

MODEL ENGINEER

Vol. 201 No. 4336

10–23 October 2008

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COVER STORY

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ON THE COVER...

The winner of the LBSC Memorial Bowl for 2008 was John Baguley, seen here with his 2 1/2 in. gauge, 3-cylinder, Helen Longish. Once again, the legacy of Curly Lawrence was celebrated in style with some fantastic locomotives and delightful company. Our coverage begins on page 436. (Photograph by Roger Bunce)

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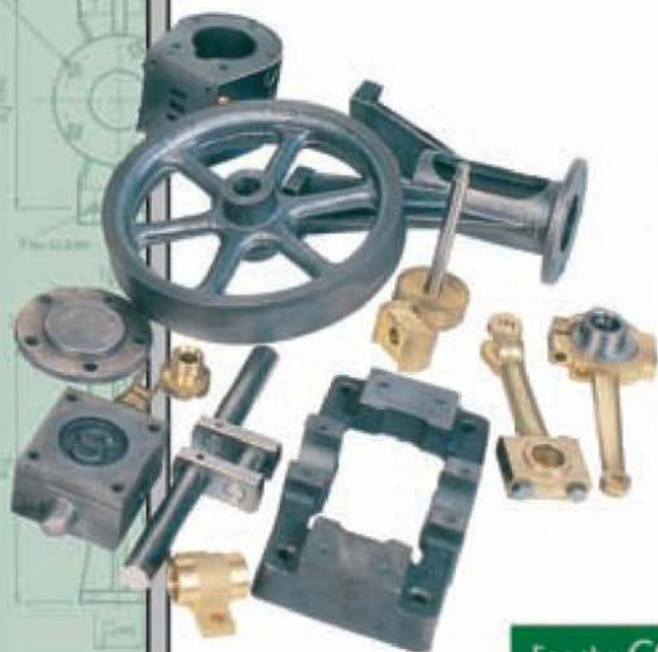
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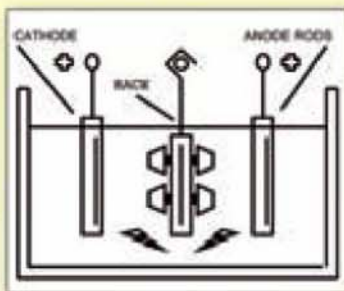
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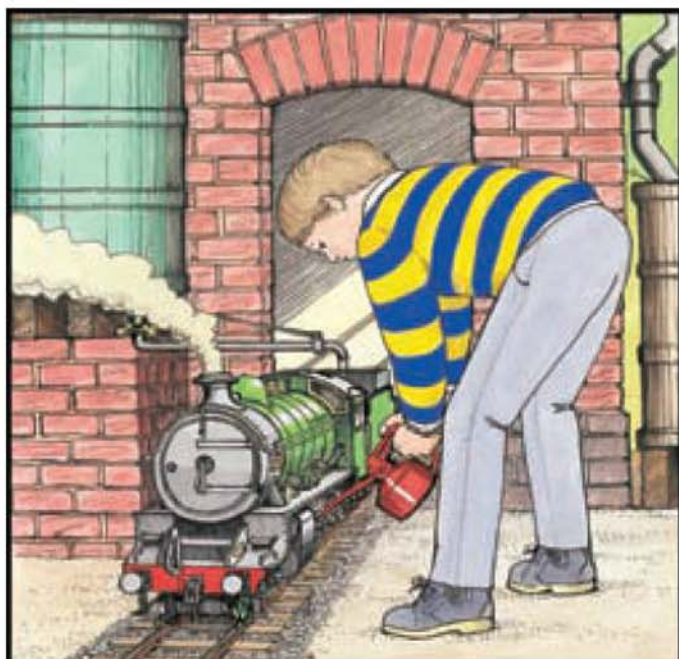
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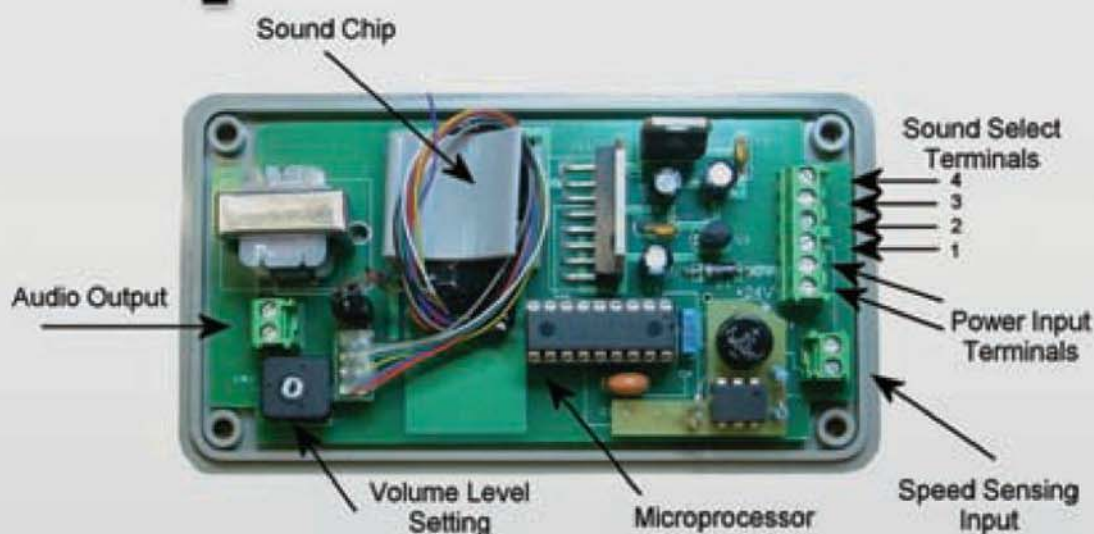
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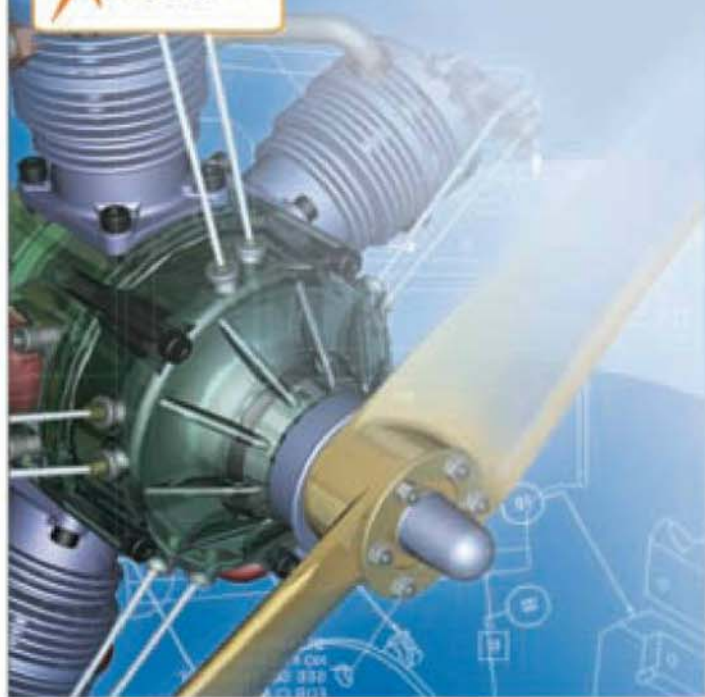
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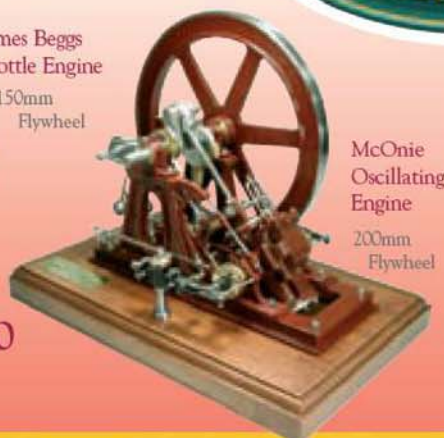


