

This design, from the Lochaber School in Fort William, used a paint roller to pick up the oil but lack of speed control spoilt their test run.



A continuous collection belt system was adopted by Snibston Discovery Park Science Club from Leicester.

The team representing 487 (North Birmingham) DF ATC from West Midlands used a simple hull with a front mounted scoop.



***Skimmit** was a catamaran fitted with a transverse collection belt with rollers to squeeze out the oil into the hull.*

The winning entry negotiates the narrow inlet in the test tank with its plate lowered to pick up the oil.

Reminiscent of IMLEC! The results chart published on a large VDU was a constant source of interest.

into the water to skim off the top layer of oil. The craft had a catamaran hull so the water passed between the hulls leaving the oil to go into the storage area at the stern of the boat. This oil well had an outlet and plug so that the collected oil could be discharged into the measuring container once the craft had been removed from the water.

The craft themselves showed many different ideas. Some students had concentrated on the internals and had just joined together plastic containers to form a hull. Others had made a former from which they produced a glass fibre hull, while others still had produced hulls from wood planking on formers. Most of the contestants chose standard propellers but one at least had built a paddle boat. I felt that this was not a good idea, as the paddle wheels tended to disturb the oil on the surface and reduced the efficiency of the oil pickup.

To describe all the entries would fill this issue and several others, I hope that the photographs included give an indication of the success of the event. These lads and lasses are the engineers of the future and the enthusiasm and energy they gave to the event led me to believe that the future of engineering is in good hands.

The presentations signified the end of the event. The Commanding Officer of HMS *Marlborough* Commander Graham presented the first few prizes. He should have left early for another appointment but his departure was delayed as his helicopter was still being used to give rides to the youngsters.

I would like to thank all involved with this event, particularity all the Naval officers and ratings of HMS *Sultan*. Nothing was too much trouble to organise or arrange and they were a credit to the Royal Navy. I would like to mention Press Officer Sub-Lieutenant Simon Willmore, who was a great help. Simon is studying engineering at Southampton University and is being sponsored by the Royal Navy. We wish him well with his future career.

RESULTS

Group	Position	Award	Presented by	Prize	Sponsor	Winner
2	1	Best presentation	CO Marl. Cdr. Graham	£200	Sea Vision UK - BP Shipping	The Community College
2	1	Best overall construction and design	CO Marl. Cdr. Graham	£200	Fleet Support Ltd.	Lochaber School
		Fujitsu Challenge 3 best individual times	Mr. Alan Habgood	Stg. console	Fujitsu	
Any		Fujitsu Challenge best school average time	Mr. Alan Habgood	Cx+Pntr	Fujitsu	Each winning team member
Any	1	Team with best corporate ID	FOTR RAdm P.R. Davies	£200	Sea Vision UK, James Fisher and Sons, Crewing and P&O	Our Ladies School
Any	Not first!	Titanic effort	Cdr. Wise (COL)	£200	Sea Vision UK, Marine Soc.	Millhouse School - Millhouse Tanker
3	1	Best presentation	Myr. Gosport Cllr. Binfield	£200	Sea Vision UK, BP Shipping	Newcastle under Lyme School
3	1	Best overall construction and design	Myr. Gosport Cllr. Binfield	£200	Sea Vision UK, MCA and IUA	City of Stoke 6th Form
1	1	Best presentation	DNR Cdr. Thwaites	£200	Sea Vision UK, DoT	Portsmouth Grammar School
1	1	Best overall construction and design	DNR Cdr. Thwaites	£200	Fleet Support Ltd.	Dulwich College Prep. School
		Young Engineers Award	Mr. David Rowley	Certificate	Young Engineers	DNR Collingwood Sultan
3	2	Most efficient collection of oil	Capt. Kidd	£300	IMAREST	Alton College (6016pts)
3	1	Most efficient collection of oil	Capt. Kidd	£500	Thales	City of Stoke (1.37m pts)
2	2	Most efficient collection of oil	Cdr. Sultan Cdr. N. Latham	£300	IMechE	Lampton School (500k pts)
2	1	Most efficient collection of oil	Cdr. Sultan Cdr. N. Latham	£500	Vosper Thornycroft	St. Swithuns (7.8m pts)
1	2	Most efficient collection of oil	FOTR RAdm P.R. Davies	£300	Seavision, NUMAST	Bancroft School (19k pts)
1	1	Most efficient collection of oil	FOTR RAdm P.R. Davies	£500	Flagship Training Ltd.	Portsmouth Grammar (75K pts)

CLUB CHAT

With Malcolm Stride

Before I begin the real business this issue I would like to make some comments about photographs. In these days of home computers and digital cameras, many of your club newsletters now include selections of excellent photographs which I am keen to include in this column. So if those of you who send in items for our use could bear this in mind and possibly include some photographs on computer media or even a reasonable sized print which can be scanned I would be very pleased to include your work. The other option is to e-mail them to the editorial office and, of course, in all cases include details of the subject and photographer.

