

MODEL ENGINEER

Vol. 194 No. 4238

7 - 20 January 2005

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GREETINGS
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Origination by
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SUBSCRIPTIONS & BACK ISSUES

Direct Subscriptions and Back Issues are available from
Highbury Leisure Subscription Services, Link House,
8 Bartholomew's Walk, Ely, Cambs CB7 4TD
Phone: 01353 654429; Fax: 01353 654400
Email: leasure@hhd.co.uk

Rates for 26 issues (annual):
UK: £55.00
Europe: £80.00
US Airmail: £130.00
RoW Airmail: £86.00

Cheques payable to Highbury Nexus Special Interests Ltd.
Second class postage paid at Rahway NJ USA.

Postmaster, please send address corrections to
Model Engineer c/o Mercury Airfreight International Inc,
2323 Randolph Avenue, Avenue 1, NJ 07001. Usps 0011099.
US Subscription Agent: Wise Owl Worldwide Publications,
5150 Candlewood Street, Suite #1
Lakewood, CA 90712-1900, USA
Phone: 562-461-7574; Fax: 562-461-7212.
Email: info@wiseowlmagazines.com
Website: www.wiseowlmagazines.com
Visa/MC/Discover accepted.
Canadian Distribution by Gordon & Gotch Periodicals
(Toll free 1-800-438-5005).
Model Engineer is published fortnightly.



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ISSN 0026-7325

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The story of Great Central Railway
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On the cover ...

Ivan Smith, Chairman of Stockholes Farm
Miniature Railway Society is seen here at
the controls of Roger Sully's 7 1/4 in. gauge
A4 Pacific No. 60022 Mallard
on the Great Cockcrow Railway during a
recent Visitors' Invitation Weekend.
Roger, an active member of Cardiff MES,
built the locomotive over a period of
some ten years and first steamed it
approximately five years ago.
This splendid model features the correct
three-cylinder layout and Roger and Ivan
are appreciative of the assistance
provided by the National Railway Museum
in York when permission was given for
them to clamber (carefully) all over the
prototype now in their care, for the
purpose of measurement and
photography.

(Photograph by Mike Chrisp)

A SADDLE STOP FOR THE MYFORD ML10 LATHE

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made but extremely useful accessory.
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CHILTERN STEAM RALLY 2004

A good variety of full size and miniature
exhibits and activities are a regular
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A STEAM RAISING FAN

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this little fan won't take long to make or
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FOR YOUR BOOKSHELF:

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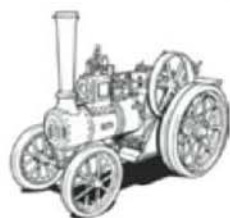
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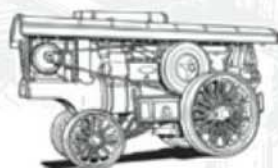


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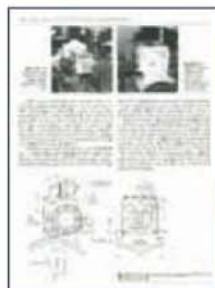
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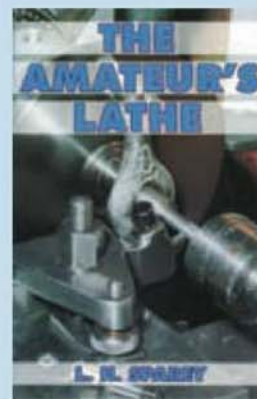
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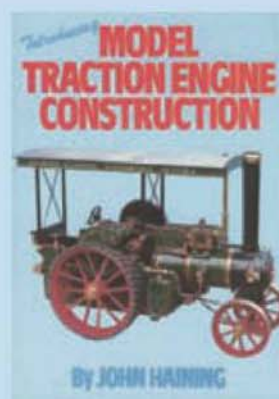
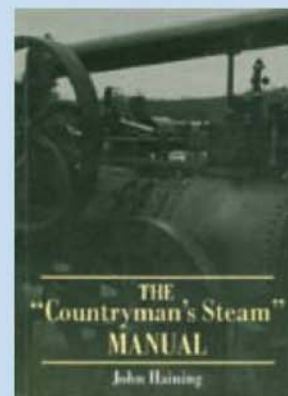
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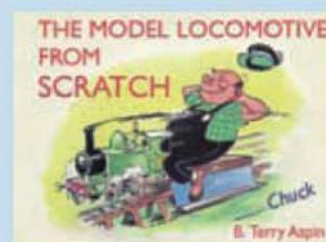
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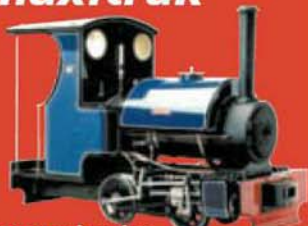
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SMOKE RINGS

With the Editors

2004 and 2005

Of the several subjects he found obscure or trying during his school days, Neil recalls that English literature may have been the one he found most difficult to come to terms with. Learning, among other things, great lumps of plays written when the Tudors were on the throne did not seem to be relevant in an age bursting with new technological developments and rapid sociological change. However, some bits and pieces of the subject matter taught have stuck, to the extent that he still remembers, albeit imperfectly, some of the passages. One little poem stuck in his mind, which we are not going to attempt to quote verbatim but can be paraphrased by the words: "When you are a child, time seems to creep along, but as you grow older, it positively flies." Perhaps some of our better read readers may be able to identify it.

As we stand at the start of another year it seems that 2004 has simply flown by and, as the little poem reminds us, maybe that is a sign of growing older — and perhaps, wiser. Changes have occurred, most notably the retirement of Mike Chriss from the position of Editor. Mike edited the magazine for five and a half years and has set a high standard both in terms of the printed word and the photographic content of the magazine. We also know from the comments and letters received that the mix of articles is now also to the liking of the vast majority of the readers. However, advancing years and the personal tragedy that occurred during 2004 have persuaded Mike to stand down and get back to some model engineering instead of spending all his time putting the magazine together. We wish him well in his projects but can reassure readers that his skills will not be completely lost to the magazine as he has generously agreed to become one of our Technical Consultants and will, no doubt, continue to make a contribution in the future.

Well, what of the future? For the time being the two of us will continue to try and maintain Mike's high standards and give you, the readers, a magazine you will look forward to and buy. However, learning from the lessons of history, we recognise that the medium to long term well being of *Model Engineer* really depends on there being three people on the editorial team. Our management is addressing this matter and we will keep you posted of developments.

The past year was also memorable for being wet! Many outdoor events seemed to have suffered the vagaries of the weather during the past year and yet the ones we visited were all successful and 'endured' with typical British stoicism. Younger readers may need to be reminded that not all our summers are accompanied by a hose pipe ban! In any case there are so many facets to model engineering it is usually possible to work around the weather and engage in indoor activities during inclement conditions. At least in the summer months the rain is warmer! One thing is certain, the range and quality of work seen at the various events held up and down the country continues to be to a very high standard and we congratulate those of you who have enthralled us with your models and other items during the past year. Most aspects of

the hobby seem to be well supported and as popular as ever.

Now that the long winter nights are upon us, we assume most readers will retire to their workshops to press on with their latest projects or, perhaps, to repair the ravages of the past season. We hope that success crowns your efforts and that you will continue to gain satisfaction from your hobby during 2005 and beyond. We wish all our readers and their families a happy, prosperous and peaceful New Year.

Model engineering at South Kent College

Course Tutor Colin Humphrey writes:

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"Model engineering enthusiasts can get help with their steam or traction engine, swap ideas with other model engineering enthusiasts, or just improve their machining skills by using the extensive range of equipment that the college can offer including lathes, milling machines and grinding machines, under expert tuition if required."

"Contact me, Colin Humphrey at the college, tel: 01233-655531 or Pauline Grant, also at the college, tel: 01233-655514."

Break-in at Derby

Richard Rose, Chairman of Derby SMEE has written to acquaint us with the loss of two 5in. gauge driving cars following a break-in at their track site. The loss was discovered 30 October, but evidence suggests that the break-in occurred earlier, perhaps between 16 and 20 October. Since nothing else was touched, it seems that the thief

M.E. postal address

All contributors and correspondents are urged to note that letters or material for the attention of the Editors should be sent to the Orpington office which now has responsibility for its distribution.

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The Orpington office address appears at the top left hand corner of the contents page of each issue.

or thieves may have had knowledge of the vehicles and their whereabouts on the site.

One of the missing 5in. gauge driving cars is about 4ft. long, burgundy in colour with Midland style carriage line and round type company transfers and black carriage ends. It runs on twin cast bogies with all wheels braked and running in ball races. Marking on the rear of the car reads '9mph max' and the initials 'AH' are painted on the sides of the car.

The other missing 5in. gauge car is about 3ft. long, painted green with silver windows and red and yellow stripes which go right around the body. A door is painted on the end of the vehicle. The roof is covered in grey plastic and the running gear is painted black with yellow bearing caps. The body and footboards are made of wood.

Further detailed information is available describing both vehicles.

Any information regarding the two missing driving cars should be sent to the Case Officer, PC 1391 Flowers, A Division HQ, Wyatts Way, Ripley, Derbyshire DE5 3SU; tel: 01773-571743, quoting Crime No. 184630-04.

London

Model Engineering Exhibition

Readers are reminded that this exhibition, until recently held at Wembley Exhibition Centre, has this year moved to a new home in the Great Hall at Alexandra Palace in North London.

Now in its ninth year, the event will be open 21-23 January inclusive 10:30-18:00 Friday and Saturday, 10:30-17:00 Sunday. Tickets are available at the door, admission is £8.50 (adults), £7.50 (senior citizens), £5 (child 5-14 inclusive), £22 (family ticket - 2 adults plus 3 children).

CHUCK, the MUDDLE ENGINEER

by B. TERRY ASPIN



POST BAG

PTFE piston rings

SIRS, - I write concerning the enquiry from Mr. J. Southouse regarding PTFE piston rings (*M.E.* 4235, 26 November 2004).

An article written by John Mercer and published in *M.E.* 3814 (4 December 1987) covers the subject from machining to fitting.

One very important point not mentioned is that one should not smoke while machining PTFE. Dust from this material or any of its variants produces a highly toxic gas when drawn through the red-hot tip of a lighted cigarette.

Bill Connor, Kent.

Paperware

SIRS, - With reference to Mr. Melvyn Strelitz's letter concerning the use of paper for making railway wheels and even possibly bullets (*M.E.* 4235, 26 November 2004), I would like to add a few more uses to which I have seen paper put and a short description of how the process was carried out.

I served an engineering apprenticeship with a large printing and stationery company in the early 1960s, and for a time carried out maintenance and repairs on a group of machines which were producing a wide variety of paper based items. These included tables and chairs, some of which were used in the canteen and had lasted for at least 20 years, containers of various sizes ranging from around 1in. to some 15in. in diameter, and transformer cores from about 1/4in. bore upwards, both round and square.

During the war, this department had produced various aircraft parts including expendable wing mounted fuel tanks for long range missions, for which the workers at the time had received a letter of commendation from the government, and of which the few that were still working there were very proud.

A couple of these tanks had been kept as a reminder; on inspection they looked and sounded like aluminium alloy, but were in fact all made from paper with only the fuel connection and the fixing strap being metal. They were about 7ft. long, cigar shaped, and perhaps 2ft. 6in. diameter at their widest point, but could be picked up with one hand and were strong enough to stand on without deflecting.

The manufacturing process consisted of laminating sheets of a soft unglazed paper onto a former using a special water-based paste. On

drying the result was not unlike the modern plastic laminates, but without the use of synthetic resins and the high pressures required to bond them.

The only fault with the material was that exposure to damp conditions caused it to soften and de-laminate. This was overcome in most cases by 'frying' the items in tanks of boiling paraffin wax during which they took on a golden brown colour and became totally waterproof. Containers then had metal bottoms spun on during which the heat generated melted the wax and sealed the paper to the metal making it completely waterproof and virtually indestructible.

In the case of furniture and the like, the items were dipped in a lacquer which sealed them and produced a dark brown polished wood effect which, going by the aforementioned canteen tables, took a lot of wearing out.

I have no doubt that by the use of this method of manufacture, and the relative cheapness of the materials, any number of items could have been produced; yes, even railway wheels and, with suitable bracing perhaps more than just 'light duty' but maybe requiring more than just a 'fry up' to seal them.

As for the bullets, perhaps the addition of a small steel tip would have given them the necessary penetrating power.

The advent of plastics and injection moulding put an end to the 'Laminating Department' which had all gone for scrap before the end of the '60s. Considering the gas heated tanks of boiling wax and the vats of highly volatile lacquer it's probably just as well. I'm sure the HSE would have had something to say on the matter!

Ian Cook, Aberdeen.

Feedback

SIRS - Could I offer comments on a couple of items in *M.E.* 4234, 12 November 2004?

The idea of placing a groove near the end of a shaft to prevent it jamming when it enters a hole at a slight angle, mentioned on page 568 in the *Shaft/hole Assembly Tip*, is not actually novel. The idea was patented over 60 years ago by the Pilot Plug Gauge Co. Ltd. of Queen's Road in Coventry, England.

The basic principle involved can be traced back even further than this. The humble scribing block/surface gauge often has a decorative acorn or sphere on the top of its pillar/spindle. If correctly sized, this acts in just the same way to align the scriber holder

when placing it on the pillar/spindle. Such a scribing block was described in these pages over 100 years ago (*M.E.* 40, 1 January 1901, page 6) and I am sure the basic design had been around long before that.

To avoid jamming, the section of the shaft dimensioned 'x' in the figure in Mike Jasper's tip should really be turned spherical to the same diameter as the shaft but if 'x' is very small compared to the shaft diameter then there should be no problem.

At the end of Dave Robert's article *When Cotton was King* he recommends a couple of books. I have not seen the one by M. Williams but, when I read it a few years ago, I found Harold Catling's book *The Spinning Mule* (ISBN 0-902228-61-7) fascinating and very readable. Although concentrating on the spinning mule, it deals with the entire history of spinning with clear diagrams of many different machines from the simple cottage wheel up. One sentence which sticks in my mind is almost the last in the book:

"It will seem even less credible that in Lancashire alone there were once nearly 50,000,000 mule spindles, each accelerated to 10,000rpm before being stopped and reversed with infinite precision four times a minute throughout a fifty-six hour week."

This would have been in the early 20th century. It hardly seems possible that once there were more working mule spindles in Lancashire alone than there were people in the whole of Great Britain, and now there are none, apart from a few sad remnants preserved in museums and two, I believe, in my garage.

P. F. Gascoyne, Oxfordshire.

Spend a pound to save sixpence!

SIRS, - Your correspondent, Mr. P. King (*M.E.* 4233, 29 October 2004) invited comment on his letter, *Pleasure or Purpose?*

While I am in agreement with some of his observations over 40 years I would like to offer a few of my own coloured by 50 years as a Tooling Engineer and part-time Model Engineer.

When I was an apprentice on 9d. an hour, my boss found it cheaper to have me make bolts from black mild steel bar on old capstan lathes and horizontal milling machines rather than pay the premium asked for small quantities of non-standard items by the manufacturers of the day with more sophisticated machinery.

For my own projects I manufactured my own tooling on my



Mr. Gascoyne tells us that the finial at the top of this surface gauge column is not only decorative but facilitates assembly of the monkey.

treadle lathe and by handwork. Any money I could save by using materials from the scrap box would be used to purchase items that could not be made easily, such as micrometers. Thinking, drawing and working time were not costed.

Cheapness of purchased tooling must be measured against disposable income after usual budgetary requirements have been met and, although proprietary items may now be cheaper relative to disposable income, I must confess that I still gain greater satisfaction from making my own tooling than were I in the enviable position of being able to purchase it without a second thought. This view, of course, may bring me into conflict with those who would prefer to buy ready made tooling or locomotives, or have their Vintage motors refurbished by experts, regardless of cost.

An old friend once said to me "We'd spend a pound to save sixpence!" The pound was mythical but the sixpence was real! I believe the desire to make one's own equipment is as strong now as it was in those days when there was little alternative.

Don Jardine, Finistere, France.

Monotube steam generators

SIRS, - It is encouraging to read that another model engineer is experimenting with MSGs (Monotube Steam Generators) for locomotives, albeit for gas or oil fired systems only. However, the very clever French steam engineer Serpollet devised very successful installations for the Paris tramways and French railcars many years ago, but for solid fuel firing. This was of mainly coke, a plentiful and relatively low cost by-product of widespread coal gas production in those days.

A practical development of this system has been patented by myself, as it has full size applications as well



Mr. Ed Bush in America sent us these views of the prototype and his attractive miniature version of a Pace inverted vertical steam engine

as for models, and fellow club member Ted Jolliffe kindly offered to promote it in the UK. While the original version was more suited to larger installations, an improved one for model use is at present in the advanced design stage and should be available in the near future, only a nominal licence fee for genuine amateur use being required.

As regards certification I fully agree with Keith Pearson's comments, as the safety aspect is without question but it would appear that anything that can even remotely be classed as a 'pressure vessel' is now in the 'catch-all' net of the authorities, even if the content may amount to just one or two teaspoonfuls of water.

The relatively small diameter steam tubes of locomotives are not normally subject to such regulations and it would seem only logical therefore that MSG elements should be treated in the same way.

Incidentally, the above system may employ standard quality copper or even domestic plumbing tube, which will sustain a surprisingly high pressure, but stainless tube is not advised, the total material cost for the average MSG being only a few pounds.

Cyril Cannell,
Monasystems (I.O.M.) Ltd.
Isle of Man.

James Carson & Co. Engineers

SIRS, - A few years ago I had the good fortune to acquire a veritable hen's tooth — a 1911 catalogue of the model engineering products of James Carson & Co, Engineers, then of Cricklewood, London but recently, and since about 1900, of 51 Summer Row, Birmingham.

What gave the item its very special quality was that it had belonged to L. Lawrence of Norbury (LBSC) with his address stamp but also pencilled notes, including one relating to the false backhead "for display purposes" of the 3 1/2 in.

gauge *Great Bear* now owned by Sir W. McAlpine. This states "old Carson himself told me".

It seems that Carsons gave up business about 1913 and were taken over by Bassett-Lowke, to whom they had almost certainly been previously supplying models and fittings. Also probably to Clyde Model Dockyard and Stevens Model Dockyard in Aldgate, London.

From the similarities in the illustrations it appears that many of those in the Bassett-Lowke catalogues of the next two decades were taken from Carson blocks.

From his writings, Carsons appear to be one of the very few model engineers for whom LBSC had any time, and it seems that they were very important players in the field at that time. They seem in 1905-06 to have started a Model Engineers' Co-operative Society, based on Summer Row, the aim of which was the supply of fittings and materials.

It is certain that they were a major factor in the early growth of model engineering and I am sure that some of your readers will have information, and even models, which are relevant to 'Old Carson' and ? his sons (if any).

Almost certainly there are quite a lot of Carson models around somewhere.

Michael Gilkes, West Sussex.

Chinese mini-lathes

SIRS, - Regarding recent letters on above subject, I recently purchased one of these machines from the friendly folk at Warco, and find it delightful; the variable speed is a joy to use.

The main reasons for my choice were that the price was within my budget, and after 30 years using a Portass lathe it was time for a change. I would have liked to have purchased a Myford lathe, but these are beyond my budget, and I had no wish to purchase a second-hand lathe of doubtful quality. Sorry Mr. Myford, but if the Lottery Jackpot comes up

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Correspondence for *Post Bag* should be sent for the attention of The Editor (Model Engineer)

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Publication is at the discretion of the Editors.

The content of letters may be edited to suit the magazine style and space available.

Correspondents should note that production schedules normally involve a minimum lead time of six weeks for material submitted for publication.

In the interests of security, correspondents' details are not published unless specific instruction to do so has been given.

Responses to published letters are forwarded as appropriate.

you will be one of the first to get a call: "Send me one of everything!"

My main niggle with the mini-lathe is chatter on deep cuts on steel. I understand that the bearings fitted are deep groove ball bearings which I am told are prone to chatter. One of our suppliers, Arc Euro Trade, advertise a set of taper roller bearings to replace these. This gives rise to the following queries. Has anybody tried this? Was it a difficult job? How did you do it? And crucially, did it make any improvement?

Worried about loss of alignment, I decided it was too difficult to do myself, but would be interested to hear of anybody else's experience.

Harry Barrett, Middlesex.

Model E. Pace & Co. inverted steam engine

SIRS, - My wife and I visited the Sydney, Australia Power House Museum in 2002. This outstanding museum should be visited by anyone who has the opportunity to do so. On display are a variety of engines, locomotives, airplanes, boats and other items. I fell in love with a small inverted E. Pace & Co. Bedford steam engine which along with many others, and a steam calliope, was in steam at the time of our visit.

On our return to the United States on the container freighter *MV Columbus Florida*, I made sketches for a model of approximately 1:8 scale with a 7 1/2 in. flywheel. The engine was built from scrap material that I have collected over the years.

Photographs of the prototype and my model are enclosed. The engine runs well on our cappuccino machine.

Ed Bush, NM, USA.

Light and moisture in the home workshop

SIRS, - Having been on holiday in Cyprus at the end of October, I realised on returning home just how dark it was in England, and how lacking in light the interior of my workshop was. I decided to do something about it and so headed off to the lighting section in my local DIY store.

A great many halogen lights seemed to be available, mostly in decorative styles, but what caught my eye were the so called 'security' lights. Whilst a lot of these are expensive because they contain

motion sensors, I was able to purchase a couple of plain 150W floodlights for less than £8.

While these are intended for outdoor use, they provide superb illumination in my workshop and I commend them to others. Care is needed not to position them too close to flammable materials since the case gets hot, and some ventilation flow is needed around them. I have installed one above my lathe and the other at the far end of the workshop: together they provide a very bright and fairly even illumination.

On a related topic, some years ago, I acquired a dehumidifier to tackle the problems of damp and corrosion in my workshop. This problem seemed to be at its worst during wet Autumn and Spring periods. I run the dehumidifier on a time switch to use Economy 7, and it has completely eliminated corrosion problems in my workshop. It is amazing how much water can be collected — up to 2 gallons a week in wet weather!

Arthur L. Rowe, Derbyshire.

Hardening spring steel

SIRS, - the recent feature by Stan Nipper and Martin Wallis concerning the construction of their Savage *Universal Carrier* prompts the following recollection.

When heat treating spring steel, either wire or flat strip, at a small firm of instrument makers, the material was held on a piece of thin iron wire and gently heated in a large 'woolly' gas flame until medium red. It was then quenched in a can of well stirred oil — usually old lubricating oil but *not* motor oil as mentioned in your note.

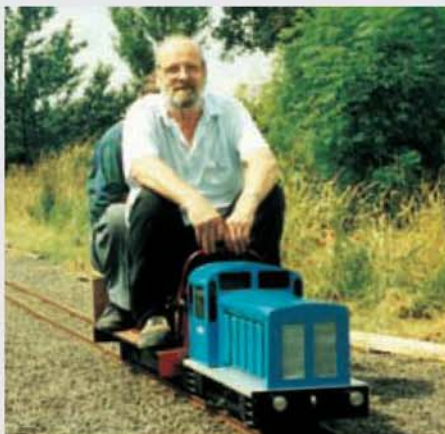
After the first quench the item was passed through the flame again until the oil ignited. After it had burned off it was quenched again in oil. For springs the item was usually 'flamed' twice; this gave a temper approximately to 'blue' colour, one 'flaming' gave an approximation to straw colour. The method appears very rough and ready but it seemed to give satisfactory results and was quick and required no great skill — ideal for a small firm with limited equipment.

When I joined a larger firm I saw the skilled instrument makers there use the same method — and teach their apprentice as well! What's more, I still use the technique!

Don Unwin, Cambridgeshire.



Ten year-old Matthew Johnson undeterred by the snow with the chassis for his first wagon based on PDR wagon kit on its first outing.



Peter Leedell with Doug Sharpe's first attempt at locomotive building: 0-4-0 D2900. The motor came from a defunct battery electric lawnmower.



A proud moment for Peter Leedell, trying out his LMS 0-4-0 BEL 1 for the first time. It is now a permanent member of our operating fleet.

Ivan Smith

describes how he encourages youngsters and first-time builders.

A couple of our junior members entered in for the Monty Ellis *Letter to a Grandson* Grant competition and, as a result of this, the Editor asked if I would write a short article on activities here at Stockholes Farm Miniature Railway. In particular, how we encourage youngsters and first-time builders. We were especially proud when the two juniors won special awards from Mr. Ellis.

Before I expand on the above perhaps a little background will help. I have been involved in model engineering for just over 30 years. I started after I finished my degree in mechanical engineering when I wanted something to fill all the free time I suddenly found myself with. And it certainly does!

Over the next 15 years, starting with LBSC's 'Words and Music', I built a 3 1/2 in. gauge Black Five (*Doris*) followed by 3 1/2 in. gauge Duchess and 3 1/2 in. gauge Derby 4F. Later I moved into 5 in. gauge by completing a Caledonian Dock tank, plus completely rebuilding a 5 in. gauge B1.

Between 1978 and 1988 my wife and I were living near Cardiff and I was a member of the Whitchurch (Cardiff) DMES. During a club visit to Harrow and Wembley Society I was given the chance to drive a 7 1/4 in. gauge Black 5. That was

STOCKHOLES FARM MINIATURE RAILWAY



Phil Amson with his first two attempts at wagon building, a completed 'Chatterley Whitfield' wagon and part constructed Walker's Tar wagon.



Joshua Hague (age 9) running his first attempt at locomotive building, 0-6-0 then running as D2334, for the first time with a controller.

it. Any future building I did would have to be 7 1/4 in gauge standard gauge.

Then sixteen years ago a transfer with work enabled us to move to our present home situated halfway between Doncaster and Scunthorpe. By this time I was well on the way with my first 7 1/4 in.

gauge locomotive, so when we found Stockholes Farm it was perfect for our intention of building a railway, which had always been a dream.

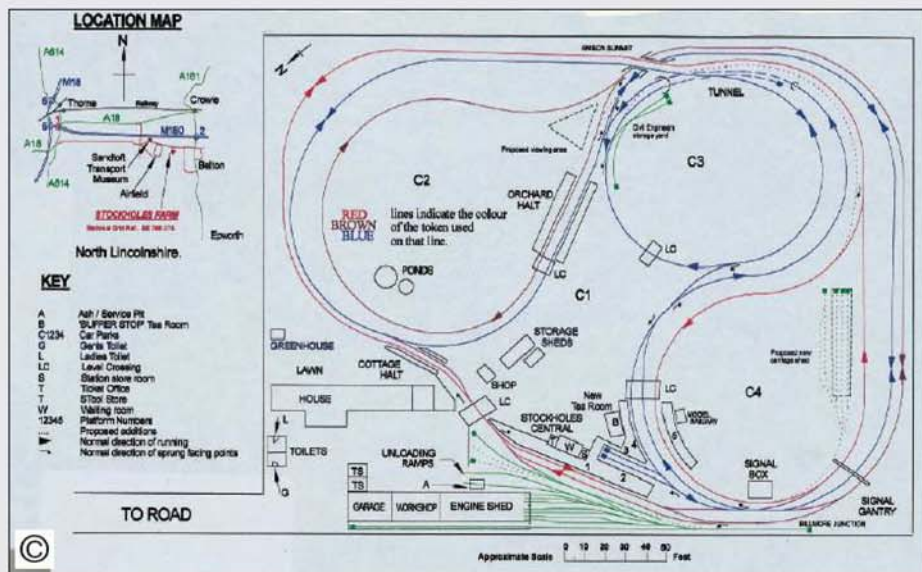
Over the ensuing years the railway has developed very well and 2004 saw its 15th Anniversary. For those who are interested in following 'knotted spaghetti', a copy of the present track layout accompanies this article. There are two completely independent circuits, each approximately 3,000ft. long. It is, of course, possible to travel on one then the other, giving a journey of some 6,000 feet. The main work currently in hand is replacement of the light (2lb./yd.) rail originally laid, with 4lb./yd. rail. However, even this heavier section is still light compared to some 7 1/4 in. gauge systems, and so we restrict usage to 7 1/4 in. gauge standard gauge only.

A society was soon formed with two objectives:

1. To help build and operate the railway.
2. To encourage others, especially youngsters, to become involved in the hobby.

Society membership has increased steadily and has given tremendous support and assistance over the years. It is fair to say that without this the railway would not have developed into anything like it is today.

For my personal outlook and how I treat fellow society members two factors have had a significant effect. The first was a number of years ago. One of the early society members, Dave Billmore and I were asked if we were interested in going to a house to clear a workshop. I have no



Our current track plan. We currently depart from Stockholes Central platforms 1, 3, and 4 in a southerly direction; prior to this platform 1 departures headed north and platform 4 departures headed east.



Thomas Chatham (age 10) making a start on his first locomotive, cutting a chassis member for 0-4-0 D2902.



Harry Billmore, age 14, driving his part-built Class 31 which he took over from Adam Oldridge.



Ten year-old Joshua Hague with his 0-4-0 Drewry locomotive in LMS guise as number 7050.

MATURE RAILWAY SOCIETY



Left: Adam Oldridge, then 15 years-old, testing the first bogie for the Class 31 A1A-A1A.



Adam Oldridge with the basic chassis for his Class 31 A1A-A1A

doubt many of you have seen the situation before: a widow needs to get rid of a workshop and all equipment. Luckily, at this particular time Dave was looking to buy a lathe and this exercise provided it. Although old, it was in immaculate condition, as was the rest of the equipment. This was when I resolved to get the most out of the equipment that I possess. Used but not abused.

The second, and this does not just apply to model engineers but to society as a whole, I believe we get out what we put in and thankfully, as a whole, model engineers tend to be an unselfish group and will do anything to help others. Another way of looking at it is that while juniors are helping build and run the railway, or in my workshop building locomotives or trucks, they are not out on the streets 'amusing themselves'.