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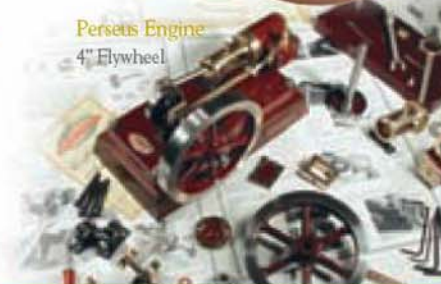
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The Model Engineer Exhibition at Ascot has just ended and a round of thanks is in order for the numerous people who helped make it a success. In the next issue, we will begin our coverage of this interesting event, but first a bit of acknowledgement of those behind the scenes who made it happen.

Terri Lock, the general exhibition organiser managed to get things to happen when they needed to. She was crucial to the event's success.

Gill Sheppard was instrumental in the challenging task of overseeing the check-in of the models. She has the admiration and heart-felt thanks of all the staff at Model Engineer for a hard job superbly done.

Our sincere thanks to all those who participated; traders, visitors, volunteers on club stands, and the competition judges ably headed by Ivan Law.

The Society of Model and Experimental Engineers had a busy and interesting schedule of lectures and demonstrations and all who visited their stand were impressed. Stuart Walker, stand manager, and Mike Chrisp, the chairman of SMEE, were both instrumental in many ways throughout planning and operation of the exhibition.

At the Sinsheim track opposite the grandstand, Hans Schrupf, the track master from Messe Sinsheim in Germany, and his associate Arnold Münchberger spent two and a half days before the exhibition with a crew of eight, energetic lads setting up the track.

Most especially our thanks go to the visitors whose interest in the Model Engineer Exhibition made all the effort worthwhile.

Engineers Emporium and Model Works

Engineers Emporium has announced the acquisition of the stock and designs of the 5in. gauge locomotive range of Model Works International Sales Ltd. They will support customers old and new.

The designs are currently being reviewed to improve quality; manufacture of parts will commence shortly. Spares and kits to complete outstanding orders will be available as well as upgrades to previous kits.

T. 01455 220340 (9-3 daily) or leave a message or email info@theengineersemporium.co.uk

Neil Shackleton Hemingway 1932 - 2008

Neil S. Hemingway, born on 2 September 1932 in Rochdale, Lancashire, attended Rochdale Boys Grammar School before completing his national service in the RAF as a radio operator. He later gained an honours degree in chemistry and worked as an industrial

chemist before becoming production manager at Bayer Dyestuffs, UK in Altrincham, Cheshire.

In 1976 Neil took voluntary redundancy and started his business, NS & A Hemingway, born out of his lifelong hobby of model engineering. He was a member of SMEE and also the Rochdale Society where he was the longest serving member for over 47 years.

Neil introduced to the hobby a range of workshop kits and accessories produced kits containing everything the model engineer needed to complete a project from steel to springs and screws, without having to source the materials themselves.

He built up a world-wide customer base for his business and was always happy to talk to and give freely of his time and knowledge to those in need of help. Neil himself was an able model engineer and spent much time in the company of George Thomas, Dennis Chaddock, Ivan Law and Tubal Cain discussing the vagaries of

model engineering, often until the early hours.

His other interests included his long-standing and committed membership of the Masons, he was the Worshipful Master of his lodge in 1980. He also had a keen interest in amateur radio, gaining the Certificate of Radio Amateurs Examination in 1988.

He was immensely proud of his relationship to Ernest Shackleton the explorer and was researching the genealogy of Robert Butterworth, another relative, up until his death.

Neil, a modest man, was devastated by the sudden and unexpected death, in 2002, of his beloved wife Audrey. He gradually withdrew from the world he had so much enjoyed and finally moved to Littleborough in 2007. He is survived by his daughter, Jane.

He died peacefully in hospital on 6 September 2008 after a short illness.

Model engineering has indeed lost a true friend, he will be sorely missed by all those who knew him.



