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Vol. 191 No. 4202

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IN THIS ISSUE

● Vol. 191 No. 4202 22 August 2003 ●

SMOKE RINGS

Editorial news, views and comment.
PAGE 189

POST BAG

Letters to the Editors.
PAGE 190

BROWSING AT BRISTOL

A glimpse at the exhibition and trade
stands accompanying IMLEC 2003.
PAGE 192

EDWARDIAN ELEGANCE

The Glasgow & South Western Railway and
James Manson's '381' class 4-6-0s. Part IV.
PAGE 195

BLOCK TOOL

Details of applications for which this tool
has been found particularly useful. Part II.
PAGE 200

GEORGE CORLISS AND HIS ENGINES

Recalling the man and some of the unusual
features of his innovative steam engines.
PAGE 202

THE HIGHLAND RAILWAY JONES 'BIG GOODS' & LOCH 4-4-0 LOCOMOTIVES IN 5in. GAUGE.

Draincocks and linkages, and cleading for
the 'Big Goods' locomotive. Part XXIX.
PAGE 205

ROAD STEAM: SAVAGE'S LITTLE SAMSON in 3in., 4in. (and other) Scales

Clacks, safety valves, a feedwater heater
and some notes on boiler testing. Part XL.
PAGE 208

KEITH'S COLUMN: SAINT CHRISTOPHER

A GWR LOCOMOTIVE for 7 1/4 in. gauge
Continuing with the tender brake gear
plus thoughts about injectors. Part XLII.
PAGE 212

PETE'S PAGE: MILLING A WORM

Repairing a precious music box. Part II
PAGE 215

REPLICA 18th CENTURY HOODED WALL CLOCK

Making the few remaining parts and
pondering about the prototype. Part VI.
PAGE 216



On the cover ...

Although a number of companies in the
UK and, to a lesser extent, Europe made
overtypes steam wagons, the one which
usually comes to mind when discussion
turns to this class of vehicle is Foden.
Arguably, they made more overtype steam
wagons than anyone else and their 'C'
type was probably one of the most
satisfactory from the user's point of view.
This fine half-size model of a 'C' type
Foden was built by Eric Lindsay of Bath
and is seen here in steam at the 2003
International Model Locomotive Efficiency
Competition held at Ashton Court track
of Bristol SMEE on 12/13 July.
Our report on the exhibition and trade
representation at this event begins on
page 192 of this issue.

(Photograph by Neil Read)

TWIN-CYLINDER TWISTY

A neat twin-cylinder engine based on
the fascinating *Twisty* theme. Part I.
PAGE 218

DIY DRO

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AND FIT TO YOUR LATHE OR MILLING MACHINE
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wire theme which you can 'do-it-yourself'.
PAGE 220

FOR YOUR BOOKSHELF:

Reviews of 'LBSC' *His Life and Locomotives*
by the late Brian Hollingsworth and
The Taig Lathe by Tony Jeffree.
PAGE 222

POLLY RALLY AT RUDDINGTON

All owners, drivers and visitors are
welcome at the Nottingham SME track
for this event on 6/7 September 2003.
PAGE 223

CLUB CHAT & CLUB DIARY

Recent activities and forthcoming events.
PAGE 224

INDEX to ADVERTISERS

Barrett Small Tools	180	Model Engineering Services	182
Bruce Engineering	182	Nexus Special Interest Books	184
Camden Miniature Steam Services	185	Parkside Electronics	186
Chester UK Ltd.	236	Phoenix Precision Paints	186
Chronos UK Ltd.	181	Plaistow Traction Engines	183
Compass House Tools	180	Polly Model Engineering	188
Compton Buildings	186	Reeves 2000	182
G. & M. Tools	187	Norman Spink	226
Greenwood Tools	185	Steam & Diesel Castings	188
Hemingway Kits	188	Stuart Models	183
Highbury House Communications	228	Tracy Tools Ltd.	186
Home & Workshop Machinery	235	Warren Machine Tools Ltd.	178
J & B Groves Limited	188	C. G. & W. Young	180
Live Steam Models	188		
Maxittrak Ltd.	182		

Classified Advertisements on pages 229-234

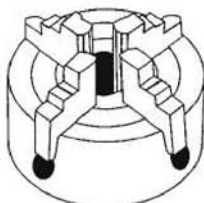
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We are pleased to announce the publication of this major new book by well known author and contributor to *Model Engineer* magazine, Stan Bray, on the construction of model and miniature locomotives from Gauge 1 to 7 1/4" gauge, with the accent on the passenger hauling gauges.

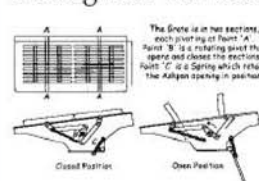
The bulk of the book is Stan passing on hints, tips, ideas and practices he has picked up over fifty years as a model engineer, and he covers the subject with chapters on each major part, such as frames, axleboxes, valve gear, cylinders, boiler, platework etc.



He also covers electric and I.C. powered locomotives.

Each chapter is illustrated with drawings and photographs of the relevant parts of the locomotive, (the photographs covering boiler construction are in colour for extra clarity), and there are seven pages of Appendices of useful charts.

Throughout the book there are also photographs of



model and miniature locomotives from around the world, reflecting Stan's pioneering of overseas visits, with models, from the early 1970s on, and his subsequent involvement with the rapid growth of the model engineering hobby in Europe and world wide.



Written in Stan's inimitable style, there are numerous asides, often humorous, so this book is a good read, as well as containing a huge amount of practical and useful information and ideas. Whilst especially useful for the beginner, the ideas, hints and tips in this book make it one every model or miniature locomotive builder should have on their bookshelves.

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With the Editors

Polly Models Ltd. and Bruce Engineering

A few days before these notes were being prepared we learned the final outcome of negotiations concerning Bruce Engineering. Both Bruce Davey of Bruce Engineering and Andy Clarke of Polly Models Ltd. have written to us as follows:

From Polly Models Ltd.

"The directors of Polly Model Engineering Limited are pleased to announce the acquisition of the model engineering manufacturing and supplies business of Bruce Engineering. Bruce Davey and Gerry have been respected suppliers to the hobby for many years and understandably wish to retire, although they will retain an association with the new company. Managing Director Andy Clarke of Polly Model Engineering is well known throughout the hobby and respected for the work he has put in to improve the products. Andy's wife, Jayne will be responsible for much of the day-to-day contact with customers, while Pete Thomas will assist with the management of the company and product development.

"In merging together the businesses of Polly Model Engineering and Bruce Engineering, the directors will seek to build upon the strong experience and reputation of these two businesses. The trading name of Bruce Engineering will be retained for the supplies business and kits will continue to be marketed under the Polly Model Engineering name. As committed and experienced enthusiasts themselves, the directors intend to develop and expand the range of products and services in order to continue to meet the needs of model engineers in the twenty-first century.

"Model engineering enthusiasts are invited to meet the team at the forthcoming annual Polly Model Rally to be held at Ruddington (Nottingham SMEE track) over the weekend 6/7 September. A number of Polly locomotives are expected to be in action, refreshments will be available and by special arrangement footplate rides will be available on the full size GCR Northern." (See pages 223/224 in this issue for further details - Eds.)

From Bruce Engineering:

"As time moves on we all look to change and due to an advantageous offer from Polly Models we at Bruce Engineering are starting earlier than expected. This will take effect from 1 September 2003. My wife and I would like to sincerely thank all our customers for their loyal support over the many years we have been in business. No doubt we will meet at the various shows around the country.

"Polly Models have a fine reputation for a quality product and good service and we feel sure that the future of Bruce Engineering will be safe in their hands. I will be backing them up for some time to ensure a smooth transition.

"The full range of Bruce Engineering products, Anthony Mount models, Stuart Models and Cheddar Models will be available along with some new ones in the pipeline."

Andy and Jayne Clarke of Polly Models Ltd. can be contacted at Polly Model Engineering Limited, Bridge Court, Bridge Street, Long Eaton, Nottingham NG10 4QQ; tel: 0115-973-6700;

e-mail: sales@pollymodelengineering.co.uk
website: www.pollymodelengineering.co.uk

Editorial comment:

Bruce and Gerry Davey have been associated with the hobby for many years and between them have been a tower of strength throughout my time with *Model Engineer* magazine. They have supported the hobby by providing what model engineers require and by attending a bewildering number of rallies, exhibitions and other events around the UK and abroad. I am sure readers will want to join me in wishing them a long and happy retirement enjoying the things they have not been able to do while running a busy and successful business.

I have known Andy Clarke for only a few years, but in this short time have been much impressed not only by his enthusiasm for the hobby and, like Bruce and Gerry, his presence at many events, but by his single-minded concern for his business, and the fine quality of his products. I am certain that readers will want to join me in wishing Andy, Jayne and Pete every success in their new venture.

The business jargon word 'synergy' implies that the effect of a combination is greater than the sum of the individual components. I am convinced that we shall all benefit from the synergy resulting from bringing together Bruce Engineering and Polly Models Ltd.

Kinver & West Midlands Society of Model Engineers Ltd.

Rumours have been rife concerning the continued presence of Kinver & W. Midlands SME Ltd. at their superb location in the village of Kinver. Chairman John Campbell has telephoned to allay the concerns being expressed by those with information which is only partly correct.

It should first be noted that KWMSME occupy a part of the land which was donated to the people of Kinver for recreational and leisure purposes. It is administered by Trustees who we understand have sought a substantial sum from the British

Legion which occupied premises adjacent to the model engineers. As a result, the British Legion has been unable to retain a presence and has closed. No decision concerning the subsequent use of their building has yet been taken and rumours concerning its future are unfounded.

KWMSME has given permission for us to report that they have a further 18 years of their lease yet to run at an annual rent indexed linked to inflation. Other recreational and leisure facilities for which the land is used are also secure. So IMLEC 2004 is also safe and John Hurley will be very pleased to hear from you. Watch this space!

Pressure Safety Systems Regulations 2000 (PSSR)

Readers should be aware that the Miniature Railways Liaison Group continues to meet and has been busy preparing a guidance document concerning the Pressure Safety Systems Regulations 2000. A consultation document is now ready and copies are available from Tommy Winn, Health and Safety Executive, 375 West George Street, Glasgow G2 4LW; e-mail: tom.winn@hse.gsi.gov.uk

The consultation document will be sent, preferably electronically, with details of how to make comments which should be returned to the same address at HSE by 31 October 2003.

Acetylene and copper

The British Oxygen Company publishes leaflets on an occasional basis which are both helpful and interesting. A recent document under the title *Facts about Acetylene* says of acetylene "Do not use with copper, silver or mercury."

Following contact with BOC and the British Compressed Gases Association, we can assure readers that the note refers to the materials being used to pipe the acetylene, *not* to the workpiece! Builders may continue to use oxy-acetylene equipment when making their copper boilers.

The relevant Code of Practice CP 6 is available from BCGA, 6 St. Mary's Street, Wallingford OX10 0EL; tel 01491-825533; www.bega.co.uk

CHUCK the MUDDLE ENGINEER

by B. TERRY ASPIN



POST BAG

Injectors: The Linden Secret

SIRS, - I was interested to read the letter from Fred La Roche in *Post Bag* (M.E. 4200, 25 July 2003) explaining the Linden Secret in the late Jim Ewins' writings. I have been acquainted with this principle and it is incorporated in my own designs. I should, however, like to reinforce its importance in day-to-day operation. One of the vagaries of small locomotive operation is that the boiler may either prime or surge, especially if it should be over-filled. In such circumstances an injector can be expected to stop working and for steam to issue from the overflow. If it is of the lifting variety it should re-start automatically whenever the disturbance within the boiler has subsided, whereas if it does not lift, it is necessary to cut off the steam and go through the rigmarole of re-starting. At any locomotive rally, just observe the occasional overflow spouting forth with the driver completely oblivious to the problem!

Prototype design does sometimes dictate the fitting of a lifting injector, for instance on the 'Tilbury Tanks', and I can think of at least two marine examples where my own injectors lift from bilge tanks (incidentally avoiding the need for any water valve). The first is an 8oz. size automatically feeding a Cheddar Models radio controlled power plant in a very smart model boat in the West Country. The second is a 26oz. size feeding the boiler of a Thames Launch with the owner happily tending to more urgent needs on board!

My own observations of commercial injectors are that those built by Gordon Chiverton and John Cashmore do lift well, the implication being that they both have the relief on the forcing sections of their combining cones, as originally designed by Linden.

D. A. G. Brown, Rutland.

Acorn Machine Co.

SIRS, - Some time ago, I recall promising our Editor that I would give an account of my experiences at the Acorn Machine Co. (1936) wartime factory at Westbury, near Buckingham where I lived at the time. I worked there for a few months after my two years at Wolverton Technical College before joining the RAF as an Aircraft Apprentice at Halton in 1941.

There were about twenty workers, about half a dozen from the factory

at Acton, the others local recruits, mainly former farm boys. Our

main product was Acorn's half-inch capstan lathe which sold at £108, through the Ministry of course. We also imported lease-lend machine tools — mainly Buffalo drills from Buffalo, New York, and Atlas lathes from Kalamazoo, Michigan. Some of these we used, others were passed on, if I remember correctly. We also made things for Moore & Wright. The scribing blocks were flatted on a band Linisher, spray painted and adorned with the blue and gold M&W label. Two skilled fitters built up the capstans by selective assembly from boxes of parts.

The boss was one Ted Barlow, a dapper little man with a pock marked face who wore snazzy suits, ties and 'winkle-picker' shoes. He chained smoked Craven A cigarettes from a tin of fifty in his pocket, lighting the next from the last, leaving a trail of half smoked ends. We lads watched him go by and dived to grab a butt and smoke it! Well, you did in those days.

He had a new Ford 10 car (Essential Use Only) and made frequent trips to Acton returning with a stack of 'tins of fifty' in the back, and probably a new suit. He was said to have been an airman in WWI and had a nervous tic. He constantly turned his head from side to side as if he was looking out for the Red Baron (that's why pilots wore silk scarfs — to stop the collar chafing).

The office, stores, etc. were run by a tribe of sisters and brothers-in-law: the Meyer family. While he was in the factory his wife would call: "Te-e-ed" on the Tannoy and we would all chorus back: "Te-e-ed".

My first job was rough turning four-way toolpost bases on an Atlas 5in. lathe. My clothes, skin and nose filled with iron dust. As I had been to technical school and had read up a thing or two, I soon moved on to a bit of millwrighting and tool setting. I didn't realise this was skilled work, all it needed was a bit of intelligence! I was paid the junior rate of 17/4d. (seventeen shillings and four pence) per week, about 74p in today's new-fangled currency.

When I left to go to Halton, Mr. Barlow tried to persuade me to stay and said I could progress to the drawing office, and so on. But, like every other young man at the time, I wanted the uniform and the glamour rather than a career and a white feather. We all thought we would become fearless fighter pilots. My first lost opportunity!



The ship lift in Peterborough, Ontario, Canada as photographed in 1949 by Mr. Jim Newell.

A rather chubby young man used to visit and fiddle with the machines. I think he was doing jig and tool work. His name was Norman Draper. Norman J. Shaw, Bedfordshire.

Canadian ship lift

SIRS, - I have been enjoying John Olsen's interesting series about European ship lifts and canals.

One of the articles mentioned that you knew of two lift locks in Ontario, Canada but that you had no details. I was in Canada in 1949 and was taken to this lift lock in Peterborough. It was said to be the largest in the world at that time.

I enclose a photograph (above) taken at Peterborough in 1949 for your interest. A boat sails into whichever of the top locks is up, the right hand one in my picture, and is lowered by the action of a huge (7ft. diameter) piston which is visible under the lock. When one goes down, the other goes up; they balance each other.

Jim Newell, Belfast.

Using a Jacot drum

SIRS, - In *Post Bag* (M.E. 4197, 13 June 2003) Mr. Ghadiyali mentions and provides a sketch of the Jacot Drum, a tool used in clock and watch work for repairing pivots. I thought that some readers might like further information on this tool and its use.

It is quite a simple tool to make and I have described its construction in my book *Tools for the Clockmaker* and again in Volume 1 of the series *How to Repair Antique Clocks* both of which are available from RiteTime Publishing at 18 Woolmer Way, Bordon, Hampshire GU35 9QF; (01420-487747); website: www.ritetimepublishing.com

In the latter book, the tool is designed to be mounted in the tailstock chuck but in the former I designed it for fixing to the lathe cross-slide of the Unimat 3.

The Jacot tool consists of a drum (really a disc some 1in. in diameter and 1/4in. thick) mounted so that its periphery is at lathe centre height.

The edge of the drum has a series of 'beds' or troughs formed. A bed is selected to suit the size of the pivot, and the opposite end of the arbor runs in a hollow centre in the lathe headstock.

Because the pivot to be repaired is only resting in its bed, it is safer to rotate the work with a bow and ferrule secured to the arbor shown on the left of Mr Ghadiyali's illustration. The pivot file and burnisher, the traditional tool for this work, can be used with considerable pressure, even on a small pivot, because of the support provided by the bed in the Jacot Drum. One of the difficulties in repairing clock pivots is the fact that traditionally any centres in the pivot are always removed and the end of the pivot rounded and burnished.

Whale bone is the traditional material for the bow, but I have used a 1/4in. diameter garden cane for years now. The line can be nylon mono-filament which is given a turn around the ferrule. The bow of course rotated the work backwards and forwards, the pivot file being used on the forward stroke only.

John Wilding, Sussex.

English Spanner

SIRS, - Seeing a letter in *Post Bag* (M.E. 4195, 16 May 2003) and having spent a large part of my working life in Germany, perhaps I can throw a little more light on the subject of the 'Engländer'. I attach a photograph (above) of an 'Englishman' made by the Austrian firm Stubai. I purchased this adjustable spanner about four years ago in Germany but this type is no longer in general production due to its relatively high cost of manufacture.

This model has two jaws and has the advantage that one side is adjusted to suit the nut and the other side is fitted with an identical nut or a packing piece thereby preventing the jaws from spreading. Another advantage is that one set of jaws can be adjusted to the flats on a nut or



Mr. Phillip Chalk's Engländer was made by the Austrian firm, Stubai.

another similar object and the dimensions across the object can be measured on the opposite jaws.

The term Engländer is now widely used by the general public to refer to adjustable spanners or shifters, while German engineers normally use the correct terms for a specific type of adjustable spanner. Phillip Chalk, Kent.

Clarksons and Bulpit(t)s

SIRS, - I would like to thank all those who replied to my enquiry about Clarksons of York. From information received I am able to pursue a line of research that may shed some light on this elusive company.

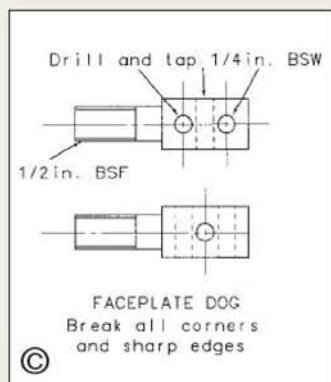
Another question has cropped up and once again I am turning to readers of *Model Engineer* for help. In the 1920s and 30s, the famous steam toy maker Bowman bought in a lot of brass items from a Birmingham based firm known as Bulpit(t)s, which were then assembled in Dereham.

At the moment precisely nothing is known about this company. If any readers have even the slightest information (which would at least double our knowledge!) then I would be more than grateful. Marcus Rooks, Cornwall.

Working thin material for clock hands

SIRS, - I found Peter Heimann's article (*M.E.* 4197, 13 June 2003) on making a chapter ring for his Regulator clock extremely helpful and it has encouraged me to have a go! But, in the section on hands, he notes: "This thin gauge plate (0.025in.) is the very devil to work by hand, and bluing without the benefit of a controlled furnace is, to say the least, tricky."

I would like to offer a simple tip which I developed and which makes fretting out and finish filing tolerably easy. Just take a piece of good quality plywood (birch is ideal), available from model shops rather than DIY merchants, around 1/16in. to 1/8in. thick and a little larger than the finished hand size. Cover the surface with double-sided adhesive tape and then stick the



Mr. Derek Cooke's faceplate dogs (see letter 'Oddments' below).

hand blank to it. Using this backing allows easy cutting down to at least 0.010in. thick material, given a fine toothed piercing saw, but any holes in the design should be cut first.

When finished, I slide an old fashioned double-edged razor blade under the hand to separate it from the backing with negligible distortion; a little oil helps and some lighter fuel finishes the job by removing any residual adhesive tape stickiness.

I agree that bluing is more of a problem but patience using bluing salts to get an even temperature helps. Failing that, the use of Black-it produces a nice, albeit non-traditional, finish.

Roger Castle-Smith, Buckinghamshire.

Oddments

SIRS, - I was taught when young that a business letter should only embrace one subject. Having been disinclined to write for some time, owing to shingles (19 months now, and the neuralgia still active) and a transcontinental move, and being over 80, you might perhaps allow a little latitude.

1: Someone asked about gas turbine locomotives. I believe Parsons (Heaton) produced one in the mid-fifties. It is not generally known that Sir Charles Parsons patented a gas turbine half a century ahead of the necessary metallurgical skills, and then patented his version of the steam turbine to be going on with. I gather that the two halves of *Turbinia* have been re-united, and are on show somewhere in Newcastle-upon-Tyne. It took a long time for naval architects to catch up with the 'oomph' available from Parson's turbines. Even so, *Turbinia* made monkeys of the Grand Fleet at Queen Victoria's Diamond Jubilee.

2: What lathe to buy? I would not presume to tell any one, except to say the best and biggest you can afford which will fit the space you have. But, where should you put it? At right angles to a wall, and with plenty of room to walk behind it is

best. If you use anything like the oddball set-ups I use with my 5in. centre height lathe, you will agree. Point the tailstock end to the wall. If you have a garden shed workshop, and want to machine the end of a long shaft, you can always put a hole in the wall, and make a support for the shaft outside.

3: Face plate dogs. I avoid faceplate work if I possibly can. One dodge is to bolt or clamp the work to a square of 8 or 10mm mild steel, and centre this in the 4-jaw chuck. But when the worst happens, and there is no way out, I use Cooke's variation on a very old theme. I am sure that thousands have followed this course, but have been too busy or shy to mention it. The dogs are used with 1/4in. Whitworth screws, anything up to 4in. long, to centre the work, and one or more may be left *in situ* to resist turning forces. The dogs are 20mm square, and the three holes for the screws are drilled clearance halfway and threaded the rest. As the holes are very close together, the middle one is drilled at right-angle to the other two (just in case, see drawing above).

4: A reader recently mentioned the sticks used for making ice lollipops, and their use as spatulas for grease etc. When trimmed with a pocket knife, they are good for cleaning 'gunge' out of grooves. Other goodies are available when you shove a trolley around the supermarket. Cotton buds (look like a double ended bacterial swab) are great for mopping up excess Loctite before it gets into the wrong spot, and for applying liquid fluxes to small areas. They are normally used for babies' noses, women's make-up, etc. I still have some old-fashioned brazing spelter. I prefer it for some uses to the ready-fluxed rods. Then, make your way to the shelves with laundry powders, and find a tin of Borax. It is good, too, for coating things like home-made taps when heat-treating: it stops the edges being burnt off. Talking of heat treatment, wend your way to the cooking oil shelves. Rape seed oil will be available there, but will be labelled *Canola*. This is something to do with the ignorant confusing a member of the Brassica family with a crime.

As you approach the checkout, there will be a tobacco counter. Eschew the bad habit, but do buy a packet of pipe cleaners. These have an infinite number of uses in the workshop.

Someone fairly recently spoke of cutting those new fangled toothpaste dispensers for re-use. The best tool for dealing with these objects is a 4in. gimlet. "What's a gimlet daddy?" It is a cross between a corkscrew and an auger bit, which was used long ago to start wood screws in softwood.

"What's an auger bit daddy?" Never mind, a long No. 8 wood screw will do, or a short (countersunk head) one soldered to a piece of 8 or 10mm dia. rod will fit the bill. Looking into the rear of the exhausted tube, engage the gimlet with the hole in the spigot in the back end of a plastic disc and withdraw the disc. This will expose a thin stainless steel 'spider'. (The nymphal stage of at least some arachnoids have only 6 legs, so there!). A tiny hook at the end of a suitable piece of wire will enable you to withdraw the legs only just sufficiently to clear the wall of the tube. As you withdraw the last, the spider will come to hand. Return to the gimlet (or whatever), and withdraw the piston. Wash all carefully, and flatten the spider. Fill the tube with greasy tapping compound or whatever, using a lolly stick spatula, enter the piston, etc. and marvel at the simple ingenuity of the device.

Derek Cooke, Western Australia.

Exceptional service!

SIRS, - I have just had exceptional service from a smallish(?) firm and would like you to pass on the good news to the rest of the lads.

I 'phoned one afternoon asking about some 1/2in. Whitworth set screws and they were on my doorstep the next morning, before I had even paid for them!

This company deserves our custom: John Taylor Fasteners Ltd., Unit 5, Gratton Way, Roundswell Industrial Estate, Barnstaple, North Devon EX31 3NL; tel: 01271-373212; fax: 01271-344419.

Len Walker, Devon.

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Correspondence may also be sent to the Editor at PO Box 310, Hemel Hempstead, Hertfordshire, HP3 8AX; fax: 01442-269366; email: mike.chrisp@virgin.net or neil.read@nexusmedia.com or scalemodels@compuserve.com

In the interests of security, correspondents' details are not published unless a specific instruction to do so has been given. Responses to published letters are forwarded via the Editorial Office as appropriate.

Publication is at the discretion of the Editor. The content of letters may be edited to suit the magazine style and space available. Correspondents should note that production schedules normally involve a minimum lead time of six weeks for material submitted for publication.



1
The 5in. gauge modified Simplex, Galloping Gertie resplendent after her rebuild and ready for a further fifteen years service.



2
A striking contrast to British and European practice was this Buchanan locomotive of 1877.

BROWSING AT BRISTOL

Neil Read

reviews some of the exhibits in the exhibition marquee and browses along 'Trade Row' at Ashton Court.

Events like IMLEC bring a sense of anticipation into the lives of the editorial team at *Model Engineer*, not just because of the competition entries, important as they are, but because of the feeling of "I wonder what else I will see?" For me personally, each visit to a different track is a mini-adventure anyway as it is usually my first and it is always a pleasure to contrast the layout and methods of construction used with others I have seen.

Set in the magnificent grounds of Ashton Court, the Bristol Society of Model and Experimental Engineer's track did not disappoint me in any way. Accessed through a most imposing gateway, the track stands on land adopted mainly for the purpose of a golf course but is secluded from golfers by mature hedges and pleasant, shady, wooded areas. Adjacent to the main tracks for IMLEC 2003, a large marquee had been erected which housed the catering facilities for the event and a display of work by the members and some visitors. The organisers had chosen a range of exhibits which reflected the interests of the Bristol SMEE membership. Not surprisingly, in view of the excellent track facilities, many members are interested in the construction and operation of miniature locomotives. Three or four examples should serve here as examples of what was on offer.

The first exhibit to catch my eye was, at first glance, quite new but proved to be a 5in. gauge loco with a history (photo 1). The model was of Beyer Peacock engine No. 16, originally with the M & SW Junction Railway and absorbed into the GWR in 1925. The model (*Galloping Gertie*) was constructed by David Caseley using castings for Simplex though the superstructure is as near to that of the original as possible. The engine has been a regular passenger hauler at Ashton Court for the past fifteen years but had succumbed to the inevitable results of such hard work. A major overhaul by John Milton has returned this attractive engine to first class order and members are looking forward to a further 15 years of happy steaming.

Construction of locomotives in the U.S. tended to follow different paths to those in Europe but the various prototypes can form most attractive model engines. The 5in. gauge NYC & HRRR locomotive exhibited by Frank Buffman (photo 2) was case to point and looked striking in its pale blue livery. The loco was built by Peter Volbrecht who based the design on that of a 1877 Buchanan engine. As one observer noted, these engines were simple and accessible — a desirable feature if some mechanical derangement required attention out on the prairie.

Visitor Lionel Flippance from Guildford MES had brought along a boiler (photo 3) for his latest locomotive project. This is for a 5in. gauge model

of a British Railways 2-8-2 heavy freight engine, a locomotive that never got beyond the design stage but was based around the Britannia class boiler. Lionel is building three of these engines and plans to use a standard boiler in No.1 but carry out various subtle changes in the boiler designs of the other two in order to test for improvements in efficiency. We await his report with interest.

Not all the exhibits were of the 'glass case' variety. Jim McLaughlin's *Sweet Pea* (photo 4) was obviously well used but the original care employed in its building and finishing originally was still apparent. As Jim pointed out: "It's dirty because I am here at the track using it each weekend!" Quite right too!

Demonstrating that clocks are not his only interest, our respected contributor Peter Heimann displayed a 5in. gauge Simplex built for gas firing. Inverted on a display stand, this model was presented so that visitors could admire the complex pipe work and other details (photo 5).

It was good to see some road steam exhibits. The 2in. Clayton underframe steam wagon built by Tom Collins was nicely made and finished and appeared to be to Robin Dyer's well known design serialised in these pages 25 years ago (photo 6). I believe production of the full size version of this wagon lasted for 8 years but only 45 units were built and only one of those was articulated like Mr. Collins' model. It is



3
The first of three boilers for Lionel Flippance's latest project: three models of the designed but never built British Railways 2-8-2 heavy goods loco.



4
Jim McLaughlin's fine Sweet Pea is a working engine which bears its coal dust with pride.



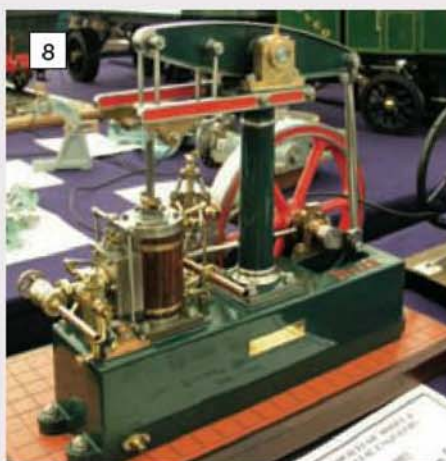
5
A worm's eye view of the gas fired Simplex chassis built by our contributor Peter Heimann.



6
This Clayton articulated undertype steam wagon was the work of Tom Collins and looked very refined in its green livery.



7
The Minnie traction engine built and exhibited by Howard Janes.



8
The beam engine built by Richard Beel from an ash bin find.



9
The circa 1900 2:1 ratio toothless gear device built and exhibited by David Hanstead.

interesting to speculate as to how many more miniature Claytons are running around our rally fields than were ever built in full size form.

The recent *M.E.* reader's survey suggests that many readers still like to build traction engines in smaller sizes. A 3in. or 4in. to the foot engine may be desirable but the cost of building such a beast and the engineering facilities required are mild deterrents to say the least. It was therefore appropriate that an example of a 1in. to the foot Minnie traction engine was on display. This little engine, to the design of L. C. Mason, was built and exhibited by Howard Janes (photo 7).

Proof that it pays to stay on good terms with your Street Environment Operatives (dustmen), the castings for Richard Beel's Stuart beam engine came to him from a discerning member of that not always appreciated group. In short, they were found in a dustbin. The parts consisted of a cracked bed, flywheel, column, beam and the four main bearings, all in a pretty dire state. After some thought, Mr. Beel plugged and redrilled all the holes made by the previous owner, carefully removing the broken taps as he did so. They were then drilled and tapped oversize. Others were bored and bushed as appropriate. No cylinder casting came with the 'set' so one was acquired together with the other missing bits and pieces. After the engine was assembled a governor was constructed with a redesigned belt drive in keeping with an engine of this type. The engine runs well on air and, having arisen from an ash bin, has been given the name *Phoenix* (photo 8).