It is principally for these two reasons that I open up my own workshop for the benefit of those not so fortunate, and encourage them to become involved in this wonderful hobby of ours.

The philosophy I have adopted with both junior members and the more mature adult first-time builders is quite straightforward: to encourage them to build something they want to build, but to ensure that they can see the results of their work as soon as possible. As a consequence, once a chassis has four wheels, it can then be pushed around the track; similarly once a motor has been added, just a battery plus a simple on/off switch has given members, particularly juniors, hours of pleasure.

In designing the battery electric locomotives built here we gear them for a maximum speed of about 7mph. This allows them to be driven around the circuit at full speed safely. Although the purists may decry this approach, in my view it is completely pointless in suggesting to a ten year-old (or a 70 year-old for that matter) that if they put ten hours work in during a week and do this religiously for five years they will have an award-winning model. At this stage they are simply not interested in that but want something they have built to run and enjoy as soon as possible.

In consequence of the above, several locomotives have been built here at Stockholes Farm over the years, so I will now go into a little detail of some of them, roughly in chronological order.

Dave Billmore: J70 0-6-0 Tram Engine

Dave joined the society just over ten years ago, and after an introductory period helping to build and operate the railway expressed a desire to have a go at building something himself. He had acquired a 12V Sinclair C5 motor and after discussions decided upon a tram engine. At that time Dave had two young sons, so the choice *Toby the Tram Engine* was popular with them; a useful feature is that the skirts on the tram engine can hide a multitude of sins. Once complete, the locomotive proved very popular with young Sam and Harry, and was a vital part of the motive power fleet in the early days. More recently Dave has acquired a

Holmside, which is maintained here, and he is currently building a driving truck here also.

Alan Turner: 0-4-0 Diesel Shunter

Alan approached us about six years ago when he was 15 years of age and asked if he could become involved in the society. He proved to be a great help and every encouragement was given when he expressed a wish to build something to operate. He had been given a battery electric lawnmower which was used as the basis of the locomotive. The mower provided the motor and all gears and chain for the transmission. Alan has since moved away to university to take a degree in mechanical engineering and, while no longer an active member, still keeps in touch. Mechanically the locomotive is finished but not operational as no controller has yet been fitted as Alan plans to construct one in due course.

Doug Sharpe: 0-4-0 Diesel D2900

Doug joined us nearing retirement; he was seriously into vintage motorbikes so had a practical aptitude but had never been involved in model engineering or miniature railways. Like Alan he had also got hold of a battery lawnmower and since this mower could provide the motor and all the chains and gears for the transmission on a locomotive, he chose D2900. It has forward and reverse but only single speed i.e. on/off. Doug has now expressed a wish to devise a variable speed mechanical drive, so this is something we hope to investigate in the future.

Adam Oldridge: Class 31 A1A-A1A

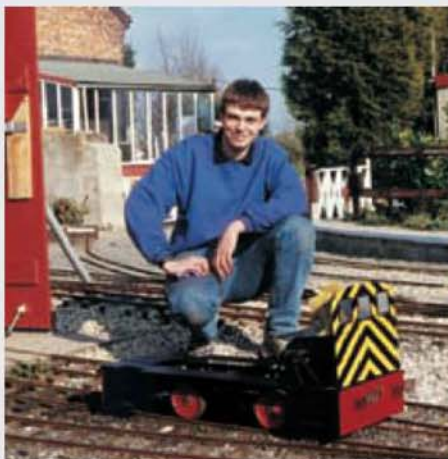
Adam became involved in the society a few years ago when he was 14 and, in addition to working on building the railway, expressed a dream to build something. Unlike the previous three locomotives described Adam chose something a bit more demanding in the form of a Class 31. Over the next few years this was developed to the stage of complete basic chassis with two motors and basic body. Then, like Alan, Adam has gone to college, but instead of leaving the locomotive to gather dust decided to sell it on and luckily another junior member, Harry Billmore, was more than keen to take the project further.

Harry Billmore: Class 31 A1A-A1A

Taking on the locomotive just described, Harry (14) has fitted a second pair of motors together with air horn and parking brake, and a new control panel. Before acquiring the Class 31 Harry had part built a flat wagon which is now finished and ready to run. Harry was one of the



Harry Billmore (14) testing out his Class 31 A1A-A1A locomotive after taking it over from Adam.



Alan Turner with his 0-4-0 Diesel Shunter, another locomotive which utilises a lawnmower motor.



Thomas Garlick (then 15) left, and Adam Oldridge (also then 15) with their part-built locomotives.

recipients of a special award from Monty Ellis following his entry into the *Letter to a Grandson* grant competition. In addition to being involved with 7 $\frac{1}{4}$ in. gauge here at Stockholes he also helps dad Dave run a 16mm garden railway and is also a junior volunteer at the Welshpool Railway.

Thomas Garlick: Class 128 Parcels Van

Thomas joined the society when he was about 14 and following a desire to build something decided to build a Class 128 Parcels Van. The parcels van was chosen because it eliminated the need to fit large windows in the vehicle. Thomas got the vehicle running to the stage of a running chassis, with one motor and basic body, but when he went to college to study media studies, work on the Class 128 had to stop. This locomotive has just been sold onto another member Bob Measures (a mature first-time builder) who plans to complete the project.

Rick Collett: GWR King

Although the railway here is LMS biased we allow work to be done on this GWR locomotive. Rick and I made a fatal mistake of going to an auction a few years ago — I came away with a part-built Royal Scot and Rick bought this part-built King. He has been working on it over the years, in between building trucks, 16mm gauge, and more recently setting up the 00 gauge layout in the building on platform five here at Stockholes. With no previous experience in 7 $\frac{1}{4}$ in. gauge this is a very slow demanding process but steady progress is being made.

Joshua Hague: 0-6-0 Tram Engine

One of our youngest members, Joshua now 10, is actively involved in building a locomotive. This time the prototype chosen was a Drewery 0-6-0 Tram engine. The main reason for this choice of prototype is that being a tram engine the side skirts hide all the wheels, etc., so there is no need to fit the coupling rods. Joshua was also one of the recipients of a special award from Monty Ellis following his entry into the *Letter to a Grandson* grant competition. He is already planing his driving truck to go with the locomotive. I open my workshop for two juniors on a Thursday evening and for the record Joshua has only missed one Thursday work night in two years.

Thomas Chatham: 0-4-0 D2902

Another of our younger members Thomas, now 12, has spent about two years building this locomotive. The motors used are car fan motors

and we are in the process of fitting four of them. Thomas and Joshua were very pleased to see their models on display at the Harrogate exhibition last year.

Don Turner: Holmside

Don bought this locomotive basically complete, but it wouldn't work. Help was needed to rectify the problems so the locomotive was brought into the workshop and completely stripped down. We are slowly working through every bit as it is re-assembled. At the time of writing we have got the chassis running on compressed air.

Peter Leedell: 0-4-0 BEL1

Peter is one of our newer members and was looking for something to do when he retired in 2004. He had done no model engineering before but as a joiner has practical skills and has made a superb job of his first locomotive BEL1. The prototype was one of the pioneer battery electric locomotives. Peter intends to build three bodies for the locomotive so that it can be displayed in three guises: North Staffordshire, LMS and as a BR locomotive. He is currently working on a driving truck.

A joiner by trade, Peter was only too pleased to lend a hand building the body for Doug Sharpe's locomotive. Before attempting the actual body for Doug he quickly made a couple of prototypes to sort out the technique, which were then surplus to requirements. As we waste nothing at Stockholes, the two bodies were snapped up by young Joshua and Thomas for their locomotives.

Roger Garside: 45xx

When Roger retired from work one of his desires was to build a steam locomotive and in due course bought a 7 $\frac{1}{4}$ in. gauge G 45xx from Winsons/ModelWorks. Roger has been able to assemble most of the locomotive at home but now needs help to get it operational. The locomotive is now here at Stockholes and has been fully stripped down and partially reassembled to the stage of running on air, although I have to admit that I have had to use a few more than the "*few basic hand tools*" as claimed in Winson's sales brochure! This is long distance model engineering as Roger lives near Poole in Dorset, some 250 miles away from Stockholes!

In addition to the members above, a few others have spent significant time working on their own projects here at Stockholes Farm, but also have their own facilities at home. The models have not been based here while under construction.

Robert Sully: Toby

Robert and his parents live in Cardiff; they cannot therefore be a regular attendees here at Stockholes. But a few years ago, during one of their week's holiday spent here with us, Robert spent his time in the workshop making his wheels and axles for his *Toby*.

Charles Furda: Co-Co Deltic

When he joined the society, Charles took a liking to the resident prototype Deltic based here and over the last few years has been making steady progress with his own production model. Charles has limited home workshop facilities so the majority of milling operations and some of the other heavy machining work has either been carried out here at Stockholes or undertaken by myself at a local evening class. Charles was able to use the prototype Deltic nose cones as the basis for those for his own production model, which have been made out of fibreglass.

Phil Amson, Keith Crouter and Matthew Johnson: Various Wagons

These members who have limited facilities at home have been actively building wagons. They use my workshop for the tasks which cannot be performed at home.

Wagon Kits: one of our members, Peter Wood, supplies wagon kits which have been the starting point for a number of people, both in the society and outside getting involved in 7 $\frac{1}{4}$ in. gauge miniature railways. In the early days I developed a jig for profiling the wheel treads and therefore all wheels supplied by Peter have at least been part machined here at Stockholes.

Looking around the workshop at the present time the following projects are ongoing and I think it is fair to say that without the facilities I have here being made available, none of them would have been built: Rick: GWR 4-6-0 King; Dave: driving truck for *Holmside*; Don: 0-6-0 *Holmside*; Joshua: 0-6-0 Tram engine 11105; Thomas: 0-4-0 D2902; Peter (L): 0-4-0 Bell and driving truck; Harry: Class 31 A1A-A1A and truck; Roger: GWR 2-6-2 45xx; Bob: Class 128 parcels van and Charles: Co-Co Deltic.

I am very pleased when the results of all this work is seen when the railway is operational on our open days on Bank Holiday Mondays. As for myself, I have two locomotive projects on the go, the first is a 7 $\frac{1}{4}$ in. gauge LMS 4-6-0 Patriot and the second is a 7 $\frac{1}{4}$ in. gauge LMS 4-6-2 - 2-6-4 Garratt, but that's another story!



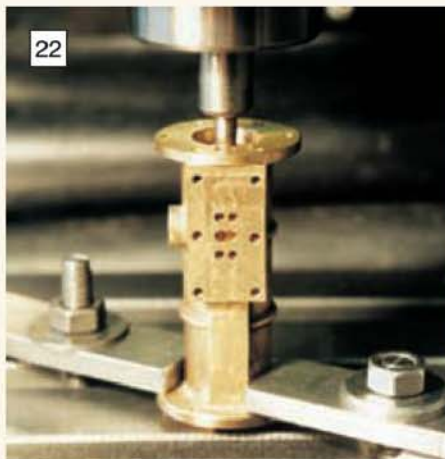
Anthony Mount

completes the cylinder before starting the cylinder top and bottom covers.

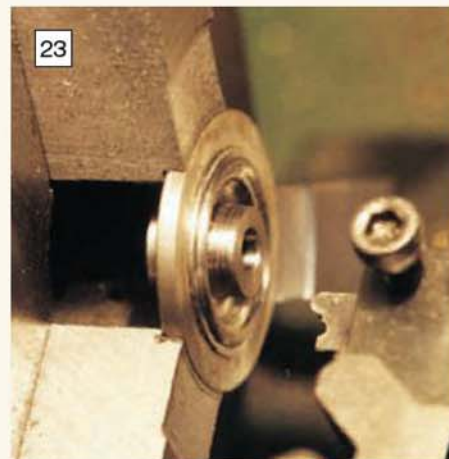
●Part V continued from page 680
(M.E. 4236 10 December 2004)

Progressing with work on the cylinder, next we need some stud holes. Use the steam chest as a template, clamped to the cylinder with toolmaker's clamps to spot the holes. Remove the steam chest and drill and tap for 8BA. The top and bottom covers can be used similarly as templates for spotting the stud holes in the cylinder flanges.

We now have ports and passages, but we still need to get the steam into the cylinder bore at the ends. Fit a 1/2in. dia. x 3/32in. Woodruff cutter and drop this down inside the cylinder, as shown in photo 22. The correct location can be obtained by winding the cutter down until it touches the top of the cylinder, then wind down the thickness of the cutter and zero the dial. Feed down another 6mm for the top of the cylinder; this dimension will be 3mm for the bottom of the cylinder. Now feed the cutter into the side of the cylinder until it breaks through into the passages. Since the cutter is only a little smaller than the bore of the cylinder it is easy, on withdrawing the cutter, to make inadvertent



22
Cutaways to get steam from the passages into the cylinder bore are cut using a Woodruff cutter.



23
A form tool was made to finish the profile of the decorative moulding on the cylinder top cover.

FAIRBAIRN'S COLUMN ENGINE

contact with the other side of the cylinder, so stop the cutter before feeding it out of the slot.

The final job on the cylinder is to plug the ends of the holes in the flanges. Just tap the ends of the holes and screw in little brass plugs with a touch of Loctite and file them off flush.

Cylinder top cover - Part 16

I have specified stainless steel for the top cylinder cover. In full size it would have been cast iron; you can use this if you prefer; I find cast iron a dusty material to use, and it can rust. I was tempted to use gunmetal to match the cylinder casting, but I get complaints from some builders who admit that while gunmetal may be nice to machine, it is the wrong colour and is not painted in this engine. So, I opted for stainless steel, and a free-cutting variety is supplied in the kit.

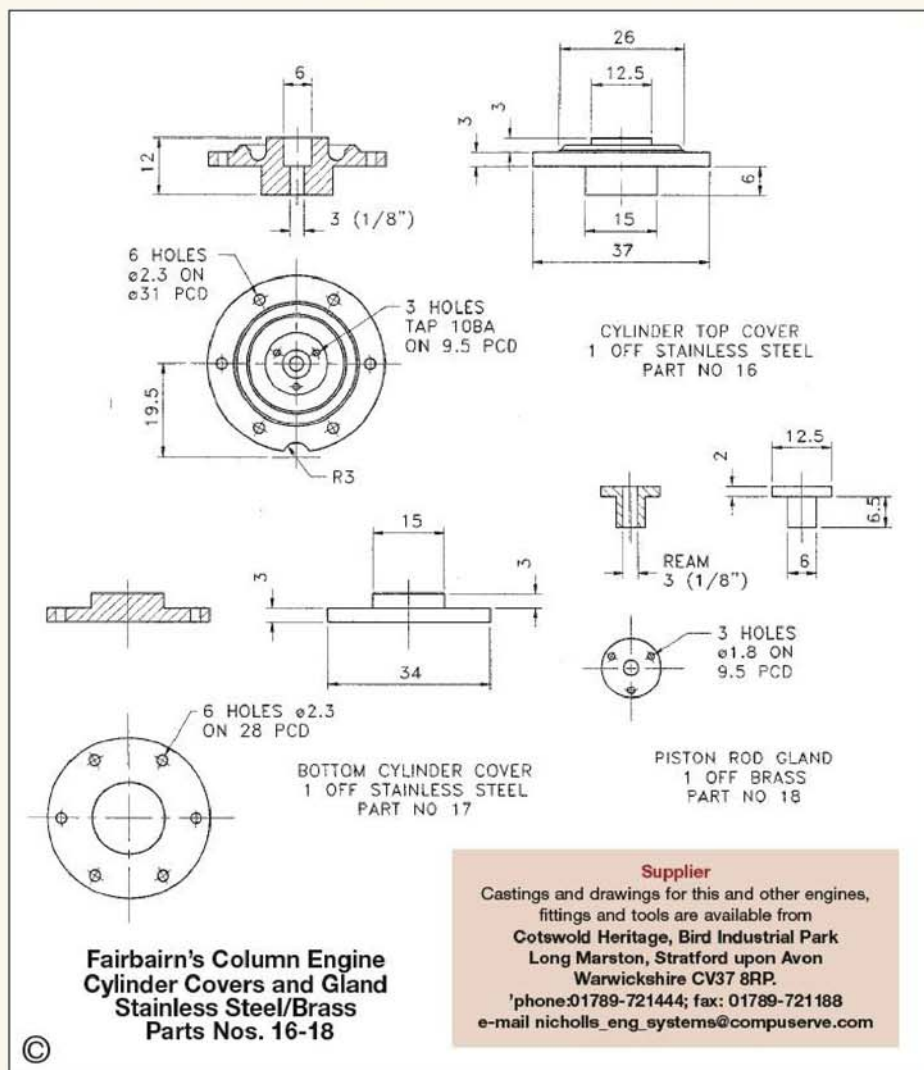
One of the problems with this component is holding it for machining. I have mentioned soft jaws before and recommend again that you invest in a set for your chuck. They are so useful that once you have a set you will wonder how you ever managed without them. The ones in the photographs are of the plain type, but they are also available with a set of indexable hexagon jaws. These will give you six different job locations with one set of jaws.

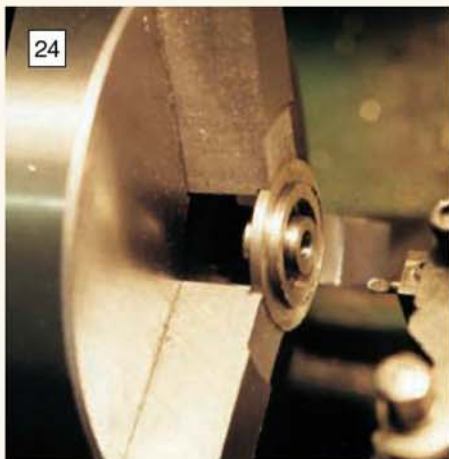
Start with a length of 1 1/2in. dia. stainless steel gripped in the 3-jaw chuck and turn it down to 37mm diameter. Reduce the diameter to 15mm for the spigot to fit the cylinder and drill 2.8mm dia. by 8mm deep, then part off.

Fit the soft jaws to the chuck and bore them out to 37mm dia. by 3mm deep. Chuck the cover and reduce to finished thickness. Turn the flat steps, counterbore the gland hole and pass a 3mm reamer through. The bottom of the counterbore is shown flat; a D-bit can be used to form this, or a slot drill or end mill can be substituted to do the job.

The next job is the decorative moulding. Photograph 23 shows the form tool which I made up for this, but considerable force was required to feed it in, and it started to chatter. So I only used it for the 'last scrape', pulling the belt round by hand. I made up a single round-ended tool from 1/8in. dia. high speed steel to form the concave sinking (photo 24), and on the other end a flat tool to form the flats either side of the bead. The form tool only had to form the bead.

The cover was then held in a chuck on a dividing head fixed to the lathe cross-slide. This will automatically bring the cover to lathe centre height, assuming that like mine your dividing head was bored on the cross-slide when it was





24
Machining the concave form into the cylinder top cover. Note the use of soft chuck jaws.



25
The completed top (right) and bottom (left) cylinder covers.



26
The finished piston and piston rod. The rod is of stainless steel and the piston brass.

made. A 4mm dia. centre drill was held in the lathe chuck and the cross-slide fed in until the edge of the cover just touched the centre drill. A piece of white paper held under the cover improved visibility when trying to judge when the two parts are about to touch.

As my lathe cross-slide has a 2mm pitch feed screw, one extra turn of the handle brings the point of the centre drill to the edge of the cover. As the pitch circle diameter (PCD) is 31mm, feeding in the cross-slide 3mm from the edge brings the drill into position. The cover is then indexed round for six positions, and the stud holes spotted.

I was using a dividing head with 24 holes in the index plate, so the stud holes were positioned by indexing every 4 holes in this 24 hole circle. While set up the gland stud holes can also be prepared. These are on a 9.5mm PCD, which is 13.75mm from the cover edge. There are only three holes one of which is in line with the valve rod cut-out. By indexing round to position 2 (hole 2 on the dividing head) this location is achieved. Spot the first hole, index round to hole 10 and then hole 18.

Go back to hole 2, remove the centre drill, fit an end mill and cut the scallop for the valve rod boss.

Do not try and do it in one bite, complete the cut by taking a few thousandths of an inch at a time.

Having spotted all the holes, they can then be opened out to 2.3mm diameter for the 8BA studs, or the cover can be removed from the lathe and the holes drilled at the drilling machine. Some curved packing will be required when clamping the cover in the drill vice to avoid damaging the edge of the cover, and to get a firm grip on the cover.

Remove all burrs, then all that is left is to tap the 10BA gland stud holes. Using such a small tap into stainless steel might fill some with dread, but it need not be a horror story. Years ago, in an article, and in his book *Screw Threads and Twist Drills*, Tom Walshaw explained how many of the published lists of tapping sizes had thread engagements that could be as much as 90%. In many applications this is just not necessary. The force required to form a thread with 90% engagement is many times that of, say, 65%. Hence all the broken taps we hear about. Read the book (*phone 01689-886660/1 for details) and all will be revealed.

I drilled the holes 1.4mm diameter and had no problem tapping them 10BA using carbon steel taps with, of course, plenty of cutting lubricant.

When helping out on the exhibition stand of Polly Models/Bruce Engineering, who stock carbon steel taps, I have had quite a few people turn up their noses at carbon steel saying they prefer HSS as they are stronger and have a better ground finish. In fact, carbon steel is harder than HSS. High speed steel is so called because it will retain its hardness at the high temperatures associated with high speed turning. This is not a temperature likely to be reached during a tapping operation. Also, those who have tried may have noticed how ground thread HSS taps squeal in brass while carbon steel taps do not.

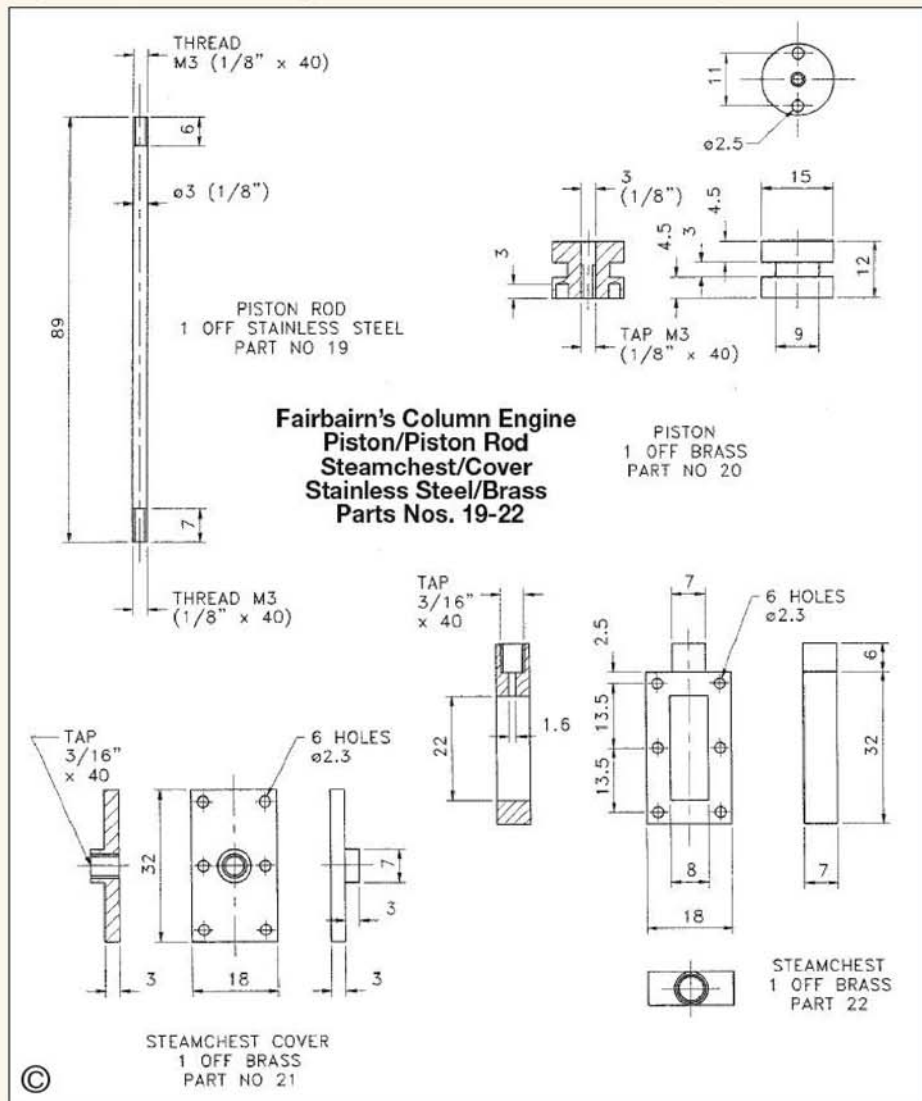
That completes work on the top cover which is shown with the bottom cover in photo 25.

Bottom cylinder cover - Part 17

After all the trials and tribulations of the top cover, the bottom cover is simplicity itself. Reduce the bar to 34mm dia., form the spigot, part off (or saw off if you prefer) reverse, hold in soft jaws and face off, then over to the dividing head to drill the stud holes!

Piston rod gland - Part 18

The piston rod gland is prepared from a length of 1/2in. dia. brass. Reduce the end to a sliding fit in the cover, drill and ream for the piston rod, part off, reverse and face off. Set up the dividing head again and drill for the stud holes.





Machining the steam chest cover from a piece of solid brass bar.

Piston rod - Part 19

The piston rod is a straight length of 3mm diameter stainless steel rod threaded M3 at each end. Check the surface finish of the rod and polish if required. The smoother the finish, the less wear on the packing and gland. After threading you may find that the thread has raised a burr which stands above the surface of the rod, if so, dress it flush with a fine file.

Polishing can be done with fine emery paper, but you might like to try the 3M company polishing pads. They are a fibrous material, often coloured green, available in sheet form about 6mm thick. They look like washing up scouring pads. An excellent finish can be obtained by their use.

Piston - Part 20

The piston should be a dissimilar material to the cylinder and, for a small stationary engine such as this with little hard work to do, brass will be suitable. To achieve concentricity use the next size larger stock size and turn down to finished diameter. Form the packing groove and then centre the end. Drill down tapping size and counterbore 5mm deep by 3mm dia., a snug fit on the piston rod. Thread the piston using a tailstock tap holder, part off, reverse and finish to thickness.

Arrange for the threads to be on the tight side, and with the piston in the 3-jaw chuck and the rod in the tailstock drill chuck, screw the parts together by turning the 3-jaw chuck around by hand, all in the aid of true co-axial alignment. A complete piston and rod is shown in **photo 26**.

Steam chest cover - Part 21

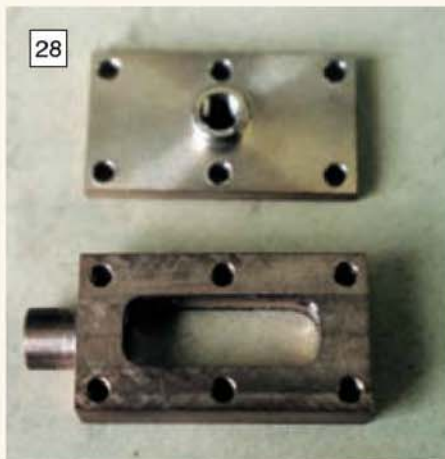
The steam chest cover can be cut from a piece of 3mm thick brass sheet with the inlet boss silver-soldered in, or it can be machined from the solid using 6mm thick brass. **Photograph 27** reveals that I used the latter option.

The block was set up in the 4-jaw independent chuck and the boss turned and tapped. Co-ordinates were again used to position the stud holes.

Steam chest - Part 22

As the steam chest is quite small it did not warrant a casting. Machine a block of brass to the overall dimensions shown, hold it in the 4-jaw independent chuck and set the end to run true. Turn the gland spigot to 7mm diameter, centre, drill and ream 1.6mm. Counterbore and tap $\frac{3}{16}$ in. x 40 threads per inch.

Transfer to the milling machine and, using co-ordinates, spot the stud holes; they can be further



The finished steam chest and cover. No castings are needed for these small items.

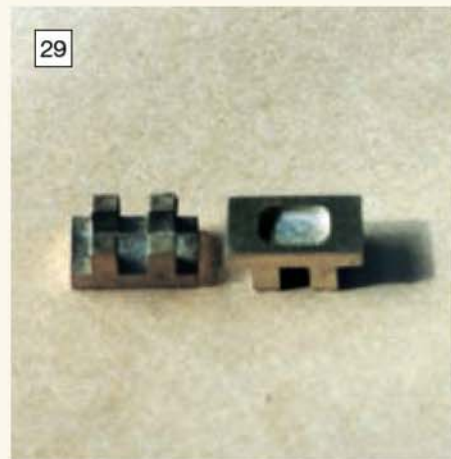
drilled in the milling machine or in the drilling machine. The studs are 8BA and the clearance drill would be 2.3mm, however with a configuration of studs such as this, a little more clearance is beneficial so use a 2.4mm drill.

To cut out the centre slot, hold the block in the milling machine vice, fit a 5mm slot drill in the spindle nose and set the table stops to leave a 5mm wall thickness. The slot can then be milled out in a series of steps secure in the knowledge that the stops will give the required wall thickness. **Photograph 28** shows the completed steam chest and cover.

Slide valve - Part 23

The slide valve is a lost wax casting and there is no machining to do. The first task is to file off the remains of the riser and to bring the valve to length. Next lay a piece of fine emery cloth on a flat surface and rub the bottom of the valve on it until it is smooth and flat.

Using the same process but with a coarser emery cloth, clean up the sides of the valve until the valve fits into the steam chest. Do not have a close fit, as the pressure of the steam forces the valve down onto the valve face, so the slide valve needs to be able to move laterally to seat down firmly. A pair of valves can be seen in **photo 29**.



A pair of slide valves for the engine (one only is required) made from lost wax castings.

Valve rod gland - Part 24

The valve rod gland is somewhat different from the usual form of glands. The cylinder is a long way down, the steam chest is at the bottom of the cylinder and the valve rod is long and slender, so it needs support. The gland is therefore made long to give the support and to get its top above the level of the base inside the column.