Locomotive lubrication

SIRS, - I have recently completed a GWR Metro locomotive in 5in. gauge and my friend Stanley Lutton has finished, apart from painting, a Holmside in 7½in. gauge.

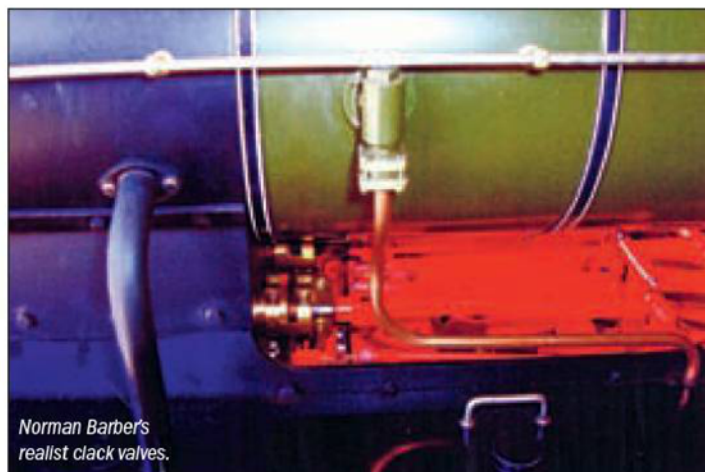
Both have inside valve gear and saddle tanks or side tanks. In full-size, lubrication of this gear could be carried out by climbing between the frames. In models the situation is far different. In fact it is virtually impossible to see, let alone apply oil to all the pivot points. We both wonder why on earth we ever made such difficult to lubricate locomotives. We have certainly vowed that never again will we make this type of locomotive. However, we have to somehow to overcome this problem.

Trying to make flexible pipe connections to a visible area is really not feasible. Turning the locomotive on its side before running it does not appeal. It crossed my mind recently that modern motor cars do not require the lubrication that once was the case. On earlier cars the king pins were often in need of replacement even though they were regularly greased. Could we learn from this and use different modern materials in place of phosphor bronze for bushes. Has any reader faced this problem and found a satisfactory solution? Are there any experts out there who can suggest a material which will take the wear and not require any lubrication?

Stephen Atkinson, Belfast.

Boiler clack valves

SIRS, - In his article on Stowe (M.E. 4330, 18 July 2008) Neville Evans makes the point that the injector clack valves are highly conspicuous features of the locomotive and present a problem of compromise to achieve scale appearance and functional ability. This is of course a problem which arises with many locomotives. Neville offers two designs, one incorporating bolted flanges as in the prototype and achieving scale appearance and the other



employing the 'conventional' model engineering approach using what he describes (quite correctly) as a more practical but rather unsightly union and cone. May I suggest a compromise which I incorporated in my *Maid of Kent*. This is, of course an LBSC design and makes no claim to scale. It is, however, based on the Southern Railway L1 class which was fitted with clack valves very similar to the 'Schools'. I did not like the idea of totally unrealistic union nuts on the clacks but did not fancy the very fiddly bolted flange configuration of the prototype. I therefore used a conventional nut and olive connection with the nut made to represent the flange connection, based on photographs of the prototype. The size of the flange is ½in. A/F which is the same size specified by Neville for Stowe. It is inevitable, of course, that when tightened the square flange finishes up in the wrong orientation. I overcame this by fitting a small washer made of soft solder behind the olive. The union nut could then be tightened to the required orientation by compressing the washer.

Norman Barber, Essex.

Pure boiler water

SIRS, - In *Post Bag* (M.E. 4331, 1 August 2008) Ron Bettell raises the possibility of using de-ionised water in boilers and mentions a source employed by his window cleaner.

Another source is a car-washing device sold under the 'Plash' brand name for about £19. This is, connected to an

ordinary hose and can be set to supply plain tap water, tap water with detergent or de-ionised water in the form of a fine spray (via an internal filter) to rinse down the car after washing. The paintwork is left shining and streak free with no need for leathering off.

