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Vol. 193 No. 4232

15 - 28 October 2004

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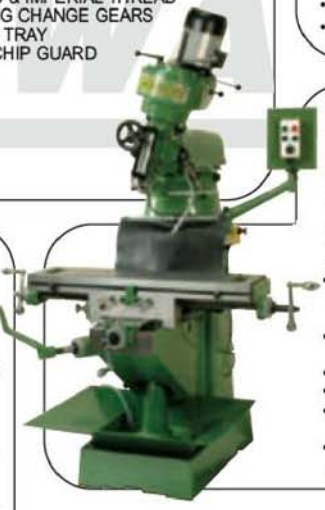

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IN THIS ISSUE

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On the cover ...

Enjoying a run with his 2½in. gauge 2-6-6-4 Mallet Annabel *on the Cuckoo Line at the North London SME tracksite in Colney Heath, Jim Robson was pleased to obtain* Annabel *when several of the late LBSC's locomotives became available following the latter's death.*
A huge locomotive for 2½in. gauge and an impressive passenger hauler, Annabel *is thought to have been built between 1929 and 1936, and was bought by 'Bro. Wholesale', Noel van Raalte, for his private track at Bursleden in Hampshire. Jim has spent much time and energy researching Annabel's history and presents his findings for our interest and enjoyment in a feature beginning on page 432 in this issue.*

(Photograph by Mike Chrisp)

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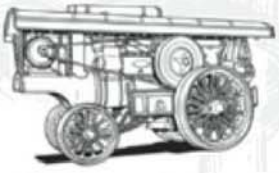

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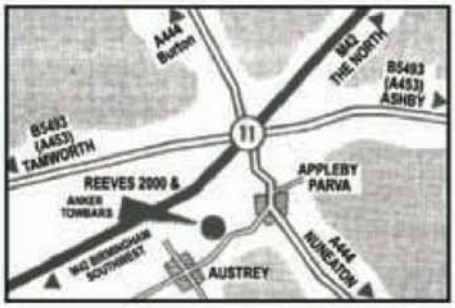

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Spares Available for Fobco Star, 7/8 and 10/8 Pillar & Bench Drills £ POA
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Denford Novamill CNC Bench Top Vertical Mill, 1ph, VGC, Manuals, 1996 Machine £3000.00
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Gate Mini Jig Borer/Mill, Imp, Collets, 1ph, GC £1250.00
Richmond No 1 Universal Mill, Vertical/Horizontal, Swivel Table, 3ph £ 550.00
Bridgeport Turret Mill, 36" x 9", DRO, PF, Single Phase From New £2250.00
Alexander 2A Die Sinker/Engraver, Single Phase, 240 Volt, VGC £ 750.00
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BCA Jig Borer/Mill, Stand, Collets, 3ph, £1250.00
BCA Jig Borer/Mill, Stand, 4 Collets, Keyless Chuck, Vice, 1ph £1250.00
BCA Jig Borer/Mill, Stand, 11 Collets, Drill Chuck, 3ph £1450.00
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Elliott OO Omnimill, Vertical/Horizontal, 3 MT Spindle, Collet Chuck, Vice, 3ph £1750.00
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Tom Senior Major, Turret Type Vertical Head, Refurbishment Needed, Runs Well, 1ph £1250.00
Tom Senior M1 Horizontal Mill, Arbor Support and Arbor, Coolant, No Motor £ 275.00
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Stand For Above £ 145.00
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Mikron 79 Gear Hobber £ 650.00
Strausak Gear Hob Sharpener £ 350.00
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Gravograph Model T-12009, 3D, Stand, Type, Accessories, 1ph £ 550.00
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Hauser 2 BA Jig Borer, 3ph £1500.00
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SMOKE RINGS
With the Editors

Please note that communications by e-mail to Editorial Staff should be addressed as follows:

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We regret the inconvenience caused by rejection of e-mailed correspondence sent to previous addresses which are no longer valid.

David Parsons is presented with his Certificate and Myford ML7 Tri-lever lathe by Northern Association Chairman Don Broadley MBE.

Junior award

We were delighted to receive the following news from Don Broadley MBE, Chairman of the Northern Association of Model Engineers:

"You will recall that, at the time of the Northern Association Exhibition at the end of March, the Association was anonymously donated a Myford Tri-lever ML7B lathe to be awarded to a suitable and deserving 'young person'. Given such generosity, the task of finding such a person was onerous to say the least and we doubted the feasibility of doing so on such a short timescale. Jim Matthews of Erewash and Bryan Cantwell of Urmston agreed to visit societies exhibiting at the exhibition seeking someone who would fill the bill, I have to say without much conviction that they would be successful. Both were chosen because of their long standing in model engineering and in the Northern Association.

"However, fears were unfounded and they unanimously recommended David Parsons of the local Warrington Society. David was undertaking a part-time engineering course at St. Helens College and is described as being as keen as the proverbial mustard. The Parsons did not have a suitable workshop to house such a marvellous machine and it has taken until now, with the assistance of helpers from the Warrington Society to build a small self contained 'shop'. David was awarded a Certificate at a club meeting shortly after the exhibition and the accompanying photograph shows me presenting the lathe, complete with a full set of Myford accessories, on 22 July just outside his new 'shop'.

Finally, a number of additional items, included in the anonymous donation, were sold at the exhibition raising over £200. This has been deposited in a special 'Juniors' Account' to be awarded at future Northern Association events.

"I might add that the anonymous donor passed away only four days after Eric Clifford and I collected the lathe. My thanks go to Stan Bray who acted as intermediary."

It is very satisfying to learn that despite all our concerns and apparent evidence to the contrary, some young people are keen to use their brains and hands to make things. The foregoing note from Don Broadley together with Monty Ellis' generous financial award of not so long ago indicate that the future of our hobby may not be as bleak as some would have us believe.

Concerning the Monty Ellis Award, readers will perhaps recall that recipients were involved with Plymouth Miniature Steam and Stockholes Farm Miniature Railway, organisations which have taken positive steps to promote and nurture the activity among youngsters and beginners. We have been delighted to receive further information from both of these groups and look forward to publishing accounts of their activities in these pages at the earliest opportunity.

Miguel de Rancougne Auction Part II - 16/17 October

In their sale of Toys and Models for the Collector on 16/17 October, Special Auction Services of Kennetholme, Midgham near Reading in Berkshire will be including 100 Lots from the remaining part of the Miguel de Rancougne Collection. The first part of the sale, on Saturday, includes Gauge 1 live steam locomotives and carriages, including complete sets from the late David Jenkinson's property, plus numerous diecast collectibles.

The de Rancougne estate, which incorporates rare petrol ignition engines, tether racing cars and off-road radio controlled cars will be sold on Sunday 17 October.

Viewing is from 9.00 until 11.45am each day at the saleroom which can be found adjacent to the Berkshire Arms Hotel on the A4 main road, 8 miles west of Junction 12 on the M4/A4. A Catalogue is available, price £10 from the Auctioneers at S.A.S, Midgham, Reading RG7 5UX; tel: 0118-9712949; fax: 0118-9712420 or via website details at **www.invaluable.com/sas**

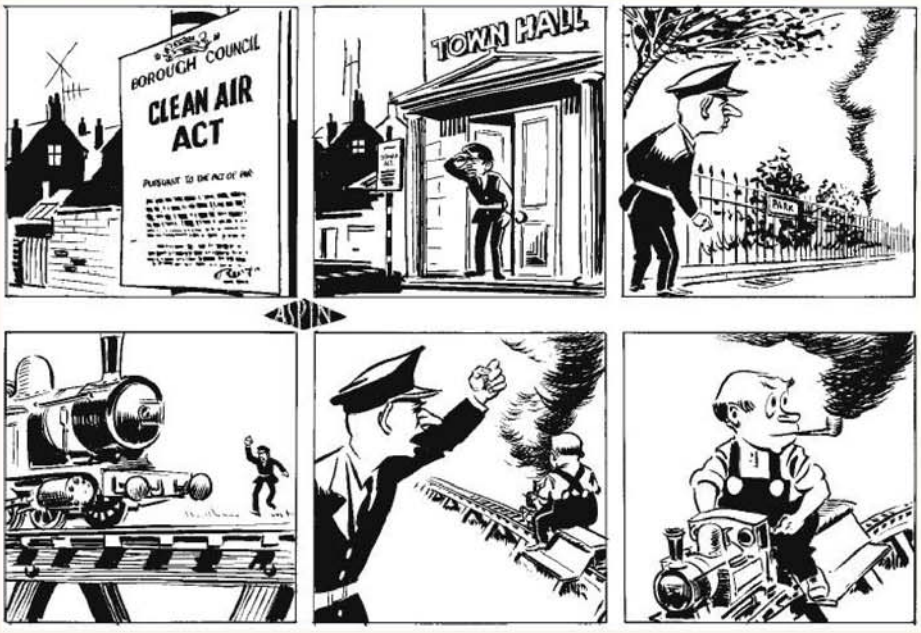
Miguel de Rancougne's property will be of special interest to all collectors of vintage model aero and racing car engines of which there are 30 examples ranging from the rare Gerald Smith *Wizard*, an original Ohlsson taper fin *Gold Seal*, Hallam and Fisher ignition engines, to the diesels by Paul Bugl, Delmo, Maraget and Barbini. Approximately thirty cars cover the classic period of post-war tethered racing to more recent R/C running both for speed and off-road.

Remaining Lots will appeal to model makers as they comprise boxes of discarded components typical of any serious enthusiast's workshop. Generally separated into groups of associated interest are sets of ignition and glow plugs, wheels, castings, tanks, engine components and general material worthy of salvage.

To be auctioned from 12 o'clock, Sunday 17 October, the Rancougne Collection can be viewed on both days of the auction from 9am.

***L-R: Ohlsson* Gold Seal *on original mount with coil; Gerald Smith 10cc* Wizard; *Batzloff 1941* Triumph 60.

CHUCK, the MUDDLE ENGINEER — by B. TERRY ASPIN



POST BAG

Trains and boats and planes

SIRS, - Family and friends are mourning the death from brain cancer of Adrian Gurr, 52, from Bearsted, on 2 August 2004. So many attended his funeral at Vinters Park Crematorium in Maidstone on Friday 13 August that many had to stand outside. A light aircraft circled overhead as the funeral ended.

An IT Network Manager for IBM, in his spare time Adrian became a qualified pilot. He joined Maidstone Model Engineering Society in 1978 and became a Committee Member and then served as Chairman for several years. His last stint as a Committee Member was in 2002.

His first locomotive was a 3½in. gauge *Rob Roy*, and in 1987 he completed a 5in. gauge model of LNER V1/V3 *Enterprise* with which he visited many tracks around the country. He was part way through building his next project, a 5in. gauge Bulleid Pacific Merchant Navy class locomotive. He regularly did public running on Sunday afternoons for the Society and often passenger hauled four full trolleys with *Enterprise*. He also built model boats and was a member of the Cygnets Model Boat Club.

Despite his illness, he was determined to make the annual MMES holiday in June, known as Sue's Holidays Including Trains Week (S.H.I.T. Week for short) and this year, despite being in a wheelchair and needing round-the-clock care from his friends, enjoyed visiting Lancashire tracks, returning to the Heart of Kent Hospice after his holiday.

Adrian fought his illness with tremendous bravery and will be greatly missed. He leaves a mother, sister and two nephews in the UK and a brother and two more nephews in Australia. The family has requested donations in favour of the Heart of Kent Hospice and so far have raised over £1000. A charity run by MMES over the August Bank Holiday weekend raised a further £505.

Sue Parham, Kent.

Gordon Lane

SIRS, - It is with great sadness that I have to report the death of Gordon Lane, late President of Northampton Society of Model Engineers Ltd. He passed away peacefully after some time spent in hospital.

Gordon always had a good yarn to tell of his days on the railway and afterwards in the RAF. His absence will be a great loss to the club.

In his younger days, Gordon was involved in building and racing slot cars, and he built boats too. Later in life he developed an interest in wood carving, a craft skill at which he became very good, as with everything else he did. Gordon was part builder of *Jenna*, now owned by a NSME member, a locomotive built in the American style and based on the *Sweet Pea* design. He also built an American diesel locomotive.

Together with other club members Gordon was a joint instigator of the NSME Steak Barbecues which were so enticing that supplies often ran out and more had then to be obtained.

So we must now say a sad farewell to Gordon Lane with thanks for all he put into our lives.

Harvey J. Fisher,
Buckinghamshire.

A little goer!

SIRS, - I enclose photographs of *Matt*, a recently completed gauge free-lance 0-4-0 tank engine in 3½in. gauge which I hope will be of interest. My fourteenth locomotive, the first having been run in 1940, *Matt* was built to be run safely by a child. This little engine has turned out to be a real goer; some idea of its size may be gained from knowing that the diameters of the steam gauge and smokebox are 1⅞in. and 3½in. respectively.

The late Adrian Gurr at the controls of his locomotive **Enterprise.**

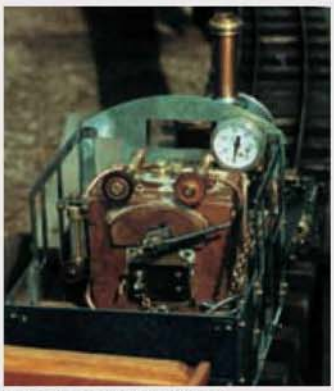
To regulate the maximum speed, I made the steam ports small; single 5/64in. dia. holes lead to steam passages which are also single 5/64in. holes. The exhaust port is 5/32in. diameter. The cylindrical valve is operated by slip-eccentric gear. The firebox is about 4in. square and the boiler barrel 3in. dia. with about a dozen 3/8in. dia. tubes.

Several steam trials were necessary to get the ashpan openings right and to get the best position and size for the exhaust nozzle. After these were squared away we had some good runs. With 80-100psi she will take my 160lb. up the 1.5% grade as fast as I want to ride and will handle me and a child, no problem.

The most interesting thing about *Matt* is the water consumption which seems very small for the work done. The small grate is easily fired and furnishes lots of steam. I can only think this efficiency has come about because the small ports give a high steam chest pressure with plenty of expansion and good efficiency in the cylinders, and less wastage of steam to fill large ports and passages.

My next engine will have six drivers with the same design of cylinders and the same arrangement of ports and passages.

Charles S. Purinton,
Massachusetts, USA.



Two views of Mr. Charles Purinton's 3½in. gauge locomotive **Matt** *designed and built for a youthful driver.*

Bandsaw blades

SIRS, - The blade of my recently purchased 3½in. horizontal bandsaw broke at the joint after only a few weeks' use. I tried to braze it but my best efforts were unsuccessful, the joint would not hold. Since the teeth were still in good condition, I enquired of several suppliers about having the blade repaired, only to be quoted a cost similar to the price of a new blade. When VAT and carriage is included, these new blades are quite expensive

Can anyone tell me if anything is commercially available with which I can join blades myself without a great expense. When I worked in the engineering industry, I recall an attachment mounted on the side of a vertical bandsaw for the purpose.

My bandsaw uses a non-standard blade, so there is an inevitable delay while replacement blades are made. This delay and the cost of the service lead me to want to make up my own blades from a roll of bandsaw blade which I can obtain at reasonable cost.

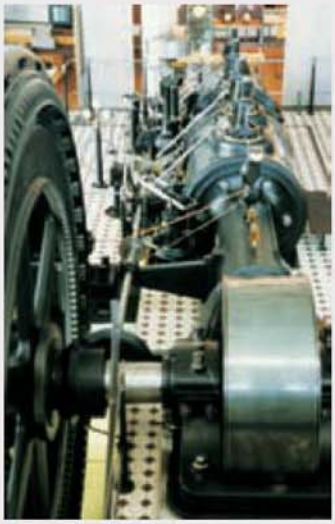
G. McLatchie,
South Lanarkshire.

Blowlamps and Primus stoves

SIRS, - I have a number of friends who collect these interesting pieces of history, they lovingly polish and display them and are no doubt delighted with their acquisitions to which I have added more. However they neither restore nor use them and examination of their collections shows that a small number of the 'blow-lamps' with drawn brass tube fuel tanks have incipient cracks longitudinal to the axis of the tube used. This defect is one I have also found in the boilers of several toy steam engine/boiler combinations of the sort sold up to about forty years ago by various manufacturers for driving Meccano models. The surface crack is sometimes just visible when the brass is polished, in other cases it has penetrated right through the metal and is very visible.

I suggest that anyone restoring old blow-lamps should run a dye penetrant

The vertical engine which reader Mr. R. E. Smith has restored and about which he seeks information.



Mr. David Hall's photograph of the tandem compound steam engine at Mannheim in Germany.

crack test before any use with paraffin/kerosene. Nearly forty years ago I saw the hands and face of a plumber whose blow-lamp blew apart with just such a crack — it was a dreadful sight. The cause of the cracks is unknown to me, but I surmise that it derives from the very small longitudinal marks left by the drawing or extruding process which 'work' and, as stress raisers, then fatigue with the small degree of expansion/contraction of the vessel in use. In the case of some I wondered if some form of stress corrosion was an additional cause as the edges of the cracks were very black and crumbly. It is also possible that there are suitable and unsuitable brasses for this use. Unfortunately external polish is no guarantee that internal defects are not working their way outwards. The worst example that I have seen was a toy boiler with about ten cracks, the next a blow-lamp with a corrugated body and about three or four cracks

I have never seen either of these effects with Primus stoves, but the tanks on these are clearly manufactured by a different method, either a heavy section pressing or less likely a casting which has been well polished, eliminating surface defects.

The fault in blow-lamps and toy boilers probably takes many years to become visible and then dangerous, which is why reported accidents are so rare, but naturally the more use they have had the greater the risk that the fault is progressing.

Peter King,
Christchurch, New Zealand.

(The effect described by Mr. King is known as 'season cracking' and is indeed a form of stress corrosion which occurs following the working of cold-working (alpha phase) brasses. Stress relief annealing following initial forming inhibits the effect but all users of brass pressure vessels are well advised to heed Mr. King's warning — Ed.)

Stationary engine

SIRS, - I enclose a photograph of a steam engine which has been lying in a corner of a garage for many years and which I have cleaned and restored.

The combined firebox and boiler are 12in. high and 6in. diameter. The flywheel is 8 1/2in. diameter and steam to the 1in. dia. by 2 1/2in. stroke double acting single cylinder is controlled by a slide valve.

The owner knows nothing of its origin or history — any information would be gratefully received.

R. E. Smith, Suffolk.

Engineering adhesives

SIRS, - It was with very great interest that I read *Anaerobic Adhesives for Model Engineers* in *M.E.* 4228, 20 August 2004.

As a clockmaker I was introduced to these adhesives many years ago. Other clockmakers will know that John Wilding and other leading writers on clock construction have pioneered their use in the fabrication of many components in clockmaking. It is very difficult, however, for the amateur to access or fully understand all the technical data and techniques so well presented by Bob Goss in his article.

Most of the data that I have seen up to now could only be described as good bedtime reading for industrial chemists! I agree wholeheartedly with the comments which Bob makes in his article, and feel that the product happily works in conjunction with the traditional methods and techniques employed by the model engineer/clockmaker.

Without doubt many design and production processes are greatly simplified and improved by the use of these products. When repairing clocks I am often saddened to see otherwise good workmanship marred by the use of poor riveting and incorrect soldering. Traditional methods maybe, but not always the best or only methods to contemplate.

I am sure Bob Goss' article will do much to dispel the myth that industrial adhesives are a cheap and quick remedy. The more understanding we have, the better placed we are to advance the use of this useful product in the workshop.

Ian Beilby, Yorkshire.

Technical museum

SIRS, - You published an article by Christopher Hogg in *M.E.* 4216, 5 March 2004, in which he described the German auto and technik museums at Sinsheim and Speyer. I would like to add that both are superb, Speyer possibly having the edge.

I would advise those making a visit not to miss the technical museum in nearby Mannheim which is marked by an elderly portable steam engine on a plinth near the Heidelburg road. Mannheim, Sinsheim and Speyer are within a rough 30 mile triangle of one another.

The splendid Mannheim museum reflects the heavy industrial past of the area with a display of several early steam and i.c. engines. In steam daily are an ancient 0-6-0 locomotive and verandah each of which trundle visitors out of the museum along a stretch of track. The locomotive is steamed from the museum boiler in the fashion of a fireless engine.

The *pièce-de-resistance* though is the museum's tandem compound steam engine driving a flywheel generator. To see this huge machine in action with live steam is a treat for every steam enthusiast. Technical details include: tandem compound steam engine No. 3917 of 1908 built by Maschinenfabrik, Esslingen; generator by Felton and Guilleance-Lahmeyer, Frankfurt; working pressure 9.5bar; speed 107rpm giving 625kVA at 100 volts.

David Hall, Gwent.

Princess Royal

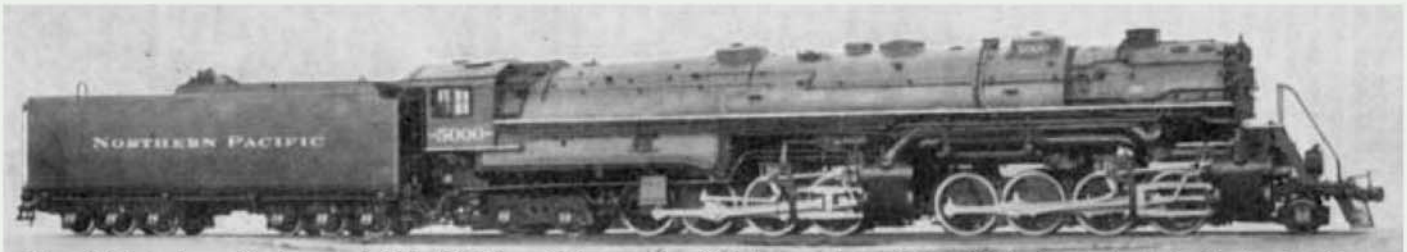
SIRS, - I read of Martin Johnson's interest in the LMS Princess class 4-6-2 which used to be available from Clarksons of York. (*M.E.* 4226, 23 July 2004). I too had been looking for plans and castings since last year. Initially I attempted to locate Mr. H. Clarkson, and received a reply in December. He informed me that he had sold the business in 1983 and that an Elliot Brick who lived near Huddersfield had purchased the plans, castings, rights etc., for the 3 1/2 inch gauge *Princess Royal*. I then attempted to locate Elliot Brick, however the only one I could find in the UK was not the person I was looking for, I assume therefore that he has passed away. Prior to this contact I had spoken with a local dealer who knew of Elliot Brick and that he had the commercial rights to the H. P. Jackson *Princess Royal* design and commented that *"... he has done nothing with it ..."* by which I took it to mean that he had not made any attempt to market the design.

I had resigned myself to not finding a set of plans and castings and began researching the Princess Royal Class at the National Railway Museum Library. The Librarian informed me that drawings were soon to be published by Wild Swan (tel: 01235-816478). Their *Locomotive Profile* series was reviewed in *M.E.* 4221, 14 May 2004, including *LMS Locomotive Profile No. 4* on the Princess Royal Pacifics; there were many changes in this small class of locomotives and for any modeller looking for accuracy, this is certainly a book worth having.

Finally I tried an advert (*M.E.* 4220, 30 April 2004) which produced no replies as regards plans or castings, but did raise a 'phone call from the Chairman of a local club of which I was unaware. We arranged to meet at the then upcoming Harrogate Show, and while there I met someone who had built and was exhibiting a completed *Princess Royal* locomotive and, after a small discussion I now have a set of plans for this locomotive.

I realise that this is not a direct answer to Mr. Johnson's original question, but I hope at least the information is of interest.

Melvyn O'Connell,
North Yorkshire.



The original caption to this photograph (M.E. 1465 6 June 1929) states that this is "an experimental 2-8-8-4 Mallet locomotive for the Northern Pacific Railroad using four single expansion cylinders of 26in. dia. by 32in. stroke. The largest railway engine in the world, the engine and tender weigh 499 tons."

ANNABEL
A STORY OF A LOCOMOTIVE

Jim Robson,
now the happy owner of this unique locomotive, describes the results of his researches but still wonders *"Who is* Annabel*? What is she?"*

When in 1943 I first discovered *Model Engineer* magazine, hereinafter referred to as *M.E.*, I was not a member of any model club, nor had I any intent, ability or wherewithal to build a model locomotive. Nevertheless, in that first issue, and every subsequent one, the first article I read was LBSC's column. I always enjoyed the *Lobby Chats*, especially when he wrote about his own locomotives and track, and when he sometimes described visits by the privileged few who were invited to the 'Polar Route.'

One locomotive which used to crop up from time to time was *Annabel*, a 2½in. gauge, 2-6-6-4 Mallet. This engine always caught my fancy and I would read even more avidly than usual when it got a mention. I never expected to see the locomotive let alone drive it, and as for owning it, such a possibility never crossed my mind. However, the impossible it happened in 1973, and during the years I have owned *Annabel* she has given me great joy and has always created much interest wherever she has been exhibited or run.

To my shame, I must confess that she has not had many steam-ups of late, something which I hope to rectify in the not too distant future. She is still in the same rather dilapidated state of oily black paint as received; the late Laurie Lawrence (no relation to LBSC) had continually berated me over the years to refurbish the paintwork, even offering to pay for the paint!

Once I had the locomotive I became interested in her antecedence, to which end I began delving through the back issues of *M.E.* As my investigation proceeded, it occurred to me that others might be just as interested and may also even have some facts that they could pass on. Unfortunately, at the time I wrote this in 1974 *M.E.* no longer had the original blocks for the photographs which I wished to include, nor did they have the means, which now exist, to copy photographs from back issues, so the article found itself on the back burner. Later, in the process of moving house I mislaid the article and, more importantly, the references to the magazines from which my excerpts had been taken.

Inevitably, what we seek turns up when we stop looking for it; the same occurred with my article and having rediscovered my notes, I now present them here in the hope they will be of interest. Sadly, the lapse of some thirty years probably means that some of the folk who had knowledge of the locomotive are no longer with us, but hopefully there may be still be some out there, more obstinate than the rest, who can help.

The Author prepares Annabel *for a run. Of the photograph at the top of this page he says* "Apart from the 8 coupled wheels, this locomotive bears a strong resemblance and, at 1929, the date is right. Since the builder had to work around *Fayette* he may have adapted the wheel arrangement to suit."

I should like here to pay tribute to the late Tom Pinnock, 'Bro. Six and Eightpence', whose encyclopaedic knowledge of back issues of *M.E.*, got me off to a flying start. He also had some knowledge of the late Noel van Raalte and did some research off his own bat, of which more anon.

Dismal failure

Annabel was built sometime between 1929 and 1936, we know that much because the two power units are built with *Fayette* wheels, motion and cylinders and *Fayette* was described in *M.E.* in 1929. Somewhere between 1936 and 1937, a gentleman named Noel van Raalte bought her to run with other locomotives he had purchased, on his projected track at Bursleden, near Southampton in Hampshire. We also know that around that time she was brought to Curly to try out, since at that time the Bursleden track was not yet in existence.

Let Curly take up the story:

"Subsequently a large car deposited two men at the door, one of normal stature but apparently out of physical condition, the other of Bill Massive size. An indefinable something about both appealed to me at once. The first introduced himself as Noel van Raalte, the writer of the letter, and said 'Meet my delicate little friend Mr. Moir.' Thus did fate take a hand in the game. The two engines were a Mallet and an LNER Pacific ('Tishy'). I recognised the Mallet as one I had seen, partly completed, at one of the M.E. exhibitions, and promptly named her 'Articulated Annabel'.

"We took her out to the track and proceeded to get up steam. The result was a dismal failure, for after nearly half an hour's cajolery we managed to get 50lb on the gauge; she lost it and konked out after half a lap." Curly continued *"I was about to suggest returning the engine to the seller but seeing the look of despondency on Mr. van Raalte's face I offered to see what I could do."*

This was the beginning of a firm friendship. Noel van Raalte became, initially, Bro. Eustace, because like the Genie in Alf's Button, he did everything wholesale, and subsequently, Bro. Wholesale.

"Well, two very disconsolate brothers duly departed hence, leaving 'Annabel' behind, for kind attentions of the 'monkey-gland' department. It is not the least good having a grate as big as Victoria Station if you can't get a decent draught through it; one of the secrets of successful steaming is to proportion your grate to the amount of available draught or vice versa, it doesn't matter which, and make certain that the flow of air goes evenly all over the grate. Annabel hadn't any ashpan, not even a shield for the trailing truck, and the air was just short-circuiting up the tube-plate, leaving the back of the firebox without any flow of air through the grate at all.

"To remedy matters, first of all I fitted a new chimney liner, blastpipe and blower, of a size which experience has taught me would be the most

Curly must have had good reason for overwriting the BRR on the tender with ERIE. Perhaps she is the builder's freelance version of the type in general.

Annabel's four sets of cylinders are 7/8in. bore x 1 1/4in. stroke controlled by Baker valve gear operated by a steam reverser.

Builder's plates, one each side of the smokebox, carry the legend "American Locomotive Company Schenectady 1928."

suitable for this particular size of boiler, then made and fitted an ashpan with an opening at the back only, of a size sufficient to ensure a flow of air passing through the grate at a good speed, though not enough to throttle it.

"On lighting up for another test, using the same blower and fuel as before, steam was raised to full working pressure in just over twelve minutes. Half-way round the track, the safety-valves began to blow off furiously, and I had to open the firehole door a little to keep the engine quiet. However, I was unable to get any water into the boiler via the four axle pumps and two injectors. Knowing that Mr. van Raalte was a Gilbert & Sullivan fan, and had met W. S. Gilbert, I wrote in lyric form, with apologies to W. S. Gilbert, as follows:

Annabel
Steams like (a witch)
Lovely fire
Burns quite well;
But alas!
Sad to say,
Boiler feeds
Not O.K.
All four pumps
Both injectors
N.B.G.
Don't despair!
Urgent need-
By Thursday next,
I'll rig a feed,
Hope the day
Fine will be;
Cheerio
LBSC

"I modified one of the two duplex pumps and discarded the other, and fitted one of my injectors. When tested, the engine steamed in five minutes and ran perfectly for about an hour but the articulation worked stiffly and did some damage to the track. Bro. Wholesale was delighted with the performance and took her back to Bursleden where, apart from a setback due to an over enthusiastic driver tipping her off the track, she ran until 1940."

Power for the headlamp is provided by a miniature working turbo-generator given to Curly by Bobby Thompson of the Southeastern Live Steamers.