UK News

Richard Harvey, editor of **Bournemouth DSME** *News* reports how *"a few other diehards and myself"* made the trip north to the Harrogate Show. The 'raiding party' also took in a visit to the National Railway Museum and were very impressed with the exhibits and described the museum as *"a must for all the family."* The society is also investigating the provision of some two-seat driving trucks for use by members who do not have their own and for members who may occasionally need the company of a more experienced club member. This sounds like an excellent idea and certainly better than the experienced member walking alongside the 'learner'. Members have been carrying out maintenance on the track and have re-profiled the trolley wheels.

In April, members of **Bedford MES** were regaled by Barry Jordan describing how he builds his fabulous miniature machine tools. The club locomotive, *Loch Treig*, has had *"a fairly major shopping"* with work carried out on the side and piston rods, new links, major regulator rebuild and a screw operated handbrake made and fitted. The newsletter editor has promised *"not to reveal the names of those who have religiously set the brake when parking and have then had trouble shifting the train with a full load and the parking brake applied."* Since he has stuck to his rule, I can't embarrass them even more by quoting their names in this column! I suspect there are many out there who have done the same thing. The new garage to house the lawnmowers and other items is well under way and following the completion of this, attention will turn to extending the workshop. Other work includes preparations to complete the steaming bays and to concrete the members' enclosure adjacent to the ticket office. Congratulations are due to Betty and Malcolm Freestone who are to celebrate their 50th wedding anniversary at the track on 14 August. The event will be looked upon as an excuse for members and guests to come to the track and enjoy themselves.

The **Birmingham SME** newsletter contains an article on the 'British Steam Car Challenge', a project with the twofold aim of breaking the land speed record for steam powered vehicles and fostering interest in alternative fuels. From the published pictures the vehicle looks similar to some of the earlier streamlined record breaking cars having a very 'curvy' all-enveloping body with a closed central cockpit. Motive power is provided by a two stage non-condensing turbine fed by boilers fired by LPG. The boilers are designed to produce a massive 2MW of heat release and each comprises 28 finned tubes manufactured in stainless steel. Each boiler has been designed to produce steam at 500psi and 725deg. F at a mass flow rate of 625lb./hr. Now that's what I call a flash steam boiler! Several members of the *Thrust* supersonic car team have been reunited to work on the project. Further information can be

ENTRIES ARE INVITED FOR THE

LBSC MEMORIAL BOWL COMPETITION 2004

HOSTED BY

WORTHING & DISTRICT SOCIETY OF MODEL ENGINEERS

SUNDAY 4 SEPTEMBER

Any steam locomotive to or based on an LBSC design in $2^1/_2$, $3^1/_2$ or 5in. gauge is eligible provided it has not won an award in a previous LBSC Memorial Bowl Competition

Please apply for an Official Entry Form
to the Model Engineer Editorial Office
PO Box 310, Hemel Hempstead, Hertfordshire HP3 8LX
tel/fax 01442-269366; e-mail mchrisp@highburyleisure.co.uk

ALL VISITORS WILL BE VERY WELCOME MODEL ENGINEERS, THEIR FAMILIES AND FRIENDS, PARTICULARLY SO

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.