Bristol SMEE member David Hanstead must be a man of catholic tastes and considerable

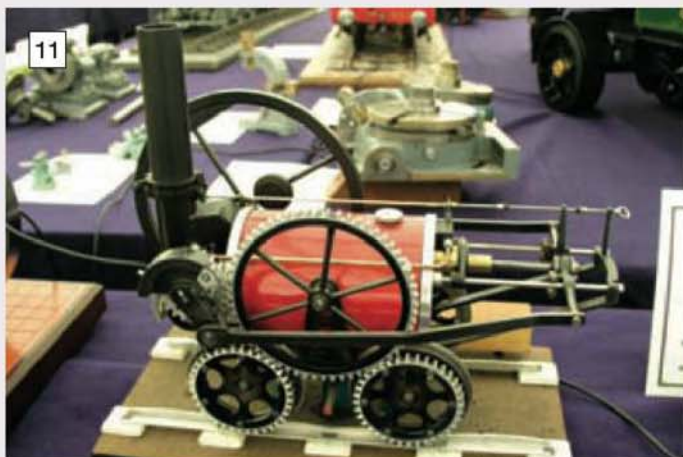
energy. He entered four exhibits, namely a model of Trevithick's 1804 locomotive, a model hot air engine, a gas fuelled Gnome rotary engine and a 2:1 toothless gear system of circa 1900 (photo 9). I particularly liked the latter item and, judging by



10
The fine regulator clock built by Bob Lilley to the design of Peter Heimann.

the number of times the handles were twiddled, so did most visitors. I would suggest that next time this gadget is exhibited a collection box for an appropriate charity is placed nearby. At a nominal amount per twiddle it is bound to be a good 'money spinner'! Mr. Hanstead's model of the Trevithick locomotive of 1804 was a representation of an engine that was arguably the first to demonstrate the ability of steam to haul loads. It was demonstrated in Pen-y-Daren, North Wales and preceded Stephenson's *Locomotion* by 24 years. No one knows what the actual locomotive looked like as details have been lost, but patient research has derived a best guess and it is on this design that the model is based (photo 11). Mr. Hanstead's model is powered by a Stirling engine mechanism and uses solid fuel to give a scale speed range of 4 to 15 miles per hour.

Only one horological exhibit was on display but the regulator clock by Bob Lilley was a most attractive item (photo 10). This was to Peter Heimann's design serialised in these pages during 1999 and, from memory, appeared to follow the original drawings fairly closely. Carefully fitted into a neat glazed cabinet, it must form a most attractive timepiece in Mr. Lilley's home. Also from Mr. Lilley was an excellent example of a rotary table to the design of David Piddington. For readers unfamiliar with this tool, it adapted the worm and micro-worm used on the George Thomas pattern dividing head for use on a conventional pattern rotary table. It therefore combined the conventional facilities of a rotary table with the ability to index a wide range of divisions including large prime numbers (photo 12).



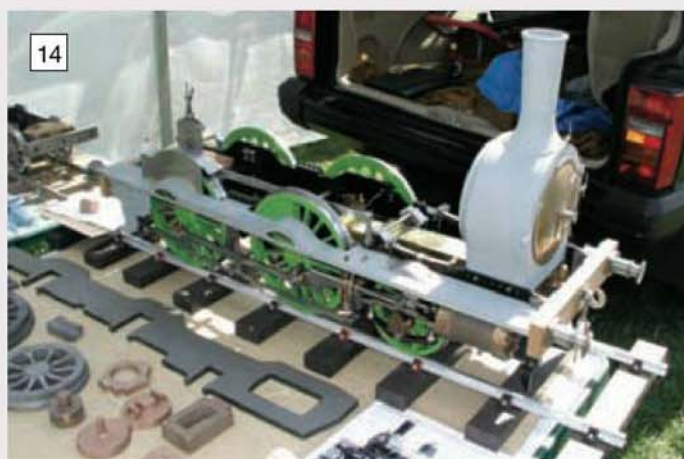
Also from the David Hanstead stable was this attractive little model depicting Richard Trevithick's Pen-y-Daren locomotive.



In addition to his fine regulator clock Bob Lilley displayed this neat rotary table built to the design of David Piddington.



A classic car enthusiast's delight. A 1930s Riley saloon which would have represented a serious purchase for the first owner in those depressed times.



Chris Rayward's part-built Wenford, the drawings and castings for which are available from Hotspur Designs.

A most attractive collection of paintings by Mary Coleman were also on display (photo 15). These pastels showed a variety of subject matter ranging from landscapes to still life and were a delightful change to the harsh world of engineering otherwise dominating the weekend.

Outside in the brilliant sunshine there was still much to see. Eric Lindsay's 6in. to the foot overtype Foden steam wagon was in steam throughout two days of the event (photo 16). Like the prototype wagons, the boiler in this model is pressed to 200psi and the way it held its steam was most impressive. Bristol member Peter Bashford chose to drive to the event in his

1930s Riley saloon car (photo 13). This was a most attractive vehicle and typified the elegant body styles in vogue at that time. I am sure that many visitors admired this fine motor car. I certainly did and could not agree with the elderly lady who remarked that it was a pity he could not afford something more modern.

The model engineering trade always actively supports IMLEC and the companies who attended were welcome sights for those looking to replenish supplies. Michael Breeze had ventured into GWR country with a selection of drawings inspired by designs from certain other well-known railway companies like the LNER. Chris Rayward of Hotspur Designs was offering drawings and castings for the LNWR 0-6-2T 'Coal Tank' in 5in. gauge and the LSWR 2-4-0WT Wenford in 7 1/4in. gauge (photo 14). Early drawings and castings were also available for a new loco in 5in. gauge, the LNWR 0-4-2T 'Dock Tank'. Ever cheerful Bruce and Gerry Davey of Bruce Engineering had brought a selection from their range of castings, boilers, fittings and tooling. For those starting a project John Keatley (Metals) Ltd. could meet their non-ferrous metal requirements and JB Cutting Tools were able to supply the tooling to cut it. Help with the machining of those trickier parts could be had from WOM models, who specialise in CNC milling of links and connecting rods. Those with projects coming to an end could purchase the paint to finish their masterpiece from Phoenix Precision Paints. Also along 'Trade Row', Bristol society members had a stand disposing of surplus model related magazines and various books

whilst an energetic team sold raffle tickets throughout the competition. Last but by no means least, representatives of the Southern Federation of Model Engineering Societies were on hand throughout the weekend.

Well, that was the non-competitive side of IMLEC for 2003. Those of you who attended will know the winner and the less successful runners in the competition. Those who did not must await the competition report, which will appear in due course. In the meantime, why not make a note to visit IMLEC next year? The 2004 event will be hosted by Kinver & West Midlands Society of Model Engineers on 10 and 11 July.

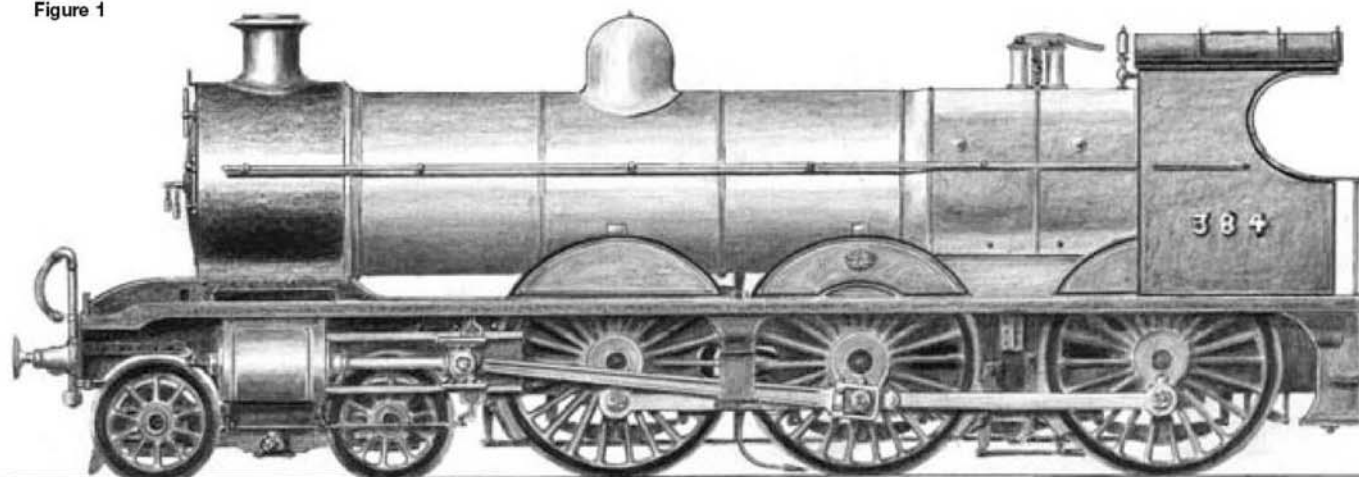


Some of the lovely pastels on display and available from Mary Coleman.



Eric Lindsay's 6in. to the foot scale Foden steam wagon basks in the warm sunshine.

Figure 1



©

EDWARDIAN ELEGANCE

Ron Isted
discusses the Glasgow & South
Western Railway, and describes
James Manson's '381' class 4-6-0s.

●Part IV continued from page T32
(M.E. 4198, 27 June 2003)

In proportion to its size, Scotland must surely have given the world more fine civil, marine and railway engineers than any other country. Apart from household names like James Watt, many other talented but less well-known men, for example the American locomotive designer William McQueen, came from this relatively small country. Scottish engineers also invaded the land immediately to the south: the Stirling dynasty and Dugald Drummond are familiar names in railway engineering. It is therefore not surprising that the upper echelons of Scottish Railways staff were usually 'home-grown', with one very notable exception to be mentioned later. When the Scots were not busy showing other nationalities how to design and build decent locomotives, they frequently progressed in their careers by moving from one native railway to another.

So when James Manson became Locomotive Superintendent of the Glasgow and South Western Railway on 1 September 1890 for a salary of £750 per annum plus a free house, he

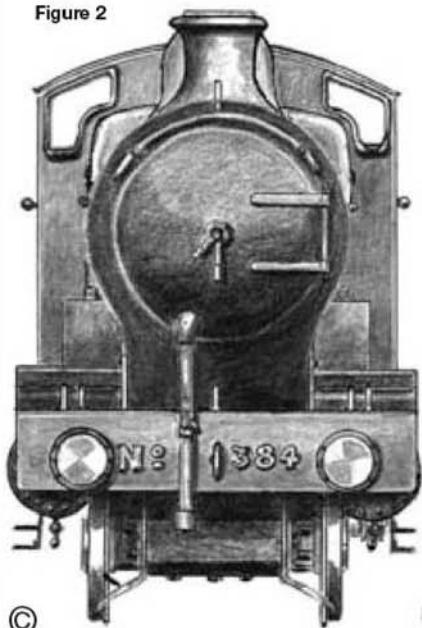
was following a good Scottish tradition, having just served seven years in a similar position on the Great North of Scotland Railway and before that a similar time at sea, as an engineer on the

Bibby Line ships. But he and his family were also no strangers to the Glasgow and South Western, as earlier in his career James had served eight years in their employ, while his father was a traffic inspector, and two brothers were in the Locomotive Department — a family loyalty we unfortunately seldom see these days.

In the 1890s, not only was rail traffic showing a healthy increase, but the overall weight of passenger trains was rising at an even higher rate due to the introduction of improved facilities, including corridor trains, dining cars, lavatories and generally more spacious accommodation, particularly for the previously despised third class passenger, who was now admitted to most of the fastest trains. All these developments led to a vast augmentation of the dead weight per passenger to be hauled around the country at ever higher speeds, although it was partially counter-balanced by lower resistance due to the use of harder steel wheels and rails, together with the growing use of bogie coaches.

Matters reached crisis point around the turn of the century, when several Locomotive Superintendents (and their Design Offices) were more or less compelled to produce locomotives which were a break with tradition, rather than the steady development which had generally been the norm, of adding 1/2in. to cylinder diameter, a couple of inches to boiler diameter, six inches to coupled wheelbase, and so on.

Figure 2



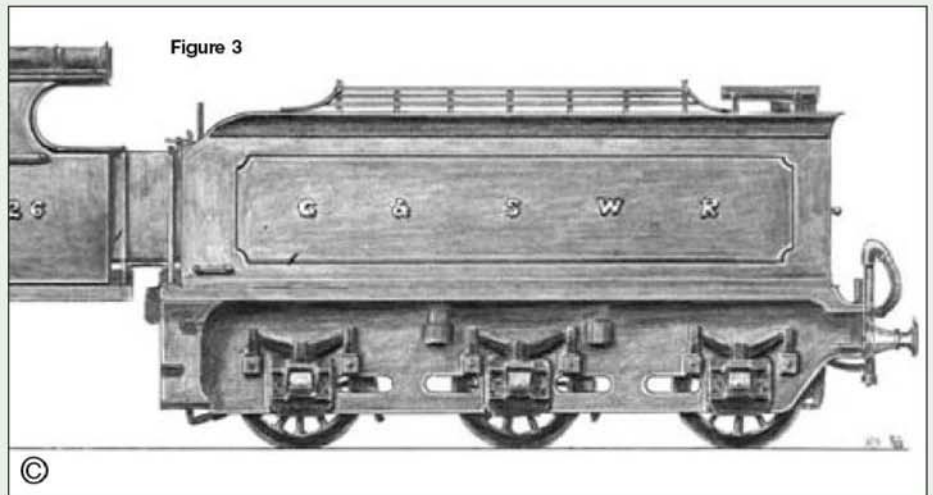
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Unfortunately, many failed to jump the gap and in a desperate attempt to produce a much more powerful locomotive, instead saddled the long-suffering footplate crews, not to mention the shareholders, with sluggish coal gobbling monsters that had very brief and inglorious careers on express trains, before being either demoted to goods work, where their design weaknesses were (sometimes) less obvious, or else summarily scrapped. Many otherwise illustrious faces peer mournfully at us from this gloomy gallery of failure, including D. Drummond (LSWR), J. G. Robinson (GCR) and W. Worsdell (NER), all of whom later reverted to enlargements of their earlier four-coupled designs and in all three cases produced absolute masterpieces: Drummond's 'D15', Robinson's 'Directors' and Worsdell's 'R1'.

But two men did get a 'big engine' right at the first attempt, both in that country of fine engines, Scotland, where David Jones produced his famous and brilliantly successful 'Goods' 4-6-0 in 1894 for the Highland Railway. The only slightly embarrassing detail is that he was actually a Mancunian, one of the few Englishmen to storm the Scottish citadel of engineering! The other was, however, a thoroughbred Scot, who for reasons to be discussed later, has never really received his due credit: James Manson, whose fine '381' class is the subject of this article.

Glasgow and South Western Railway No. 381, the first of an order for ten locomotives at £3,738 each, was delivered from the Atlas Works, Glasgow, early in 1903. The contract had been signed in March 1902 with Sharp Stewart and Co., shortly before the firm joined with Dübs and Neilson Reid to form the North British Locomotive Company, hence the high serial number, as shown in fig 6. The design work, all of which was carried out in the G&SWR's own drawing office at Kilmarnock must therefore have been done as far back as the second half of 1901. The only 4-6-0s running in the British Isles at that time were the Highland 'Jones Goods' previously mentioned, together with the first half dozen of the passenger version, the 'Castles', both highly successful, the North Eastern Railway Worsdell 'S' and 'S1' classes, generally unsatisfactory, and two rather bizarre looking goods engines on the Great Western, both of which had short careers.

So James Manson and the design team of this relatively small and certainly not rich Scottish Railway really were making a leap into the unknown and the result was a "huge" (to quote a contemporary description), but very well proportioned locomotive (fig 1), the nominal tractive effort of which exceeded the current typical Victorian 4-4-0 by about 30%, as indeed did most of its other dimensions. The '381s' were the first engines in Scotland to carry a Belpaire firebox and another interesting detail was the use of balanced slide valves above the outside cylinders, similar to contemporary American practice, although Manson had used them 12 years earlier on the GNSR. On these new engines, they were driven via vertical rocking shafts through openings in the frames from inside Stephenson gear with launch type links, another typically American feature, the eccentrics for which were mounted on the driving rather than the more usual leading coupled axle (fig 4).



Incidentally, the external rocker and valve spindle cannot be seen in most photographs (or in my fig 1) as they are hidden by the footplate valance. The intermediate valve rods, approximately 6ft. 10in. long, had substantial 'U' pieces in them in order to clear the leading coupled axle, and reversing was by the highly satisfactory Stirling steam reverser, already standard on the Glasgow and South Western for 30 years.

Steam ports were 16 1/2 x 1 5/8in. and exhaust 16 1/2 x 4 3/4in., a very generous opening, which contributed to their free-running capabilities when first built, but the 'bridge' between the ports was only 1 1/4 inch. The valve lap was 1in., the eccentrics set at 69 1/4deg. with a throw of 5 1/2in., but so far I have been unable to unearth details of lead, full gear cut-off, or total valve travel. Because of the rocking shaft, the eccentrics were 'crossed', which of course increases in the lead as the engine is notched up, the usual practice in this country. The grate area was 24.58sq.ft. and the external diameter of the boiler barrel 4ft. 9 1/4in. throughout, as the three sections were butt and strap jointed, rather than the more usual 'telescopic' construction. The engine wheelbase was 27ft. 8in., weight 67tons 2cwt. and nominal tractive effort at 85% of boiler pressure, 20,400lb, all figures which bear a remarkable resemblance to the first Great Western Railway outside cylinder 4-6-0 No. 100 built in February 1902, for which the respective figures were 27ft. 2in., 67tons 14cwt. and 20,530lb.

Both Swindon and Kilmarnock locomotives incorporated main frames in two parts, the join being just in front of the leading coupled wheels. The overlap on the Scottish engine was a substantial 2ft. 9in. long and very well braced, but a significant difference lay in the use of 1 1/8in. plate compared to the 1 1/4in. of the English engine. It has been said that James Manson was constrained by weight restrictions, but as quoted above, there was little difference in the overall weight and in fact the maximum axle loading on No. 381 was a hundredweight more than on GWR No. 100.

A further feature common to both locomotives when new was the use of yet another American import, the swing link bogie, which Manson had pioneered in Britain in 1888. But while the Churchward engine was so equipped only for a year or two, the Manson 4-6-0s retained theirs throughout their careers and this may have contributed in later years to some of the problems to be mentioned later.

At this point, you are probably wondering why I have not made a comparison nearer home, namely with the Highland Railway 'Castles,' built

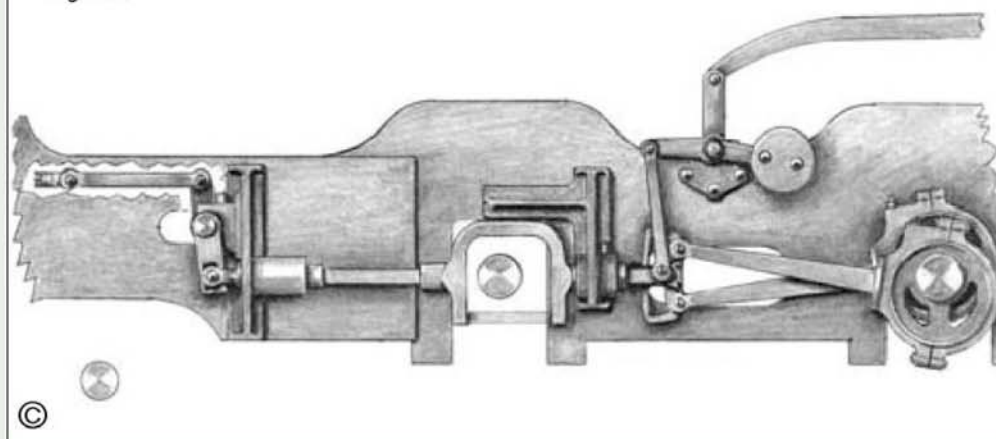
by Dübs in 1900, which cost their owners £400 per engine more than the Glasgow and South Western paid for their '381s' three years later. Well, while there are external similarities, the 5ft. 9in. wheels of the Highland engines rather precluded them from the 'express passenger' category and they were certainly not intended for the sustained high speeds and power output demanded by the GSW schedules. The only other express passenger 4-6-0s running in Scotland when No. 381 was actually delivered, were the two rival 'Caledonian Giants' as Charles Rous-Marten christened them, Nos. 49 and 50, which had emerged from the St. Rollox works of the G&SWR's much hated rival two months earlier. The Caley engines were certainly larger and heavier (by six tons), but were really an enlargement, in extreme form, of the Victorian inside cylinder 4-4-0, rather than a break with tradition.

Unlike the wealthy GWR or Caledonian, neither the Glasgow and South Western nor the Highland Railways could afford to spend time and money on what we now call 'Research and Development' — building one or two engines for test and modifying them over a period to eradicate the bugs before indulging in quantity production. David Jones and James Manson *had* to get it right first time on paper, in order in the latter case to place an order with an outside firm for ten locomotives straight off the drawing board.

That the '381s' were successful is shown by the fact that a further seven virtually identical engines were built at the G&SWR's own works at Kilmarnock in 1910/11, making a total of 17. With the benefit of hindsight, if there is one criticism that can be made, it is surely that this second batch should not have been built 'saturated'. By 1910, the 25% or more saving in coal and water brought about by superheated steam had been well proven, unlike ten years previously, and I would have thought that even accountants and boards of directors would have realised that the slight increase in initial expenditure would pay for itself in a very short time. Strangely, the Glasgow and South Western's blue-clad rival, the Caley, built a class of unsuperheated 4-6-0s as late as 1922, so perhaps the answer lies in a secret ingredient in Scottish water, which not only has its own built-in superheat, but contributes an indefinable something to the amber liquid, (alcoholic content about 40%), for which Scotland is as justly renowned as for its engineers.

In fact the North British Locomotive Company did build two superheated 4-6-0s for the G&SWR in July 1911, based on the '381s', but incorporating several modifications, including

Figure 4



the substitution of 8in. piston valves in place of the balanced slide valves. The footplate was raised in two stages to clear them, which did not improve the engine's appearance and even more disfiguring was the Weir feedwater apparatus, mounted on top of the boiler of the second machine between chimney and dome. On test, they achieved a saving of around 23% in fuel and water compared to their saturated cousins, which however were never modernised.

Partly to satisfy their hunger and thirst and partly because the G&SWR was not equipped with water troughs, all except the last three '381s' were given large bogie tenders carrying 4,100 gallons of water and four tons of coal. Considering their massive size and weight (over 50 tons), these seem remarkably low figures, the equivalent for the McIntosh bogie tenders on the Caledonian being 5,000 gallons and five tons. In due course, the thrifty Glasgow and South Western had second thoughts about their engines towing more than 50 tons of non-revenue earning ironmongery around the countryside and the three final locomotives of the second batch were equipped with 6-wheel tenders. Now, although these weighed a good six tons less than the eight-wheeled version, they officially carried precisely the same amount of coal and water: perhaps Scottish water has another secret ingredient: compressibility?

As the length of the tender makes a big difference to the convenience or otherwise when driving a miniature locomotive, I have produced a drawing of the six-wheeled version, **Figure 3**, the length of which in full size was about 20ft., compared to the 25ft. or so of the bogie version. Unfortunately, I have had to scale the dimensions from a small photograph, which appeared in a contemporary issue of *The Locomotive*, and have been unable to confirm them, as no G/A drawing appears to exist. I think it is pretty accurate, but the details of the brake gear should be treated with some caution, as they were almost indecipherable on the photograph. Remember that only engines Nos. 125, 126 and 127 were equipped with these tenders and this batch of locomotives incorporated several minor, but very visible, modifications compared to my fig 1. These include the differently shaped cab cut-away, shown in fig 3, a sharper bend in the reach rod above the reversing arm, while the brake blocks were all in front of the coupled wheels instead of as shown in fig 1.

For the first few years, there's no doubt that James Manson's big engines put up some quite superb performances over the difficult road between Carlisle and Glasgow St. Enoch. In the early years of the 20th Century the fastest booking was 103 minutes for the 91¼ miles

between Kilmarnock and Carlisle, average 53mph, good going when you remember that the first 20 miles includes long stretches of 1:100 gradient up to New Cumnock, while other timings, including the heavy 'dinners' and Pullman expresses run in conjunction with the Midland Railway were little slower. At that time, the '381s' were both excellent hill-climbers and very free running locomotives, being timed at 85mph by observers like Charles Rous-Marten, who published details of a run behind No. 387 at the head of a heavy load for those days of 360 tons, when the 37 miles from New Cumnock to Dumfries were reeled off in 36 minutes 27 seconds start to stop. He claimed that the footplate crew were completely unaware that their performance was being logged, so that it was not a 'special effort' and this is born out by another trip timed by David Smith, when No. 389 with her regular driver, John McIntosh of Glasgow Cokerhill shed, achieved a 'pass to pass' time over the same distance of exactly 30 minutes, averaging 74 miles per hour. John's brother Maxwell had the engine shown in fig 1, No. 384, from new and Rous-Marten published details of a quite extraordinary effort by this engine and crew with a load of no less than 400 tons, when 67mph was sustained on level track and a steady 50mph up 3½ miles of 1:200.

Now, I have to say that I find this last feat difficult to believe: an unsuperheated engine sustaining that speed up such a gradient while hauling over seven times its own weight would be really quite remarkable for that period. Let us look at a few figures: using the Johansen formula $R = 4 + 0.025V + 0.00166V^2$, where R = train resistance and V = speed of the train in miles per hour, the resistance at 50mph works out at 9.41bf/ton, so with a train of 400 tons, the total drawbar pull at that speed on level track would need to be 1.678 tons — a good, but not exceptional output for an engine of this size and vintage. But in the case quoted by Rous-Marten, the train sustained this speed up 3½ miles of 1:200 and the additional resistance due to gravity equals the load divided by the gradient, i.e. $400 \div 200$ or a further two tons, making a total drawbar pull of no less than 3.678 tons, equal to a drawbar horsepower of 1098. The crucial word is 'sustained', because if the speed on the gradient fell (say) from 60mph to a minimum of 50mph, the figures would be considerably reduced and, I would have thought, much more commensurate with the expected output from a medium-sized unsuperheated locomotive with a relatively small grate area, although still an excellent performance for the period.

Remember, it predates the LNWR 'Precursors' and 'Georges' and the Churchward revolution on the GWR — in fact I would doubt whether any British locomotive, including GWR No 100 as originally built, could have equalled it. But, as I said, I do have serious reservations about the timings quoted and I'm afraid it would not be the first time that Rous-Marten, who was first and foremost a journalist, may have been economical with the truth.

There is absolutely no doubt, however, that in the first ten years or so of their existence, these regal looking locomotives and their regular crews made some of the finest running to be found anywhere in the British Isles. So why did everything almost overnight go so terribly pear-shaped, that after the first World War, they were officially fitted with Jemmies to try to make them steam?

I should perhaps explain that a Jemmy, which I believe was known in Scotland as a Razor, was a home-made (usually) and strictly unofficial device, employed by footplate crews to make a shy engine generate more steam by restricting the exhaust nozzle and thereby sharpening the blast. This, of course, also violently increased back pressure, while fuel consumption soared, hence the extremely dim view taken by officialdom of such gadgets and woe betide any driver caught using one. To have official sanction for the fitting of them, compete with control gear from the cab(!), is a sad commentary on just how dire the situation on the Glasgow and South Western Railway had become.

I think there are three main reasons for this spectacular deterioration in performance: first, from about 1909 "there set in a tide of economy" to quote that marvellous writer about the G&SWR, David L. Smith. Together with a rapid decline in maintenance standards brought about by the war, the slightest weakness in design became cruelly exposed. As mentioned above the 11/8in. main frames were in two parts, probably to avoid joggling the front section to clear the bogie wheels, a problem not exactly unknown in our sizes! Also the works at Kilmarnock might have had difficulty in coping with a one-piece frame over 35ft. long, although the North British Locomotive Co., which built the first batch, would have had the capacity to do so. In spite of being very well braced with a 2ft. 9in. overlap, the whole front end of the '381' class developed a disconcerting tendency to work loose, which could not have inspired confidence to run fast, while hot boxes became another frequent hazard of the hard-pressed men on the footplate.

The second reason was, to put it bluntly, Robert Harben Whitelegg, another Englishman, this time from Liverpool, who became G&SWR Locomotive Superintendent in 1918 at the height of the war and immediately set about modifying existing locomotives to his own rather controversial ideas, particularly with regard to valves and valve-setting. In the case of the '381' class, the alterations sabotaged both their hill-climbing and free-running capabilities and had an even more catastrophic effect on coal consumption. This had soared anyway due to the

Figure 5



declining quality of fuel available, the best coal being diverted to feed the voracious warships of the Royal Navy, in order to ensure that Britannia continued to rule the waves. With their relatively small grate area of just over 24¹/₂sq.ft., compared to the 27.6sq.ft. of GWR No. 100, the '381s' would be very susceptible to problems with inferior fuel.

The third reason for their fall from grace came later, when the London Midland and Scottish Railway was formed in 1923. While the takeover by the Midland Railway of the Southern (i.e. English) Division of that unhappy company in the 1920s has been well documented, the massacre of its erst-while rival by the ex-Caledonian Railway officials, who dominated the Northern Division, has received scant publicity. Yet the figures speak for themselves. In the carnage of the first ten years after the 1923 Grouping, just one eighth of former CR locomotives were withdrawn from service, while no less than four fifths of the G&SWR stock were put to the torch.

The last of James Manson's 4-6-0s, No. 384, the engine shown in fig 1 and the one involved in the debatable Rous-Marten exploit, was withdrawn in 1933 after a very creditable 30 years all but two months of hard work and, by an ironic coincidence, the former Caley No. 50, one of the two rival 'Caledonian Giants', was taken out of service that very same month. The famous 'Cardean' class of the same railway had an average life of 22 years 7 months (omitting the engine smashed beyond repair in the 1915 accident of Quintinshill), while the 1903 batch of Glasgow and South Western 4-6-0s averaged 27 years 1 month in spite of their problems, so perhaps a little unprejudiced re-appraisal is called for. In passing, Churchward's first outside-cylinder 4-6-0 No. 100 lasted just six months longer, in spite of various modernisation alterations.

If I may digress for a moment, not only amateur enthusiasts are creatures of prejudice where railways are concerned: professional engineers, whom one might expect to display a cold and logical impartiality towards such things, can get just as steamed up, if you'll pardon the pun, as has already been demonstrated by the dastardly doings on the LMS in the 1920s. Another example is Horwich-trained E. S. Cox, later to become 'Executive Officer (Design)', otherwise known as Assistant Chief Mechanical Engineer, for British Railways, who described the Glasgow and South Western as "...a difficult line to love"(!) and its locomotives as having "...a kind of unfinished appearance which only just succeeded in making them locomotives at

all"(!) This from the man intimately associated with the appearance of the BR 76xxx and 77xxx 2-6-0s — but my own prejudices are beginning to surface, so I will return quickly to the point.

I have never seen a miniature version of a '381', which is quite surprising as they are surely among the most graceful 4-6-0s ever to take the rails, not the least of the visual attractions being that lovely long 11ft. connecting rod — even Swindon could only muster 10ft. 8¹/₂in. But there are also purely practical inducements to build a live steam model: the boiler is very plain and straightforward and, although fitted with a Belpaire firebox, the top is almost level with the top of the barrel, so it would be perfectly possible to build a 'round-top' and fit the cladding to give the appearance of a Belpaire job. Please, however, unlike the G&SWR, do equip it with a superheater!

The balanced slide-valves would make an interesting project in themselves, as they seem to be seldom used in small size, in spite of frequent efforts by the late K. N. Harris to extol their virtues over miniature piston valves. For those interested, I have listed articles and letters in *M.E.* over recent years in the bibliography, but of course ordinary un-balanced slide valves could be used without affecting the external appearance.

As is so often the case, the major challenge lies in the combination of outside cylinders with a leading bogie and the problem is compounded in this particular design by the low 'pitch' of the cylinder centre line, i.e. the height above rail level. On the full size engine, they are horizontal, with the centre line pitched at 3ft. 3in., equivalent to 2⁷/₁₆in. in 3¹/₂in. gauge. Compare this with LBSC's *Maisie* for example, where the same size cylinders (which is incorrect for a GN Atlantic anyway) are pitched at 2¹³/₁₆in. above rail level, equivalent to 6in. higher. But in order to ease clearances, Curly also reduced the bogie wheel diameter from the 3ft. 8in. of the full size engine to a choice of 3ft. 2in. or even 3ft., (2³/₄in. to 2³/₈in. or 2¹/₄in.), which seems rather drastic.

Let us examine the problem from another angle, using the minimum dimensions for 3¹/₂in. gauge: scale piston stroke, 1⁵/₈in. plus minimum piston thickness, ³/₈in. plus two cylinder covers, ¹/₄in. plus two 'registers', ³/₃₂in., total 2¹¹/₃₂in., neglecting clearance, which will add approximately ¹/₁₆ inch. The minimum length for the cylinder assembly is therefore 2¹³/₃₂in., but preferably 2⁷/₁₆in. With a scale bogie wheelbase of 4⁷/₈in., 6ft. 6in. on the full size engine, and assuming scale diameter over bogie wheel flanges rather than tread, we are left with just 2³/₈in. between the flanges on the bogie centre line and the bottom of our 2¹³/₃₂in. long cylinder assembly a bare ¹/₈in. above. Yes, I do know that cylinders are round and it's not quite as bad as it looks on paper, but clearances are extremely tight and, as always, the problem is exacerbated by the over-scale up-and-down movement and by the tighter curves of miniature tracks.