Use 5mm ($\frac{3}{16}$ in.) hexagon brass bar and turn the body to leave a short section of hexagon at the top. The bottom is threaded $\frac{3}{16}$ in. x 40tpi, and the rod is drilled through and reamed for the valve rod.

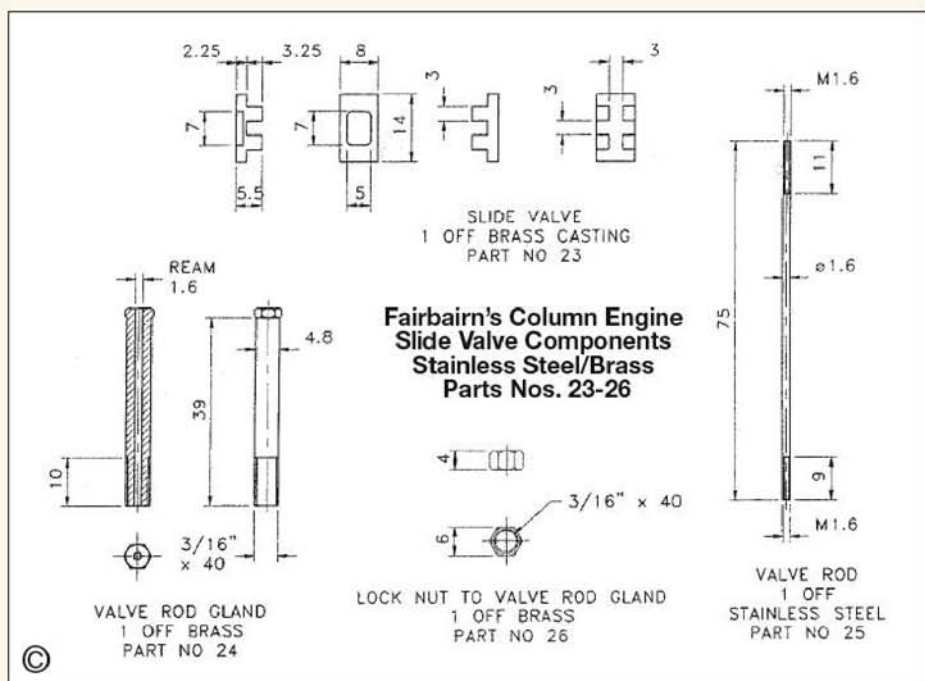
Valve rod - Part 25

The valve rod is a straight length of 1.6mm dia. stainless steel threaded M1.6 at both ends.

Lock nut to the valve rod gland - Part 26

An O-ring is used as the seal and a lock nut is used to fix the gland to the steam chest, the nut being a short section of 6mm ($\frac{1}{4}$ in.) brass hexagon rod tapped $\frac{3}{16}$ in. x 40 threads per inch. If you cannot get hold of an O-ring of suitable size, then graphited yarn can be used instead.

●To be continued.





The diameter of the indentations made by the 10mm ball and a smart blow from a 1 1/2 lb. hammer can be assessed using a linen tester, as here.

diameters of the two dimples formed.

$$\text{Thus: } 30 \times \pi (D_d^2) / 4 = K T \times \pi (D_m^2) / 4$$

$$\text{So } T = 30 D_d^2 / K D_m^2$$

where D_d = diameter of impression in mild steel datum bar.

D_m = diameter of impression in material checked.

K = a constant to take into account inertia and load dissipation in the gadget.

T = 'tonnage' of the test piece.

K can be obtained by using material from the same stock as the datum bar and measuring the two impression diameters.

$$\text{Then } K = D_d^2 / D_m^2$$

I use $K = 1.1$

The dimples, usually about 3 to 4mm dia. could be measured using a toolroom microscope

fitted with a graticule but not having one, I found a magnifier of the type known as a 'linen tester' adequate.

It has a graduated spectacle plate and is quite capable of measuring the dimple diameters to 0.005 inch. **Photograph 4** shows it in use.

It is advisable to scribe a line through the datum bar dimple on completion of a measurement to avoid subsequent confusion.

Figure 3 shows a simple curve for quickly obtaining the result of a test. It is based on my usage with steel though a point has been added for freely machinable cast iron.

Making the device is quite simple. **Figure 2** gives the salient dimensions of the components.

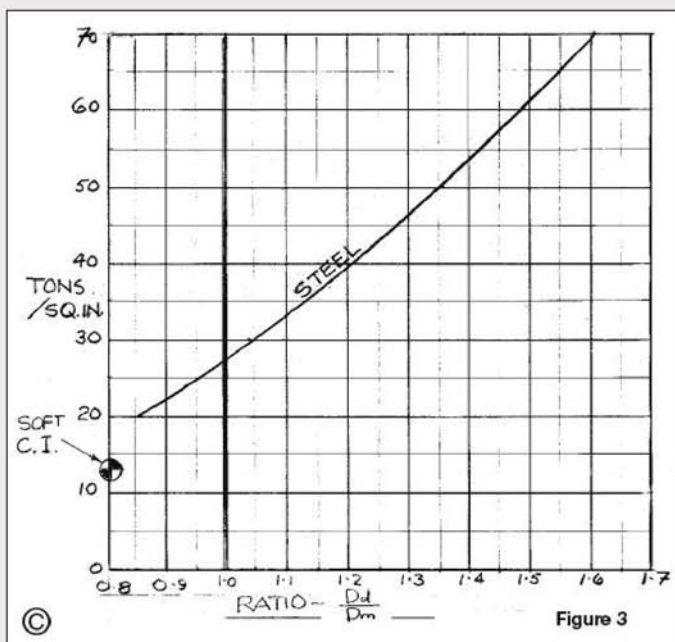


Figure 3

Provided the same mode of operation is retained these dimensions can be greatly altered to suit stock available.

A Brinell testing machine uses a precise 10mm dia. ball and an exact 5,000kg load applied for 15 seconds. Here, our load is a very variable whack with a hammer. So, if you do not have a 10mm dia. ball available, use what you do happen to have. Even a ball as small as 1/4in. dia. gives acceptable results. The comparator gives good results on test pieces of 1/8in. or more in thickness.

PARADOXICAL GEARS

Jacques Maurel

in France, explains how to make your own demonstration set of paradoxical gears.

●Part III continued from page 741 (M.E. 4237, 24 December 2004)

It is quite possible to make your own two-tooth paradoxical set of gears as shown in **photo 9** and puzzle your friends with it. Why two teeth? Because it is the best compromise, each step gear being made with five wheels, the whole ten wheels being machined at the same setting. An arc of a circle is used to approximate the involute shape. A one-tooth gear would need the true involute form for good running, and a three-tooth gear would necessitate more work on more discs.

Procedure

The ten wheels can be made as follows:

1: Saw off the ten blanks (60 x 105mm) for the gear wheels from 2mm PVC or hard polystyrene plastic sheet.

2: Make the holding plate (HP) blank (see drawing); use 3mm aluminium alloy and accurately drill the holes: a, b, c, d, e, f 3.3mm diameter.

3: Pile up the ten blanks and clamp them onto the holding plate using toolmaker's clamps; use it

as a template to drill the holes 'd' and 'e' 3.3mm dia. and then holes 'b' and 'c' 4mm diameter. Fit two 4mm dia. by 25mm long pins into these holes so that they protrude 2.5mm each side of

the stack. They are used to accurately position the stack on the holding plate for machining. Take care to keep the drill perpendicular because of the thickness of the work. Mark two

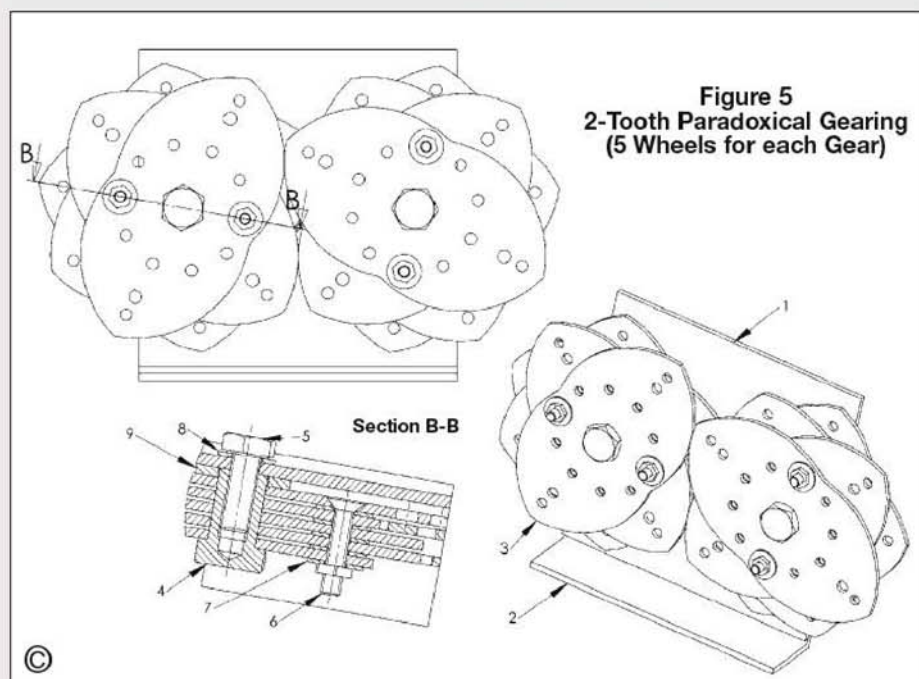
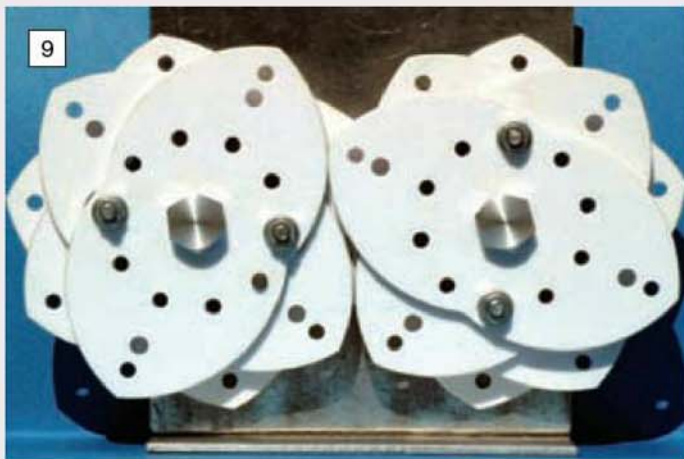


Figure 5
2-Tooth Paradoxical Gearing
(5 Wheels for each Gear)



The paradoxical pair of gears described in this article. Each gear consists of five layers of material to form a crude helical gear.



Setting up to machine the blanks. The layers for both of the two gears can be machined together.

perpendicular lines intersecting at point 'a' and the apexes of the two teeth on the highest blank.

4: Take off the stack (linked with its pins) from the holding plate and enlarge the holes 'd' and 'e' to 4.5mm diameter.

5: The corresponding holes in the holding plate will be tapped M4, and the hole 'a' enlarged to 4mm diameter.

6: It is now time to make the driver (see drawing). Use 40mm dia. free cutting mild steel and turn it to size. Mark out and drill the three holes 3.3mm diameter.

7: Using the driver as a template fastened with a toolmaker's clamp on to the holding plate, drill 3.3mm dia. in the holding plate the three holes 'g' (driver centred at 'a') and the three holes 'h' (driver centred at 'f'). Take out the driver, enlarge these holes to 4.5mm dia. and countersink for M4 countersunk head screws.

8: Tap the three holes M4 on the driver.

9: Fasten the holding plate and the driver centred at 'f' position, with 3 off M4 x 15mm countersunk screws. Secure the stack with two off M4 x 25mm hexagon head screws and washers. Set the whole assembly in the chuck of a rotary table on a vertical milling machine (photo 10). Using a 10mm dia. long reach end mill, roughly adjust it so that its longitudinal path could intersect the chuck axis — use the transverse movement and then lock it. The mill being flush with the topmost blank, adjust it using the longitudinal axis and rotary movement so that the edge of the end mill just cuts the apex point of the tooth. Lock the longitudinal axis.

10: Down feed the rotating milling cutter until it is flush with the holding plate. Now feed the rotary table in a clockwise direction until the milling machine spindle axis cuts the perpendicular line (photo 11), this being the lowest part of the tooth profile. It is far better to rough out the stack with a hacksaw so that only a few millimetres of stock will need to be removed by the milling cutter.

11: Stop the milling machine, raise the cutter so that it is over the top of the blanks, feed back the rotary table to its starting point. Remove the stack of blanks, turn it over and repeat step 10. Repeat twice more to complete the machining of the teeth profiles.

12: Remove the stack, fasten the holding plate with the driver centred at 'a', and clamp the stack on it again. Chuck the whole lot on the rotary table and drill the ten indexing holes on a 38mm pitch circle diameter (photo 11). Five holes would be sufficient but ten permit the clamping bolts to be diametrically opposed, which is necessary to get good parallelism between the five wheels of each gear. At the same setting,

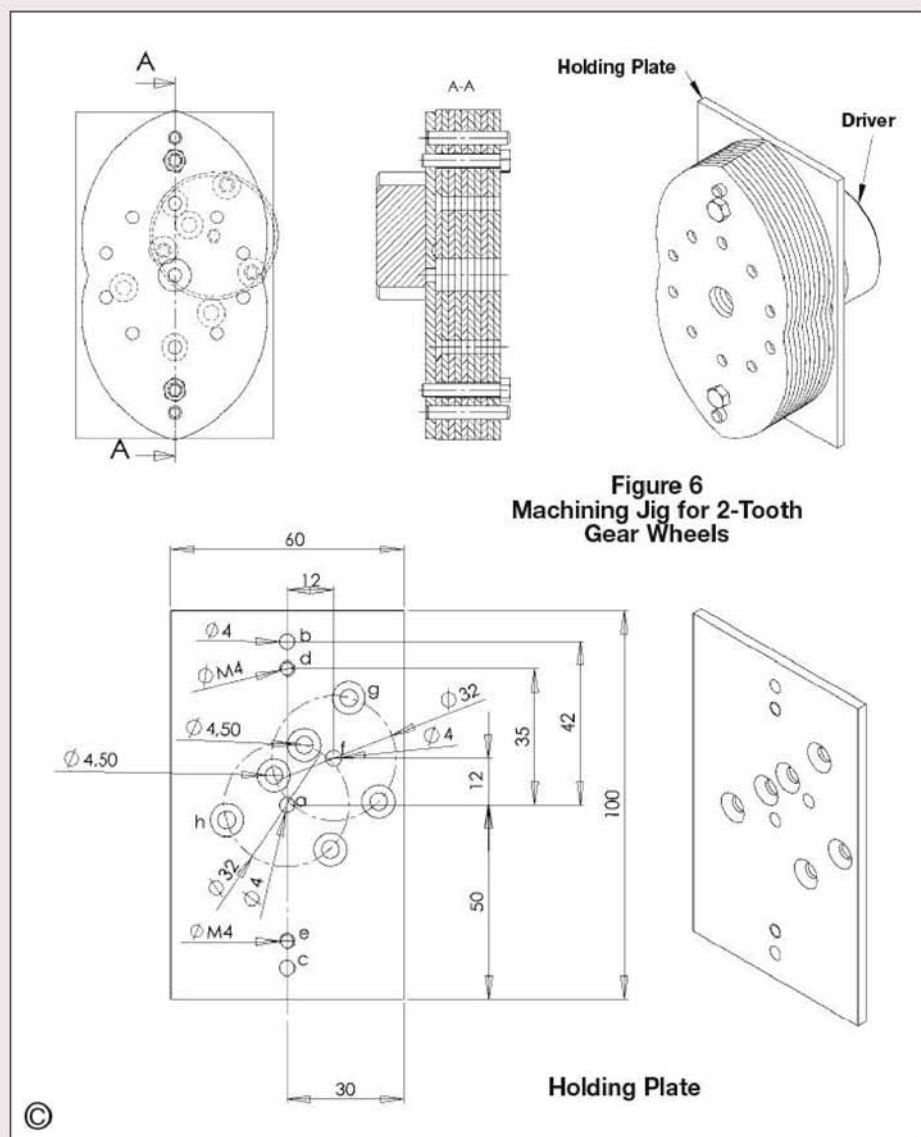
enlarge hole 'a' in the stack to 10mm by milling, using an 8mm dia. long reach end mill and the rotary table motion, thus ensuring good concentricity with the pitch circle diameter of the ten indexed holes.

Setting up

Before making the axle (part 4), buy the ten 4mm washers (part 7), the 10mm washer (part 9), and measure them to determine the exact gear thickness.

1: Make the two stacks of five wheels on each axle (part 4), beginning with the countersunk wheel. Do not forget to rotate each wheel two indexing holes further, in the same direction for the two stacks, and use a 4mm dia. pin to locate accurately the five wheels before fastening the two bolts (part 6). If it is impossible to drive the pin in, the concentricity between the hole 'a' and the pitch circle of the indexing holes is almost certainly at fault.

2: Set the two step gears on the bracket (part



**Figure 6
Machining Jig for 2-Tooth
Gear Wheels**

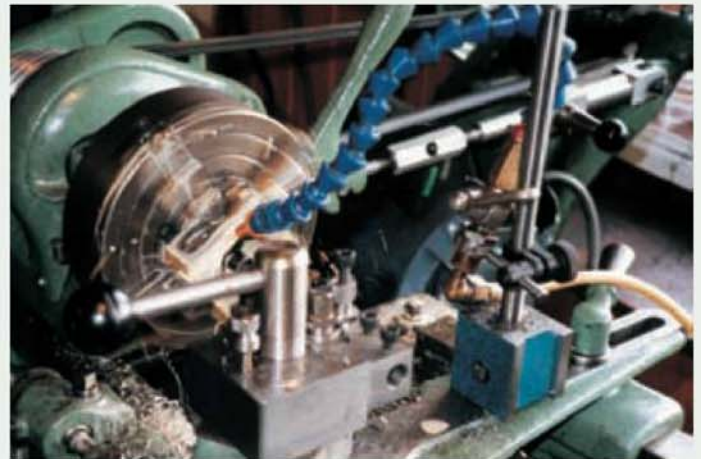


12

Figure 7



'Kit of parts' for the South Bend lathe showing the special indexing pillar, spacer washer, T-bolt, one tool holder and associated components.



Boring a tool holder in the South Bend lathe. The boring bar is held in an alternative quick change system made by the author.

A VERSATILE PILLAR TOOLPOST

A. N. Eastwood

describes the tool holders for his pillar tool post system and then deals with the design for the South Bend lathe.

●Part II continued from page 695
(M.E. 4236, 10 December 2004)

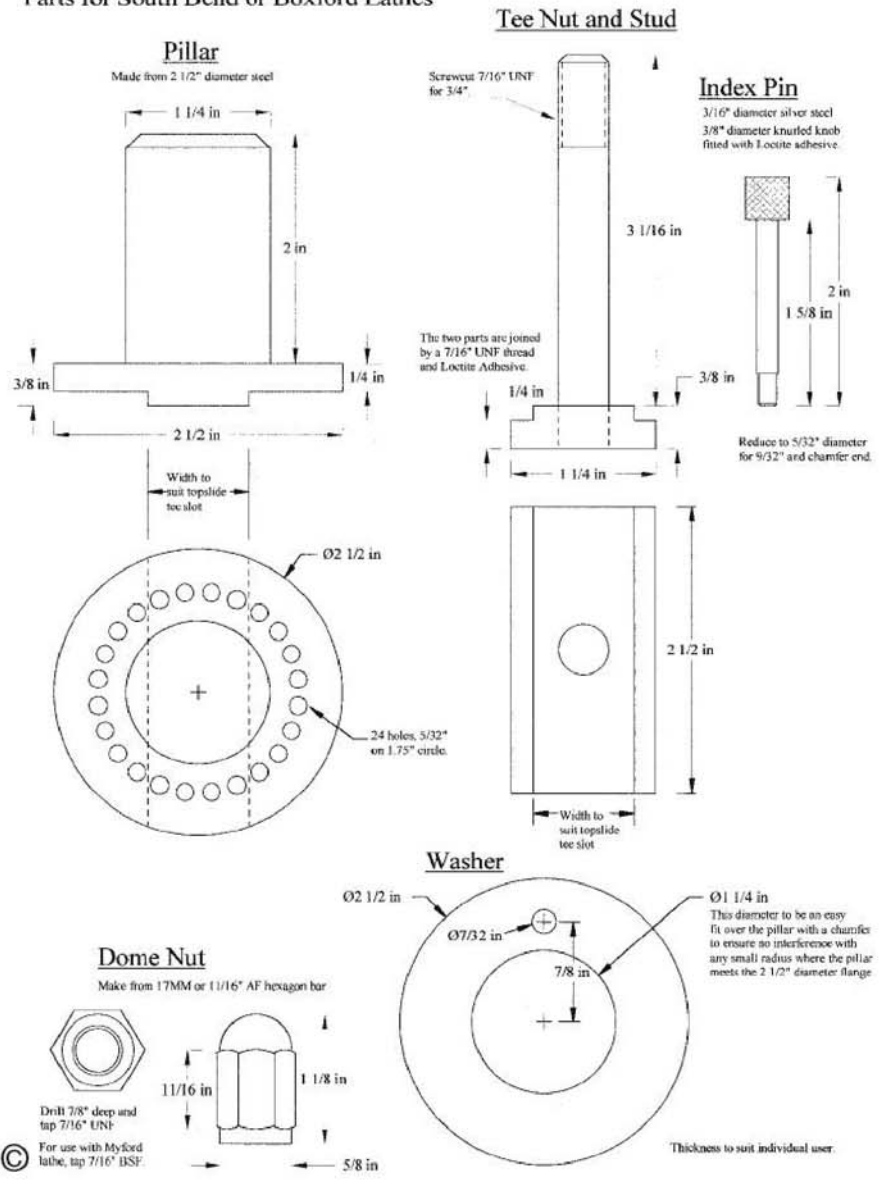
Before going any further, make a tool holder. The holders are simple jobs, which is just as well as you will want to make plenty of them, but one will do for now. Nine holders can be made from a two-foot length of 2 x 1 in. mild steel. Cut a 2 1/2 in. length of steel, and mark the centre of the 1 1/4 in. bore and centre drill it in the drilling machine; note that the hole is always centred 1 1/4 in. from the clamping end of any type of tool holder. Set the piece in the 4-jaw chuck with a piece of 1/4 in. packing behind it to ensure that it is held properly parallel to the face of the chuck. Pull out the packing piece after you have adjusted the chuck to get the centre you have just drilled as accurately aligned as you can get it.

Drill through, and open out the hole with the largest drill you have; a 1 in. dia. blacksmith's drill will save much wear on your boring tool. Then bore out to 1 1/4 in. dia., using a stub of the bar material from which you made the pillar, as a gauge. If you turn about 0.005 in. off the diameter of this gauge at one end it may help you by indicating when there is very little left to remove. Drill the hole for the clamping screw before slitting the tool holder. If you are using M10 bolts, tapping size is 8.5mm and clearance is letter Y or 13/32 inch. A 40mm long clamping screw can be fitted into a blind hole, which looks good, although there is no necessity to do this. This length of screw, used without a washer under the head, gives an adequate 12mm of thread engagement.

The slits in all my tool holders were made with a 1/8 in. wide saw in my horizontal milling machine, but any width of slitting saw between 1/16 and 1/8 in. will do. You could even make the slits with a hacksaw, but I find that this never looks very neat. The rest of the tool holder is a simple milling, drilling and tapping exercise. I

PILLAR TYPE QUICK CHANGE TOOLPOST SYSTEM

Parts for South Bend or Boxford Lathes





One of the 30deg. tool holders assembled with the South Bend pillar.

used M6 x 12mm socket head cap screws for tool clamping, and an ordinary M6 x 40mm bolt and nut for height adjustment. Grind or face the end of the bolt smooth to avoid marking the top slide. The height adjustment screw needs only about $\frac{1}{4}$ in. of thread in the tool holder; the rest of the hole should be opened out to 6mm diameter. I recommend making the tool slot $\frac{13}{32}$ in. high, and a little over $\frac{3}{8}$ in. deep, so that it will accommodate tools of up to 10mm square section. If you have any $\frac{7}{16}$ in. square tools they can be used if you position a $\frac{7}{16}$ in. slot just a little lower than shown on the drawing.

Now you can fit the pillar to the top-slide. Take the three dowels and remove the points, leaving only a small chamfer to aid entry into the holes in the pillar, and slot them for a screwdriver. Screw them fully home into the top-slide. Place the pillar onto the stud and push it down over the dowels. If you did everything accurately it will go on, but you may need to try it in all three possible positions. It will probably require a very firm push to get it on and be difficult to get off. If it gets stuck half way you can use the tool holder to pull it off again. Clamp the holder to the pillar, put a packing piece beneath the adjusting screw to prevent marking the top-slide, and use the adjusting screw to lift the assembly. If all is well, clamp the pillar down with a $\frac{7}{16}$ in. BSF nut.

If you have no access to a milling machine the tool slot can now be milled in the lathe. Simply clamp the tool block to the pillar at a height which allows a $\frac{13}{32}$ in. slot drill to produce a slot positioned $\frac{1}{4}$ in. from the bottom of the block. Open-ended slots like this must always be cut with a two- or three-flute cutter but never with a four-flute end mill as the latter is likely to break when it emerges at the end of the slot.

Holders for boring tools are slightly different, in that they are fitted to the pillar at 90deg. to the usual position of a turning tool holder. For this reason the clamp screw is fitted from the opposite side when seen from the top, and the adjusting screw is placed so that its hole just misses the tapped hole for the clamp screw. Finish the holes for the boring bars by reaming to size. These holes should be drilled in the lathe with the block clamped to the pillar so that the lathe centre is $\frac{7}{16}$ in. from the bottom face of the tool holder. Using the tailstock barrel to push the tool holder onto the drill is the easiest way to drill holes like this.

I have found that holders made with the slotted face at a 30deg. angle are very useful as they provide extra clearance when working close to the tailstock, and recommend that some tool holders



Drilling the indexing holes in the base of the South Bend pillar using the dividing head fitted to a versatile milling/drilling machine.

are made to this alternative design. Since making this system I have never felt the need to remove the pillar from the Myford top slide. I own a commercial knurling tool of the type where the work is clamped between the two knurls. Due to its long overhang from a conventional tool post it tended to lever itself out of square with the work when the saddle was traversed to form a long knurl. Adapting it to fit the pillar tool post as shown in the photograph has made it far more useful.

Use with a second lathe

The South Bend 9 inch lathe, in common with many others, including Boxfords, has a T-slotted top-slide. I made a pillar from a piece of 2.5in. dia. steel, as shown in the photograph. This is prevented from rotating relative to the top-slide by a tenon milled on the underside of the 2.5in. diameter. The centre height of the South Bend above its top-slide surface is $\frac{7}{16}$ in. greater than that of the Myford. It was therefore a simple matter to machine the pillar such that tools set to centre height on the Myford would be correctly centred on the South Bend if a $\frac{3}{16}$ in. spacer was positioned beneath the adjusting screw. I have made a special washer of the correct thickness, but a thinner washer would allow thicker tool holders to be used with large section tools if the system is made solely for use on a 4 or 5in. centre height lathe.

Positive tool positioning

In amateur and model work such as locomotive construction there is not much repetition work, and most jobs in the lathe require multiple tool passes. Critical diameters are achieved by careful measurement before the finishing cut and little reliance need be placed on the ability to replace a tool in exactly the same position as before. Where an indexing system really scores is not in exact radial positioning, but in the ability to



A commercial knurling tool modified to fit the pillar tool post system and in use on the Myford.

replace a tool at the correct angular position relative to the lathe axis. Chamfering, screw cutting and parting operations are all assisted if a tool post indexing system is provided. I drilled 24 holes in the flange at the base of the pillar made for the South Bend lathe. These holes were drilled and reamed to $\frac{5}{32}$ in. dia. on a pitch circle of 1.8in. diameter. Accurate positioning 15deg. apart was achieved by using a dividing head.

Each tool holder needed a $\frac{3}{16}$ in. reamed hole for a silver-steel index pin, which is reduced to $\frac{5}{32}$ in. dia. for about $\frac{1}{4}$ inch. A thin sheet steel washer with a single clearance hole for the index pin will prevent swarf entering the unused holes. If the set has been made like mine, for two lathes, the $\frac{3}{16}$ in. washer can perform this duty. The index pins must pass right through the tool holders and be retractable so that the holders can be used on the Myford lathe. An alternative would be to provide twelve $\frac{3}{16}$ in. or $\frac{7}{32}$ in. holes, and if I was starting this project again I would adopt this approach, as I have not found any need for the greater number of index positions.

It should be noted that repeatability is not absolutely accurate to the last 0.001 inch. I tested this by placing a piece of $\frac{1}{2}$ in. dia. steel bar in a collet and reducing it to 0.4585in. dia. at a single pass using a new carbide tool, with the lathe cross-slide gibs tightened to prevent movement. I then removed and replaced the tool holder, and advanced the bar in the collet so that the next cut was performed at the same distance from the headstock. Each cut was followed by measurement with a good 'tenths' micrometer. Seven cuts were made in this way and the maximum variation between the largest and smallest diameters produced was 0.0021 inch.

A 0.005in. deep cut over the whole-machined length was followed by successive 0.005in. cuts made as before, but without advancing the bar in the collet. After eliminating the error caused by the fact that my old South Bend lathe turns slightly taper, the maximum variation over seven cuts was 0.0011 inch. These results are better than I had expected with a simple system like this, but are definitely not in the high precision class. As a comparison the more complex system referred to in the first paragraph produced a maximum variation over seven cuts of just 0.0004 inch.

Indexing in this way is not applicable to the Myford lathe, as it would be unacceptable to drill a ring of holes into the top slide. The benefit of this system for the Myford lies in the ability to make a good collection of tool holders, each of which can be rapidly and accurately set to centre height.