AUGUST

6 **Aylesbury (Vale of) MES.** *Track Night.* Contact Andy Rapley: 01296-420750.
6 **Canvey R&MEC.** *Shunting Competition.* Contact Brian Baker: 01702-512752.
6 **Maidstone MES (UK).** *Evening Run & Barbecue.* Contact Martin Parham: 01622-630298.
6 **North London SME.** *Stationary Steam Section Entertains at Colney Heath plus Barbecue.* Contact David Harris: 01707-326518.
6 **North Norfolk MEC.** *S. Kinch: Restoration of a Riley.* Contact Gordon Ford: 01263-512350.
6 **North Wiltshire MES.** *Lanterns on the Lake Day.* Contact Les Stiff: 01249-521658.
6 **Rochdale SMEE.** *Meeting.* Contact Mike Foster: 01706-360849.
6 **Romford MEC.** *Competition Night.* Contact Colin Hunt: 01708-709302.
6-8 **British Columbia SME.** *Trainfest Meet.* Contact Sean Laurence: (604) 931-1547.
7 **Great Western Soc.** (Didcot Railway Centre). *Didcot Steamday.* Contact Jeanette Howse: 01235-817200.
7 **Ickenham DSME.** *Public Running.* Contact D. Sexton: 01895-254159.
7 **Isle of Wight MES.** *Track & Pond at Broadfields.* Contact Ken Stratton: 01983-531384.
7 **Maxitrak Owners Club.** *Annual Rally at Surrey SME track, Leatherhead plus Maxitrak Track Day.* Contact Eric Penn 0208-979-4335.
7 **Old Locomotive Committee.** *Northampton SME host **Lionsmeet 2004** at, Lower Delapre Park, Far Cotton, Northampton.* OLCO contact Peter Gardner: 01252-541999; NSME contact Pete Jarman: 01234-708501 (eve).
7 **Sutton MEC.** *Hosts to Gauge 1 Association.* Contact Mike Dean: 0208-657-5401.
7 **York City & DSME.** *Summer Workshop (Sheetmetal) & Meeting.* Contact Pat Martindale: 01262-676291.
7/8 **Guildford MES.** *OMLEC.* Contact Dave Longhurst: 01428-605424.
8 **Bristol SMEE.** *Public Running Day.* Contact Trevor Chambers: 0145-441-5085.
8 **Cambridge MES.** *Public Running.* Contact Rex Mountfield: 01284-386128.
8 **Cardiff MES.** *Steam-Up and Family Day.* Contact Trevor Jenkins: 029-2075-5568.
8 **East Somerset SMEE.** *Public Running.* Contact Roger Davis: 01749-677195.
8 **Great Western Soc.** (Didcot Railway Centre). *Freight & Passenger Steamday.* Contact Jeanette Howse: 01235-817200.
8 **Harlington LS.** *Public Open Day.* Contact Peter Tarrant: 01895-851168.
8 **Hereford SME.** *Public Open Day.* Contact Richard Donovan: 01432-760881.
8 **Hornsby ME.** *Running Day.* Contact Ted Gray: 9484-7583.
8 **Leighton Buzzard NG Rly.** *Fancy Dress Day.* Enquiries: 01525-373888.
8 **Ottawa Valley Live Steamers.** *Steaming Day.* Contact John Bryant: 761-1109.
8 **Plymouth MSLS.** *Members' Day.* Contact John Brooker: 01752-671722.
8 **Surrey SME.** *Public Running.* Contact John Cook: 020-8397-3932.
8 **Sutton MEC.** *Track Day.* Contact Mike Dean: 0208-657-5401.
8 **Teesside Small Gauge Rly.** *Running.* Contact Mike Aslin: 01642-724255.
9 **Erewash Valley MES.** *Steaming Evening.* Contact Jim Matthews: 01332-705259.
9 **Melton Mowbray DMES.** *Summer Evening Steam-Up.* Contact Phil Tansley: 0116-2673646.
9 **Saffron Walden DSME.** *Club Night.* Contact Jack Setterfield: 01843-596822.
10 **Historical MRS (North West Area).** *A Selection of Short Varied Presentations.* Contact David Goodwin: 01224-880018.
10 **King's Lynn DSME.** *Meeting.* Contact Mike Coote: 01533-673728.
11 **Frimley & Ascot LC.** *Teddy Bear Special.* Contact Bob Dowman: 01252-835042.
11 **Great Western Soc.** (Didcot Railway Centre). *Didcot Steamday.* Contact Jeanette Howse: 01235-817200.
11 **Isle of Wight MES.** *Trip aboard the Shieldhall.* Contact Ken Stratton: 01983-531384.
11 **Norwich DSME.** *Barbecue at Eaton Park.* Contact Paul Reed: 01603-462925.
11 **St. Albans DMES.** *Simon Cast: Modelworks Presentation.* Contact Roy Verden: 01923-220590.
12 **Worthing DSME.** *Bits & Pieces.* Contact Bob Phillips: 01903-243018.
13-15 **Frimley & Ascot LC.** *Open Days.* Contact Bob Dowman: 01252-835042.
14 **Great Western Soc.** (Didcot Railway Centre). *Didcot Steam & Railcar Day.* Contact Jeanette Howse: 01235-817200.
14 **Maxitrak Owners Club.** *5th Maxitrak Meet at Ipswich SME.* Contact David Barton: 01473-726577.
14 **North London SME.** *Visit of Brean Sands Modellers.* Contact David Harris: 01707-326518.
14 **Wigan DMES.** *Visit to Butterley MRS.* Contact John Chamberlain: 01744-882255.
14/15 **Leeds SMEE.** *August Rally.* Contact Colin Abrey: 01132-649630.
15 **Bedford MES.** *Public Running 'Teddy Bears Day'.* Contact Ted Jolliffe: 01234-327791.
15 **Birmingham SME.** *Simply Trains at BSME.* Contact John Walker: 01789-266065.

found on the project web site at **www.steamcar.co.uk** At the society AGM Peter Flavell was presented with the Reeves Rose Bowl for his achievements on behalf of the club. The society is again holding their national rally which this year will take place over the weekend 10-12 September.

One of the ideas that came out of the recent 'ideas evening' at **Frimley & Ascot Locomotive Club** was that of holding a shunting competition. The society hopes to stage such an event soon and we will report the result as soon as we get information. This sort of event does make a change from the usual trundling round and round by locomotives; perhaps other clubs who have held such events would care to send information to this column.