As usual with a working model, a compromise has to be made and three dimensions are capable of variation without too much of an adverse effect on the well-balanced proportions of the prototype. First a small reduction in bogie wheel diameter, but not as much as *Maisie*, second, lengthening the bogie wheelbase and third, a reduction of piston thickness by using piston rings as discussed in a

Figure 6



previous article — this last being potentially the best choice. Most people, however, will probably opt for a combination of the first two, with the emphasis on reduction of wheel diameter, as lengthening the wheelbase soon becomes obvious and leads to other complications.

Commercially available 3¹/₂in. gauge cylinder castings which could probably be utilised for a G&SWR 4-6-0 include Martin Evans' *Marquis*, *William* and *Jubilee* and LBSC's *Betty*, *Bantam Cock* and *Princess Marina*. All the above are intended for the equivalent of 18in. diameter compared to the 20in. of the '381' class, but a small reduction in the scale cylinder diameter may be a good idea in a small version. In 5in. gauge, Martin Evans' *Nigel Gresley* cylinders would be worth investigation and possibly *Torquay Manor*, but the 3¹/₂in. length may not be reducible to the required length without losing too much of the end 'ribbing', into which the cover retaining screws are fitted.

When it comes to wheel castings, the 22-spoke 6ft. 6in. driving and coupled wheels of the prototype, (4⁷/₈in. for 3¹/₂in. gauge and 6²⁹/₃₂in. for 5in. gauge), have a crankpin throw of 13in. (1¹³/₁₆in. and 1⁵/₃₂in.) and the only 22-spoke wheels of suitable diameter I have found for 3¹/₂in. gauge, are for LBSC's *Roedean*, with a designed crankpin throw of 7⁷/₈in., but there may be problems with the balance weights. The wheels for *Maisie* have 21 spokes and are intended for 4³/₄in. dia. (equivalent to 6ft. 4in.), but the crankpin throw is the required 1¹³/₁₆in. In 5in. gauge, LBSC's *Maid of Kent* wheels have the correct 22 spokes and the crankpin throw is 1¹/₈in., but the finished diameter is ³/₃₂in. over the scale figure of 6²⁹/₃₂in.

The rest of the engine is relatively straightforward and a miniature version of James Manson's '381' should produce a powerful passenger hauler, with the added advantage that you are unlikely to come across too many identical locomotives — unless this article is more successful than my wildest dreams!

Finding a definitive reference to the Glasgow and South Western Railway colour scheme is not quite as easy as for previous subjects in this series, as only one engine survived the holocaust of the 20s and 30s: an 0-6-0T designed by James Manson's successor, Peter Drummond. Incidentally this locomotive, which now resides in the Glasgow Museum of Transport, was the inspiration for the popular 5in. gauge *Butch*, formerly marketed by Kennions, but currently handled by GLR Distributors. The prototype, GSWR No. 9, is of course painted in the lighter green introduced by Drummond, so only the lining

The Glasgow & South Western Railway and James Manson's '381' class 4-6-0s Useful Dimensions

Note: these are intended specifically for use in producing a miniature version of No. 447, so 'internal' measurements such as heating surface and diameter of boiler barrel sections are omitted.

The figures for 3¹/₂in. and 5in. gauges have been calculated to the nearest ¹/₆₄in., using ³/₄in. to the foot and 1¹/₁₆in. to the foot respectively.

For gauge 1, halve the 3¹/₂in. gauge figures, for 2¹/₂in. gauge, halve the 5in. gauge figures, for 7¹/₄in. gauge, double the 3¹/₂in. gauge figures. Figures prefixed by ≈ are approximate only

Description	Full Size	3 ¹ / ₂ in. scale (3 ¹ / ₂ in. gauge)	1 ¹ / ₁₆ in. scale (5in. gauge)
Overall length: engine and tender	64ft. 6in.	4ft. 0 ³ / ₈ in.	5ft. 8 ¹⁷ / ₃₂ in.
Overall length: engine	37ft. 0 ³ / ₄ in.	2ft. 3 ¹⁵ / ₆₄ in.	3ft. 3 ³ / ₈ in.
Overall length: tender (8-wheel)	26ft. 7 ¹ / ₄ in.	1ft. 7 ⁶¹ / ₆₄ in.	2ft. 4 ¹⁷ / ₆₄ in.
Maximum width over cylinder cladding	8ft. 11in.	6 ¹¹ / ₁₆ in.	9 ¹⁵ / ₃₂ in.
Height to top of chimney	12ft. 11 ¹³ / ₁₆ in.	9 ⁴⁷ / ₆₄ in.	1ft. 1 ⁵¹ / ₆₄ in.
Overall length of main frames	35ft. 4in.	2ft. 2 ¹ / ₂ in.	3ft. 1 ³⁵ / ₆₄ in.
Thickness of main frame	1 ¹ / ₈ in.	1 ¹ / ₁₆ in.	3 ³ / ₃₂ in.
Engine wheelbase	6ft. 6in.+	4 ⁷ / ₈ in.	6 ²⁹ / ₃₂ in.
	6ft. 2in.+	4 ⁵ / ₈ in.	6 ³⁵ / ₆₄ in.
	6ft. 9in.+	5 ¹ / ₁₆ in.	7 ¹¹ / ₆₄ in.
	8ft. 3in.	6 ³ / ₁₆ in.	8 ⁴⁹ / ₆₄ in.
Tender wheelbase (8-wheel)	5ft. 6in.+	4 ¹ / ₈ in.	5 ²⁹ / ₃₂ in.
	6ft. 0in.+	4 ¹ / ₂ in.	6 ³ / ₈ in.
	5ft. 6in.	4 ¹ / ₈ in.	5 ²⁷ / ₃₂ in.
Tender wheelbase (6-wheel)	6ft. 9in.+ 6ft. 9in.	5 ¹ / ₁₆ + 5 ¹ / ₁₆ in.	7 ¹¹ / ₆₄ + 7 ¹¹ / ₆₄ in.
Bogie wheel diameter (10 spokes)	3ft. 3in.	2 ⁷ / ₁₆ in.	3 ²⁹ / ₆₄ in.
Driving and coupled wheel diameter (22 spokes)	6ft. 6in.	4 ⁷ / ₈ in.	6 ²⁹ / ₃₂ in.
Tender wheel diameter (8-wheel)	3ft. 8in.	2 ³ / ₄ in.	3 ⁵⁷ / ₆₄ in.
Tender wheel diameter (6-wheel)	3ft. 10 ¹ / ₂ in.	2 ²⁹ / ₃₂ in.	4 ⁷ / ₆₄ in.
Height to top of buffer beam	4ft. 6 ⁵ / ₈ in.	3 ¹³ / ₃₂ in.	4 ²⁷ / ₃₂ in.
Width over buffer beam/footplate	8ft. 7in.	6 ⁷ / ₁₆ in.	9 ¹ / ₈ in.
Height to top of footplate	5ft. 0in.	3 ³ / ₄ in.	5 ⁵ / ₁₆ in.
Height to top of cab roof angle iron	12ft. 6in.	9 ³ / ₈ in.	1ft. 1 ⁹ / ₃₂ in.
Width over cab sides (exterior)	7ft. 8in.	5 ³ / ₄ in.	8 ⁹ / ₆₄ in.
Width over cab pillars	7ft. 6 ¹ / ₂ in.	5 ²¹ / ₃₂ in.	8 ¹ / ₆₄ in.
Width over footsteps	8ft. 8in.	6 ¹ / ₂ in.	9 ¹³ / ₆₄ in.
Width of splashers	1ft. 1 ³ / ₄ in.	5 ⁵ / ₆₄ in.	1 ⁷ / ₃₂ in.
Width of connecting rod splasher	5 ¹ / ₈ in.	5 ¹ / ₁₆ in.	2 ⁹ / ₆₄ in.
Cylinders: bore x stroke	20 x 26in.	1 ¹ / ₄ x 1 ⁵ / ₈ in.	1 ⁴⁹ / ₆₄ x 2 ¹⁹ / ₆₄ in.
Length of connecting rod	11ft. 0in.	8 ¹ / ₄ in.	11 ¹¹ / ₁₆ in.
Length of eccentric rods	4ft. 1in.	3 ¹ / ₁₆ in.	4 ¹¹ / ₃₂ in.
Centres of eccentric rod pins	11 ³ / ₄ in.	4 ⁷ / ₆₄ in.	1 ³ / ₆₄ in.
Pitch of boiler	8ft. 3in.	6 ³ / ₁₆ in.	8 ⁴⁹ / ₆₄ in.
Diameter of boiler over cladding	5ft. 0 ³ / ₄ in.	3 ⁵¹ / ₆₄ in.	5 ³ / ₈ in.
Diameter of smokebox (exterior)	5ft. 8in.	4 ¹ / ₄ in.	6 ¹ / ₆₄ in.
Length of smokebox	4ft. 2in.	3 ¹ / ₈ in.	4 ²⁷ / ₆₄ in.
Height of chimney	1ft. 11in.	1 ⁷ / ₁₆ in.	2 ¹ / ₃₂ in.
Diameter of chimney (exterior)	1ft. 5 ³ / ₄ in.	1 ⁷ / ₆₄ in.	1 ³⁷ / ₆₄ in.
Side-play of bogie (swing link)	5 ¹ / ₂ in.	11 ³ / ₃₂ in.	3 ¹ / ₆₄ in.

Dimensions indicated thus ≈ have been scaled from a drawing or photograph.

and lettering details are really of use to us. The green used during Manson's time was rather darker and the only representations of it I have come across so far, are a superb water colour painting of No. 386 by Victor Welch in O. S. Nock's *Scottish Railways* and another by the same artist on the cover of the 1970 paper back version of David L. Smith's *Tales of the Glasgow and South Western*, depicting a G&SW double-headed express with 4-4-0 No 86 and an unidentified '381' in charge (N.B. not No. 128 as it says in the caption!) Both paintings tally fairly well with regard to the green and also match a small sample panel in *Carter's Britain's Railway Liveries*.

To return to the Manson colour scheme: the green was applied to the boiler, dome, cab sides and front, cylinders, wheel centres and of course the tender. The lining was black, edged either side in white, and this included cylinders and tender, on both of which the corners of the lining were reverse curves as shown in my figs 1 and 3.

Footplate edging, steps, tender frames and axle boxes were claret lined in white, while buffer beams, including buffer stocks, were vermilion edged in yellow, with yellow numbers as shown in fig 2, shaded pale yellow and white left and below and black to the right. The smokebox, chimney, cab roof and wheel tyres were black.

A miniature version of James Manson's 'big engine' would be a fine memorial to a very underrated engineer, whose attitude to his staff was in many ways far in advance of his time, while his memory for the names of footplate crews and other members of the Locomotive Department was legendary, in an era when relations between management and workers were usually rather — shall we be charitable and say 'less relaxed' than in later years. In 1886, when Locomotive Superintendent of the Great North of Scotland Railway, he developed the famous single line tablet exchanging apparatus named after him, but deliberately refrained from taking out a patent in

the hope that other railways would adopt it without royalty payments and thereby reduce the number of injuries caused by 'exchanging' at speed large, heavy and potentially lethal lumps of metal by hand. Ironically, the Glasgow and South Western refused to install it, but the rival Caledonian made extensive use of it, as did the Highland Railway and of course the Great North of Scotland.

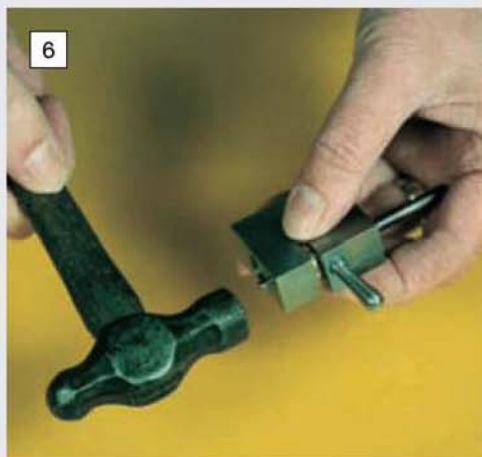
On his retirement in 1912, James Manson continued to live in Kilmarnock as a much respected member of the community until his death in 1935 at the age of 89. Of the 257 engines built to his design for the G&SWR, just eight 0-6-0s outlived him, the last being withdrawn in December 1937.

In conclusion, I would once again like to acknowledge the help of Keith Moore and the staff of the library of the Institution of Mechanical Engineers in digging out 100 year-old volumes of *Engineer*, *Engineering*, *The Railway Engineer* and *The Locomotive* referred to in the bibliography.

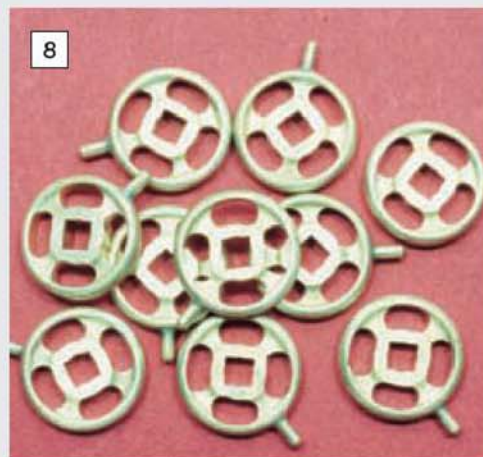
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●To be continued.



Using the stripping accessory to assist in driving the punch from the work piece.



Above: hand wheels made using the block tool.

Left: a guide rod ensures that the square hole is correctly aligned with its lever.

Bill Steer

continues his description of this handy little tool and outlines some of the applications for which he has already found it useful.

●Part II continued from page 79
(M.E. 4200, 25 July 2003)

The stripping accessory (fig 6) is simply a wedge-shaped piece of mild steel with a slot running through its middle and equipped with a small handle. It is used to assist with the extraction of the punch once a hole has been cut. The small wedge of metal, left after cutting out the gap in the main block may well serve as the basis for this.

Producing square holes

Assuming that the punch is to be used for making a square hole in a hand wheel, the centre of the wheel should contain a pilot hole of diameter equal to the A/F size of the square to be punched, i.e. for a $\frac{3}{32}$ in. square the pilot hole should also be $\frac{3}{32}$ inch. If there is any danger that the drill will produce an oversize hole then it may be advisable to drill slightly undersize and then ream out to size. An appropriately sized retractable guide pin should be selected and positioned in the block in such a way that its upper portion is projecting from the base of the working gap. At the correct height it should just be gripped by the spring loaded detent. The pilot hole in the hand wheel should then be located on this pin.

With the hand wheel sitting firmly on the base of the working gap, the punch can be inserted through the hole in the top of the block and rested on the work. The block body should then be positioned on its base unit which, in turn, is supported on something substantial. I have a small blacksmith's anvil which is very useful for this type of operation. A few gentle blows to the punch with a light hammer will then take it through, displacing the guide pin as it does so. Finally, the block should be lifted from its base and the stripping accessory inserted in the gap above the work. A few gentle taps to the guide pin will then cause the punch to be ejected (photo 6).

When making square holes in such things as drain cock operating levers, it is important that the sides of the square are in correct alignment with the rest of the lever. This can be easily accomplished by fitting a guide rod to the punch (photo 7). Here the guide engages with a hole in the lever which will eventually be fitted with a crankpin, and effectively restrains any rotation of the punch. Photograph 8 shows a collection of small hand wheels punched with this tool and photo 9 some drain cock levers.

Other uses of the block tool

As well as its original function, the block tool has proved to be extremely useful as a small tapping machine, particularly for threading nuts.

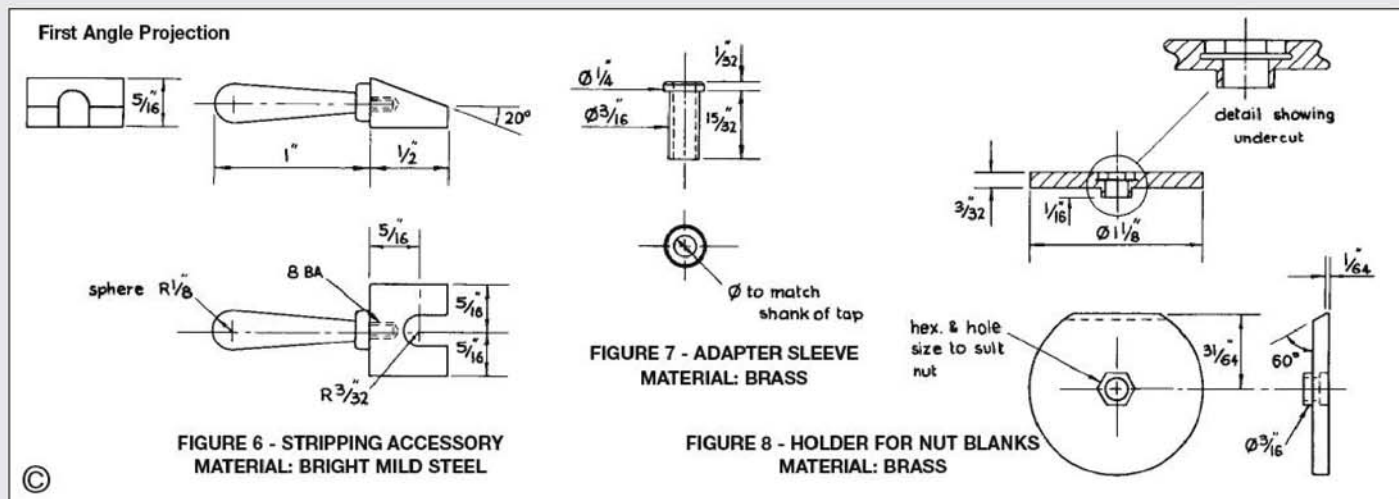
Although nuts are not an expensive commodity, I generally prefer to make my own, apart from those used for temporary assembly. That way I have better control of their sizes and finish. Also, since it does not take very long to produce a batch, it saves time in going through the catalogues and making up an order. I just have to ensure that I maintain adequate stocks of hexagon material.

Making nuts

As I mentioned in a previous article (M.E. 3681, 21 May 1982) my preferred method of making nuts is to set up the lathe for repetitive working, using appropriate stops, and then to proceed with the following operations.

First the end of the hexagon rod is faced and chamfered with a combination tool. A rear mounted parting tool is then brought in at a pre-set distance from the facing tool and used to cut part way through the stock. The depth of cut is such that the diameter of the remaining metal is just slightly less than that of the drill used to make the tapping hole. Finally, the face of the embryonic nut is centred and drilled to size.

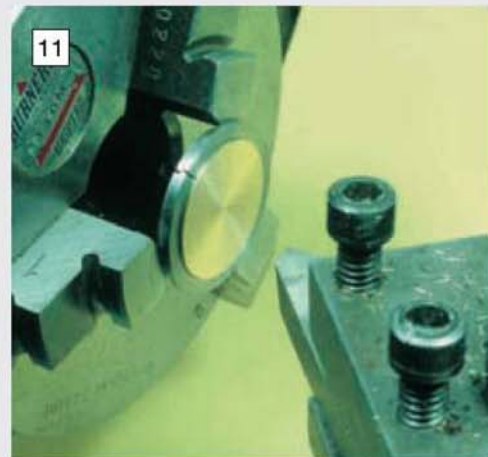
Drilling continues until the nut parts company with the parent material and ends up on the shank, safely out of harm's way. The operation is then repeated until the required number of blanks has been produced. Once set up, blanks can be made





Above: drain cock levers with neat square holes.

Right: the block tool in use as a tapping aid. In this view, the work piece is one of a batch of 6BA nuts.



Using a split ring to hold the nut holder blank for turning operations on the lathe.

in this way very quickly. They next have to be tapped. For many years I used a simple tapping aid in conjunction with my drilling machine. However once the block tool had come into existence its advantages in this role soon became apparent.

The tapping machine

Photograph 10 shows the block tool being used to tap a 6BA nut blank. On checking my collection of taps I found that most of the smaller sizes had shanks just a little over $\frac{1}{8}$ in. in dia. but for others no standard seemed to exist, consequently they are used in conjunction with adaptor sleeves (fig 7) made to suit the tap.

The nut blanks are located under the tap by means of a small disc shaped holder (fig 8). My own holders are made of brass and although a harder material might be considered to be more appropriate, the brass holders are surprisingly durable. The use of brass much simplifies their manufacture and in turn allows speedy replacement should they show signs of wear.

Construction of the nut holders

A length of suitable round brass stock should be held in the lathe and its end faced and shaped to the profile of the underside, as shown in the drawing. The outer diameter should also be turned down to size. Using a parting tool, a disc, a little over $\frac{3}{32}$ in. thick, should then be separated from the stock material. Unless one has access to a small instrument lathe equipped with a set of stepped internal collets, it will be necessary to make a split ring in order to hold the disc for the subsequent machining operations.

A suitable ring is shown in fig 9. In use the ring is positioned in the 3-jaw chuck in such a way that it grips the work firmly, using the

previously machined surface as a datum to act against the rear edge. With the disc thus set up the parted-off surface can now be faced to size (photo 11). A clearance hole for the size of tap with which the holder is to be used is drilled through the middle. This is then partially opened up with a very small boring tool to give a flat bottomed hole, the diameter of which is the same size as the A/F dimension of the nut blank. Its depth is about half the thickness of the nut.

The hexagon recess

The round hole is next converted to a hexagon by means of a suitable punch. In order to simplify the punch manufacture, I make these out of the same material that I use to make the nut blanks i.e. bright mild steel, hexagon section. This has the dual advantage that it is exactly the right size and also it is ready to hand. Of course, the down side is that it is soft, but not as soft as the brass. Because of this one can get away with using these punches at least once and if necessary they can be re-faced before using again. I have case hardened them at times but for this application there is little advantage.

Unfortunately, the sizes of the punches required, at least for the larger nuts, preclude the use of the block tool itself for their guidance. However, since we are not punching the hole all the way through the disc, a hand-guided punch with a circular lead-in works well in this case. A suitable punch is shown in fig 10. With the disc resting on a smooth flat surface, the lead-in of the punch should engage the small clearance hole. Check that the punch is vertical and then tap it a few times with a small hammer until it reaches the bottom of the hole. This process will leave a burr at the bottom, which will need to be

removed. To do this, return the holder to the lathe, using the adaptor ring, and very carefully face the bottom of the hole, at the same time undercutting the hexagon surface.

For the very smallest of nuts, these operations are best carried out in a watchmaker's lathe, if available. Use a tool made up as shown in fig 11. This is very tiny, especially for the smaller sizes of nut, and is best made by filing the shape on the end of a piece of square section silver-steel, which is then hardened and tempered. Hardening small tools like this can be a problem due to overheating. I generally surround the tip with a small scrap of steel in which an appropriately sized hole has been drilled. This then acts like a miniature muffle furnace when the flame is applied and helps to even out the heating.

Finally, a flat should be produced on the nut holder (note the chamfer to this edge). This can be filed or milled and is used to prevent the holder from rotating while tapping is taking place. Should it be found that the fit of the nut blanks in the holder is too tight, careful scraping of the hexagonal edges with a graver will soon alleviate any problem.

Use of the nut tapper

In use, a nut blank is popped into the holder, which is then positioned in the block tool under the tap. Slight downward pressure on the tap keeps the nut in place, while the holder prevents it from rotating. The block and holder should be steadied with one hand and the tap operated with the other, in the normal way. One particular advantage of this little tool that I have found is that having made a batch of nut blanks, perhaps on a cold winter's evening, one can retire to the warmth and comfort of the family living room to complete the tapping operation. The action harmonises agreeably with the click of knitting needles!

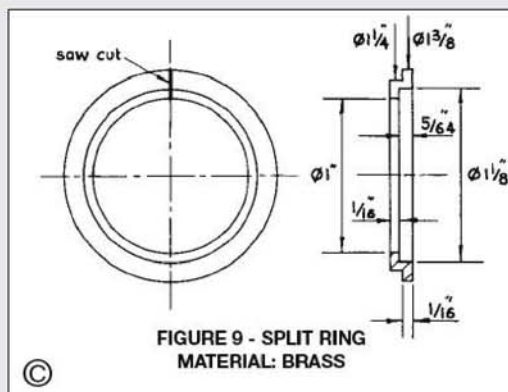


FIGURE 9 - SPLIT RING
MATERIAL: BRASS

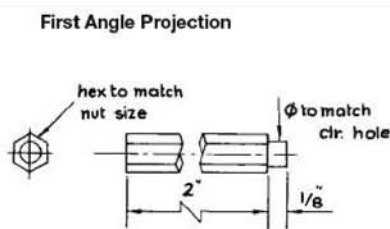


FIGURE 10 - PUNCH FOR PRODUCING
HEXAGON RECESS
MATERIAL: BRIGHT MILD STEEL

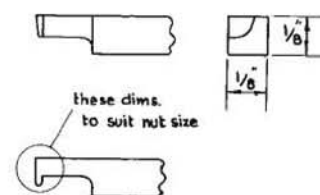


FIGURE 11 - UNDERCUTTING &
FACING TOOL
MATERIAL: SILVER STEEL

Use as a staking tool

In general, the throat depth of the block tool limits its use as a staking tool. Despite this, I have used it for closing $\frac{3}{64}$ in. dia. brass rivets in small detailed fittings with great success. In this application the punch is made in the form of a rivet set and works against a small, hardened steel anvil, with a matching dimple in its middle. The anvil is positioned in the bottom location hole. Figure 12 gives details of a suggested set and anvil for small rivets, the exact size and shape of these will obviously vary depending on the job in hand.

I find that the best way of making the depressions in these small rivet sets is to first prepare a male punch, shaped to match the required rivet head. Turning then to the embryonic set, its end is touched with a suitable sized centre drill and opened up either with a spherical dental burr or with a series of small twist drills to produce a roughly shaped hemispherical cavity. This cavity is then finished to size by means of the aforementioned punch. The set is then finally hardened and tempered to a dark straw/purple colour.

Following on from this, if the male punch is used in conjunction with a hardened anvil, containing its own impression, we have a set of top and bottom press tools. I have used such a combination to produce neat rows of 'dummy' rivets along the edge of thin brass sheet.

Punching holes with the aid of a bottom die

When making square holes in relatively thick materials using the method previously described for hand wheels, the amount of metal removed is minimal and thus the forces on the work are not

excessive. With thin materials it is quite reasonable to punch holes directly without the use of the pilot hole, provided a hardened steel die is used to support the work and thus help with the shearing action. Punches and dies for use in the block tool are easily made using a combination of the techniques previously described.

Figure 13 shows a punch and die for producing round holes. It is important that both components are a good fit together. For circular holes this simply requires normal engineering methods, i.e. the hole can be reamed and the punch turned to fit, but for holes of other shapes something further is required. Yes, you have guessed, just like the hand wheels, the punch is made first and this is driven through a pilot hole in the unhardened die. Of course, with any hole that is not round some form of registration is required to keep the punch and die aligned with one another, and this is open to many ingenious solutions!

One particularly useful application that I have found for the block tool in its punching guise is for making neat clearance holes around the edges of gaskets for the fixing screws, something else which I have always found to be quite tricky.

On other occasions I have found it useful for producing clean holes in shim stock and spring steel. For these latter applications a thin smear of tallow, or other grease, on the work helps to reduce the friction on the punch and cuts down the force required.

Conclusion

This then is the block tool. As I mentioned at the outset, it is something that has evolved over a period of time. In essence it is a very simple tool, but despite this I have found it to be extremely versatile in the way it handles so many different jobs. I hope that this will be echoed by anybody who cares to make one for their own use.

GEORGE CORLISS AND HIS ENGINES

P. J. M. Southworth
tells us about this ingenious man
and his innovative steam engines.

The following quotation was written by J. Scott Russell (Brunel's partner on the *Great Eastern*) about the Corliss engine in a report to the Government on the Paris exhibition of 1867. "A mechanism as beautiful as the human hand releases or retains its grip of the feeding valve and gives a greater or lesser dose of steam in nice proportion to each varying want."

George Corliss was born on 2 June 1817 at Easton, New York State, USA. At the age of fourteen he started work as a general clerk, book keeper, salesman and inspector of the cloth manufactured in the mill. He attended an academy for about three years at the end of which, in 1838 when he was barely 21, he opened a country store, marrying a year later. Eventually he became bored with the monotony and sold up. However, during the time he had his shop, customers complained about the workmanship of

the ready-made shoes. This gave him the idea that machinery might be used in their manufacture. For recreation after selling up, he constructed a machine that would make 20 stitches a minute in

heavy leather. This, and the development of a sewing machine introduced him to the machine shop. In 1844 he became a resident of Providence, Rhode Island, and in 1848 was associated with

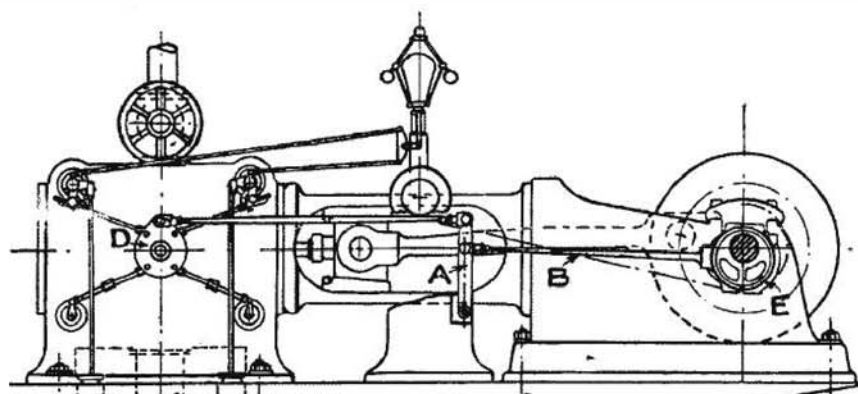
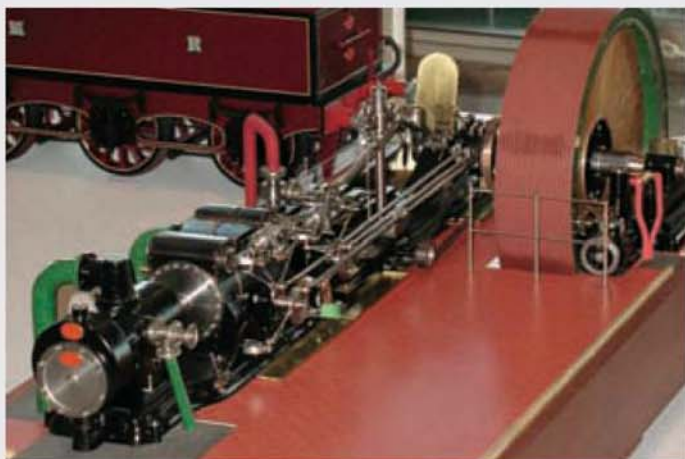
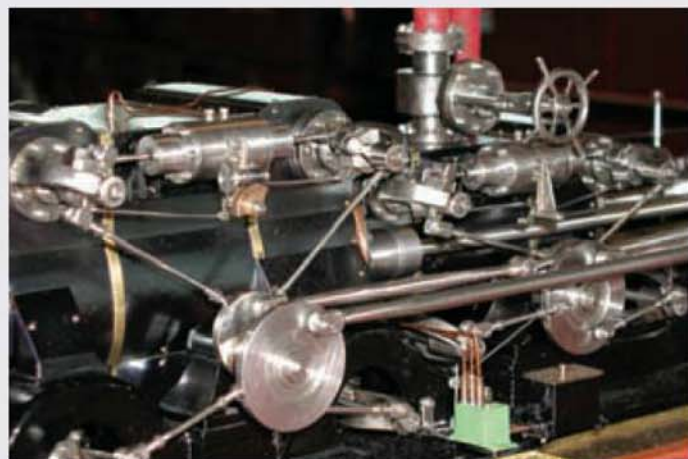


Figure 1: A single wrist plate operating all four valves. In this engine the dash pots are in the floor connected to the valves via two vertical rods. E: eccentric, A: rocking lever which caters for the angular thrust of the eccentric, B: eccentric rod, D: wrist plate.



The Author's magnificent 1:16 scale Pollitt & Wigzell Corliss valve steam engine at the 71st Model Engineer Exhibition at Sandown.



Detail view of the the valve gear actuation mechanism on the model Pollitt & Wigzell engine showing some of the features referred to in the text.

J. Barstow and E. J. Nightingale, doing business under the name of Corliss, Nightingale & Co. In 1848 the first Corliss engine was built.