LBSC records that *"she could haul four fully loaded cars up the 1 in 75 of the giant racer without trouble."* (They look as though they would seat two passengers each!) After the mishap in 1938 she came back to Curly for a complete rebuild, which he did and says, *"there is not now much left of the original engine, she is all 'Curly'."*

After her return, *"she has actually started a load of six heavy adults from a dead stand on a grade of 1 in 70. She is a peach to drive; you can make her crawl, with no sound from the chimney, or she will fly, with the coupling rods invisible, with the steam reversing gear notched up just off middle."*

Curly and Bro. Wholsale remained friends until his untimely death in 1940 after an operation for internal haemorrhage. Curly wrote a eulogy, *Bro. Wholesale of Bursleden* in *M.E.* 2039, 6 June, 1940 in which he said; *"I have very few personal friends, but he was one them."* He describes their first meeting and the saga of *Annabel* and concludes with details of a codicil in Noel van Raalte's will, which obviously touched him deeply, leaving *"such of the engines, rolling stock and as much of the BRR as I cared to take away, and all the tools, materials and sundries in his workshop, the tools to be shared with Tom Glazebrook in return for his kindnesses."* So *Annabel* and *Tishy* returned to the Polar Route, there to remain until Curly was summoned to the Grand Workshop above.

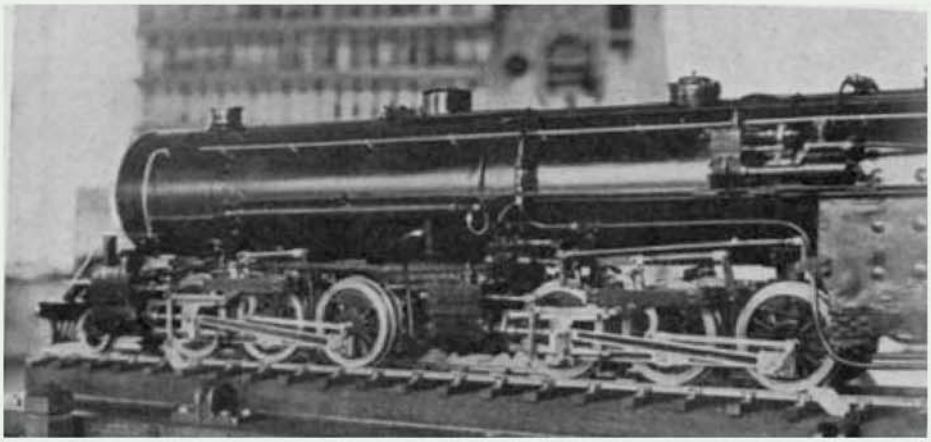
Five feet of black oiliness

Curly, as Patron of North London SME, used to contribute to the Society's News Sheet, as *Curly's Corner*. Several of these described his stable of locomotives and one is dedicated to *Annabel*. He describes her as 'five feet of black oiliness'. This is still true, possibly more so today!

He continues, *"she is a 'simple' with all four cylinders taking steam direct from the boiler. They are 7/8in. bore and 1 1/4in. stroke, the coupled wheels being 2 3/4in. diameter. The wheel arrangement is 2-6-6-4, the second six being the only part rigid. The leading chassis is like a 2-6-0, and there is a four-wheel bogie under the cave of old Kentucky that does duty for a firebox. When she hits a curve, the leading pony truck first swings over as though she were feeling her way, in a manner of speaking, then the first set of coupled wheels follow, being pivoted bodily to the back main frame. Then her big boiler lazily swings to the curve, and the twelve-wheel tender plays follow-my-leader."*

I could have told you all that myself, but I think Curly's words, echoing back over the years,

Annabel's *front end photographed by Noel van Raalte and published in* M.E. *1885, 24 June 1937.*



***This view was also photographed by Noel van Raalte and appeared in Curly's* Shop Shed and Road, M.E. *1903, 28 October 1037 with the caption* "All business end - the works of 2½in. gauge *Annabel*."**

some of them never before read except by the older NLSME members, have a magic that I could never emulate.

The locomotive alone is 38in. long and weighs 78lb. empty; with the tender, the total length is 5 feet. (Curly, in one his last mentions of the locomotive says *"I do not run her as often as I used to as she lives over the garage and with the onset of Anno Domini is a bit of a job to carry downstairs."* Bearing in mind the weight, and the fact that he was well over 70 at the time I find that a bit of an understatement!

The four sets of Baker valve gear are controlled by a steam reverser via a complex system of rods to allow the front bogie to swivel without affecting the valve cut-off settings.

To revert to Curly: *"the steam reverser is made exactly as I described in these notes some years ago and it works well. Briefly, the reverser consists of a small cylinder, like that on a 'donkey pump', mounted above the weighbar, or reverse shaft; the piston rod is furnished with guides and crosshead, and a connecting rod coupled to the reversing arm. It has a crosshead arm, union link and combination lever, exactly the same as a Walschaerts or Baker gear.*

"The rod from the 'Johnson bar', as the American enginemen call the reversing lever in the cab, is connected to the lower top hole in the combination lever. When the driver moves his reversing lever, the reach rod communicates this movement to the combination lever, which in turn moves the slide valve, admitting steam to the cylinder and working the gear according to which way the lever in the cab was moved. But the movement of the crosshead also actuates the combination lever, moving it in the reverse direction and returning the slide-valve to its central position, cutting off steam from the power cylinder. The valve has no lap and only just spans the ports; therefore, the slightest movement of the lever in the cab produces a corresponding movement in the power cylinder, and the gear is operated as accurately as if the reversing lever were directly connected."

"To allow for articulation, the gears on the front and back engines are connected by what are sometimes called differential beams. Two beams, pivoted horizontally at their centres, are arranged one behind the other. The offside ends are coupled by a union link; the nearside ends are connected to front and back reverse shafts. When the front engine swings on a curve, the pivots alter their position, but owing to one end of the beams being permanently coupled, the other ends alter their position in exact relation to the amount of swing, and keep the two reverse shafts exactly in unison."

Running down the side of the boiler is a thin rod, operated from the cab, which disappears into the smokebox and operates a bell-crank inside. I was a bit mystified by this as it did not appear to do anything. I later discovered in the notes that it used to operate a smaller blast nozzle which swung down over the fixed blast pipe rather like a candle-snuffer to sharpen the blast when running light. Curly thought that, although ingenious, it was not really necessary. Whether he removed it, or whether it succumbed to the smokebox environment, remains a mystery. There is also a rather delightfully toned chime whistle disguised as the air reservoirs on either side of the boiler.

Blobs and gadgets

Among the alterations which Curly made were moving the dummy headlight from top of the front buffer beam, (which is where it ought to be so that it swings with the front bogie and points down the track) to the smokebox door. He then fitted it with a bulb powered, initially by a battery, and later by a steam turbine mounted just in front of the cab. I guess that he moved the light up to the door to prevent the wire chafing as the bogie moved. He had been looking at the problem of a miniature turbo-generator. See *M.E.* 2717, 18 June 1953. In the USA, they had been thinking how much nicer it would be to emulate the prototype and have a working generator, the problem being the size.

"However, they tackled the problem and working turbo-generators have now been around for some time past. The two worthy brothers responsible are Otha Hege and Frank Kaylor of Lexington, North Carolina who perfected the miniature working turbo-generator about a year and a half ago. Otha was responsible for Milly-Amp part, and Frank for the spinning-jenny. The construction was fully described by Bobby Thompson, of the Southeastern Live Steamers, in the Miniature Locomotive. I thought that, if only I could squeeze the time in, I would build one for Annabel, to use in place of a battery. However, a kindly fate took pity on my lack of time, and I got one without the trouble of building it. Bobby has followed my notes for many years, and as a mark of consideration offered to send one as a gift. This offer was accepted with avidity, at the time of writing it is not yet fitted, meanwhile, I have forwarded Bobby Thompson one of my little injectors to feed his locomotive with another variety of juice — one good turn deserves another.

The two builders plates, added either side of the smoke box, read, 'American Locomotive Company Schenectady 1928'. I believe these were also a gift from the USA, possibly from Billy van Brocklin of New York.

With all these gadgets and blobs to play with there is always something to do, even when standing still, and there is always the chance that you might be able to convince the lay observer that you actually know what you are doing! The only thing that does not work is the bell, which always seems to disappoint people for some reason!

Another change that LBSC made after her return to Purley was to delete the letters BRR (Bursleden Rail Road) from the tender sides and replace them with ERIE. Possibly, he had reason to believe that the prototype was from that railroad? They certainly had Mallets. I have spent quite a lot of time browsing through American Mallet locomotive books but have not yet found an identical prototype; however, she does, reflect the general arrangement and appearance of Mallet locomotives in the United Stated circa 1928.

I have found that it takes me more than the twelve minutes mentioned to get up steam, more like fifteen. In addition, *Annabel* tends to be sulky until thoroughly warmed through, not really surprising with all that cold metal and pipework. She usually manages to stagger round one lap of the NLSME Cuckoo Line and we have to stop for a blow-up. Next time she is happier and then just gets better and faster; with full regulator and notched up the speed increases to the scary point. Curly says that he could run for thirty minutes without touching the fire, with a grate size 6½ x 4in. it is hardly surprising that she can run for long periods without the fire needing attention. I have found the average time to be about fifteen minutes at the end of a run, with a personal best of twenty.

Even after all this time I have never mastered the locomotive to the point where I can drive her without continuous concentration. It does my self-respect no good at all that Bryan Luxford can drive her with complete nonchalance, bags of steam, plenty of water, while engaging in chit-chat with admiring onlookers; it makes you sick . Whose engine is it anyway!

As visitors to the North London Society track will know, we do not have 2½in. gauge on the main line but only on a smaller circle known as the 'Cuckoo Line'. While *Annabel* is quite happy running round and making her driver dizzy, what she really likes is to stretch her legs on a longer run. To which end she has been to visit other tracks including Birmingham (where I first drove her, and had no thought that there was any chance that I might own her some day), Romford, Colchester, Nottingham and the old raised track at Harrow. Descending the back straight at Birmingham at speed, which seemed to increase as I closed the regulator, was exhilarating, almost to the cycle clips point.

Out and about

One of Annabel's disadvantages is cleaning her, especially after a run. Dropping the fire is no problem, the grate is fixed to the ashpan and the four-wheel bogie to the ashpan, all you have to do is to back the locomotive so that bogie overhangs the rail in a steaming bay, put a bucket under it, unscrew the rod which passes through the frames and ashpan and stand clear!

However, cleaning the smokebox and tubes is quite a different story. The only access at the front is a 1 1/4in. door with six dogs, as in full size, except that in full size the smokebox would have been at least 7ft. in diameter with a proportionate increase in the door size. So I had to manage as best as I could, sucking the char out via a smaller tube attached to a vacuum cleaner and cleaning as many tubes as could be lined up through the small opening. After a season of frustration, I removed the smokebox front so that all was revealed and I could give her a real clearout. I improved the alignment of the blower while I was at it.

While poking around with a thin piece of wire behind the blastpipe a hole appeared at the bottom of the tubeplate. Thinking I had made a hole in a thin part of the tubeplate I was horrified but then found it to be one of three bottom tubes which I had not previously known to exist! The locomotive seemed to have run quite well without them and having cleared them I could not honestly see any improvement. I suspect that they contribute little to the steaming for two reasons; first that although the grate area is large, the depth of fire is not since the bottom edge of the combustion chamber is only about 3/4in. above the grate so that a high fire will soon allow small pieces of ash and semi-burnt coal to clog the bottom tubes.

At the front end, when pulling away with a cold engine, even with all the drain-cocks open, large jets of condensate shoot from the blast nozzle, most of which falls back into the bottom of the smokebox creating an oily slurry which prevents ash and char from being blown through to the front of the smokebox. The resultant paste is very difficult to remove and quite successfully resists the small tube on the vacuum cleaner ploy. Back in 1974, having seen how easy it was to clean with the smokebox front removed, I decided that rather than remove some 20 or thereabouts 8BA hexagon head bolts, it would be much easier to make the bolt heads dummy, fit a flange and have either a push-in and twist lock or a device with a hook accessed via the chimney, as on Mr. Taylor's LNWR tank. This seemed a much more sensible idea and I really must get around to it soon.

While visiting the Colchester track it was suggested that a 'brick arch' would solve the problem of bits blocking the bottom tubes so I made one out of a piece of stainless steel. Unfortunately I have not yet been able to fathom a way of fixing it, given the way in which the grate and ashpan are secured and not wanting to risk fixing it to the firebox. It would be interesting to at least see if it had any effect.

So far, the only repairs I have had to make have been to make a new flexible pipe from the front cylinders to the blast pipe. This consists of two pieces of tube, one telescoping inside the other with a swivelling ball joint at each end. The whole thing disintegrated towards the end of our run at Harrow in 1976. I managed to salvage some of the bits and remade the rest. She seems none the worse for the surgery.

***The original caption to this contemporary photograph by C. J. Grose reads* "A corner of USA in England. World events indicate a cordial and permanent alliance between the two great English speaking countries. May we hope that this picture of Tom Glazebrook as an American 'hogger' driving *Annabel* on LBSC's railway, is a happy augury of things to come."**

The other part to succumb was the superheater. Until then I had noticed that, even on a warm day, she always ran with a plume of condensate from the chimney which gives quite a pretty rainbow effect in the sunlight. I decided to try a method of superheater spearheads described by the late Arthur Marsh, (a great loss to North London SME and model engineering in general). His technique was to take a piece of copper tube with an I/D slightly greater than the combined O/D of two of the superheater tubes and annealed it. He next took two pieces of steel rod, each of the same diameter as the O/D of the superheater tubes, slid the two rods into the large tube and formed the latter around them in a figure of eight so that the tube was a snug fit over any pair of superheater tubes.

Having cut the larger tube to an appropriate length, in my case I cut the old tubes back to a point where they were sound, and cut the return tubes long enough to protrude into the combustion chamber. At the hot end, a bullet shaped plug of bronze was turned with a step to fit the tube. This was brazed in with high melting point silver-solder, the other end slid over the appropriate pair of tubes and was brazed with Easyflo. Having replaced all four headers and reassembled the whole gubbins into the boiler, I was quite pleased that at the first trial, it was steam tight and the plume had gone. This seemed to me a most easy and effective way of making or replacing superheater spearheads.

On the flyleaf of Nevil Shute's *Trustee from the Toolroom* he quotes; *"An engineer is a man who can do for five bob what any bloody fool can do for a quid."* That could have been written especially for Arthur Marsh.

Footnote

Here are some extracts from a letter the late Tom Pinnock (well-known to both *SMEE* and *NLSME*) wrote to me while I was still researching:

"LBSC remembered seeing this engine in an unfinished state at an M.E. Exhibition. I have gone through reports from 1929 to 1936 and there is one, and only one model which seems to 'fill the bill' — that is a 2 1/2in. gauge Mallet entered for competition in the 1931 M.E. Exhibition by Quartermaster Sergeant W. H. Webb of Highams Park, London, E4, which won a Silver Medal there. LBSC's column at the time shows that he attended that particular exhibition, so he would have seen that model. However, there is the difficulty that he refers to having seen the model in an unfinished state. There are two possible explanations: first, it might have been un-painted; secondly, (which I think more likely), it had previously appeared on a Club Stand.

"In M.E. of this period there are no systematic descriptions of competition or club stand models and there are no photos of this particular model. This being so, we cannot say with certainty that Annabel is in fact the medal-winning model shown by QMS Webb. However, it does seem rather unlikely that there should have been two 2 1/2in. gauge Mallets within a year or two of each other both which appeared at the same M.E. Exhibition. Moreover, Noel van Raalte, being a man of considerable means, (he entered and drove a Bentley in the Indianapolis 500) would, I feel have been attracted by the chance of buying and running a medal-winning model. On the whole, I consider it probable that the Webb model was the origin of Annabel. But, on the information we have, it cannot be proved. It is possible that an enquiry in M.E. as to this model might produce further evidence.

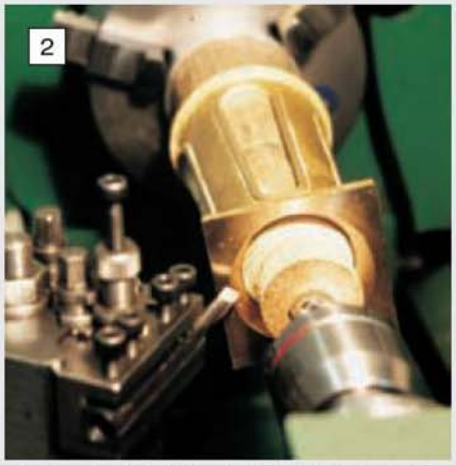
Yours sincerely, Tom."

(In case you did not know, or hadn't guessed, Tom Pinnock was a particularly successful Solicitor!)

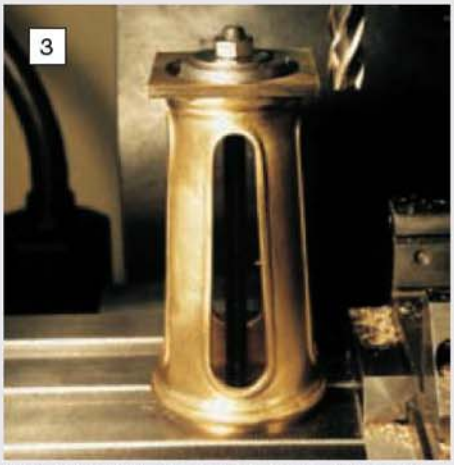
I think that is more than enough chat from me, if any reader knows any further details regarding the antecedence of *Annabel*, particularly any information regarding QSM Webb and/or the possible prototype I would be most grateful to hear from them.

If anyone wishes to learn more about *LBSC*, there is a particularly good book by Brian Hollingsworth, which includes comment and photos of *Annabel* and Noel van Raalte. This book has been reprinted by Adam Harris and is available from Camden Miniature Steam Services (01373-830151).

Fairbairn's engine in the single cylinder, double webbed crank configuration.



Cutting the large, internal chamfer in the top of the column using a wooden plug for support.



Milling the four edges of the square at the top of the column on the vertical milling machine.

FAIRBAIRN'S COLUMN ENGINE

Anthony Mount

discusses the choice of threads for this model and begins construction with the main column.

●*Part II continued from page 315 (M.E. 4230, 17 September 2004)*

BA threaded fasteners are specified for this engine; these are still generally available and, incidentally, are based on a metric standard. I show fine imperial threads for use on components, these being in most common use among model engineers, at least in the UK. However, a range of standard metric fine threads and fasteners for model engineers is available, details of which are included in T. D. Walshaw's article published in *M.E.* 3991, 21 April 1995. This feature covers threads and nut sizes as designated in PD6507-1982 by the British Standards Institute and which came about from a working party promoted by *Model Engineer* way back in 1980 seeking a set of standard metric threads to suit the requirements of model engineers. From this it is evident that 0.5mm pitch can be substituted for 40tpi threads, 0.75mm pitch for 32tpi threads and 1mm pitch for 26tpi threads, depending, of course, on the application.

To let you see what you are letting yourself in for by building this engine some photographs of the different configurations were included with Part I of this series. As promised, General Arrangement drawings of the remaining types are shown here, so you can chose which one appeals to you the most.

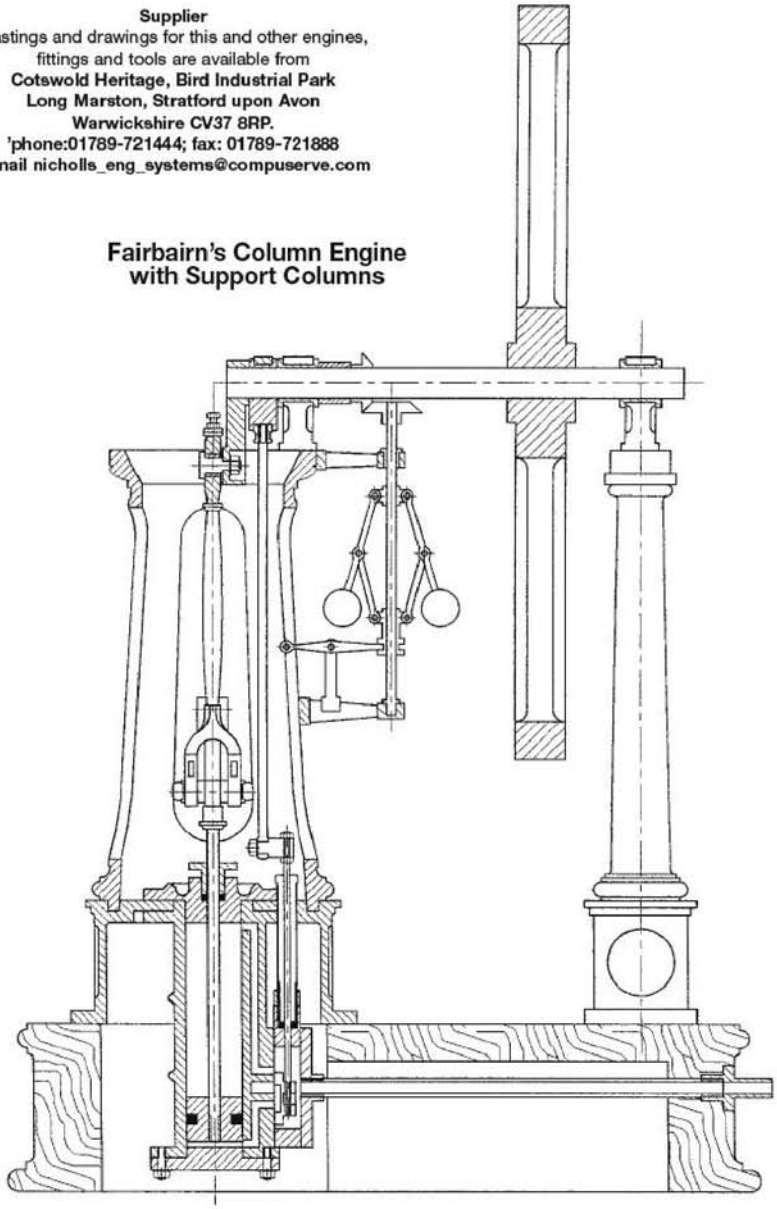
Let's make a start on construction, and as it is one of the largest castings, the column is an ideal piece to begin.

Column - Part 01

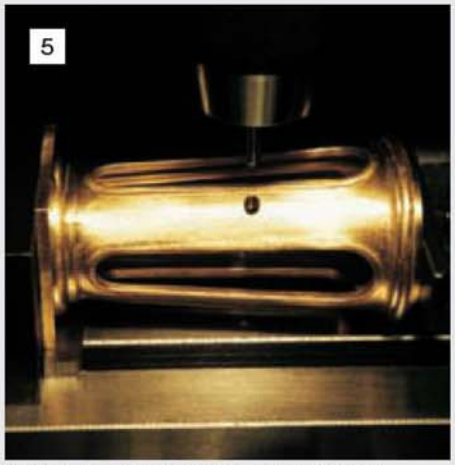
The main support is in the form of a classical Doric column. Supplied as a lost-wax (investment) casting in brass, it is provided with four slots to

Supplier
Castings and drawings for this and other engines, fittings and tools are available from
Cotswold Heritage, Bird Industrial Park
Long Marston, Stratford upon Avon
Warwickshire CV37 8RP.
'phone:01789-721444; fax: 01789-721888
e-mail nicholls_eng_systems@compuserve.com

Fairbairn's Column Engine with Support Columns



Using a wobbler to pick up the edges of the casting so that the hole coordinates can be set.

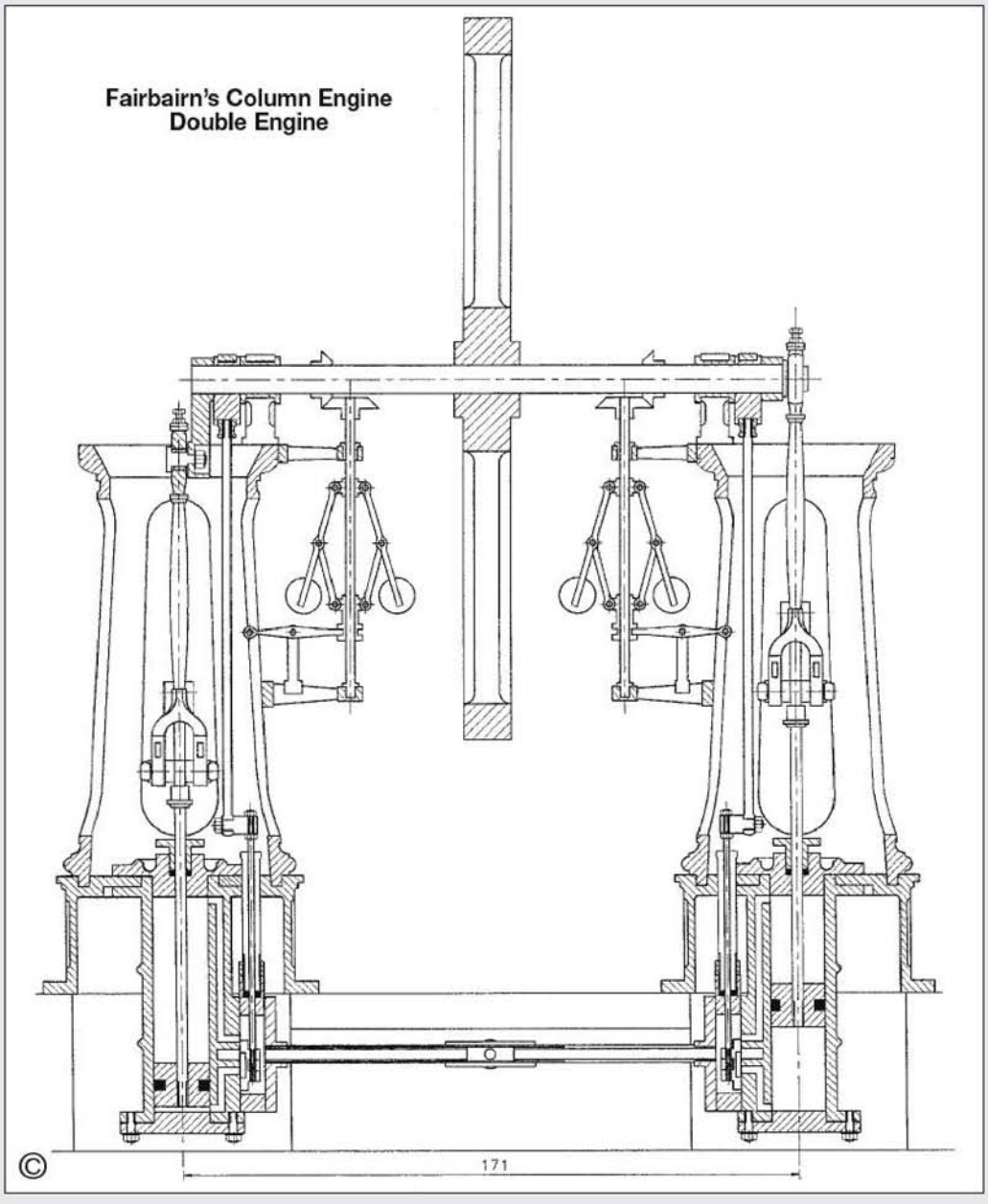


Drilling the holes for the governor lugs and parallel motion pivot point.

Once machined, the base can be clamped to the column for spotting through the fixing holes.

allow access to the components inside the column. Start by cleaning up any imperfections; being a lost-wax casting, the definition is very good but there will be the odd pimple here and there. Use a fine file and emery cloth inside and out. One of the facets inside my casting looked as if it had a run of treacle down it — something like a shallow lava flow just 0.001in or so deep. This was apparently caused by the core not being hot enough; I filled it with car body filler and rubbed it down.

The casting needs to be machined top and bottom; the problem was how to hold it. My solution was to make up a tapered wooden bung. I found an aluminium alloy ring from a previous job, reduced the end of the wooden plug and hammered on the ring to provide something firm for the chuck jaws to grip on. The other end of the wooden plug was drilled 8mm for a mild steel pin which was pressed in; one end of this pin was drilled with a centre hole to allow the outer end to be supported on a tailstock centre. The wooden plug was then turned to an 8deg. included angle to fit inside the column.



The column was pushed onto the plug and, after a few taps with a hammer, was found to be gripped very firmly. The casting itself was found to be slightly barrel shaped. An advantage of it being in brass now came in handy, as a few more blows along the sides with a nylon faced hammer straightened it out. It was then possible to face off the top of the column; the setup is shown in **photo 2** where the top inside chamfer is being machined. In the first instance, just enough was removed to clean it up.

The bottom of the column was faced off and the outside of the locating spigot turned. Then my attention returned to the top of the column which was faced off to bring the column to the finished length. I also took a cut across the curved moulding below the top edge, bringing it to just a shade under 55mm diameter which made it possible to use this as a reference diameter when machining the top square. A little juggling with top- and cross-slides merged the cut into a smooth curve with the moulding.

The column was removed from its plug and set upon the milling machine for the four top edges to be machined square. Someone had been too enthusiastic with an angle grinder when removing flash, so I had to make the square a little undersize, but fortunately

this dimension is not important. To secure the column to the milling machine table, a stud was passed right through the column body into a table T-nut. A circular plate about 6mm thick was used as a washer at the top of the column to spread the force of the top clamping nut (**photo 3**).

Care was taken when setting up that the slots in the column were set square or parallel to the axis of the machine table so that the column top square was properly aligned. An end mill was used to take a cut along one side, using the machined moulding below as a reference to show where to stop. The operation was repeated on another side at right angles to the first and the other edges machined to bring the top to finished size. Depending on the configuration of your engine, the two or four tapped holes for the pedestal studs can be drilled next. Use of an edge finder and co-ordinate drilling technique are the best way to locate the positions of these holes. **Photograph 4** shows the edge being picked up with an edge finder.

The column was re-mounted on the plug and the deep chamfer at the inside top of the column machined using a boring tool (photo 2); this cut into the holes previously drilled and tapped. The surface of the plug will be marred during this operation but no matter, it is an expendable item.

The next operation, namely drilling the holes for the parallel motion pivot and the governor bottom bracket bolts, was the most difficult. Fortunately they are in line and one fulfils a dual role. Bear in mind that for a double engine they are handed. Also the engine with a wall box is the opposite to that drawn.

The column was set up between angle plates bolted to the milling machine table. A stud passing through the plates and column was used to clamp the column tightly between the angle plates (**photo 5**). This provided a rigid setup, and allowed the column to be set parallel with the table by packing with a parallel under one of the straight top edges. An edge finder was used to pick up the top and then an edge; the dials were zeroed and the centre line of the chuck positioned on the top edge and centre of the column. Co-ordinates were used to come 69mm down from the top edge and 15.37mm either side of the column centreline. These are the positions for the holes for the governor lugs and parallel motion pivot point.