The **Fylde SME** newsletter cover headline declares *"Trophies for two FSME members at NAME Exhibition."* The awards in question were the Jack Coulson Memorial Trophy to Bob Shaw for his $7^1/4$in. gauge Britannia class *Coeur-de-Lion* which was 7,000 hours in the building and looked magnificent in the photographs, and the Bryan Cantwell UDMES Trophy to Dennis Evans for his $3^1/2$in. gauge *Duke of Gloucester* which was also very impressive. We offer our congratulations to the winners and state here that we would love to see both locomotives at Sandown in the future. Following the demise of the club *Bo-Bo* locomotive, Fylde members have been offered the loan of a new locomotive for a trial weekend from a company in Southport. This excellent offer is being taken up.

Richard Donovan, Chairman of **Hereford SME,** has obviously learnt 'Australian' during his recent trip as he opens his notes with *"G'day mates. We had a bonzer time down under but sadly reality is now returning."* Richard also picked up the following motto which he thinks should be pinned on all our workshop notice boards: *"Do not let reality get in the road of your dreams."* Hereford members are busy preparing for 25/26 September when they host the **$7^1/4$" Gauge Society** AGM. Following the Halloween Events at Malvern Girls College last year the anonymous contributor nicknamed 'Blowing off' has investigated other customs local to Hereford and Worcestershire including 'Wassailing the Trees', 'Burning the Bush', 'Twelfth Night Fires', 'Easter Monday Heaving' and 'Ho Pickers Cribbing'. However, the one that appealed to our anonymous contributor is the wonderfully named 'Grunging the Futtock' which is supposed to date back to the stone age when Stone Age man would spend the winter working on his latest project (usually a new flint axe or similar) and woe betide any wife who interrupted this work. When the spring came our Stone Age man would emerge from his dark recess with his handiwork. This would be followed by the ceremony of 'Grunging the Futtock' where all the men would gather together and display their winter's handiwork. The ceremony apparently ended with much eating and drinking and a promise by the men folk to spend more quality time with their families. If this sounds strange but familiar, don't blame me I only report things from newsletters! As the editor comments *"this will not prevent our more adventurous members displaying their latest 'Futtocks' on the table during the next 'Bits & Pieces' evening".*

At the time of writing members of the **Model Engineers Society of Northern Ireland** are concentrating their efforts on preparations for their forthcoming 60th anniversary celebrations. Twenty or more members attended the Harrogate Exhibition (including some exhibitors) and as the Chairman comments *"no doubt the plastic will take a bashing."* The society had a presentation in April by Mervyn Thompson about his 'Thompson Metal Models.' Mervyn is a farmer from Broughshane who has diversified into toy making with farm machinery as his inspiration. Among other things Mervyn recounted his struggles with authority regarding safety and patent rights, something which may have a familiar ring for many readers. The newsletter also carries photographs from the official opening of the 'G' scale track at Cultra.

The 20th model locomotive rally put on by the **Isle of Wight MES** was very successful with over 60 attending on the Saturday and 180 on the Sunday. The event also commemorated the life of Don Young and several of his designs were in evidence. These included a Railmotor 3 and two LMS 4F locomotives. The track was so busy on the Sunday that timed running periods were in operation to ensure everyone had a go. Did the site ring to the sound of *"Come in number 20 your time is up"*? The boating pond was also very busy with lots of boats including the late Sid Hendicott's paddle steamer *Gracie Fields.* Visitors included Bob Symes and Don's brother Colin who donated a teak garden seat in memory of his brother. W. Ellington-Boot notes that the flavour of the month is *"white"* with *"everything being painted this fetching colour. Ceiling, walls, doors, fencing, tea trolley, etc."* The society had a talk by Gil Hughes on how railway artists captured the spirit of the steam railways. The talk was illustrated with an *"impressive series of pictures."* Gil spent some time talking about the late Terence Cuneo and his work and following this made contact with Cuneo's daughter Carole who subsequently paid a visit to the Broadfields site with her grandson Theo. Theo enjoyed some train rides and operated a boat on the pond while other members became engrossed in Cuneo books and literature and received an update on the Terence Cuneo Memorial which is to be placed at Waterloo Station in November this year. The Cuneo website is at **www.terencecuneo.co.uk** In March, members took the 'Wootton Tramway' to the London Transport Museum at Acton and had a very successful weekend operating. This followed a very foggy crossing which took $1^1/2$ hours; the group discovered that they were going