There were two important features on the engine, namely the wrist plate (fig 1, item D) and the application of the governor. Instead of operating the throttle valve, the governor controlled the tripping point of the two steam slide valves which were closed by means of a spring. Since it controlled the engine speed to very fine limits for the first time, it was this trip gear that made the Corliss engine so popular. It also used less steam, therefore saving money due to its greater efficiency (a 30% saving of coal). This first engine also had two exhaust valves, but they were situated next to the inlet valves. Between 1849 and 1853 Corliss started to use the cylindrical rotating valve which became the 'Corliss valve'. The third engine, built in 1857, was horizontal and had the two exhaust valves at the bottom. Here now were all the features of the Corliss valve engine that became so popular. In 1856, the Corliss Steam Engine Co. was incorporated in Providence, Rhode Island.

The engine was not only popular in America, but, due to its economy it was used worldwide. Among other applications, it was employed in the spinning of cotton due to its ability to run at a constant speed without 'hunting', which would have broken the thread. 'Hunting' is the term used to describe small variations in speed around a given speed. There are a number of reasons for

this. An over-sensitive governor can cause hunting as it over-corrects. When the engine slows, the governor senses this and allows more steam into the cylinder. The engine speeds up, and the governor corrects by cutting down the steam. There were several ways of controlling this, one of which was by fitting a dashpot to the governor. This took the form of an oil-filled cylinder with the piston connected to the governor linkage. An adjustable valve was fitted to control the oil flow from one side of the piston to the other. This provided a fine control over the governor thereby damping down the over-corrections or fluctuations of the governor. Due to the restrictions of the trip gear, the speed of the Corliss engine rarely went above about 90rpm.

Figure 2 shows the general layout of the cylinder with the two inlet valves at the top and the exhaust valves at the bottom. There are two major advantages to this arrangement. The first is that the hot incoming steam is kept well away from the cooler outgoing exhaust steam, and the second is that the cylinder is self-draining through the exhaust valves. It must be remembered that the steam cools as it does work by pushing the piston along the cylinder, and the last thing that is required is for the incoming steam to be cooled down before any energy is removed from it. Both the slide and piston valves suffer from this, as the exhaust steam cools not only the passages into the cylinder, but the valve as well.

The trip gear, which is under the control of the

governor, is only used on the inlet valves, leaving the exhaust valves to be fully opened and closed under the control of the eccentric. Some makers elected to have two eccentrics, one to operate the inlet valves and the other for the exhaust valves, in which case there would be two wrist plates. This arrangement gives a wider range of cut-off.

Figure 3 is a cross-section through one end of the cylinder and shows the valve connected to the spindle via a drive dog. At its back is a stuffing box, with the outer end supported by a bearing. Apart from being able to control the steam going into the cylinder to a greater degree, the outgoing cooler steam is well away from the incoming hot steam, leading to greater thermal efficiency. Also, with having the exhaust valves at the bottom, the cylinder is self-draining. Even so manually operated drains are always fitted, which are always left open when starting the engine. If water gets into the cylinder in any quantity, hydraulic lock can easily blow off a cylinder end cover, or worse. After the engine had been warmed through and before opening the stop valve, it was good practice to turn the engine over using the barring engine. Among other things, this ensured that everything was free and that there was no water in the cylinders to cause trouble. It also warned workers in the mill that the engine was about to start; in those days guards on machinery were virtually non-existent.

The trip gear is possibly the most interesting part of the engine. Each manufacturer often had

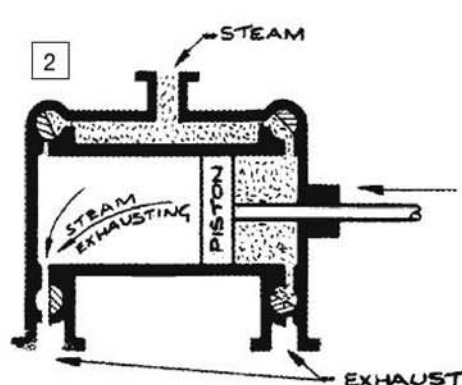


Figure 2: Section through a cylinder and valves showing the principle of the Corliss valve cylinder. Figure 2a shows a simple Corliss valve. Figure 2b shows the fully developed Corliss valve.

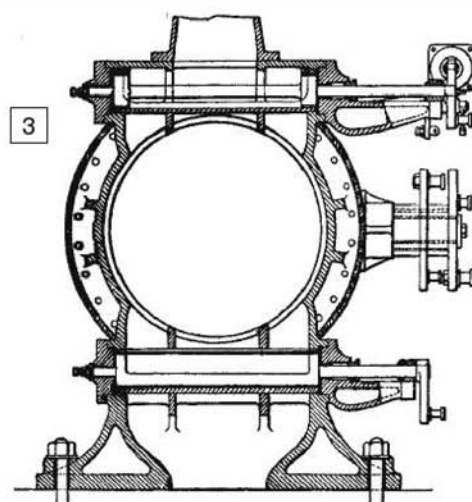
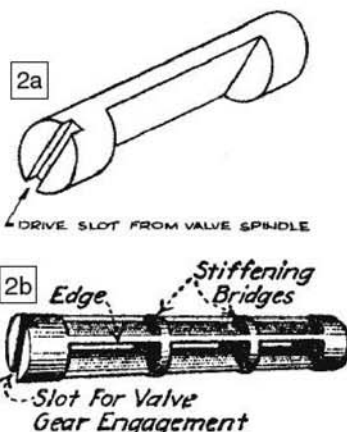


Figure 3: Section through a cylinder, valves and valve bonnets showing operating levers and two wrist plates, one to operate the inlet valves and the other the exhaust valves.

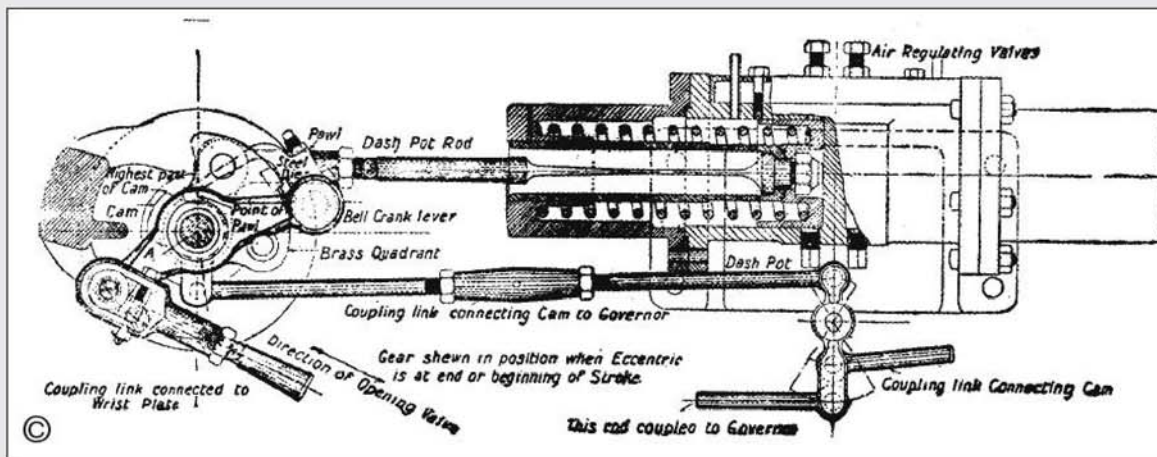


Figure 4:
The Pollit & Wigzell trip gear and dash pot patented in 1893 No. 16,393. The spring snaps the valve shut with the piston being cushioned by air at the end of its stroke. The thinning of the rods is to cater for the slight movement up and down due to the valve arm moving through an arc.

their own design which was of course patented, though there were one or two that were used by a number of makers. Covered by patent No. 2462 taken out in 1880, Dobson's design was one of them. The purpose of this gear was to time the closing of the valve relative to the amount of steam required in the cylinder to do the work. There are two dies, one connected to the valve, the other being controlled by the governor. As the eccentric, via rods, wrist plate and dies open the valve, steam is admitted into the cylinder.

At the point of cut off, depending on engine load, the dies are disengaged by the action of the governor and the valve snapped shut by the dashpot spring. The dashpot (fig 4) consists of a cylinder and piston, the rod of which is connected to the Corliss valve. At the back of the piston is a spring which snaps the valve shut when the latch on the trip gear releases. To prevent the piston from hammering into the cylinder end, an air cushion is used, controlled by an adjustable screw on the outside of the cylinder.

Watching an engine on starting up, the valves are fully opened, and as the engine speed increases, the governor slowly takes over and the cut off gets earlier so admitting less steam into the cylinder. This action can still be seen on Corliss engines in preservation today. However, since very little steam is required to run a preserved engine on no load, and more often than not below its normal working speed, the valves are only slightly opened once the engine has settled down to its running speed. In other words the valve is closed almost as soon as it has opened.

There are two engines that do not have the conventional layout of the valves and both are open to the public. The first, at Trencherfield Mill in Wigan was built by J. & E. Wood in 1907. It is a four-cylinder, triple expansion engine and has all the four valves at the bottom of the cylinders. Wood's company made a number of engines with this valve arrangement, which were successful.

The second engine is at Wiseman Street Mill, Weaver's Triangle in Burnley (call the Burnley Tourist Information Centre on 01282-664421 for opening times). Built circa 1880 by W. & J. Yates, this has all the valves at the top of the cylinder which is a rather a strange arrangement as it virtually nullifies all the advantages of the Corliss layout. This is because by putting the exhaust valves at the top of the cylinder they do not act as drains. Also, as they are next to the inlet valves, the cold outgoing steam cools the hot incoming steam. In the case of this engine, it was because the high-pressure cylinder was a replacement and

there was no room to put the valves at the bottom.

So far, we have assumed that all Corliss valve engines are horizontal, this of course is not so. Engines were made with vertical cylinders; they had the advantage of requiring smaller engine

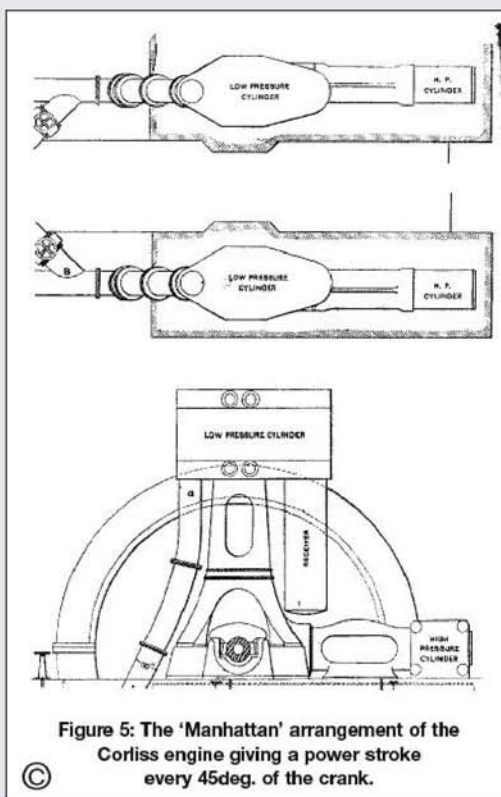


Figure 5: The 'Manhattan' arrangement of the Corliss engine giving a power stroke every 45deg. of the crank.

houses and foundations. When installed in water works, the pumps could be fitted beneath with the pump rods operated from a crank at either end, or more usually from rods connected directly to the cross head.

Corliss valves were not only used in the engines that drove the cotton and woollen industries. They were also used in the mines for winding, driving the ventilation fans, generating electricity and many other uses. One of the more notable installations was in Manhattan, New York, built to supply current for the elevated railway of the city. E. P. Allis & Co built eight engines for this project in 1901. They had two horizontal 44in. dia. high pressure cylinders, two vertical 88in. dia. low pressure cylinders and a 60in. stroke running at 75 revolutions per minute. They produced 8,000hp on 150psi, with an overload of 12,000 horsepower. Each engine weighed 643 tons and between each pair of cylinders was a generator. This arrangement gave a power stroke every 45 degrees. This meant that a lighter flywheel could be used, which in this case was the rotating parts of the generator weighing 150 tons. Though the design was not new, this engine arrangement has been known ever since as a 'Manhattan' (fig 5). One English firm that built a few was Saxons of Manchester, but only singles, i.e. having one high pressure and one low-pressure cylinder on one side of the flywheel.

In his book *Locomotives* written in the 1930s, A. M. Bell refers to a number of outside cylinder express locomotives on French railways using Corliss valves and Gooch gear (fig 6). In this case, due to the speed, no trip gear was or could be used. It was applied to the locomotives between 1890-1895. "The gear in spite of its complications, appears to have been very successful in steam economy, and probably would have been more largely used had not compounding become so popular on French railways."

There are over 30 preserved sites in the UK that have engines fitted with Corliss valves, having a good variety of trip gear and all doing the same job, tripping the valves when sufficient steam has been let into the cylinder to do the work required.

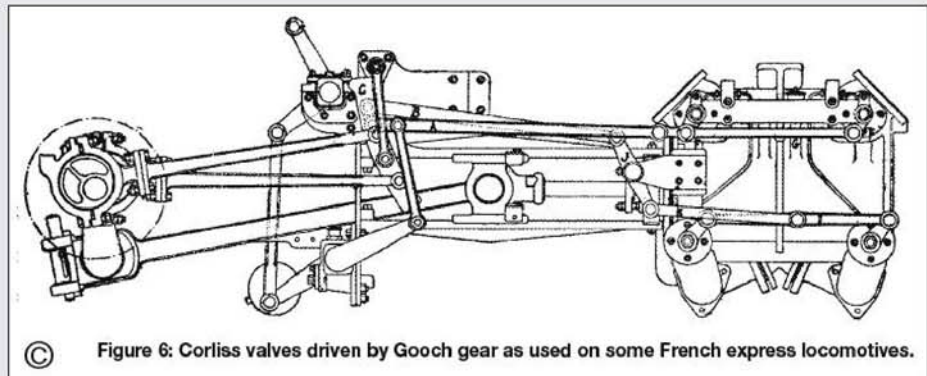
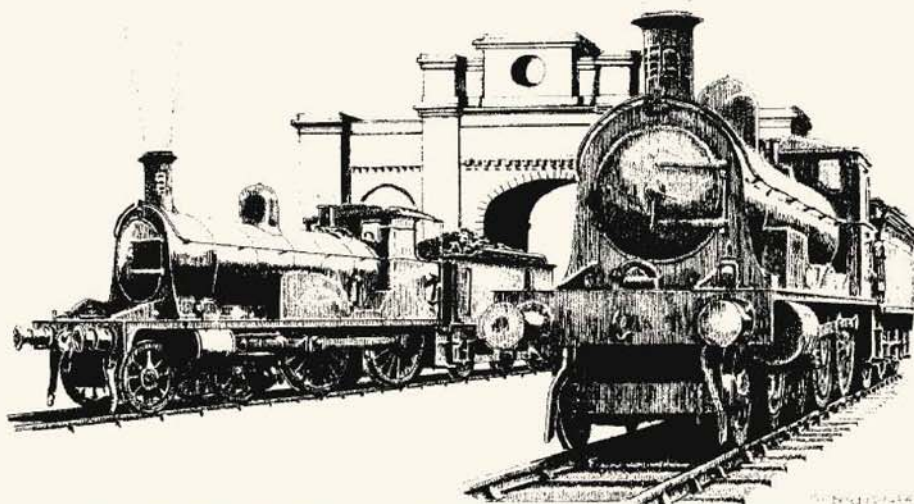


Figure 6: Corliss valves driven by Gooch gear as used on some French express locomotives.

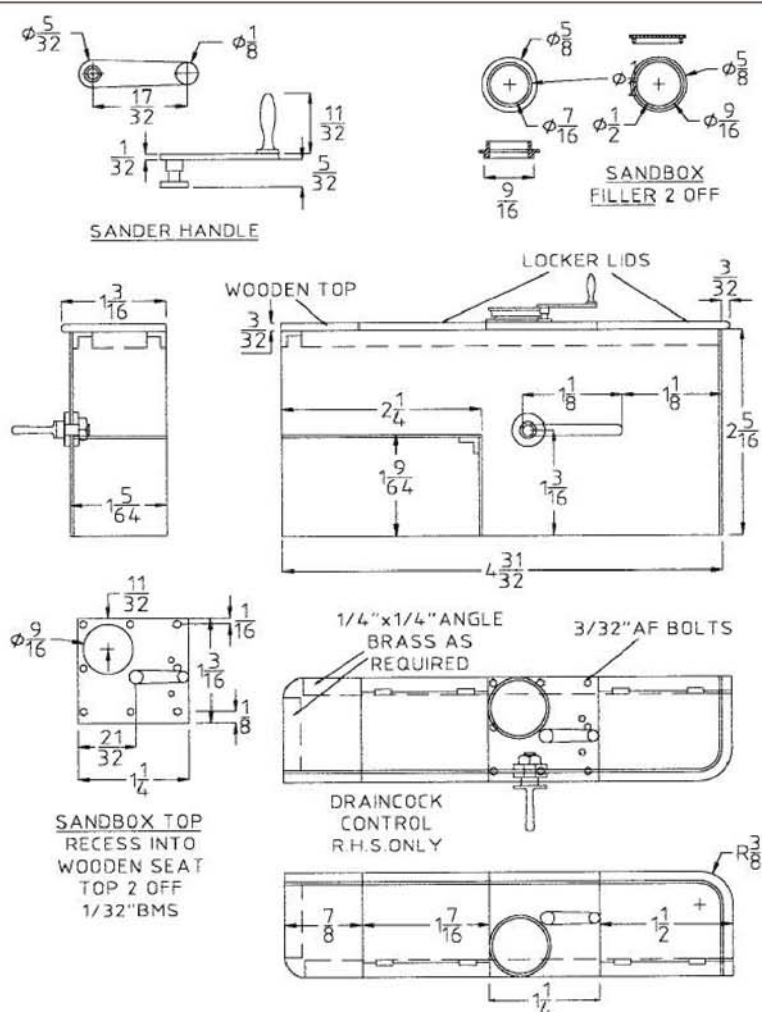
makes the draincocks, associated linkages, and the tinplate cleading for the 'Big Goods' locomotive.

The draincocks on our two locomotives are of somewhat distinctive shape as a swift perusal of the accompanying drawings and photograph will show. The bodies represent quite a challenge to the would-be fabricator, I have therefore decided on a lost wax casting. These small items will have the tapers ready cast into them, the only requirement will be to run a tapered reamer into the hole to clean-up any minor irregularities that may occur. We are still, however, faced with the problem of fitting a tapered plug exactly into a tapered hole, whether or not we use a casting or a fabrication. The solution is as old as steam engines themselves.

The first requirement is to turn a series of small tapers, at an included angle of approximately 6deg. in a piece of 1/4in. dia. free cutting stainless steel (make sure that it is leaded), cutting them off



THE HIGHLAND RAILWAY JONES 'BIG GOODS' & LOCH 4-4-0 LOCOMOTIVES IN 5in. GAUGE



BIG GOODS CAB SEATS

2 OFF 1/32" TIN PLATE OR BRASS

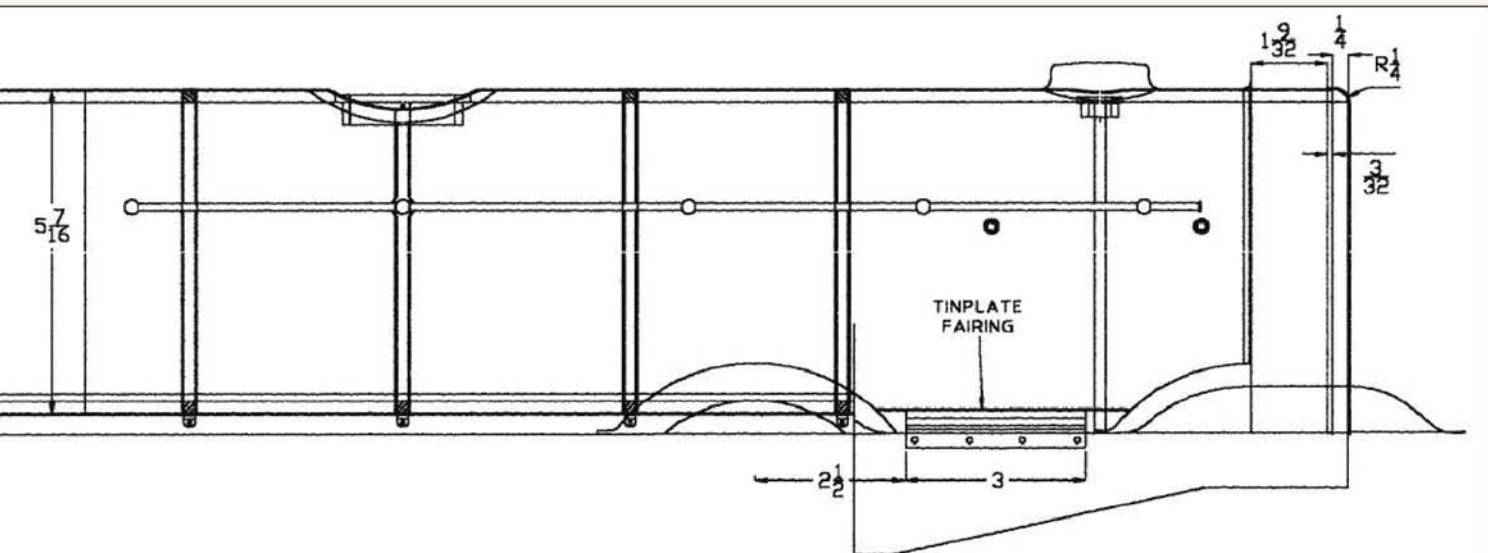
at a suitable length to form the complete plug, squares, screwed thread and all. I say 'approximately' because an exact figure would be almost impossible to achieve, so we must think the problem away. We therefore set the angle of the toolpost at 3deg. before turning the tapers and lock it up so as to be sure not to alter it while turning up some reamer blanks in silver-steel. Make certain that your tool is at *exactly* the rod centre. If said tool is even slightly high or low, you won't turn a true taper, so take great pains.

Fashion the cutting edge as per the drawing, and harden. Deryck puts a cutting tip on his reamers so that they can be used as a drill; see the second drawing for details. The dual action reamer cuts out the operation of having to drill a pilot hole first, if you choose to fabricate your own bodies.

When you have some satisfactory taper plugs, insert one in the reamed, tapered cross hole and drill down No. 50, right through the body, taper plug and all. Remove the plug and clean up. Tap the bottom $\frac{3}{32}$ in. of the hole 10BA and cross drill right through $\frac{1}{32}$ in. dia. The hole is sealed with a small 10BA hexagon headed screw, which is about $\frac{1}{8}$ in. A/F. Don't forget to make lots of taper plugs (a lifetime supply is not too much) because as soon as the word gets around, all your pals will be using them as well.

Draincock linkages

The linkages on our two locomotives differ, in that because of the much longer operating rod on the 'Big Goods' the rod has to be split with the addition of an intermediate rocker, so as to give a slight change of direction near to the centre. The rocker also splits the long rod, which has the effect of increasing its rigidity. The mighty Stanier 'Princesses' used a similar device in the centre of their overlong radius rods. This feature constitutes the main difference between the linkages of the two locomotives. Most of the gadgets are the same, even to the slides mounted in the right-hand cab seats. The rectangular control rods are of $\frac{3}{16} \times 1\frac{1}{8}$ in. section, which may



ODS BOILER CLEADING 22g TINPLATE

seem to be a little on the flimsy side, but as they only have to move four small plug cocks they should be amply strong, especially as they are supported by running inside the firebox cleading.

The two drawings will give all the detail required, but don't mix them up or you'll find that you'll have to build the other engine as well to suit the alternative linkage.

Expansion joint fairing

The firebox when heated can move to a considerable degree, as it is made of copper, a metal with a high coefficient of expansion. We therefore have to include a sliding joint in the holding down arrangements at the rear end of the boiler. The usual double angle is used and on the Highland Railway this rather unsightly feature

was covered by a fairing as can be seen on the photograph. I have used a small piece of bent tinplate and am holding it on with two small hexagon headed screws. I have found on my own 'Loch', that as the boiler has come out a little on the wide side, (this is a good fault, provided that the boiler still fits easily between the frames), I have had to pack out the lower angle a little, I used two small pieces of aluminium alloy of appropriate size.

'Big Goods' boiler cleading

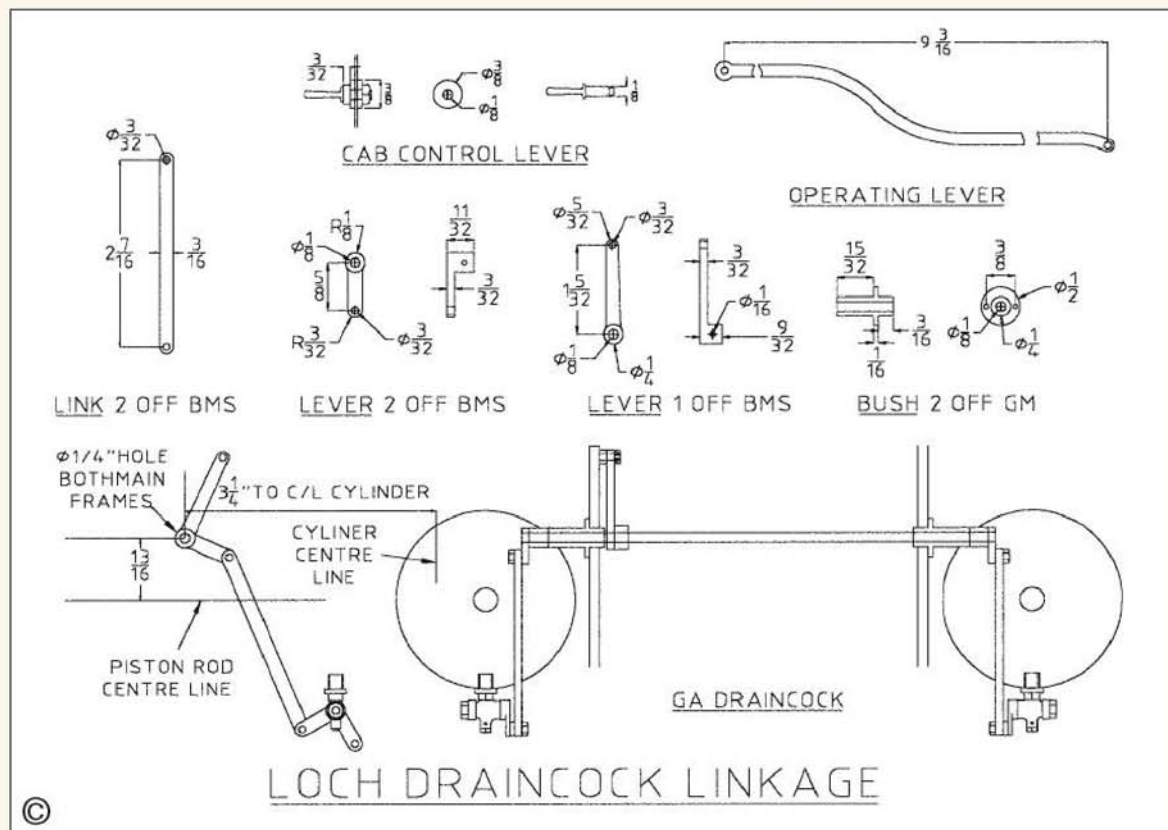
I have included a drawing of the 'Big Goods' boiler cleading, (pronounced 'cladding') because although it is rather similar to that of the 'Loch', it is so much bigger that it needs separate treatment. You'll use a lot more tinplate, that's

all. A number of readers have spoken to me about my attraction to tinplate, I can assure you that it's purely platonic and that I like the strength, malleability, and cheapness of this material. Available in large, mirror finished sheets, it cuts and bends easily and as it is ready tinned, solders wonderfully well. Paint sticks to it far better than it does to brass, affording an excellent protection against corrosion.

My North Eastern, Worsdell Atlantic was largely built of tinplate by Wilfred Tucker, and I can say that there is no rust present in the superstructure at all. I am in fact going to build the 'Loch' tender of this material. Over the last half a century or so many scores of motorcycles have passed through my hands for rebuilding. Most of them had steel petrol tanks, which

suffered to a greater or lesser extent from rusting on the inside. The answer was to clean out the rust, usually with the aid of an energetic friend and a handful of nuts and bolts, rattled around the innards for half an hour or so. The inside of the tank was then coated with 'Petseal', a thin two pack resin, which was sloshed around the inside of the tank until it was fully wetted, and allowed to dry overnight. End of problem. I have never heard of a tank so treated that gave the slightest trouble ever after. You can buy 'Petseal' from your friendly local neighbourhood classic motorcycle agent but don't try to use it to houstrain your pet greyhound!

●To be continued.



ROAD STEAM

Martin Wallis

deals with the clacks, safety valves and feedwater heater.

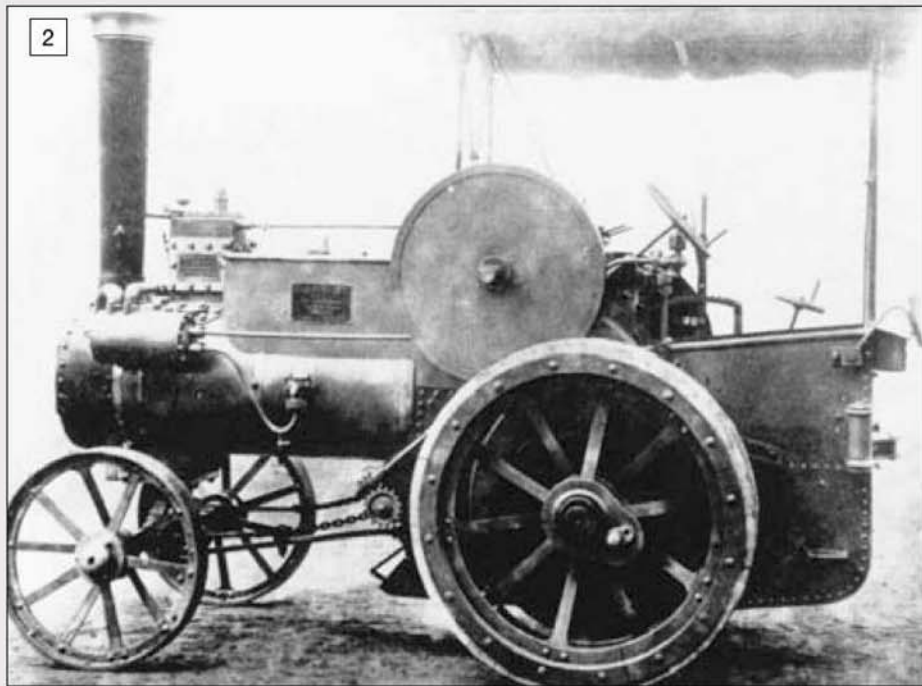
●Part XL continued from page 95
(M.E. 4200, 25 July 2003)

With the feed pump now complete we can turn to the boiler clacks and the safety valves. The style of boiler clacks seem universal. Savages seem to have used the same pattern on all of their *Little Samsons*. By contrast, the safety valve arrangement, and what goes on generally on top of the cylinder, is far from standard. Inspection of photo 1 shows an engine with all sorts of bits and pieces fixed to the top of the cylinder, including a Pickering governor. By contrast the engine in photo 2 has next to nothing, apparently just the safety valves; I assume it had two safety valves and that they were mounted transversely.

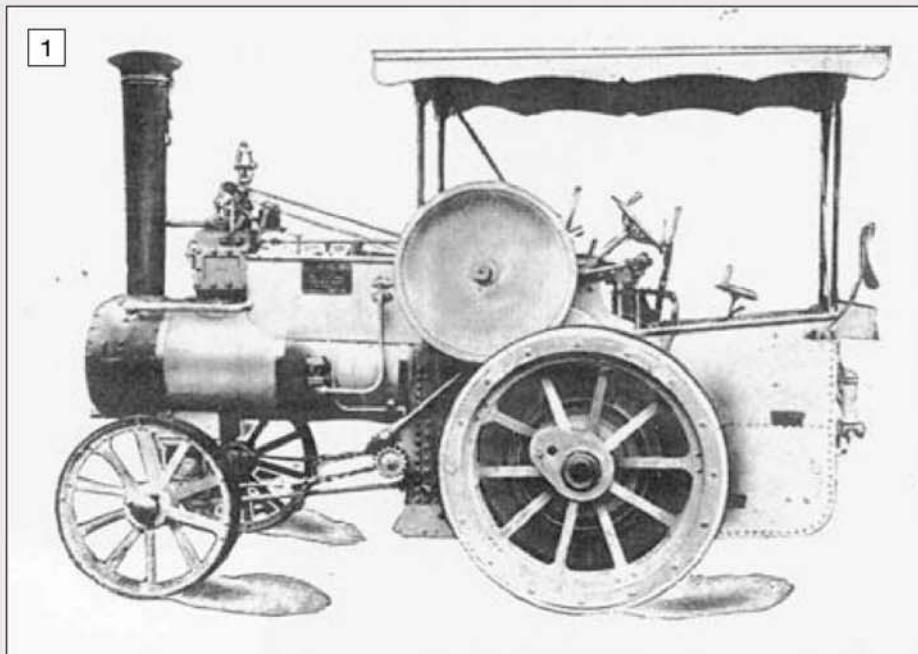
None of the *Little Samsons* appear to have been fitted with a whistle. I guess this could be another precaution against frightening horses, the others being the plated flywheel, motion covers and the safety valves exhausting into the chimney. I imagine modellers will choose to fit one, the top of the cylinder being its natural home.