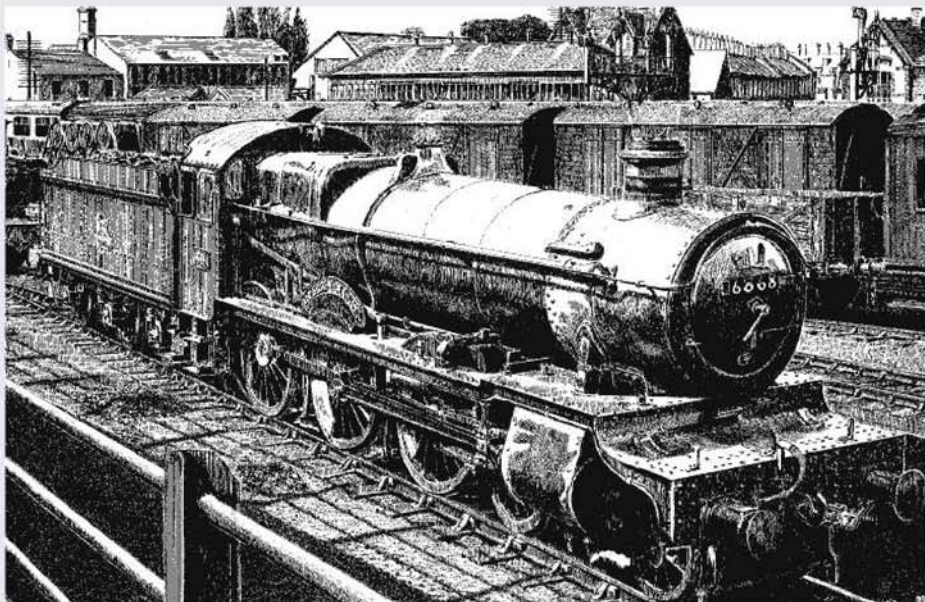
Neville Evans

considers full size and miniature smokeboxes, and their design and construction.

●Part XIII continued from page 568
(M.E. 4234, 12 November 2004)

The smokebox represents yet another example of what Chapelon (to whom we doff our caps) called "*the organs of the locomotive*." It became recognised as having a large influence on the performance of the engine as a whole because of its role in the draughting of the boiler. The provision of a large volume in the smokebox plays an important part in achieving a smooth constant flow of air through the fire grate. The short smokeboxes of earlier locomotives were particularly bad in this respect and sometimes, due to the short, severe pulses that they generated in the firebox, particularly at low speeds with a heavy load, burning coal was pulled through the fire tubes, resulting in the bottom of the smokebox door becoming red hot and large losses of unburned fuel also took place.

It must also be borne in mind that in a large smokebox there is a greater volume available for the deposit of ash. One of the most important features is that of increased accessibility for the



PENRHOS GRANGE

details housed within the smokebox, which in our case includes the regulator assembly.

Smokebox gases are liable to be of an acidic nature and therefore highly corrosive. The use of stainless steel or bronze bolts and screws with the heads inside the smokebox and the vulnerable threads and nuts on the outside can therefore be recommended. The GWR drumhead smokebox (I prefer to think of them as being cylindrical) used this feature, and it was attached to the saddle by a row of nine rather obtrusive bolts, with heads outside, as can be seen from the artwork.

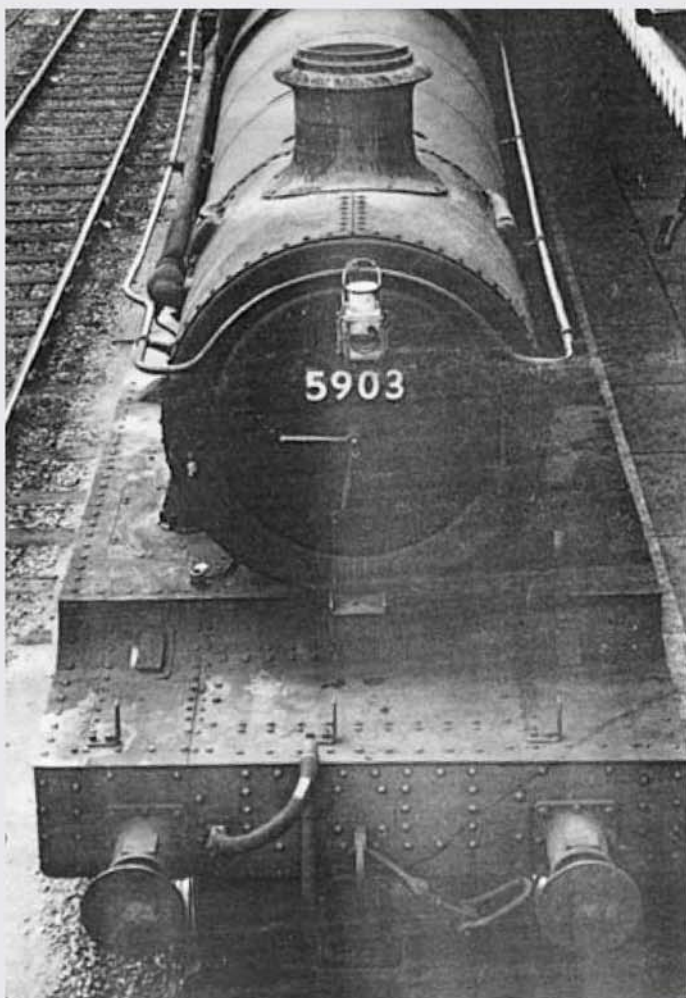
The chief mechanical function of the smokebox is to locate the front of the boiler and so it must possess sufficient structural rigidity to do this. One must also remember that because of the high temperatures found inside the smokebox, the effects of expansion are more uniformly distributed in a simple cylindrical tube, which must of course be combined with a smokebox saddle. This kind of smokebox is therefore easier to maintain air tight than is the horseshoe form, but requires to be much longer to maintain a reasonable volume. The very length of a drumhead smokebox, especially when combined with a

tapered boiler, which tends to reduce the diameter of the front tube, makes access to the bits that are attached to the boiler tube plate difficult. I consider that a smokebox that is split horizontally in the middle, the top and bottom being held together by a series of set screws and a strap is a great boon. My *Cock of the North* had just such a feature, and smokebox assembly work was a real pleasure. The problem was, of course, that when assembled and painted, the screw heads disappeared and the boiler joint was filled, which meant that the smokebox reverted to a cylindrical drumhead.

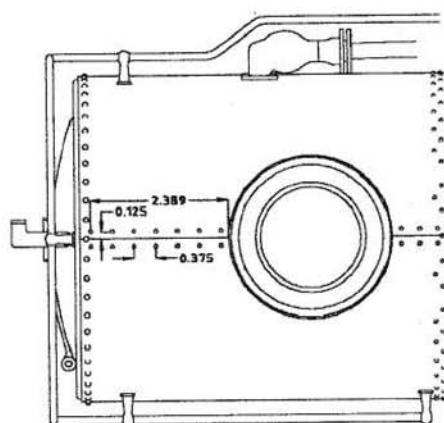
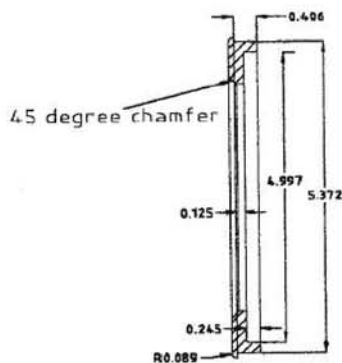
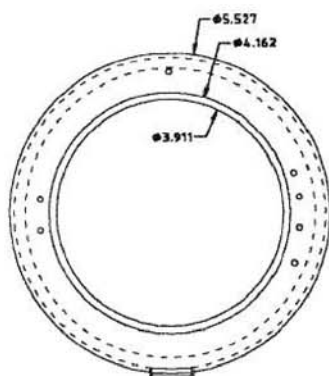
On the GWR the standard two outside cylindered locomotives used a smokebox saddle cast in two halves which included the cylinders, together with their associated steam passages. This arrangement derived from American practice. In the USA, where there was a preference for bar framing, it was indeed usual for the cylinders to be cast as a pair and bolted onto the frames direct. Most of the last American steam engines, of course, used frames and cylinders that were cast as a monobloc. I seem to remember that the North British Locomotive Co, built a batch of huge Beyer Garretts that called for this method of construction. They were unable to source castings of this size and complexity in Great Britain, and so the order for the frame castings went, I think, to Alco in America, who made a lovely job of them.

The problems of excess weight at the front end of the engine, expense, difficulty of machining, and weakness where the short bar frames meet the main plate frames, meant that this system of construction was scrapped on the GWR when Hawksworth took over the reins. In our small way, we are following the example of Hawksworth, in that we are dispensing with the half cylinder and combined saddle set up. Instead we are going for the much simpler, and in my view more effective system of through frames, cunningly disguised as bar frames, together with separate cylinders and saddle. The smokebox can be made of steel, brass or even copper. I have drawn it as being $\frac{1}{8}$ in. thick, so as to obviate the necessity for a thin washer between the boiler and smokebox.

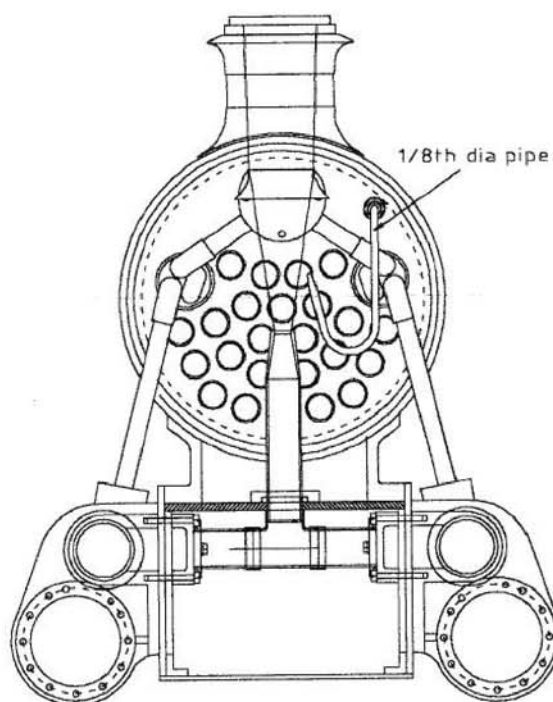
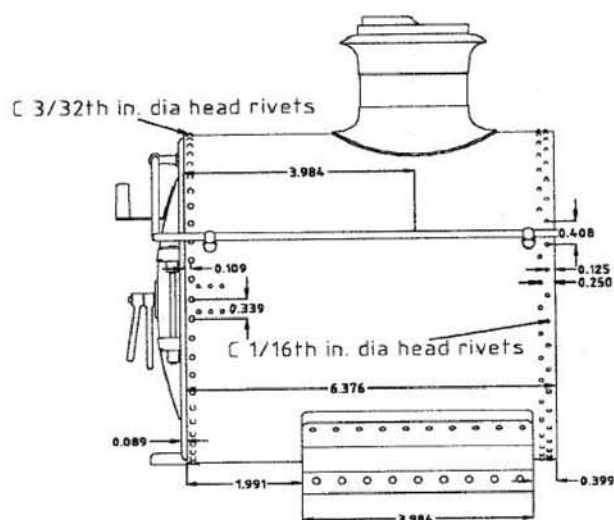
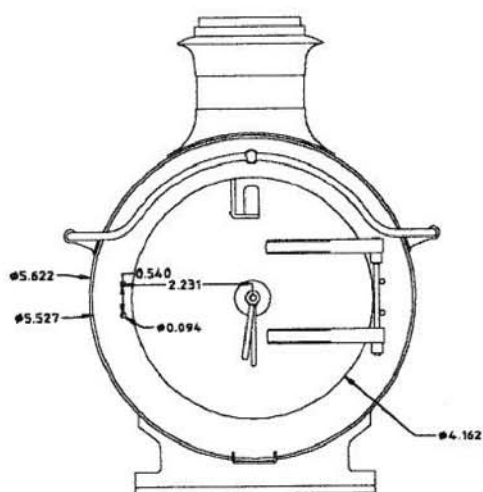
If you decide on $\frac{1}{16}$ in. plate, which is after all much easier to form into a tube, then I would stick to brass as a material. Thinnish steel could



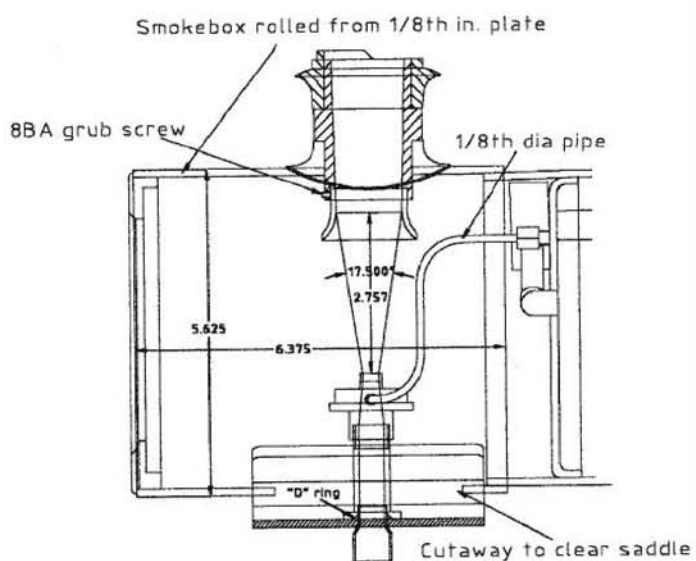
This front end view of a GWR Hall class locomotive reveals the similarity between it and the GWR Grange currently being described.



SMOKEBOX FRONT

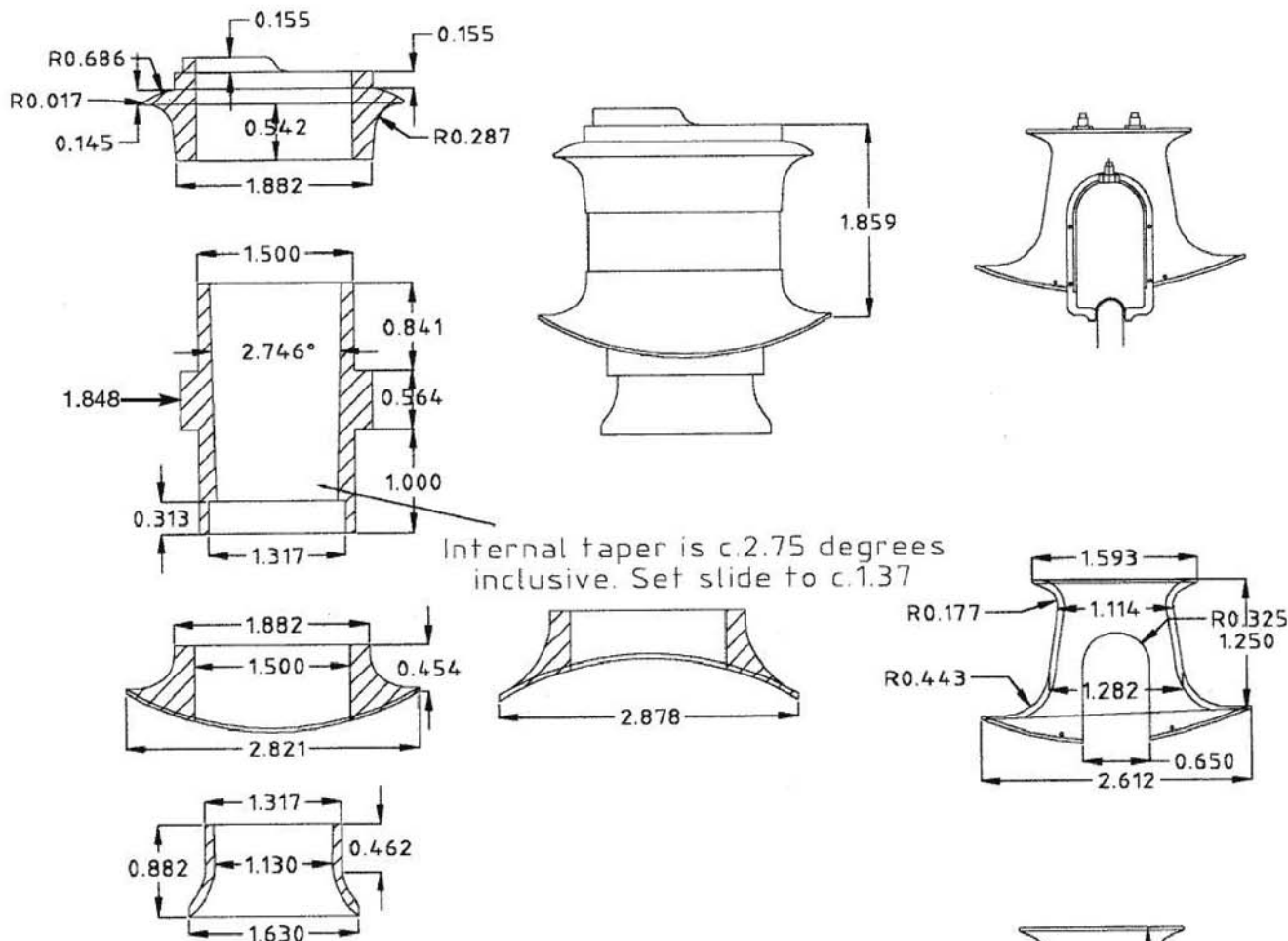


GRANGE SMOKEBOX from FRONT
showing single jet blower

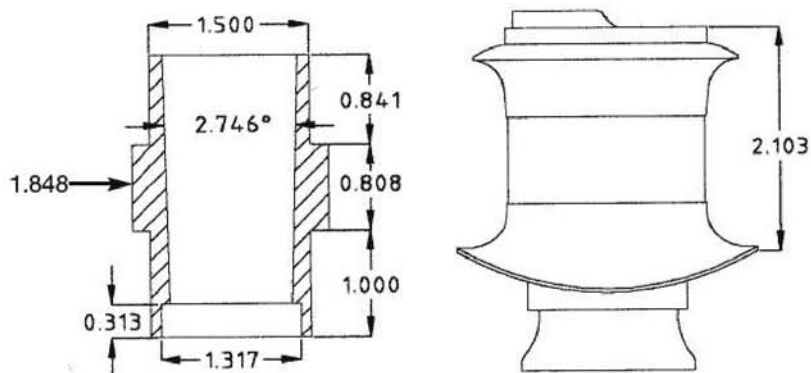


GRANGE SMOKEBOX
showing multijet blower

GRANGE SMOKEBOX



CHIMNEY " 6800 GRANGE CLASS "



CHIMNEY " 4901 HALL CLASS "

G.W.R. short safety valve bonnet

corrode quite quickly in the acid conditions. The smokebox front is best made from brass, or even a gunmetal casting, if a suitable one be at hand. The large number of rivets, front and rear, are probably best put in as dummies, the underside being lightly countersunk (I do it by hand, using a short $\frac{1}{8}$ in. drill and a small chuck). The bashing down is performed with the aid of a long thickish punch with a tapered end.

Blastpipe and draughting

The draughting arrangements for our Great Western 2-cylinder locomotives will remain constant

throughout the range. Simon Bowdich sent me one of his usual learned screeds based on the work of Professor Bill Hall, which I have followed to the letter. However, I must emphasise that, as always, draughting arrangements are largely empirical and fine tuning will, no doubt, become necessary when the locomotives are on the track.

It will be noted that I have shown two arrangements of the blastpipe nozzle, one a rather elaborate arrangement using a multi-jet blower and a second type which uses a bent pipe which simply goes up the chimney. This is the sort that I would use from preference. The

advantage of the second system is that there is far less obstruction in the middle of the smokebox, giving freer flow of combustion gases to mix with the blast. The snags are that it is obviously more vulnerable to accidental damage and when used in conjunction with a screen type spark arrester, positioning is more difficult because we must make a hole in the screen to poke it through.

The blower pipe itself is quite simple, provided that the business end is brought down to a thin taper surrounding a 0.040in. hole. What I have done is to anneal the end of the tube and to slide a piece of 1mm stainless steel wire into it. The tube

is then gently beaten around the wire against a flat metal surface, turning it continuously the while in the fingers. The tube takes on a lovely taper and when the correct shape has been achieved I simply pull the stainless steel wire out of the tube with a pair of pliers. This system is used on my *Princess* and performs faultlessly. I have a selection of cunningly bent spanners that I use on awkward bits like the union nut which holds the pipe onto its union and lies in the dark depths of the smokebox. The detailed drawings of the blastpipe and blower will have to be held over until the next issue.

Blastpipe and chimney

The blastpipe arrangements are quite straightforward. The proportions and dimensions, as I mentioned earlier, are due to the late Prof. Bill Hall, and should be pretty close to the finished tuned up article. I must point out that as usual, it is necessary to have a detachable bell mouth, so as to allow access to the steam pipe/regulator assembly. Use a small(ish) grub screw to hold it on.

I have detailed two chimneys. The only difference between them lies in the length of the middle portion, which also forms the blastpipe. The long variety was used on many GWR classes: the 'Stars', 'Saints', 'Halls' and the 4-4-0 'Counties' but not the later 4-6-0 'Counties'. The chimney situation on the 'Counties' is a little complex and I shall go into it more deeply when we come to describe them. Suffice it to say that they didn't use a 'King' chimney, as is popularly thought, but that their single chimneys were merely modifications of their doubles. The shorter version came out on the 'Granges', after a false start on the first one which saw the light of day disfigured by a particularly hideous cast device, of which the less said the better. The short 'Grange' chimneys were used on the 'Halls' quite freely, presumably after refits and the like, but I have never seen a 'Grange' with a long chimney. The bottom portion of the chimney will be available as a casting, as it is common to all of them. The other two bits can be simply turned from steel tube with a copper tap piece.

Safety valve cover

We have decided on a brass lost wax casting for the safety valve cover. Mike 'The Pattern' has in his possession a huge lump of material from which to hew the offending item, so it's simply a matter of time and a huge pile of swarf, before we are able to offer it over the counter so to speak. The short cover (or should it be bonnet?) was common to all the later GWR locomotives, bearing in mind that with the smaller boilers, the radius of the underside differed slightly. There is, of course, no problem with the later No. 1 boilers, although the 'Saints' used the longer and more graceful pattern.

Egg on face time!

I feel that I should apologise for the dreadful drawings of the GWR safety valve, that appeared at a minuscule scale in part 12 (*M.E.* 4234, 12 November 2004) and also for the slipped step on the valance drawing. I am re-issuing the safety valve drawing as soon as possible, sorry again folks.

●*To be continued.*

RE-CASING A FRENCH CLOCK MOVEMENT

Ian Beilby

continues his series on reclaiming redundant, good quality French clock movements.

●*Part II continued from page 683 (M.E. 4236, 10 December 2004)*

Having decided on a suitable design for the main plate, the dimensions were worked out with reference to the diameter of the bezel and length of the pendulum. **Figures 1, 2 and 3** give the overall dimensions I used for the main plate. As you can see there are quite a number of dimensions, far too many to go on one

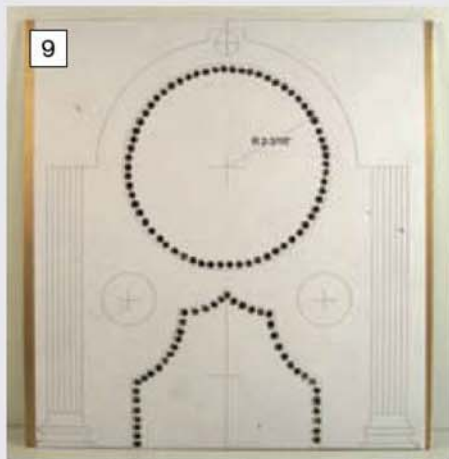
drawing, and so reference to the three drawings must be made when transferring the dimensions onto the brass plate.

As previously mentioned, the overall plate dimensions are influenced by the diameter of the dial bezel and the pendulum length. The dimensions I am using are suitable for a movement with a dial bezel of 4⁵/₈in. dia. and a total pendulum length of 6¹/₂ inch. Any variation from the above dimensions would have to be taken into account, and the dimensions of the plate and some of the fittings would have to be altered accordingly. These considerations apply equally to the materials required to complete the project. The list of materials here is therefore only suitable if the clock being re-cased is to the same

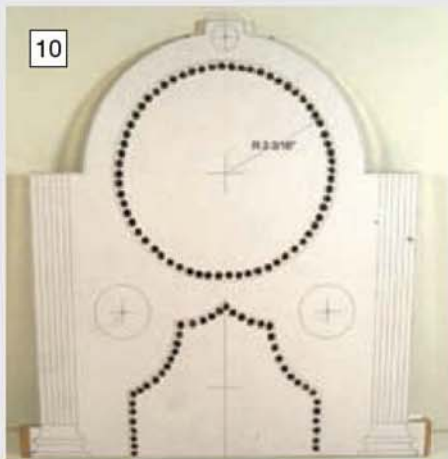
dimensions as those given above.

When designing the main plate and fittings I gave considerable thought to different methods of attaching the decorative pillars and finials to the plate. Soldering and riveting are both techniques frequently used in metalwork. However, unless the constructor is reasonably proficient in both these disciplines the results can be both unreliable and visually unpleasant. So I discarded these methods and chose to screw all the components to the plate with 4BA screws.

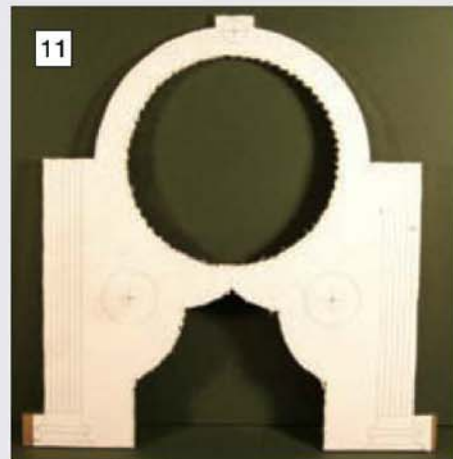
Admittedly, this method involves a lot of drilling and tapping of components but, if proper care is taken at the marking out stage, the components can be reliably and securely located on the main plate. Another advantage of this method is that all the



Marking out of the main plate was simplified by gluing the full size drawing to the brass.



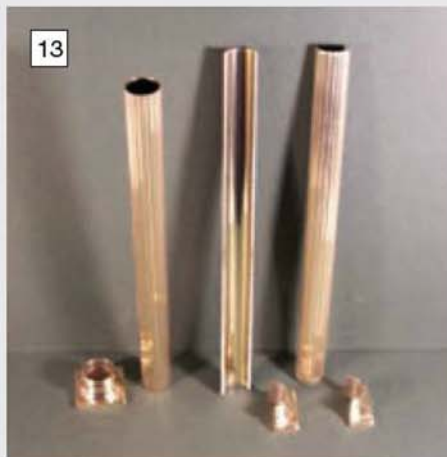
The large apertures were cut by first chain-drilling round the lines.



The material was then removed using an Abrafile blade to join up the holes.



Here the plate has been cleaned up and the dial bezel being checked for fit.



The fluted pillars and capitals used on the rebuilt clock. Fluted tube can be bought commercially.



It is necessary to cut the fluted tubes and capitals in half using a bandsaw or hacksaw.

components can be easily unscrewed and replaced; they can therefore be easily removed at a later date for cleaning and re-polishing, if necessary. However, I did not want any screw heads or threads to be visible on the front of the plate and quite a bit of thought had to be given to obscuring the screws from view. I also wanted the project to be relatively easy to construct and therefore opted for the use of commercially available brass angle and brass strip in the fabrication.

The only tools required, other than the tapping equipment, is a pillar drill, hacksaw and various files. A motorised bandsaw, if available, speeds up the work and reduces the physical strain on the constructor but if care is taken, all the operations can be performed just as well with hand tools alone. The brass plate should be checked with an engineer's square and the edges draw-filed.

As will be seen from some of the following photos, I drew my design using CAD and managed to print the drawings full size, simply gluing them onto the brass sheet with Photo-mount adhesive (photo 9). Although not in line with traditional workshop practice, there are many advantages to

this method of working. Not only is it quicker, the measurements do not have to be transferred to the actual plate, and this method also rules out the possibility of errors. The paper also protects the surface of the brass sheet from accidental scratches and marks which would have to be polished out during the final stage of construction. I appreciate that not everyone has this facility, and in that case the relevant dimensions should be marked onto the brass sheet in the traditional way.

Referring to fig 1, the plate is initially marked out and the plate cut and filed to size and shape. The positions of various holes at A, B and C are marked and centre punched. In order not to clutter the drawing with too many dimensions I have only given their relative positions on the right-hand side of the plate, their positions on the left-hand side of the plate are just the same. As noted on the drawing, the holes at A are tapped 4BA. The holes at B should provide clearance for a No. 6 wood screw, and at C the holes should be drilled 4BA clearance.

The $\frac{1}{4}$ in. x $\frac{3}{4}$ in. projecting step at each side of the bottom of the plate is to accommodate the

profile for the base of the capitals situated at the bottom of each fluted pillar. This projection is later filed to the profile of the capital.

Figure 2 gives the various dimensions of the pendulum aperture, and fig 3 shows the main plate with the attached decorative items and rectangular bases for the finials.

After the plate has been marked out and the various holes drilled and tapped, the apertures for the movement and the pendulum can be cut from the sheet. The best way to achieve this is initially to chain drill the apertures on the inside of the line. A $\frac{1}{8}$ in. dia. drill can be used and photo 10 shows the plate at this stage. The apertures can then be cut out with the use of an Abraflex blade fitted to the hacksaw (photo 11). The resulting uneven edge should be filed to the line and brought to a good finish.