It will be noticed that this point comes on a steeply curved surface. Fortunately, 5mm ($^3/_{16}$in.) dia. centre drills are available, and one of these was used to drill all the way through the column without danger of drill wander. If you are still using imperial stock, change the lugs to $^3/_{16}$in. diameter and use a $^3/_{16}$in. centre drill.

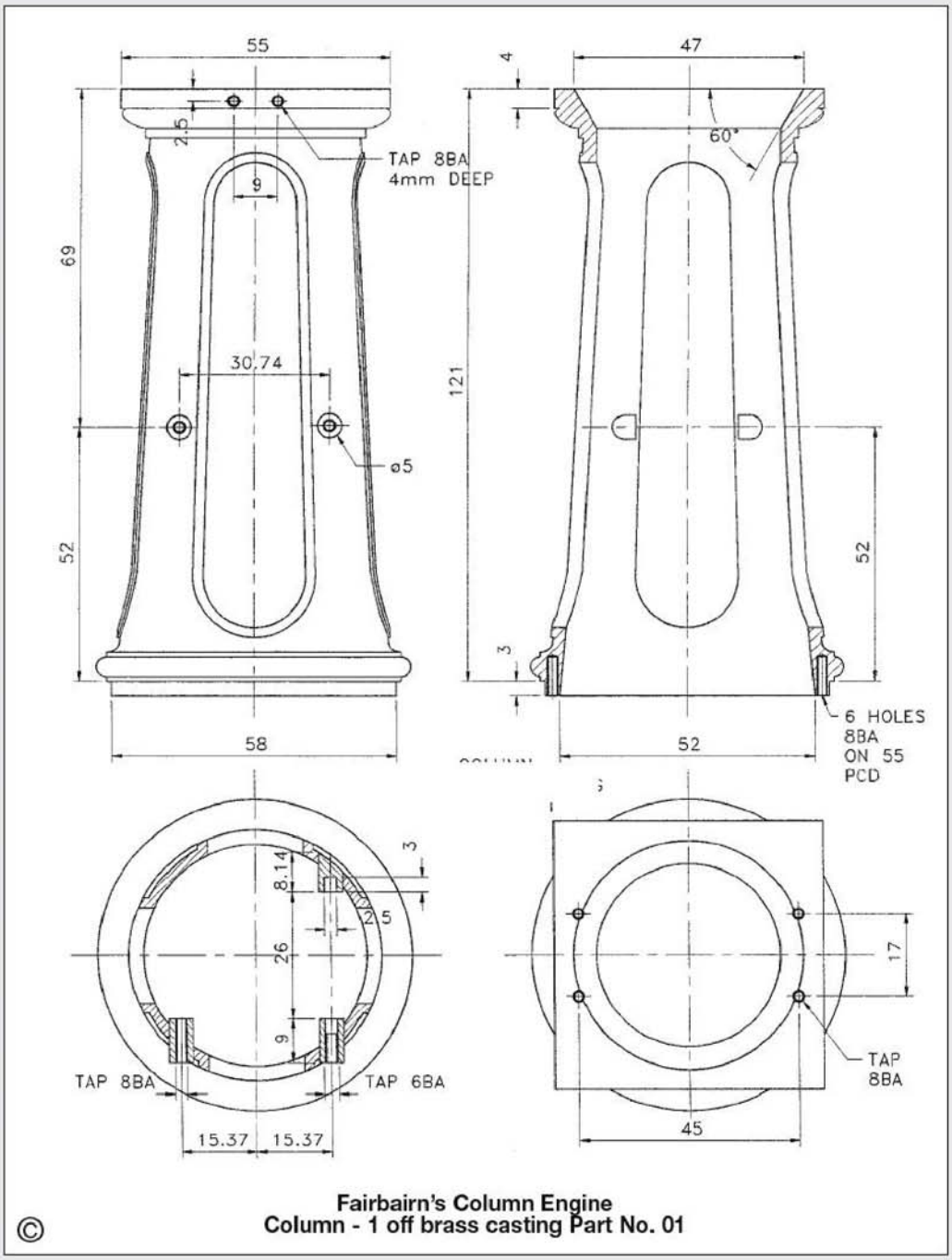
Had this centre drill been long enough, it would have been nice to be able to drill through to the other side of the column. But centre drills are not long enough, so the casting had to be turned over and the position relocated with co-ordinates to drill the pivot point on the other side of the column. Great care was taken as the drill broke through, because it was cutting intermittently on the internally curved column surface, and the point of a centre drill is vulnerable. An alternative would have been to use a one-size smaller centre drill and to open out the hole to finished size with an end mill used as a drill. To some extent, end mills used in this way are self-centring.

As already noted, it is important to bear in mind that these lugs are in different arrangements, depending on the configuration of the engine under construction. The lugs can be made up and silver-soldered into the column. I used a simple jig to hold the lugs in position; it consisted of a block of aluminium alloy with two rebates either side. The rebates were tapered to wedge into the slot in the column. The resulting 'ears' of the block were the width between the inside faces of the lugs. So all I needed to do was to push the block into the slot from the inside the column, then insert the lugs from outside until they stopped against the block. Without thought, because they are painted, I made my lugs from steel. However, this was not a good idea when it came to filing down the single one flush with the column. The different materials did not make it easy to bring them flush. With the benefit of hindsight, brass would have been a better choice of material.

After the base has been completed it can be used as a template to drill the fixing holes in the bottom flange of the column (details next time). I have shown them as 8BA but should the flange have worked out a little thin, or if they are near the edge, you may prefer to use 10BA screws.

To hold the base and column together for spotting the holes, I made up a round bar to sit in the bottom of two slots in the column. The bar was drilled in the centre and tapped for a stud to pass through a washer in the base into the bar, which locked the two parts together (**photo 6**).

●*To be continued.*



Fairbairn's Column Engine
Column - 1 off brass casting Part No. 01

M.Y. OTTO DI-CYCLE

Our Author prepares himself for an outing on his replica Otto Di-Cycle.

Malcolm Young
continues with the construction of this unique replica of a velocipede dating from the late 1870s.

●*Part II continued from page 320 (M.E. 4230, 17 September 2004)*

For the drive shafts, I first thought of using recycled Marina half shafts; however, they are much too heavy for my requirements. They are also toughened and would need to be softened prior to being worked. Whereas I have the means to heat and soften small items, long shafts presented a problem so I decided to use the splined ends only and fit them to custom made shafts.

As previously mentioned, the bore size of the bearings needed to be 25mm, so in order to keep machining to a minimum, a metre of 1in. (25.4mm) mild steel bar was purchased. While grateful for their efforts, I was disappointed, as indeed were they, that the free offerings from a number of contacts were of 25mm material which did not provide the few thou. required to form true running bearing 'lands'.

The length of the shafts was just within the capacity of my standard length Super 7. That said, to be truthful, the tailstock overhung the end of the bed.

Pedal cranks

Resorting once more to *M.Y. Coventry* practice, I used a pair of reclaimed cotter pin type cranks. The normal chainwheel was removed from the right-hand crank and the crank was then cut in half. One reason for this is so it can be swung in the Myford in order to graft on the modified 3-speed sprocket dog, the other being that the cranks were longer than required so needed to be cut through in any case. The large diameter wheels means that gearing as such is not required; however, using the 3-speed sprocket fixing enables gearing to be altered by changing the sprockets, should this be desired.

Frame

The original appears to have had little more than a cross-tube to which all the cycle parts were fitted. The wheels rotated independently and, as they were driven from their respective pulleys, were not interconnected other than through the pedal crankshaft. My differential arrangement required a cross-frame as it had to rigidly support the axle bearings as well as the cycle parts. The simplicity of a single large diameter tube was attractive but awkward from the fixings point of view. A rectangular section would have probably been the easiest to which to attach the bits and pieces, but did not appeal from the visual aspect. Hence the 'space frame' design.

Both lower tubes are of steel conduit with the galvanising removed, while the top tube is bicycle frame '501' top tube. The triangular stretchers are made from 2.5mm mild steel sheet, the same material from which the inner spoke plates for the wheel hubs were cut. All four stretchers were machined as a 'laminate' to ensure identical measurements. Spacing of the stretchers had to be such that they were clear of the bearing carriers; this being arranged, the parts were tacked using the MIG kit and then brazed together.

The four bearing carriers were made from 25 x 6mm mild steel strip and accurately located prior to tack welding and brazing. Considerable attention was paid to locating the hole positions for the bearing holding bolts as satisfactory operation of the differential unit depends upon true alignment.

At this stage, the location of control handles and mountings for the brake caliper arms had not been determined; however, the position of the seat tube was decided upon. A twisted but rust-free BSA bicycle was dragged from Kevin's scrap heap and the required section cut out.

Pedal bracket

A single large diameter down tube is used as with *M.Y. Coventry*. A number of the Raleigh family of cycles, such as *Choppers, Grifters, Shoppers* and the like, have this size material as a main frame tube so it appears on Kevin's scrap heap occasionally. My method is to graft the tube directly to a standard bottom bracket and fabricate a top section which provides a means of attaching it to the frame in such a manner that it also allows for chain adjustment. Again, care is necessary during assembly of the parts because alignment of the chain and sprocket drive is dependent on this.

Disc brakes

A noticeable feature of the *Otto* is the drive pulley arrangement which is completely absent in my adaptation. However, the upper drive pulleys also serve as brake wheels so I made the brake discs large enough to feature in their place. ▶

A view of the disc brake mechanism in place on the Author's finished Di-Cycle.

Cut from 6mm aluminium alloy plate, the brake discs were set to run true against a reference.

Modern cycling has gone 'innovation mad', with many machines featuring extremely compact mechanically operated brake calipers. I contacted a local cycle shop and, as I had helped him with a few bits of jobs in the past, he insisted I had a pair of calipers free of charge — the good old barter system lives on! Incidentally, the 'as new' Brookes saddle came from the same source at a nominal charge.

As supplied, the calipers are designed for use on a disk of 3mm thickness and my initial intention was to reduce the outer rim of the disks to suit this. However, by inserting a distance piece between the inner and outer halves of the caliper, it was a simple operation to increase the 'throat' dimension.

The disks were cut from 6mm aluminium alloy plate. Once again my cheapy bandsaw did a valiant job. With a fine tooth blade, slow speed selected and the centre guide pin located in a deep pop mark, it cut a very accurate circle. As the disks are almost 10in. diameter, a chipboard disk was bolted to the standard Myford face-plate. Prior to truing the disks in the lathe, much drilling, sawing and filing was done to form the spokes. Both disks were bolted together for this operation.

As the disks were to be bolted directly to the wheel hubs, I realised from the outset that a true running disk would probably have to be achieved by 'adjustment', possibly by using shims. However, another problem revealed itself in that the spoke tension had distorted the spoke plates into a very shallow dome shape. My solution was to mount thin hard rubber washers between the hub and the disk which (fingers crossed) would accommodate the fact that the mating surfaces were not parallel, and allow a measure of 'adjustment'.

Manufacture of the hinged caliper mounting arms required a few mock-ups using cardboard templates. The resulting folded sections were made from these and were welded up from 2mm mild steel sheet.

Components of the stirrup-type control handles.

Control handles

The picture of the *Otto* shows the handles to be in the form of inverted stirrups, a feature of the design to which I intended to adhere. Whereas I reasoned each handle served two functions in the original machine, they would only operate their respective side brake in my modified design.

How to position the handles on the frame occupied much thought until the idea of drilling through the top tube presented itself. Drilling fairly large holes through thin walled tubing is not the smoothest of machining jobs but it was accomplished without breakage or — more importantly — injury. The maxim *'fasten it down and go slow'* paid dividends.

The outer stirrup was made from some excess rim channel while flat strip was used for inner 'pull-up' section. Two pieces of tubing were machined to fabricate the upright for the outer handle, this acted as a bearing and guide for the thinner tube attached to the inner stirrup. A steel 'plug' was welded into the bottom of the outer upright and this was drilled and tapped 6mm to accommodate a cable adjuster. While the handles would eventually be clad with wood, this was left, pending successful trials.

An initial assembly of the Di-Cycle was made for trial purposes.

Dummy assembly

With what appeared to be all the essential components on hand, while far from finished, but at least tacked together, the decision was made to do a 'put together' in order to ascertain if any modifications were required. Another major reason for the assembly was to obtain some idea as to the form and fitting of the stabiliser 'tail'.

With my son Richard's help, the frame was swinging merrily between the wheels within about 30 minutes. Apart from aligning the axle drive squares, which has to be done blind, no problems arose.

Despite the 'half-mast' situation, the urge to 'have a sit on it' was irresistible. Richard had a go first, hanging on to dad for safety. The lack and absolute necessity of the tail-piece immediately revealed itself. While unbalancing in the forward direction is merely a matter of stepping down, the rider is totally helpless in the case of rearward imbalance and a crack on the back of the head unavoidable. After a few carefully supervised and assisted attempts at balancing were made, some necessary measurements were taken and the contraption reduced to its component parts.

The control handles fitted to the Di-Cycle.

Stabiliser (tail)

A straight length of 32mm O/D tubing was retrieved from Kevin's scrap heap. As with most things Victorian, while a straight piece of material may serve the purpose, tapers and gracious curves are a must for the period. To this end, the straight tube had two longitudinal wedges of material removed over about 70% of its length. A cutting disc in the small angle grinder proved an ideal tool for the purpose.

Gentle persuasion by squeezing in the vice and tapping with a copper hammer produced the necessary reduction in diameter. It was then a case of resorting to my 'jig and jack' technique, as explained in previous articles, to form frame tube bends. I freely admit that guesswork was the basis of engineering for this operation as I had no readily available means of obtaining any dimensions. Once the shallow 'S' shape looked 'something like', I 'bit the bullet' and gas welded the seams. Welding had to be done a few inches at a time, the cut edges requiring regular realignment.

A suitable bracket to enable the tail to be attached to the frame, incorporating 'resilient mounting', was fabricated and brazed to the curved tube. A study of the available graphics show a small wheel attached to the end of the tail. The wheel is small and does not appear to swivel, indicating that there is no intention that it should serve any other function than to prevent the rider falling backwards when balance is lost.

Chain and differential guards

A sheet of suitable 'tin', in reality a scrap shelf from an office cabinet, provided the raw material. This was folded using the workshop vice as the main holding device, then folding the material using an assorted array of angle, round

A handy piece of timber was found for the pedals.

and rectangular bar held in place with 'G' clamps. Two multi-angled brackets were made up and brazed to the pedal tube to form mountings for the guards, another trial and error operation as side clearance is minimal.

Initial test run

A position was reached when the all the essential parts were assembled. At this point, the tail piece had a 'non-steering' wheel. Richard was first aboard, not an especially willing victim, it was immediately obvious that even 'placing the bum on the saddle' is not a simple operation. However, once this first hurdle had been overcome, we were able to make some progress in an approximate direction provided sufficient body weight was kept on the tail wheel. Initially, any attempt to di-cycle (balance on the main wheels), resulted in the rider stepping off in a forward direction.

To be frank, the initial impressions were not very heartening and thoughts of resorting to plans B or even C (converting the thing into a 'Salvo' tricycle or quad), although contemplated, had to be pushed to one side.

The initial test did point to the following:

- Lower gearing was required; I had to go along with this suggestion by Richard as the machine is a heavy brute.
- Chain tension was not being maintained
- The fixed position of the tailwheel made steering difficult, especially at this point on the learning curve when panic set in as soon as the stabiliser left the ground.
- Transmission 'backlash', which affected the rider's balance, had to be minimised.

Modifications

Lowering the gearing and reducing transmission backlash had to be resolved as a single problem. While mounting the sprockets on the Sturmey Archer 'dogs' made gearing alterations easy, it was partly responsible for the backlash. The decision was made to solder the sprockets onto the 'dogs', and gear down using 13t for the drive sprocket and 18t for the driven sprocket.

A design defect was the cause of the chain going slack. I had underestimated the stress to which the central pedal support would be subject

Head-on view; note the snail cam chain adjuster.

and the chain tension was twisting the top mounting bracket. Over-confidence in this department had resulted in the component being already painted. Disappointingly, as extra bracing had to be introduced, a partial strip down and subsequent repaint was necessary. In order to facilitate steering while in 'tricycle' mode, the stabiliser wheel was equipped for castor action.

A second rebuild and testing session, pointed to the modifications being successful, but it was very clear that this machine required practice if it were to be ridden in the 'proper' manner. I also decided to reduce the height of the control handles and adjust the castor angle on the stabiliser.

Completion

Once the height of the control handles had been reduced and the revised castor angle applied to the third wheel, all remaining tacked parts were brazed and thoroughly cleaned of flux, scale, dirt and grease. Some parts had already been painting at this point, including the wheels, prior to assembly, and the pedal support tube. The remaining parts were given the same treatment; five coats of paint were applied by air spray. A few small parts were hand painted. First, a coat of cellulose base etch primer was applied, all subsequent coats are oil based — second coat: red oxide, third coat: grey undercoat, then finally two coats of gloss black. Apart from the etch primer coat which is left 'as applied' intermediate coats were flatted using Scotchbrite.

Countersunk socket-head fixings are used where practical, these are located in custom made brass washers. A large 'snail' cam on the upper pedal support bracket functions as a chain adjuster.

Pedals

In order to create some illusion of authenticity, the plastic pedals had to be replaced. My previous method of replacing the rubber blocks with wooden ones was rejected in favour of a designed-from-the-solid version.

A set of fairly modern pedals was retrieved from my usual source. Whereas the old style of pedal bearings were adjustable and were held together by means of long through-bolts, the modern equivalent is a made-to-length, riveted affair. In order to dismantle a pedal, the riveted ends of the through-bolts were filed off and the bolts punched out. It was then only necessary to grind the end of the pedal spindle away until the outer bearing cone was released, care being necessary at this juncture to avoid a cataract of ball bearings descending into every crevice.

Apart from the two rubber blocks and the through-bolts, all the original parts were recycled. In this case, a single pad of shaped and drilled wood serves in place of the rubber blocks, new through-bolts were required and the ground-off end of the pedal spindle was drilled and tapped to accommodate a 5mm countersunk screw.

Never one to throw anything away, a piece of oil-stained timber behind the drill press proved to be of adequate size and thickness to provide the material from which the pedal blocks could be made. After sketching out a pattern on my favourite medium — cornflake box — the required shapes were cut from the block with the bandsaw. I quickly realised that the salvaged off-cut of timber was ideally suited to the job.

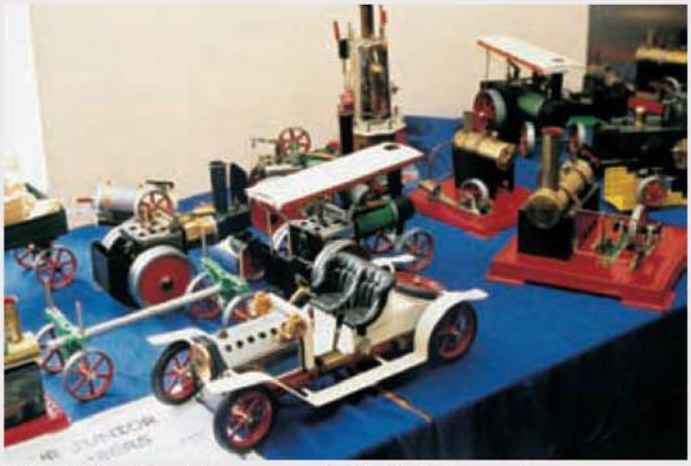
In total, five holes were bored in each pedal block. The two large diameter holes are just for 'looks', although they do reduce the bulk. The drill press was used for these holes. Boring the longitudinal holes to accommodate the bearing spacer and through-bolts was done on the Myford with the pedal block clamped to the cross-slide. A degree of accuracy was important for obvious reasons. Good alignment resulted by using this method and made the job of clearing the lathe of wood cuttings worthwhile. An ample helping of abrasive paperwork and a few coats of varnish completed the woodwork.

New through-bolts were made from 5mm steel rod which was threaded about 10mm at each end. The 'dome' effect on the outer end of the bolts is just a plain nut with a gravity formed blob of soft solder applied.

●*To be continued.*

A rear view of the initial assembly of the Di-Cycle.

The polished brasswork of Jim Ledger's Anne *gleamed in the sunlight.*



A fine display of models was presented by the junior members.

WORTHING EXHIBITION 2004

Gerry Collins
reports another successful event held by the Worthing & District Society of Model Engineers.

It seems only a few months ago that I made the trip to Field Place, Worthing to visit the Worthing DSME exhibition, and here I was on the A27 heading for the 2004 show. Maybe not so surprising for an annual event, but the Worthing Society wisely organise their exhibition every other year so there are plenty of new models to see and old friends to meet. Field Place is run by the council and has tennis courts, bowling greens and many other facilities including the Barn Theatre which the society uses for the main display of models.

I understand that the weather on Saturday was fine and sunny but showers were the order of the day for my visit on Sunday. Enjoying the protection of the glass-sided foyer, members of the marine section operated their boats on the portable pool situated outside. It was pointed out to me that while the boats are used to getting wet, the members like to keep dry and warm!

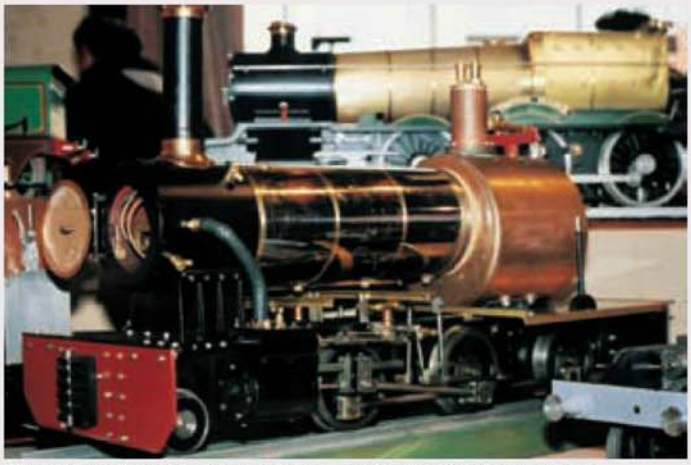
Having entered the main hall the first smiling face to greet me was 'Mr. Stirling Engine' himself *aka* Roy Darlington. As always he was demonstrating the low temperature Stirling engine to youngsters who seemed amazed that just the heat of their hand was enough to keep the engine running. Roy also had on display some of his 'Hi-Tec' models such as his moon buggy and speedboat, both of which deserved careful study.

To show that you do not need a small fortune to start model engineering John Rea had set up a simple workshop with a small lathe and milling machine together with a selection of hand tools

Lynton & Barnstaple Railway 2-6-2 tank Engine Lew *built by Jim Ledger.*

John Rea demonstrates to John Bibby the small lathe in the workshop area.

This Aberdeen lifeboat model BP Forties *was awarded the Dodd Trophy.*



This enlarged version of a Sweet Pea *engine is called* Runner Bean.

The late Jim Forsfold left his unfinished **Enterprise** *to the society. It has been completed by John Rea, who is seen driving the engine on the track.*

Between the showers the track was busy with queues of passengers, the cost of a train ride being included in the entrance fee.

and, together with John Bibby, was machining castings for a Stuart V10 steam engine. It certainly demonstrated that a large workshop is not needed to build a steam engine that runs.

Visitors were taken back to the bygone days of model engineering by John White who was machining items on a Barnes treadle lathe of the 1880s. Treadle lathes certainly teach you to keep the lathe tools sharp! This brought back memories for me because the first lathe which my father and I bought was one of these machines. Purchased from a local beekeeper, when we went to collect it we found it in the lower deck of a Southdown bus body. The upper deck was on the other side of the garden for use as summer accommodation when they had visitors.

One of the Worthing DSME stalwarts was the late Jim Worsfold and, through the courtesy of his family, his model of a Shand Mason fire engine was on display. Jim will be long remembered for his cheerful disposition and his help and advice to fellow members. When Jim died his part-built 5in. gauge LNER 2-6-2T, designed by the late Martin Evans, was presented to the society and completed by John Rea. This engine was seen on the track hauling crowds of happy passengers.

Worthing Society members have a wealth of quality locomotive models. It was certainly good the see a number which were new to me. Martin Evans' *Torquay Manor* is a very popular model, and Alan Norman has called his version *Compton Manor,* No. 7807 representing one of the first batch built in 1938. Withdrawn in 1964 it was scrapped at Cashmore's yard at Great Bridge. When you build a model of a Great Western engine you must be prepared to drill plenty of holes and insert several hundred rivets. The riveting on Alan's tender was very neatly done and would gladden the heart of any Swindon enthusiast.

A railway which closed before the era of the preservationist and is sadly missed is the Lynton & Barnstaple narrow gauge line which ran in north Devon. A model which brought back memories of pre-war summer holidays was *Lew* a 2-6-2 tank engine by Jim Ledger. Painted in Southern Railway green livery, the late and lamented Les Warnett who designed the model would have been delighted that the engine was awarded the Town Challenge Cup for the best exhibit at the exhibition.

Jim displayed another example of his model making skills with a superb 5in. gauge model of a London Chatham & Dover Railway 2-4-0 'Asia' class. Painted in green and lined out with red, yellow and black lines and Indian red frames,

Past Chairman Michael Wheelwright leaves the station with a happy load of passengers.

the locomotive and tender glinted in the sunlight entering through the large windows.

One of the most successful model designs of recent times is *Sweet Pea*, a narrow gauge 0-4-0 tank engine. Many variations have been built with different wheel configurations. On show was yet another variation with a 2-6-0 wheel arrangement. Called *Runner Bean* I feel sure it will be a powerful passenger hauler when complete.

The society boasts a large and active boat section and some superb examples of the ship builders' art were on display. In picking out only two I hope that I will not offend the others, because they were all of equally high standard. The first model I chose was a model of the Aberdeen Lifeboat *BP Forties*. One of the most successful lifeboats ever, the 'Arun' class is well suited to be seas of the Scottish coast and George Knight has captured the lines and details superbly. It was awarded, and very well deserved the Dodd Trophy for the Best Marine Model. The other model which will bring back memories to ex-servicemen who served in the South Atlantic was a 1:7 scale model of *Salvageman* by Roy Russel. This salvage tug, now owned by United Towing, served with the Royal Navy in the Falklands.

At this point I decided that some liquid refreshment was the order of the day so I made my way to the club house where the inner man was well catered for. It was interesting to note that the rota was arranged so that everyone took a turn and no one ended up with chapped hands through having to wash up all day.

Worthing DSME members run a series of junior workshops during the school holidays when youngsters build a simple steam engine which they get to keep. As a result the society has an active junior section and examples of some of their work and interests were on display. The Mamod, Wilesco and similar steam models are a great way to get young lads and lassies interested in steam and model engineering. Also in the club room was a display of model fairground organs, the work of Derek Betterton. Derek has been interested in the fairground scene since he was a youngster, and his display raises money for the Fire Services Benevolent Fund.

Having been suitably refreshed it was time to return to the main hall, passing on the way a number of large scale traction engines taking advantage of a dry spell to run up and down the paved paths outside the hall. Inside the hall a fine selection of traction engines was on display. In various scales, these reflected the different members' interests. The 1in. scale *Minnie* described in *Model Engineer* by Len Mason is a very popular design. It is unusual in that it can be built as a traction engine or as a steam roller. The fine example on display by Norman Avis was in traction engine form. Going up the scales I found a 1:4 (3in. to the foot) scale Fowler Class A7 traction engine well on the way to completion; it is the latest model by John Rea, one of the founder members of the society. Being unpainted one could see the excellent fit of the boiler cleading.

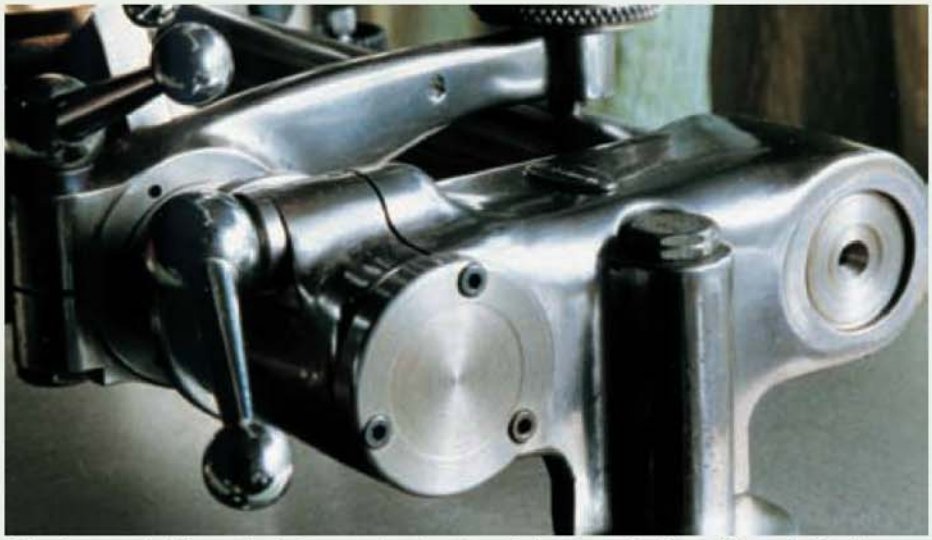
Over the years the exhibition has attracted a number of cups and awards, many dedicated to the memory of past members. It is therefore on a happy note that I record here that The John Bibby Trophy for the Best Road Vehicle was won by, yes, you've guessed it, John Bibby for his 1:8 ($1\frac{1}{2}$in. to the foot) scale Allchin 8hp Road Locomotive No. 1246. How pleasing that a member is honoured while he is still with us rather than waiting until he has passed to the great workshop in the sky before his name is associated with a piece of silverware.

I hope these notes have given a flavour of an excellent club exhibition. I have only been allocated space to cover a small fraction of the models on display. All the stewards were happy to talk about the models on show, and their particular modelling techniques which have been adopted to overcome a problem. Headed by the new Chairman of the Society, Dereck Langridge, this year's organising committee are to be congratulated on an excellent show. The display cards were very descriptive and helpful, a feature that could be followed by many other clubs.

Why not make a note in your diary now for April 2006 when the next show is held? I look forward to seeing you there.

PETE'S PAGE

Peter Spenlove-Spenlove reveals how to make your iron castings stand out from the crowd.



This photograph of the author's Quorn tool and cutter grinder shows the fine polish applied to the surface of the castings. The ball handles were also polished but subsequently chrome plated.

POLISHING CAST IRON

Our Editor recently asked me to explain the bright finish on the cast parts of my Quorn tool and cutter grinder. Most other Quorns seen at exhibitions have their cast parts filled and painted, but mine are polished.