Boiler clacks

Our *Little Samson* has two clacks, one on each side of the boiler. The left-hand clack is for the feed pump; most of the works photos of the engine show this clack with a cast elbow. The right-hand clack is for the injector and has no elbow. An elbow complete with a cored hole through it is supplied as part of the set of lost wax castings.



By way of a contrast with photo 1 above, this *Little Samson* has just a displacement lubricator and safety valves on the cylinder. The safety valve exhausts into the chimney.



Little Samson with a governor, mechanical and displacement lubricators, and set of safety valves bolted to the top of the cylinder. Note that the bottom tender step has been removed leaving just two studs and nuts, observe also the odd dished steering wheel and the works plate displaced to the top of the motion cover.

SAVAGE'S LITTLE SAMSON in 3in, 4in. (and other) Scales

Since *Little Samson* was not designed for agricultural duties, for example driving a threshing drum, 'WPW' the Savage draughtsman and presumed designer, had a free hand to fit a clack on the flywheel side of the boiler. Engines used for belt work tended not to have a clack on

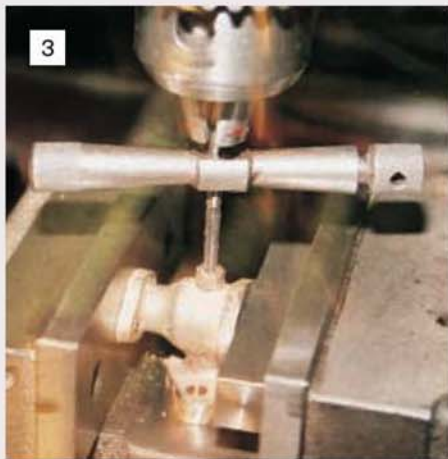
the left-hand side as the belt might catch on it. The engine manufacturer John Fowler resolved this problem by fitting a special 'squashed-up' clack valve high up on the boiler side, almost under the motion plate. Locating the clack on the side of the firebox is not a good idea for the feed pump delivery, as cold water hitting one of the hottest parts of the boiler would create all sorts of unfortunate internal stresses. An injector clack on the side of the firebox is, however, acceptable as the water delivered is already fairly hot.

After working through the feed pump assembly, machining the clacks will be very straightforward. Remember to drill the holes using the milling machine rather than the drilling machine, as the work may be much better held and indexing (using the dials or digital readout to move the work exact amounts) is available. Castings are supplied for the clack box cover plates so the metal tarnishes to the same colour.

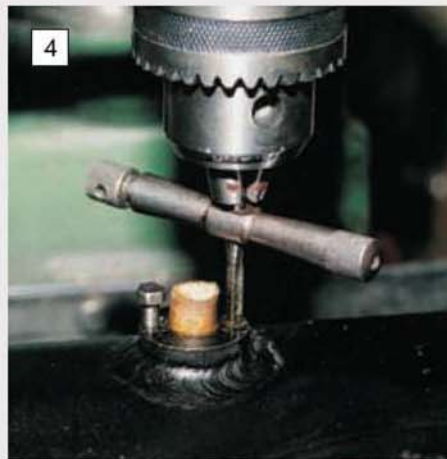
Clack box mountings

A word of explanation may be helpful here. While the fitting has oval flanges, readers will note that the boss on the side of the boiler is round. I know commercial boiler makers are not at all keen on making oval pads for a boiler, it is very much quicker to saw off a piece of round bar and face and drill it in the lathe. In consequence, a round boss was specified. Aesthetically, a large round boss sticking through the lagging would be unsatisfactory so its size has been minimised to that which will still just accommodate the two studs which hold the fittings. Ideally, the round boss will be hidden behind the lagging and out of sight.

There is, of course, nothing to stop a builder



With the work securely held in a vice, a drill chuck is used in the milling machine to guide the tap on for boiler clack.



A similar set up guarantees that the tapped thread is parallel to the axis of the hole in the boiler. The cork prevents swarf entering the boiler.



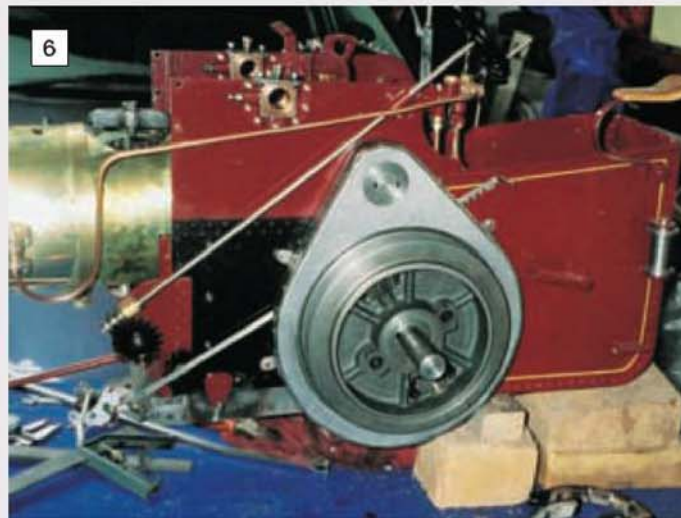
The completed clack mounted on the boiler. Note that the sides of the oval overlap the boiler pad to make a neat, close-scale fitting.

supplying the boilermaker in advance with ready cut out oval section pads, filed and drilled, ready to be welded to the boiler. Such builders would still be wise to check with the boiler manufacturer in advance.

The pipework to feed the clacks may be deduced from the various Savage works photographs, or devised by the builder. Predictably, Savage had several arrangements and I doubt if a builder working to his own whims will be far from one or other of the original Savage pictures.

Safety valves

The safety valves are a prominent and important item. I have seen several pictures of full size engines which have been reduced to their component parts due to failure of the safety valve(s). One such incident took place not more than a mile from where I am preparing these words. The engine was a steam plough and the boiler barrel fractured completely, the explosion leaving the cylinder and smoke box end several engine lengths away from the rest of it. The unfortunate machine was built in 1879 and blew up in 1904. A new boiler, number 10305, was then supplied to which all the salvaged parts were duly fitted. As with all accidents, it was the result of an accumulation of a series of unfortunate circumstances, but my



The pipework runs from the feed pump to the clack. By rights there ought to be a cast elbow on the clack this side. Since the pipe is hard to clean behind the flywheel it is to be painted black. (Photos 3-6: S. Nipper)

understanding is that the main cause was a lack of boiler wash outs in a notoriously hard water area, resulting in the failure of both safety valves and pressure gauge.

Lost wax castings are again supplied for the safety valve base and cover plate, the steam exhausting through a horizontal pipe into the chimney. In this design, winding down the top plug, which threads into the safety valve chimney, sets the compression in the springs.

There is nothing to stop commercial safety valves from being threaded into the casting, but it is vital that they will pass as much steam as those detailed in the drawing. This may be judged by the size of the ball. Part of the steam test, which is part of the mandatory testing requirements, is the operation of the safety valves. The safety valves must clear all the steam a boiler can make; no more than 10% over normal working pressure is allowed under these circumstances. Once the safety valves have been made and fitted the exhaust pipe may now be marked out and the hole in the chimney drilled for it.

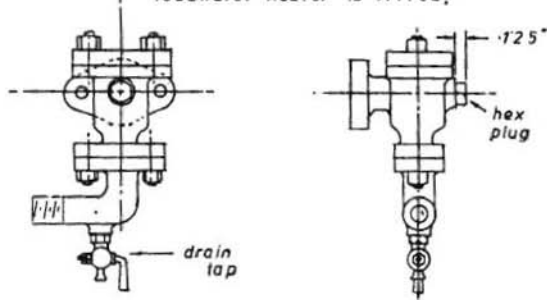
Safety first

The mention of safety valve testing reminds me of a previous boiler inspector. I have had experience of three commercial boiler inspectors over the last ten years. The first, now retired, was a splendid chap who, on the face of it, seemed quite relaxed but always did a very thorough visual inspection. His speciality was the safety valves check. A really big fire would be made up for maximum steam raising, with the blower hard on and the ashpan fully open. When the poor old girl was blowing fit to burst (an unfortunate choice of words — sorry!) he would shout over the noise and declare everything to be fine. He

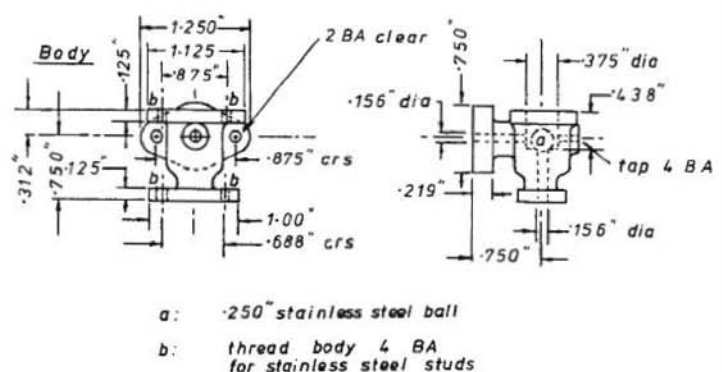
Little Samson INJECTOR AND FEED PUMP CLACK BOXES FIRST ANGLE PROJECTION

2 of each Lost wax castings

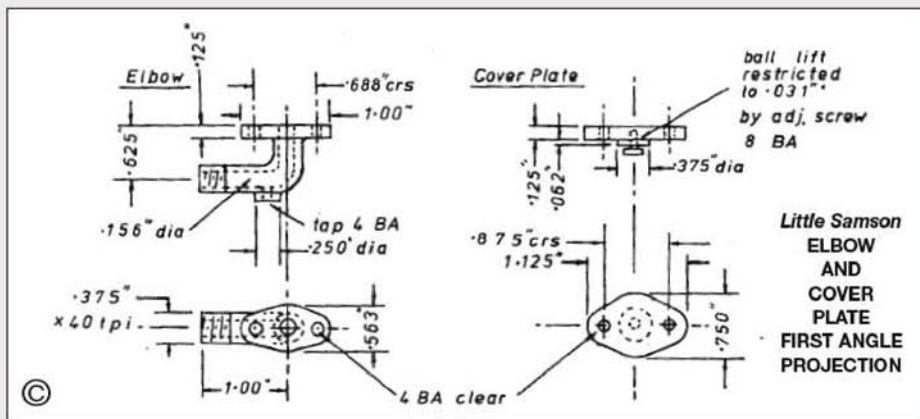
NOTE No elbow needed on feed pump clack box if external feedwater heater is fitted.



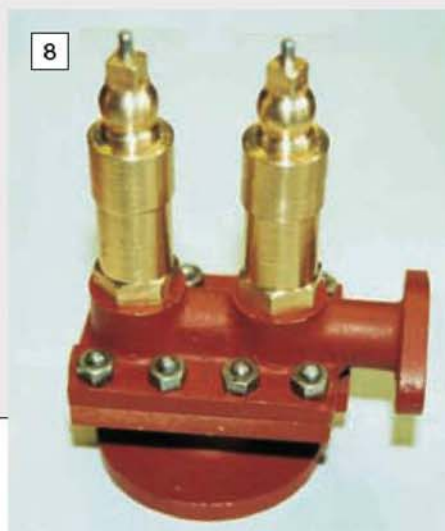
Little Samson CLACK VALVES FIRST ANGLE PROJECTION



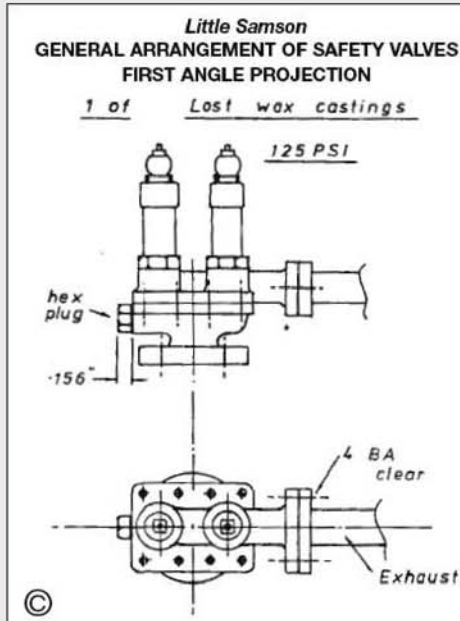
- a: .250\" stainless steel ball
- b: thread body 4 BA for stainless steel studs



John Freeborne's two machined 4in. scale safety valve castings.



John's completed and very elegant safety valve chimneys.



would then hop in his car and depart leaving me with the unfortunate beast. An engine blowing off hard is not friendly, the noise and steam being most unpleasant, and every effort would be made to lose the excess steam as quickly as possible.

The second boiler inspector was equally a pleasant enough chap whose father owned two full size engines; sadly he only lasted with me for two years as the company he worked for put their prices up more than I thought was reasonable. His speciality was getting water into the boiler, asking how reliable the injector and pump were, and what was the injector's minimum working pressure.

My present boiler inspector is certainly the most thorough to date, he is very helpful and knowledgeable. For example, on his first visit all the boiler plates were ultrasonically tested, not as a consequence of corrosion (visually it could be seen

An assembly not yet described is the blast pipe and blower. The exhaust steam from the cylinder is directed up the chimney via the blast pipe, which not only gets rid of the steam but also keeps the fire bright. It follows that the harder the engine is working the more exhaust there will be and in consequence, the more air is pulled through the fire, and the hotter it burns.

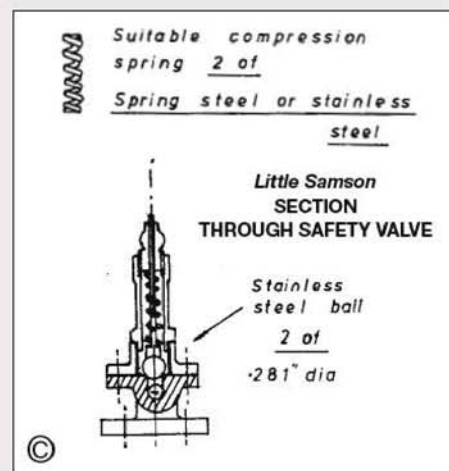
The size given for the blast nozzle is a guide; if too much steam is raised it might usefully be opened out a fraction. Conversely, if the engine could benefit from more steam the size might be reduced. The beginner should, however, be warned that the size of the blast nozzle is but one factor, the other is the quality of the coal. Poor coal is poor coal and fiddling with the blasting arrangements might help but will not resolve the problem.

The blower draws steam from a drilling in the

Blast pipe and blower



Disassembled chimneys, springs and balls. (Photo 7-9: P. Kybert)

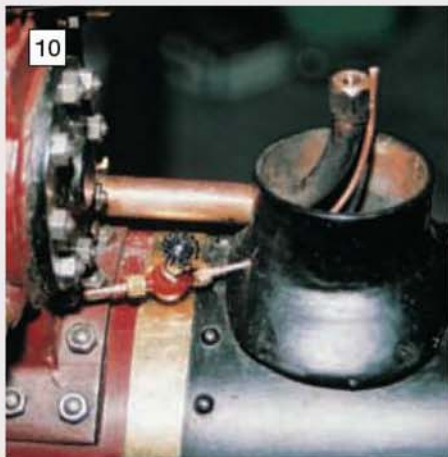


base of the cylinder and, via an in-line globe valve to throttle it, directs a jet of steam up the chimney. This increases the amount of air drawn through the fire. The works pictures show that *Little Samson* was not fitted with such a thing, but I would guess an owner or two might have retro-fitted one. On smaller scale models, where the fire is of quite a small volume, a blower may be useful — just what is needed to wake up a dull fire after a tea break. Following modelling conventions, I fitted a blower to my 6in. Fowler but in practice have never used it (apart from my first boiler inspector's safety valve checks). There has never been the need. Indeed the Fowler's brass blower pipe in the chimney has now largely rotted away so it couldn't be used.

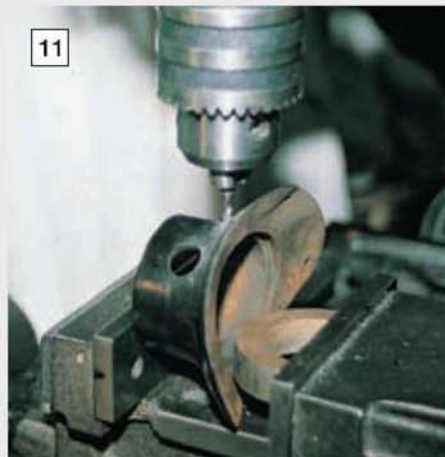
Stan's 3in. scale blower arrangement in photo 10 shows what is required and how it is fitted.

Feed water heater

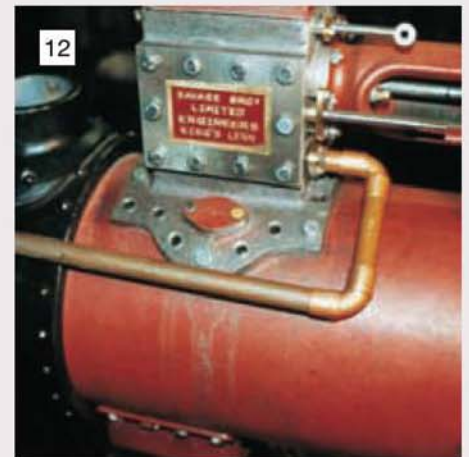
Photographs 1 and 2 show two *Little Samsons* both fitted with a feed water heater, the first inside the motion covers and the second outside. As yet, a model *Little Samson* has not been fitted with a feed water heater, the interest being so low that I have not prepared a drawing for one. However, a copy of the Savage works drawing is available and could be scaled accordingly. The feed water heater is simply a heat exchanger, the



Stan's 3in. Little Samson blast pipe arrangement is simple but effective. (Photos 10-11: S. Nipper)



Drilling the hole for the blower in the chimney base which is an awkward casting to hold.



Alternative route for the exhaust, temporarily made up from off-the-shelf plumbing fittings, prior to fitting a feed water heater. (Photo: P. Kybert)

full size one having fourteen $\frac{3}{4}$ in. dia. tubes running the length of the casting. The feed water travels through these tubes and the exhaust steam is fed around them.

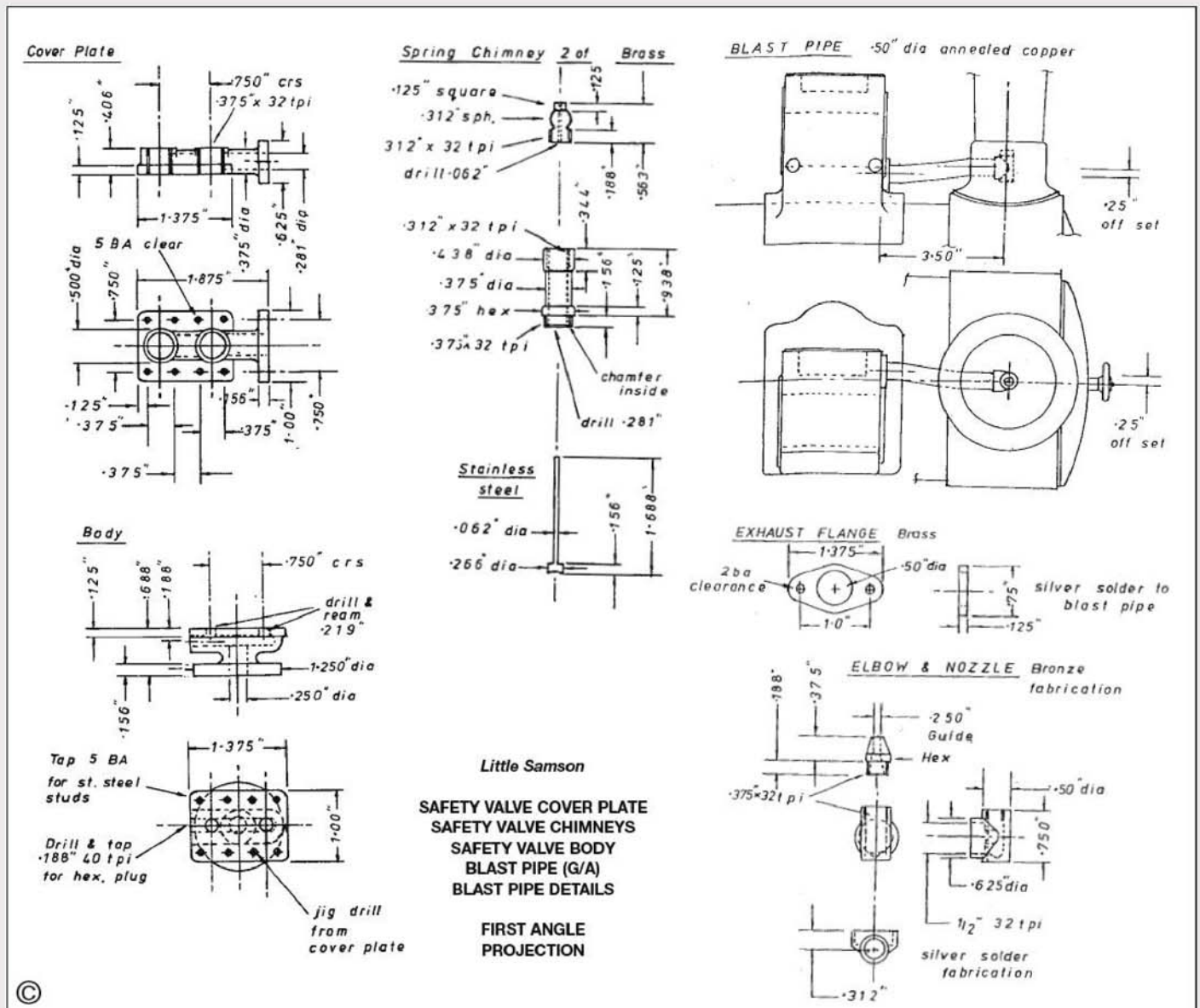
It might be noted that in photo 1, where the feed water heater is hidden behind the motion plate, steam exhausts from the back face of the cylinder casting and into the feed water heater. It then travels along a pipe which runs beneath the

valve chest cover into the smokebox. In photo 2 the exhaust steam leaves the cylinder at the front, the usual place, entering and leaving the feed water heater at the top. The exhaust still enters the smoke box tube rather than the chimney base. The position of the backwards facing exhaust flange is shown in photo 12, the cylinder casting having an oval pad both front and back giving the builder a free choice.

Supplier

A Little Samson catalogue listing drawings, copies of Works Drawings, materials and castings in 3in. and 4in. scales is available for £2.50 post paid (UK) from Little Samson Models, 38 Wheatsheaf Way, Linton Cambridge CB1 6XD. Visit <http://homepages.tesco.net/~little.samson>

●To be continued.



KEITH'S COLUMN

Keith Wilson

continues with the design and construction of the tender brake gear, and has some helpful advice concerning injector operation.

●Part XLIII continued from page (M.E. 4200, 25 July 2003)

We come to the tender brakegear. As I have mentioned before, properly compensated brakes add enormously to the stopping power which may not often be fully needed, but when it is...! The drawing of this system makes the operation clear, my apologies for the mixed-up style of dimensioning; as so often happens I only noticed it after the drawings had been posted.

Reading from left to right (just to be original!) we see the weighshaft, adjusters, knuckles, compensating levers 1, pull rods, links, crossbeam 1, compensating levers 2, crossbeam 2, and it should be fairly obvious from here on.

The weighshaft itself is easy to make, the levers mounted on it are somewhat hefty and need to be firmly mounted on the shaft. Incidentally, the middle-size lever is shewn differently on the general drawing to that on the weighshaft drawing, the reason (excuse!) being that they were done several years apart. The straight one is correct. I shew two $\frac{3}{16}$ in. dia. taper pins for the main lever; do not try fewer. I shewed the details of the smaller (22in.) cylinder when describing the (30in.) engine brake cylinder. The upward pull of the piston with full emergency application is of the order of 35lbf., which doesn't look much on paper but I for one would keep my fingers well clear.

At the pivot point, the torque is about 120in.lbf. (quite a twist), which the pins have to bear. Even with two of them, in double shear, this is quite enough to work them loose in time, so fix them

with Loctite 601, then poke the holes through, ream and pin, bashing the pins in firmly. This loading gives a pull on the linkage of something like 160lbf., fingers even more carefully kept clear. Any questions?

The first compensating levers divide this load into two unequal parts: 60lbf. and 100lbf. in round figures — still plenty. The 60lbf. goes onto the first crossbeam, giving roughly 60lbf. per wheel (remember that the hanging levers themselves roughly double the force). The 100lbf. goes along the first pull rods and is divided into two lots of 60lbf. by the second compensating levers. There's no need for me to explain further, but our original maximum force of 34lbf. has been transformed into something like 60lbf. per wheel; no wonder the brakes stop the train!

In practice of course, the full braking force is

not likely to be applied, but the figures I have given should provide some food for thought.

Some years ago, one of my Kings was under test on a fast track when the pipe 'twixt engine and tender pulled off; result all brakes very firmly applied. The driver's nose did not quite go down the chimmuck, but by exhaust soot 'twas close!

The precise shape of the weighshaft levers does not of course affect the brake power, but they look nice. In view of the stresses produced in cutting forks, life is made easier by making one short lever and the main long lever as one unit 'back-to-back', parting them later. The same applies to the short lever and the 'middle-sized' one. When applying brakes, the shaft itself will flex somewhat, but this is normal and should produce no lasting ill effects. The bearings at the ends have been shewn recently but are included here for completeness.

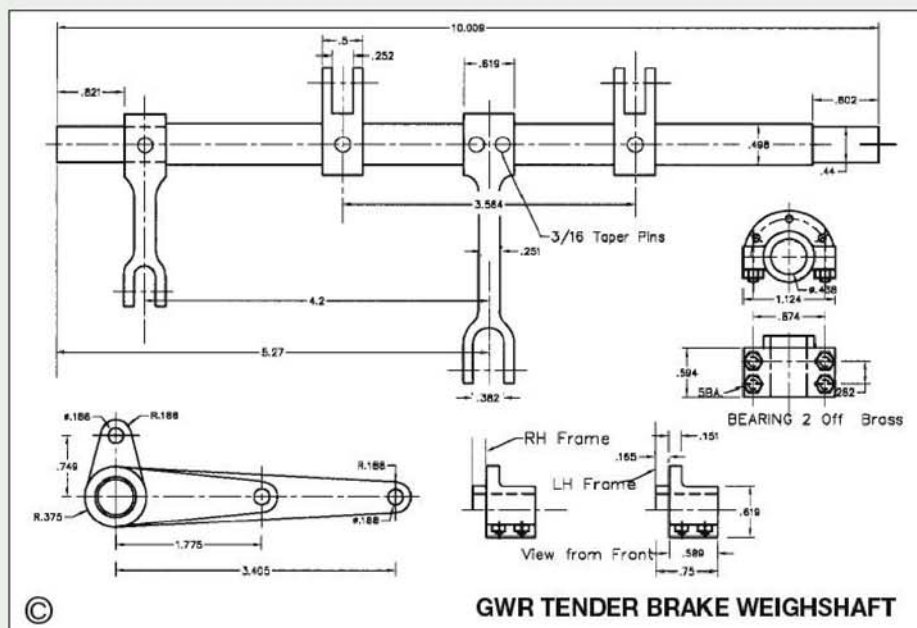
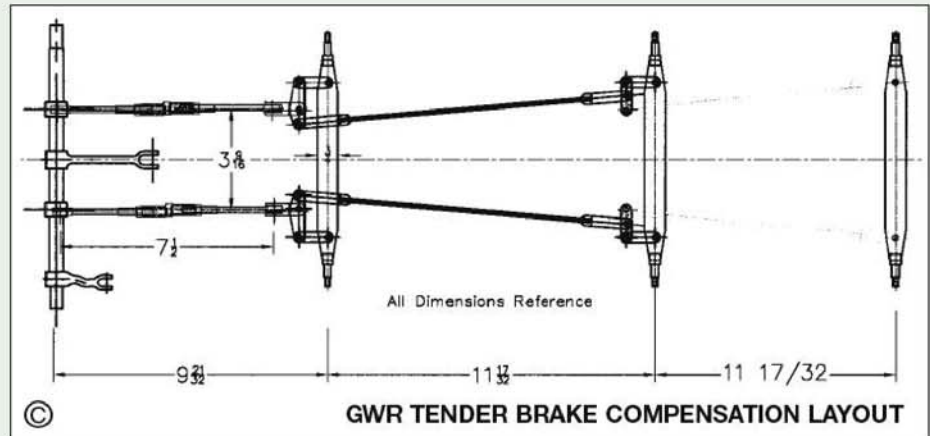
Something that has caused me some minor annoyance years ago was the instruction to look up past notes instead of providing the information again. Admittedly this was somewhat understandable in view of the lack of computers in those days requiring separate drawings and typings each time; not so nowadays, a few presses of buttons deals with the matter. However, while this has few terrors for regular steady readers who stack all their copies, for newcomers and those without back issues to hand — 'nuff sed?

Oh hang it!

The brake hanging levers themselves can be tricky for several reasons. If in cast iron, they are brittle and a derailment can snap them off like the proverbial rotten carrot. If of lost-wax cast steel, this doesn't matter so much because steel is much tougher, but they are then more costly. So if you are not too bothered about 'scale', the older system of fabricating from mild steel is worthy of some consideration. At only 1mm thick, they look darned flimsy, but when assembled you will find them hard to bend without recourse to a hammer, etc. I shew 1mm because that is a standard laser-

SAINT CHRISTOPHER

A GWR LOCOMOTIVE for 7 $\frac{1}{4}$ in. gauge





Underside rear end view of the Author's 3000 gallon tender showing the brake gear. Note the 'train pipe' about halfway up the picture. One of the rear brake lever brackets can be seen above this immediately to the left of the crossbeam.



Rear compensating levers, rearmost pullrods, and train pipe again, this time where it crosses from right to left side and is clipped to the frames front and middle. Its rear end is supported from the standpipe, not yet fitted.

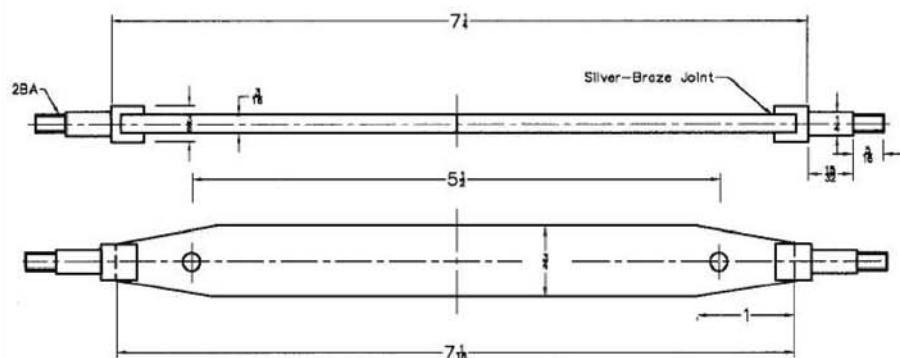


Front compensating levers, pullrods, crossbeam and links. The trainpipe is now to be seen at the bottom of the picture. The rear end of the adjustable rod is just visible, together with the knuckle joint to the compensating lever.

cutting size, but 1.5mm is about twice as strong and costs no more in practical terms; the choice, as ever, is yours.

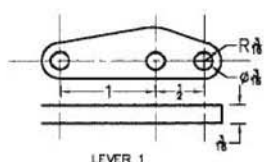
The little links are easy to make, but preferably matched in pairs, so laser-cutting rears its head. Compensating levers need not match so closely and can be dealt with by filing or Linishing.