I have been using one of these gadgets for some time and it really does work well so maybe it could be used to provide clean and lime free boiler water.

Ron Wright, Surrey.

Offset turning (1)

SIRS, - David Lockley's letter (M.E. 4332, 15 August 2008) is not in fact correct, as he makes the assumption that the ends of the chuck jaws are planes perpendicular to the travel of the jaws, which is not so. The jaws are in theory pointed, but in practice have a small near-flat cylindrical portion on the point of the jaw, which does affect the calculation slightly. (On my Burnerd Griptru chuck, this 'flat' is about ¼in. across, whereas on my Czech TOS chuck it is about ⅓in.).

If the more correct assumption of jaws with a pointed end is used, the offset can be calculated as follows (see **fig 1**):

Draw a circle representing the work-piece, and another circle with three lines representing the jaws. Where the three jaw lines meet is the axis of rotation. Now the work piece circle is offset straight down by the amount of offset desired, and the packing is inserted under the top jaw. You now have the triangle shown in

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the figure, with the two angles A and B. Solve for the hypotenuse (jaw radius) and then subtract from it the radius of the part. This gives you the distance (radially) that the jaw had to open to produce the required offset. Add this distance to the amount of offset and you have the thickness of the packing shim needed between the 12 o'clock jaw and the work piece.

From the Sine Rule for solving triangles ($a/\sin A = b/\sin B = c/\sin C$):
 $\sin A = (\text{Offset} \times \sin 60) / \text{Radius of work piece}$
 $B = 180 - (60 + A)$
 $\text{Radius of jaw} = (\text{offset} \times \sin B) / \sin A$
 $\text{Required shim } T_s = (\text{Radius of jaw} - \text{Radius of work piece}) + \text{Offset}.$

Suppose we have a 1in. dia. work piece and a desired Offset of 0.100in.

$$\sin A = (0.1 \times \sin 60) / 0.5 = 0.173$$

$$\arcsin A = 9.974 \text{ degrees}$$

$$B = 180 - (60 + 9.974) = 110.026$$

$$\text{Radius of jaw} = (0.1 \times \sin 110.026) / 0.173 = 0.542$$

Thus, required shim thickness $T_s = 0.142\text{in}.$

This relatively simple method of calculating the offset by trigonometry was sent to me by Richard Egge of the 'Little Engines' website in Atlanta, after I had worked out my own algebraic formula for calculating the offset, which involved two or three pages of algebra! That formula was given in my article on constructing my Rail Rolls (M.E. 4319, 15 February 2008, p207), and although expressed differently from Tubal Cain's formula, it gives the same result. Note that the size of the packing is not independent of the size of the work piece.

David Lockley's 'rule' of the packing needing to be 1.5 times the desired offset, does in fact work where the work piece is hexagonal rather than round, because the planes on the contact surfaces are, and remain, perpendicular to the chuck jaws, and this in effect validates in reverse his assumption of the

flat ends of the jaws, and it is also independent of the size of the hexagon bar (see **fig 2**). But using it for a cylindrical work piece of, for example, 5.5in. dia., a packing of 0.75in. will give an offset of 0.525in., not 0.5in. This is easy to see on a CAD system by construction, but a calculation using either formula will confirm it. Note that the two unpacked jaws do not now meet the surface of the work-piece at 90deg., but at just under 81 degrees.

In practice, with the calculation of the packing thickness either by the above method, or (for those for whom trigonometry is a no-no) by either Tubal Cain's or my own formulae, the error resulting from the slightly flattened jaw ends is usually negligible.

If you use this method, always check the eccentricity with a DTI before making a cut. If, rarely, the ultimate accuracy turns out to be really important, then the solution is not to use a 3-jaw chuck at all: set up the work by DTI in the 4-jaw instead.