I first learned of the possibilities of polishing cast iron at an early age. In the 1930s most people had a coal fired kitchen range for cooking and providing hot water. These ranges were constructed almost entirely of cast iron to a regional design. The visible parts were black with a few bright parts such as the knobs and hinges. As a boy, it was my job to use blacklead (graphite) to polish the black parts and then to polish the bright work. For the latter I started with a 'chain mail' pad, followed by soft soapy wire wool and finished with liquid metal polish. The bright work was not plated, it was just plain cast iron.

When I bought my Quorn castings I remembered that unless it was of very poor quality, cast iron could take a polish. I was also aware that an exhibition quality paint finish would chip readily in use in the workshop. The parts are small and often in close proximity to other parts. I do not particularly like the more durable hammer or crackle finishes, both of which can mask the odd scratch or two. So, I took a casting and polished part of it. The iron was fine grained, of very good quality and thus took a polish well. Although tedious, it is a satisfying job and I will now explain how I did it.

Many of us have a double-ended bench grinder in our workshops; mine is a good quality machine with 8in. diameter wheels but a 6in. model will serve. You will need two or three compressed felt polishing bobs. These are available in various diameters and widths; mine are 2in. wide and 4in. to 6in. diameter. They are fitted to the bench grinder in place of the grinding wheel. The periphery of the bob is coated with emery or carborundum grit. To do this, it is coated with traditional carpenter's glue applied hot and the sticky surface rolled in a tray of grit.

After leaving it for a day to set, the coated bob is mounted on the grinder. For best results you will need a two bobs, one with coarse and the other with fine grit. Most of mine are 2in. wide but 1in. width is useful for small work. They can be re-coated many times and last for years in the home workshop. The grit wears away but a fresh lot can be applied which need not be of the same grade as previously. Goggles must always be worn as the grit will fly when the machine is running.

Polishing mops work in a similar way, but the grit is not glued on. Most mops are made of layers of cotton cloth stitched together and cut into a circular form with a hole in the middle. They too, are mounted on a grinding spindle. You will need a bar of 'polishing soap' to use with the mops. This is a bar of hard waxy material which is impregnated with grit. The grit is very fine and the types vary. The bar is rubbed against the rotating mop, which takes up a charge of 'soap'. The intended work should be indicated to the supplier as suitable grit can be supplied for cast iron, aluminium alloys and plastics. It is advisable to keep a mop specifically for clear plastics, as one which has been used on metal will leave dark streaks on the surface. Also, as plastics are soft, use an unstitched mop which is gentler in its action. These mops also last a long time but bobs and mops which are worn down to, say 3in. dia., lose their efficiency because of the reduced surface speed at this diameter.

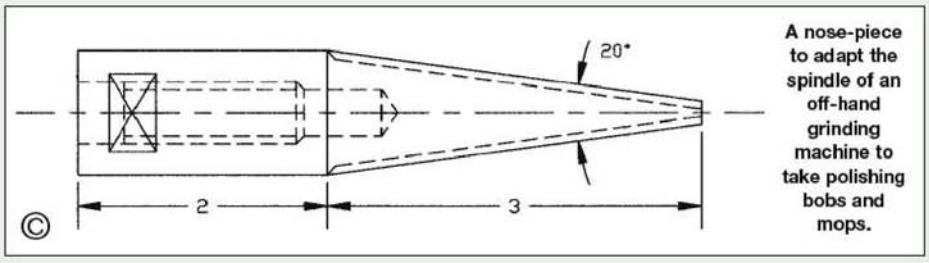
Bobs and mops are designed to be screwed by hand onto a tapered, threaded spindle. This is usually an extension nose-piece fitted onto the grinding machine spindle. The small end diameter of the tapered outer thread is usually between 3/16 and 1/4 inch. Most reputable makers supply left handed and right handed versions for use on the left or right hand spindle respectively. Mine is right handed and fits firmly on the right hand end of my grinding machine spindle with the tool rest and end cover removed.

With the power off, you hold the grinding wheel on the opposite end to stop the spindle turning while you screw the bob or mop onto the taper. Make sure it is firmly in place and running true, spinning it by hand to check. Simply reverse the fitting procedure to remove it. The tapered thread on the nose will cut a thread in the soft bore of the mop, which it will pick up next time you need to fit it. Make sure the nose itself stays firmly in place while removing the mop. Two spanner flats are usually provided for security of assembly. When starting a newly mounted grinding wheel, bob or mop for the first time always stand to one side just in case a breakage occurs. This precaution is sensible whenever you run a rotating abrasive wheel at any time.

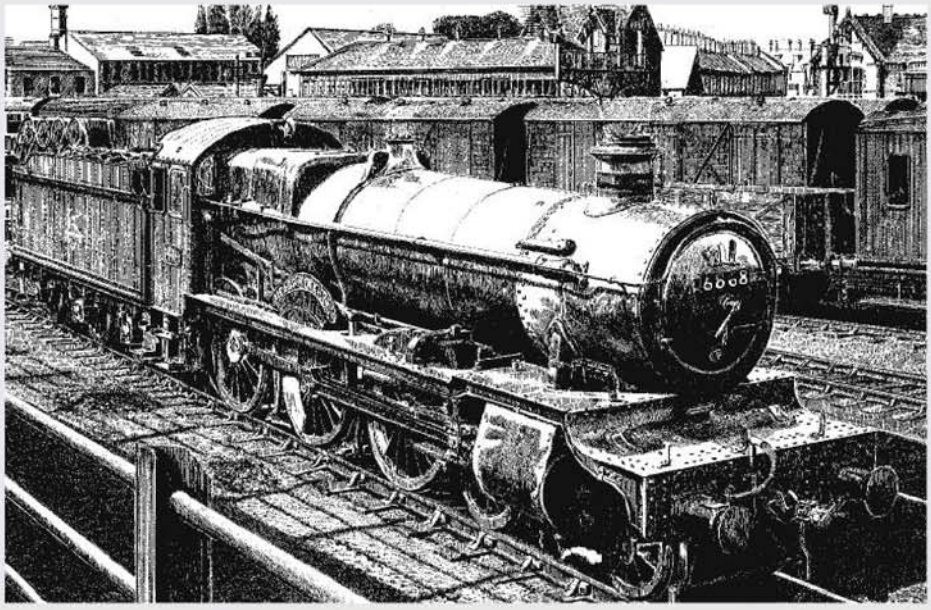
When working with bobs and mops, hold the work firmly so that should it be 'grabbed', as it often is, it is not torn from your grasp. Avoid putting your fingers through holes, as a grab can then cause serious injury, particularly if the edges are sharp. Grabs are instantaneous and the work will be shot at the floor to find your feet. Wear safety boots or place your feet in a substantial box open at the side. Professionals wear safety boots, leather gaiters and a leather apron with the tie straps at the back. If it strikes your unprotected toes, even a small item picked up and fired at high speed can be very painful. Consider remounting a bench mounted off-hand grinder on a pedestal so that grabbed work can go to the floor unimpeded. You may need to move the machine anyway to gain better access to larger mops.

Having assembled your polishing station you will be keen to start polishing those castings but be patient. The as-cast surface is too rough to polish so you will first need to clean it up with old files, belt sander and emery cloth to remove all the big lumps and sharp excrescences. Cast iron can have very hard scale or even foundry sand on it, which will remove the abrasive from the bob. My Quorn castings were hand finished until most of the surface was to a file or Linisher finish brightness. Then the felt bob was used to remove the file marks. At this stage I came to appreciate how good the iron was and changed the bob for a mop to try and improve the finish.

The ball handles on my Quorn were made of mild steel which was also polished. To resist frequent handling they were subsequently bright chrome plated. The castings were left as polished and are occasionally wiped over with an oily rag to prevent rust. The machine is also covered when not in use.



A nose-piece to adapt the spindle of an off-hand grinding machine to take polishing bobs and mops.



PENRHOS GRANGE

Neville Evans

describes the regulator and steam circuit before returning to the tender for his 4-4-0 HR Loch design.

●*Part XI continued from page 328 (M.E. 4230, 17 September 2004)*

As I mentioned in Part 9 (*M.E.* 4228, 20 August 2004), the steam circuit has been designed to give maximum superheat coupled with reasonable simplicity of construction and ease of maintenance. The regulator is of the disc type and is mounted in the smokebox. Curly Lawrence, the LBSC whose writings started so many people off on a lifelong journey along miniature railways, used to advise against placing anything that contained moving parts in the smokebox, because of the harsh conditions of heat and general grottiness that were to be found therein. However, I have a theory that if it was good enough for George Jackson Churchward, then it's good enough for me.

The steam circuit begins with a continuous copper tube that runs the length of the boiler and, in fact, forms a large and very rigid stay through the middle, from backhead to front tubeplate. Steam is picked up from the front of the firebox by a large diameter pipe and passes through the regulator on its way to the superheater and thence to the cylinders. There are two separate elements, one for each cylinder, as is my usual practice, which eliminates the dry header. I have tried to make things as easy to construct and as accessible as possible. By removing four screws and breaking two joints the moving parts of the regulator, together with the superheater assembly, can be withdrawn for inspection.

The regulator is a straightforward piece of equipment which is fitted onto the tubeplate bush, which isn't really a bush but a collar. The reason for this apparent anomaly is to preserve alignment between the regulator operating rod, the port disc and the port face. The regulator body must be concentric with the steam pipe, as the steam pipe tube goes through the tubeplate at a slight angle. The regulator body slides over the pipe, and after fluxing well silver-solder will flow between the collar and tubeplate and into the joints between the steampipe and collar and tubeplate.

I have shown a small valve hole that goes just in front of the main valve, the 1/16in. diameter is purely nominal at this stage, but I would think that it is about right for starting purposes. The obvious and possibly preferred alternative is to file a sharp-pointed nick in the leading edge of one of the ports, as per the drawing.

The port disc is held down by a light spring, which merely acts as a retainer until full boiler pressure seals it to the port face. Note that the regulator rod requires a locating collar at the cab end, which locates it lengthwise onto the backhead bush. The collar is pinned to the shaft so that it is touching the back of the bush. Details of the regulator handle and the oil dispensing apparatus that goes with will be shown at a later date.

Above left, the brake valve made by Dave Noble and, above right, the real thing on 6106 (Prairie). Although generally the same shape, they do look rather different, plus the fact that the full size one doesn't have the dummy ejector control on the top.

Lapping

The steam tightness of the regulator depends upon the precision with which the port disc is fitted to the port face. It is essential, in my opinion, to lap the faces of the ports against a lightly blued surface plate. Don't, whatever you do, try to lap them against one another. A suitable lap can be made from a piece of aluminium alloy. Mine is about 4 x 4 x 2in. which I faced across in the lathe. An important feature is that circular grooves 0.015in. or so deep and the same width, were turned in the face of the lapping plate, at regular intervals, to retain a reservoir of lapping paste. The face was re-turned smooth with a very light cut, and charged by rubbing paste into it with a piece of newspaper. I know that lathes are not supposed to face off perfectly accurately, but all I can say is that it works for me. Over the years I've retouched the lap lightly, on a smooth linisher belt, and tested it against my posh, as opposed to my rough, surface plate with satisfactory results.

An important point is to get some proper lapping paste. This commodity is available in any engineers merchants. If you haven't got one near you, (check your local *Yellow Pages*), then your friendly neighbourhood hardware store will be pleased to obtain it for you. Buy a tin and share it with your friends. Practice a bit of lapping by trying the effect of smooth up and down strokes, followed by a figure-of-eight movement. When you are reasonably happy with your efforts, try the piece on your surface plate. Spread a thin film of engineer's blue on the plate, and rub the job up and down on it. If you get a perfect blue covering first time, it means that you've used too much of the blue, so clean it off with a touch of white spirit and start again. If you can't get engineer's blue, then a blue or black marker pen will probably do just as well. The test of any lapped surface is that you should be able to wring the surfaces together, without oil, and they should then stick together, held by vacuum pressure alone — if they aren't too heavy.

Superheater

This incorporates a double bend in the firebox to get more radiant heat into the steam. The late Professor Hall wrote an article (*M.E.* 4161, 25 January 2002) in which he pointed out that most small locomotives suffer from too little superheat, which leads to condensation in the cylinders and therefore loss of power and efficiency. In conjunction with Paul Gammon who can actually ▶

make, or cause to be made, the blessed things in aircraft quality stainless steel, these bends will be available from Bruce Engineering.

One possible snag that I can foresee is that as the second loop of the superheater occurs just within one of the flues, it may be that it will become difficult to extract when required, due to build up of ash in front of it. For this reason it may be considered advisable to increase the length of the return loop to avoid the likelihood of blocked flues. We must balance this against the extra drag that a longer superheater tube might cause, which might result in lower steam chest pressures at full throttle. I'll try to get my pal Ivor 'the engine' to carry out some experiments. Actually, a quick mass flow test at about 80psi on air should give some interesting comparative results.

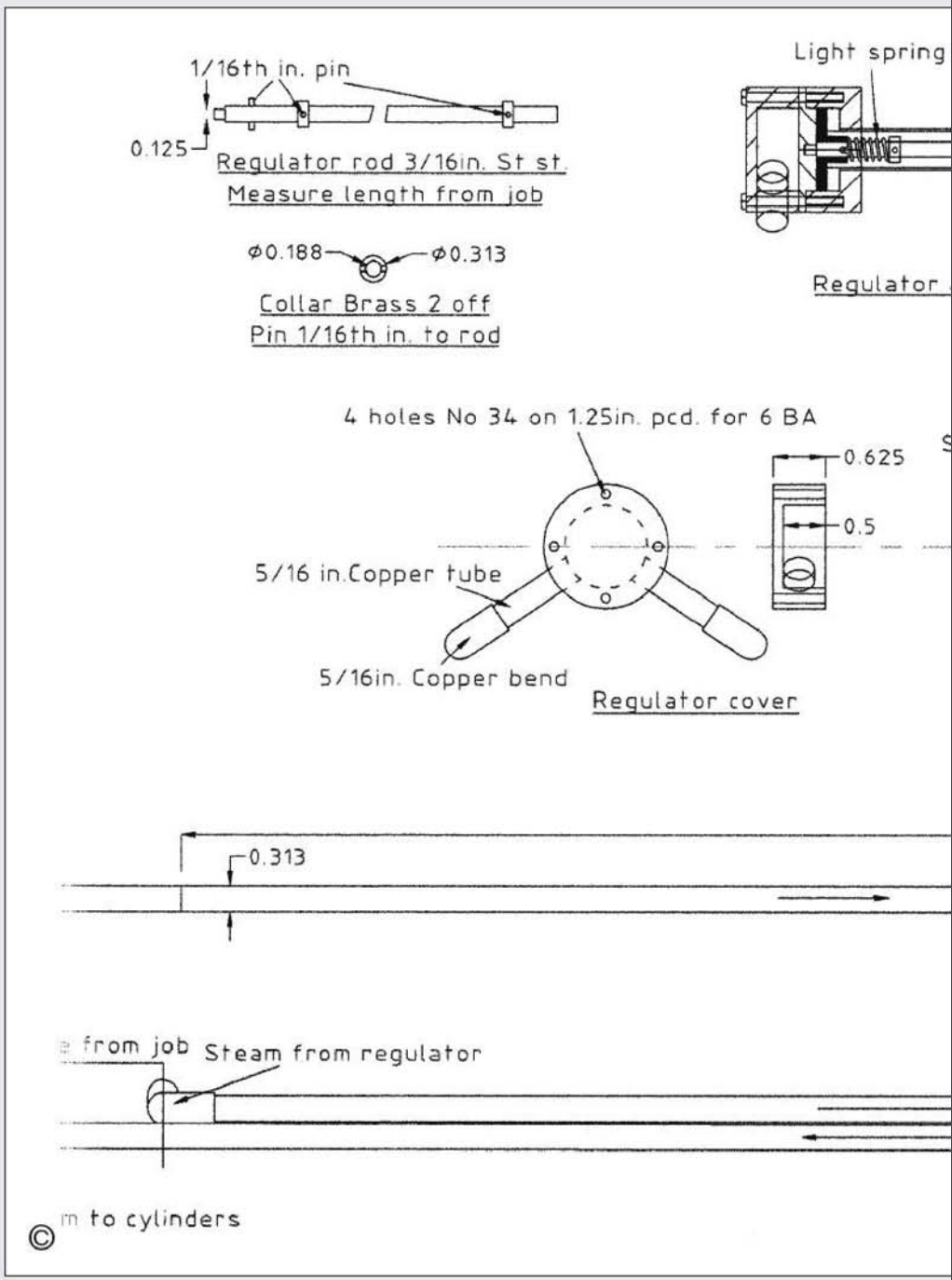
Jones tender

Peter Lamberton came up from Cornwall the other day, to pick up his boiler from Ian Stott of Dragon Boilers, bringing his nearly completed *Loch* for us to fit said boiler to the chassis. Needless to say, it fitted like a glove and I enclose pictures for your pleasure. Peter has also nearly completed the tender. I say 'nearly' because yours truly had, of course, neglected to detail the tender valances and the toolbox. These omissions have now been remedied as per the appended drawings.

An interesting fact emerged while I was studying some photographs the other day, in the course of preparing this article. On page 23 of the invaluable *Highland Railway Liveries* by Howard Geddes and Eddie Bellas, there appears a picture of No. 122 *Loch Moy* which unusually shows the rear of the tender. I notice, however, that this a modified tender, which differs a little from the standard issue in that there is no toolbox, the frames having been slightly shortened, and there is a continuous coal rail over the complete tank. I don't know how many other locomotives carried this type of tender, but I show a drawing with the modifications included. I must say that I quite like it, as it seems to be much more compact than the other version and, to my eye at least, is better proportioned.

Toolbox

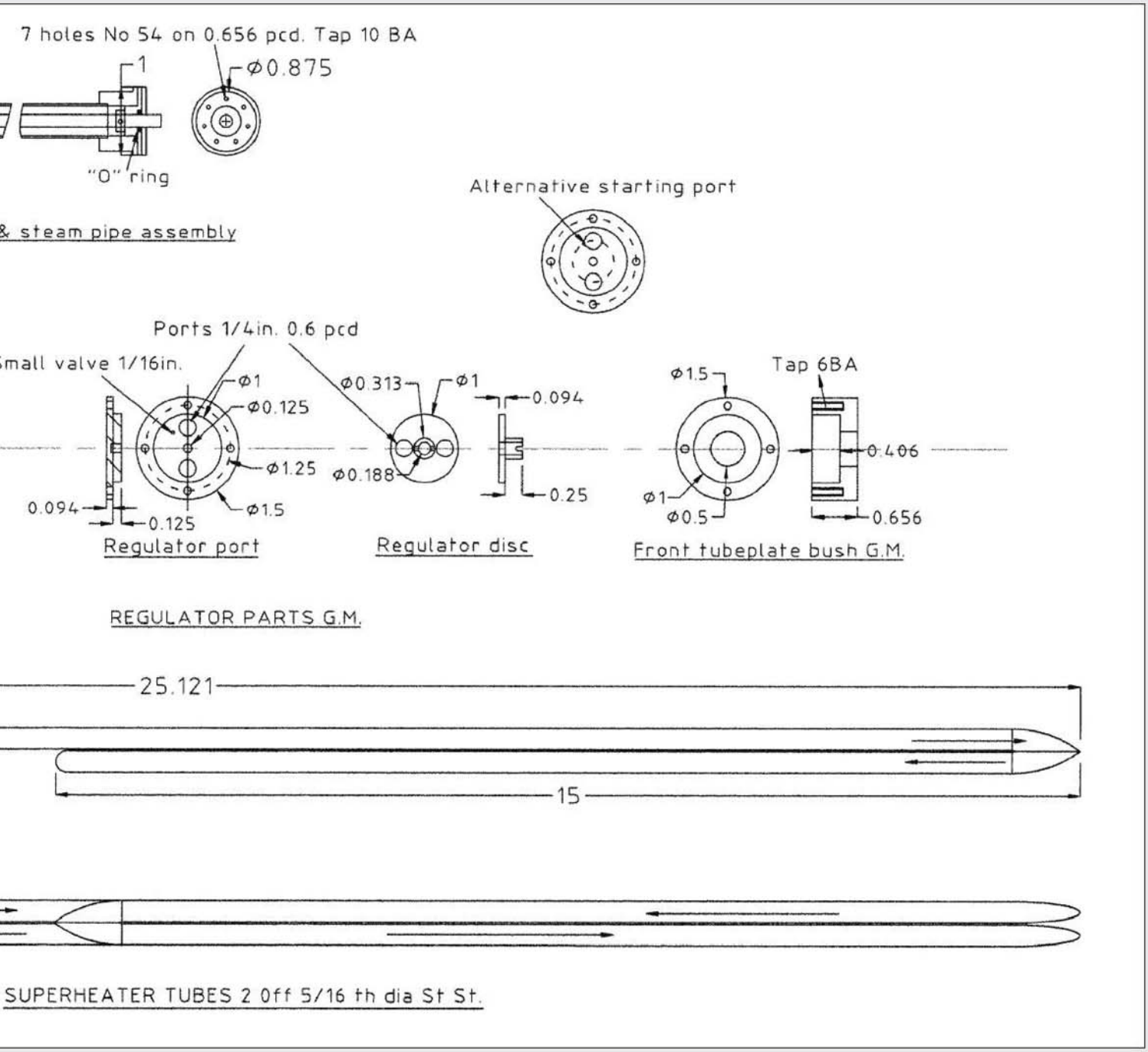
As can be seen, the toolbox is pretty simple to make and Pete Thomas of Bruce Engineering has made a few 'foldies' on his amazing machine. These devices merely have to be folded on the recessed lines (hence the name) and a toolbox body correct to 0.001in. appears as from a hat!

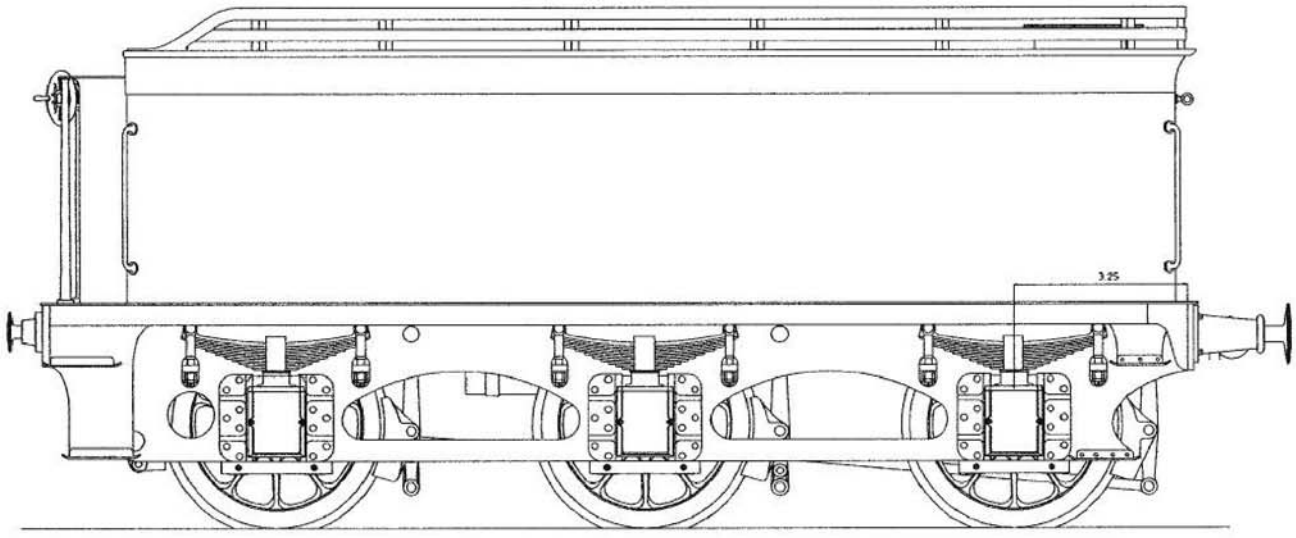


These views of Peter Lambert's Loch fitted with its new boiler reveal the elegant lines of this 4-4-0. The right hand picture shows a rear three-quarter view of the tender.

Wonderful. It even makes me feel quite clever! The only misgiving Pete has is to the 'accuracy' to which the folded shapes can be formed! Generally he reckons the cut tolerance to be of the order of a couple of thou (may be much better, but as it is sufficiently good, he rarely bothers to calibrate the cutter). He uses a depth control which ensures the fold lines are machined to a consistent depth, but there is a tolerance on the setting for a given day.

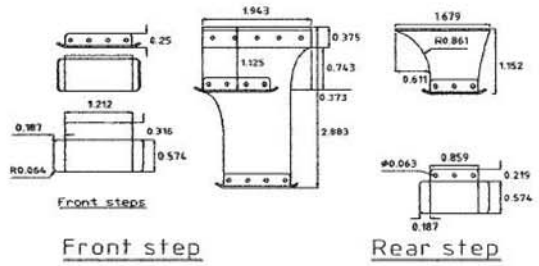
The variation in the brass and this small variation in cut depth, combined with the biggest variability of all — the ham-fisted human who makes the bends — leads to a modest tolerance on the bends. However, having said all that, with the Polly tanks he makes, he drills and taps the 8BA fixing holes for the tank tops while still in ▶





SHORT JONES TENDER

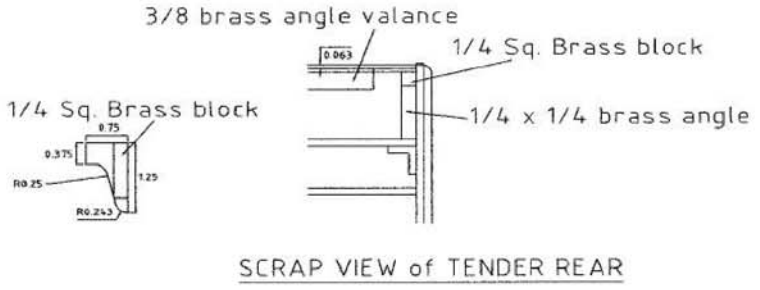
All dimensions as long tender except for length of rear platform and coal rail



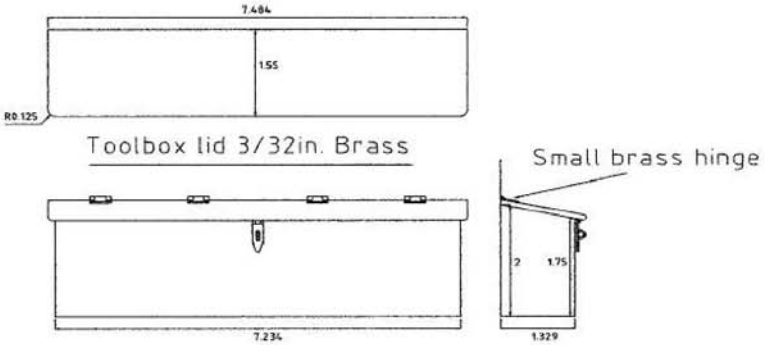
Front step

Rear step

TENDER STEPS



SCRAP VIEW of TENDER REAR



LONG TENDER TOOLBOX

Left: an early example of a folded brass sandbox (for a GWR Large Prairie Tank). The fold lines are precisely defined with allowance for bending, so that when cut out on the CNC machine the boxes can easily be formed into accurate shapes. A wide variety of toolboxes and sandboxes have been made in this way.

the flat, and reckons the holes line up within a couple of thou when the tank is assembled. In fact, he was recently told by a kit builder that the brasswork for the *Polly V* lines up unbelievably well — far better than laser cut platework previously encountered. The hinges can be obtained from any model shop, the lock hasps and even the tiny padlocks come from the same source. Dolls houses, which are becoming so popular nowadays, contain lots of them in tiny furniture. Seek and ye shall find.

Valances and steps

The valances are made from 3/8in. angle brass. Note that the shorter tender has valances with fancy curved bits on the back end, just like the locomotive, whereas some of the longer tenders, with toolbox, have to be content with straight valances. When I was preparing the general arrangement drawing of the tender I referred to the works G/A, as is my wont. This drawing shows a straight-ended valance, hence the apparent anomaly. I can only give the usual advice, which is to pick a particular engine and to model that one.

The tender step backing plates are made from bright mild steel plate. I would point out, however, that the steps themselves are only 1/32in. thick, or should it be thin, and may be thought to be a little on the flimsy side. The rear steps seem to vary in size and shape. I have drawn what seems to be an average sort of step. Please, once more, refer to your own particular locomotive.

●*To be continued.*

The type of plate used by the 'Pennsy' between the years 1891 to 1927. (Photo: Alan Miller)

The post-1927 type of plate with the name Altoona Works prominent. (Photo: Alan Miller)

A plate taken from a Norfolk and Western Railroad Y6 compound. (Photo: V. Edwards)

NORTH AMERICAN STEAM LOCOMOTIVE BUILDER'S PLATES

Eric Ellis

takes a look at the plates for locomotives built by two railway companies in their own workshops.

●*Part VI continued from page 324 (M.E. 4230, 17 September 2004)*

The received wisdom of steam locomotive building in the UK and North America were different and are often defined as follows. Generally speaking, UK railway companies built their own locomotives, and just about everything else the railway needed. North American railroads bought all their locomotives and everything else from contract suppliers.

There is some veracity in this, but it is not completely true and there were exceptions to the rule. At least 30 railroads in North America in the 20th century built some of their own engines, and we will look at two. The biggest of all by far was the Pennsylvania Railroad. It must also be admitted that they did buy in locomotives, mainly from Baldwin and Alco, but their system was so huge they had little choice when having to deal with mergers and sudden traffic upsurges. Just prior to the Depression, 'Pennsy' ran 6,150 engines on over 10,000 miles of track.

A line was completed from Harrisburg to Pittsburgh in 1854, over the Allegheny Mountains via Horseshoe Curve, and the company constructed its 12th Street shops in Altoona, turning out the first locomotive in 1866. By the early 1890s Juniata Shops had been built, followed in 1924 by a new erecting and machine shop with much expanded building and repair capacity.

The PRR standardised as much as possible on locomotive parts and complete units such as boilers, making them interchangeable between classes where appropriate. They also favoured Belpaire fireboxes, but not exclusively. In their own way the PRR was to Altoona what the LMS was to Crewe, the GWR to Swindon, and other railways to various towns worldwide — main works, predominant employer, etc. They had their own test plant, unusual in North America, and big enough to take late steam built outputs.