Strictly speaking, the long pull-rods should be long forgings, but have a quarter-twist in them at each end so that the greatest bending strength was in the vertical plane, thus sagging would be less. A lot less, as anyone knowing something about bending stresses will appreciate. For the sake of illustration, and assuming that the rods were 4 x 1in., the strength ratio is just 4 times. (The likelihood of them bending under their own



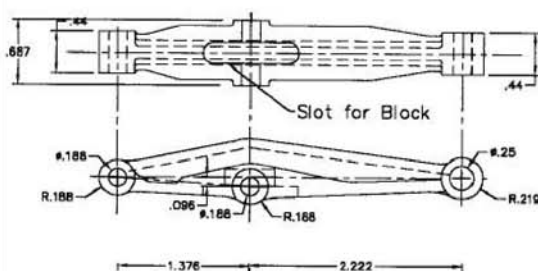
COMPENSATION LEVERS
2 Off Each Mild Steel

BREAK CROSSBEAMS
3 Off, Mild Steel

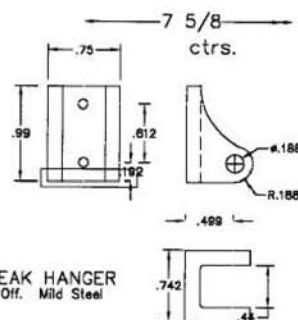


LEVER 1

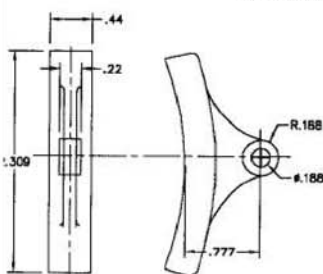
LEVER 2



BREAK LEVERS
6 Off Lost Wax

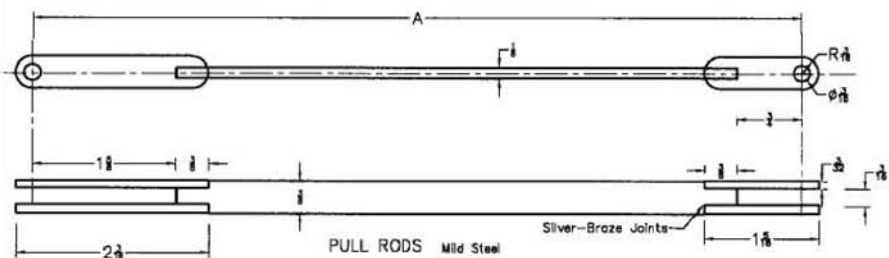


BREAK HANGER
6 Off, Mild Steel

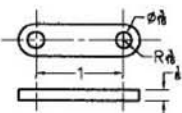


BREAK BLOCK
6 Off Lost Wax

Wilson's Words of Wisdom:
The only laws that man can break
are those which man has made.



PULL RODS Mild Steel
2 Off A = 11-19/32
2 Off A = 12-9/16



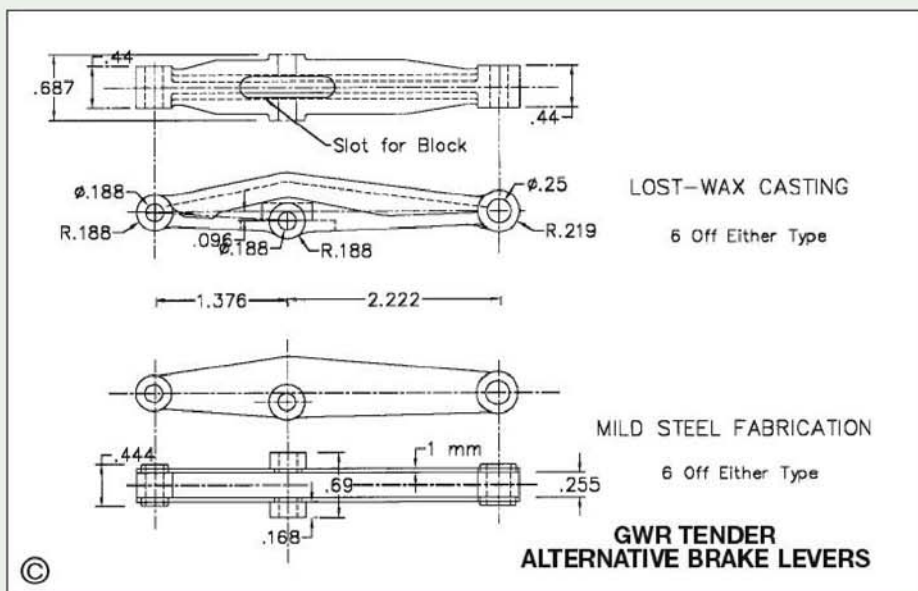
COMPENSATING LINKS
4 Pairs Off, Mild Steel

GWR TENDER
BRAKE DETAILS

weight is clearly 1/16.) The way I shew is therefore probably easier; anyone wishing to make them 'to scale' is welcome so to do, which reminds me of one of the shortest jokes on record,

to wit: Masochist: "Beat me." Sadist: "No!" I know of a shorter one, but it is quite unsuitable for these pages, as you might well expect.

From the fact that the wheelbase is divided



equally, it looks at first that the four pull-rods should all be equal, but don't be fooled — 'some are more equal than others'(?)

Brake crossbeams present a problem for they would be carved from $\frac{3}{4} \times \frac{3}{8}$ in. material, and for good measure the ends should not be parallel to the main beam, but at 3deg., to match the wheel tyre profile. This, however, would mean that the brake hanger brackets would need to be in three pairs, also at 3 degrees. I for one am too lazy to do this, so I slope off the blocks to same amount, normal backlash then is sufficient to cope. In similar vein, the ends of the crossbeams can be made separately as lathe jobs, silver-brazing them in place on the ends of plain rectangular crossbeams. It saves time, and few will notice.

To assemble this gear, $\frac{3}{16}$ in. dia. steel pins are required; these can be of plain $\frac{3}{16}$ in. mild steel with a couple of circlips. An easier way is to start with $\frac{1}{4}$ in. dia. mild steel, reducing it to $\frac{3}{16}$ in. dia. for the appropriate length, and using just one circlip. Fitted from above with the $\frac{1}{4}$ in. heads on top, should the circlip fail or fall (unlikely) the pins remain in place and the brakes are sound.

For the actual brake blocks, the easiest way that I know is to get a flame-profiled ring which can be mounted on a faceplate and machined. Castings are of course possible, but are not so easy to machine or to clean up. Although I have not shewn it in the drawings, the edge of the block where it bears against the wheel should be rounded off. There's no point in wearing away the wheel flanges!

Despite the system being self-adjusting, the long pull-rods seem to need modification in order for the compensation to work. I have never discovered why. Usually, the deep forks at the front end of each need to be deeper, despite careful dimensioning. Also, the long rods seem to be too long overall, but it is only by about $\frac{1}{8}$ in. You will discover much on assembly.

A vacuum release valve will be required for occasions when the brakes must be released when the tender is disconnected from the engine. You will discover for yourself that when applied, brakes will tend to leak off, however when you want them off they will stick on like nobody's business! That's Sod's Law for you.

By pure luck, at time of writing I am assembling a couple of 3000 gallon tenders. These are not exactly the same as our 4000 or 3500 gallon tenders, but the same brake gear applies. Pictures are therefore available and accompany this article. I hope they help.

Squirts

One or two little matters concerning injectors have recently come to my attention, so a few words. I have written in the past about giving injectors all the steam and water they want and letting them decide for themselves (after all they know best) how much to take of each. Off hand, I cannot recall any notes on pipe sizes; these are most important.

The theory of fluid flow through a pipe of given size has so many variable parameters that I don't think it is possible to calculate much that is useful; however some simple empirical facts have been amassed over the years.

From many samples, I reckon that a fluid rate of flow of the steam/water combination in the delivery pipe should be about 7ft./sec. maximum. The calculation is an easy one, thus:

1 pint of water occupies 34.66in.³ A flow rate of 1pint/minute is therefore equivalent to 34.66in.³/min. or 0.588in.³/sec., so a 3-pint squirt delivers 1.733in.³/sec.

From my many years of experience, $\frac{1}{4}$ in. O/D 20swg pipes (wall thickness = 0.036in.) having an internal cross-sectional area of 0.025in.² are satisfactory.

Combining these two figures gives a fluid flow rate of $1.733/0.025 = 69.32$ in./sec which is a little less than 6ft./sec.

It is quite possible that smaller pipes might suffice, but examination of Swindon locomotive drawings shews a scale diameter of just under 2in., but it is not too reliable to use a micro-filmed drawing for dimensions of this magnitude, for the very thickness of the lines has an effect.

When I built the 10 $\frac{1}{4}$ in. 47xx pair, I used $\frac{3}{8}$ in. pipes. I believe that I put in two 5 pint injectors on each. This is well within the flow-rates calculated above. They worked, and still do.

So, to summarise, any reasonable-sized $\frac{7}{16}$ in. gauge locomotives will be happy with $\frac{1}{4}$ in. pipes for delivery for injectors of up to 3.5 pints per minute capacity.

Use the same size pipe for water feed to the injector, for the volume of water before and after the injector does not appreciably change. There is of course less pressure to shove water through the feed pipe, so in theory it should be bigger; however I find that same size pipes are okay. The same applies to steam supply. Don't forget that an injector sucks water through itself, it is not all gravity flow, for an injector with overflow passages just over four times diameter of the



Side view of middle horns, axlebox, wheel, brake levers, springs, springbolts and shock absorbers.



Opposite side, similar details. Note colouring, for these tenders will be coupled behind Bulldogs, and 'Indian red' is used for frames in their prime. Inside I have used 'light buff'.

steam cone will lift water from a few feet below the itself. It will also re-start by itself, and can obviously be started steam-on-first. It is instructive to feed the water into an injector with a transparent pipe from a bucket on the floor, watching the water creep fairly quickly up the pipe until it hits the injector, when it will kick and snort for a fraction of a second as the squirt 'picks up' at which moment the flow of water into the injector will markedly increase.

A rough guide for water and steam control valves sizes: a $\frac{3}{32}$ in. dia. steam valve is happy up to at least $3\frac{1}{2}$ in. pints. Water valve minimum when fully open: $\frac{3}{16}$ in. diameter. This steam valve size may seem rather small in view of the $\frac{1}{4}$ in. O/D pipe, well it is fluid friction in a pipe this long that causes the trouble, a small constriction like the valve does not seem to produce any observable hindrance.

In general, injectors are the best possible method of filling boilers. You can put water in when you need it, often 'topping-up' when stationary. With a mechanical pump, the locomotive must be running to feed; often if steaming is a bit down (due to a low fire, for example) this is just when water is not required unless water level is dangerously low.

In any pipe or flow-system (electric wires included) you will never get a flow without a pressure difference betwixt the ends. Thus we can never 'send water through a pipe' or 'a current through a wire'; we can only create this pressure difference and leave the rest to natural law.

For those who like to consult/insult me (praise or condemn) by e-mail, please note that my address is now keithgwrloco@blucyonder.co.uk. If you received no reply after 6 July, you now know why.

●To be continued.

Peter Spenlove-Spenlove

continues his account of how he made a new worm for a music box.

●Part II continued from page 102
(M.E. 4200, 25 July 2003)

Having spent a couple of hours or more on setting up I was eventually able to start the job of milling the worm. It took just five or six minutes! With the milling cutter rotating and the clasp nut disengaged, the cutter was advanced and the cross-slide and saddle rack traverse used to bring the cutter to just touch the worm blank. The cross-slide index was zeroed and the motor drive to the cutter stopped. I moved the drive to the cutter and the cutter itself $\frac{1}{8}$ in. or so to the left of the start of the thread and engaged the clasp nuts.

By turning the countershaft by hand, the cutter was then advanced to the starting point. This allowed all the various gears, leadscrew and other parts to absorb the backlash, which is always present however carefully we try to eliminate it. Just before switching on the cutter motor, I pulled on the 'overhead' belt to check that the cutter was still just touching the blank.

The cutter spindle was switched on and the cutter fed in to its required full depth. Some good quality cutting fluid was applied to the work. Next, the countershaft was gently turned by hand again. I took it easy and soon found that a thread began to form. I continued until the cutter reached the other (inner) end and retracted the cutter using the cross-slide handle.

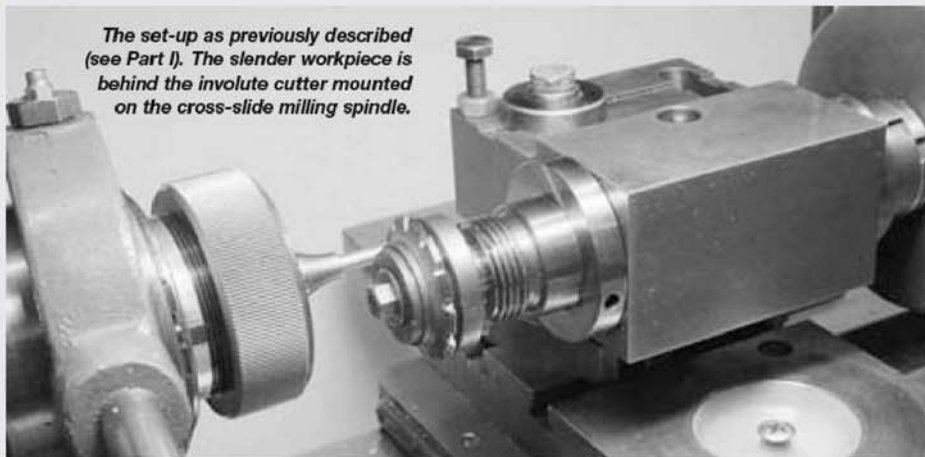
I milled my worm in this single pass. If you need to make a similar worm and find that one pass leaves the finish rough, provided the core diameter in your worm is adequate so that the work is still rigid, there is no reason why a second, or even a third pass should not be made. However, rather than disengaging the clasp nut, consider winding the whole lot backwards by hand on the countershaft to return to the start point $\frac{1}{8}$ in. to the right of the start, as before, to absorb the backlash.

When you feed the cutter in again, make sure it is in the right place before taking a finishing cut. Two things can go wrong to cause the cutter to cut only one or other worm groove flank. A change gear stud or quadrant which was not tightly positioned might shift. Also a bit of swarf could get in the clasp nut although it was, we hope, clean and not disengaged.

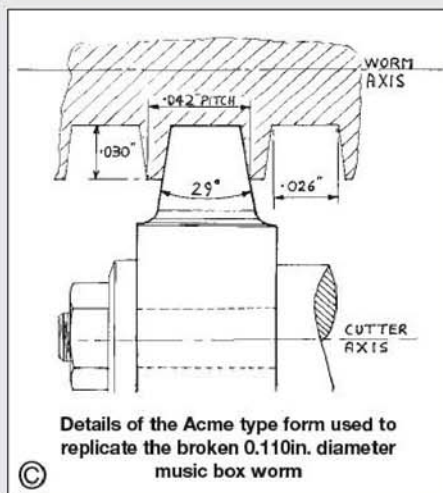
For the music box worm, now fully formed on the end of a 13in. length of silver-steel, some finish turning was needed. A bit of heat from a small gas flame softened the adhesive to allow me to remove the $\frac{1}{2}$ in. dia. mild steel bush. The surplus glue was cleaned off and the worm put in the $\frac{3}{16}$ in. collet in the lathe for turning the $\frac{2}{2}$ in. length to 0.100in. diameter. This was completed in stages of about $\frac{1}{4}$ in. at a time by advancing the $\frac{3}{16}$ in. diameter from the collet to turn close to the collet.

My collet system uses the Myford lever collet chuck which makes it quick and easy to advance

The set-up as previously described (see Part I). The slender workpiece is behind the involute cutter mounted on the cross-slide milling spindle.



MILLING A WORM



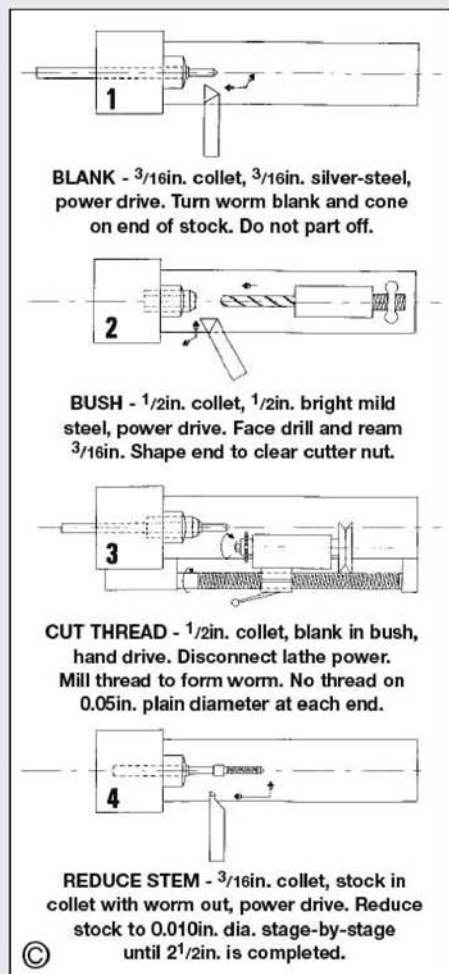
the rod $\frac{1}{4}$ in. at a time. The Myford screwed nose collet is just as good but a bit slower. Having read this far, newcomers will realise that this method of milling a thread or worm can be modified. For instance, by altering the attitude of the milling head, end or slot mills could be used. The cutter shape can be altered so as to produce other than a square thread form, i.e. an Acme or special profile.

A grinding spindle could also be used in place of the milling head. The grinding wheel can be 'dressed' i.e. shaped while rotating, by the careful use of a diamond dressing tool, or carborundum dressing stick to do so. Neither of these are particularly costly items and are readily available at tool merchants.

Grinding in the lathe

The spindle fitted to the milling head used for this job was ground in the Myford. It was turned, hardened and then finish ground, including the thread, to replicate the Myford standard nose.

A conventional square edged disc wheel was used to grind all the diameters and faces. Then a thin disc wheel was mounted and shaped to Whitworth form to finish the Myford thread. It is a very messy process and grinding debris and Myford lathes definitely do not mix! Greased aluminium cooking foil on the slideways will collect the grit. But even so, the lathe and surrounding area should be cleaned very carefully. If possible, everything should be covered but not with paper or cotton cloth. Sparks could start a smouldering patch, which might burst into flames when your back is turned. A copious flow of



water-soluble grinding fluid is usually employed on industrial grinding machines. Most of us do not have this facility, so great care is needed.

The work piece should be on the move while grinding. A wheel that is cutting generates heat in the work surface. If the work stops, the heat generated is localised at the point of the cut, and will cause local expansion and possible burning. On cooling, a hollow may be found at that point thus spoiling a precision job. It is unlikely that at home, we will have the ideal wheel for the material being ground, but we can, and must, re-dress the wheel we are using before it becomes glazed or loaded. This will help to keep the work cool and give a good and reasonably accurate finish.

REPLICA 18th CENTURY HOODED WALL CLOCK

Ian Beilby

concludes his description of this unusual and attractive timepiece with notes on the remaining few components and some thoughts concerning the prototype.

●Part VI continued from page 86
(M.E. 4200, 25 July 2003)

The dimensions of the calendar wheel, which should be cut from 1mm sheet brass, are shown in fig 27. Since at this diameter the teeth are fairly coarse, I cut my wheel all the way around with a $\frac{1}{4}$ in. 60deg. fly cutter to a depth of $\frac{3}{16}$ in., and then filed the backs of the teeth by hand. However, the engraver who does my horological work will provide calendar wheels to given dimensions, and as the wheel has to be sent to them for engraving, it can be as quick to let them make the wheel as well.

The only other remaining items to make for the dial are the calendar post, the collet for the calendar wheel, and a jumper spring for the calendar wheel. The dimensions of the collet for the calendar wheel are shown in **fig 28**. The $\frac{1}{4}$ in. dimension is machined first, reversed in the chuck for machining the wheel seating, and at the same setting the collet is drilled $\frac{1}{8}$ in. from the tailstock. The calendar wheel is then placed on the

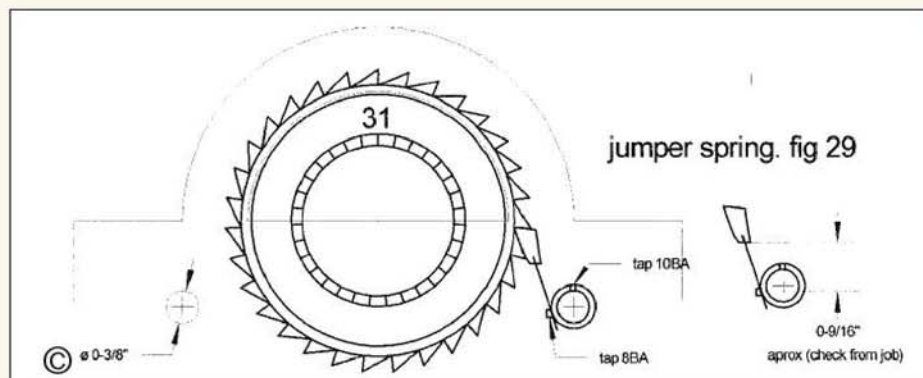
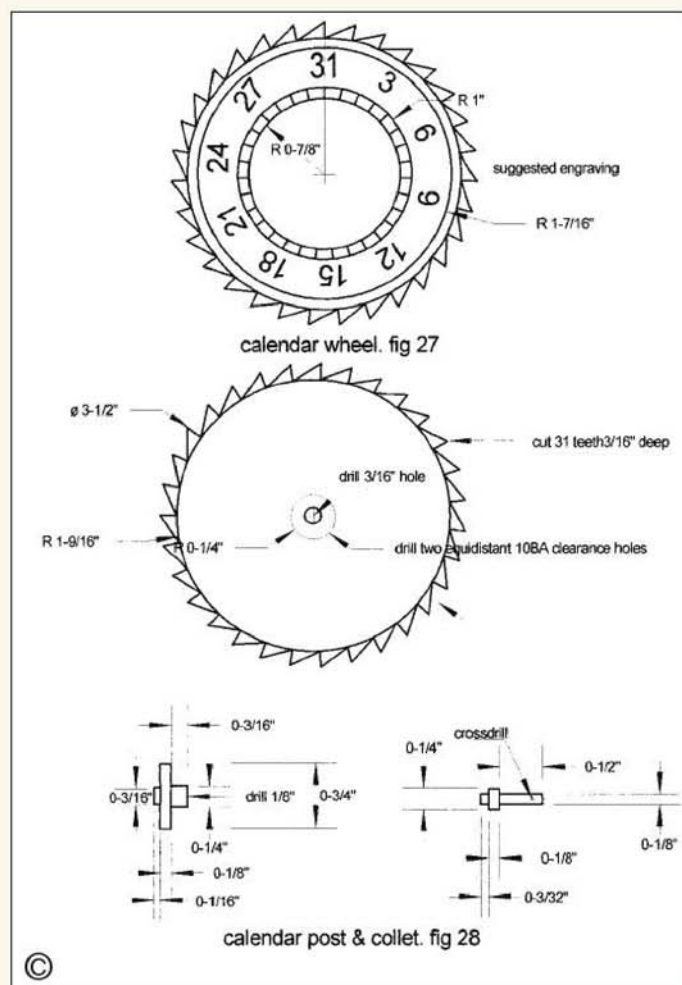
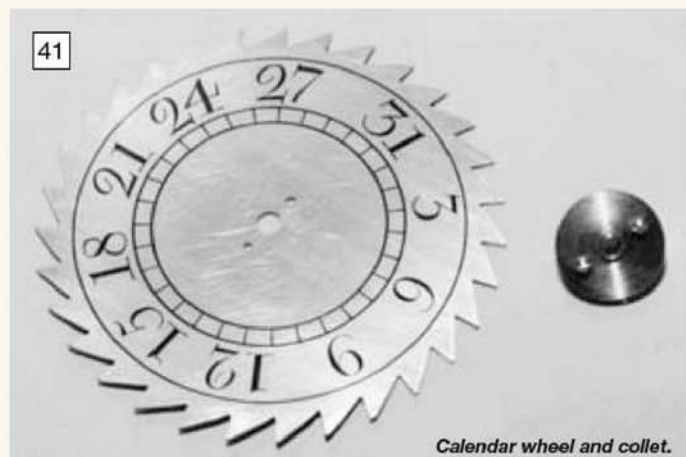
collet and used as a jig to drill the two holes for the 10BA screws which secure the wheel to the collet. The wheel and collet can be seen in **photo 41**.

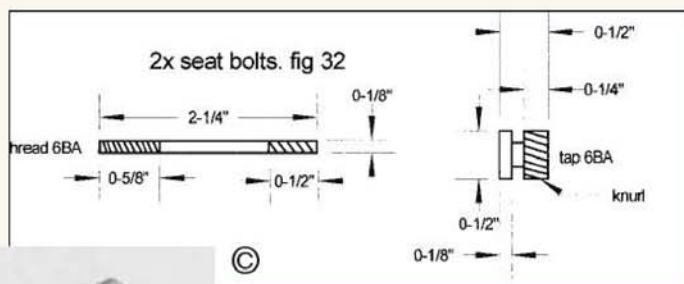
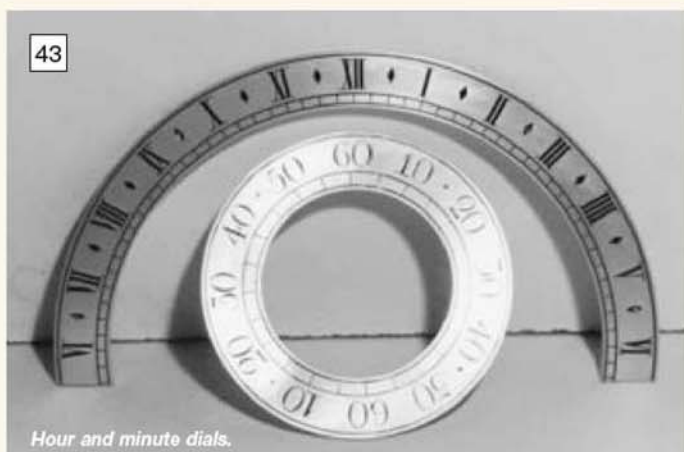
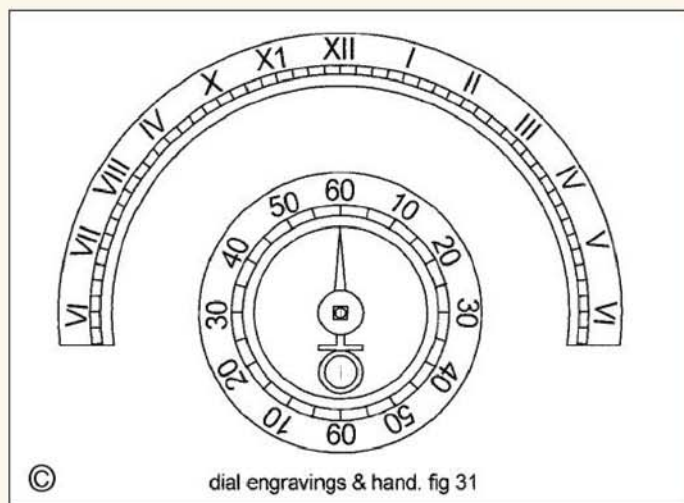
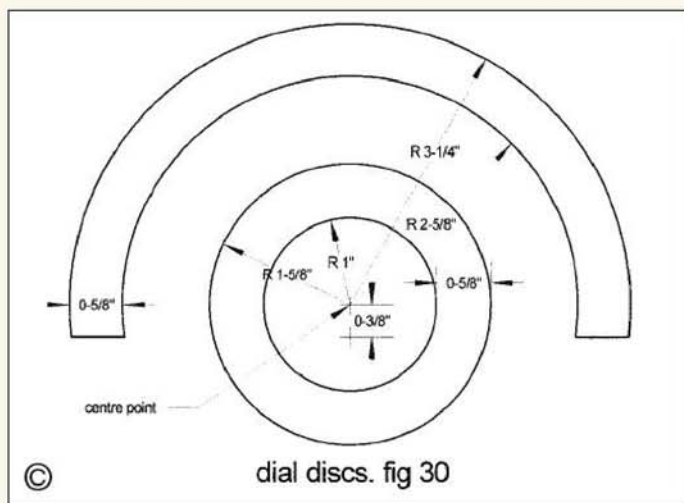
Before making the calendar post, which is also dimensioned in fig 28, a check should be made with the sun/moon disc in place, to ensure that the $\frac{1}{8} \times \frac{1}{4}$ in. dimension is sufficient to allow the calendar wheel to clear the back of the sun/moon disc. If not, the $\frac{1}{8}$ in. dimension should be increased to give sufficient clearance between the back of the disc and the wheel.

The calendar post can be made from $\frac{1}{4}$ in. steel, the $\frac{1}{2} \times \frac{1}{8}$ in. dimension is turned first, reversed in the chuck and then the $\frac{3}{32} \times \frac{1}{8}$ in. dimension turned. The position of a cross-hole for a securing pin is determined by fitting the calendar wheel onto the post; the hole is then drilled and the post riveted into the back of the dial. As before, the hole for the post should be opened from the rear of the dial using a tapered broach so as to obtain a good tight fit prior to riveting.

Jumper spring

Figure 29 and photo 42 show the jumper spring, which is simply fabricated from brass and a length of spring steel screwed onto an adjustable collar located on a dial pillar. I make no apology for not providing the more traditional form of spring made from shaped brass strip and riveted to the back of the dial. I consider this type of spring far better, both in action and because it provides some small degree of adjustment, other than by bending the actual spring. Furthermore,





since the calendar wheel operates behind the sun/moon disc, the wheel runs some $\frac{3}{16}$ in. behind the dial. Fixing the jumper spring to the dial pillar gives more allowance for this clearance.

The detent which engages with the teeth of the wheel is filed from a piece of $\frac{1}{8}$ in. thick brass, which can be marked out from the actual calendar wheel; a fine saw cut is then made in the bottom of the detent with the piercing saw. I found the strip of spring steel could be secured in the saw cut simply by simply closing the saw cut in the jaws of the vice and reinforcing the grip by the use of Loctite.

The collar is machined from a length of $\frac{1}{2}$ in. brass rod, drilled $\frac{3}{8}$ in., and parted off at $\frac{1}{8}$ inch. The rim of the collar is then drilled and tapped 8BA and another hole is drilled and tapped 10BA at 90deg. to the first. The 8BA screw is to fasten the spring steel to the collar, and the 10BA screw is to hold the collar in place on the pillar. In fig 29, I suggest a dimension for the 8BA hole in the spring steel, but this is better checked from the job.

The calendar wheel is placed on its post and the brass collar is placed on the dial pillar and held in place by the 10BA screw. The calendar wheel must be positioned so that one of the date numbers is opposite the marker on the dial (the dial can be held in place temporarily with Blu-Tack) and the detent of the spring located in one of the teeth of the wheel. The exact position for the hole which has to be punched in the spring steel for the 8BA screw can now be determined. After the hole has been made, the spring steel can be fixed to the collar with the 8BA screw. It should be possible to adjust the position of the jumper spring to give a positive but light locking action to the wheel. The working faces of both the calendar wheel teeth and the detent should have a smooth finish.



The various components can now be assembled along with the dial in order to check the action of the calendar wheel. The pin in the sun/moon disc should engage with the calendar wheel and advance the wheel by one tooth only. Likewise the detent should fall in place after only one tooth has passed; the detent should have a light but positive action. If this is not the case, you may find that the pin in the sun/moon disc requires some adjustment. The pin may need to be bent slightly downwards if the calendar wheel is travelling too far, or upwards if not far enough.

Even if all the measurements have been strictly observed, some adjustment may be necessary, which is why I suggested not having the sun/moon disc painted until the clock is finished.

The detent may also require some adjustment, a certain amount being possible owing to its method of fixing. After all these adjustments have been made and everything is working correctly, the dial can be engraved and the sun/moon disc painted.

Figures 30 and 31 give the dimensions and numbering of the hour and minute dials, and I assume the constructor will have them made, engraved, waxed and silvered. Photograph 43 shows the two dials after silvering. These and the spandrels can then be fitted in place from the rear of the dial with 12BA screws.

Minute hand

An illustration of the minute hand is given in fig 31; this design can quite simply be drawn, cut out and stuck onto a blank piece of $\frac{1}{16}$ in. steel, where it can be sawn out with the piercing saw, filed to shape and fettled. It is easier to drill the two holes required in the hand before actually sawing out the shape from the blank. The square hole which fits the minute pipe should be checked from the job while filing. When the hand is finished it should be polished and then blued. Photograph 44 shows the minute hand after having been filed to shape. I have used a commercially available brass $\frac{1}{8}$ in. domed hand collet, used typically on Longcase clocks.