When working on a project such as this, especially when making a prototype, I tend to leave finishing until after the completion of all the components. A lot of effort goes into the final finishing of the components and should a mistake be made or an error discovered requiring

Materials

- | | |
|--|---|
| 1: 1 x Brass Sheet $\frac{1}{8}$ x $8\frac{1}{2}$ x $9\frac{1}{4}$ in. | Main plate |
| 2: 2 x Brass Strip $\frac{1}{8}$ x 1 x 12in. | Finial and rear column bases |
| 3: 1 x Brass Angle $\frac{1}{8}$ x 1 x 12in. | Plate and finial brackets |
| 4: 2 x Brass Angle $\frac{1}{8}$ x $\frac{1}{2}$ x 9in. | Rear columns $\frac{1}{2}$ in. brackets |
| 5: 1 x Brass strip $\frac{1}{8}$ x $\frac{1}{2}$ x 12in. | Bracing strip |
| 6: 1 x $\frac{3}{4}$ dia x 9in. fluted brass tube | Fluted pillars |
| 7: 1 x $1\frac{1}{4}$ in. brass capital | Pillar base |
| 8: 5 x 35mm brass finials | Finials |
| 9: 2 x 30mm rosette | Rosette |
| 10: 1 x 4BA steel studding | Studding |
| 11: 1 x 8BA steel studding | Studding |
| 12: 4BA brass screws c/sk, cheese head | Screws |

Suppliers

Ian Cobb,
8 Poplar Avenue,
Birstall,
Leicester.
LE4 3DU.

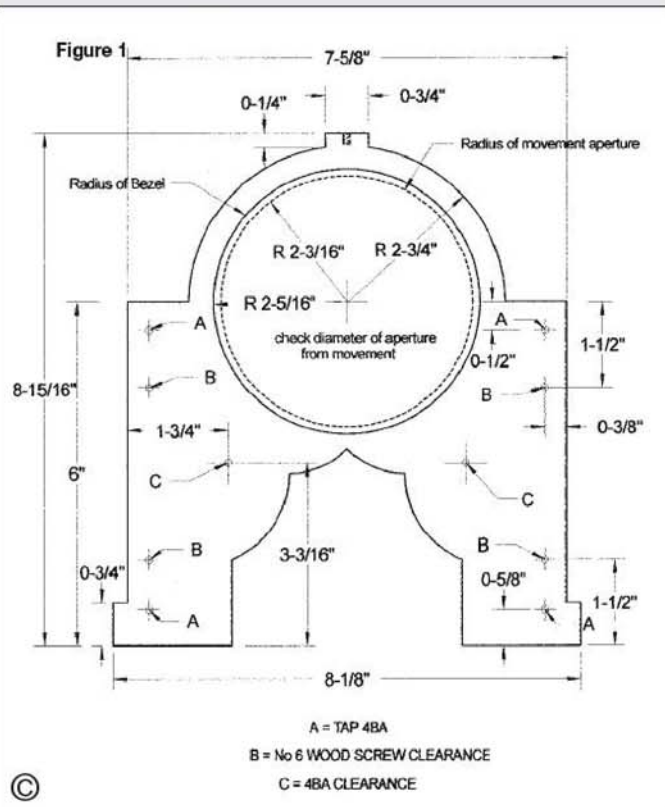
Brass plate, angle, strip.

M & P,
1 Ellen Street,
Portslade,
Brighton,
East Sussex,
BN41 1EU.

Fluted brass tube, rosettes, finials.

Chronos Ltd,
Unit 14,
Dukeminster Trading Estate,
Church Street,
Dunstable,
Beds,
LU5 4HU

Tools, brass angle, brass strip, screws.





15: To give something for the fixing screws to bite into wooden dowel sections were cut and glued into the backs of the fluted tube halves using epoxy resin adhesive.



16: The fluted half pillars were attached to their half-capitals using epoxy resin adhesive.



17: A half pillar being attached to the front plate. Some work with a file was necessary to blend the front plate to the pillar and capital.



18: The plate with one side carefully filed to match its pillar and capital assembly.

the making of another component, valuable time has not been wasted on a discarded component.

Photograph 12 shows the plate with the apertures filed to the line, and a check being made with the dial bezel fitted in place. This completes most of the work on the main plate, and we can now turn our attention to the fluted pillars and capitals.

Photographs 13 and 14 show the fluted pillars and capitals. Illustrations of both the pillars and capitals before and after sawing in half are included. The pillars should be sawn to 6in. length. I sawed both items on my bandsaw utilising the fence and a push stick. When using a bandsaw a push stick should be used at all times to feed the work when cutting involves one's fingers to be near the blade.

If no bandsaw is available, the pillars can be held in the soft jaws of a vice and sawn down the

centre with a hacksaw. The flutes provide a locating point for the saw blade, and it is better to establish a starting cut on one side of the pillar before bringing the blade down and cutting through both edges of the pillar.

If you work carefully and slowly it should be possible to cut the pillar accurately in half. In effect, the flutes provide an easy cutting line to follow. If the saw has produced a slightly uneven cut or edge, this can be remedied by placing the edges of the pillar on a piece of emery cloth on a flat surface, and sanding the edges smooth. A similar procedure is used when sawing the capitals in half.

A 6in. length of $\frac{5}{8}$ in. dia. dowel is then sawn in half and glued into the rear of the pillars with two-part epoxy resin (photo 15). The half-capitals which form the base of the pillars are fastened to the front of the pillars using the same adhesive (photo 16).

The pillars can now be attached to the front edge of the plate with short countersunk brass wood screws. To accommodate the countersunk heads of the screws, the holes at B in fig 1 should be countersunk at the back of the plate. The dowel in the pillars should be spotted and pilot drilled before being screwed to the plate. Take care not to drill through the front of the pillars!

Photograph 17 shows the base of one pillar attached to the plate, and you can clearly see the outer step which requires filing to the profile of the base. A fine scriber or pencil should be used to mark the outline of the base, and the pillars removed in order to file the profile (photo 18).

In the next part we will make the rectangular bases for the finials, the brackets, and tap the decorative finials.

●To be continued.

Figure 2

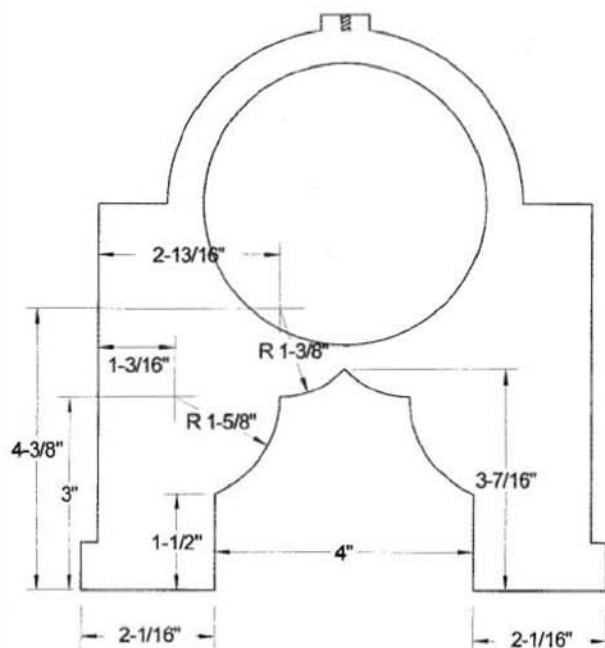
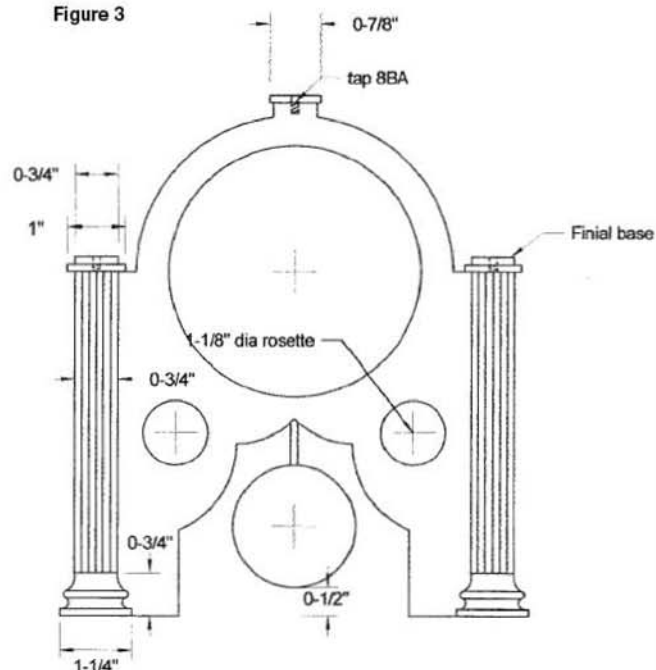


Figure 3





SAVAGE'S UNIVERSAL CARRIER

Stan Nipper and Martin Wallis continue with work on the front axle and steering.

●Part V continued from page 573
(M.E. 4234, 12 November 2004)

Supplied as a gunmetal casting, the steering box is cored out to receive the two bevel wheels. Preliminary attention with a file will tidy up the casting and a start may then be made on the machining.

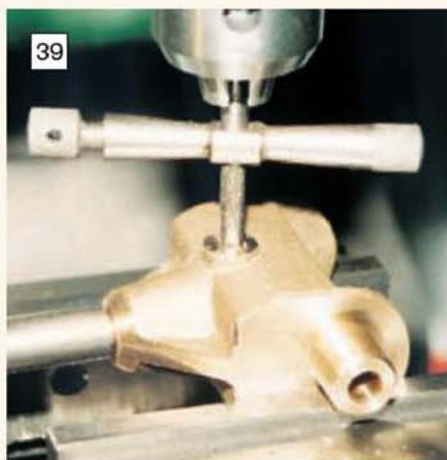
First mark out and centre pop the middle of the top and bottom bosses, then lightly centre drill them in the drilling machine. Transfer the casting to the lathe; grip the end of one boss in the 3-jaw chuck, support the other with the tailstock and lightly skim the available boss. Reverse in the chuck and skim the other boss. Re-skim the first boss to be on the safe side, as there could still be a little run out, and finally take the two bosses to size. Skim the two end faces until the steering box will fit neatly between the two king pin brackets.

Drill and ream the 0.375in. dia. hole at the top and the 8mm dia. hole at the bottom, the 8mm diameter being a departure from imperial to suit the bore of the metric bevel wheel. The remaining machining operation is the 8mm dia. hole for the other bevel gear, the tricky one which must both intersect and be perpendicular to the axis of the first bevel. A good way to achieve this accurately is by the use of the milling machine. The challenge is to devise a way to hold the casting so that the first pair of holes is parallel to the table axis.

If the 0.375in. dia. hole is sleeved down to 8mm so a length of 8mm dia. bar may be passed through, the casting may be laid on a pair of V-blocks on the machine table. A small angle plate may then be employed to secure the casting and prevent it from rotating on the 8mm dia. bar. A further piece of 8mm dia. bar is then put in the collet and brought up to touch the side of the bar laid in the V-blocks and the dial or digital readout zeroed. A further 8mm movement will bring the quill axis directly over the bar. It sounds complicated but, as usual, is much easier to do than to describe in words.

After facing across the top of the boss, the second 8mm dia. hole may then be confidently drilled and reamed. It is worth mentioning that when drilling gunmetal, either the drill should be backed off or the quill locked and the drilling achieved by winding up the knee. The reason is that gunmetal is notorious for snatching if there is even the smallest play in the system. Snatching is where the drill grabs or corkscrews into the work.

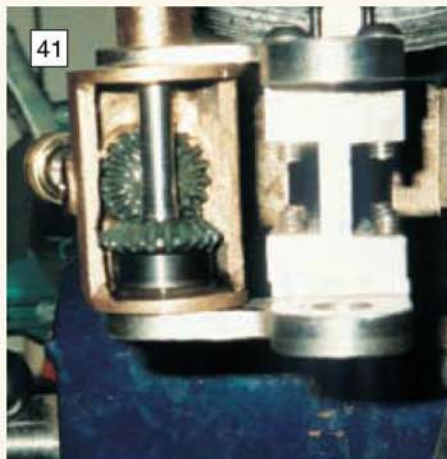
The bevel wheels are each drilled for a grub screw to secure them to their respective shafts. A deep dimple should be put in the shaft to avoid burrs being thrown up which could make subsequent dismantling difficult. A 1/4in. x 32tpi hole is specified to give access to the grub screw; this hole is shown being tapped in photo 39. A small taper pin may be substituted for the grub screw, but not too big or it will weaken the shaft.



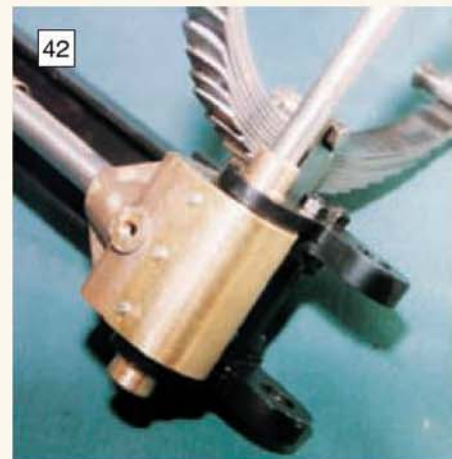
The access hole in the steering box being tapped in the milling machine. (Photo: Stan Nipper)



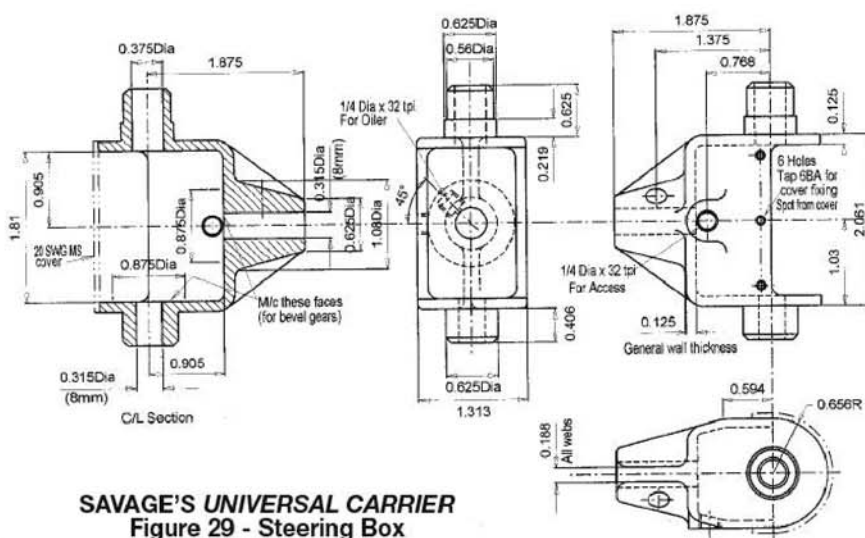
The steering box is fixed on a stub mandrel for machining the inside face. (Photo: Stan Nipper)



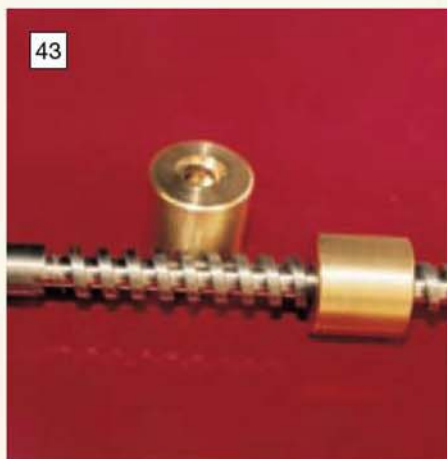
A view of the inside of the steering box. (Photo: John Thompson)



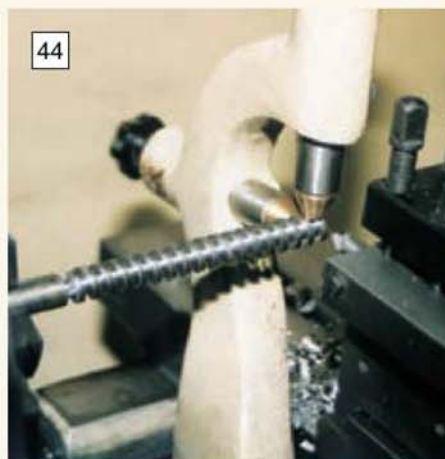
A cover plate on the steering box keeps out the dirt. (Photo: Stan Nipper)



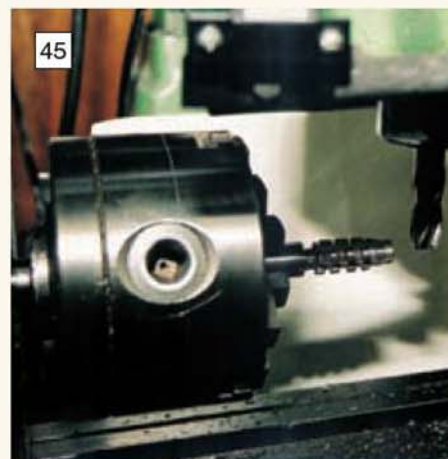
SAVAGE'S UNIVERSAL CARRIER
Figure 29 - Steering Box



The drag link male thread and nut. (Photo: Stan Nipper)



Cutting the male thread. Note the use of the travelling steady. (Photo: Stan Nipper)



Machining the flutes in the tap (photo: Stan Nipper).

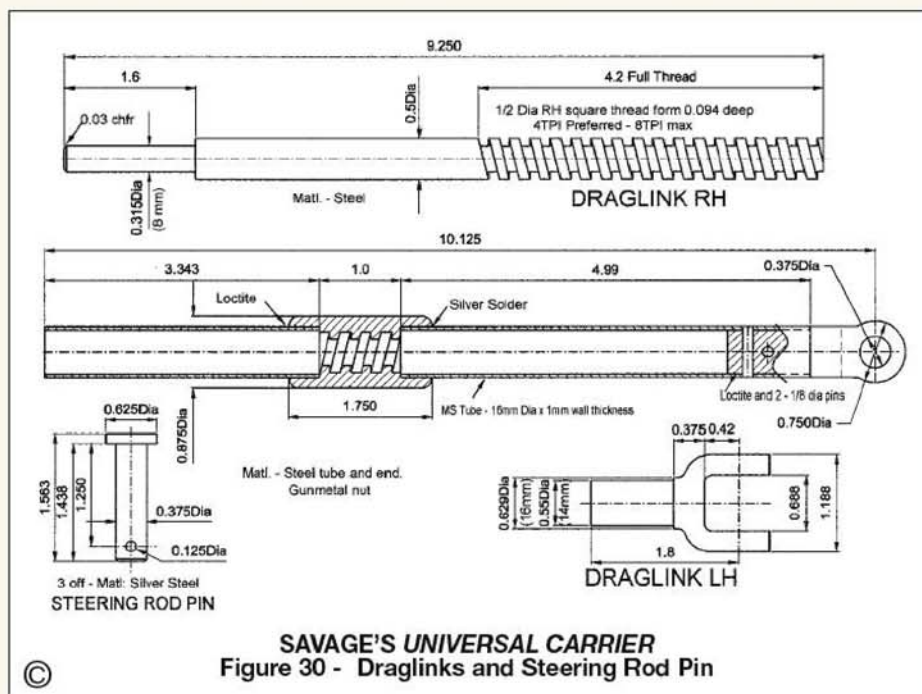
Drag link

The drag link which actuates the steering is made from a 9.25in. length of 0.5in. diameter steel with a coarse thread on a little under half its length. A matching bronze nut silver-soldered to a length of

0.5in clearance steel tubing completes the assembly. A 4tpi thread is specified, but a finer thread, perhaps down to 8tpi, might suffice but is not recommended. To move the front wheels from lock to lock a travel of a little over 3in. is needed,

as illustrated on the general arrangement in the last instalment. Thus, with a 4tpi thread, traverse from straight ahead to full left or right lock requires 1 1/2in. of travel or 6 turns of the steering wheel, which is just about true to prototype. A finer thread would make the steering rather slow and certainly tedious.

The thread and nut may both be screwcut on the lathe, the nut being made first for, being an internal thread, it is trickier. The male thread can be subsequently manufactured to fit. Alternatively, a tap may be made from silver-steel. This can be screwcut in the usual way, the flutes machined in and then completed by hardening and tempering. The tap is then used to cut the thread in the nut. Stan chose to make a tap and the completed thread and nut is shown in photo 43, the external screw cutting in photo 44, and the tap in photos 45 and 46. I believe a detailed explanation of screwcutting is inappropriate here as there are plenty of learned texts that may be consulted, and in any event our worthy Editor offered a useful synopsis in *M.E.* 4222, 28 May 2004.

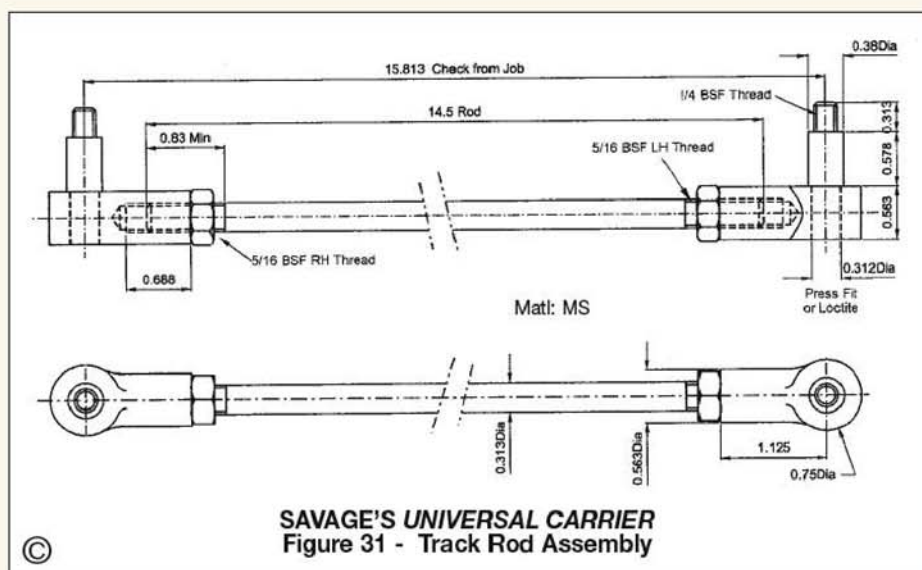


Commercial thread and nut

It may be possible to purchase a suitable commercial thread and nut. John was fortunate in finding a second hand gate valve which had appropriate parts. Both threads appeared to be Acme (14 1/2deg. sides) which was fine as the thread is completely hidden. The gate valve manufacturer was tracked down but purchasing just the thread and nut assembly as spare parts proved prohibitively expensive, and to make life really difficult their minimum order was £100!

One small bonus for builders attempting to purchase ready-cut threads is that the thread does not necessarily have to be a right-hand one; a left-hand thread would be fine. Should the thread be left-hand, the bevel in the bottom of the gearbox is simply re-positioned at the top thus achieving the same results. The thread, however, should be 1/2in. or 12mm overall diameter for if it is larger it would look cumbersome and out of place.

A length of 5/8 by 1/2in. bore steel tube is needed to make up the nut assembly. A 5in. length is faced off at both ends, the nut silver-soldered to one end and the drag link to the other, either by silver-soldering or using a press fit and two steel pins. On the other side of the nut a similar but shorter length of 5/8in. tube is fitted to keep dirt and dust out. As it is not structural this piece of tubing may be secured using Loctite or made a light press fit. Either will serve the purpose. By avoiding silver-solder it will be possible to remove the tube to inspect the nut without the need for excessive heat.

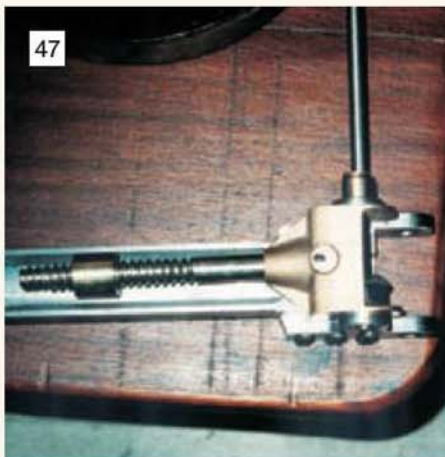


46



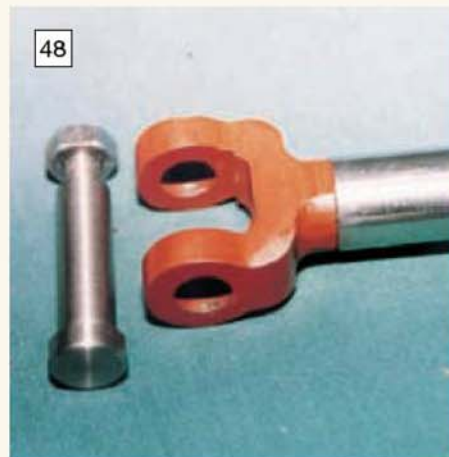
The completed tap for cutting the internal drag link thread. (Photo: Stan Nipper)

47



John's thread and nut were recovered from a commercial gate valve. (Photo: John Thompson)

48



The forked drag link end from Stan Nipper's wagon. (Photo: Stan Nipper)

49



A close view of one of the track rod ends. (Photo: Stan Nipper)

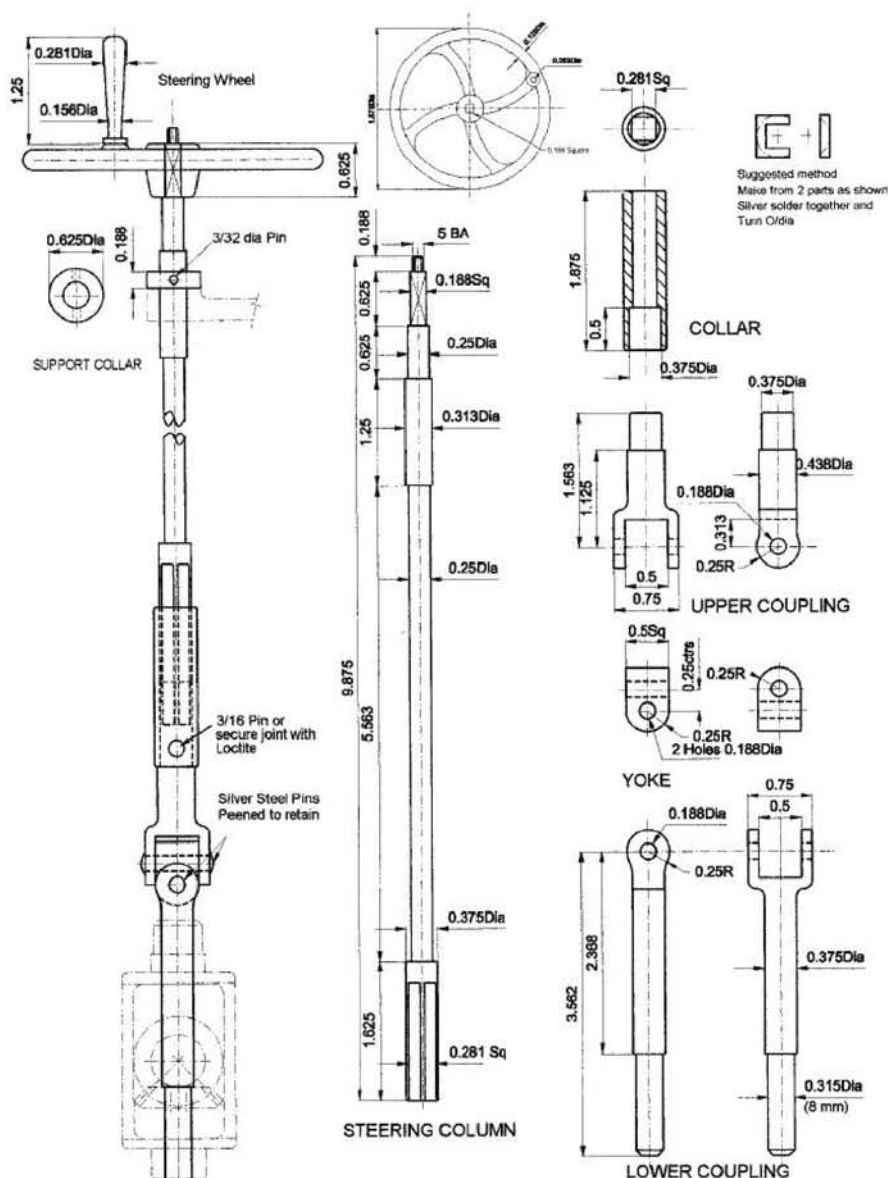
Lubrication

The bevel wheels should be packed with grease before the brass cover is fitted, a smear of silicone bathroom sealant may be beneficial to keep the grease in and dust and grit out. The drag link tube should also be packed with grease before the rod is threaded in; this should keep it adequately lubricated for a year or more. Builders may wish to drill a small hole in the top of the nut for lubrication purposes but if well packed with grease this should not be necessary.

Track rod

The track rod is the last part needed to complete the front axle arrangement. It runs across the engine ahead of the front axle connecting the two stub axles together. The given length of 15.183in. is mathematically derived and should be checked on the model. The quickest way to check is to clamp a 2 or 3ft. length of bright bar to the inside face of each front wheel and, with the steering set to dead ahead, check that the pieces of bar are parallel.

If $\frac{5}{16}$ in. or the 8mm metric equivalent left- and right-hand taps and dies are available, the tracking may be adjusted by slackening the two nuts and turning the rod. If suitable taps and dies are not available the threads on both ends could just as easily be both right hand; in which case the track rod will need to be dropped in order to make any adjustments. This may well upset 'Inspector Meticulous' but it will almost certainly go unobserved by all but the most fastidious of onlookers.



All Items except otherwise shown - Matl: MS

SAVAGE'S UNIVERSAL CARRIER
Figure 32 - Steering Column Assembly & Details

Drawings and castings for the Savage Universal Carrier are available from
Little Samson Models, 38 Wheatshaf Way, Linton, Cambridge CB1 6XD
website: www.littlesamson.co.uk e-mail: edward@littlesamson.co.uk



The drag link assembled on the model. The working parts are totally enclosed. (Photo: Stan Nipper)



The track rod runs across the front of the front axle. (Photo: John Thompson)

THE WAGON THAT WINS!