Some of the best known Altoona built steam locomotives were E6s 4-4-2s, K4s 4-6-2s, I1s 2-10-0s, M1a 4-8-2s, J1 2-10-4s, T1 4-4-4-4s, and Q2 4-4-6-4s. A total of around 6,800 engines were built at the plant, the last being a T1 in 1945, road (running) number 5524. A very impressive feat was the building of 125 2-10-4s, despite all the other wartime work, in 1942/4. Never mind the fact that it was a borrowed design.

Original 'Pennsy' builder plates were round, and a new oval shape was added when building began at Juniata in 1891. The last round plates were cast in 1904, with the oval continuing to the end of steam. They were mostly of brass, but cast iron was used on later classes such as J1, J1a and Q2. They had Juniata Shops cast in from 1891 to 1927 and then Altoona Works (**photos 1** and **2**).

Unusually, square fixing holes were provided which means a dome shaped head to the bolts. Good solid plates for good solid locomotives. PRR had oval builder's plates even on contract builder's locomotives, probably starting at the same time.

Several important things happened in Virginia in 1881. The Atlantic Mississippi and Ohio Railroad became the Norfolk and Western Railroad (N&W), Big Lick was renamed Roanoke and a railroad works was chartered as the Roanoke Machine Works (RMW) to build and repair locomotives and cars (rolling stock) for the N&W and the Shenandoah Valley Railroads.

By 1884, RMW had built its first locomotive (for the N&W, which partly owned them) and by 1895 approximately 150 had been completed. In 1897 the N&W Railway, re-organised in 1896, had full ownership of RMW and continued repairs and new building. Expansion continued so that by 1927, with the exception of some 0-8-0s bought from C&O in 1950, they were able to supply and maintain their own requirements for conventional steam motive power 'in house'. This was unusual for what was, after all, a medium sized company by US standards (the main line from Norfolk to Cincinnati was 676 miles). A total of 447 new locomotives were built at the works.

Consider this: N&W continued to build their own mainline and switcher (shunter) engines until December 1953 — all steam. For the most part, their main servicing facilities were modern, enabling quick turn-arounds. Monthly mileage was high despite shortish runs, and they were one of the last main line companies to give up steam in 1960. They even tried converting two old 4-8-0s to automatic firing and water level control for switching duties in 1947/8 (are there any ex-ship's engineers out there who remember Bailey boards?) It all speaks volumes for the company's shareholders, management and staff.

And what locomotives! The three best-known types are the streamlined J class 4-8-4, class A 2-6-6-4 and the Y6 class 2-8-8-2 compound. Blue Ridge, east of Roanoke, and a similar grade (gradient) to Shap, must have been ankle deep in discarded cardboard film cartons in the late 1950s.

The builder's plates from RMW were circular and similar to the later N&W Roanoke Shop plates. The type of lettering is unknown. **Photograph 3** is of a brass example from a Y6 compound 2-8-8-2. An interesting feature of this, and some other builders, is the use of a common pattern for the railway with replaceable class, date, and build number for each individual locomotive, thus saving on pattern making costs. If only the Y7 had been built.

Acknowledgements

My thanks go to several people who have helped with photographs and information for this article including V. Edwards and Alan Miller. Sources were many including;

1: *Guide to North American Steam Locomotives*, and *The Historical Guide to North American Railroads* both compiled by George H. Drury published by Kalmbach.

2: *The Norfolk & Western Railway. A History*, by Striplin.

All three books are excellent and can be recommended to anyone interested in North American steam locomotives.

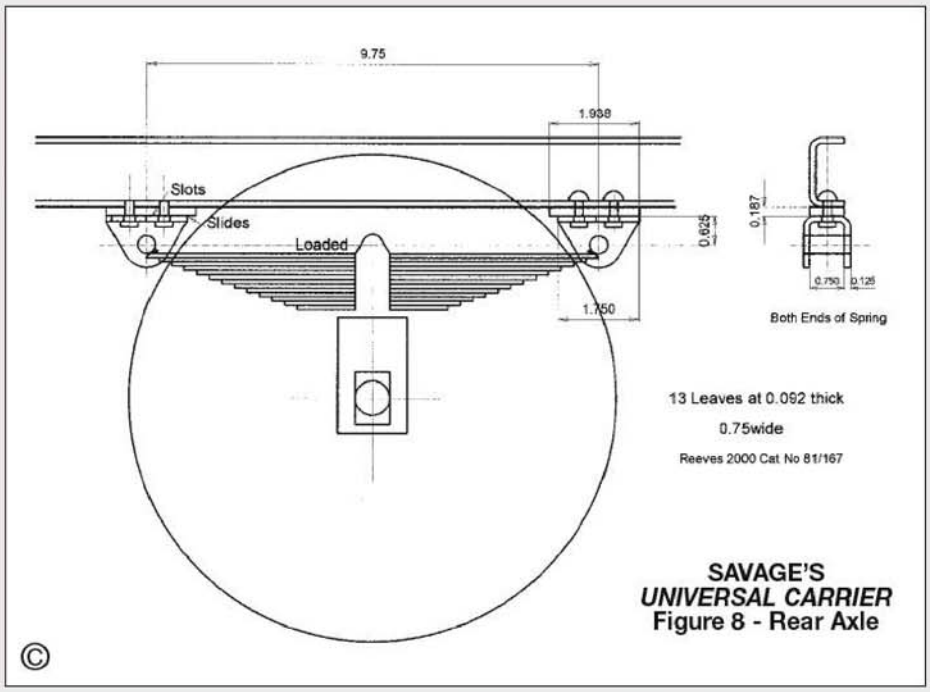
Undoubtedly there are gaps and errors in these articles; I would be pleased to hear from anyone who could expand or correct my knowledge.

●*To be continued.*

Stan Nipper and Martin Wallis
describe the leaf springs and back axle.

●*Part III continued from page 333 (M.E. 4230, 17 September 2004)*

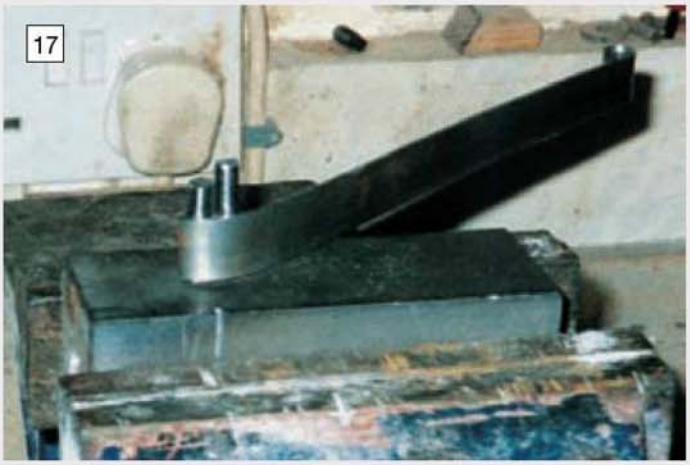
SAVAGE'S *UNIVERSAL CARRIER*



The *Universal Carrier* is sprung front and back with leaf springs. These are easy enough to make and in no time the chassis will be ready for its wheels. The springs need to be robust as the front spring has to take the weight of the boiler, and the back spring will need to take the weight of the driver. A good plan is to make at least the top three leaves from spring steel and to alternate with Tufnol leaves for the remainder. If the spring proves too weak some Tufnol leaves may be removed and steel ones inserted.

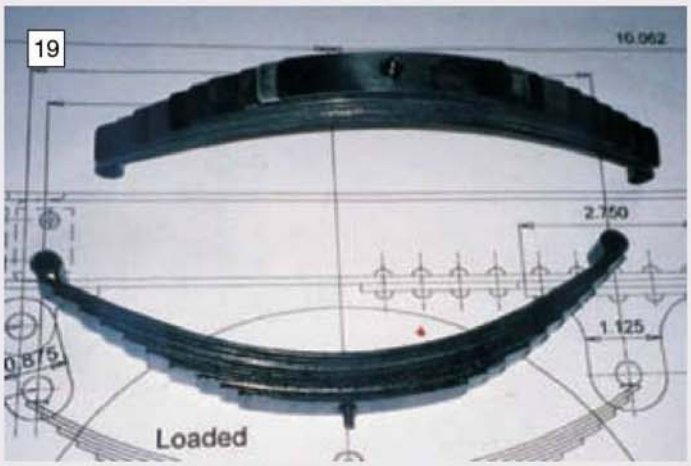
Spring steel

The spring steel required is 5/8in. wide x 0.062in. for the front and 3/4in. wide x 0.092 for the back springs. As purchased it is possible to roll it to the required radius by deforming it beyond its

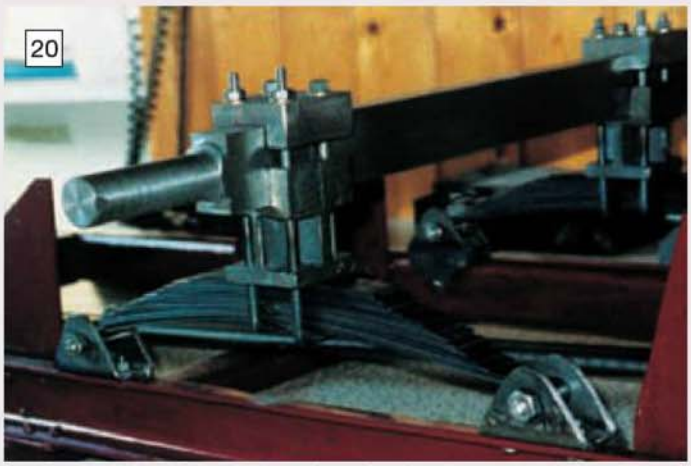


This simple jig is mounted in the vice and used to form the end loops in the top spring leaves. (Photos 17-20: John Thompson)

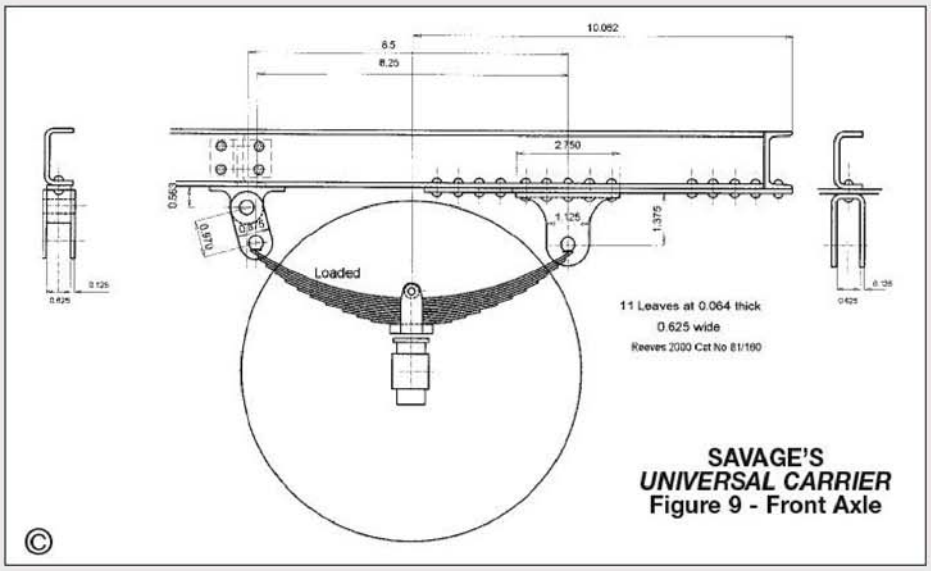
Formed to the appropriate curve, this front spring top leaf now has loops formed at its ends.



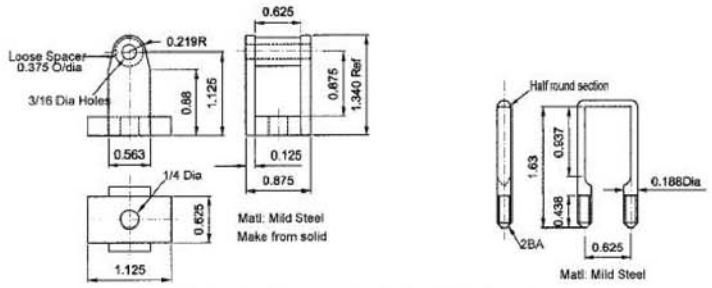
A pair of assembled front springs. The 11 spring steel leaves required for each are 0.062in. thick x 5/8in. wide.



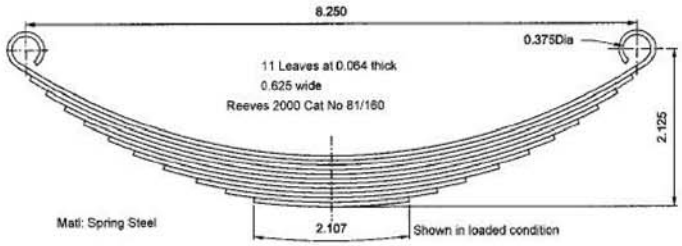
Back axle and fixed chassis spring housings. In this case, oval eyes are formed in the top leaf to accommodate the necessary spring movement.



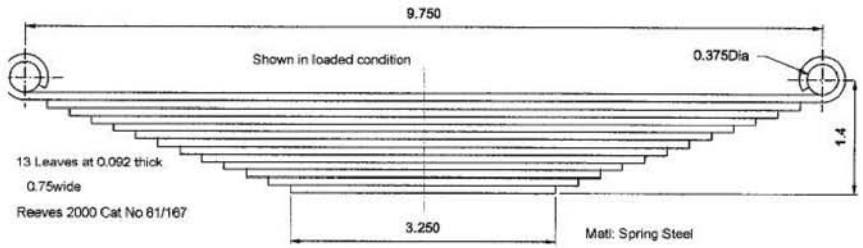
SAVAGE'S *UNIVERSAL CARRIER*
Figure 9 - Front Axle



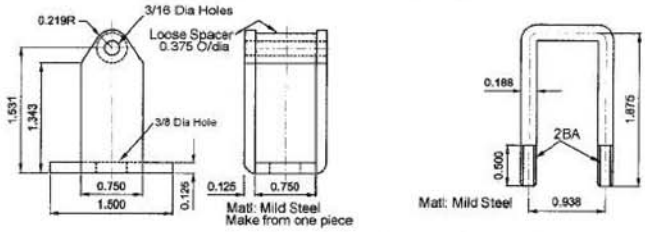
SAVAGE'S *UNIVERSAL CARRIER*
Figure 10 - Front Spring Clip and U-Bolt



SAVAGE'S *UNIVERSAL CARRIER*
Figure 11 - Front Spring



SAVAGE'S *UNIVERSAL CARRIER*
Figure 12 - Rear Spring



SAVAGE'S *UNIVERSAL CARRIER*
Figure 13 - Rear Spring Clip and U-Bolt

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

elastic limit so a permanent bend may be achieved. Alternatively, the spring may be softened by normalising, which is done by heating it to red heat and allowing it to cool slowly in the hearth. The spring may then be bent much more readily and, once shaped, is then re-heat treated. If a local company or friend has a furnace then that is ideal but otherwise it will need to be done on the hearth.

First heat the spring to red heat and quench in oil *(Readers should take adequate precautions against fire. In particular, use sufficient oil to prevent the contents of the quench tank from overheating and igniting. Readers are advised not to use motor oil as the results can be unpredictable. Used motor oil should be avoided at all costs as it can contain heavier fractions of petrol and can ignite very readily — Ed.)* John used animal fat, either dripping or lard which may still be bought from butchers. This was on advice in an old gunsmith's book in a chapter on making springs for a flintlock rifle. I guess it gives a healthier, barbecue type of smell.

Once hardened the spring should be tempered to blue. This is necessary to remove some of the brittleness and avoid broken leaves. First clean up the leaf with emery cloth until it is bright, and then heat with a soft blue flame. As soon as it goes blue quench it in the medium of your choice. Achieving an even blue colour will not be easy, as may be imagined, and a little experimentation may be in order. John's gunsmith's book says the tempering should be repeated twice more. I have no idea why, but I guess the author might have been anticipating variation due to the hit and miss nature of the process.

To form the round eyes at the ends of the top spring the material will certainly need to be normalised first. A jig will be required, but this is nothing more complicated than two pieces, or round bar in a metal block (**photo 17**).

Spring clips

The Savage drawings detail spring clips which neatly hold the leaf spring together. The clip is topped by a round, loose spacer which, it is assumed, becomes useful when the wagon is very heavily loaded and a spring assister (a second leaf spring above the first) makes contact with the main spring. Only a minority of wagons were thus equipped so the spring clips are not strictly essential and may be omitted, see John's back axle arrangement (**photo 20**). The spring assisters are not particularly visible but do appear to have been standard on tipping wagons (**photo 25**).

Back axle

The back axle is 'dead', that is to say it does not rotate. Each wheel is individually driven by its own chain and sprocket from the differential in the engine unit. For the back axle, a piece of bright rectangular bar $\frac{3}{4}$ x $1\frac{1}{8}$ x $20\frac{1}{2}$in. long is required. With care, a $\frac{3}{4}$in. dia. may be achieved ▶

The back axle spring pads are assembled on the back axle and the pad and clamp drilled through together. (Photos 21-24: Stan Nipper)

A pair of the spring pads shown finished machined. These components are for Stan Nipper's wagon.

The back axle radial rods fit between the rear engine supports and the rear spring pads. Here the lock nuts are yet to be fitted.

On Stan Nipper's wagon the Savage back spring design has been adapted to include two swing links.

on a 3/4in. wide piece of stock but it does not matter too much if a very small flat is left on one side. Should a small flat offend there is no reason why the diameter should not be reduced by 0.010in., but this means the bearing bush in the wheel cannot be reamed.

The back axle is fitted to the back springs via the back axle spring pads. These are robust little castings which incorporate two lugs for the radial rods that connect the back axle horizontally to the chassis.

Loaded and unloaded

A brief pause for thought may be useful. The back spring is attached to the chassis at each end by spring housings (**fig 8**). When unladen the back spring will be curved and when loaded it will be flat, as drawn. In the case of a model 'loaded' will mean with driver, a load far in excess of a scale payload. The difference between loaded and unloaded ought to be about 1/2in., and in consequence the centres between the two loops at the end of the top leaf will vary, albeit by a very small amount. Further to this the notional 1/2in. movement of the back axle is not linear but radial as dictated by the arc of the radial rod which connects it to the chassis.

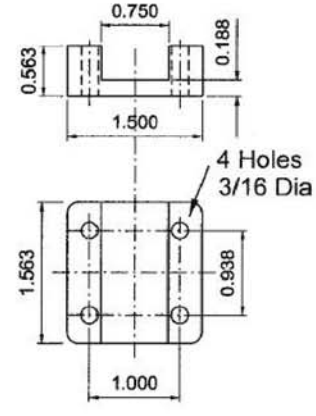
On the Savage drawings these small spring movements are taken up by allowing the spring housings to move along in slots on the underside of the chassis. The model drawings copy the Savage arrangement by showing special stepped fixings fitted from below with the head riveted over within the channel section. Fixing a head within the channel section is undoubtedly not easy, on both full size and model alike, so this method is open to interpretation.

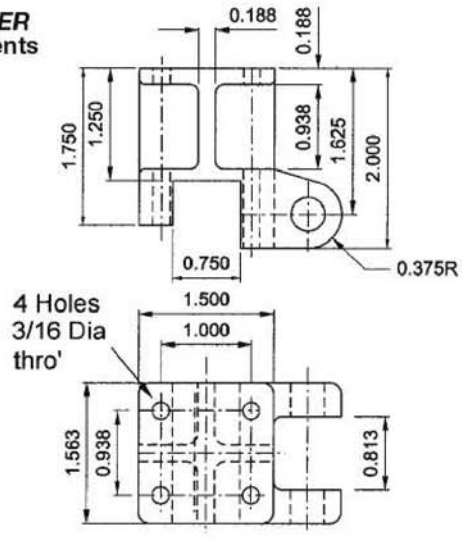
Two alternatives are offered. John has fixed his spring housings to the chassis without movement and has made the loops in the ends of the top leaf oval rather than round which allows for the movement. Stan has added swing links at both ends (**photo 24**), which has been accomplished with a marginal increase in height.

Radial rods and rear engine supports

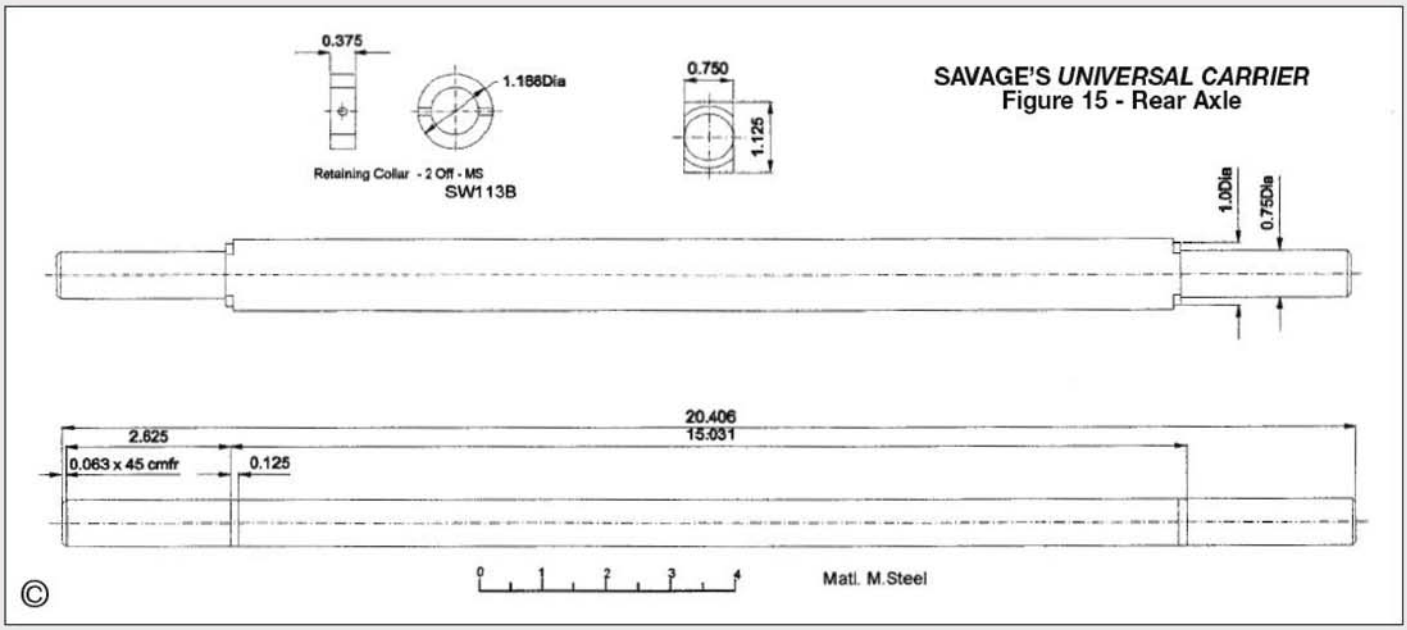
Two adjustable back axle radial rods are required, one for each side. They are essentially heavily engineered bottle screws with left and right-hand threads. A hexagon is provided to make any adjustments and a lock nut and spring washer are fitted at each end to prevent any movement in service. The thread is detailed as BSF but M8 would

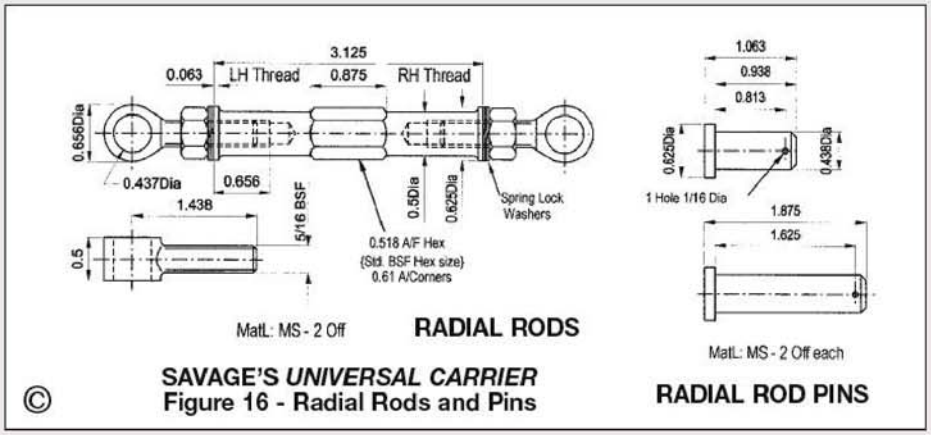
SAVAGE'S *UNIVERSAL CARRIER*
Figure 14 - Rear Axle Components

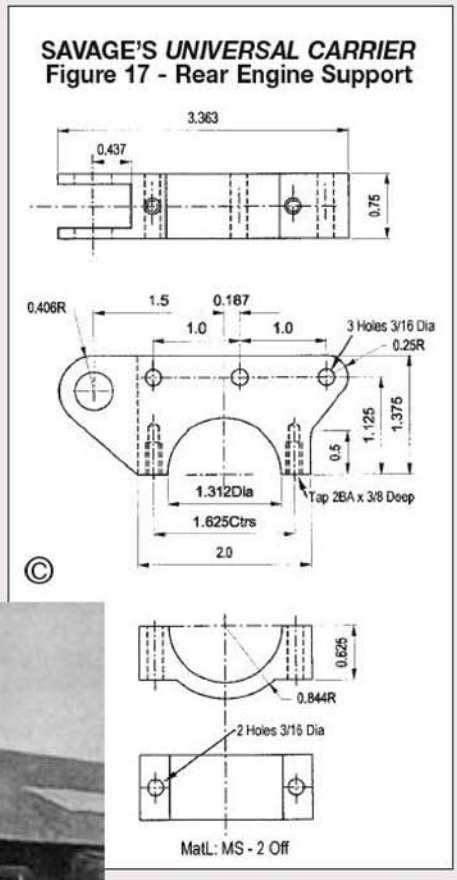




© **REAR AXLE CLAMP (Cast Iron)** **REAR SPRING PAD (Cast Iron)**





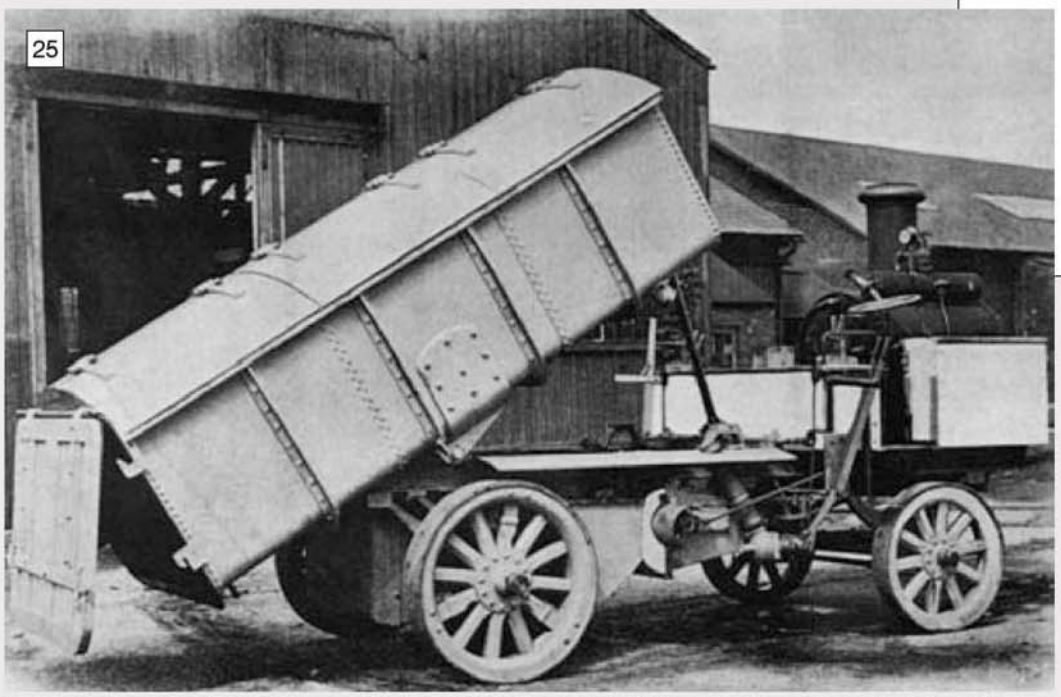


be just as good, the problem being to source a left-hand tap and die. Happily, there is no reason why both the threads should not be the usual right-hand thread and the assembly dropped out to make adjustments, but the correct arrangement is to be preferred. Manufacture by silver-soldered fabrication is fine as, when correctly set, it may be painted all over including the thread as the need for further adjustment is very unlikely.

The rear engine supports complete the back axle assembly. A casting was considered but there are some quite thin sections in places and, since they may be easily enough cut from bright bar, that seemed better. A 1/2in. slot has to be machined in for the radial rod and a 1.312in. hole bored for the engine mountings. Three 2BA fixings hold it to the chassis.

Next time the front axle and steering will be described, by which time the builder will have the chassis, springs and axles. With the addition of the wheels the wagon will be mobile and a significant portion of the construction completed.

●*To be continued.*



An early Savage type OA tipping wagon fitted with Musker water tube boiler and the separate engine and gearbox.

The finished collet chuck. The No. 3 Morse taper shank enables it to be used on both the Author's lathe and milling machine.

A selection of ER25 collets. The number of slits does not necessarily relate to the capacity of the collet. The far right collet has no release groove.

SETTING UP THE CLARKE CL300M LATHE
ER COLLET CHUCK

Neil Wyatt

describes a useful accessory for your lathe or milling machine.

●*Part VII continued from page 323 (M.E. 4230, 17 September 2004)*

When it comes to holding work in the lathe, little can rival the 3-jaw chuck for flexibility, speed and convenience at the expense of accuracy. On the other hand, the 4-jaw chuck allows work to be set accurately, but requires skill and/or patience to do so. Collet chucks allow the rapid and accurate holding of round work, with the twin penalties of a limited maximum capacity and the need for a range of collets.

Very small horological lathes typically use collets with an 8mm dia. body. Naturally their maximum capacity is less than this, typically 5 millimetres. For lathes with a 3MT taper in the headstock there are more options. Direct fitting finger collets are obtainable but these have limited ranges, each really being intended for a specific size of work. Other systems use separate chucks. Among these, the ER (extended range) collets are particularly suitable for model engineers, as each one can grip down to the next in the range, typically a step of 1mm. A full set of ER25 chucks will grip from 1 to 16 millimetres, but a chuck and full collet set is a substantial investment.

However, if you make your own chuck, individual collets can be obtained in the most useful sizes. For example, a 6-7mm collet will hold both 6mm and 1/4in. dia. shank milling cutters. Second-hand collets may sometimes be obtained, or you can even make your own. Collet chucks may also be used to hold milling cutters and since the MT3 taper is common to many milling machines, such an accessory has many uses.