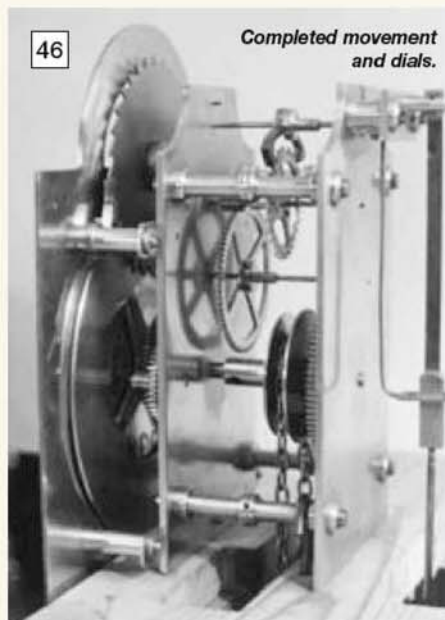
Now the dial and hand are complete, the clock is ready for final assembly. The various components are given a final clean and polish. Any scribing marks, etc. on the plates should be removed, and the register pins can be punched out. Light clock oil should be used to lubricate the pivots and pallet faces. The clock should be fastened some 5ft. 3in. from the floor.

I have had a suitable case made into which the movement is secured with two seat bolts which screw through the seatboard and into the bottom two pillars. The dimensions of the bolts I used are

given in fig 32 and the bolts can be seen in photo 45. However, these dimensions should be checked against the type of case you are using. The knurled brass heads are secured to the bolt with Loctite. A conventional chain weight pulley and lead counterweight are used. The chain is suspended at either end from two brass hooks screwed into the bottom of the seatboard. The movement and dial on the test board can be seen in photo 46.

After all the work and perseverance that goes into constructing a clock, I know many constructors prefer their movements to be visible, in order that their workmanship can be fully appreciated. However, the movement really does need to be housed in a case of some sort in order to keep the movement free of dust.

As noted at the beginning of this series, should other constructors consider my case design suitable, I have all the relevant drawings and dimensions, and would be happy to supply them if they contact me at 216 Fulford Road, York YO10 4DX. tel: 01904-655405; e-mail: ian@beilby216.freemove.co.uk



The inevitable question

I have found my clock performs well with a weight of 3.5lb. and, as the chain drive and pulley are arranged to give a double fall, the clock will

run for two days before requiring rewinding. Any unconventional clock such as this is certainly a conversation piece, and one of the first questions asked, is why did I think Richard Snow made a clock like this in the first place.

It could have been the novelty value, a conversation piece as well as a timepiece, but in early 18th century rural Yorkshire a clock like this would not come cheaply. It would be affordable — but only just! Was this a one off (as far as we know) clock, commissioned by an affluent farmer, wanting a clock to amuse as well as tell the time?

Or possibly in the dales in 1736, someone was simply telling us that he did not really want a modern mechanical machine to tell the time of day, with their complicated pointers and numbers. Living in the country, perhaps he felt happier and more at home with the time shown to him as it always had been by the seasons, the length of the day, and of course, the Sun and the Moon.

Maybe, if our clock is still around in 250 years time, someone will ask the same question.



TWIN-CYLINDER *TWISTY*

Les Kerr

in Australia describes a novel 'twist' on the *Twisty* theme.

●Part I

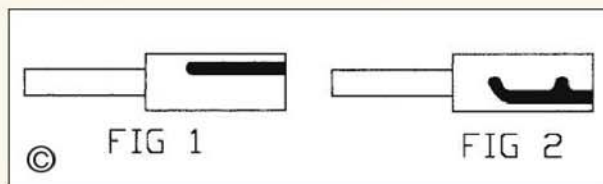
Back in *M.E.* 4163, 22 February 2002, Colin Andrews wrote an excellent article on a single cylinder engine, which he called *Twisty*. I must admit that on initial reading I found it difficult to understand fully how it worked. However, on further study I realised what a clever, simple engine it is. This prompted me to produce a twin-cylinder version which is the subject of this article. Being well balanced, at a working pressure of 60psi, my engine exceeded 6000rpm and in operation it sounded more like a petrol engine.

A study of photo 1 will reveal that the cylinder is made from a length of brass tube which contains a piston at each end. The pistons are connected together so that when one is in compression the other is in exhaust. Arranged at right angles at the centre of the piston connecting rod is a further connected shaft with a $\frac{3}{16}$ in. dia. ball on the end. This ball fits into a $\frac{3}{16}$ in. dia. hole in a small pulley offset by 6mm from the crankshaft. If you can imagine the crankshaft rotating then the pistons will move up and down by 12mm and at the same time they will rotate back and forth.

On its outer circumference, each piston has two 2mm wide grooves cut parallel to the axis and running from the top to about three-quarters of their length. One groove (fig 1) starts to align with the inlet port



The author's twin-cylinder Twisty, a neat, well balanced and fast running engine of deceptively simple design.



The method used to clamp the cylinder tube for machining the slot in the side wall. Care must be taken to avoid distorting the tube.

just past top dead centre on the compression cycle, and remains in line until just before bottom dead centre at which time the piston has rotated sufficiently to close off the inlet port from the groove. This cycle allows steam to pass into the cylinder to force the piston down. Similarly, the second groove (fig 2) aligns with the outlet port at bottom dead centre on the exhaust cycle and remains in line until top dead centre.

Since, apart from the valve action, the engine is a flat twin, it is not self-starting at top or bottom dead centre. This problem could be overcome by adding a second pair of cylinders to the large pulley side and driven from a hole 90deg. offset from the original driving hole.

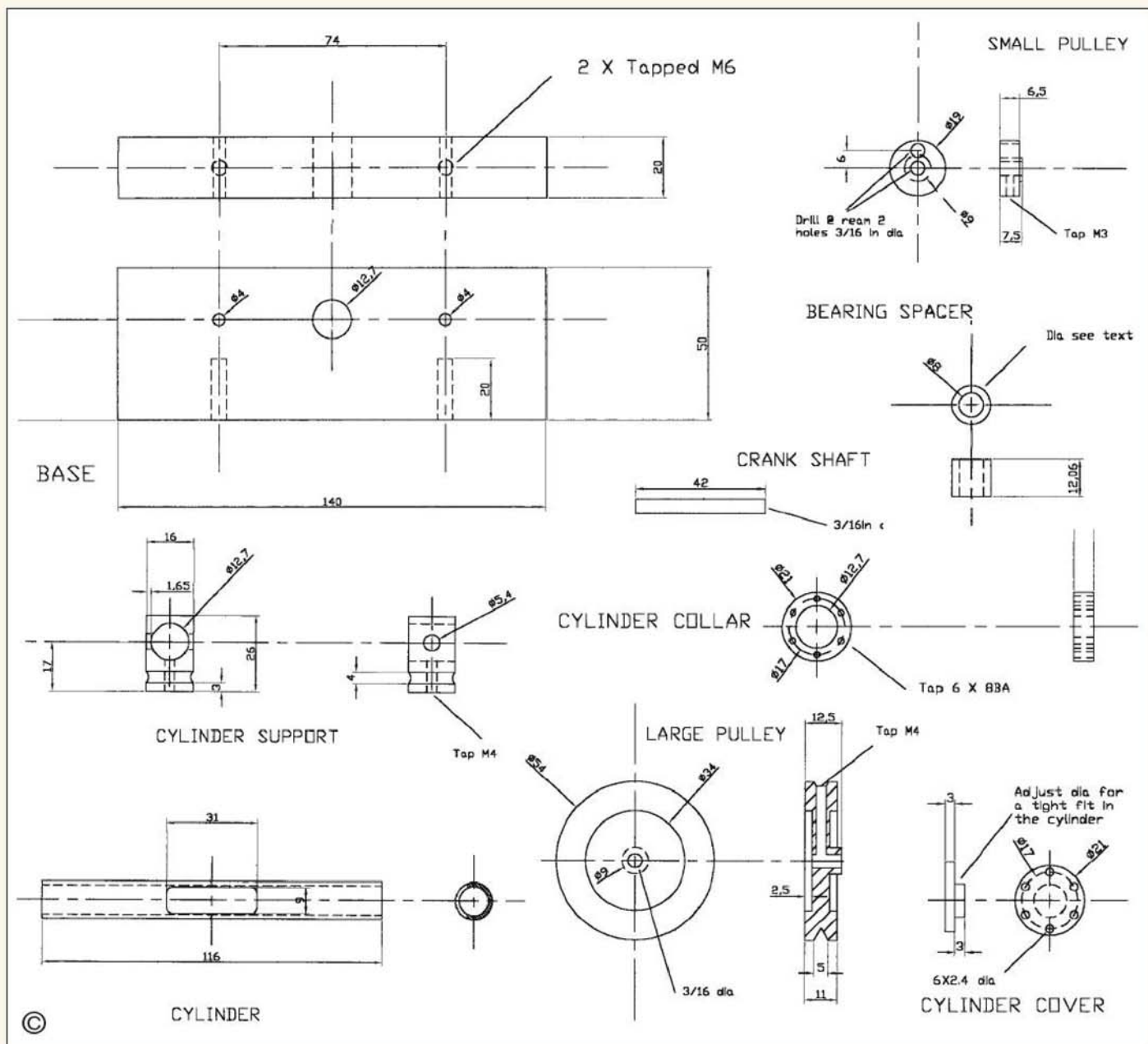
Ball races were used to mount the crankshaft to reduce friction.

Construction

In the past I silver-soldered all my fabrications, but since the advent of Loctite 620 high strength, high temperature retaining compound, I have found that my blowtorch is seldom used. I have used this product for assembling this engine. If a mistake is made, the parts can be separated by heating until the Loctite burns. When cool, they can then be parted easily.

Base

I made my base from aluminium alloy, but any material will do. First precision drill the three holes for mounting the cylinder supports and the bearings. Then turn it through 90deg. and drill and tap the mounting holes.



Bearing spacer

Chuck a piece of $5/8$ in. dia aluminium alloy and turn the outer diameter so that it just slides into the $1/2$ in. hole in the base. Drill out the 8mm dia hole and part off to length. Using Loctite fit the bush so that it is exactly in the centre of the base. To achieve this I turned up a $5/32$ in. length of rod which I used to push the bush up against.

Crankshaft

Take a piece of $3/16$ in. dia. stainless or silver-steel and check that it will fit into the bearings. If not, as I found in my case, polish its diameter in the lathe using fine emery cloth. Once it fits the bearings, cut it to length and de-burr the ends.

Using Loctite, fit two ball races of $3/16$ in. bore x $1/2$ in. outer diameter x $5/32$ in. long into the base. Keep them aligned by fitting the crankshaft while the Loctite cures. Use as little Loctite as possible as the last thing we want is to get it into the bearings.

Small and large pulleys

I used brass for the small pulley and aluminium alloy for the large. These are simple turning jobs but little looks worse than an out-of-true pulley.

To avoid this I always mount my pulleys on a mandrel to give them a final skim. The mandrel is a piece of $3/16$ in. dia. stainless steel set to run true in the 4-jaw chuck to which the pulley is attached using Loctite. To remove the mandrel, heat the joint until the Loctite burns, then leave the assembly to cool and you will find that the shaft is easily removed.

Cylinder

I used a piece of $1/2$ in. outer diameter seamless brass tube. The internal diameter was 0.4 inch. Face both ends of the tube to the correct length in the lathe and de-burr the inside edges. Be careful not to apply excessive pressure, as any distortion in the pipe will cause the piston to bind.

To mill the slot I made two hardwood end caps and a clamp (photo 2) to hold the work firm during this process.

Cylinder supports (2 off)

Mount a piece of 16mm square aluminium alloy in the drill vice and drill the $1/2$ in. dia. hole. Leave an extra $1/2$ in. of metal on the top side to hold the work in the lathe.

Using the dial gauge, centralise the piece in

the 4-jaw chuck and face the end. Drill and tap the mounting hole. Using a profiled lathe tool, shape as shown on the drawing. Part off to length.

Return the job to the drilling machine to drill the remaining hole 2mm dia. *not 5.4mm dia.* as shown on the drawing. It will be enlarged later.

Cylinder collar (2 off)

Chuck a length of 1in. dia. brass. Reduce its diameter to 21mm for a length of 6mm. Drill a $1/2$ in. dia. hole to a depth of 7mm. Transfer the chuck with the work to the dividing head and drill and tap six 8BA equi-spaced holes on a 17mm dia. pitch circle. Return to the lathe and part off to size.

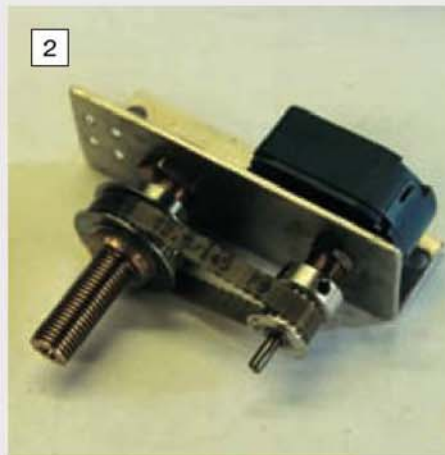
Cylinder cover (2 off)

Chuck a length of 1in dia brass. Reduce its diameter to 21mm for a length of 7mm. Reduce 3mm to a diameter that is a tight fit in the cylinder end. Transfer the chuck with the work to the dividing head and drill six 2.4mm equi-spaced holes on a 17mm dia. pitch circle. Return to the lathe and part off to size.

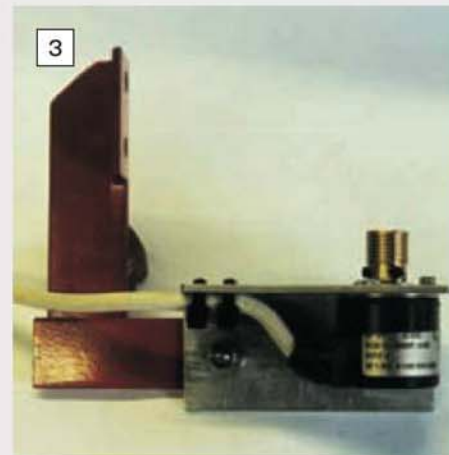
●To be continued.



The Author's DRO unit fitted to his own Myford VME milling machine.



The original 500ppr belt driven encoder was not entirely successful due to small pulley sizes.



The directly driven 1,500ppr encoder gives a much smoother operating movement.

DIY DRO

A novel Digital Read Out unit to make and fit to your Lathe or Milling Machine

Alan L. Thatcher describes his variation on a modern aid to accurate working.
 ●Photographs by Richard Coleman.

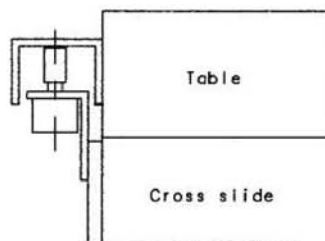
It was probably about five years ago that I first considered making this digital readout (DRO) system. I had seen how accurate, professionally made DROs were made using a

wire to drive the encoder and then I read an article in *Model Engineers' Workshop* which set me to think about the possibility of making something similar. I was quite sure that it would be possible to make the encoder a fair bit smaller and protect it against coolant and swarf. So, I started with a 500 pulse per revolution shaft encoder with a 2 to 1 gear ratio. I tried looking at gear drives but aware that there is always the problem of backlash between the teeth, or setting

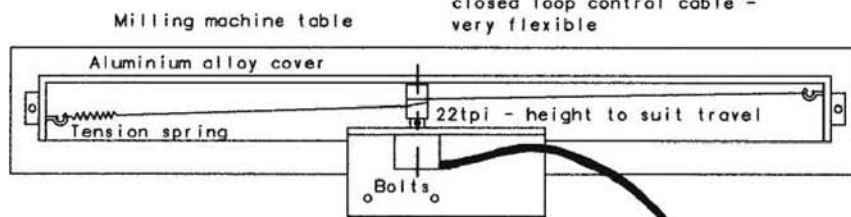
them too tight, I chose a toothed belt and pulleys. To achieve my aim of getting the mechanism in as small a channel casing as possible, I had to use a toothed belt just 2.5mm wide. I duly made up the pulleys and the large pulley support, fitted it with ball races and show the result in photo 2.

When all was ready I had to devise a way of driving it. I did not particularly like the spring rewind shown in *M.E.W.*, so I went to bed. As John, our club mathematician says: "If you have

0.5in dia cut with
22tpi V-thread, 0.17in. deep
with 0.01 bottom radius



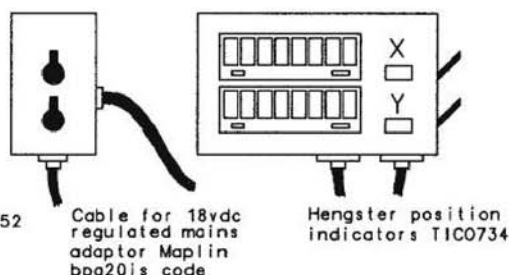
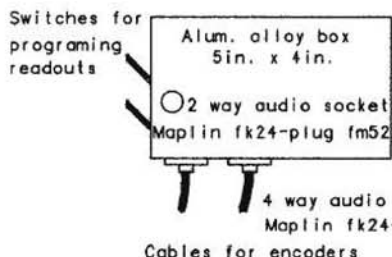
0.02in. dia. plastic covered
multi-strand model aircraft
closed loop control cable -
very flexible



I can supply small 30mm dia.
1500ppr shaft encoder
phone 01491 681707 for
information.

Counters programmable
for imperial and metric

Remote resets





Both the X- and Y-axes are equipped with encoders and, as can be seen here, the installation is neat and business-like and protected from swarf.



The digital readout box features backlit 12mm characters and is mounted on the right hand side of the machine for convenient viewing.

a problem it is best to sleep on it." After a while, I thought of a long rack bolted to the bed which could have a gear wheel running up and down it, but it looked as if there would be too many problems with regard to gear wheel size. This idea was therefore scrapped and I went back to bed and slept on it again.

The idea then occurred to me of running a fine cable from one end of the bed to the other with one turn around the pulley, working out the pulley size accordingly. This I did, but as I was using model control line wire, there was too much stress. I looked for better wire and came up with model aircraft, closed loop wire of 0.020in. diameter. It is plastic coated and really flexible. I then made up an aluminium alloy channel with hooks at each end and a spring attached to one end of the wire to maintain the tension. This was fitted up along the front of my milling machine table. The design is such that I did not even have to drill any holes in the machine. I have a Myford VME milling machine, but the device could be adapted to any similar machine tool.

Once installed, I found that pulling the wire around the pulley kept jamming it up, so it was back to bed to sleep on it again. I then came up with the notion of running the wire along a thread screw cut along a shaft which, at 22tpi came out at just over 1 1/8in. high. It looked a bit tall, but at least the wire ran up and down the thread without jamming, which was pleasing.

I should perhaps have mentioned earlier that before starting work on the project I spent some time looking through the RS Catalogue seeking a suitable digital display with the appropriate connections for shaft encoders with A and B channels at 90deg. — and at the right price. At the time of writing there appeared only to be two

types. One featured digits 12mm high, the others were 7mm high. I chose the version with the 12mm characters and background lighting which was not available with the 7mm unit. The 12mm unit is programmable, much easier to read but about £20 more expensive.

The unit was mounted in a suitable box with an allowance for a second readout, and fitted to the milling machine. Having plugged it all together with a power supply for the encoder it was switched on and everything worked. However, it seemed a little jerky in operation, a problem which was located in the 1/4in. dia. encoder shaft which was supported by a plain bearing. Deciding to replace this arrangement with a couple of ball races, I purchased two 1/4in. O/D ball races which accepted a 1/8in. dia. silver-steel shaft. This modification made it much smoother but some 'notchiness' could still be felt from the teeth of the belt, and its adjustment was very important. This was probably due to the small size of the pulleys.

Still not entirely happy with the smoothness of running, I contacted some alternative suppliers in an attempt to find a source of small 2,000 pulse per revolution shaft encoders which would allow me a direct drive from a larger threaded pulley fitted directly onto the encoder shaft. Several telephone calls and various companies later, I found I could only obtain large encoders some 2in. or more in diameter. They were also all very expensive. At this point I nearly gave up, but one last telephone call located a company prepared to ask their supplier on mainland Europe if they made a smaller (30mm dia. body) encoder with more than 1,000 pulses per revolution.

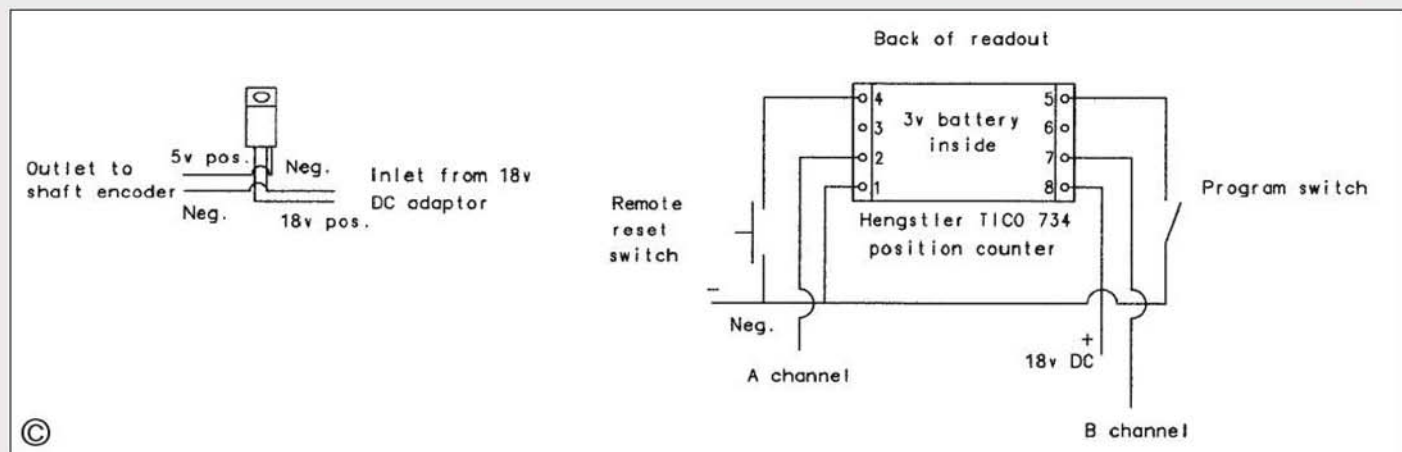
Impatient for a return call and having not heard anything after a couple of days, I thought that the matter was ended. Much to my pleasure,

the company did call back with the good news that a 30mm dia. body, 1500 pulses per revolution shaft encoder was available and they would get one sent over if I opened an account with them, which needless to say, I did. I am therefore now in a position to supply a 1500pulse/rev. encoder to anyone else wishing to build this digital readout system for themselves (see drawing for contact number).

Once the encoder had arrived, it was a simple matter to work out the pulley sizes, which came out at 0.500in. dia. with a round bottomed 22tpi thread 0.017in. deep. This gave me a pulley height of 1in. including room for two 4BA grub screws set at 90deg. to each other. As the encoder was already fitted with ball races, this arrangement gave me the really smooth operating movement I was seeking. The height of the pulley allows for 21in. of table travel. The hooks at each end of the inverted aluminium alloy channel need to be set at two different heights because, as you run from one end to the other, the cable rises or falls accordingly.

All this is connected as shown to a position indicator (RS stock number 248-8373), which at that time cost £62 plus VAT. Alternatively you could use add/subtract counter RS stock number 260-088 plus quad adaptor 260-836, which together cost £45 plus VAT. Although the alternative is cheaper, its display is only 8mm high and without the back light facility. I have not tried this last counter, but can see no reason for it not to work.

So there you have the design which I have devised and find so useful on my milling machine. I wish you pleasure and satisfaction in making up and using a digital readout system for your own milling machine or lathe.



FOR YOUR BOOKSHELF

'LBSC' His Life and Locomotives

Despite the occasional letters to *Post Bag* criticising current levels of authenticity in model locomotive construction, or the choice of GWR locomotives as suitable subjects for a model, there can be little doubt that the model engineer contemplating the building of a miniature locomotive is better off now than ever before in the history of our hobby. Not only does the aspiring model locomotive builder presently have access to an almost bewildering range of published designs, he or she has a large number of suppliers to cater for the need for castings and other materials. The chances are that one or more of the many clubs located up and down the country will also be within easy reach of the family car. The builder can also take heart from the fact that, with care, building a published design will result in a loco capable of pulling a substantial load and which will have a long operational life.

Brian Hollingsworth's book *'LBSC' His Life and Locomotives* is a reminder that things were not always thus. One hundred years ago the model locomotive was little more than a crude toy. Usually spirit fired, it was barely able to pull itself along let alone a driver and several full sized passengers.

LBSC's influence on miniature locomotive design and building could be argued to be as profound as that of George Stephenson on the full size article. Just as Stephenson pointed the way forward for locomotive construction with *Rocket*, so LBSC's 2 1/2in. gauge *Ayesha* proved to be a watershed in the model world and demonstrated that such a small loco could be coal fired and capable of hauling living, adult passengers. It is likely that without LBSC the hobby as we know it would not exist.

I first became aware of LBSC when I bought a second-hand copy of his book, *Shop, Shed and Road*. Although I had heard the name through discussions with older model engineers, nothing prepared me for actually reading the words of

the great man. Here was someone who not only could design and build model steam locomotives but could also write about it and encourage even the newest 'tyro' to have a go. The second printing of Brian Hollingsworth's book is a fitting tribute to this giant of the model engineering world.

Lillian (Curly) Lawrence, who later came to be known as LBSC, was a complex character and Brian Hollingsworth deals sympathetically with his early life in a relatively poor home. He then describes how the young Curly started his working life on the railway before moving on to other fields in search of a "bigger pay-packet". Chapter four deals with, what has become known as, the 'Battle of the Boilers' and details how LBSC's reputation became established through his challenge to the accepted authorities on model locomotive construction of the day. The next five chapters deal with the bulk of his career as a designer of miniature steam locomotives and contributor to a variety of periodicals. This includes the period during 1929-30 when LBSC and his wife briefly moved to the USA. The assertion of LBSC's feminine side, which started to become dominant after World War II, is dealt with in a factual though sensitive way.

The penultimate chapter deals with the final years of LBSC's life. Chapter 12, the last of the book, is a summary which records the passing of LBSC's wife, Mabel, and comments on the man and the scope of his contribution to the hobby and full size locomotive practice. A most useful appendix keyed to the illustrations and photos published in the book gives a full listing of Curly's locomotive designs with dates and sources.

Since the publication of the first edition of his book Brian Hollingsworth has passed on and this reprinting contains an appreciation by Dr. Brian Rogers.

For all those interested in LBSC and his locomotives, or just keen to understand how model engineering developed into the hobby it has now become, this book is a must. It is a fascinating insight into the life of one of the founders of modern model engineering. Buy it, you will not be disappointed.

In hardback, *'LBSC' His Life and Locomotives* by Brian Hollingsworth, ISBN 0-9536523-5-1, costs £26.50 including UK post and packing and is published by Camden Miniature Steam Services, Barrow Farm, Rode, Frome, Somerset BA11 6PS; tel: 01373-830151; fax: 01373-830516; email: orders@camdenmin.demon.co.uk website: www.camdenmin.co.uk

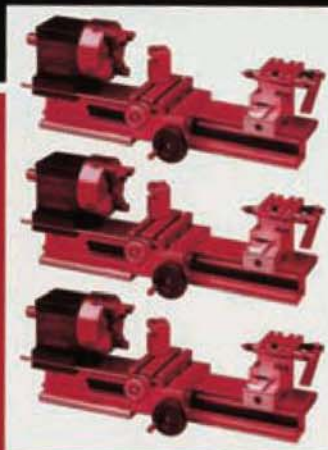
Neil Read

The Taig Lathe

There can be little doubt that taking up model engineering as a hobby does present some problems to the would-be practitioner. Somewhere suitable to work is required together with an adequate bench and the necessary tools. If serious model engineering is to be done then before long the need for a lathe will make itself felt. All this costs money and takes up space. Small wonder that someone with limited means or space may try to find an alternative pastime.

For those in the situation just described, one of the inexpensive 'desk top' lathes now on the market must appeal. Such machines are also

The Taig Lathe



Tony Jeffree

useful to those who choose to work in the smaller scales or who are clock and watch makers or repairers. There are a number of these small machine tools on the market, but one of the most respected and enduring is the American built Taig, which is sold in the UK under the Peatol brand name.

The author was prompted to write this book after he bought a Taig lathe in the early 1990s. At that time no instruction manual was available for the machine and this book sets out to remedy this omission. It is *not* a book on lathe practice but one dedicated to enabling owners to get the most from his or her Taig lathe.

The book is divided into ten chapters. The first two introduce the lathe and deal with the applications for which the lathe is suitable, safety issues and the assembly and mounting of the machine. Successive chapters then deal with work holding, cutting tools, standard accessories, care of the lathe and checking alignment. Chapters 8, 9 and 10 deal with a number of accessories built by the author to enhance the scope of the machine. These include a filing rest, a dividing attachment and a lead screw and gear train assembly designed to enable fine feeds to be obtained and screw cutting to be carried out. A useful appendix lists some of the suppliers used to construct the accessories and gives a handy listing of the lathe's specification. A full index is also included.

The book is generally well written and illustrated with numerous black and white photographs. Where appropriate, drawings are provided so that interested readers can construct the accessories built by the author for themselves. If you own a Taig lathe and wish to develop it to its full potential then this book should be on your bookshelf. It would also appeal to students of small lathe design and the uses to which they can be put in the amateur's workshop. Users of other makes of small lathe and who are keen to extend their capabilities would find the book a useful source of ideas.

In paperback *The Taig Lathe* by Tony Jeffree, ISBN 0-9543493-0-X costs £15 plus £2 postage and packing (UK) and is available from the publishers Division Master Limited, 11a Poplar Grove, Sale, Cheshire, M33 3AX; tel: 0161-973-4278; fax: 0161-973-6534; email: tony@divisionmaster.com website: <http://www.divisionmaster.com>

Neil Read

'LBSC' HIS LIFE AND LOCOMOTIVES

by Brian Hollingsworth





Towards the close of a perfect Polly Rally in 2002, locomotives pose clean and tidy on the steaming bays at Ruddington after a good running session. A blue Polly III leads the line-up with a maroon Polly I and Geerlig's Polly V in procession behind.

POLLY RALLY AT RUDDINGTON

Whether as an owner, friend or interested visitor, all are welcome to the forthcoming event scheduled for the weekend 6/7 September and hosted by Nottingham SMEE.

It hardly seems almost a year since the first Polly Rally, held last summer at the Nottingham SMEE track at Ruddington. Polly locomotives have an excellent reputation and there can be few clubs without a Polly among the membership. It therefore seemed very fitting when Polly Model Engineering proprietor Andy Clarke teamed up with Nottingham SMEE to organise a rally for owners and enthusiasts. Since acquiring the business a few years ago, Andy has worked to successfully re-establish the reputation of Polly as a leading supplier of kit-built locomotives, riding cars and accessories. Andy's background as a toolmaker and steam enthusiast has equipped him well as he constantly strives to improve product quality and ensure customer satisfaction.

Last summer's Rally saw the public launch of



Andy Clarke with his head in the firebox of the unpainted production prototype Polly V enjoys his run.



Resplendent in a lined out maroon livery Geerlig's prototype Polly V poses on the steaming bays at Ruddington.



Geerlig with his 'tenderised' Polly IV. All are welcome to this year's event but please note that spark arrestors and boiler certificates are required.

Polly V, Andy's new development of the *Polly* concept with larger wheels and more of a mainline prototype appearance. Two examples of the 2-6-0 tank were to be seen running. Gerlig from France added an international flavour to the event with his prototype loco previously seen at Harrogate, while Andy Clarke ran his production prototype loco. Both locomotives operated faultlessly throughout the day. While the *Polly Vs* drew a lot of attention, there were about 16 other *Pollys* in attendance and many were steamed by their owners during the course of the day, some having travelled many miles to join in the fun. For less experienced owners it was an opportunity for guidance and encouragement with more experienced owners on hand. Some simply came to enjoy the spectacle and help to fill the trains.

The emphasis of the *Polly* Rally is fun for all

the family, with refreshments on hand together with the other attractions of the Ruddington Heritage Centre, which include the bus collection as well as the standard gauge railway. If possible, this year it is hoped to make the two day event even more enjoyable. The Nottingham SMEE facilities include a 7¹/₄in. ground level track as well as the half mile long raised track used by the *Pollys*. Additionally, by special arrangement with the GCR Nottingham group, footplate rides on the standard gauge will be available, together with refreshments during the day and a barbecue on Saturday evening.