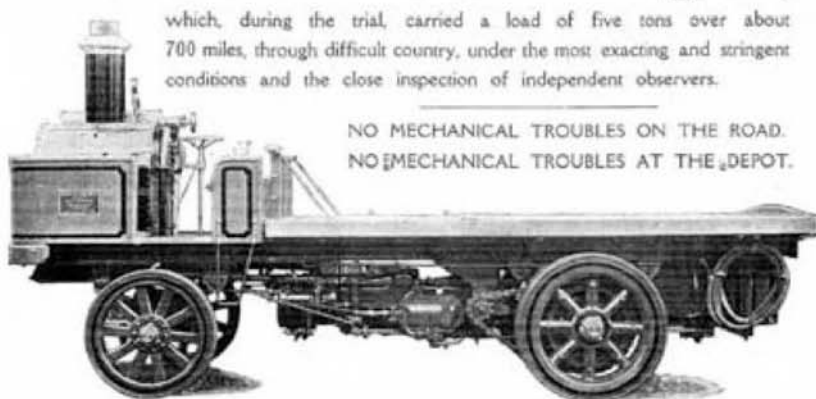
Royal Automobile Club Commercial Motor Trials, September 9th to October 12th, 1907.

HIGHEST AWARD—GOLD MEDAL

TO

Savage's New Design Steam Motor Wagon,

which, during the trial, carried a load of five tons over about 700 miles, through difficult country, under the most exacting and stringent conditions and the close inspection of independent observers.



NO MECHANICAL TROUBLES ON THE ROAD.
NO MECHANICAL TROUBLES AT THE DEPOT.

RELIABILITY—25 to 40 per cent. less stoppages in time than any other Steam Wagon in the trials.

ECONOMY—Both in consumption of fuel and wear and tear of working parts.

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Telegraphic Address—“SAVAGE, LYNN.” Telephone No.—Nec. Tel. No. 9, LYNN. Codes used—Private and Lieber's Standard.



The steering column and wheel fitted on the model. (Photo: Martin Wallis)

Steering column and steering wheel

On wagons fitted with the vertical boiler or water tube boiler, the steering column is vertical, but on the locomotive version it is inclined backwards at 8 degrees. To take account of either the 8deg. inclination or the inevitable small misalignments on the vertical boiler and water tube arrangements, a universal joint is fitted directly above the steering box. The column is also telescopic to keep the steering wheel at a fixed height as the front axle moves up and down on its suspension.

The column may be turned from a length of 0.375in. dia. mild steel, free cutting for preference, and popped in the dividing head to cut the 0.281in. square on its end. The collar into which the 0.281in. square end fits is very easy to make (fig 32). A minimum of silver-solder should be used when fabricating the internal square hole so as to avoid over generous fillets on the inside corners. The collar should be made of steel but if it is to be painted bronze or brass, which is easier to silver-solder, may be substituted.

The steering wheel is borrowed from *Little Samson* which no doubt is exactly what Savages did themselves all those years ago. In common with *Little Samson*, two types of steering wheel were used, a plain one and a dished design. The example shown in the advert is the dished variety but since the pattern and mould for the flat one is very much easier to make, it is this which has been adopted.

Next time we will deal with the wheels, beyond which we will have a completed rolling chassis; real progress and something to be very proud of!

●To be continued.

PROPORTIONAL DIVIDERS

Peter Spenlove-Spenlove explains how to make and use this simple drawing instrument.

It seems that a number of model engineers are making replicas of early machines. By definition, this is usually in a reduced size. The builder will seek etchings, drawings and photographs in early books and journals where hopefully a detailed scale drawing will be found.

The next task is to re-draw it in a size suitable for the model. The original drawing will usually have to be scaled up, which can be done photographically or by other costly means. This is out of the question for most amateurs, but there is nothing stopping us using a pencil and a simple drawing board almost anywhere: in a reference library, on the kitchen table or at the workbench. Apart from normal drawing aids such as compasses, rule, stencils and templates of standard shapes and a T-square or graph paper to keep the lines true, proportional dividers will also prove useful.

It is normal to measure the original dimension and multiply it by a factor of enlargement to obtain the new dimension, which is then placed on the drawing. Each size requires a calculation and it is easy to make a mistake or push the wrong button on a calculator. Proportional dividers cannot make mistakes — unless they are dropped.

This tool was part of most engineering students' drawing kit. We all bought a flat lidded, velvet lined tray filled with drawing instruments. Each had interchangeable ends: divider or centre points, a pencil point or bow pen for Indian ink. Proportional dividers are simple double-ended devices. Most have points at each end and make no pencil or ink marks. In essence, the construction is simple. Two flat brass bars of about $1/8$ in. x $1/2$ in. section and of equal length are each slotted for most of their length. The slot is about $3/16$ in. wide and goes right through the bar thickness. Each end of both bars is furnished with a point. The longitudinal distance between the tips of the points is exactly the same on both bars.

Passing through both slots is a pivot which can be moved along the slot to allow one bar to swivel, scissors like, to separate the points. It will be realised that if the pivot is near the end of the slot, the points at that end will open only a little but the points at the far end will open much more. The ratio between the spread of the points at each end will depend on the position of the

pivot. Commercial proportional dividers are marked with a scale along the side of the slot to indicate the ratio. If much scaling up or down is expected to be done from drawings and photographs, it might be worth hunting in second hand shops, especially in a university town, for proportional dividers. But for a one-off job, a simple tool can be made.

The principle of the design is based on the law of levers. Suppose your reference book contains a drawing of, say a locomotive which you wish to build. One assumes it is reasonably well drawn with all dimensions in true proportion. With your rule, you measure a key item on the drawing; say the driving wheel diameter. Your model needs wheels of the same type and suitable for your track. Looking through catalogues of suppliers of model wheel castings you find a type with a suitable diameter and spoke details. If the model is to look right, it should have its other parts scaled to suit the chosen wheels. If your chosen prototype does not have wheels then another prominent part can be chosen; e.g. the length of a beam in a beam engine. The point is to obtain a ratio of the reference drawing to the drawing of the proposed model.

If the locomotive wheel on the drawing in the book measures 1in. dia. and you want to use 5in. dia. wheels, the ratio will be 1:5. Therefore all other dimensions taken from the original drawing will have to be scaled up by a factor of five. This is obviously a simple example and the ratio will probably not be a simple, round number but some awkward fraction. However, keeping to the 1:5 ratio, it is a simple matter to make a special pair of proportional dividers for this job.

The slots can be omitted and a simple pivot put through a well-fitted hole in each bar. Add a locking nut and spring washer. Make and fit points at each end. Measure the length between the tips of the points on each bar. It must be the same on each bar. Now divide the length by six. Drill the pivot holes one-sixth from one end on both bars. Going to the law of levers, we have one unit length from point to pivot and five units at the other end. Put the pivot through and fit a spring washer and a knurled finger nut for locking the bars together.

Open the short end one inch. The 1:5 ratio should result in the other end being 5in. apart. All details can now be scaled to your new drawing, either directly, or tabulated, or both. Obviously, some sizes will have to be modified to suit available standard sizes and to allow the part to function safely. But most of the outline shapes can be got right, such as the cab or tender

profile, dome position and contour and so on.

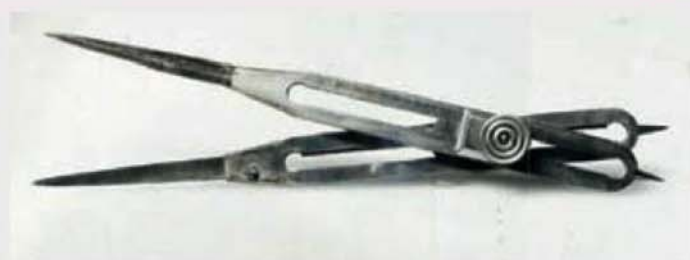
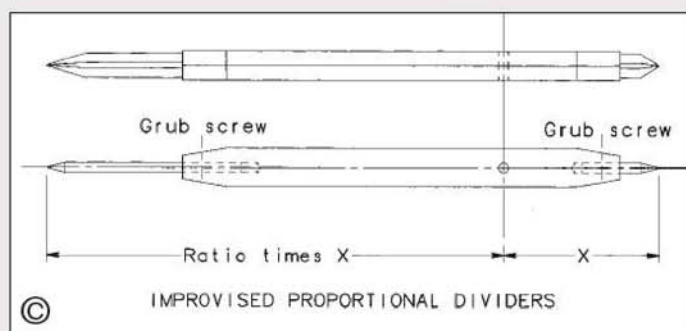
Plans of boat hulls can be scaled up or down with proportional dividers quite accurately because the curved shape at any point is seldom a convenient number; i.e. rule measurement will give a dimension in between the usual rule markings, except perhaps at a few points. If the drawing is to be scaled up by, say five times, any small rule error will be magnified five times. With care, of course, these errors can be averaged out when the curved shape is drawn by joining the dots. A French curve is the traditional draftsman's tool for doing this.

A snag with proportional dividers concerns setting the points to the original drawing or photograph, when care should be taken to avoid piercing the paper with one or both points. If you have access to a photocopier, use it to make a copy of the original, enlarged if possible. This can be punctured with impunity without risk of damage to the perhaps valuable original.

Returning to the example of the boat hull plan, a convenient technique is to mark the photocopy with a longitudinal centre line from bow to stern and draw transverse lines at random spacing across the hull from end to end. Establish the size ratio of the photocopy to the final drawing and draw the final size drawing centre line and cross lines spaced in proportion to the photocopy.

The sizes from the centre line to hull edge at each cross line can now be easily transferred using the proportional dividers. Where the curve is steep and changes quickly, the cross lines should be closely spaced. At this stage there is no need to actually define any cross line spacing nor centre line to hull edge in figures. Later, of course, the actual detail design work will begin to take account of available materials and function of the model to be constructed.

If the enlarged drawing contains several 'random' shaped curves; i.e. not perfect parts of a circle, it is very helpful to draw on a sheet of decimal graph paper. Having joined up the dots with a French curve and drawn the other details, you will want to put some dimensions (in figures) on so that actual cutting of material can begin. Counting squares at various points is a great help when marking out the material. Take great care if using the proportional dividers to transfer high ratio dimensions. Errors are multiplied by the ratio figure. That is a good reason for working from an enlarged photocopy of the original. The ratio is less, hence errors are less too — assuming the photocopier has been properly and accurately set up!



A pair of second hand commercial adjustable proportional dividers such as this may be obtained quite cheaply.



Ken Ellwood with some of his models displayed at the rally held in June at West Cumbria Guild of Model Engineers' track in Curwen Hall Park



At the controls of his 3 1/2 in. gauge 9F Times and Star at the rally held to celebrate his remarkable output of models.

MODEL OF PRODUCTIVITY

THE STORY OF KEN ELLWOOD

Tom H. Jones
of West Cumbria Guild of Model
Engineers tells the story.

Many Model Engineers interested in steam locomotive or road vehicle building will build two or three models in a lifetime. Apart from National Service in Egypt: 1951-53, a year in Australia: 1968-69, and a period in Maryport, Ken Ellwood, has lived entirely in Workington, Cumbria and has built no less than twenty-four locomotives and four road vehicles at the time of writing.

To celebrate his work, West Cumbria Guild of Model Engineers held a Ken Ellwood Rally on Sunday 18 July 2004, at their track at Curwen Hall Park, Workington, Cumbria. Eleven locomotives and a traction engine, all of his making, were assembled for the afternoon and several ran in steam. Ken has been a valued member of the Guild since 1985. Four other members now own and run his locomotives and fellow members regularly seek his advice and

assistance. Ken is one of the club's boiler inspectors, representing the geographical area with the bulk of the club's testing.

Born in 1930 Ken's interest in steam was stimulated when, as a young boy living in the Salterbeck area of Workington, he used to collect coal spilled by the Lowca Pit waste gantry alongside the railway. There was also a busy steel industry and docks with their own steam activities in close proximity to his home.

His model engineering activities began at the age of 17 years with the purchase of a Super Adept lathe for the sum of £5-17s-6d (£5.87). Within a year some jobs were beyond this lathe's capacity and he built a larger lathe using a piece of mild steel twin trough girder as the bed. By the time Ken married Diana in 1955, he already had three locomotives and a beam engine to his credit.

Ken's trade was as a painter, but he soon showed his natural skills while working for the Borough of Workington (now Allerdale Borough Council) on mechanical repairs to machinery, and was appointed their fitter. Ken's career has been extremely varied and he went on to work at Quaker

Oats (Whitehaven), Tynebrand (Maryport), Electroflo, Manpower Services and finally as a contractor at BNFL, Sellafield until his retirement.

Amazingly Ken's prodigious output was despite an interruption between 1951 and 1971 when he did little or no model engineering. During this time he developed a passion for motorbikes and owned and repaired/restored 300 bikes (yes, three hundred!)

Working in an extremely compact workshop, Ken's rapid progress on locomotive construction is achieved by a well-developed natural skill for inventiveness, identifying quick but sound construction methods and sticking to the basic functional machine rather than spending time adorning it with all the non-functional frills. His record construction time is four months from start to completion. This speed does not imply inferior workmanship. Ken builds for ease of use and maintenance and his locomotives all run beautifully. They have won the Stephenson Trials (an efficiency competition amongst several Northern Clubs) for ten of the eleven years they have been entered. He also came first in the 3 1/2 in. gauge section of the 1993 International Model Locomotive Efficiency Competition (IMLEC) at Leyland with his version of the last steam locomotive built by British Railways *Evening Star*, his model running with the name *Times and Star* after a local newspaper! Many of Ken's locomotives have not been proprietary designs but have been derived from outlines in books with remarkably little of the detailed design set down on paper before construction.

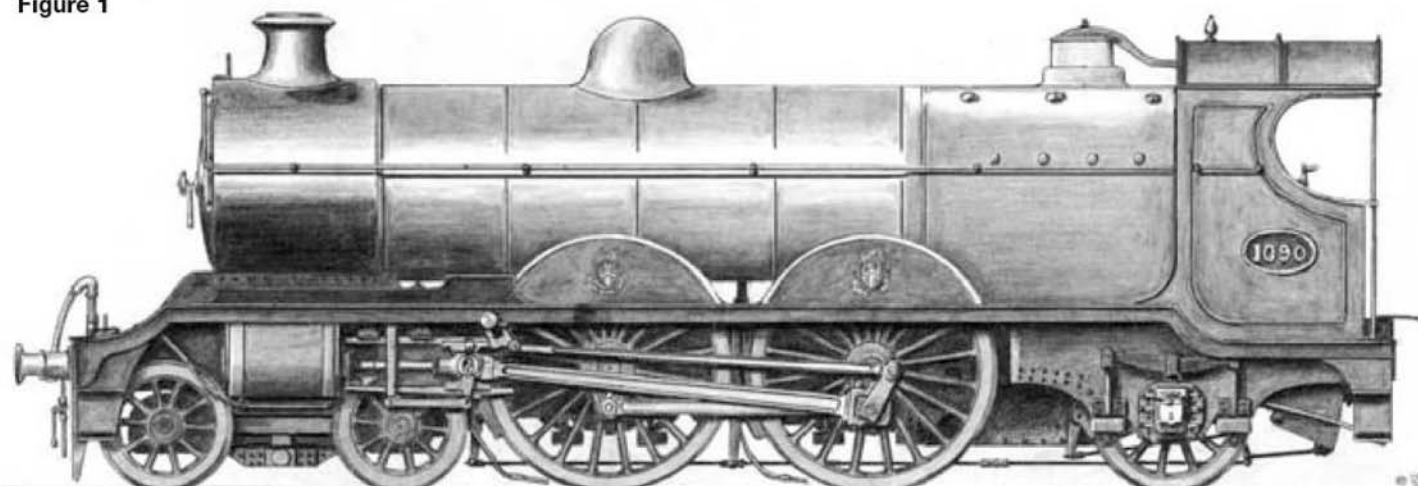
Although Ken has had a continuous track in his garden from about 1969, which he still uses for test purposes, he has regularly run on the club track with a variety of his locomotives, many of which have now changed hands. A large house would be required to store all that he has built. The furthest afield is now resident in Somerset. As well as assisting those seeking his advice, Ken has turned his workshop into a surgery for many an ailing locomotive.

Ken admits to deriving considerable enjoyment from the social contacts which his hobby has brought throughout the years and like hundreds of other children at the club's Curwen Park Track, Ken's own children have all enjoyed riding behind his locomotives.

Models built by Ken Ellwood

Name	Type	Gauge or Scale	Wheel Arrangement	Designer	Year Completed	At Rally
<i>Beatrice</i>	Freelance locomotive	3 1/2 in.	0-4-0	D. Simmonds	1949	
<i>Tich</i>	Freelance locomotive	3 1/2 in.	0-4-0	LBSC	1950	
<i>Mollyette</i>	LMS tank locomotive	'O'	0-6-0		1957	
	Burrell traction engine	1:8	N/A		1966	
	BR Standard Class 2 locomotive	5 in.	2-6-0	D. Young	1971	
	Clayton lorry	1:6	N/A	Dwyer	1972	
<i>Juliet</i>	Freelance locomotive	3 1/2 in.	0-4-0	LBSC	1973	
<i>Simplicity</i>	Wallis & Stevens roller	1:4	N/A	Plastow	1974	
<i>Chunky</i>	Foden lorry	1:4	N/A	Morris	1975	
	Burrell traction engine	1:6	N/A	Plastow	1977	✓
<i>Rail motor</i>	Southern S4 locomotive	5 in.	0-4-0	S. Titkey/H. Lumb	1980	
	Duchess locomotive	3 1/2 in.	4-6-2	Clarkson	1986	
<i>Times & Star</i>	Standard Class 9 locomotive	3 1/2 in.	2-10-0	LBSC	1987	✓
<i>Bantam Cock</i>	LNER V4 locomotive	3 1/2 in.	2-6-2	LBSC	1988	
<i>Tich Lg (Nabic)</i>	Freelance locomotive	5 in.	0-4-0	LBSC	1989	
<i>Mabel</i>	LNWR tender locomotive	3 1/2 in.	2-4-0	LBSC	1990	✓
<i>Jeanie Deans</i>	LNWR locomotive	3 1/2 in.	2-2-2-0	LBSC	1990	✓
<i>Britannia</i>	Standard Class 7 locomotive	3 1/2 in.	4-6-2	LBSC	1991	✓
	Ivatt Class 2 locomotive	3 1/2 in.	2-6-0	M. Evans	1993	✓
	Derby 4F locomotive	3 1/2 in.	0-6-0	D. Young	1994	✓
	LNER B2 Class locomotive	3 1/2 in.	4-6-0	K. Ellwood	1994	✓
<i>Marquess</i>	LNER K4/1 tender locomotive	3 1/2 in.	2-6-0	M. Evans	1995	
<i>Patriot</i>	LMS Baby Scot locomotive	3 1/2 in.	4-6-0	K. Ellwood	1996	✓
	LMS (NCC N. Ireland)	3 1/2 in.	2-6-0	K. Ellwood	1997	✓
<i>Boxhill</i>	LBSCR Terrier tank locomotive	5 in.	0-6-0	M. Evans	1998	✓
<i>Bantam Cock</i>	LNER V4 conj. valve gear	3 1/2 in.	2-6-2	K. Ellwood	1999	
<i>Cumbria</i>	Duchess locomotive	3 1/2 in.	4-6-2	Clarkson	2001	
<i>Cumbria</i>	Lowca tank locomotive	3 1/2 in.	0-4-0	K. Ellwood	2002	✓

Figure 1



©

EDWARDIAN ELEGANCE

Ron Isted

**describes the Great Central
Railway Atlantic No. 1090.**

● *Part X continued from page 334*
(M.E. 4230, 17 September 2004)

Once upon a time, in the Gorton area of Manchester, not far from the Great Central Railway's locomotive works and the adjacent similar establishment belonging to the famous firm of Messrs. Beyer, Peacock & Co. Ltd., there stood a Public House in which the employees of both concerns were wont to quench their collective thirsts — strictly during off-duty hours, naturally. Apart from the beverages on sale, mine host also arranged additional (sometimes bizarre) attractions to bring in the punters, and in the Autumn of 1903, he actually had 'on exhibition' in his hostelry an extremely large lady, rumoured to tip the scales at around 32 stones (just over 203 kilos to you metric types). What her real name was I am unable to reveal, but she was immediately nicknamed *Jersey Lill* by one of the regulars. A typical example of Mancunian humour, this was an ironic reference to a famous, beautiful (and very shapely) London actress, Lilly Langtry, whose name, in the less reputable journalistic circles of the day, had been coupled with none other than the monarch whose name appears in the generic title of this series of articles. (Hands up who muttered 'nothing changes'!)

A month or two after the generously proportioned *Jersey Lill* was installed in the aforementioned Manchester pub, the first of John G. Robinson's Great Central Atlantic locomotives emerged from Beyer Peacock's factory just down the road. Immediately, some joker whose name is lost in the mists of history — perhaps he who christened the large lady herself — bestowed the same appellation on this gargantuan and, by the standards of the day, heavy railway locomotive.

Now I am well aware that the above version of events is totally at variance with the generally accepted tradition of how what is now reckoned one of the most elegant locomotives of all time acquired its nickname, but consider the facts as they appeared to our Edwardian forebears. Just

three years earlier, the GCR was still building William Pollitt's dainty little 4-2-2s, with a 4ft. 3in. boiler and weighing in at just over 47 tons: the new 4-4-2 weighed not far off 67 tons and was equipped with a massive 15½ft. long boiler of 5ft. diameter (5ft. 6¼in. over cladding). Is it surprising that your mythical Edwardian average man found J. G. Robinson's latest creation a little over the top? We are so accustomed nowadays to all railway rolling stock being built out to the limits of the loading gauge, that the GCR Atlantics seem to us to be positively slender. In our eyes, they certainly do bear a much greater resemblance to that famous beauty of the Edwardian theatre, Lilly Langtry, than to the unfortunate Jersey Lill. By the way, I make full acknowledgement to the late O. S. Nock, who was responsible for the above piece of investigative journalism.

Figure 2



©

The final total of Great Central Railway Atlantics amounted to 31 locomotives, of which four were 3-cylinder compounds operating on the Smith system, described in a previous article. The other 27 engines all began life as 2-cylinder simples, of which a dozen were built by the North British Locomotive Co. at their Hyde Park Works in Glasgow, including the subject of this article, NBL No. 16940, Great Central Railway No. 1090. Completed in November 1905, this engine was immediately allocated to the GCR London shed, Neasden, where it replaced one of the Pollitt singles mentioned earlier on the best trains. Just three years later, No. 1090 was summoned back to the Great Central's Gorton Works in Manchester, to be rebuilt into a 3-cylinder simple with divided drive and Walschaerts valve gear — the only example of this gear, or indeed of any gear outside the frames, on the Great Central (figs 1 and 2). The engine officially became class 8J, but the GCR's classification system was so completely illogical — the later 2-8-0s were for example 8K and 2-6-4Ts, 1B — as to be largely meaningless.

I fear that some admirers of John Robinson's engines will react with horror to what they see as desecration of the simple and elegant design of the original GCR Atlantics, but the action of Walschaerts gear has always fascinated me and I find the appearance of this engine even more impressive than her Stephenson-equipped sisters. The contrast between the complexities of the motion work and the uncluttered aspect of the rest of the engine seem to me very pleasing to the eye, but I'm pretty certain not everybody will agree.

Leaving aside personal prejudices, the interesting question arises of just why Robinson produced this particular variation on his Atlantic theme: was it to enable him to make a more direct comparison of simple versus compound? If so, why use Walschaerts valve gear on the simple, when the compounds were all equipped with Stephenson? In any case, I have found no records of comparative trials between the two designs, although the trials between the first two simple Atlantics and the equivalent 4-6-0s are fairly well documented. If he wished to evaluate Walschaerts versus Stephenson valve gear, why rebuild the engine with three cylinders?



All we do know is that JGR was delighted with the performance of his 3-cylinder compound Atlantics, because in the spring of 1908 he wrote an interesting letter to our old friend, railway journalist Charles Rous-Marten, whose name has cropped up several times in this series of articles. In it, he said they "*did exceedingly good work*" and expressed his intention "*to continue this type*" (i.e. 3-cylinder compounds). He also made the comment: "*being a three-cylinder engine, the balancing is of course superior to the two-cylinder engine*" and perhaps this is the key to why No. 1090 was rebuilt in December 1908. But even that doesn't really make sense, because Robinson's subsequent designs were without exception equipped with two or four cylinders. In view of his statements quoted above, one might have expected more compounds, but after the death in 1906 of Walter Smith, inventor of the system named after him, it is said that his executors demanded such exorbitant royalty payments that no further compounds of that type were built by the Great Central Railway.

Whatever the reasons for the rebuilding of No. 1090, she certainly was a good engine, outperforming Ivatt's Great Northern Atlantics on their home ground when working between Retford and Grantham in the days before World War One. This was, of course, before either class was superheated and whether the Great Central engine could have equalled the amazing feats of weight haulage by the GN machines in the 1930s is, to say the least, doubtful. In March 1914, No. 1090 was fitted with an 18-element superheater of John Robinson's own design, one of the most

successful superheaters ever produced in this country, together with a Wakefield mechanical lubricator, while retaining the balanced slide valves fitted five years before. As a matter of interest, not long afterwards JGR brought out his own design of mechanical lubricator, known as the 'Intensifore', which, unlike his superheater, "*nobody loved*", according to Richard Hardy, so perhaps No. 1090 had a lucky escape.

The engine remained at Neasden until 1922, but in September of that year she re-entered Gorton Works and was again rebuilt, or rather de-rebuilt, as a two-cylinder machine, incorporating 10in. piston valves actuated by Stephenson gear. Presumably the cylinders had reached the re-boring limit after nearly 14 years of top link work and it was not considered worthwhile to cast a new set as a one-off. Shortly after this second transformation, No. 1090 moved to Leicester and in October 1924 became No. 6090 under the LNER renumbering scheme, when Great Central Brunswick Green was replaced by the so-called apple green colour scheme based on that of the former Great Northern Railway. A mere four years later, as part of an economy drive, the ex-Great Central Atlantics were the only tender locomotives of that wheel arrangement inherited by the LNER to be demoted to a funeral black. This seems rather unfair, as they were still fully engaged on express passenger duties.

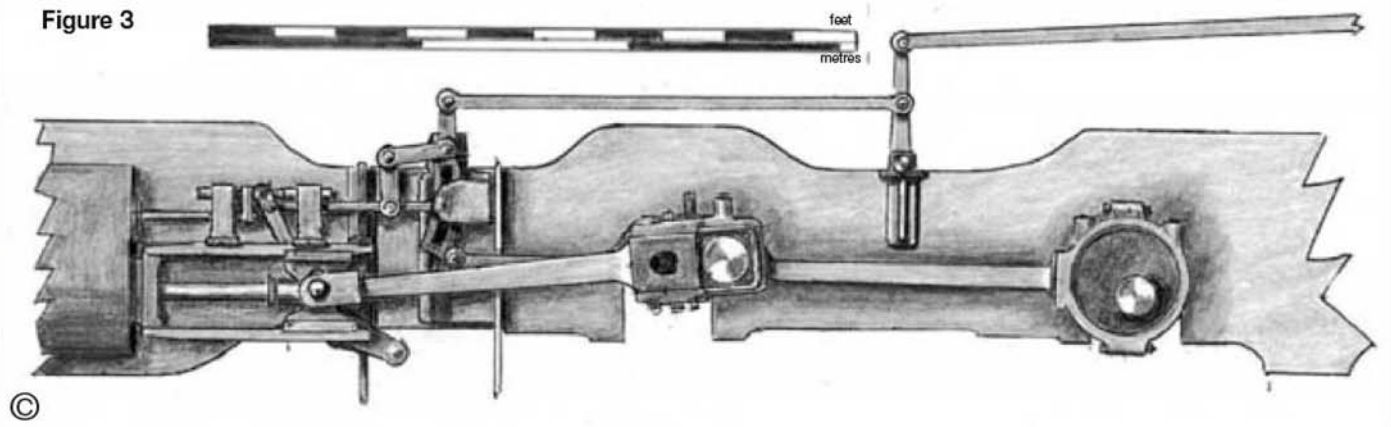
Later minor modifications were made to bring the engine within the LNER composite loading gauge, with its maximum height of 13ft. compared to the 13ft. 3in. dimension to the top of No. 6090's shapely GCR chimney. If I may digress for a

moment, the famous quote "*Remember, as the hat is to the well dressed man, so is the chimney to the locomotive*", often attributed to John Robinson, in fact first appeared in 1899 in a book by the rival Midland Railway's London District Locomotive Superintendent, John Weatherburn, although there is no doubt that it applied equally to Great Central Railway locomotives. The Robinson chimney really was a work of art; apart from the two horizontal lines of the top and the edge of the flange, there is not a straight line anywhere on its external surface, as I discovered when trying to draw it. To return to No. 6090, this particular locomotive never suffered the indignity of the notorious 'flowerpot' chimney produced in the 1920s, as by the time she was finally modified to the composite loading gauge in 1936, a much more elegant replacement design had come into use.

In passing, it is interesting to recall that the Great Central Railway London Extension into Marylebone was the only railway in this country built to the continental loading gauge. This was carried out on the advice of the company's chairman, Sir Edward Watkin, with a view to through working to France via the Metropolitan Railway, the South Eastern Railway and the proposed Channel Tunnel. And guess who just happened to be chairman of all three companies? Unfortunately, Sir Edward's magnificent vision came to naught, the Great Central main line was closed and the tracks ripped up in the 1970s — perhaps, when the Channel Tunnel Rail Link is finally completed, a new Great Central Railway will arise, phoenix-like, from the ashes. If it does, I suggest the first through train should be worked by a specially-built replica GCR Atlantic; after all, they did in their palmy days operate through workings between Manchester and Plymouth, a 374 mile trip, and wouldn't it be fantastic to see a Robinson Atlantic in the Gare du Nord?