15	**Canterbury DMES (UK).** *Public Running Day.* Contact Granville Askham: 01227-463295.
15	**Chichester DSME.** *Public Open Afternoon.* Contact Brian Bird: 01243-542266.
15	**Great Western Soc.** (Didcot Railway Centre). *Didcot Steamday.* Contact Jeanette Howse: 01235-817200.
15	**Guildford MES.** *Public Open Afternoon.* Contact Dave Longhurst: 01428-605424.
15	**Guild of Model Wheelwrights** *at Mid-Somerset Show, Shepton Mallet.* Contact Biddy Hepper: 01492-623274.
15	**Keighley DMES.** *Open Day.* Contact K. Parkin: 01274-564866.
15	**Pinewood MRS.** *Public Running.* Contact Ivan Hurst: 01276-28803.
15	**Plymouth MSLS.** *Public Running.* Contact John Brooker: 01752-671722.
15	**Rugby MES.** *Public Running.* Contact David Eadon: 01788-576956.
15	**Saffron Walden DSME.** *Running Day (public pm).* Contact Jack Setterfield: 01843-596822.
15	**Taunton ME.** *Public Running Day.* Contact Don Martin: 01460-63162.
15	**Teesside Small Gauge Rly.** *Running.* Contact Mike Aslin: 01642-724255.
15	**Wimborne DSME.** *Running Day.* Contact Eric Basire: 01202-897158.
15	**Woking MRS.** *Family Fun Day.* Contact Ronald Dewar: 01932-343331.
15	**York City & DSME.** *Running Day.* Contact Pat Martindale: 01262-676291.
16	**Lancaster & Morecambe MES.** *Informal Evening.* Contact Harry Carr: 01524-411956.
16	**Peterborough SME.** *Barbecue & Social Evening.* Contact Tony Meek: 01778-345142.
16	**Salisbury DMES.** *Ivan Perryman: Model Boiler Making.* Contact Pete Parrish: 01980-610346.
17	**Basingstoke DMES.** *Meeting Night.* Contact Guy Harding: 01256-844861.
17	**Chesterfield MES.** *George Wainwright: Slides.* Contact Mike Rhodes: 01623-648676.
17	**Northampton SME.** *Running Night – Visitors Welcome.* Contact Pete Jarman: 01234-708501 (eve).
17	**South Durham SME.** *Evening Steam-Up.* Contact B. Owens: 01325-721503.
18	**Bournemouth DSME.** *Barbecue.* Contact Mike Baker: 01202-383653.
18	**Great Western Soc.** (Didcot Railway Centre). *Didcot Steamday.* Contact Jeanette Howse: 01235-817200.
18	**Hull DSME.** *Running Evening at West Park.* Contact Tony Finn: 01482-898434.
18	**Maidstone MES (UK).** *Members' Afternoon Playtime Run.* Contact Martin Parham: 01622-630298.
18	**MELSA.** *Meeting.* Contact Graham Chadbone: 07-4121-4341.
18	**West Wiltshire SME.** *Steam-Up.* Contact R. Nev. Boulton: 01380-828101.
18/19	**Guernsey MES.** *West Show, L'eree.* Contact Dave Simon: 01481-251017.
19	**Bedford MES.** *Holiday Running.* Contact Ted Jolliffe: 01234-327791.
19	**Cardiff MES.** *Forum.* Contact Trevor Jenkins: 029-2075-5568.
19	**East Somerset SMEE.** *Club Running.* Contact Roger Davis: 01749-677195.
19	**Leyland SME.** *Guest Speaker: 12/24 Volt Electirc Traction.* Contact Mark Entwistle: 01772-422411.
19	**Sutton MEC.** *Evening Steam-Up.* Contact Mike Dean: 0208-657-5401.
20	**Canvey R&MEC.** *Steam-Up/Gala Day Briefing.* Contact Brian Baker: 01702-512752.
20	**North London SME.** *Barbecue at Colney Heath.* Contact David Harris: 01707-326518.
20	**Rochdale SMEE.** *Sid Mortimer: Building Bridget.* Contact Mike Foster: 01706-360849.
20	**Steam LS of Victoria.** *Gathering.* Contact Graham Plaskett: (03) 9750-5022.
20-22	**Bristol SMEE.** ***Bristol Model Engineering and Hobbies Exhibition*** at Thornbury Leisure Centre, Nr. Bristol, South Gloocestershire. 10am-7pm (Fri) 10am-6pm (Sat) 10am-5pm (Sun). Adult: £6, Child: £2.50, OAP: £5.50, Family (2+3): £14. Contact 0117-977-6956.
20-22	**Guild of Model Wheelwrights** *at Bristol MES Model Engineering and Hobbies Exhibition.* Contact Biddy Hepper: 01492-623274.
21/22	**Birmingham SME.** *Christian Motorcyclists' Association Camping Weekend at BSME.* Contact John Walker: 01789-266065.
21	**Chesterfield MES.** *Running Day.* Contact Mike Rhodes: 01623-648676.
21	**Great Western Soc.** (Didcot Railway Centre). *Didcot Steam & Railcar Day.* Contact Jeanette Howse: 01235-817200.
21	**Guild of Model Wheelwrights** *at Ruthin Show, Denbighshire.* Contact Biddy Hepper: 01492-623274.
21	**Hornsby ME.** *Family Day & Boiler Inspection.* Contact Ted Gray: 9484-7583.
21	**Malden DSME.** *Families Day/Night Run.* Contact John Mottram: 01483-473786.
21	**National $2^1/2$in. Gauge Ass'n.** *Northern Area Summer Rally at Fylde.* Contact Clive Young: 01233-626455.

backwards because the ship's compass for the normal direction was out of service so the Captain had just turned the ship round after leaving Cowes and crossed in reverse. It was so foggy that the group could not tell which way they were facing!