Spindle arbor

Before starting this project, I suggest you obtain at least one collet so that you can make sure each critical dimension is correct as you proceed. I do not know how common they are, but some collets do not have a groove for automatic release. If you have any of these collets (I have just one) it may be worth the effort of an evening spent making a spare chuck nose without the release flange.

The top-slide travel on the CL300M is insufficient to turn a full-length MT3 taper, so I used a purchased item. Be sure to get one tapped for a drawbar, not one with a driving tang. I used the drawbar previously made and described for my simple milling cutter holder. Fit the arbor to the headstock and use the drawbar to ensure that it is well home and will not shift when you are machining it.

The outside of the blank end of the arbor needs to be shortened and a section of 3/4in. x 20tpi thread cut on the end. A short section of the original blank surface should be left; this comes ground concentrically with the taper and provides an accurate register for the body of the chuck.

It is convenient to have a hole in the arbor such that stock held can pass right through the collet. This will also facilitate boring accurate holes in home made collets. However the diameter of the thread on the arbor means that this hole should be no more than 17/32in. diameter. Start by drilling 3/8in. diameter. The drill will cut through the end of the blank without difficulty, but the shank is hardened, as will be obvious when the drill starts to struggle. Just make the bore as deep as is practical, you cannot go all the way in any case because of the need for a drawbar. Open up this hole to 17/32in. dia. with a small boring bar. Unlike the blank for the milling adaptor, the blank end on this one was only 7/8in. instead of a full inch, leaving less room for error when boring it out. I had expected to have sufficient metal to use a 7/8in. dia. thread and a 1in. dia. register.

Break all the sharp edges on the turned surfaces, and put the completed arbor to one side.

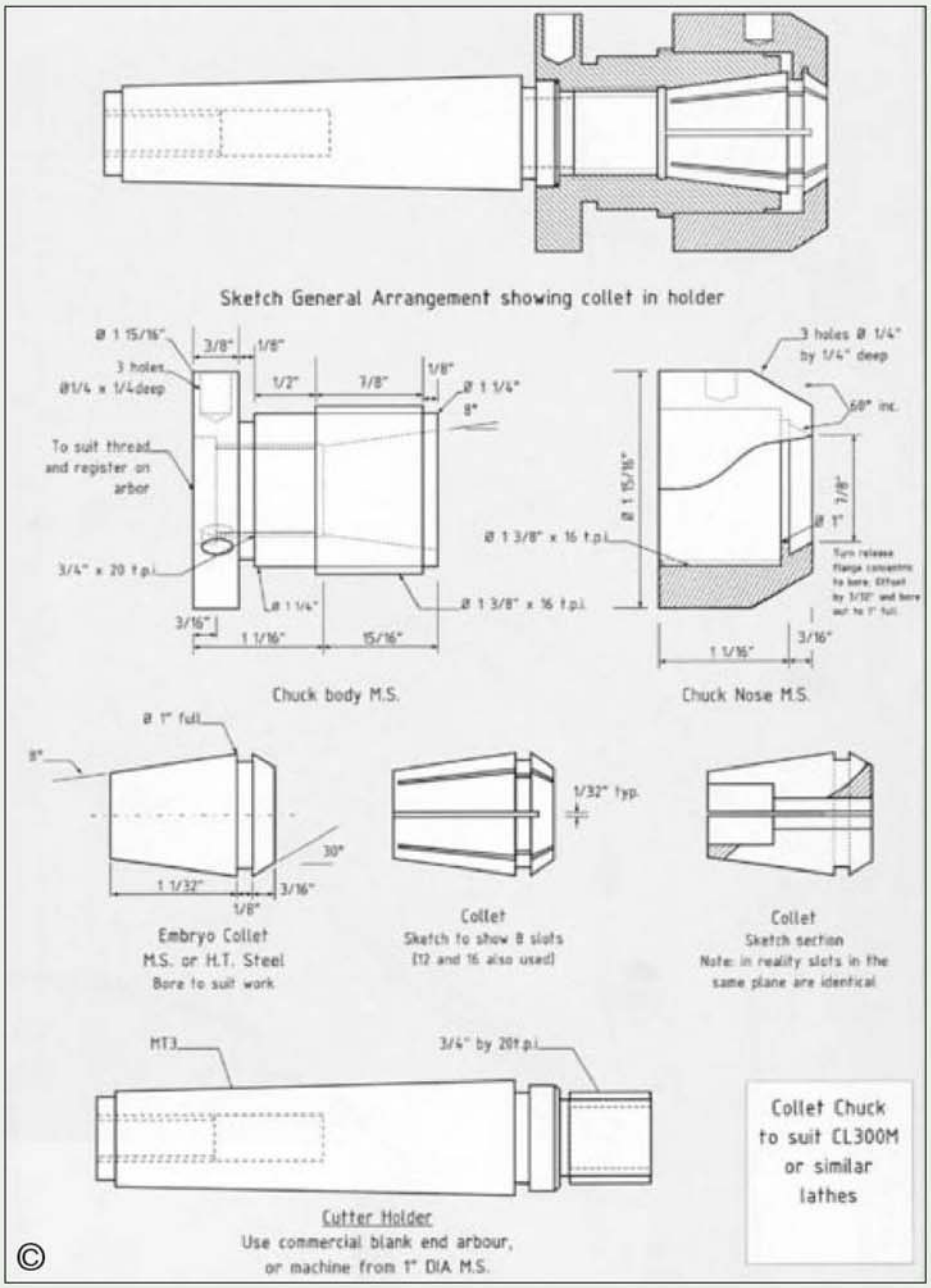
Chuck body

Using the outside jaws, mount a 2 1/4in. length of 2in. dia. free-cutting mild steel in the 3-jaw chuck. Make sure it is secure, as you will be working on it without any steady. Face the end, and drill right though at 3/8in. dia., or whatever diameter allows your smallest boring bar to enter the hole. Now bore the hole to 0.710in. dia. and thread this internally to receive the end of the arbor. Keep checking the fit, opening up the thread just 0.001in. at a time, until the two parts will just mate. Now bore out the register for the 7/8in. section of the blank, initially undersize, then opening out the register with cuts of less than 0.001in. at a time until it is just possible to screw the arbor all the way home.

The arbor fitted to the lathe mandrel and shown after screw cutting the nose thread.

Here, the internal screw thread and arbor register have been machined into the chuck body.

The tool used for internal screw cutting up to a shoulder. The boring bar is a commercial item.



Fitted to the arbor, the chuck body is ready for threading the O/D and taper turning in the bore.

A small angle 'square' made to enable the top-slide to be set for repeatable tapers.

Make sure the threads are clean, and screw the two parts together as firmly as you can. The use of a thread locking compound when assembling the two parts is advisable. In any case, scribe a deep line to show the proper alignment of the two parts, just in case.

With the two parts assembled, mount the MT3 taper in the headstock and secure it with a drawbar. Reduce the outside diameter of the main part of the blank. Cut a suitable run-out groove with a parting tool, and thread the body. I have suggested 16tpi, as the thread needs to be sufficiently robust to take repeated use, while still being fine enough to facilitate tightening of the chuck. With a 60deg. tool tip angle, the thread depth is 0.034 inch. Don't forget to 'break' the top of the thread with a file.

At this point I made the little 'square' shown in one photograph. Although the internal angle is 90deg., the outer edge is at 8deg. to the inner one. The mild steel bar was slotted using a slitting saw for accuracy and to get the proper width. The brass blade was soft soldered in place. By using this square to set the top-slide for boring the internal taper in the collet body, it can be used at any time in the future to accurately set the taper for making collets. If you intend only to use home made collets, the accuracy of the square is not critical. If you plan to use commercial E25 collets I suggest boring the body to fit such a collet, then fitting the square to the top slide.

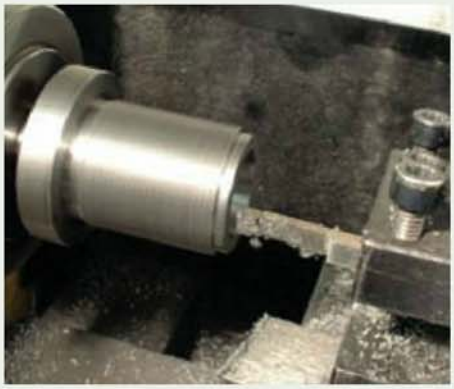
Boring the taper in the body can be a slow job if the top-slide has to be wound back and forth by hand. A short piece sawn from a cheap Allen key then held in an electric screwdriver provides an easy, controllable 'power drive'. What is more, it gives a better surface finish. Open out the end of the taper to 15/16in. diameter and 1in. deep. The last job on the body is to drill three equally spaced 6mm or 1/4in. holes for a tommy bar, to facilitate tightening and loosening the chuck.

Chuck nose

Start the chuck nose with a suitable blank in the 3-jaw chuck. Drill right through, open up to 1/2in. dia. or so in gradual steps and then bore right through 7/8in diameter. Making sure enough metal is left for the taper and release flange, increase the bore for the internal thread. You will need a tool that allows you to bore up to a shoulder. If you use auto-feed, stop before you reach full depth and make the last part of the cut by hand. Use an undercutting tool to cut a run-out groove, then thread the inside of the nose using the body as a gauge. Tidy up the end of the nose, remove it from the chuck and fit it to the chuck body. Using the draw bar, fit the chuck in the mandrel.

You now need to face the front of the nose so that it is exactly 0.250in. from the end face of the recess bored from the rear. Set the top-slide for boring at 30deg. and, using a tool ground with side clearance of over 60deg., bore the inside taper of the collet nose. I used a boring bar with a selection of tiny tool bits for these awkward jobs, as shown in the photograph. This is tricky to set up, but as long as you are careful to cut to exactly the same depth each time you will be left with a circular collar between the taper and the inner recess. This will be partly turned away to produce the collet-release flange, but you should now finish the outside of the nose. The external finish of the chuck nose is up to you, but I advise tapering it as much as possible, to limit possible interference when using the chuck.

Machining away part of the release flange requires care and attention. First mount the nose eccentrically in the 4-jaw chuck (or use a little packing under one jaw of the 3-jaw chuck). I ground up a small boring tool with reversed angles so I could poke it right through the bore, and cut outwards. Cut for the full width of the flange, or maybe a little more. The dimensions given are such that, once the tool starts to cut for a full revolution, it should be possible to 'click' in a collet and release it by gently pushing it sideways. You should be able to screw the nose fully home by hand to the point where a collet closes completely, and it should self-extract without difficulty as you unscrew the nose. Before you remove the nose to test the fit of a collet, mark it so it can be replaced in the chuck in exactly the same position; if you don't, you could be letting yourself in a for a little bit of ▶



The internal taper in the chuck body is bored using the set-over top-slide.

In addition to its use on the lathe, the chuck is a handy accessory for the Author's milling machine.

Shown here, a 60deg. dovetail cutter is firmly gripped by an ER collet in the Author' chuck.

juggling. I centre-popped a dimple to show the position of the flange from the outside.

You need to make suitable grooves or holes for tightening the chuck nose. It's a bit big for spanner flats! Three or six eqispaced 6mm or 1/4in. dia. holes will be fine, but as I had just acquired a milling machine (and with it a suitable C-spanner) I milled six slots instead. It is possible to mill slots using the lathe, by clamping the chuck nose to the side of tool post, packing up the tool post to get the nose exactly on lathe centre height. Finally, break any sharp edges; one way of doing so is to spin the work rapidly in the lathe while carefully pressing one of those handy DIY spongy sanding blocks against it. Take care to keep grit out of your lathe slides by covering vulnerable areas with newspaper.

Collets

I have shown the dimensions for making your own collets. Commercial collets are of a hardened springy steel. Mild steel collets should work, but may have a tendency to 'close up'. Silver-steel collets could be used, but the heat treatment may damage their accuracy. The ideal option for us is probably high-tensile steel, such as EN24 *(readers may care to specify EN24T - Ed.)*, which can be readily machined but will still make a long-lived collet. I suggest making the blanks 'tail first', so that a counterbore can be drilled in the end, a feature which while not universal, is found in some collets. Bore (not drill) the internal hole to size with the collet fixed in the chuck to ensure its concentricity. Cut the slots using a slitting saw with the blank mounted on a mandrel. The slots could be cut with a hacksaw, but these are likely to be too narrow. I have heard of the trick of using two hacksaw blades side by side, which should work, but may not give the neatest result.

The chuck is straightforward to use. ER25 collets have 1mm of adjustment, so 12-13mm will hold 1/2in. dia. cutters and material. A 6-7mm chuck is ideal for 1/4in. dia., but I suggest having a 5-6mm chuck for the common 6mm cutters. Expect to use a reasonable amount of force to adequately close a collet securely. A C-spanner or tommy bar is essential. If you have made a good job of the internal taper, then you should be rewarded with the collets holding work and cutters with an almost imperceptible run-out.

●*To be continued.*

WORLD TIME DIAL CLOCK

Ian Beilby

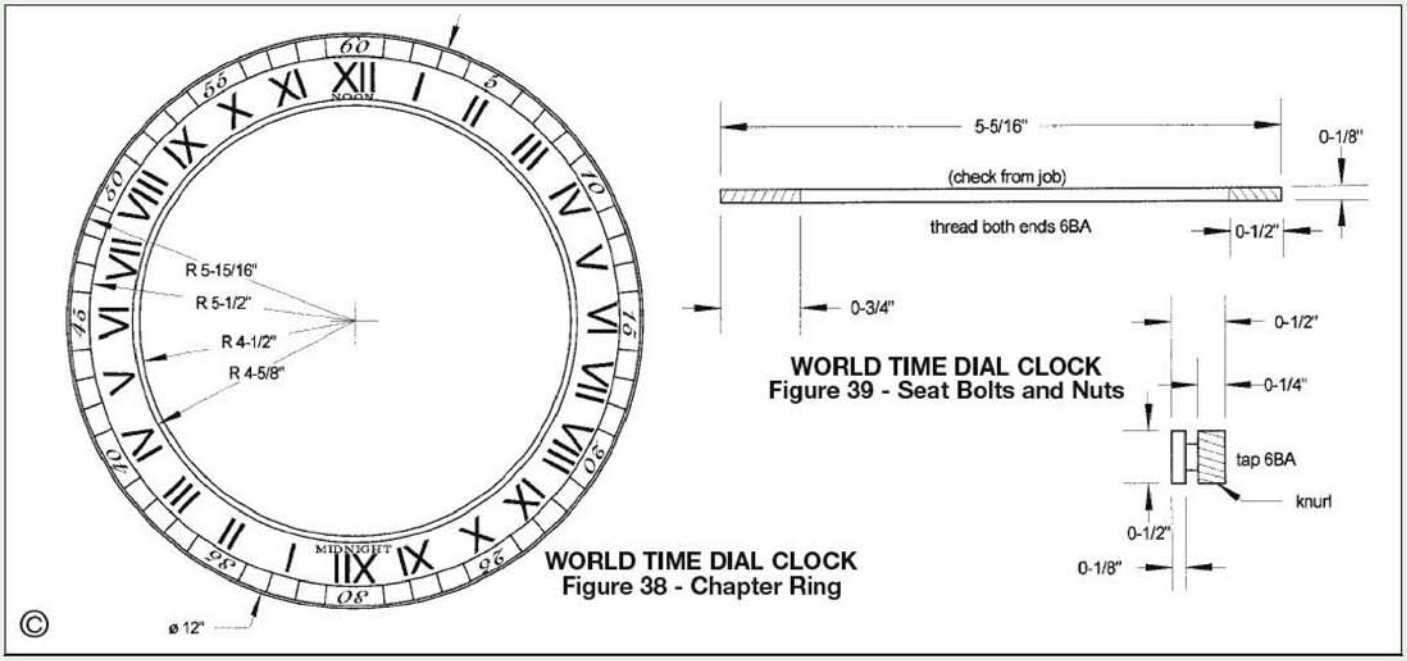
completes the construction of his unique and fascinating clock.

●*Part XIII continued from page 339 (M.E. 4230, 17 September 2004)*

With all the components for the clock movement and dial now made, the only items that remain to be fixed to the dial are the chapter ring and spandrels which should be secured in place from behind the dial using 12BA screws. I am assuming the chapter ring (**fig 38** and **photo 111**) will be engraved and silvered. The minute hand should be polished and blued. The completed movement and minute hand are shown in **photos 112** and **113**. Finally, the dial should be stripped of its components, any scratches or scriber marks polished out, and the dial and hour pointer sent to the artist to paint the starry band and the image of the sun (**photos 117** and **119**).

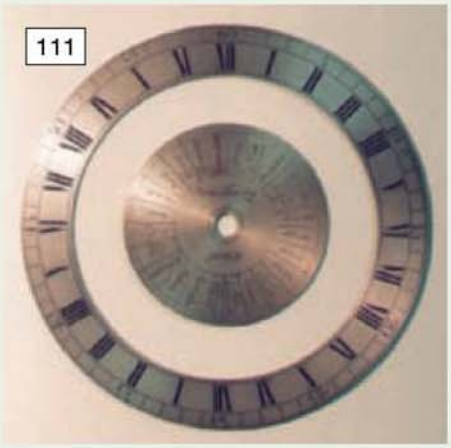
Seat bolts

The movement should be firmly fixed to the seatboard; **fig 39** shows the dimensions of the two seatbolts which I have used. The bolts are simply made from a length of 1/8in. steel rod, turned and threaded 6BA at both ends. The nuts are simply made from 1/2in. brass rod, drilled and tapped 6BA. To facilitate tightening the bolts, the heads of the nuts should be knurled and secured to the bolts with Loctite. Some of the machining operations, and the finished bolts, are shown in



WORLD TIME DIAL CLOCK
Figure 38 - Chapter Ring

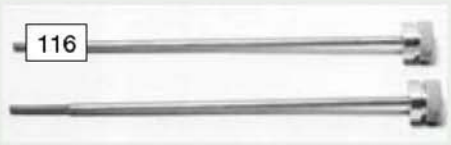
WORLD TIME DIAL CLOCK
Figure 39 - Seat Bolts and Nuts



Engraved and silvered dial and chapter ring.

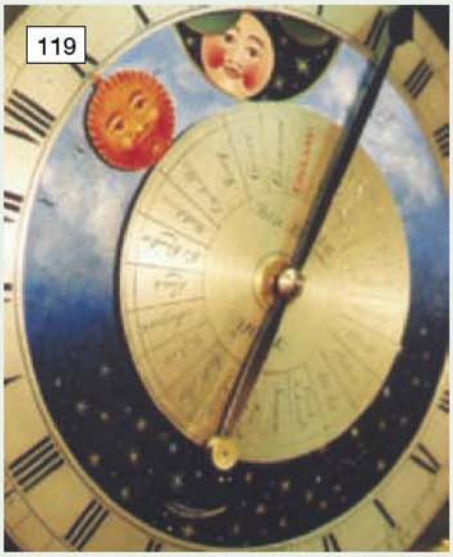
Tapping a knurled seat bolt nut.

Parting off the final seat bolt nut.



The final components completed: the seat bolts with nuts secured in place with Loctite.

Cheerful hand painted images of the sun (above) and moon (below).



The Author's clock is made even more attractive with the hand painted sky with clouds and stars.

photos 114 to 116. The bolts are suitable for the case which I have designed and made; the length of the bolts may have to be altered depending on the dimensions of your own case.

All the components of the clock have now been made.

Completion

Before final assembly and oiling, the clock plates and all components should be inspected, the plate register pins should be knocked out, and any scratches or scriber marks removed with fine emery paper. The plates can be polished and lacquered, but this is a matter of personal choice, some constructors prefer to leave the plates with a straight grain from fine emery paper worked vertically on the plates.

Fine quality clock oil should be used to oil all the pivots, etc. A weight of around 8lb. should allow the clock to perform well. The driving chain is arranged to give a double fall and is attached to two hooks screwed into the bottom of the seatboard.

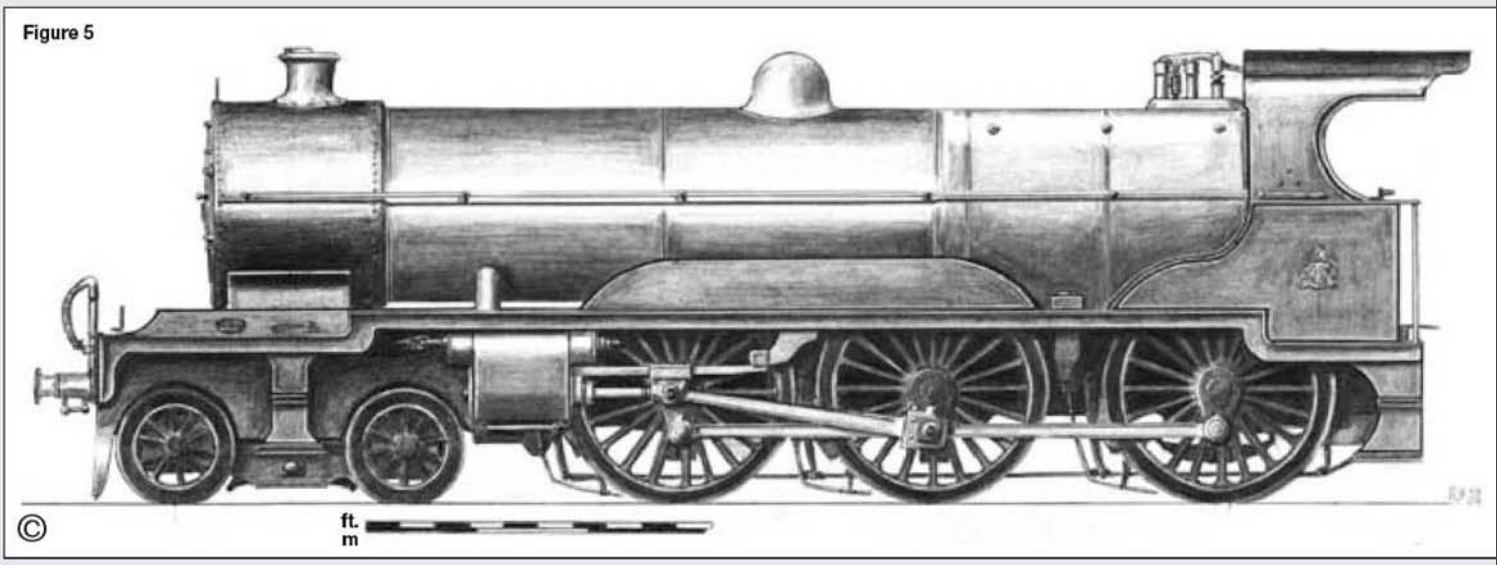
For convenience, the case should be fastened to the wall with the bottom of the dial positioned some 60in. from the ground. The finished clock and dial are shown in **photos 119 to 121**.

Prior to publication of the first part of this series, my clock has been running for nearly a year, and I am pleased to say it is performing very well and keeping an excellent rate of time. The clock has proved to be of great interest to visitors and friends alike.

Concerning the importance of knowing the time in the Cook Islands, I will leave that to other readers/constructors to decide. But just as in the eighteenth century when John Bolton made his clock, I think the real interest and merit in constructing this clock, is in showing that much more can be done with a clock than merely telling the local time.

Maybe the need to know world times is debatable, but the clock is undoubtedly attractive.

Figure 5



EDWARDIAN ELEGANCE

Ron Isted

continues with his description of the first two Midland Compounds and considers what might have been.

●Part IX (conclusion), continued from page 337, (M.E. 4228, 20 August 2004)

In November 1907, Sandham Symes, the Midland Railway Assistant Chief Draughtsman, produced a drawing for a compound 4-6-0 (**fig 5**), similar in layout to three French Atlantics imported by the Great Western Railway a few years before. Although the original Derby Works drawings were certainly still in existence about 30 years ago, they have apparently since disappeared and my drawing is therefore based on an outline sketch in J. B. Radford's book, and an artist's impression in O. S. Nock's Locomotive Monograph (see references at the end of this article), to both of whom I make due acknowledgement.

Unfortunately, although both appear to have been extracted from the same works drawings there are several factual inconsistencies in these two accounts, which just goes to show how important it is to dig as deeply as possible into the archives, preferably to original sources. I have also referred to photographs and works drawings of several other contemporary Midland locomotives, including the 999 class 4-4-0s, to make my drawing as authentic as possible, but obviously I cannot guarantee every detail.

The proposed locomotive has been described as merely an enlarged Midland Compound, but this is untrue in several very important respects. For a start, the engine would have been a 4-cylinder instead of a 3-cylinder machine, with a layout on the system introduced by Alfred de Glehn and built in large numbers on the Continent in the form of both Atlantics and 4-6-0s, by the Societe Alsacienne de Constructions Mecaniques (SACM). By the way, and just to confuse you, Alfred de Glehn was an Englishman, born in Kent, and Alsace-Lorraine was, at the time, part of Germany!

Unlike the existing Midland compounds, the two outside cylinders on the proposed engine would have been the 13 x 28in. high pressure pair placed behind the trailing bogie wheels, while the two 21 x 26in. low pressure cylinders were between the frames and well forward. The drive was divided, the HP driving the centre pair of coupled wheels and the LP on to the leading pair, all four cylinders being supplied by $8^3/4$in. piston valves. As mentioned above, the general layout was similar to the three French Atlantics imported by the GWR in 1903-5 and subsequently copied by G. J. Churchward on his 4-cylinder single expansion Star class 4-6-0s, the first of which appeared from Swindon in 1906.

Because of British pre-occupation with appearance at the expense of accessibility, the valve gear was hidden away between the frames in both Midland and GWR designs, the outside valves being driven by means of rocking shafts, almost identical on the two engines. But only *North Star*, the very first locomotive of Churchward's famous class, shared another interesting feature with Richard Deeley's still-born 4-6-0. Both locomotives were fitted with a variant of Walschaerts, valve gear, which avoided the use of eccentrics by deriving the movement for oscillation of the expansion link from the crosshead on the opposite side of the engine. This gear, often referred to as the 'Scissors' because of its action, had already been used in both Belgium and America, but that did not prevent a dispute between Swindon and Derby over patent rights.

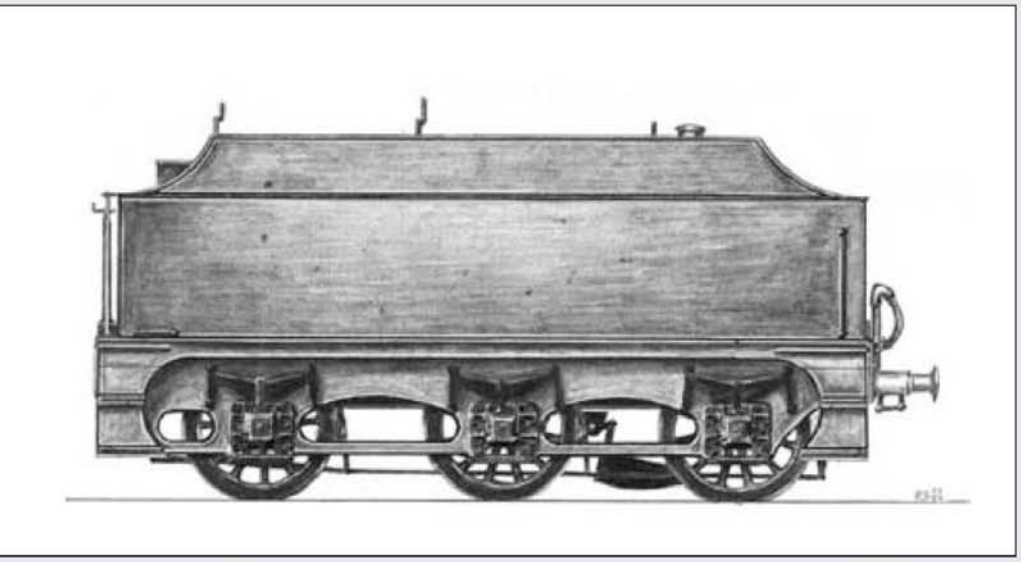
As I have said earlier, collaboration between railway design offices in this country 100 years ago was generally conspicuous by its absence, although I would just like to stir things a little by pointing out that the Derby design of superheater just happened to be a pretty close copy of that produced at Swindon! Whether this was in fact due to collaboration, or Edwardian industrial espionage, I will leave you to decide. The Scissors valve gear also appeared on Richard Deeley's 999 class 4-4-0s, and a superb 5in. gauge model, built by the late Peter Dupen, incorporating the correct valve gear of course, won the Duke of Edinburgh Trophy at the 1973 Model Engineer Exhibition. The main advantage of the gear was that it freed up space for longer journals because of the lack of eccentrics, but it meant that any fault in either set of gear effectively rendered the engine a complete cripple.

Had it been built, even with constricted steam circuit, short travel valves and fixed ratio cut-off, Richard Deeley's large Edwardian 4-6-0 would surely have had profound repercussions on British locomotive design. (By the way, I do know about Sir Henry Fowler's abortive design for a compound 4-6-0 in the 1920s, but that really is outside this story!) One problem with the Midland 4-6-0 would have been the wholesale replacement of turntables necessary because of its great length, the engine wheelbase adding up to more than 30ft., compared to 27ft. 3in. of Churchward's Star, for example.

I am also convinced that independent notching up of high and low pressure cylinders, as in the original two Smith/Johnson engines, would sooner or later have been considered essential for the 1907 machine to achieve its full potential. After all, the most efficient steam locomotive ever built, the magnificent French 3-cylinder compound 242A1, had independent control of high and low pressure cut-off. Pursuing the idea to its logical conclusion and letting our imagination really run riot, if E. L. Diamond had still been employed by the LMS and been given permission to rebuild Deeley's big 4-6-0 on the lines suggested in his 1926 paper, who knows how, or even when, the history of main line steam traction in this country would have ended.

But, of course, such a reconstruction would have necessitated four separate sets of valve gear, two of which would obviously have had to be outside the frames. Such a visual outrage would almost certainly have caused even graver offence to the aesthetic susceptibilities of footplate crews at Derby shed than did Samuel Johnson's pioneer compound 4-4-0s — but, as we used to say after a couple of hours at the pictures in the local fleapit, isn't this where we came in?

Let us turn from these slightly fantastic flights of fancy to the production of a miniature version of one of the two original Midland compounds, which would be of great interest and a memorial to a potentially revolutionary design. I feel, however, that it would be a pretty formidable challenge, especially at the design stage, and not exactly ideal for a first attempt. To those who have access to back numbers of this magazine, perhaps through a society library, I would strongly recommend the articles by C. M. Keiller.