As announced elsewhere in this issue, Polly Model Engineering Limited has recently acquired the business of Bruce Engineering and it is planned that a trade stand will be at the rally for customers old and new to meet the new

management. The integration of the two businesses will continue to provide a valuable source of materials and services to the hobby.

The directors of Polly Model Engineering Limited invite all model engineering enthusiasts and *Polly* owners in particular to come along and enjoy the day. Boiler certificates and spark arrestors will be required for *Polly* owners wishing to run their locomotives, but static models and part built locos will also be welcome. To assist with organisation, please advise us if you will be bringing a loco. We look forward to your company at Ruddington during the weekend of 6/7 September 2003.

Contact Polly Model Engineering Limited on: 0115-973-6700; e-mail: andy@pollymodelengineering.co.uk and Nottingham SMEE via Gerry Chester on 0115-925-9096.



UK News

The 2¹/₂in. Gauge Association summer rally was hosted by Worthing DSME on 7 June. Several locomotives were in steam or on show and John Llewellyn was first on the track with his *Fayette* in marsh livery. Ron Lane fired his *Green Arrow* 2-6-2 (another Curly design) for the first time but unfortunately did not make it to the track. Gerald Chandler had his electric *Austerly* 2-10-0 on show together with the C5 motor to be used as motive power. Peter Gardner's *Netta* 0-8-0 ran well and made light work of the Worthing gradients, and Ian Gorsuch also had a good run with his 4-4-2 *Atlantic* which purred around the circuit. Andrew Dick ran his New York Hudson 4-6-4 *Josie* while another good runner was Dr. John Sayer's Natal 334 type 2-8-2 which ran smoothly and created great interest, both on the track and in the steaming bays. The Association's autumn rally will take place on 27 September at the Surrey society club ground. Contact John Cook, tel: 020-8397-3932 for details.

Ascot Locomotive Society has notified us that their 7¹/₄in. standard gauge rally, which was to have been held on Saturday 16 August, has been cancelled due to a double booking at the racecourse. Although we have previously drawn readers' attention

to this cancellation, we repeat it here because this issue may reach some subscribers before the event date.

Good progress with their new track is being

made by members of Bournemouth DMES who have sorted out the replacement of the broken beams previously reported. This now apparently awaits the wheels of local government to start revolving!

Members of Bradford MES held a very well attended model boating event at Bradford Moor recently. Although a course had been set out and a map provided, it is reported that many chose their own way around the obstacles. Model engineers never do things according to the instructions do they? The event was attended by several junior members who sailed their own or other members' boats, as did some of the live steam brigade.

For their recent 30th anniversary celebrations, members of Bristol SMEE recreated their 1973 track opening cavalcade with many of the original participating locomotives in attendance. President John Wragg also cut a birthday cake to mark the occasion. Trial running in the reverse direction to normal in preparation for IMLEC met with the approval of several passengers and is being considered as a possible permanent change. Those in favour remarked how nice it was to see trains coming towards them on the other track! Some 7¹/₄in. gauge points have been donated by member Tim Marshall and have been adapted to give access to the three shed roads in the carriage shed.



Peak Forest yard on the Lindsey Model Society's 5in. gauge ground level track which is based in a member's garden.

In response to my recent plea for more input to this column from previously unreported clubs, Doug Hewson (Doug@the-hewsons-demon.co.uk) has sent information about the Lindsey Model Society, which is a member of the Ground Level 5in. Association, and which runs on a 5in. gauge ground level track based in a member's garden. The basic layout is oval with four separate goods yards arranged so that scale trains can be run from one to another. The system is controlled by two signal boxes, one containing 30 levers and the other 48.

Erewash Valley MES members recently visited the Sutton Coldfield Society with a good turnout of 14 locomotives and accompanying members. The visitors enjoyed a good day and apparently made full use of the facilities available to them. It is reported that the thrush nesting in the steaming bay roof was quite unperturbed by the noise and activity

below. Members are also carrying out some remedial work on the site drainage and are putting in land drains made from perforated plastic pipe. The first drain is now complete and appears to be working well. The new ground level track bed is also making progress and the track gang is busy milling parts for the triple gauge points which will be required.

An all-time first was reported in the Crawley MES newsletter when it was noted that on 26 May this year all passenger hauling was carried out by two electric powered engines. It was also noted how much simpler all-electric traction was compared to steam. I seem to remember a similar tale on a larger gauge railway in the 1960s, and look what that led to!

The new Class 08 Fylde SME club locomotive has now been finished and thanks are due to member Norman Almond for his efforts on this project. Work is due to finish shortly on a new lighter passenger truck currently under



Crowds of visitors flocked to the annual Fareham DSME Railway Weekend, 26/27 July, to enjoy train rides, a model exhibition, craft displays and much more. Dave Wrenn was one of many drivers providing a busy passenger service.

construction. The truck will be painted maroon to match the other rolling stock. Since the club house roof is a known perch for local youths, concern has been expressed regarding the possibility of vandalism at the track site. (*At my own club we painted the roofs with anti-climb paint which stays tacky and tends to discourage such activity.*) Club members also attended the recent Harrogate Exhibition, travelling to and from the event by coach. The newsletter reported "...evidence that quite a lot of materials had been bought..." and that two members had purchased milling machines. We wish those members many productive hours with their new machinery.

The Guildford MES 7¹/₄in. gauge club locomotive *Stoke* has been 'tweaked and titivated' and is reported now to be in 'fine fettle' and back earning its keep on public running days. Among other things, the locomotive boasts a new stainless steel grate with a baffle to reduce accumulations in the smokebox. The suspension has also been modified and the valves reset. Member David Longhurst describes his changes to the superheater arrangements for the popular *Speedy* design. The club library has re-opened after a major facelift and is now more accessible to members. Chairman, Ian Carney, has expressed concern about the encouragement of junior members in the society. This important topic seems to come up regularly; discussed at a recent open day I attended, it seems to be a regular topic of conversation in many clubs. Member Tony Rest reported on his recent rail trip across South Africa, including "...a shopping opportunity at a diamond merchants, where we sipped champagne while perusing the wares." The main trip was by luxury electric train and Tony notes that a glass of champagne was always provided when passengers returned to the train.

Criterion, newsletter of High Wycombe MEC, contains a useful tip about preventing the 'skinning' in partly used paint tins. It suggests

dropping clean ball bearings, or marbles, into the part-used tin to return the paint level to the 'full' mark. The balls also do a good stirring job when the tin is shaken. I advise all children of model engineering parents to keep a careful count of their marble stocks in future! The recent club open day was reported as very successful with four steam locomotives backed up by a couple of battery electric 'diesels' in double-headed mode. Some 300 passenger circuits were made and both trains were occupied for most of the day.

Ten years old in September, the Maxtrak Owners Club held its Owners' Club Rally this year at the Surrey SME track. If he runs out of magazine contributions, Newsletter editor Dave Bayliss has threatened to inflict on readers his "very long and very boring article" on building his 7¹/₄in. gauge locomotive *Kate*. The club is seeking a Chairman as the post is vacant at the time of writing. Members have been invited to attend the Oignies International Rally near Lille in France on 30/31 August this year. Apparently this site includes 5in. and 7¹/₄in. gauge tracks with an adjacent mining museum including the old steam winding engine still in place.

Reported in the newsletter of the Midlands Federation of Model Engineers is an option for attracting junior members to the NW Leicestershire SME which allows juniors to join for £1; as members they are then entitled to free rides. The juniors have obviously worked out the financial implications of this deal!

Alan Berry has taken over as the new editor of Norwich DMES newsletter. We wish him luck in his new role, lots of contributions, and we look forward to receiving his work at the offices. Compared with 2001, attendance at the 70th anniversary show was a little disappointing, but nevertheless turned in a healthy profit for the society. Member Robyn Murdo-

Smith has resolved the poor steaming of his *Juliet*. He applied copious quantities of Gunk to the inside of the smokebox, discovered some leaks which he has now sealed off and was apparently so pleased with the results that he drove up and down in the rain while other members watched from suitably sheltered positions. The cleaning was carried out in the kitchen one evening after his wife had retired to bed! We dare not enquire as to the outcome of this domestic liberty. The annual club auction, held recently, was reported as being one of the busiest ever with many bargains changing hands ready to be brought back next year to be auctioned again (their words).

The annual Reading SME efficiency competition will take place on 14 September this year giving club members plenty of time to get their locomotives in top notch condition. Member Alan Redgrave is looking for information on sources of decent drawings and/or photographs for the GWR 4-6-2 *The Great Bear* which he is building. Newsletter editor Gerald Payne has denied in writing the malicious rumours that he 'pulled a wheelie' on his newly acquired 3in. scale Burrell traction engine. As a Reading member present on the date in question, my lips are sealed. The new ground level semaphore signals are now working properly after a few trials and tribulations resulting in a couple of 'back to the drawing board' situations. Work on the clubhouse ceiling planned for July has been postponed because the club has purchased a milling machine from a retiring member, Morris Cross. This will mean some alterations to the workshop layout and hence no room to store ceiling panels until the milling machine has been installed. The newsletter also contains some views on attracting junior members from the experience of junior member Thomas Macey and his father Ian. This really does seem to be the topic of the day; perhaps readers would care to make

us aware of their own views and opinions on the subject?

The newsletter of Saffron Walden DSME reports a major act of vandalism carried out by none other than their Chairman! Displaying gusto and enthusiasm while recently digging a trench, he managed to sever a 10-core signalling cable with his mechanical digger. Fortunately the Hon. Sec. has been able to repair the damage but doubtless said Chairman will be living this down for a little while yet. Helped by good weather, work on the ground level track continues. The centre part of the turntable foundation is now complete and installation of signalling has started together with a water tower and signal box. A level crossing gate has been installed and will eventually be connected to the signalling system.

We are pleased to have information concerning the progress of a new society: Salisbury DMES. Meetings are held on the third Monday of each month in the Middle Woodford village hall. The hall is about three miles north of the city centre and we are sure that visitors and potential new members will be made welcome. Further details may be had from temporary secretary Peter Parrish (call 01980-610346). It is good indeed to hear of the formation of a new society; we wish them great success and hope to hear more of their progress in future.

Members of Stamford MES exhibited some of their efforts at the recent Peterborough MES annual show with a mixture of aero, marine and tool making exhibits in addition to railway items. The steaming bay turntable which was recently badly damaged by a fallen tree has been repaired by member John Love.

The 25th anniversary of Surrey SME was marked with a family day type barbecue lunch organised by member Peter Bance. Among the guests who attended were some who supported the society in its early days and several widows of past members. Two celebration cakes were cut by founder members Mick Herbert and John Cook. At the society's June open day, three locomotives were in steam on the ground level track. These were a Rio Grande Class K36 2-8-2 *Helen Claire*, a Hunslet 0-4-0 and an LBSC Atlantic 4-4-2. On the raised track a 5in. Class 37 diesel-electric locomotive was operating.

Stockholes Farm MRS reports having changed its insurance provider for several reasons, two of which relate to their requirement to

get younger junior members driving under supervision and thereby to encourage them. Another is related to their own assessment of greater flexibility in the need for guards on trains of more than one carriage. Thomas, one of the aforementioned juniors, was reported as trying out another member's new tar wagon behind his electric powered D2902. Juniors were also involved in running trains over the Easter weekend, including some freight trains.

We have received a reminder of the Warco Machine Tools open weekend to be held 30/31 August. More details may be had from Warco (call: 01428-682929).

Wigan DMES member Harry Muscroft was warmly applauded by members to mark his recent 90th birthday. Members enjoyed an interesting presentation recently when Dr. Malcolm Higgins spoke about early Chinese engineering achievements including the Great Wall, the 75 square mile Forbidden Palace, and the Summer Palace, built alongside an artificial lake on an artificial hill made from the spoil from the lake.

The newly acquired Wortley Top Forge ME club locomotive, built by Alan Ripley, is performing well. It is electric powered and modelled along the lines of an American Switcher. Alan also reported on his recent steam rail trip in the USA. The train was pulled by a 1920s Baldwin 2-8-2. The carriages were all steel Harriman style heavyweight coaches complete with concrete floors and each weighing 75 tons. Because all the seats face forward, the entire train was turned in a local triangle junction so that passengers faced forward throughout the journey. The locomotive was also driven by a lady, as evidenced by Alan's photograph of himself with her. Alan highly recommends the trip.

World News

Australia

MELSA, the Model Engineers & Live Steamers Association of Maryborough, have two members who have recently finished projects. Member Des Rowland has finished his 5in. gauge Queensland Railways A12 4-4-0 which is becoming a good passenger hauler, and Alan Houston has completed his 3 1/2in.

Catalogue

Containing details and prices of:

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gauge 4-4-2 *Katie* which started life as an LBSC *Maisie* but metamorphosed into a freelance Victorian Railways 'K' class complete with smoke deflectors and headlights. A design of clack valve fitted with an O-ring seat is also detailed in the newsletter. This has a two piece body to facilitate the machining of the O-ring seating.

South Africa

The Durban SME library is to be named after member Theo Gooden in recognition of his work on behalf of the club. Comment is made in the newsletter about the selling of South African models overseas because of

the enhanced prices available. It is suggested that the answer to this is to promote the sale of models to South African collectors. The locomotive *WASP* (Was A Sweet Pea) has had a mini overhaul after recent problems and is now performing faultlessly again hauling passengers. It racked up 10 kilometres in one morning on a recent running day. Owner, member Nalder Stephens, has designed a propane gas firing system for *Sweet Pea* locomotives using eight burners. This should have now been tested and hopefully we will hear more of this as there is great interest in this method of firing in many areas.

CLUB DIARY

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

AUGUST

- 18-25 **STAAR Research. International Rocket Week** at Kelburn Castle & Country Centre, Largs, Ayrshire. Contact John Bonsor: 07733-250135.
- 23 **Andover DMES. Evening Barbecue & Steam-Up.** Contact R.W. Hanman: 01980-846815.
- 23 **Chesterfield MES. Running Day.** Contact Mike Rhodes: 01623-648676.
- 23 **Hornsey ME. Family Day.** Contact Ted Gray: 9484-7583.
- 23-25 **Harrow & Wembley SME. Open Weekend.** Contact Dr. Roger Greenwood: 020-8427-2755.
- 23-25 **Ryedale SME. GLSMLA Rally.** Contact Doug Hewson: 01652-688408.
- 23-25 **Stockport DSME. Exhibition.** Contact Nick Russell: 0161-427-6967.
- 24 **Annerfield Miniature Railway. Running.** Contact David Jerome: 0118-9700274.
- 24 **Ascot LS. Members' Steam-Up.** Contact Ivan Hurst: 01276-28803.
- 24 **Harlington LS. Open Day.** Contact Peter Tarrant: 01895-851168.
- 24 **Maidstone MES. Charity Run.** Contact Martin Parham: 01622-630298.
- 24 **Malden DSME. Members' Barbecue.** Contact John Mottram: 01483-473786.
- 24 **MELSA. Bracken Ridge.** Contact Graham Chadbone: 07-4121-4341.
- 24 **Ottawa Valley Live Steamers. Steaming Day.** Contact John Bryant: 761-1109.
- 24 **Staines SME. Running Day.** Contact Mike Kingham: 01932-788793.
- 24 **Surrey SME. Free Day.** Contact John Cook: 020-8397-3932.
- 24 **Tallylyn Railway. Land Rover Rally.** Enquiries: 01654-710472.
- 24/25 **Cardiff MES. Summer Open Weekend.** Contact Trevor Jenkins: 029-2075-5568.
- 24/25 **Chesterfield MES. Steaming at Papplewick.** Contact Mike Rhodes: 01623-648676.
- 24/25 **Claymills Pumping Engines. In Steam.** Contact B. Eastough: 01283-812501.
- 24/25 **Elmdon MES. Running at Wythall Transport Museum Open Days.** Contact Chris Giles: 0121-458-1291.
- 24/25 **Northern Mill Engine Society. Open Days.** Contact John Philip: 01257-265003.
- 24/25 **Nottingham SMEE. Running.** Contact Gerry Chester: 0115-9259096.
- 24/25 **Romney, Hythe & Dymchurch Railway. Bank Holiday Intensive Service.** Information: 01797-362353.
- 24/25 **Guild of Model Wheelwrights at Sandwell Show, West Bromwich.** Contact Biddy Hepper: 01492-623274.
- 25 **Canterbury DMES. Meeting.** Contact Granville Askham: 01227-463295.
- 25 **Hornsey ME. Meeting.** Contact Ted Gray: 9484-7583.
- 25 **Saffron Walden DSME. Running Day with Barbecue** Contact Jack Setterfield: 01843-596822.
- 25 **Stockholes Farm MR. Open Day.** Contact Ivan Smith: 01427-872723.
- 25 **Sutton Coldfield MES. Bank Holiday Steam-Up.** Contact Neal Harrison: 0121-378-3992.
- 25 **Tallylyn Railway. Duncan's Special Day.** Enquiries: 01654-710472.
- 26 **Romney Marsh MES. Track Meeting.** Contact John Wimble: 01797-362295.
- 26 **Sutton Coldfield MES. Open Night.** Contact Neal Harrison: 0121-378-3992.

- 26 **Wigan DMES. Alan Priddey: Water Power & Allied Machinery.** Contact John Chamberlain: 01744-882255.
- 27 **Harrow & Wembley SME. Club Evening.** Contact Dr. Roger Greenwood: 020-8427-2755.
- 28 **Leyland SME. Geoff Baxendale: Things to do with an Oscilloscope.** Contact Mark Entwistle: 01772-422411.
- 28 **Worthing DSME. Toy Steam-Up.** Contact Bob Phillips: 01903-700642.
- 30 **National 2 1/2in. Gauge Ass'n. Locomotive Rally at Fylde SME.** Contact Clive Young: 01233-626455.
- 30/31 **Chesterfield MES. Open Weekend.** Contact Mike Rhodes: 01623-648676.
- 30/31 **Guild of Model Wheelwrights at Chatsworth Country Fair, Bakewell, Derbyshire.** Contact Biddy Hepper: 01492-623274.
- 31 **Chichester DSME. Steam on Sunday.** Contact Brian Bird: 01243-542266.
- 31 **Lincoln DMES. Running.** Contact Paul Thompson: 01522-888228.
- 31 **MELSA. Sunday in the Park.** Contact Graham Chadbone: 07-4121-4341.
- 31 **Nottingham SMEE. Running.** Contact Gerry Chester: 0115-9259096.
- 31 **Ottawa Valley Live Steamers. Steaming Day.** Contact John Bryant: 761-1109.

SEPTEMBER

- 1 **Lancaster & Morecambe MES. Bring & Buy.** Contact Harry Carr: 01524-411956.
- 2 **Basingstoke DMES. Stationary Engines.** Contact Ian Shanks: 01420-561741.
- 2 **Romney Marsh MES. Track Meeting.** Contact John Wimble: 01797-362295.
- 2 **South Durham SME. Meeting.** Contact B. Owens: 01325-721503.
- 2 **Stamford MES. Alan Westby: A Simple Rail Car.** Contact David Ash: 01780-751211.
- 2 **Surrey SME. Members' Barbecue.** Contact John Cook: 020-8397-3932.
- 2 **Taunton ME. David Hartland Magic.** Contact Don Martin: 01460-63162.
- 3 **Bournemouth DSME. Visit to Moors Valley Railway.** Contact Mike Baker: 01202-383653.
- 3 **Bradford MES. Keith Hale: Silver Soldering.** Contact John Mills: 01943-467844.
- 3 **Bristol SMEE. Meeting.** Contact Trevor Chambers: 01454-415085.
- 3 **Tyneside SMEE. Meeting.** Contact Ian Spencer: 0191-2843438.
- 3 **West Wiltshire SME. Steam-Up.** Contact R. Nev. Boulton: 01380-828101.
- 4 **South Lakeland MES. Meeting.** Contact Adrian Dixon: 01229-869915.
- 4 **Sutton MEC. Bits & Pieces.** Contact Mike Dean: 0208-657-5401.
- 4 **Vale of Aylesbury MES. Track Night.** Contact Clive Ellam: 01296-623433.
- 5 **Canvey R&MEC. Steam-Up & Barbecue.** Contact David A. Clark: 01375 846921.
- 5 **Maidstone MES. Evening Run & Fish 'n Chips.** Contact Martin Parham: 01622-630298.
- 5 **North London SME. Meeting.** Contact David Harris: 01707-326518.
- 5 **Portsmouth SMEE. Meeting.** Contact John Warren: 023-9259-5354.
- 5 **Rochdale SMEE. Meeting at Springfield Park.** Contact Mike Foster: 01706-360849.
- 5 **Romford MEC. Competition Night.** Contact Colin Hunt: 01708-709302.

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| <p>6 Cardiff MES. Steam-Up & Family Day. Contact Trevor Jenkins: 029-2075-5568.
 6 Chichester DSME. Hosts to Sussex Club's Steam-Up.
 Contact Brian Bird: 01243-542266.
 6 Kew Bridge Steam Museum. Tower Open Day. Information: 020-8568-4757.
 6 Leicester SME. Northern Association Rally.
 Contact Raymond Wallace: 0116-2858824.
 6 North London SME. Track Open Day at Colney Heath.
 Contact David Harris: 01707-326518.
 6 Romney Marsh MES. Visit to Great Wealden Railway.
 Contact John Wimble: 01797-362295.
 6 SM&EE. Alan Blackburn: Railway Drawings and their Accuracy.
 Contact David Boote: 01202-745862.
 6 Sutton Coldfield MES. Hog Roast. Contact Neal Harrison: 0121-378-3992.
 6 Talylyn Railway. Victorian Train. Enquiries: 01654-710472.
 6 York City & DSME. Summer Informal Meeting.
 Contact Ken Bateman: 01904-421445.
 6/7 Koninklijke Model Yacht Club. International Model Steamdays.
 Information: 0032 (0)52/47 41 74.
 6/7 Leighton Buzzard NG Rly. Steam-Up Weekend. Enquiries: 01525-373888.
 6/7 Nottingham SMEE. Polly Locomotives Rally.
 Contact Gerry Chester: 0115-9259096.
 6/7 Romney, Hythe & Dymchurch Railway. A Day Out With Thomas.
 Information: 01797-362353.
 6/7 South Lakeland MES. Open Weekend. Contact Adrian Dixon: 01229-869915.
 6/7 Tyneside SMEE. Autumn Rally. Contact Ian Spencer: 0191-2843438.
 7 Andover DMES. Members' Running Day. Contact R.W. Hanman: 01980-846815.
 7 Basingstoke DMES. Running. Contact Ian Shanks: 01420-561741.
 7 Bedford MES. BEDLEC 2003. Contact Ted Jolliffe: 01234-327791.
 7 Guildford MES. Open Afternoon - Charity Day.
 Contact Dave Longhurst: 01428-605424.
 7 Hornsby ME. Sailing Day. Contact Ted Gray: 9484-7583.
 7 Lancaster and Morecambe MES. Diesel & Electric Day.
 Contact Harry Carr: 01524-411956.
 7 Leyland SME. Ground Level Running. Contact Mark Entwistle: 01772-422411.
 7 Plymouth MSLS. Running. Contact John Brooker: 01752-671722.
 7 Rugby MES. 7 1/4in. Gauge Society. Contact David Eadon: 01788-576956.
 7 South Durham SME. Running Day. Contact B. Owens: 01325-721503.
 7 Staines SME. Club Trials. Contact Mike Kingham: 01932-788793.
 7 Surrey SME. Members' Steam-Up. Contact John Cook: 020-8397-3932.
 7 Sutton Coldfield MES. Steam-Up. Contact Neal Harrison: 0121-378-3992.
 7 Wigan DMES. Narrow Gauge Day. Contact John Chamberlain: 01744-882255.
 7 Wortley Top Forge ME. Open Day. Contact Alec Butteriss: 01226-763693.
 8 Erewash Valley MES. Steaming Evening. Contact Jim Matthews: 01332-705259.
 8 Melton Mowbray DMES. Meeting. Contact Phil Tansley: 0116-2673646.
 8 Saffron Walden DSME. Club Night. Contact Jack Setterfield: 01843-596822.
 9 Romney Marsh MES. Track Meeting. Contact John Wimble: 01797-362295.
 9 Sutton Coldfield MES. Auction. Contact Neal Harrison: 0121-378-3992.
 10 Norwich DSME. Meeting. Contact Paul Reed: 01603-462925.
 11 High Wycombe MEC. Bits & Pieces. Contact David Savage: 01494-527402.</p> | <p>11 Historical MRS (Sussex Area). An Evening with Bob Symes.
 Contact Terry Cole, 17 Coombe Drive Steyning West Sussex BN44 3PW.
 11 Leyland SME. Project Night. Contact Mark Entwistle: 01772-422411.
 11 N. W. Leicester SME. Gordon Smith: Safety Valves.
 Contact John Elliott: 01455-847040.
 11 Worthing DSME. Bits & Pieces. Contact Bob Phillips: 01903-700642.
 13 Leyland SME. LEYLEC. Contact Mark Entwistle: 01772-422411.
 13 Reading SME. Club Running. Contact Graham Bustin: 01189-615450.
 13 SM&EE. Rummage Sale. Contact David Boote: 01202-745862.
 13 Staines SME. Club Outing. Contact Mike Kingham: 01932-788793.
 13 Talylyn Railway. Victorian Train. Enquiries: 01654-710472.
 14 Basingstoke DMES. Open Day. Contact Ian Shanks: 01420-561741.
 14 Canterbury DMES. Open Day. Contact Granville Askham: 01227-463295.
 14 Gas Turbine Builders' Ass'n. Flying Event.
 Contact: Tom Wilkinson: 01508-570977.
 14 Guildford MES. Running Day. Contact Dave Longhurst: 01428-605424.
 14 Harlington LS. Exhibition & Open Day. Contact Peter Tarrant: 01895-851168.
 14 Hornsby ME. Running Day. Contact Ted Gray: 9484-7583.
 14 Lancaster and Morecambe MES. B. Woodward: Steam Safari to South Africa
 & Zimbabwe. Contact Harry Carr: 01524-411956.
 14 Leeds SMEE. Running Day. Contact Colin Abrey: 01132-649630.
 14 Leighton Buzzard NG Rly. Heritage Open Day. Enquiries: 01525-373888.
 14 Lincoln DMES. Running. Contact Paul Thompson: 01522-888228.
 14 Nottingham SMEE. Running. Contact Gerry Chester: 0115-9259096.
 14 Ottawa Valley Live Steamers. Steaming Day & Barbecue Lunch.
 Contact John Bryant: 761-1109.
 14 Oxford (City of) SME. Charity Steaming. Contact Chris Kelland: 01235-770836.
 14 Rugby MES. LBSC Memorial Bowl Competition 2003.
 Contact David Eadon: 01788-576956.
 14 Saffron Walden DSME. Running Day. Contact Jack Setterfield: 01843-596822.
 14 South Durham SME. Stephenson's Society Efficiency Trials.
 Contact B. Owens: 01325-721503.
 14 Sutton MEC. Track Day. Contact Mike Dean: 0208-657-5401.
 14 Sutton Coldfield MES. Garden Party. Contact Neal Harrison: 0121-378-3992.
 14 Talylyn Railway. First Class for Sunday Lunch. Enquiries: 01654-710472.
 14 Urmoston DSME. Open Day. Contact Alan Williams: 01925-762927.
 13/14 Bedfordshire Steam & Country Fair at Old Warden Park (home of The
 Shuttleworth Collection), Nr Biggleswade, Beds. Gates open 10a.m. Adults:
 £8, Senior Citizens: £6, Children: £4, Family: £20, Camping Weekend: £40.
 Contact Paul Worbey: 01462 851711.
 13/14 Birmingham SME. National Locomotive Rally.
 Contact John Walker: 01789-266065.
 13/14 Chesterfield MES. Steaming at Papplewick. Contact Mike Rhodes: 01623-648676.
 13/14 Claymills Pumping Engines. In Steam. Contact B. Eastough: 01283-812501.
 13/14 MELSA. Annual Competition, Display & Awards.
 Contact Graham Chadbone: 07-4121-4341.
 13/14 Northern Mill Engine Society. Open Days. Contact John Phillip: 01257-265003.
 14/15 Luscombe Valley Railway. Autumn Running Weekend.
 Contact Richard Knott: 01202-709833.</p> |
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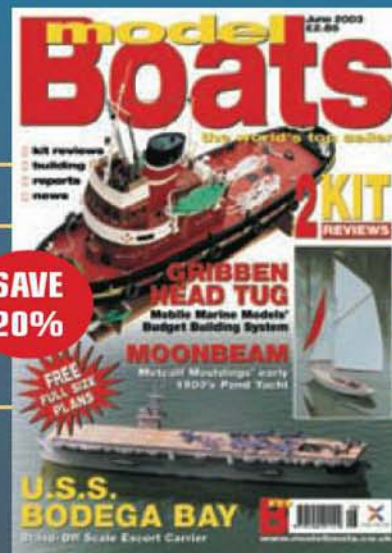
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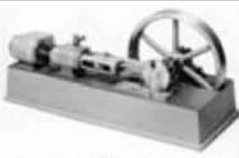


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Aimate Air Compressor 240v 3/4 hp 8 bar pressure controller moisture filter hoses blowgun tyre inflator £100.00. Tel: 01668 214572 (Northumberland).

Myford Super 7 gearbox clutch 3 & 4 jaw chucks tailstock chuck steady tools 4 way toolpost. £875.00 Tel: 01277 227640 (Brentwood).

Abwood 6" Swivel/Tilt Vice in excellent condition. £150 or best offer. Tel: 01270 587750 (Cheshire).

Milling Machine Wanted. Fair price for suitable

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Myford Super 7 Lathe with rotary centre plus many extras £980. Tel: 020 8903 4929, Mobile 077364 25463 (Wembley).

Myford Lathe ML7 cabinet 3 jaw chuck books etc. photo available via email. £1500 ono. Tel: 01926 842237 (Warwickshire).

Workshop Equipment Spark Eroder Disintegrator 16" x 18" table. Free standing 5mm 1" HSS in 3 mins. Single phas £850. Tel: 01252 842626 (Hants).

For Sale Myford ML7 Lathe also Littlejohn, Drummond & others. Private sale - offers invited. Cotnact: 01483 276909 / 07944926043 (Surrey).

For Sale, 6 inch jaw Burnerd chuck, studs, no back plate, £50.00 o.n.o. Please phone 0121 475 2022 (Birmingham).

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LATHES

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BOXFORD BUD 5" x 22" MK11, c/wheels, power cross feed, T-slotted cross slide.....	£1,400
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COLCHESTER BANTAM 1600 model, 5" x 20", geared head, power feeds, gearbox.....	£1,400
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COLCHESTER BANTAM 2000, 6 1/2" centre height x 30", between centres, 1 1/2" bore, 16 speeds, D13 camlock fitting, 3 & 4 jaw chucks in very nice condition.....	£3,250
COLCHESTER BANTAM 2000 as above but latest model made.....	£3,750
COLCHESTER STUDENT Square head, 1500 revs / 2 speed motor model, geared head, gearbox, imp/mot, power cross feed & gap bed, dual dials, 3 jaw chuck, taper turning, coolant, etc.....	£2,950
COLCHESTER MASTER SQUARE HEAD.....	JUST IN
COLCHESTER MASTER 2500; short and long bed lathes, well equipped.....	From £3250
CVA LATHE.....	COMING IN
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HARRISON 140, 5 1/2" x 24", geared head, gearbox, gap bed, power feeds, tooling, coolant.....	£1,725
HARRISON M250, 5" x 20", gearbox, power feeds, 3 & 4 chucks, E-services.....	nice condition £2,950
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CROMPTON PARKINSON HP, resilient mount, Boxford / Myford Super 7 Type motor.....	New £140



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Model B Super

£670



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

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Centurion

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



Conquest Lathe

£395



- Centre Height: 90mm
- Distance Between Centres: 325mm
- Large MT3 Spindle Taper
- Spindle Bore: 19mm
- Now C/W Quick Change Toolpost
- Variable Speed Range 100-2500rpm
- Metric or Imperial Leadscrews

626 Turret Mill

£1340



- Table Size: 156 x 745mm
- 1.5HP Motor
- MT3 or R8 Spindle
- Metric or Imperial graduations

Champion Mill/Drill

£585



- 1/2HP Motor
- Table Size: 150 x 630mm
- Complete with Drill Chuck & Arbor
- Ground Cast Iron Column
- MT3 Spindle

Craftsman Lathe

£1550



- Centre Height: 150mm
- Distance Between Centres: 570mm
- Swing in Gap: 450mm
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