Members of **Norwich DSME** have been asked to assist in the celebrations to mark the refurbishment of Eaton Park in which their track is situated. The celebrations are in the form of a garden party held by the Mayor and Mayoress of Norwich who intend to visit the track to see the locomotives in operation. Members have laid out and fenced the area for their new ground level dual gauge track, are busy seeking donations and are asking members to sponsor one metre lengths of track. Businesses who donate will have the opportunity to have their logo displayed on the passenger cars and free advertising in the magazine. Peter Lewis describes his new electric locomotive *Kenebunkport* built from photos and information from the American *Model Railroader* magazine. The electric powered model has dual gauge axles which can be easily swapped between 5in. and $7^1/4$in. gauges. The *"thought for the day"* in the magazine is *"The light at the end of the tunnel, is the headlight of an oncoming train."*

At the **Northern Association of Model Engineers** AGM held on the Saturday of the recent Association show it was decided that another exhibition would be held in three years time. It is also possible that a special 'Diamond Jubilee' exhibition will be held next year to celebrate 60 years of the association. This arises from the number of requests to the committee for such an exhibition. The Northern Association Rally will be held on Saturday 4 September at the Abbeyfield Miniature Railway site of **Sheffield DSMEE.**

Members of **Wigan DMES** enjoyed Dr. Malcolm Higgins *"evening of reminiscences and historical fact"* on his experiences of the way of life of lighthouse keepers. Malcolm's father was a lighthouse keeper and Malcolm was brought up moving from place to place according to his father's posting at the time. The evening was illustrated with drawings and pictures from Trinity House.

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.

Mick Airey	*Colchester SMEE*
Paul Ridley	*Sutton MEC*
Russ Seon	*Toronto SME*

World News

Canada

The May edition of *The Whistle*, journal of **British Columbia SME**, reports that the running season at Confederation Park started with a *"spectacular 4-day opening with clear warm sunny days."* The opening day dinner on the Saturday was described as a *"smashing success."* Although not fully completed, the new raised track was opened on the Saturday. Some shortcomings were exposed but as the President comments *"fine tuning is to be expected."* Several locomotives are undergoing overhaul *"in the shop"*, notably the Northern No. 3601 with attention to its running gear, and following a chassis overhaul, the over-stressed copper boiler of the NYC Hudson is to be replaced with a Briggs type boiler.

New Zealand

The **Canterbury SME (NZ)** security team slept on site before the official track opening at Hallswell and are reported as having a good night's sleep except for the excessive noise made by the resident mouse! The opening ceremony was performed by Mr. Mike Mora, Wigram Community Board Chairman, with Ross Fielden driving the inaugural train. Progress on the boating pond is *"slow but still moving."* A request to preserve the islands placed in the pond is to be complied with if possible. If I may add a note of caution here — past experience indicates that islands have a magnetic effect on model boats. Malcolm Cowie won the 'Mini-Americas Cup' race at the February Exhibition. A party of 35 members and families visited Lake Hood in April with about 20 model boats and a dog taking to the water. A great day was had by all.

Members of **Maidstone MES (NZ)** have had a lot to contend with recently as their area in Maidstone Park was flooded almost weekly during February with water over the raised track on two occasions. A large tree branch also fell, bent a rail and left a severe pothole on the elevated track. The 'silver lining' is that this prompted the City Council to prune the trees and improve drainage at both the northern and southern ends of the track.

Members Peter Carter, Bob Garrett and Scan Sullivan from **Hutt Valley MES** have been passed out as drivers for diesel locomotives. Congratulations are due to all three and no doubt they will soon be taking their turn at public running.

Otago MES has set up a sub-committee to look after maintenance of the buildings and grounds and a 'buildings levy' is to be collected from members to provide for contracted maintenance during the next 12 months. The 'N' Gauge layout is reported as showing steady progress under the control of Doug Stokes with wiring now under way.

South Africa

More bad news on insurance from **Durban SME**; it seems that the excess on their insurance policy is now 5% of the claim rather than a simple fixed amount. Let's hope this trend does not reach other countries. President Errol Koch attended the National Steam Meet accompanied by Donald Le Roux.

Members of **Rand SME** recently hosted the 2004 National Steam Meet which coincided with the club's 70th anniversary. A total of 11 guest model engineering clubs attended with 47 locomotives present. The traditional meeting of society chairpersons was described as friendly and interactive.