He was the brilliant model engineer mentioned earlier who, nearly 70 years ago, built some very fine compound locomotives in 2½in. gauge, including one based on the later Deeley/Fowler 4-4-0 built in such large numbers by the LMS. References are given at the end of the article.

One factor contributing to Mr. Keiller's success was the use of very high boiler pressure for such a small scale — initially 150psi — a highly desirable feature in any machine with two-stage expansion, and he also incorporated long lap, long travel valves allied to generous steam circuitry. Perhaps to his surprise, he found he had to re-set the safety valves on his engine to 135psi, as it was unable to utilise all the power developed at the original pressure due to violent slipping, this in spite of using cylinders the equivalent of only 15 x 24in. high pressure and 16½ x 24in. low pressure. Mr. Keiller's engine won a well deserved Silver Medal at the 1937 Model Engineer Exhibition and the subsequent report in the magazine remarked that he would almost certainly have walked off with the Championship Cup had he only managed to finish the tender in time!

Before discussing currently available castings for a 3½, 5, or 7¼in. model, a few details of the general construction of the two original Smith/Johnson compound 4-4-0s may be useful. The frames were only 1in. thick and were in two sections, the join occurring between the rear bogie and driving wheels. The single 19 x 26in. high pressure cylinder was inside the frames, on the exact centre line of the engine, with an 8½in. piston valve directly below it, Because of the crank axle, the drive to this valve was offset by no less than 8⅝in., although on the later engines built by the LMS, the piston valve itself was moved off centre, presumably to obviate this.

The 21 x 26in., low pressure cylinders, were outside the frames, in line with the HP, giving a length of outside and inside connecting rods within half an inch of each other, and were supplied by slide valves having steam ports 1 3/16 x 17½in. and exhaust ports 3 x 17½in., with bridges 1 1/16in. wide. The HP inside cylinder was inclined upwards at a rate of 8⅞in. over 11ft. 6in.(!), while the piston valve was inclined downwards at 9⅜in. over 11ft. 6in.(!) The LP outside cylinders were inclined at the rather less indigestible figure of 1 in 40, but the slide valves were offset from the centre line of the motion, the 17½in. length of the ports divided 9⅜in. above and 8⅛in. below (**fig 6**). The original engines were right-hand drive, and the individual notching up of high and low pressure gear was achieved by mounting the reversing and lifting arms for the HP on a sleeve rotating on the weighshaft itself. They could also be combined at any ratio the driver chose by means of a locking device on the screw reverser in the cab.

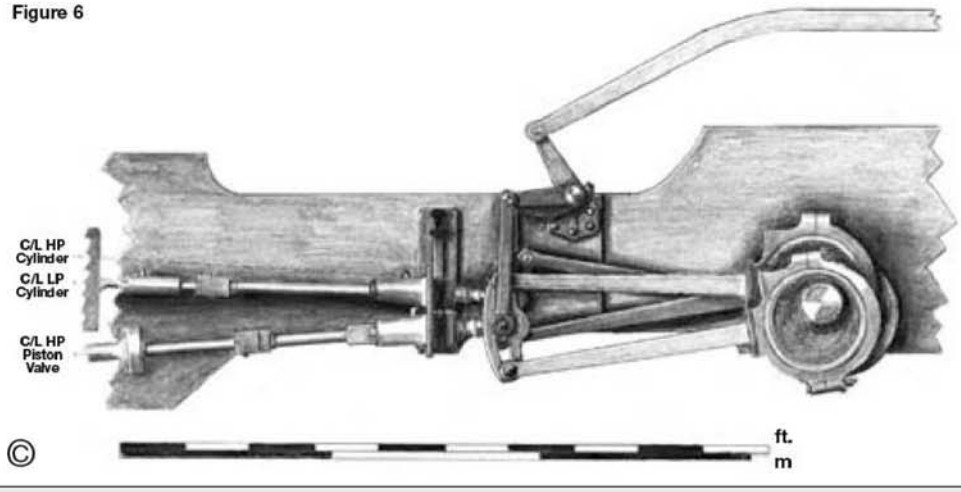
The most noticeable characteristics of the boiler were the short barrel and very large Belpaire firebox, giving a grate area on the original engines of 26sq.ft., increased on the later Deeley/Fowler machines to no less than 28.4sq.ft., the largest ever used on a British 4-4-0 — slightly bigger even than the Southern Railway Schools class of 1930. The first Midland compound, No. 2631, was fitted with normal boiler tubes, but her 'twin' sister No. 2632 was equipped with ribbed Servé tubes, which theoretically increased the heating surface by approximately 7%. One of the 1903 batch, No. 2635, also carried ribbed boiler tubes, but the experiment was obviously unsuccessful, as both engines were re-tubed as early as 1904. As a matter of interest, the three GWR French compounds imported in 1903-5 were also originally fitted with the Servé tubes, but again, all were re-equipped with plain tubes within a few years. Was there some hitherto un-revealed love/hate relationship between Swindon and Derby?

A small but noticeable detail was the capuchon on the chimney, intended to lift the exhaust clear of the cab, as apparently someone in the Derby drawing office thought that after double expansion the exhaust steam would not have the energy to do so without a little assistance! The LP cranks were set at 90deg., with the HP crank bisecting the angle between them, i.e. at 135deg., so that the exhaust rhythm sounded the same as a single expansion two-cylinder locomotive. The connecting rods for the outside (LP) cylinders were mounted outside the coupling rods, unusual in this country, but a feature shared with the Adams LSWR 4-4-0s and NER 1619, the original Smith compound. Another detail 'borrowed' from Gateshead was the design of the steam brake on the engine, the cylinder of which was suspended in a horizontal and very prominent position between the coupled wheels (see fig 1, *M.E.* 4230, 17 September 2004).

One item which added considerable bulk to the general appearance of the first five Midland compounds was the huge bogie tender, weighing not far off 53 tons and necessary because the railway had no water troughs until 1903. I believe these five tenders were unique on the Midland, as the equally massive water carts dragged round the country by the company's famous 'Spinners' and 'Belpaire' 4-4-0s had a different arrangement of springing — so you can't pinch Martin Evans' design for his fine *Princess of Wales* for use behind a 5in. gauge compound! From 1903 onwards, once the water troughs had been installed, Richard Deeley lost little time in substituting six-wheeled tenders, although I very much doubt whether 2631 or 2632 acquired them before being 'Deeleyised'.

This process took place in at least two distinct stages, the first retaining the general external appearance but incorporating the Deeley regulator, smokebox and chimney, and probably the substitution of a six-wheeled tender. The second, visually more drastic transformation took place in November 1914 when the original engine, now re-numbered 1000, was rebuilt at Derby with a superheated boiler pressed to 220psi and generally altered to conform to Deeley's own compounds. The more obvious visual alterations included an extended smokebox, raised running plate over the coupled wheels and a much more commodious cab, including a substantial rearward extension of the roof, which must have made the life of the footplate crew a lot more pleasant when battling against the Settle-Carlisle ▶

Figure 6



gales. Sister engine No. 1001, formerly 2632, was similarly rebuilt two months later, after which both locomotives served their Midland, LMS and BR masters faithfully until both were withdrawn in 1951, 41000, ex-1000, ex-2631 in October, and 41001/1000/2632 a month later.

Fortunately, this was not the end of the line for the pioneer Midland compound 4-4-0, although nearly eight years were to pass before any restoration work was carried out, by which time the engine was in a very sorry state. In the circumstances, Derby Works did a magnificent job, actually putting the locomotive back into working order and in 1959, she was once more back on the road, working special trains for enthusiasts with great success. Her happy hunting ground once again included the arduous Settle-Carlisle line, its breathtaking scenery little changed in the 57 years which had passed since this same engine put up the outstanding performances quoted earlier. The restored locomotive now lives at the National Railway Museum at York and carries the number 1000, as she is in 1914 condition, i.e. rebuilt and superheated by Richard Deeley, since it was considered impracticable to restore her to the original Smith/Johnson state — all the more reason for an enterprising model engineer to produce a miniature version of this famous engine as built!

Coming to commercially available castings for such a project, the driving and coupled wheels were 7ft. diameter with 22 spokes and in 3½in. gauge, the driving and coupled wheels for LBSC's Great Eastern 2-4-0 *Petrolea,* and his North Eastern 4-4-0 *Miss Ten To Eight,* are the right size, i.e. 5¼in. diameter. Both however have only 20 spokes rather than the 22 of the Midland compound. On the other hand, the wheels for LBSC's *Hielan' Lassie* have 22 spokes, but are 3/16in. too small (equivalent to 6ft. 9in. diameter). In 5in. gauge, the nearest seem to be the 7 3/16in. wheels for the various permutations of LMS 4-6-0s described by Martin Evans under the heading of *Fury* and *Royal Engineer*, but they have only 21 spokes and are again the equivalent of 6ft. 9in. diameter instead of the strict scale 7ft., while Martin's Great Eastern 4-4-0 Super-Claud also specifies under-scale wheels, but with only 20 spokes. It is important to remember, however, that our out-of-scale flanges and the increased vertical movement of our axleboxes may necessitate the use of under-size wheels on tread, in order to retain the visually more important exact scale size splashers. In 7¼in. gauge, Keith Wilson's GWR *Saint Christopher* design has the correct 22 spokes and is within a quarter of an inch of scale diameter.

Turning to suitable cylinder castings, on the full size locomotive, the low pressure cylinders, i.e. those outside the frames, are spaced at only 6ft. 3in. centres, equal to 6 41/64in. in 5in. gauge for example. This compares with 7 5/8in. (just over 7ft. 2in. full size) for both LBSC's NER 0-8-0 *Netta* and Martin Evans' North British Atlantic *Waverley*, and the figure is similar in other gauges. The reason for this anomaly is that as noted earlier, the connecting rods on the full size Midland compounds are inside the coupling rods. In addition, the frames, besides being only 1in. thick, are in two parts, with the front section, to which the cylinders are fixed, bolted inside the rear main frame, to leave only 3ft. 11½in. between them. One solution on a miniature version, if you wish to use commercial castings, which of course incorporate the fixing flanges, is to crank the forward section of the main frames inwards, as specified by Don Young for his Great Central Atlantic *Jersey Lily*. This also helps the perennial problem of finding room for the greater than scale movement of the bogie wheels. I must admit however, that I would approach with great trepidation the task of putting two exactly mirror image z-bends into a couple of pieces of 1/8in. plate. Perhaps an easier method would be to follow the design of the full size engine and make the frames in two parts, but adding a spacing piece between the two sections. My reservation here is that without an excessive amount of overlap, the frames would be seriously weakened and I strongly suspect that Curly would have simply Sifbronzed the lot!

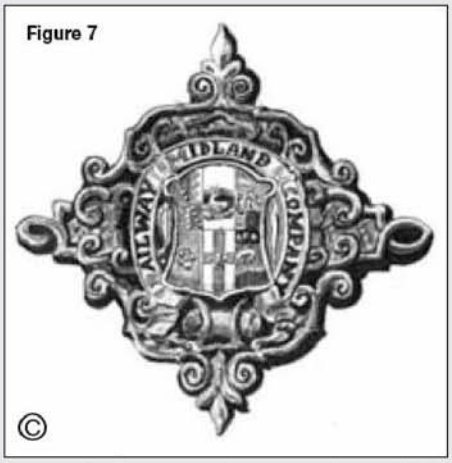
Assuming that we can get down to the scale spacing for the outside cylinders, and using 1/8in. mild steel for the frame, in 5in. gauge we shall be left with about 3 3/8in. between frames in which to fit the two low pressure slide valves together with their steamchest and the 1 11/16in. diameter high pressure cylinder. As Mr. Keiller has shown, however, scale diameter cylinders on a miniature compound locomotive are not such a good idea, especially if you are using above average boiler pressure to make good use of the two stage expansion. Clearances are not so tight therefore as they look on paper — after all, he managed to squeeze everything into the exact scale overall width (8ft. 9in.) on a 2½in. gauge engine. I would imagine that the inside HP cylinder, together with its valve, and the joint steam chest or 'receiver' for the LP valves would have to be fabricated. As I have said, this is not a project for a first attempt.

When building the boiler for a miniature version of a Midland compound, the very large Belpaire firebox of the full size machine allows us to achieve a reasonable grate area without having to adopt subterfuges such as extending it back into the cab. This is just as well, as the upper section of the cab on this engine is, if anything, even more skeletal than on G. L Churchward's locomotives, and any fiddling with the position of the backhead would quickly become obvious. On the other hand, a minimal cab does help you to see what you are doing when driving — assuming you can actually reach the controls over that whacking great tender.

A fine finish

The finish of Midland Railway locomotives was legendary, and the colour scheme must be one of the finest ever applied to a steam locomotive. The well-known 'Midland Red' originated in the 1880s, when it was officially described as oxide of iron. In 1895, by which time the quality of finish had already become world famous, *The Engineer* recorded the following painting sequence used at Derby works: 1) two coats of lead colour; 2) four coats of purple brown or chocolate colour; 3) one coat of mixture of crimson lake and purple brown; 4) application of black and yellow lining; 5) five coats of varnish. If my maths is correct, this adds up to 14 separate painting processes (counting the lining as two), each of which would presumably require 24 hours drying time, not to mention all the rubbing

Figure 7



down and stopping up between each coat in the early stages. So the engine would have to be in the paintshop for well over a fortnight, just to get through what I am tempted to call The Ceremony Of The Laying On Of Paint.

Even then the locomotive was not allowed to be moved for a further four to six days, just to ensure that everything was thoroughly dry. *The Engineer* also recorded the fact that in order to be certain of this, Derby paintshop had its very own heating boiler to maintain a steady temperature of 70deg. F (21deg. C) during the winter months for these pampered puffers — which causes one furiously to reflect on how the temperature in the cosy paintshop compared with that in the various admin. offices of the Midland Railway — or perhaps Blea Moor signalbox at 2 o'clock on a January morning? But of course, such places were only inhabited by people and this was before the days of the HSE.

I last saw the preserved Midland Compound in Clapham Museum over 30 years ago, but I still remember vividly that Derby's Midland Red stood out as being something very special, even in such distinguished company as the beautifully restored LNWR *Cornwall*, LSWR 563, LBSCR *Boxhill* and SECR 737. The finish has almost a three-dimensional look about it, which sounds ridiculous when describing what is, when all is said and done, merely a few coats of paint, but I'm sure those who have seen it will know what I mean. I have also seen many fine miniature versions of Midland locomotives at model engineering exhibitions over the last half century, but I'm afraid none of them has ever quite captured that feeling of depth in the original — like a coating of richly coloured glass.

When Nos. 2631 and 2632 left Derby Works in 1901, they carried the final Johnson version of the Midland Red colour scheme with plentiful brasswork, including the 6½in. high individual numerals on the cab side, safety valve cover, and beading round the driving wheel and coupling rod splashers. The letters MR appeared on the front buffer beam, and sides and rear of the tender, all in serif letters, although until 1899, the letters on the buffer beam only had been plain sans serif, a curious mismatch to those on the tender. Unlike the preceding single expansion Belpaire 4-4-0s, the boilers of all five Johnson compounds carried six black bands, lined each side in yellow, three round the barrel and three round the firebox, including one next to the front of the cab. An unusual detail, but common to most Johnson locomotives, was the lining around the base of the dome.

The wheels were also red at this period, with black tyres, but the lining on the red portion varied, depending on the locomotive's home

Figure 8

shed. The first compound, No. 2631, went to Carlisle and would have received the standard Derby scheme of a fine yellow line round the edge of the tyre and wheel boss, as would No. 2632 initially. But this second engine's home shed, Leeds, like Bristol and Manchester, had its own paintshop, and contemporary photographs show small variations such as lining of the spring hangers and double lining round the wheel boss on some engines resident at these sheds. The three later Smith/Johnson compounds, Nos. 2633/4/5, went to Kentish Town shed, which also had its own paintshop and made so many alterations to the standard colour scheme, that it became known as the 'London Style'. So, once again, beware of producing an engine in a condition that never existed!

The Midland Railway diamond shaped armorial device (**fig 7**) used from the 1880s until 1906 and featuring rather inaccurate versions of the arms of Birmingham, Derby, Bristol, Leicester, Lincoln and Leeds, appeared on the driving wheel splashers. Its dimensions were 14in. wide x 13 1/2in. high. While on the subject of splashers, their upper surfaces were normally black, but this was one area where Kentish Town shed asserted its independence by painting the bottom half only of the tops(!) crimson lake lined in yellow, which seems just a little, well — over the top? (Sorry). No. 2634 definitely carried this slightly quirky version and fuller details of this and other variations can be found in George Dow's excellent book *Midland Style*, listed in the references at the end of this article.

The tender body was divided into two round-cornered panels by black lines edged with yellow, with one of the railway's initials centred in each, while the initials also appeared on the back of the tender body (not the rear buffer beam at this period). All initials were in gilt, blocked to the left in blue and shaded to the right in black. Running board valances and tender frames were crimson lake lined on the lower edge in black with a yellow line above it, but the tops of the running boards along with the tender hornblocks, axleboxes and springs were all black.

Under Richard Deeley, brasswork was suppressed and the colour scheme simplified: wheels for example became black, as did the fluted sections of coupling and connecting rods, while tenders carried one square cornered panel. But the two most noticeable changes were the large 1ft. 6in. high gilt numerals, shaded to the right and bottom in black, on tank and tender sides and the introduction in 1906 of a new version of the Midland's armorial device on the lower cab panel (**fig 8**). Besides being more elegantly proportioned, somebody in the Derby drawing office had finally corrected various errors in the cities' coats of arms depicted thereon. Derby's stag, for instance, was now gazing confidently ahead instead of looking furtively over his shoulder! Incidentally, the version shown in full colour on the cover of the Science Museum publication, *Pre-grouping Railways Part 1*, is incorrect as it combines the general design of the 1906 version with the heraldic errors of the previous diamond-shaped pattern.

My drawing of the projected 4-6-0 of 1907 shows no numerals on the tender, only because far as I know, no running numbers were ever allocated to this fascinating locomotive might-have-been. I'm sure that it would make an unusual and potentially very efficient passenger hauler, besides being a splendid conversation piece! Building a miniature version of Midland Railway No. 2631 would also certainly be a rewarding if brain-teasing exercise, while driving either of them would be an art in itself, assuming of course that you incorporate all the various options discussed earlier.

Finally, there is one little known curious twist to the compound story in Britain, a country not exactly renowned for its enthusiasm towards two stage expansion in railway locomotives, although, strangely enough, ready to embrace the principle in engines for road transport, stationary and marine use. As we have seen, in the first decade of the 20th century, the Midland Railway's Derby drawing office was in the unusual position, especially for this country, of working simultaneously on designs for both three- and four-cylinder compound locomotives. What is even more unusual, and probably unique over such a short period of time, is that in 1905, while all this was going on, the same works also built a pair of two-cylinder compounds for its recently acquired satellite, the Belfast & Northern Counties Railway. These locomotives were 4-4-0s for the Irish 5ft. 3in. gauge, built to the designs of the NCC Locomotive Superintendent, Bowman Malcolm. They operated on yet another system, the Worsdell/Von Borries, but that really is another story.

In conclusion, I would once again like to acknowledge the assistance so willingly given by Keith Moore and the staff at the library of the Institution of Mechanical Engineers.

References

1. *Engineering,* 6 February 1902. Good broadside photograph of No. 2632, list of dimensions and good description of driver's options on the original pair of Midland compounds.
2. *Engineering,* 6 February 1903. Excellent side elevation, plan and cross section of original pair of Midland compounds. I found these easier to decipher than the Derby Works drawings (ref. 9 below), but they do not include the tender.
3. *Engineering,* 27 March 1903. *Acceleration and Velocity curves with the new Midland Compound Express Engines*. Interesting technical article with graph.
4. *The Engineer* 25 March 1904. Excellent three-quarter photograph of No. 2634 as built, although the technical description in Rous-Marten's accompanying article applies only to Nos. 2631/2.
5. *The Locomotive,* October 1902. Same broadside photograph of 2632 as in ref. 1 above, and brief technical description of dimensions and performance,
6. *La Locomotive Actuelle* by Maurice Demoulin, published by Béranger, Paris 1906. Good side elevation, plan and cross section, metric dimensions (and French text!)
7. Proceedings of the Istitution of Mechanical Engineers, Vol. 113, 1927. E. L. Diamond: *Cylinder Losses in a Compound Locomotive* and subsequent discussion.
8. *Locomotive Compounding and Superheating* by J. F. Gairns, published by Griffin 1907. Excellent sectional drawings of Smith reducing valve, as applied to NER 4-4-0, but identical in principle to Midland engines.

(References 1-8 above all courtesy I. Mech. E. library.)

9. Derby Works drawings: 02-5333 (NRM ref. 3/GW/7063E): G/A side elevation and plan of original Midland compounds; 02-5375 (NRM ref. 3/GW/7058E): G/A Cross sections of ditto; 02-5258 (NRM ref. 3/GW/7062E): G/A side and end elevation of original bogie tender.
10. *The Midland Compounds* by O. S. Nock, published by David & Charles 1964. Good general history and well illustrated, including artist's impression of proposed Deeley 4-6-0. More accurate text than ref. 14, and includes many of the 1902 indicator diagrams.
11. *Midland Style* by George Dow, published by Historical Model Railway Society 1975. Excellent and definitive reference book for everything Midland, including armorial devices. Well written and well illustrated, includes colour patches.
12. *The Midland Compounds* by D. F. Tee, published by the Railway Correspondence & Travel Society, 1962. Good short history, but very little about the two original engines
13. *S. W. Johnson, Midland Railway Locomotive Engineer Artist.* Jack Braithwaite, published by Wyvern Publications, 1985. Fine collection of photographs and factually useful if sometimes over adulatory text.
14. *Derby Works and Midland Locomotives* by J. B. Radford, published by Ian Allan 1971. General history, contains outline diagram of proposed Deeley 4-6-0, but several serious factual errors in the text.
15. *Locomotives* by J. T. van Riemsdijk, published by Atlantic Transport Publishers, 1994. An excellent and beautifully produced book on various compound systems, here and abroad, includes an excellent photo. of MR No. 2634, in the Deeley colour scheme (with tender from another locomotive!)
16. *Model Engineer*, 18 and 25 November 1937: *A Small Scale Compound Locomotive* by C. M. Keiller. Includes side elevation and plan of his 2 1/2in. gauge Deeley/Fowler 4-4-0.

The most useful for builders of a live steam model of one of the original Midland compound 4-4-0s are Nos. 2, 6, 9, 11 and 16.

Photocopies of Derby Works drawings (ref. 9) are available from the National Railway Museum, Copy Drawings Service, Leeman Road, York YO2 4XJ.

●*To be continued.*

CLUB CHAT
With Malcolm Stride

UK News

Finding a pair of spectacles after a recent AGM, **3mm Society** Secretary Richard Pope is reported in the July newsletter as regretting *"... the decline in the standard of members' lost property."* Richard recalled his first AGM as Secretary when a pair of long johns was handed in! Are there any other readers' tales of unusual lost property? To more serious things! The society reports that a CD ROM of Great Eastern locomotive drawings is available from the Great Eastern Society. Quite likely to be useful for those modelling in larger scales, the drawings print at A4 size in 3mm, 4mm and 7mm scales. Copies of the disc can be had by sending a cheque for £20.70 to Barry Jackson, GERS Publications Sales Officer, 14 Quantock Close, Bedford, MK41 9EW. Winners of awards at the recent AGM were Geoff Helliwell - *Tony Birch Memorial Award*, Ralph Steuart - *Market Drayton Trophy*, Tony Seal - *Cuckmere Trophy*, Howard Love - *Ralph Murfitt Trophy*, Tony Seal - *Modern Image Trophy*. I am sure all readers will join us in congratulating the winners who get such amazing detail in these diminutive models.

Andover DMES Secretary John Berry, reports the sad occasion of the last running at the Red Rice site. His photo shows the last train being pulled by John's 3½in gauge Black 5 driven by his son Andrew. Following the loss of the site, the society has explored many possible new sites and has put in a planning application for a suitable one. I am sure we all wish the society the best of luck with their endeavours in this difficult situation.

R. Davidson, electric locomotive No. 1 at the **Ashcombe Miniature Railway** suffered an unfortunate failure with the expiry of its battery. Following replacement, the locomotive performed well at the June running session during which there was a welcome interruption to enjoy *"... fish and chips, kindly brought to the track site by Jamie Mason's dad."* This term's visit was to the Spa Valley Railway which runs from Tunbridge Wells to Groombridge and uses smaller standard gauge and industrial locos. The group had two rides, one behind an 0-4-0T locomotive and the second behind a Class 08 shunter. Visits were also made to the engine shed and static buffet car.

The existing **Bournemouth DSME** committee was re-elected at the recent AGM. The society has agreed rent arrangements with the local council, the amount payable being based on the society's annual income. I seem to recall another society recently entering into a similar arrangement. Work is progressing on the new traverser, with various items being manufactured by members. The run for the Verwood Brownies was a success with a good selection of locomotives in attendance. This was followed by a visit from members of the **Gauge 0 Guild** *"... who all had plenty of rides and plenty to eat."*

The last train to run on the Andover DMES track at Red Rice was driven by Andrew Berry.

Crawley Model Engineers report some good running days interspersed with others made less enjoyable by inclement weather. I suspect this to be a common theme this year. Maintenance has included cutting some 3ft. high grass and removing some *"... kinks and wobbles"* in the track. Jim Nunn was running his Garrett when *"... the exhaust pipe from the rear unit came off and just disappeared."* Jim apparently kept going *"... amid clouds of steam until the blower valve was opened just too far and shot into the tender"* which no doubt produced even more clouds of steam! The society suffered a bout of graffiti when *"... some kind person painted a multi-coloured symbol on the club house wall."* Unable to make head or tail of it, the Wednesday Mob repainted the wall only to suffer a similar attack the following day. No doubt this was mentioned at the well attended open air meeting held by the local council to discuss the use of the park.

Reported in the **Erewash Valley MES** newsletter is the news that at the time of writing, the first circuit of the ground level track requires only 35ft. more rail to be laid for completion. The new kitchen also only requires minor work to complete. It is reported that the ladies of the society are so pleased with the results that *"... they now insist that it always be left as clean as one's kitchen at home!"* Members

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.

OCTOBER

15 **Canvey R&MEC.** *Video Clips Night.* Contact Brian Baker: 01702-512752.
15 **Exe District MSLS.** *Visit to the Met Office.* Contact Peter Parks: 01392-217915.
15 **North London SME.** *An Evening with Derek Perham & Frank Dell.* Contact David Harris: 01707-326518.
15 **Romford MEC.** *Roger Becket: Essex Sailing Barges 1800-2000.* Contact Colin Hunt: 01708-709302.
15 **Romney Marsh MES.** *DVD Evening.* Contact John Wimble: 01797-362295.
16 **Historical MRS (Scottish Area).** *Graham Todd: Special Traffic.* Contact Richard Crockett: 01896-750730.
16 **National 2½in. Gauge Ass'n (Southern Region).** *Hook Get-Together.* Contact John Cook: 0208-397-3932.
16 **York City & DSME.** *John Trenouth: History of Video Recording.* Contact Pat Martindale: 01262-676291.
16-21 **Meridienne Exhibitions.** *Midlands Model Engineering Exhibition* at The International Exhibition Centre Donington Park, Nr. Derby (M1 exit 24). 10.30am-5.30pm daily, (Wed: 10.30am-8pm, Thu: 10.30am-4pm). Advance Bookings: Adults £7.50, Senior Citizens £6.50, Children £4, Family (2+3): £19. Enquiries: 01926-614101.
16-21 **Guild of Model Wheelwrights** *at Midlands Model Engineering Exhibition, Castle Donington.* Contact Biddy Hepper: 01492-623274.
17 **Bedford MES.** *Public Running.* Contact Ted Jolliffe: 01234-327791.
17 **Cardiff MES.** *Public Running Day.* Contact Trevor Jenkins: 029-2075-5568.
17 **Frimley & Ascot LC.** *Club Running.* Contact Bob Dowman: 01252-835042.
17 **Keighley DMES.** *Open Day.* Contact K. Parkin: 01274-564866.
17 **Leyland SME.** *Diesel Day.* Contact Mark Entwistle: 01772-422411.
17 **Oxford (City of) SME.** *Public Running.* Contact Chris Kelland: 01235-770836.
17 **Peterborough SME.** *Public Running.* Contact Tony Meek: 01778-345142.
17 **Pinewood MRS.** *Public Running.* Contact Ivan Hurst: 01276-28803.
17 **Plymouth MSLS.** *Public Running.* Contact John Brooker: 01752-671722.
17 **Rugby MES.** *Public Running.* Contact David Eadon: 01788-576956.
17 **Saffron Walden DSME.** *Running Day (Public pm)* Contact Jack Setterfield: 01843-596822.
17 **Taunton ME.** *Public Running Day.* Contact Don Martin: 01460-63162.
17 **Teesside Small Gauge Rly.** *Running.* Contact Mike Aslin: 01642-724255.
17 **Wimborne DSME.** *Running Day.* Contact Eric Basire: 01202-897158.
17 **York City & DSME.** *Running Day.* Contact Pat Martindale: 01262-676291.
18 **Lancaster & Morecambe MES.** *AGM.* Contact Harry Carr: 01524-411956.
18 **Model Steam Road Vehicle Soc.** *AGM.* Contact Geoff Miles: 01869-247602.
18 **Peterborough SME.** *AGM + 'Surplus Goods".* Contact Tony Meek: 01778-345142.
18 **Salisbury DMES.** *Meeting.* Contact Pete Parrish: 01980-610346.
19 **Chesterfield MES.** *Photo. E. W. Hall, etc.* Contact Mike Rhodes: 01623-648676.
19 **Romney Marsh MES.** *Presentation by Simon Cast of Modelworks Ltd.* Contact John Wimble: 01797-362295.
19 **South Durham SME.** *Afternoon Steam-Up.* Contact B. Owens: 01325-721503.
19 **Taunton ME.** *Mike Matthews: Auction Preview at Honiton.* Contact Don Martin: 01460-63162.
20 **Birmingham SME.** *Bits & Pieces.* Contact John Walker: 01789-266065.
20 **Bournemouth DSME.** *Foundry Work.* Contact Dave Fynn: 01202-474599.
20 **Chingford DMEC.** *John Baker: Building a Fowler Engine.* Contact Martin Masterson: 0208-989-5552.
20 **Guildford MES.** *Bits & Pieces.* Contact Dave Longhurst: 01428-605424.
20 **Leeds SMEE.** *AGM.* Contact Colin Abrey: 01132-649630.
20 **Maidstone MES (UK).** *Members' Afternoon Playtime Run.* Contact Martin Parham: 01622-630298.
20 **MELSA.** *Meeting.* Contact Graham Chadbone: 07-4121-4341.
21 **Bedford MES.** *Public Running.* Contact Ted Jolliffe: 01234-327791.
21 **Cardiff MES.** *Chris Tuthill: Victory to Vanguard.* Contact Trevor Jenkins: 029-2075-5568.
21 **Isle of Wight MES.** *Dennis Saxcoburg: Two-Stroke Technology by MZ.* Contact Ken Stratton: 01983-531384.
21 **Plymouth MSLS.** *Members' Evening.* Contact John Brooker: 01752-671722.
21 **Sutton MEC.** *Chat Night.* Contact Mike Dean: 0208-657-5401.
22 **Brighton & Hove SMLE.** *Joe Whitcher: Railway Pub Signs, a Country-Wide Tour.* Contact Mick Funnell: 01323-892042.
23 **Chesterfield MES.** *Running Day.* Contact Mike Rhodes: 01623-648676.
23 **Historical MRS (Bristol Area).** *Peter Davey: Trams around Bristol.* Contact Gerry Nichols: 0117-973-1862.