Although No. 6090 had presumably acquired new cylinders and motion in 1922, this engine suffered the melancholy distinction of being the first GC Atlantic to be taken out of service, two months after the start of World War Two. Unlike several other locomotives withdrawn at that time of crisis, she was not reprieved and on 4 November 1939, just one day after official condemnation, she entered Gorton Works for the last time, to be broken up — her only contribution to the war effort was in the form of scrap metal. Of the 31 locomotives, 28 survived the war, of which 20 became part of the nationalised British

Figure 3



Railways fleet in 1948, but none was ever repainted by its new owners and the last Great Central Atlantic went for scrap in December 1950.

The main frames of these engines were a substantial 1 1/4 in. thick, and incorporated a sort of 's-bend' between front coupled and rear bogie wheels, reducing the width between frames from 4 ft. 1 1/2 in. to 3 ft. 10 1/2 in. Just forward of the cylinders, they were cranked even further inwards, so that the distance between frames was down to 3 ft. 7 1/2 in. at the front buffer beam. A massive stretcher was fitted immediately behind the s-bend with its fixing angles extended forwards into the bend and beyond it, to give a very rigid job. On No. 1090, in her 3-cylinder form, another large stretcher was also fitted a couple of feet further forward, which, combined with the bogie bolster and inside cylinder block, produced a virtually indestructible front end. No wonder the GCR fitted anti-tesla devices to its coaches!

Because of this reduced distance between frames, full cut-outs over the bogie wheels, always a potential source of problems in a miniature locomotive, were not required. In his 5 in. gauge version of a GCR Atlantic, Don Young specified the cranked frames, but wisely reduced the distance between them by the equivalent of 7 in. compared to the 3 in. of the prototype. Although Don gave full instructions in *M.E.* 3433, 21 January 1972 for bending the frames, I have to admit I would think twice about the operation: reproducing an exact mirror image double bend at precisely the same spot in two chunks of 2 1/2 x 1/8 in. steel over 3 ft. long is not the sort of process to fill me with eager anticipation. However, it has been done many times as some excellent *Jersey Lillies* in various parts of the world bear witness, so I am obviously a coward.

The two outside cylinders on No. 1090 were slightly inclined at about 1 in 100, while the inside cylinder was horizontal and set approximately 1 ft. 2 in. forward of the others. I apologise for the lack of precision, but the Gorton General Arrangement Diagram, from which these measurements were scaled, is not exactly a shining example of the draughtsman's art. Apart from omitting several crucial dimensions applicable only to this engine, there is the small matter of the vibrating link on the inside Walschaerts valve gear apparently suspended in mid air, as the drop link on my rather anaemic looking photocopy just ain't there! Matters are not improved by the varying scale, vertical and horizontal scales differing by at least 6%, and the noticeably oval wheels add a final touch of bizarre originality to the whole ensemble. Fortunately, there are some good broadside photographs of No. 1090 during her short existence as a 3-cylinder locomotive, so my drawings should be generally accurate.

Having criticised the GCR draughtsman, I have to plead guilty to not realising, until after having completed the main side elevation drawing, that the valve gear to the inside cylinder is offset to the right of the cylinder centre line. My drawing of the inside gear (fig 3) therefore looks slightly odd, with the connecting rod hiding some of the valve gear details, but it seemed logical to retain the same direction side elevation for this detail drawing as for the

Figure 4



complete locomotive. The eccentric rod is obviously cranked upwards to clear the driving axle, but the massive big end of the connecting rod almost obscures this on my drawing. But at least my outside and inside cranks are set at 120 deg., unlike the Gorton drawing, which shows them at 130 degrees!

Because of the divided drive, and in spite of the inside cylinder being set forward, its connecting rod was only 6 ft. 4 in. long, compared to the 11 ft. 3 in. of the outside rods. The cramped conditions between the inside cylinder and the leading coupled wheel also led to the drop link from the inside crosshead being tilted violently rearwards at an angle of more than 45 deg., with its point of attachment to the vibrating link approximately 1 ft. 2 in. behind and 1 ft. 1 in. below the crosshead centre. (This of course assumes that the relative positions of crosshead and vibrating link are correct on the Gorton drawing, since as already mentioned, the drop link itself has been omitted) This arrangement seems to me to be mechanically unsound, but even more so is the extraordinarily short radius rod, which scales off my G/A at just 2 ft. 8 3/4 in., compared to the eccentric rod length of 10 ft. 5 3/16 in. — so much for the oft-quoted advice to position the expansion link mid-way between cylinder and driving axle! The 'angularity' effects on the position of the valve when in full gear (i.e. when the die block was at the extreme end of the expansion link) must have been considerable, and presumably were corrected to some extent for a normal running cut-off of around 40%, but unfortunately the GA gives no dimensions.

The Gorton drawing is also not very forthcoming with details of the balanced slide valves: as one might expect with Walschaerts gear, they are above the cylinders, but port sizes are missing from my drawing. Neither outside nor inside steam chests are shown at all on the plan, so it is impossible to quote an exact figure for the off-set of the valve spindle centre lines from those of the cylinders. I estimate both inside and outside at 6 in., while the inside valve gear eccentric is about an inch further over. The port widths scale off at 1 1/2 in. steam and 3 3/4 in. exhaust, but I have not discovered any details of lap, lead or valve travel. Judging by the size of the expansion link and the layout of valve spindle/radius rod connections, I get the general feeling that Gorton was not, shall we say, in the forefront of Walschaerts valve gear design, although the late

Cecil Allen considered No. 1090 a better performer than the 2-cylinder machines.

Visible differences between this unique locomotive and her sisters included the covers to the upper parts of the outside valve gear, the cover for the expansion link bearing and the front footstep just behind the buffer beam (which really does look like an afterthought) together with the small grab-rail just above it. Not visible is the inside of the chimney, which on No. 1090 tapered downwards to a minimum of 1 ft. 2 in., compared with 1 ft. 3 in. on the standard engines. One detail that is shown on my G/A is the sheet metal cover for the four safety valves, which I therefore assume was fitted when the engine was rebuilt in 1908, as the drawing, undated, shows an un-superheated boiler. It also definitely specifies 16 x 26 in. cylinders, although other sources have quoted a diameter of 15 7/8 inches.

The tender for No. 1090, and indeed for all the North British built locomotives, is slightly larger than for the earlier engines, although the wheelbase is the same, at an equally divided 13 feet. It appears to be the same as the type attached to the famous 2-8-0s, and if so, the diameter of the wheels is 4 ft. 4 in., with 13 spokes, although that is difficult to check from photographs, because so little of the wheel is visible — but then an exhibition judge inspecting a miniature version would have the same problem, wouldn't he? One little oddity which could be easily overlooked (but probably not by an exhibition judge) is the length of the springs on the tender: the one above the middle pair of wheels is 3 ft. 6 in., while the other two are only 3 ft. Another unusual but more obvious item on the tender was what looked like a ship's steering wheel: this in fact controlled the water scoop, and was a standard Great Central Railway fitting.

When building a 5 in. gauge version of No. 1090, Don Young's *Jersey Lilly* design would of course form an excellent basis, although he was criticised at the time (1971-3) for leaning towards Doncaster rather than Gorton practice, particularly with regard to some of the footplate equipment such as the firehole door. More importantly from the visual point of view, the curve of the footplate front and rear was also criticised and as a result, Martin Evans, then editor of *Model Engineer*, published the General Arrangement Drawing of the original Beyer Peacock batch of engines in *M.E.* 3475, 19 October 1973. I have also compared Don's original outline drawing with a superb official photograph of one of the locomotives built by the North British Loco. Co., and his rendering of the front curve certainly looks too sharp, although his later detail drawing, specifying a radius of 1 3/8 in. (equivalent to 1 ft. 3 1/2 in. full size), ties in well with the Beyer Peacock G/A. On the other hand, scaling off the curve on the NBL official photo and my (unreliable) Gorton G/A of No. 1090, also built by NBL, in both cases give a radius of approximately 2 ft. 10 in. (equal to 3 in. in 5 in. gauge).

Of course one does not want to get bogged down in minute details, but this really is a big difference and on checking various photographs, it does appear that there were variations in the front footplating on the full-size locomotives. While the Beyer Peacock engines seem to have a

Great Central Railway No. 1090 Useful Dimensions

Note: these are intended specifically for use in producing a miniature version of this locomotive, so 'internal' measurements such as heating surface and boiler dimensions are omitted.
The figures for 3 1/2in. and 5in. gauges have been calculated to the nearest 1/64in., using 3/4in. to the foot and 1 1/16in. to the foot respectively.
For gauge 1, halve the 3 1/2in. gauge figures, for 2 1/2in. gauge, halve the 5in. gauge figures, for 7 1/4in. gauge, double the 3 1/2in. gauge figures.
Figures prefixed by ≈ are approximate only and should be treated with caution (see text).

Description	Full Size	3/4in. scale (3 1/2in. gauge)	1 1/16in. scale (5in. gauge)
Length over buffers, engine and tender	≈ 61ft. 3in.	45 15/16in.	65 5/64in.
Overall length of engine inc. buffers	≈ 38ft.	28 1/2in.	40 3/8in.
Length of engine main frame	36ft. 3 1/2in.	27 7/32in.	38 9/16in.
Overall length of tender inc. buffers	≈ 22ft. 8in.	17in.	24 5/64in.
Length of tender main frame	≈ 21ft. 1in.	15 13/16in.	22 13/32in.
Height to top of chimney	13ft. 3in.	9 15/16in.	14 5/64in.
Height to top of cab roof (exc. whistle)	≈ 12ft. 6in.	9 3/8in.	13 9/32in.
Width over front footplate (max. width)	8ft. 9 1/2in.	6 19/32in.	9 11/32in.
Width over rear footplate	8ft. 3in.	6 3/16in.	8 49/64in.
Height to top of footplate (front and rear)	4ft. 2 3/8in.	3 7/32in.	4 15/32in.
Height to top of footplate (centre section)	5ft. 2 1/2in.	3 29/32in.	5 17/32in.
Width over cab	7ft. 8in.	5 3/4in.	8 9/64in.
Length of cab roof	≈ 5ft. 8in.	4 1/4in.	6 1/64in.
Distance between frames (rear section)	4ft. 1 1/2in.	3 3/32in.*	4 25/64in.*
Distance between frames (between cyls.)	3ft. 10 1/2in.	2 29/32in.*	4 7/64in.*
Distance between frames (buffer beam)	3ft. 7 1/2in.	2 23/32in.*	3 55/64in.
Thickness of frames	1 1/4in.	5/64in.*	7/64in.*
Locomotive wheelbase, total	27ft. 9 1/2in.	20 27/32in.	29 13/32in.
Divided into: bogie wheelbase	6ft. 6in.	4 7/8in.	6 29/32in.
rear bogie to front driving wheel	5ft. 9 1/2in.	4 11/32in.	6 5/32in.
between driving wheels	7ft. 3in.	5 7/16in.	7 45/64in.
rear driver to trailing wheel	8ft. 3in.	6 3/16in.	8 49/64in.
Tender wheelbase, total	13ft.	9 3/4in.	13 13/16in.
Divided into	6ft. 6in. +	4 7/8in. +	6 29/32in. +
	6ft. 6in.	4 7/8in.	6 29/32in.
Diameter of coupled wheels (20 spokes)	6ft. 9in.	5 1/16in.	7 11/64in.
Throw of cranks	13in.	13 1/16in.	15 3/32in.
Diameter of bogie wheels (10 spokes)	3ft. 6in.	2 5/8in.	3 23/32in.
Diameter of trailing wheels (12 spokes)	4ft. 3in.	3 3/16in.	4 33/64in.
Diameter of tender wheels (213 spokes)	4ft. 4in.	3 1/4in.	4 39/64in.
Pitch of boiler above rail level	8ft. 6in.	6 3/8in.	9 1/32in.
Outside length of firebox	8ft. 6in.	6 3/8in.	9 1/32in.
External diameter of smokebox	5ft. 9 1/2in.	4 11/32in.	6 5/32in.
External diameter of boiler (over cladding)	5ft. 6 1/4in.	4 9/64in.	5 55/64in.
Visible length of smokebox	≈ 4ft. 5in.	3 5/16in.	4 11/16in.
Diameter of smokebox door	≈ 4ft. 6in.	3 3/8in.	4 25/32in.
Height of chimney above cladding	1ft. 10 1/4in.	1 25/64in.	1 31/32in.
Cylinder bore (x 3)	1ft. 4in.	1in.	1 27/64in.
Piston stroke	2ft. 2in.	1 5/8in.	2 19/64in.
Length of connecting rod (inside)	6ft. 4in.	4 3/4in.	6 47/64in.
Length of connecting rod (outside)	11ft. 3in.	8 7/16in.	11 61/64in.
Length of eccentric rods (inside and outside)	≈ 10ft. 5 3/4in.	7 55/64in.	11 9/64in.
C/L outside cylinders to C/L driving axle	18ft. 2 1/2in.	13 21/32in.	19 11/32in.
C/L inside cylinders to C/L driving axle	≈ 9ft. 9 1/2in.	7 11/32in.	10 13/32in.
Outside cylinders inclined approximately 1 in 100.			
Inside cylinders horizontal.			

* These dimensions are probably not practical for a live steam job!

fairly sharp curve with a sizeable level section at the lower end, on the NBL machines the curve is shallower and continues almost to the buffer beam. Because of the different viewing angles however, it is difficult to be certain. Does anybody know? While on the subject of platingwork, the width over the footplate at the front end was 8ft. 9 1/2in., but by means of yet another s-bend, it narrowed to 8ft. 3in. from just behind the cylinders right through to the cab. Another unusual detail, on both locomotive and tender footsteps, was the attachment of the middle tread from below, rather than from above, as can be confirmed in many photographs by the position of the rivets.

Obviously, the cylinder castings for Don Young's design would not be suitable for our 3-cylinder version of John Robinson's elegant engine, as we need the valves on top and a diameter of only 16in. (12 7/64in. in 5in. gauge), quite apart from the extra cylinder inside the frames. For the outside pair, those for Martin Evans' *Nigel Gresley* 2-8-0 would probably fit the bill, or even *Simplex*, provided the casting is long enough to extend the stroke from its designed 2 1/8in. to 2 1/4in. The inside cylinder presents more of a problem, as all the three-cylinder designs of recent years use piston valves rather than balanced slide valves, so this may have to be fabricated or a pattern made for a one-off casting — an expensive

business these days, assuming you can find someone to take it on in the first place.

In 3 1/2in. gauge, there is quite a choice of commercial castings which should be suitable for the outside cylinders, including *Marquess*, *Jubilee*, *William*, *Firefly*, *Bantam Cock* and *Hielan' Lassie*, the latter a three-cylinder machine and available in a slide valve version, so with any luck the inside cylinder could also be incorporated. The coupled wheels of the full size GCR Atlantic were 6ft. 9in. on tread, but only 7ft. 3in. apart, so I would once again suggest that the miniature version should be based on the diameter over flanges rather than tread, not only because of the distance between them, but to aid vertical clearance in the splashers. So we need a 20 spoke wheel with a crankpin throw of 13 1/16in. and a tread diameter of approximately 4 31/32in. (equal to 6ft. 7 1/2in. in full size) The nearest I have found in 3 1/2in. gauge are the driving and coupled wheels for LBSC's Schools class 4-4-0, *Roedean*, or the same designer's *Hielan' Lassie*, but both have 22 spokes.

GCR livery

The Great Central Railway colour scheme in its early days was extremely elaborate, particularly the lining on the splashers, but fortunately this had been simplified by the time No. 1090 was rebuilt in 1908. However, the GCR coat of arms (fig 4) still appeared no less than six times on the engine and tender, once on each splasher and once either side of the tender. Perhaps one reason for this profligacy was that this was one of the very few railway armorial devices to be granted by the College of Heralds, on 25 February 1898. Its official heraldic description is as follows: *'Argent on a cross gules, voided of the field between two wings in chief sable and as many daggers erect in base of the second a pale of the first, thereon eight arrows saltirewise banded also of the third between on the dexter side three bendlets enhanced and on the sinister a fleur-de-lis or. Crest: on a wreath of the colours a representation of a locomotive proper between two wings or.'* So now you know and there is absolutely no excuse for not getting all six representations perfect!

Locomotives were not the only items of Great Central property to display the heraldic device: George Dow, the expert on this subject, has recorded its use on crockery, cutlery, glassware including water carafes, tankards, ashtrays, biscuit barrels, uniform buttons and chamber pots! In spite of its official recognition, I have to say I find it rather uninteresting and much prefer the unofficial, heraldically 'bogus', Midland Railway device illustrated in my previous article.

The basic colour scheme for Great Central locomotives was a genuine Brunswick Green, lined in black and white and once again please note this green is *not* the same as the orange chrome green used by the GWR, erroneously referred to as Brunswick. The boiler, cab, cylinders, and tender body were green, as were the wheel centres, although the tyres were left bright. It is also worth noting that the tops of the splashers were painted green and fully lined, unlike the plain black of most companies. At one stage, the sides of the splashers were certainly a deep red/brown, but in many of the black and white photographs, they appear exactly the same

tone as the boiler, cab etc., which makes me suspect they were, at least in some cases, green; with the then current photographic emulsions, a red/brown would have looked much darker.

Footplate valance, underframes, footsteps and tender hornblocks and springs were dark red/brown with a vermilion line round the cut-outs in the tender frames, but there is photographic evidence of variations in the lining elsewhere and, surprisingly, in the position of the tender lettering. While it was always 'Great (coat of arms) Central', sometimes the coat of arms was centred over the middle pair of wheels, which actually produced a slightly lop-sided effect, since there are seven letters in 'Central' and only five in 'Great'. In other cases the complete representation was centred within the lining on the tender body and while this made the coat of arms appear slightly off centre, it was in my opinion the more pleasing version.

In addition to the query about the radius of the curve of the front footplate valance, another unsolved mystery has reared its ugly little head, in the shape of the works plate. When new, all 12 Atlantics built by the North British Locomotive Company at their Hyde Park Works in Glasgow carried the usual oval plate each side near the bottom of the smokebox wrapper, but when No. 1090 was rebuilt to its 3-cylinder form in 1908, a cover was fitted to conceal the outside valve chest and the works plate is no longer visible in any photographs. Is it simply hidden by the new valve chest cover, or was it removed? I have not seen any photographs of the engine after its re-transformation to a 2-cylinder machine — did the works plate re-appear, I wonder?

John Robinson, designer of some of the most elegant locomotives ever to grace this country's railways, was awarded the CBE in 1920 for services rendered during World War One, but retired when the LNER was formed in 1923. He had in fact been offered the post of CME in the new company, but at the age of 66, he felt it was time for a less strenuous life and recommended Nigel Gresley of the Great Northern, 20 years his junior, for the post. Robinson moved south to that haven of retired gentlefolk, Bournemouth, but became a director of Beyer Peacock, builders of his first Atlantic, and never lost interest in railway matters. He enjoyed more than 20 years of retirement and died in December 1943 at the age of 87, knowing that a large number of his locomotives were making as vital a contribution to the war effort as they had in the previous conflict.

References

1. Gorton Works drawing No. 8779 (NRM ref. 4/GW/12383/E): Side elevation, (on c/l), plan, two cross-sections and details of outside valve gear of '3 Cylinder 4-4-2 Express Passenger Engines W Class'. Although undated this presumably shows No. 1090 as first rebuilt in 1908, since the engine carries an unsuperheated boiler. Unfortunately, many crucial dimensions and even vital details are missing and some figures are illegible, even at A1 size. Note 'Engines' in the plural, which implies the intention to rebuild further examples.
2. *Locomotives Illustrated No. 145: Robinson Great Central Atlantics*: W. A. T. Aves, pub. RAS Publishing, September 2002. A large

number of superb photographs of simple and compound versions of these locomotives, excellently reproduced, including two left broadside views of No. 1090, both after superheating, i.e. post 1914.

3. *Model Engineer* 3430, 3 December 1971 to *M.E.* 3461, 16 March 1973: *Jersey Lilly* constructional series for 5in. gauge GCR Atlantic (original 2-cylinder version) by Don Young.
4. *Atlantic Era* by Martin Evans, published by MAP, 1971. Contains right broadside photo of No. 1090 apparently before superheating.
5. *British Atlantic Locomotives* by C. J. Allen, published by Ian Allan, 1976. Contains left broadside photo, same as ref. 2, together with performance details.
6. *The Harmonious Blacksmith Robinson* by A. C. Hancox, published by Stephenson Locomotive Society, 1995. Contains excellent drawings by Charles Reddy, in the Maskelyne/Hambleton style, of Robinson designs both for the Waterford, Limerick & Western Railway and for the Great Central, including the standard 2-cylinder Atlantic, together with a comprehensive bibliography.
7. *North British Steam Locomotives, built 1833-1948 for Railways in Britain* by John H. Court, published by D. Bradford Barton, n/d. Contains excellent works photo of right broadside of No. 1083.

The most useful for builders of live steam models are Nos. 1, 2 and 3. The Gorton Works drawing is available from the National Railway Museum Copy Drawings Service.

●To be continued.

ADJUSTABLE SADDLE STOP FOR THE MYFORD ML10 LATHE

Len Walker

describes this useful accessory and includes a few tips on preserving your lathe bed.

This is a simple, robust saddle stop made mainly from stock materials. My source of material was the remains of a bargain pack of bright mild steel from Ken Whiston — what variety. I sadly miss them.

Speaking of bright mild steel 'packs', why do suppliers not offer a 'starter' bundle, of say, 1 x 1/16in., 1 x 3/32in., 1 x 1/8in. and so on up to 1 x 1/2 inch? This would provide a variety of thicknesses instead of the usual variety of widths of one thickness. A wide variety of 'bits and pieces' could be made from a range of stock thicknesses with a minimum outlay. This seems so obvious to me that I wonder why no one, at least to my knowledge, has successfully filled the gap.

Construction hardly needs much description. Assemble the parts on your lathe and transfer the position of the holes for the cap head screws (Detail 2) to the dovetail strip (Detail 3). This

should be with the gib strip (Detail 13) plus a 0.005in. temporary shim in place. This will give a slight clearance to the cap head screw positions, allowing the clamping grub screw (Detail 10) and the gib strip to function freely.

The small brass 'glut' (Detail 12) can be assembled, and the position of the retaining slot marked off. An easy way to do this is to use a 6BA Allen grub screw to make its mark on the brass. The proper 6BA cheese headed retaining screw can then be fitted to suit the slot.

The 'skirt' (Detail 6) is optional. Its sole purpose is to pick up and guide a flexible plastic swarf guard sliding on the lathe bed and smoothly persuade it to run safely under the chuck instead of 'cockling' up. I have always fitted this type of swarf guard to protect the lathe bed. It is essential on the ML10 lathe as felt wipers are not fitted to the saddle. In my opinion, this is one of the most important items to fit, especially to a new lathe, before any work is attempted.

The type of material I use is sold 'off the roll' and is about 1/16in. thick. It consists of a soft plastic coating on a soft woven backing. It is sold in old type shops alongside such materials as

deck-chair canvas, and the like. It withstands oil, and can be easily replaced in a few minutes — say once a year, or whenever you fancy. My material is marked Nairn Lionella FR3, Fire Retardant.

When turning cast iron, or when using emery for polishing work, I also cover the bed with a folded newspaper which keeps most of the swarf and dust away from the bed. There can be no better testimony to the effectiveness of these measures than an unmarked bed after many years of use.

Another good practice, (after each work session or even more often) is to traverse the saddle clear and wipe the bed clean. Then flood the bed with oil, and run the saddle to and fro a few times. This will encourage it to give up any minute particles of swarf or dust trapped underneath. Wipe off the slightly dirty oil and lubricate with clean 'Myford' oil. If necessary, repeat the process until the oil shows 'clear'. This manner of working, if faithfully observed, will preserve your lathe bed for a long time and give a lovely silky feel to the saddle as it literally floats on a clean film of oil.

This saddle stop has a very positive feel and is quickly set in use. It is a real help when boring to

1

An unusual exhibit at Chiltern 2004 was this working steam driven stone crusher. Other interesting working displays included hedge laying and a saw mill.



CHILTERN STEAM RALLY 2004

Neil Read

reminds us of a midsummer event.

Many model engineers like to attend one or two steam rallies during the course of the summer months and for some, steaming their models on the rally field is the main expression of their hobby. When planning visits to the many rallies held up and down the country it is worth taking in one or two a little further afield as then one can enjoy seeing less familiar exhibits, different trade stands and generally take in a different scene. I was therefore rather pleased when our Editor, Mike, thrust a two-person pass into my hot, sticky paw and asked if I would like to attend the above event. You bet I would as it was one I had not attended before!

Organised by the Chiltern Traction Engine Club 2003 Ltd., the Chiltern Steam Rally is an annual event held in the village of Prestwood just outside Great Missenden. I have to admit that as my wife Lynda and I approached Prestwood we were beginning to think the organisers wanted to keep the event secret, as signs to the actual rally field were conspicuous by their absence. However, some helpful locals put us right and we were soon parked up and enjoying a look round. Enquiries about the signs at the event office elicited the response that they had problems with mischievous individuals taking them down; a sad reflection on the times in which we live.

Looking around the site we could see the usual displays of steam driven vehicles, classic cars, motor cycles and tractors together with a fun fair, plenty of trade stands, a craft tent and a model tent. There were also one or two unusual exhibits too like a display of hedge laying, a working stone crusher (photo 1) and saw bench (both steam driven) and displays of timber loading.

A few of the steam vehicles on display were worthy of note. The Ransomes, Sims & Jefferies 5/6 ton steam wagon (photo 2), Works No. 34270, is believed to be the only one remaining in the United Kingdom. Ransomes came to steam wagon building rather later than some of their

rivals and their overtype design did not evolve until 1920. By that time the overtype steam wagon was becoming rather outdated. However, the Ransomes had a number of technically advanced features. For example, the boiler was of

a special patented stayless design developed and built for them by Rustons, and the vehicle was fitted with Ackermann steering.

Those who remembered them on the road claimed that a Foden or Garrett could outdistance the Ransomes wagon with ease, and they were fragile if neglected. Nevertheless, Ransomes had some success in export markets and a number did sterling work in Australia and South Africa. This particular wagon was returned from Australia in 1998 and is owned by Pat and Carolyn Jenkins. The restoration work on this wagon is superb, and it appeared to run as well as it looks. Some 33 Ransomes Sims & Jefferies 5/6 ton wagons, and one 10-ton articulated version were built between 1920 and 1930.

Standing along side the Ransomes wagon was a reminder of why it had not been a greater success. The Sentinel SD4 undertype wagon (photo 3), Works No. 8448, with shaft drive and running on pneumatic tyres seems light years away from the lumbering overtype, yet they were virtually contemporaries. This wagon was the first built by Sentinel with shaft drive and is believed to have been designed from the outset to run on pneumatic tyres. The SD4 can be said to be the prototype of the better known S type introduced in 1933 and of which several hundred were made. This particular wagon is owned by Ian Woollett and worked in the Liverpool area between the years 1931 and 1947. The present owner bought it for restoration in 1953.

Aveling and Porter 6nhp heavy road locomotive Clyde, Works No. 8471 (photo 4), must have quite a tale to tell as it spent the first few years its life transporting horse manure for the army during World War One since when it has passed through the hands of a number of owners. Bought by the present owner, Bob Hyett, in 1987, it continues to receive the restoration work necessary to keep it running. It is apparently one of only three examples of this type of engine in this country and is a most stately looking machine.

Further down the line of exhibits stood a very handsome Foden C Type tractor (photo 5), Works



A rare wagon. A 1923 Ransomes Sims & Jefferies overtype brought back from Australia and the only one of its kind in the UK.



Another rare vehicle, the 1931 Sentinel SD4 steam wagon was modern and sophisticated for the period.



4
A 1914 Aveling & Porter 6nhp heavy road locomotive. A stately engine built for heavy haulage on the road.



5
A 1925 Foden C Type tractor built for estate work. Note the period lighting and Royal Warrant on the chimney.



6
Many happy returns! Burrell showman's engine Britannia celebrates 100 years of active steaming.



7
This 1:3 scale Foster traction engine was one of several large scale models in steam on the rally field.

No. 12300. This had been built in 1925 as an experimental half-track vehicle. Unsuccessful, it was rebuilt by Fodens in 1932 and sold to a contractor in Northumbria. It is currently owned by Doug Williamson. Neatly sign written on the side was information to the effect that it is an estate tractor. I am not sure that many of us own estates which would do justice to the services of such a splendid vehicle. Perhaps the Royal Warrant proudly displayed on the base of the chimney is a clue as to the type of customer that may have had the necessary funds and land area.

Celebrations were in the air at the event as one of the engines was celebrating her one hundredth

birthday. This was Burrell 8nhp showman's road locomotive, No. 2668, *Britannia* (photo 6). Bought new on 15 June 1904 by William Thurston of Cambridge, she spent the best part of her working life with this showland family. In 1953, having narrowly escaped the scrap man's torch, she was saved for preservation by J. P. Bury of Oxfordshire. She is now owned by David Davis of Prestwood.

A number of very fine models were to be seen touring the rally field, usually with a trailer full of happy children on tow behind. Mr. R. Johnson's 1:3 scale (4in. to the foot) Foster (photo 7) was particularly well turned out and

photogenic. This engine was built in 1991 and was purchased by the present owner in 2003.

Model locomotive fans were not ignored at the event and Mr. W. Buckland was exhibiting a part built 5in. gauge GWR 5101 Class 2-6-2 tank engine (photo 8) originally started by Dennis Cross and to a design by Trevor Shortland. Also by this exhibitor was a smart *Lincolnshire Lad* traction engine (photo 9).