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21 **National $2^1/2$in. Gauge Ass'n (Southern Region).** *Staines $2^1/2$in. Gauge Rally.* Contact John Cook: 0208-397-3932.
21 **Romford MEC.** *Track Afternoon.* Contact Colin Hunt: 01708-709302.
21 **Steam LS of Victoria.** *Club Runing.* Contact Graham Plaskett: (03) 9750-5022.
21 **Talyllyn Railway.** *Race the Train.* Enquiries: 01654-710472.
22 **Basingstoke DMES.** *Members' Running Day.* Contact Guy Harding: 01256-844861.
22 **Canvey R&MEC.** *Gala Day.* Contact Brian Baker: 01702-512752.
22 **Frimley & Ascot LC.** *Club Running.* Contact Bob Dowman: 01252-835042.
22 **Great Western Soc.** (Didcot Railway Centre). *Didcot Steamday.* Contact Jeanette Howse: 01235-817200.
22 **Harlington LS.** *Public Open Day.* Contact Peter Tarrant: 01895-851168.
22 **MELSA.** *Bracken Ridge.* Contact Graham Chadbone: 07-4121-4341.
22 **Ottawa Valley Live Steamers.** *Steaming Day.* Contact John Bryant: 761-1109.
22 **Staines SME.** *Passenger Day.* Contact Stan Bishop: 01784-241891.
22 **Sutton Coldfield MES.** *Garden Party.* Contact Neal Harrison: 0121-378-3992.
22 **Teesside Small Gauge Rly.** *Running.* Contact Mike Aslin: 01642-724255.
23 **Bedford MES.** *Bits & Pieces.* Contact Ted Jolliffe: 01234-327791.
23 **Exe District MSLS.** *Peter Parks: The Fathers of our Hobby.* Contact Peter Parks: 01392-217915.
23 **Hornsby ME.** *Meeting & Social.* Contact Ted Gray: 9484-7583.
25 **Great Western Soc.** (Didcot Railway Centre). *Didcot Steamday.* Contact Jeanette Howse: 01235-817200.
26 **Worthing DSME.** *Junior Night and talk on 00 Gauge.* Contact Bob Phillips: 01903-243018.
27-30 **Isle of Wight MES.** *Havenstreet 30th Steam Show.* Contact Ken Stratton: 01983-531384.
28 **Brighton & Hove SMLE.** *Public Running.* Contact Mick Funnell: 01323-892042.
28 **Hornsby ME.** *Train Operating Day.* Contact Ted Gray: 9484-7583.
28-30 **Claymills Pumping Engines.** *Steaming.* Claymills Pumping Engine Trust., Meadow Lane, Stretton, Burton on Trent, Staffordshire. Contact B. Eastough: 01283-812501.
28-30 **Great Western Soc.** (Didcot Railway Centre). *Late Summer Holiday Steamings.* Contact Jeanette Howse: 01235-817200.
28-30 **Harrow & Wembley SME.** *Open Weekend.* Contact Dr. Roger Greenwood: 020-8427-2755.
29 **Amnerfield Miniature Railway.** *Public Running.* Contact David Jerome: 0118-9700274.
29 **Chichester DSME.** *Steam on Sunday.* Contact Brian Bird: 01243-542266.
29 **Guildford MES.** *Members' Running Day.* Contact Dave Longhurst: 01428-605424.
29 **Hereford SME.** *Public Open Day.* Contact Richard Donovan: 01432-760881.
29 **High Wycombe MEC.** *Public Running.* Contact David Savage: 01494-527402.
29 **King's Lynn DSME.** *Public Running.* Contact Mike Coote: 01533-673728.
29 **MELSA.** *Sunday in the Park.* Contact Graham Chadbone: 07-4121-4341.
29 **Otago MES.** *Public Running.* Contact John Clover, 221 Ravensbourne Road, Ravenbourne 9002, New Zealand.
29 **Steam LS of Victoria.** *Working Bee & Barbecue Lunch.* Contact Graham Plaskett: (03) 9750-5022.
29 **Teesside Small Gauge Rly.** *Running.* Contact Mike Aslin: 01642-724255.
29/30 **Bristol SMEE.** *Public Running Days.* Contact Trevor Chambers: 0145-441-5085.
29/30 **Cardiff MES.** *Public Running Days.* Contact Trevor Jenkins: 029-2075-5568.
29/30 **Elmdon MES.** *Public Running.* Contact Chris Giles: 0121-458-1291.
29/30 **Guild of Model Wheelwrights** *at Sandwell Show* Sandwell Valley, West Bromwich. Contact Biddy Hepper: 01492-623274.
29/30 **Malden DSME.** *Public Open Days.* Contact John Mottram: 01483-473786.
29/30 **Northern Mill Engine Society.** *Open Days.* Contact John Phillp: 01257-265003.
29/30 **Oxford (City of) SME.** *Public Running.* Contact Chris Kelland: 01235-770836.
30 **Bedford MES.** *Public Running.* Contact Ted Jolliffe: 01234-327791.
30 **Brighton & Hove SMLE.** *Public Running.* Contact Mick Funnell: 01323-892042.
30 **Frimley & Ascot LC.** *Public Running.* Contact Bob Dowman: 01252-835042.
30 **Lancaster & Morecambe MES.** *Bank Holiday Running Day.* Contact Harry Carr: 01524-411956.
30 **Saffron Walden DSME.** *Running Day with Barbecue (public pm).* Contact Jack Setterfield: 01843-596822.
30 **Stockholes Farm MR.** *August Bank Holiday Running.* Contact Ivan Smith: 01427-872723.
30 **Talyllyn Railway.** *Duncan's Special Day.* Enquiries: 01654-710472.
30 **Taunton ME.** *Public Running Day.* Contact Don Martin: 01460-63162.