North Norfolk MEC has made good use of a grant received under the 'Awards for All' scheme.

Chris Jones of Reading SME makes up the fire in his new SAR Class 15CA locomotive.

Club News Editor Malcolm Stride runs his 'noisy and racy' Eldon 60cc straight six 2-stroke.

visited **Sutton Coldfield MES** recently with three locos running.

Members of **Furness MRC** are making good progress with the track repairs reported in past issues. Shuttering has been fitted and the tops of the support sleepers laid with concrete. Track panels have been refitted ready to be joined and re-gauged. Hopefully we will soon be able to report trains running.

Readers may recall that last year we noted the closure of the **Hereford Waterworks Museum** for major refurbishment and building work. We have had news that work on the main building is now almost finished, including a complete new roof using Welsh slate from the Penhryn Quarry at Bethesda and lead work carried out using traditional methods. The museum was recently visited by Carole Souter, Chief Executive of the Heritage Lottery Fund which is supporting this work. Volunteer Peter Allen has taken on the task of restoring the small Tangye semi-diesel engine to operating condition. Once restored this engine will again drive the air compressor to provide pressure for cold starting its big brother. With a 4in. bore and stroke, the engine is rated at 2½hp and was built in 1932.

High Wycombe MEC has a new Secretary in the person of Eric Stevens. Eric can be contacted at 26 Calverly Crescent, High Wycombe, Buckinghamshire HP13 5EU, tel. 01494-438761 and e-mail at **eric.stevens1@virgin.net** We wish Eric much pleasure in his new role.

Good news from **North Norfolk MEC** which has been awarded a large grant under the 'Awards for All' scheme. This grant will be used by the club for its project to extend the existing club track at the North Norfolk Railway station in Holt. As well as enabling the track to be extended, it will also permit much improved construction providing smoother and more comfortable riding. The new track will make use of re-cycled plastic for sleepers. Operational facilities including the steaming bays will be improved and a separate length of track is to be provided for driver training and locomotive testing. For other clubs who may be interested, the 'Awards for All' scheme is operated by the National Lottery and aims to help local organisations achieve a specific project by providing small grants in a straightforward way. Details of the scheme can be found on **www.awardsforall.org.uk**

Nigel Smith has taken on the task of producing the **Northampton SME** newsletter. A volunteer with the Great Central Railway, Nigel is also involved with the production of their newsletter. As my Grandmother used to say *"He's a glutton for punishment!"* We wish Nigel success in his new role and look forward to receiving the results of his endeavours in due course. The society is to obtain a new boiler test kit, the old one being refurbished for members' use. Members are also now responsible for providing their own boiler adaptor for connection to the new test kit once it is available. The society has announced the date of IMLEC 2005 as 2/3 July on the basis that the British Grand Prix at nearby Silverstone is extremely likely to be held on the following weekend.

Members of **Norwich DSME** have organised a trip to the Donington exhibition and are no doubt all now feverishly producing shopping lists. Excellent progress has been made on the new track extension with the track bed *"... within yards of the first crossing."* The work was given a boost by the provision of a mini-digger and driver who dug out 840 metres of track bed in one (long) day. The work is being supported by donations from members. The club hosted a visit by the Mayor and Lady Mayoress of Norwich in June during which the new club house was officially opened. The Mayor and his Lady also enjoyed a ride on the raised track and toured the site to see what has been achieved so far. Member Bernard Ambrose recommends a visit to the **Markham Grange Steam Museum** just off the A1(M) junction 39 near Doncaster. Visit **www.mgsteam@btinternet.com** for further information. Admission is free, the museum is open weekdays and is in steam on Wednesdays and Bank Holiday weekends.

Another society making good progress with major works is **Pinewood MRS** which has completed

23	**Melton Mowbray DMES.** *Society Dinner.* Contact Phil Tansley: 0116-2673646.
23/24	**Claymills Pumping Engines.** Claymills Pumping Engine Trust., Meadow Lane, Stretton, Burton on Trent, Staffordshire. *Steaming.* Contact B. Eastough: 01283-812501.
24	**Amnerfield Miniature Railway.** *Public Running.* Contact David Jerome: 0118-9700274.
24	**Harlington LS.** *Public Open Day.* Contact Peter Tarrant: 01895-851168.
24	**MELSA.** *Bracken Ridge.* Contact Graham Chadbone: 07-4121-4341.
24	**Ottawa Valley Live Steamers.** *Steaming Day.* Contact John Bryant: 761-1109.
24	**Portsmouth MES.** *Last Day of Running Season.* Contact John Warren: 023-9259-5354.
24	**Teesside Small Gauge Rly.** *Running.* Contact Mike Aslin: 01642-724255.
24	**Guild of Model Wheelwrights** *at Avoncroft Museum of Historic Buildings, Stoke Heath, Bromsgrove.* Contact Biddy Hepper: 01492-623274.
25	**Bedford MES.** *Wainwright's Autumn Auction.* Contact Ted Jolliffe: 01234-327791.
25	**Exe District MSLS.** *Meeting.* Contact Peter Parks: 01392-217915.
26	**Basingstoke DMES.** *Meeting Night.* Contact Guy Harding: 01256-844861.
26	**Cardiff MES.** *Steam-Up and Family Day.* Contact Trevor Jenkins: 029-2075-5568.
26	**Historical MRS (E. Lancashire/N. Manchester Area).** *John Ryan: The LNWR on old Postcards.* Contact John Sykes: 01706-823989.
26	**Romney Marsh MES.** *Track Meeting.* Contact John Wimble: 01797-362295.
26	**Sutton Coldfield MES.** *Peter McMillan: Railway Braking Systems.* Contact Neal Harrison: 0121-378-3992.
27	**Birmingham SME.** *Meeting.* Contact John Walker: 01789-266065.
27	**Chingford DMEC.** *Film: The Great St. Trinians Train Robbery.* Contact Martin Masterson: 0208-989-5552.
27	**Historical MRS (Bedford Area).** *David Baker: Railway Films and Archive Footage.* Contact John Chamney: 01442-851214.
27	**Hull DSME.** *Photographic Competition.* Contact Tony Finn: 01482-898434.
28	**Brighton & Hove SMLE.** *Workshop Evening.* Contact Mick Funnel (01323-892042) or Gerry Collins (01273-553228) to confirm.
28	**Cardiff MES.** *Keith Richards: Even more from the Mines.* Contact Trevor Jenkins: 029-2075-5568.
28	**Leyland SME.** *Rolling Stock & Railway Accoutre Evening.* Contact Mark Entwistle: 01772-422411.
28	**Reading SME.** *AGM.* Contact Graham Bustin: 0118-9615450.
28	**Sutton MEC.** *Winter Projects.* Contact Mike Dean: 0208-657-5401.
28	**Wimborne DSME.** *Tom McConnell: The Logistics of War.* Contact Eric Basire: 01202-897158.
28	**Worthing DSME.** *John Knareborough: A Century of Electricity in the Home.* Contact Bob Phillips: 01903-243018.
29	**Chichester DSME.** *OGM.* Contact Brian Bird: 01243-536468.
29	**Colchester SMEE.** *Ron Howes: Kew Bridge Engines.* Contact L. G. Hammond: 01376-511686.
29	**Hereford SME.** *Richard Donovan: New Zealand 2004.* Contact Richard Donovan: 01432-760881.
29	**Historical MRS (Essex Area).** *Nick Pomfret: Edward Betteley – Railway Photographer.* Contact Jem Harrison, 27 Colne Place, Basildon, Essex SS16 5UZ.
29	**Malden DSME.** *D.A.G. Brown: Injectors.* Contact John Mottram: 01483-473786.
30	**Brighton & Hove SMLE.** *Last Track Day of the Season.* Contact Mick Funnell: 01323-892042.
30	**Ickenham DSME.** *IDSME Model Railway Exhibition.* Contact David Sexton: 01895-630125.
30	**Northampton SME.** *Night Run with Refreshments – Visitors Welcome.* Contact Pete Jarman: 01234-708501 (eve).
30	**North London SME.** *Halloween Evening.* Contact David Harris: 01707-326518.
30	**Woking MRS.** *Halloween.* Contact Ronald Dewar: 01932-343331.
30/31	**Gas Turbine Builders' Ass'n.** *Seminar, Workshop and Engine Efficiency Competition.* Contact: Tom Wilkinson: 01508-570977.
31	**Basingstoke DMES.** *Halloween Run.* Contact Guy Harding: 01256-844861.
31	**Bournemouth DSME.** *End of Summer Run/Barbecue.* Contact Dave Fynn: 01202-474599.
31	**Great Western Soc.** (Didcot Railway Centre). *Didcot Steamday.* Contact Jeanette Howse: 01235-817200.
31	**Hereford SME.** *Public Open Day.* Contact Richard Donovan: 01432-760881.
31	**King's Lynn DSME.** *Track Running.* Contact Mike Coote: 01533-673728.
31	**Leighton Buzzard NG Rly.** *Halloween Haunting.* Enquiries: 01525-373888.

In Memoriam

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

John Carey	*Romney Marsh MES*
Stan Elliman	*Romney Marsh MES*
Ken Hind	*Erewash Valley MES*
John Merrett	*Brandon DMES*
Edward Shirley	*Romney Marsh MES*

major track alterations including the turntable area, two steaming bays and a complete survey of the track by the Chief Engineer. Progress has also been made on the carriage shed extension. At an eventful council planning meeting which was marked by several power cuts, approval was given for new stores and all-weather shelter. The Chairman remarked that *"... the railway runs on the third Sunday of each month and is an enjoyable ride for the kiddies."* He sounds like a very useful ally to have! During the season, society members have paid visits to several other clubs including **Guildford, Sussex** and the **Isle of Wight.**

Times have been busy at **Reading SME** with the replacement of the club house ceiling. After lots of often dirty effort by a group of members, the new ceiling has transformed the look of the club room. When the old ceiling was brought down, members used garden rakes to remove the debris which included at least one very smelly squirrel's nest! During the same month members were at the Knowl Hill steam rally with the portable track and exhibits in the model tent. To cap all this effort, Saturday club running saw the introduction of two new locomotives to the track, not to mention an extremely noisy and racy Eldon 60cc straight six two-stroke being run by a certain Club News editor! The new locomotives were Mike and Chris Jones' 3½in. gauge SAR Class 15CA 2-8-2 and Alan Thatcher's 7¼in. gauge GWR 15xx loco to the *Paddington* design. Both are unusual, the SAR because being narrow gauge, the locomotive is very large for 3½in. gauge while Alan's 15xx is gas fired using burners to a design from the USA. We will no doubt hear more of this as Alan makes progress resolving the inevitable problems with such new developments — although he did manage some laps on this very first outing. The other locomotive running on the day was Mike Sinclair trying the ground level track with his 5in. gauge LNER Shire.

Mike and Chris Jones seem to get around — the cover of the **Romney Marsh MES** newsletter carries a photograph of Mike's 5in. gauge New York Central 4-4-0 being driven by Eddie Wilkinson. Having driven this locomotive on the Reading track, I can testify to the fact that it is an excellent runner and very easy to drive. The smile on Eddie's face indicates that he enjoyed his drive as much as I did. The locomotive was one of many at the society open weekend. Others included, on Saturday, Martin Parham's LNER P2 *Lord President*, Mike Starnes' 3½in. gauge *Evening Star*, Geoff Riddles' freelance 4-6-4, Harry Parry's 4-4-2 Atlantic, Dick Brown's *Simplex*, Geoff Howell's 0-4-2 Maxitrak *Dixie* and David Mills with his father's electric *Genesis*. On Sunday, locomotives included Granville Askham's Adams 4-4-0 and John Linkins with a GER 0-6-0T. The event coincided with the Society's 35th Anniversary, so congratulations are in order to all. The society hosted the **2½in. Gauge Association** rally earlier in the year with some eight locomotives running on the track.

Stamford MES has also seen some new locomotives on its track; at the July meeting six were in steam, only two of which had been seen at the track before. These included three locos to the Polly design, a *Lion*, a *Simplex* and a King Arthur which has already proved its worth as a passenger hauler. The only difficulty with this locomotive on a ground level track is leaning across the long (I assume eight wheel) tender when driving. Track maintenance work has included replacement of sleepers and refurbishment of the steaming bays. This is in addition to the other (model engineering?) activities of ground clearance, pruning and levelling around the site. The society newsletter carries a warning about building new boilers to older 'words and music'. The testers were presented with a boiler to LBSC's design with the expansion brackets and top feed attached with screws and soft solder. This could not be passed because present requirements are for new boilers to be silver-soldered throughout. Perhaps those selling older designs could include a comment to this effect with copies of boiler drawings. The problem with the offending boiler was sorted out with the help of the boiler inspector who managed to remove all traces of the soft solder and silver-solder new fittings in place. Finally, the following appeared in the Stamford newsletter and may be the answer for all those suffering a slow response when reporting incidents to the authorities:

George Phillips of Mississippi was going up to bed when his wife told him he'd left the light on in the garden shed, which she could see from the bedroom window. George opened the back door to go to turn off the light but saw people in the shed stealing things. He phoned the police, who asked "Is someone in your house?" and he said "No." They said all patrols were busy and that he should simply lock his door and an officer would be along when available. George replied "Okay" hung up, counted to 30, and phoned the police again.

"Hello. I called you a while ago because there were people in my shed. Well, you don't have to worry about them now cause I've just shot them all." He put the phone down. Within five minutes three police cars, an Armed Response Unit, and an ambulance showed up at the Phillips residence. Of course, the police caught the burglars red-handed.

One of the policemen said to George "I thought you said that you'd shot them!"

George replied "I thought you said nobody was available!"

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31 **Maidstone MES (UK).** *Public Running Day.* Contact Martin Parham: 01622-630298.
31 **MELSA.** *Sunday in the Park.* Contact Graham Chadbone: 07-4121-4341.
31 **Oxford (City of) SME.** *Public Running.* Contact Chris Kelland: 01235-770836.
31 **Teesside Small Gauge Rly.** *Running.* Contact Mike Aslin: 01642-724255.

NOVEMBER

1 **Historical MRS (London Area).** *David Larkin: Wagon Miscellany.* Contact John Millbank: 0208-948-0556.
1 **Lancaster & Morecambe MES.** *Topic Night; Painting & Lining.* Contact Harry Carr: 01524-411956.
1 **Peterborough SME.** *Bits & Pieces.* Contact Tony Meek: 01778-345142.
2 **Stamford MES.** *Bits & Pieces.* Contact David Ash: 01780-751211.
2 **Taunton ME.** *Dave Bide: Rocking Horse Building.* Contact Don Martin: 01460-63162.
3 **Birmingham SME.** *Peter Jackson: The Story of Coins.* Contact John Walker: 01789-266065.
3 **Bradford MES.** *Auction.* Contact John Mills: 01943-467844.
3 **Guildford MES.** *Tony Drake: The Bluebell Railway.* Contact Dave Longhurst: 01428-605424.
3 **Leeds SMEE.** *Bonfire Night Steam-Up & Supper.* Contact Colin Abrey: 01132-649630.
3 **Tyneside SMEE.** *Guy Fawkes Evening Run.* Contact Ian Spencer, 0191-2843438.
4 **Cardiff MES.** *Tony Bird: More on Clocks.* Contact Trevor Jenkins: 029-2075-5568.
4 **South Lakeland MES.** *Meeting.* Contact Adrian Dixon: 01229-869915.
5 **Canvey R&MEC.** *Ken Alder: Adventures Down-Under.* Contact Brian Baker: 01702-512752.
5 **Cardiff MES.** *Fireworks Display.* Contact Trevor Jenkins: 029-2075-5568.
5 **Colchester SMEE.** *Derek Lewis: Railways of Essex.* Contact L. G. Hammond: 01376-511686.
5 **Maidstone MES (UK).** *Evening Run & Chilli Spuds.* Contact Martin Parham: 01622-630298.
5 **North London SME.** *North American HO Section Entertains.* Contact David Harris: 01707-326518.
5 **North Norfolk MEC.** *Tim Christian: A Cinema Photographer's View of Engineering.* Contact Gordon Ford: 01263-512350.
5 **Portsmouth MES.** *M. Ross: Portsmouth Dockyard.* Contact John Warren: 023-9259-5354.
5 **Rochdale SMEE.** *Geoff Dowden: Constructing a NE Covered Wagon.* Contact Mike Foster: 01706-360849.
5 **Romford MEC.** *Competition Night.* Contact Colin Hunt: 01708-709302.
6 **Brighton & Hove SMLE.** *Halloween/Guy Fawkes Barbecue, Steam-Up and Fireworks.* Contact Mick Funnell: 01323-892042.
6 **Isle of Wight MES.** *Track & Pond.* Contact Ken Stratton: 01983-531384.
6 **Keighley DMES.** *Bonfire Night (Ticket Only).* Contact K. Parkin: 01274-564866.
6 **Malden DSME.** *Bonfire Night (Ticket Only).* Contact John Mottram: 01483-473786.
6 **Oxford (City of) SME.** *Firework Night - Barbecue and Night Run.* Contact Chris Kelland: 01235-770836.
6 **Peterborough SME.** *Guy Fawkes Run, Firework Display and Barbecue.* Contact Tony Meek: 01778-345142.
6 **Romney Marsh MES.** *Bonfire Night Track Meeting & Barbecue.* Contact John Wimble: 01797-362295.
6 **SM&EE.** *Brian Perkins: Machining from the Solid.* Contact David Boote: 01202-745862.
6 **The Society of Ornamental Turners.** *AGM.* Contact N. S. Edwards: 01234-359392.
6 **Stockholes Farm MR.** *Bonfire Night.* Contact Ivan Smith: 01427-872723.
6 **York City & DSME.** *Bonfire Steaming Event.* Contact Pat Martindale: 01262-676291.
7 **Ellenroad Engine House,** Elizabethan Way, Milnrow, Rochdale, Lancashire OL16 4LE. *In Steam plus Hand Spinning & Weaving Demonstration.* Enquiries: 01706-881952.
7 **Frimley & Ascot LC.** *Public Running.* Contact Bob Dowman: 01252-835042.
7 **Hereford SME.** *Exhibition & Swapmeet.* Contact Richard Donovan: 01432-760881.
7 **Pinewood MRS.** *Members' Steam-Up/Night Run & Barbecue.* Contact Ivan Hurst: 01276-28803.
7 **Reading SME.** *Public Running.* Contact Graham Bustin: 0118-9615450.
7 **Sutton MEC.** *Bits & Pieces.* Contact Mike Dean: 0208-657-5401.

THE MODEL ENGINEER EXHIBITION

Please return completed form to:
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Church St., Twyford, Bucks. MK18 4EU

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PERSONAL DETAILS (Please print)

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Address .....

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Post Code ..... Home Tel: ..... Daytime Tel: .....

Model Club or Association .....

Have you entered before? (Y/N) .....

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How many years have you been a modeller? .....

Mail Order Protection - please tick this box if you would prefer not to receive mail from other companies which may be of interest to you ☐

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Entry Class (competition entries only) .....

Model Title (to be used for catalogue and display card) .....

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Model Description .....

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Model Scale ..... Length ..... Width ..... Height ..... Weight .....

Type of construction .....

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Parts not made by you and commercial items.....

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Have you supplied a photograph? (Y/N) .....

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Name and address of local newspaper .....

.....

NB Please make a copy of this form and any photographs enclosed for your own reference. Please note that Highbury Leisure will not accept liability for any loss of documents or photographs submitted with this form

TO HELP YOU GET THE BEST FROM THE MODEL ENGINEER EXHIBITION

These notes are written purely for guidance. Full information is contained in the Competitors' Information booklet which is sent to every entrant as part of the information package. If you have an item and are unsure as to the Class into which it should be entered, leave that section blank and we will take care of it. The Judges have the right to move any competition exhibit into another class if they feel that by doing so its chances of gaining higher marks or a more appropriate award are improved.

If the item is offered as a Loan exhibit please indicate this by writing Loan on the form in the box identifying the Class. Loan models are not judged but carry all other privileges associated with competition entries.

Part built models are particularly welcome in the Loan Section; visitors like to see work in progress, and entry does not preclude the item being entered in competition when completed.

The classes listed below are those associated with mainstream model engineering.

Club exhibits

Where a club is exhibiting, each model should be entered on a separate entry form and clearly identified as a club exhibit by entering Loan/Club in the class section box. This ensures that we have a full record of all models on display during the show and facilitates matters of administration and insurance.

Additional forms

If you do not wish to deface your copy of the magazine we are happy to receive photocopies of the entry form, one for each model. We will be pleased to send out extra forms if required, so if you know of a modeller who is not a reader of one of our magazines but who you think may wish to participate, please advise them to contact our Exhibitions Office , or simply photocopy the entry form for them.

The success of the show depends largely on the number of models on display. Your work could well be the stimulus which inspires someone else to start in the hobby. There can be no doubt that this event is our showcase on the world of modelling in all its aspects. Every modelling discipline needs more and more participants, and it is by displaying not only the crème-de-la-crème, but also examples of work of a more achievable standard, that people are encouraged to join into the wonderful world of modelling, in whatever aspect.

We look forward to seeing a sample of your work at the show!

COMPETITION CLASSES

Engineering Section

- A1 Hot air engines.
- A2 General engineering models (including stationary and marine engines).
- A3 Internal combustion engines.
- A4 Mechanical propelled road vehicles (including tractors).
- A5 Tools and workshop appliances.
- A6 Horological, scientific and optical apparatus.
- A7 General engineering exhibits — not covered by the above

Railway Section

- BI Working steam locomotives 1in scale and over.
- B2 Working steam locomotives under 1in scale.
- B3 Locomotives of any scale, experimental, freelance or based on any published design and not necessarily replicas of full size prototypes, intended for track duties.
- B4 Scratchbuilt model locomotives of any scale, not covered by classes BI, B2, B3, including working models of non-steam, electrically or clockwork powered steam prototypes.
- B5 Scratchbuilt model locomotives gauge 1 (10mm scale) and under.
- B6 Kitbuilt model locomotives gauge 1 (10mm scale) and under.
- B7 Scratchbuilt rolling stock, gauge 1 (10mm scale) and under.
- B8 Kitbuilt rolling stock, gauge 1 (10mm scale) and under.
- B9 Passenger or goods rolling stock, above 1in scale.
- B10 Passenger or goods rolling stock, under 1in scale.
- B11 Railway buildings and lineside accessories to any recognised model railway scale.
- B12 Tramway vehicles.

Marine Models

- C1 Working scale models of powered vessels (from any period). Scale 1:1 to 1:48
- C2 Working scale models of powered vessels (from any period). Scale 1:49 to 1:384
- C3 Non-working scale models (from any period). Scale 1:1 to 1:48
- C4 Non-working scale models (from any period). Scale 1:49 to 1:384
- C5 Sailing ships and oared vessels of any period - working.
- C6 Sailing ships and oared vessels of any period - non-working.
- C7 Non-scale powered functional models including hydroplanes.
- C8 Miniatures. Length of hull not to exceed 15in for 1:32 scale; 12in for 1:25 scale; 10in for 1:16 scale; 9in for 1:8 scale. No limit for smaller scales.
- C9 For any model boat built from a commercial kit. Before acceptance in this class the kit must have been readily available for at least 3 months prior to the opening date of the exhibition and at least 20 kits must have been sold either by mail order or through the retail trade.

Scale Aircraft Section

- D1 Scale radio control flying models
- D2 Scale flying control-line and free flight
- D3 Scale non-flying models, including kit and scratch-built
- D4 Scale flying radio controlled helicopters

Model Horse Drawn Vehicle Section

- G1 Carriages & other sprung vehicles. (Omnibuses, trade vans etc.) Wagons, carts and farm implements. Caravans.

Junior Section

- J1 For any type of model, mechanical or engineering work, by an under 14 year old.
- J2 For any type of model, mechanical or engineering work, by an under 16 year old.
- J3 For any type of model, mechanical or engineering work, by an under 18 year old.

All entries will be judged for standard of craftsmanship, regardless of the modelling discipline, i.e. a boat will not be competing against a military figure. Providing a model attains sufficient marks it will be awarded a gold, silver or bronze medals

Model Vehicle Section

- K1 Non-working cars, including small commercial vehicles (e.g. Ford Transit) all scales down to 1/42.
- K2 Non-working trucks, articulated tractor and trailer units, plus other large commercial vehicles based on truck-type chassis, all scales down to 1/42.
- K3 Non-working motor bikes, including push bikes, all scales down to 1/42.
- K4 Non-working emergency vehicles, fire, police and ambulance, all scales down to 1/42.
- K5 Non-working vehicles including small commercial vehicles (e.g. Ford Transit). Scale from 1/43 or smaller.
- K6 Any available body shells including Concours, in any scale or material, to be judged on appearance only.
- K7 Functional model cars/vehicles which must be able to move under its own power of any type. Can be either free-running, tethered radio controlled or slot car, but must represent a reasonable full size replica

DUKE OF EDINBURGH CHALLENGE TROPHY

Rules and Particulars

1. The Duke of Edinburgh Challenge Trophy is awarded to the winner of the Championship Award at the Model Engineer Exhibition.
2. The trophy remains at all times the property of HIGHBURY LEISURE.
3. The name of the winner and the date of the year in which the award is made will be engraved on the trophy, which may remain, at the discretion of HIGHBURY LEISURE in his/her possession until required for renovation and display at the following Model Engineer Exhibition.
4. Any piece of model engineering work will be eligible for this Championship Award after it has been awarded, at The Model Engineer Exhibition, a Gold or Silver medal by HIGHBURY LEISURE.
5. No model may be entered more than once.
6. Entry shall be free. Competitors must state on the entry form:
   (a) That exhibits are their own bona-fide work.
   (b) Any parts or kits that were purchased or were not the outcome of their own work.
   (c) That the model has not been structurally altered since winning the qualifying award.
7. HIGHBURY LEISURE. may at their sole discretion vary the conditions of entry without notice.

COMPETITION RULES

1. Each entry shall be made separately on the official form and every question must be answered.
2. Competition Application Forms must be received by the stated closing date. LATE ENTRIES WILL ONLY BE ACCEPTED AT THE DISCRETION OF THE ORGANISERS.
3. Competitors must state on their form the following:
   (a) Insured value of their model.
   (b) The exhibit is their own work and property.
   (c) Parts or kits purchased.
   (d) Parts not the outcome of their own work.
   (e) The origin of the design, in the case of a model that has been made by more than one person.

NOTE: Entry in the competition can only be made by one of the parties and only their work will be eligible for judging.

4. Models will be insured for the period during which they are in the custody of HIGHBURY LEISURE.
5. A junior shall mean a person under 18 years of age on December 31st in the year of entry.
6. Past Gold and Silver medal award winners at any of the exhibitions promoted by HIGHBURY LEISURE. are eligible to re-enter their model for the 'Duke of Edinburgh Challenge Trophy.'

Past winners at any of the exhibitions promoted by HIGHBURY LEISURE. will not be eligible for re-entry into the competition unless it has been substantially altered in any way.

7. HIGHBURY LEISURE. reserve the right to:
   (a) Transfer an entry to a more appropriate class.
   (b) Describe and photograph any models entered for competition or display and to make use of any such photographs or descriptions in any way they may think fit.
   (c) Refuse any entry or model on arrival at the exhibition and shall not be required to furnish a reason for doing so.
8. Entry into the competition sections is not permitted by:
   (a) Professional model makers.
   (b) Anyone who has a financial interest in the direct supply of materials and designs to the public.

NOTE: If unsure, please contact the Competition organisers, prior to the show.

9. The judges' decision is final. All awards are at the discretion of the judges and no correspondence regarding the awards will be entered into.
10. Exhibitors must present their model receipt for all models collected at the end of the exhibition and sign as retrieved.
11. The signed release for each model must be presented to security staff when leaving the exhibition complex with display model(s) after the close of the exhibition.

IMPORTANT NOTE PLEASE MAKE COPIES, INCLUDING PHOTOGRAPHS, OF ALL INFORMATION RELATING TO YOUR MODEL, AS HIGHBURY LEISURE WILL NOT ACCEPT LIABILITY FOR ANY LOSS.

CLOSING DATE 17TH DECEMBER 2004

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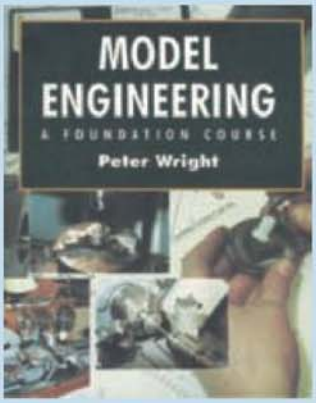

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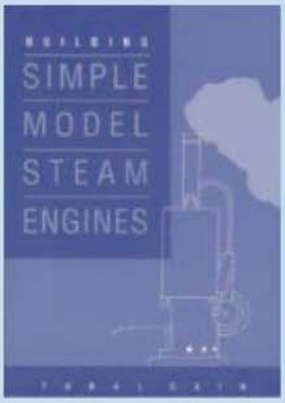

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GOOD NEWS TRAVELS FAST!

We have heard on the grapevine that G and M Tools popular website

www.gandmtools.co.uk

is about to undergo an update, becoming even easier to use and more browser friendly.

Tim Muddle, partner at G and M responsible for marketing, is optimistic that the new look site will prove just as popular and he says "will be database driven to allow us to update much faster and put newly acquired tools and machines on the site as they arrive in stock".

Sounds as though anyone looking to acquire a modelling machine in the near future should go online NOW!!

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