Well, that completes our short tour of the Chiltern Steam Rally 2004. We enjoyed our visit to Prestwood and even the occasional shower did not manage to dampen our spirits. Why not give this event a try yourself next year? 



8
The 5in. gauge, 2-6-2, GWR 5101 Class locomotive under construction by Mr. W. Buckland.



9
Also by Mr. Buckland was this very attractive 2in. to the foot Lincolnshire Lad traction engine based on the Ruston design.

A STEAM RAISING FAN

D. Bushell

describes a simple fan which he designed for use on his *Rob Roy*.

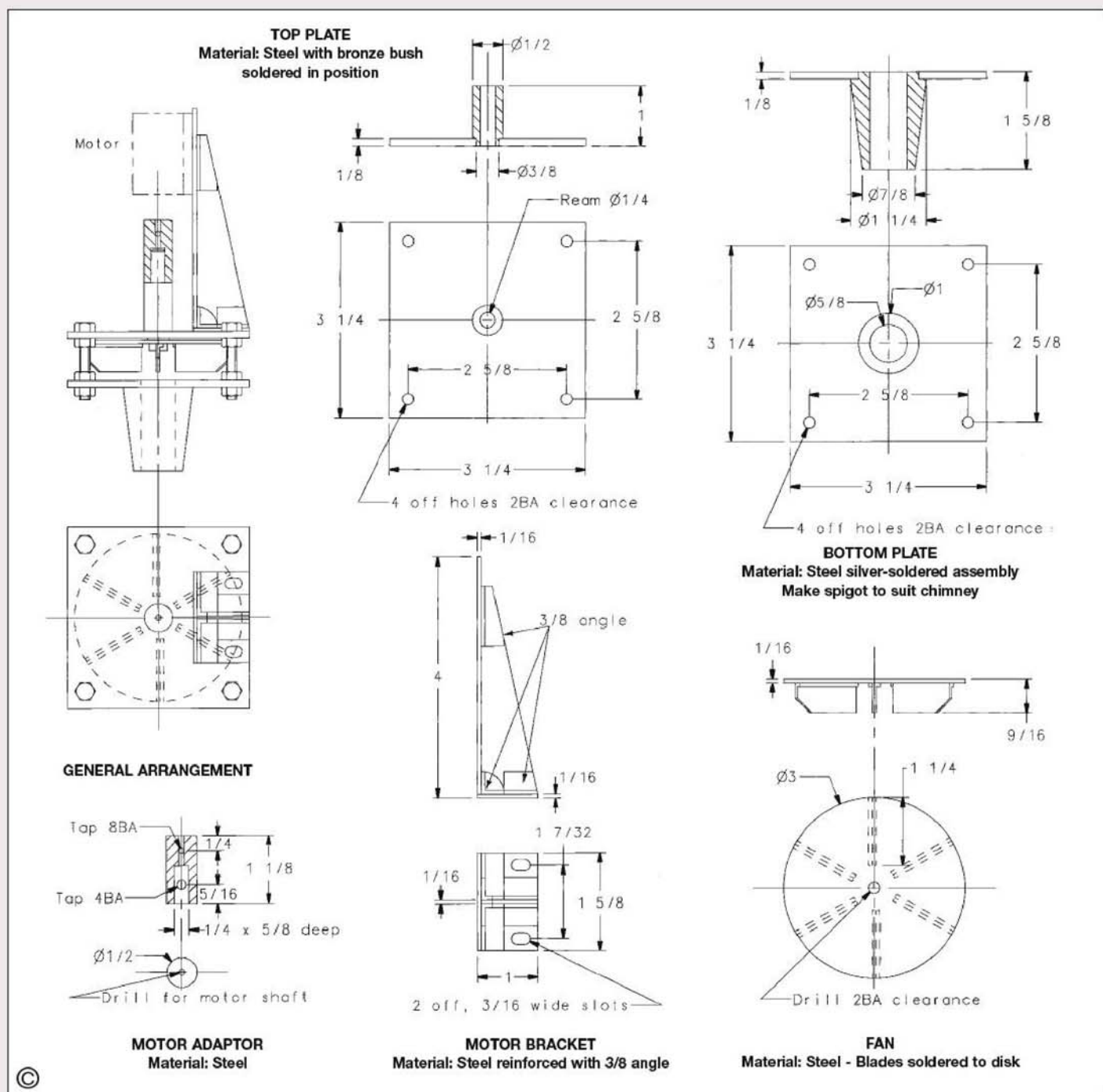
The steam raising fan about to be described was inspired by a letter which appeared in the *Post Bag* columns of *M.E.* 3395, 19 June 1970. This described a readily portable, pocket-sized fan with a battery-powered motor. I have simplified the basic design to suit the material I had to hand and readers who are persuaded to make a similar device for themselves are encouraged to modify the basic idea to suit what they have in stock.

I decided to use square material for the main plates and these were clamped together for

drilling the 2BA clearance holes. Hexagon headed 2BA screws and nuts were used to space the plates and these also provide the adjustment necessary to obtain the best action on the fire. A bush was soft-soldered to the top plate to take a spindle. This latter item was made from 1/4in. dia. silver-steel. An adaptor to suit the chimney of my locomotive was turned up and silver-soldered into the bottom plate. The fan was made from a 3in. diameter disk of 16swg steel with the vanes soldered on. The drawing shows 16swg vanes but thinner material would be adequate. The fan is secured to the spindle by means of a 2BA cheese head screw.

The motor I used was obtained from my local model shop and is labelled as a Ripmax-Lightspeed 400. It has a voltage range of 3.6 to

8.4 and a no load speed at 7.2v of 16,400 revs. per minute. The current drain at maximum efficiency is 3.3 amps. The shaft diameter is 2.3mm and the code number is given as M-LSM 40084. It cost me less than £4 and a suitable bracket cost less than £2. This motor was mounted on an angle bracket made from 16swg steel reinforced with 3/8in. angle and sits with its spindle hanging down and engaged in the tubular motor adaptor. The parts can be riveted or screwed together as preferred. The mounting holes in the base of the angle plate were slotted to give some adjustment and allow the motor spindle to align with the tubular adaptor. I do not show a battery case but you may be able to buy something or make one to suit your needs if nothing else suitable is available.



FOR YOUR BOOKSHELF

FRANK WHITTLE INVENTION OF THE JET

by Andrew Nahum

Published in the UK by Icon Books

ISBN 1-84046-538-7

Price £9.99

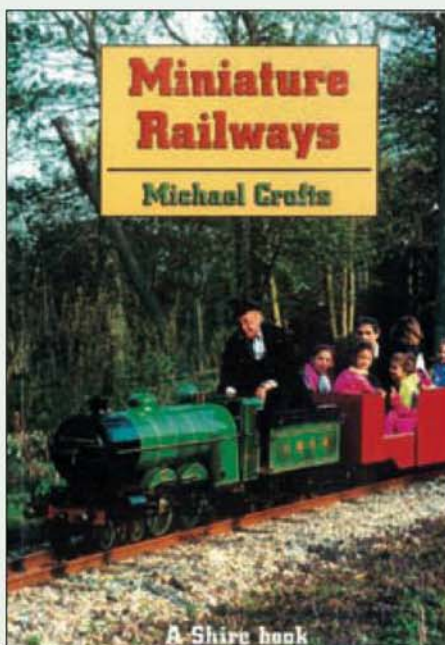
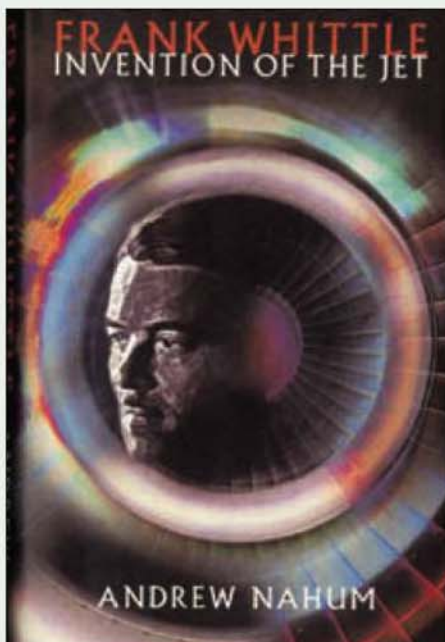
Conventional wisdom warns us against 'judging a book by its cover'. By the same token I suppose one should not judge a book by its size and weight — a trap that the writer almost fell into with respect to this book. That would have been a pity as, although only measuring approximately 7 x 4³/₄in. (almost pocket-book size) and extending to 170 pages, it is without doubt one of the most fascinating books to be presented for review for some considerable time.

Most people with even the remotest interest in engineering and science will know that Sir Frank Whittle had a very good claim to being the inventor of the jet engine. They may also have heard that his genius was almost snuffed out by those who felt that an aeroplane ought to have a propeller to drive it and by the indifference of officialdom. Some, with a more inquiring frame of mind, may have read that much of the development of this engine took place in the years leading up to and during World War Two. This was largely at public expense and could cause the reader to ask how this could have been possible when other matters were perhaps more pressing.

If such thoughts and questions have ever run through your mind, then spend a few hours studying this book. In its pages Andrew Nahum, Curator of Aeronautics at the Science Museum, London, offers a balanced account of this remarkable invention and its development. Whittle's charm, drive and brilliance are all acknowledged but, through interviews and statements of the period, we are also given the views of the engineers and functionaries who had to deal with him on a day to day basis. The result is a more complex and absorbing story than might be thought possible.

The story told does not end with the disappearance of Sir Frank Whittle's company, Power Jets Limited, as this book traces the post war development of the jet engine and examines events like the tragic failures of the early Comet design and the Rolls Royce crash in the 1970s. Some notes at the end of the book review contemporary developments going on in Germany and the U.S.A. at the time that Whittle was undertaking his work.

The main body of the book is divided into twelve chapters. Chapter one deals with the young Frank Whittle's early career in the Royal Air Force and his early thoughts on the jet engine. Chapter two covers the events leading up to the formation of his development company, Power Jets Limited. Chapter three leads us through the early wartime developments and the beginning of the association with Rover. Chapter



four introduces us to the concept of the 'straight through' engine, which was originated at Rover and, through adoption by Rolls Royce, became the precursor of all that was to follow. Chapters six and seven cover the nationalisation of Power Jets Limited and chapter eight its eventual demise. Chapters nine and ten bring us to the development of the Comet and its problems. Chapter eleven briefly covers the story behind the development of Concorde and chapter twelve some of the mystery behind the RB211 engine and the collapse of Rolls Royce. These two chapters do not cover these developments in detail but place them in an historical context and relate what happened to the political and public mood of the time. The book ends with a detailed bibliography and is illustrated with three diagrams and eight black and white plates.

Frank Whittle, Invention of the Jet, is well written and gives an insight into the nature of genius and the effort needed to turn an idea into a practical and commercial proposition. It should appeal to all with an interest in engineering history, aviation history or a curiosity about how Britain organised its manufacturing resources to cope with the threat from Nazi Germany. Highly recommended, it is published in the UK by Icon Books, Grange Road, Duxford, Cambridge, CB2 4QF; email info@iconbooks.co.uk website: www.iconbooks.co.uk Neil Read

MINIATURE RAILWAYS

by Michael Crofts

Published in the UK by

Shire Publications

ISBN ISBN 0-7478-0529-6

Price £4.99

I am sure there are many readers who, like me, have a small collection of Shire books. These slim volumes are available in a bewildering variety of titles and cover a wide range of topics and interests. Often they are the only easily obtainable reference source on a particular subject.

A recent title to be brought to our notice is *Miniature Railways*. This book deals with those charming little railways, which for the last 125 years have been a feature of many seaside resorts, country estates and some private gardens. After a brief introduction, the opening chapter explains, with examples, how a miniature railway can be pretty much of any size and built for virtually any purpose and gives some history on how the concept first developed. The next chapter deals with the wide variety of gauges in use and some of the implications of this diversity.

The third chapter looks at the civil engineering used to construct the tracks and the architecture of the buildings serving the various lines. Next it is the turn of the locomotives to be reviewed. Different types of motive power are considered as are the likely costs of buying a ready built engine or the time commitments if you choose to build your own engine. The final two chapters look at rolling stock options and operating systems and signalling respectively. The book includes a 'places to visit' appendix in the form

of a gazetteer listing miniature railways county by county arranged in alphabetical order. A bibliography is also included as are lists of relevant societies, clubs and magazines and websites. The book is written in a light and amusing style which underlines the fact that miniature railways are often eccentric and whimsical creations built out of a sense of fun.

Recommended, and excellent value for money, the book runs to 48 pages and is beautifully illustrated with photographs. The modern images are in full colour though, of course, historical photos are printed in the original black and white. *Miniature Railways* (ISBN 0-7478-0529-6) is written by Michael Crofts and is available in softback for £4.99. Available from all good booksellers and heritage centres, it is published by Shire Publications, Cromwell House, Church Street, Princes Risborough, Buckinghamshire,

HP27 9AA; tel: 01844-344301; fax: 01844-347080; email: shire@shirebooks.co.uk website: www.shirebooks.co.uk Neil Read

NEW DVD AND VIDEO CATALOGUE FROM DD HOME ENTERTAINMENT

If you had to make do with socks and underwear as Christmas gifts and would like to start the New Year with something more original and unusual, why not take a look at the new DVD and video mail order catalogue from DD Home Entertainment?

Established for over 17 years, DD Home Entertainment is one of Britain's most experienced DVD and video mail order companies, and specialises in bringing its

customers titles that are hard to find in the shops.

Its new 64 page full colour 2005 catalogue features literally hundreds of titles from such big names as the BBC, Carlton Discovery, Channel 4 and Universal Studios — including exclusive titles that aren't even in the shops yet!

DD Home Entertainment is particularly strong in British heritage and nostalgia from the 1930s to the 1970s with a great range of titles for men including rare aviation, military, steam railways and motor bikes — which could prove a very popular alternative to the same old socks, ties and hankies!

Best of all, every order over £20 from the catalogue comes with a free £12.99 'phone card to save money off your 'phone bill — just the ticket for ringing friends and relatives after Christmas!

Simply ring 0870-060-0286 for your free copy of the new DD Home Entertainment catalogue.



UK News

Progress on improvements is being made at Bradford MES with two new water heaters for hand washing in the club house and an order placed for the new shutters to be fitted to the front of the building. Raised track maintenance is also progressing with all the wooden base sleepers now having been replaced with a pre-cast concrete version. Renewal of the 5in. gauge rails between the turntable and station is also nearing completion and "a good number" of defective wooden sleepers at track level have been replaced. There has been some "good sailing at Bradford Moor" by members of the marine section. The club recently enjoyed a talk about the work of the Royal National Lifeboat Institution by Martin Chapelow from the local branch. During the evening some members (including Chairman Colin Brear) modelled some old and modern varieties of lifeboat crews' working clothing. The marine section are to display a collection box at their regattas to raise funds for this excellent organisation which relies solely on charity to fund its work. In a previous issue I reported on John Hawkes' search for a new worm gear for his Centec mill. I am pleased to report that he has been successful in his quest and has had a new worm gear made by John Ward of Lathe Parts (tel: 01282-869262). John specialises in parts for Southbend

and Boxford lathes but "is willing and able to make parts for other machines". Other readers may find this contact useful.

The 'Exhibition Issue' of the Bristol SMEE newsletter reports that the Thornbury exhibition had the "best attendance yet" with the result that "the treasurer was seen to be smiling". Personally I find it worrying when treasurers smile at me as it always seems to cost me money! The experimental running in a clockwise direction around the track has continued since August with the result that following the solving of some operational and safety issues, this will now be adopted as a permanent feature. The society has established a team led by Don Cordall to "come up with a concrete proposal, fully costed" for replacement of the raised track. As Don comments, "one thing is for sure, it won't be cheap". The society held a 3 1/2in. gauge rally in June for their own members and local model engineering societies to run "without the pressure" (should that be tension?) of pulling passengers. The rally was organised because "for some time now this gauge has been sadly neglected and pushed into the background as 5in. and 7 1/4in. gauge locomotives have become more popular". The day was deemed a great success and members have expressed the wish that it be repeated. The following was in the newsletter under the heading "It Makes You Think" and I have included it in full:

"The Poincare Conjecture is concerned with topology, the study of shapes, spaces and surfaces. Think of the way a rubber band stretched around the middle of an apple might be moved so its circumference eventually falls to zero as it slips off. Try to do the same trick with a rubber band looped through an American doughnut and you'll find that it has a different topology: there is no way of shrinking the rubber band to a point without breaking either the band or doughnut. Mathematicians say the surface of the apple is 'simply connected' but that the surface of the doughnut is not. Poincare, a century ago, asked the same question for higher dimensional space. He knew that a two-dimensional sphere (the one we are familiar with, called a 2-sphere by topologists, made of points the same distance from a point in three-dimensional space) is marked by this property of simple connectivity, and asked about shrinking rubber bands to a point for a three-dimensional sphere, a 3-sphere, in four-dimensional space. Mathematicians have struggled with Poincare's conjecture ever since, even though the conjecture has been proved for four or more dimensions."

My question is "What shape is a three sphere in four dimensional space"?

Crawley Model Engineers report that since the inaugural meeting of the 'Friends of Goffs Park Association' they have had direct contact with the Parks Management with the result that the quality of the park has improved considerably. The first Sunday in September proved to be a good passenger hauling day with good weather and a large

number of visitors to the park. The wasps' nest in the roof was dealt with using "some potent spray as supplied by a well-known vermin specialist." The Editor reports that "one puff was enough" to deal with the wasps. Let's hope that there is not a sudden reduction in membership after this! New plastic fascia panels and barge boards have been fitted to the 'Hut' and it is reported as looking very smart. The second running Sunday in September was not as successful as the first with the weather "turning nasty" and sending the public home early. The last running day of the season was more successful with "many people turning up for a last ride of the year" bringing the passenger total for the year to 4,284.

In his notes for the October issue of the Chichester DSME secretary Brian Bird comments on the summer season being over. He is absolutely correct because literally as I type this it has just started to snow outside. I suppose if it lasts it will make the 'Santa Special' season very festive. The newsletter also reports that the 'Wednesday Gang' continue to excel in all sorts of jobs including the smart new paint job on the outside of their club building. As ever though there are jobs 'pending', including painting the footbridge and repairing the roof. Being a working party member of a model engineering club must be the only 'job for life' left these days. The society has welcomed four new members who will, no doubt, eventually swell the ranks of the Wednesday gang and ponder on how they became painters and decorators when they set out to be model engineers.



Above: John Brady and family pose for the camera at York.

Below: John Peterson with his North London Railway 4-4-0T at Maidstone.



We have received details of the early 2005 programme from Chingford DMEC which includes several interesting talks. On 19 January, Shedman by K. Catchpole; on 9 February, Alan Rose - Part 3 of the model boat building series; on 16 February, Building a Gresley Pl Mikado by Geoff Moore and on 23 February, return visit of D. A. G. Brown, The Injector Man. Details of all these events can be obtained from Martin Masterson, tel: 0208-989-5552 or from the club website at www.cdmecc.co.uk

The 30th anniversary celebrations of Erewash Valley MES were graced by the Mayor of Erewash, Councillor Doug Hodges who cut the celebration cake during the afternoon. The newsletter Editor's words sum up the celebration: "sunshine, a celebration cake, a new kitchen, two operational tracks and a variety of locomotives. All set for a most enjoyable weekend." Member John Stone even had a special celebration headboard on his locomotive for the occasion. Several members joined the group for the



Above: Geoff Jago with his new locomotive at the busy Fareham weekend.

Below: An unusual but beautifully made group at Donington.



annual visit to Peterborough SME during the year and judging from the photographs in the newsletter, had an enjoyable visit with good weather.

Members of East Somerset SMEE manned a stand at the Bristol Exhibition and put on a fine display of models. Member Terry Gorman won the CuP Alloys Silver Trophy for "the best example of silver-soldering in the whole exhibition". Congratulations to Terry on his award. Progress has also been made on the negotiations for the lease at the Royal Bath & West Showground

with the final version in the process of being drawn up. Hopefully we will soon be reporting that work on the track has actually started. In the meantime members are actively "scrounging" useful materials and equipment from various sources in anticipation. Membership has now risen to 34 which must be very heartening for this newly established club. In the meantime the club has been carrying out public running at the 'Hunter's Rest Miniature Railway' which is owned by the landlord (Paul Thomas) of the public

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.

JANUARY

- 7 Aylesbury (Vale of) MES. Modelworks talk about their Classic Live Steam kits. Contact Andy Rapley: 01296-420750.
- 7 North London SME. Bring & Buy Auction. Contact David Harris: 01707-326518.
- 7 Portsmouth MES. Roger Heap: Electronics. Contact John Warren: 023-9259-5354.
- 7 Rochdale SMEE. Meeting. Contact Mike Foster: 01706-360849.
- 8 Glasgow & S.W. Rly Ass'n. Modelling Matters. Contact Bruce Steven: 0141-810-3871.
- 8 Reading SME. Club Running. Contact Graham Bustin: 0118-9615450.
- 8 SM&EE. George Evans: Introduction to Steam and Valves. Contact David Boote: 01202-745862.
- 8 York City & DSME. Auction. Contact Pat Martindale: 01262-676291.
- 9 Brighton Toy & Model Museum. Junior Friends Christmas Party. Enquiries 01273-749494.
- 9 Sutton MEC. Track Day. Contact Mike Dean: 0208-657-5401.
- 10 Bedford MES. Meeting. Contact Ted Jolliffe: 01234-327791.
- 10 Melton Mowbray DMES. Auction. Contact Phil Tansley: 0116-2673646.
- 11 Crawley ME. Goffs Park Light Rly. AGM. Contact Allan Sinclair: 01293-888203.
- 11 Dockland & E. London MES. Bits & Pieces. Contact P. M. Jonas: 01708-228510.

- 11 King's Lynn DSME. Ron Bowyer: Mechanical Music. Contact Mike Coote: 01533-673728.
- 11 Stamford MES. AGM. Contact Derek Brown: 01780-753162.
- 11 Taunton ME. Meeting (TBA). Contact Don Martin: 01460-63162.
- 12 Birmingham SME. Peter Flavell: Building a Working Model Submarine. Contact John Walker: 01789-266065.
- 12 Harrow & Wembley SME. Tony Smith: Models, Trains & Views of Holland. Contact Dr. Roger Greenwood: 020-8427-2755.
- 12 High Wycombe MEC. Bits & Pieces. Contact Eric Stevens: 01494-438761.
- 12 Norwich DSME. Alan Gibson: Proper Rivet Counting. Contact Paul Reed: 01603-462925.
- 12 St. Albans DMES. Frank Banfield's Old Films. Contact Roy Verden: 01923-220590.
- 13 Sutton MEC. Toy Steam-Up. Contact Mike Dean: 0208-657-5401.
- 13 Worthing DSME. Ian Gledhill: The Volks Railway. Contact Bob Phillips: 01903-243018.
- 14 Brighton & Hove SMLE. Meeting. Contact Mick Funnell: 01323-892042.
- 14 Hereford SME. Bits & Pieces. Contact Richard Donovan: 01432-760881.
- 14 Romney Marsh MES. DVD Evening. Contact John Wimble: 01797-362295.
- 16 Frimley & Ascot LC. Club Running. Contact Bob Dowman: 01252-835042.

In Memoriam

It is with the deepest regret that we record the passing of
Neil Pennington of *Furness Model Railway Club*.
The sympathy of staff at *Model Engineer* is extended
to the family and friends he leaves behind.

house in the grounds of which it is laid. The members are grateful to Paul for his support which has enabled them to generate some much needed funds for the club.

Members of **Furness Model Railway Club** are preparing for their golden jubilee celebrations in 2006 by compiling a list of past members to be invited to a reunion in April. No doubt the compiler of the list, Fred Firth, would appreciate contact from any past members reading this. Fred can be contacted by e-mail on fred_l.firth@virgin.net or on Barrow-in-Furness 821192. The club track is up and running again following the major repair work previously reported in this column. The first passengers were carried on 18 July. Members of the 'HO' and 'OO' section are working on a new fiddle yard for their layout.

The Wednesday evening meetings of **Fylde SME** have proved very useful in answering "how do you do that?" questions from members. This must be one of the greatest benefits for inexperienced members of societies as well as those more experienced tackling something new.

High Wycombe MEC has changed the venue and date of the monthly evening meetings. These are now at the Rossetti Hall (part of Little Missenden Parish Offices), 38 New Pond Road, Homer Green, Buckinghamshire, and are on the second Wednesday of the month commencing 12 January with a 'Bits & Pieces' evening. Member Graham Taylor has produced plans and a 20 page manual for building his surface effect flying model *Whizzy Wig*. More information can be obtained from Graham at Hypercraft Associates, 102 Garratt Way, High Wycombe, Buckinghamshire HP13 5XT, tel: 01494-510612 or e-mail at enquiries@hypercraft-associates.com. Graham also has a website at <http://groups.yahoo.com/group/whizzywigxge>

The newsletter carries a photograph of four generations of the Knott family on one train and asks "is this a record?" For the record, the passengers were John Knott (driving), his son and son's wife, their daughter and son in law and great grandson Mathew. I think many of us will have carried three generations on one train, can anyone equal four generations?

Kinver and West Midlands SME (hosts of IMLEC last year) are now in the secure position of owning their own land following the completion of the purchase on 27 September 2004. We congratulate the society on their achievement in securing their excellent site in this way. Some 25 members visited the Bridgnorth works of the Severn Valley Railway the day after the signing and had a tour of the workshops which included seeing the "awesome site of a wheel set mounted in the former Derby works wheel turning lathe". The tour was conducted by SVR's engineer Dave Reynolds after he had done a 13 hour shift.

Donal Corcoran, Chairman of **North London SME**, reports that the 60th anniversary exhibition was very successful and was blessed with good weather which encouraged everyone to turn out. The 'Catering Corps' were very pleased with the new kitchen which enabled them "to do the job in such pleasant surroundings". The 'OO' gauge section are building a new extension to their permanent layout which will also act as a portable exhibition layout. The garden railway has also extended their layout with a new turntable and extra sidings to accommodate more locomotives. John Squire, section leader of the Gauge '1' group extols the virtues of the gauge compared with the larger

scales with the comment "If you have a derailment you pick up the train, there is no blood, you go home clean." Perhaps he has a point? A good selection of 15 locomotives attended the locomotive invitation day in August with visitors from Maidstone, Erewash Valley, Canvey Island, Harrow, Chesterfield and Bournemouth turning up for the day with the sun coming out and a "super day was had by all".

Work on the clubhouse at **Reading SME** is now complete and has made a great difference to the internal appearance of the building resulting in a much brighter atmosphere inside. The open day in September was a great success with 15 visiting locomotives and 24 visitors. The afternoon is reported as becoming "a little exciting" when visitor Ralph Manwaring fell off his driving truck at the bottom bend of the ground level track and then chased his runaway Pansy all the way up the hill. The runaway locomotive was finally apprehended by Jim Brown and Brian Hadnam with the driver eventually "emerging from the trees at the top of the hill panting". The new grassed area on the raised bed by the steaming bays has also been completed and now shows signs of the grass growing. I am also pleased to report that Alan Thatcher's gas-fired locomotive is now running well.

Rotherham DMES is another club which has been successful with an application to the National Lottery 'Awards for All' scheme previously mentioned in this column. Rotherham has gained an award to purchase two new steel containers for their site. The containers are now installed and in the process of being fitted out. One will be a workshop and the other is to be used for equipment storage. The club has also

welcomed six new members.

Rugby MES is celebrating member Glyn Winsall's fine win at IMLEC this year and mentions that Glyn's father Fred won the competition at Bristol in 1974. The society hosted a visit by approximately 30 members of the **Lutterworth Railway Society** on 24 June with Phil Bevan running his *Flying Scotsman* on the raised track and the Class 31 and Roger Johnston with his *Pegasus* on the ground level track. Rugby is another club welcoming new members which seems to be a positive trend. The club has completed the fourth new carriage which was put into service at the public running session on 15th August. The new addition meant that three fully braked trains were running that day.

The 'One Day Rally' at **Saffron Walden DSME** was reported as a great success with "thirty bodies and fifteen locos on site". The club locomotive is progressing slowly and a trolley is to be manufactured to move the locomotive from the steaming bays to the hobby room so that work can continue during the winter months. The stainless steel water tank has been cleaned internally ("clean enough to eat your dinner off") and moved into position ready for the pipe work and submersible pump.

In the **Sutton MEC** newsletter Keith Roper wonders why model engineers still use imperial units for a lot of their work. I must admit to being one of the 'Luddites', mainly because most of my tools are imperial. I have got one set of drawings which uses both so you get such things as "10mm by 40tpi" threads! He mentions that CAD programs do not like fractions and convert them to decimals. Perhaps our readers have an opinion?

- 16 **St. Albans DMES. Club Running.** Contact Roy Verden: 01923-220590.
- 16 **York City & DSME. Running Day.** Contact Pat Martindale: 01262-676291.
- 18 **Chesterfield MES. Meeting, Slide Show.** Contact Mike Rhodes: 01623-648676.
- 18 **Erewash Valley MES. Ladies Meeting.** Contact Jim Matthews: 01332-705259.
- 18 **Romney Marsh MES. Tim Keenan: The Story of Wingham Engineering.** Contact John Wimble: 01797-362295.
- 18 **West Wiltshire SME. Nick McCamley: The Corsham Underground.** Contact R. Nev. Boulton: 01380-828101.
- 19 **Birmingham SME. Video Competition.** Contact John Walker: 01789-266065.
- 19 **Bristol SMEE. Auction.** Contact Trevor Chambers: 0145-441-5085.
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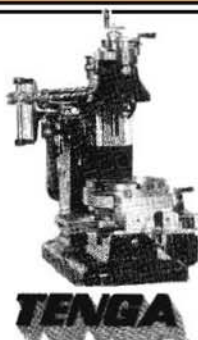
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