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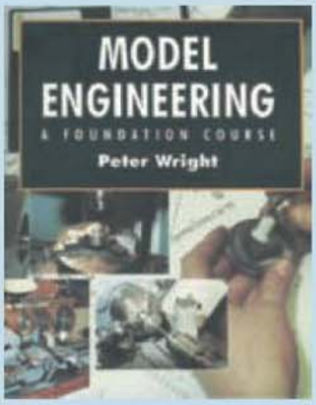

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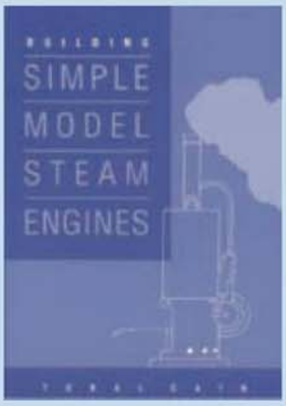

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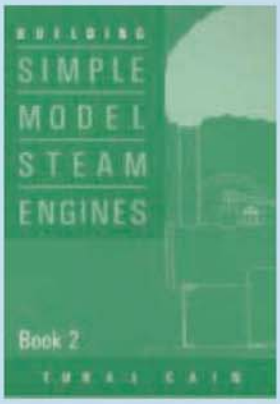

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For further information please contact Toby Wilson
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Main image:
Peter Pan, a fine 10 1/4" gauge model GNR Atlantic 4-4-2 Locomotive and Tender built by Bassett-Lowke.
This locomotive was built for Captain J.E.P. Howey for his line at Staughton Manor in the early 1900's. It ran at Wembley in 1927 in an Exhibition and during this time hauled King George V and Queen Mary and bears a small plaque to this event.

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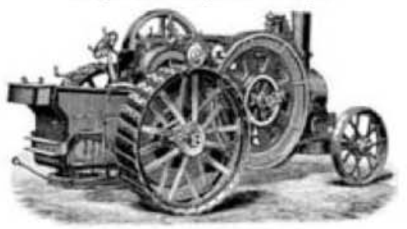

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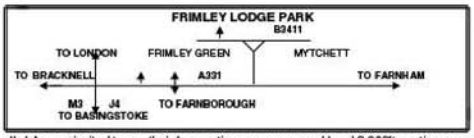

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DB8 Lathe

£699

- Centre Height: 105mm • Distance Between Centres: 400mm • Complete with 3 & 4 Jaw Chucks, Fixed & Travelling Steadies & Face Plate
- Hardened & Ground Bedways

DB10G Lathe

£850

- Centre Height: 125mm • Distance Between Centres: 550mm • Thread Cutting Gearbox • Complete with 3 & 4 Jaw Chucks, Fixed & Travelling Steadies & Face Plate • Vee Bedway

Model B Super

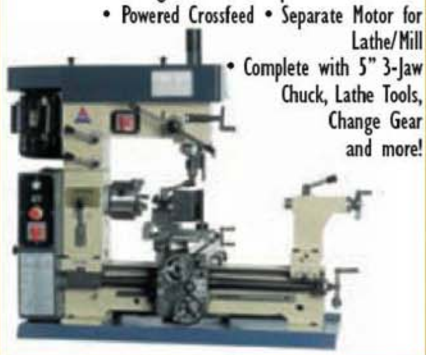
£670

- Maximum Swing: 420mm
- Distance Between Centres: 520mm
- Cast Iron Construction
- Metric or Imperial
- All Tapers MT3
- Supplied with 3-Jaw Chuck, Drill Chuck & Arbor and more!

Centurion

£1100

- Distance Between Centres: 520mm
- Centre Height 210mm • Spindle Bore: 28mm
- Powered Crossfeed • Separate Motor for Lathe/Mill
- Complete with 5" 3-Jaw Chuck, Lathe Tools, Change Gear and more!



Craftsman Lathe

£1499

- Centre Height: 150mm
- Distance Between Centres: 570mm
- Swing in Gap: 450mm
- Powered Crossfeed
- Spindle Bore: 36mm
- Complete with 3 & 4 Jaw Chucks, Fixed & Travelling Steadies, Face Plate, Machine Stand, Accuracy Report & much more!

Crusader Lathe

£1795

- Centre Height: 150mm • Distance Between Centres: 860mm • Complete with 3 & 4 Jaw Chucks
- Fixed & Travelling Steadies • Face Plate
- Machine Tray • Splash Guard • Machine Stand

CUB Geared Head Lathe

£2460

- Centre Height: 150mm • Distance Between Centres: 500/750mm • Complete with 3 & 4 Jaw Chucks
- Fixed & Travelling Steadies • Face Plate
- Machine Tray • Splash Guard • Machine Stand

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Nr. Chester, Flintshire CH5 3PZ

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