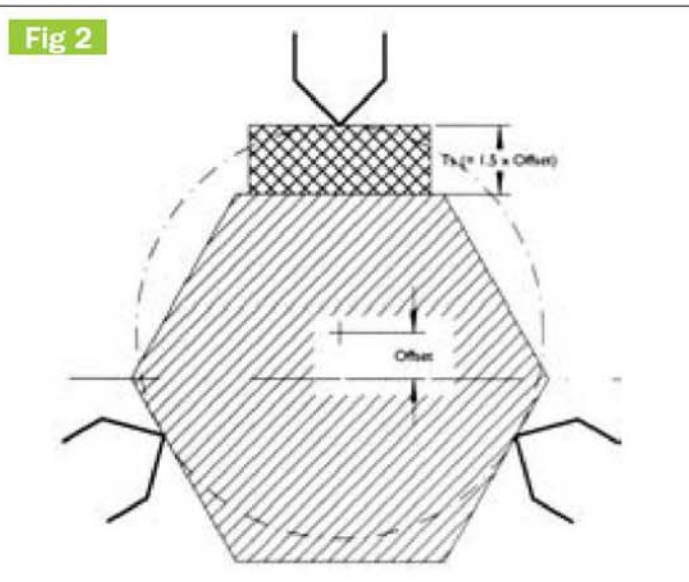
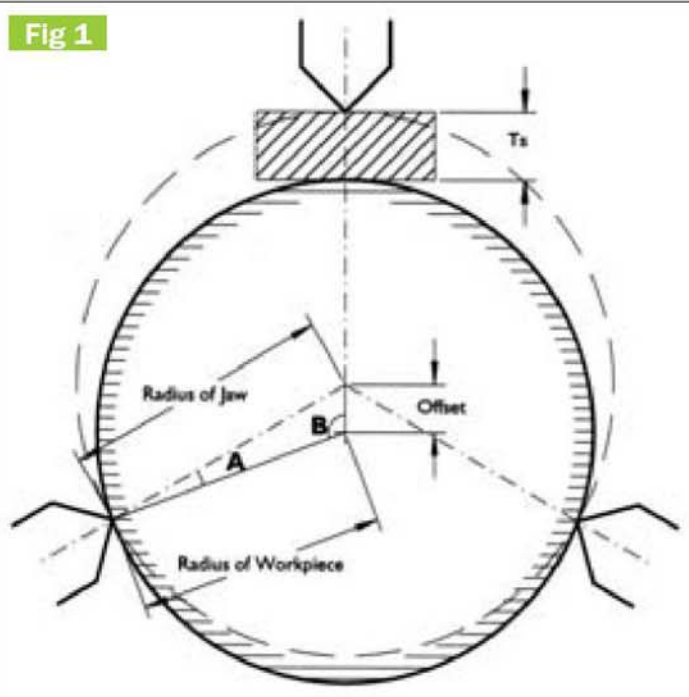
Tony Finn, East Riding of Yorkshire.

Offset turning (2)

SIRS, - The previous correspondence on the subject of calculating the correct thickness of packing for offsetting round work in the 3-jaw chuck was mathematically correct and should have closed the matter. Mr. Lockley (M.E. 4332, 15 August 2008) has invented his own geometry to simplify matters further. While I am pleased to see total freedom of expression in M.E., I find it disturbing that no editorial 'caution' comment accompanied the letter, especially as it is impossible for both your previous contributors and Mr. Lockley to be right.

I can supply you with any number of fallacious proofs such as that all triangles are isosceles, that $1=2$, etc. The question remains as to whether you would publish them "in good faith" or whether your technical staff would cast an eye over them first?

Michael Wheelwright, West Sussex.



Tony Finn's offset turning diagrams.

The letters pages are for reader's comments, theories and views, but where possible we do check for errors and will check with the writer if we think something is amiss.

We do not believe there is an error in David Lockley's method as described; he makes an important statement in his last paragraph that "the jaws must be wide enough to accommodate the new lines of action". What he is saying is that the face of the jaws must always be tangential to the bar being turned. If this is the case his method holds good, but

its usefulness will depend on the size of the flat on the jaws. As Tony Finn, points out, the method holds true for hexagonal stock with the same proviso.

The problems occur when the offset is large enough to cause the grip to be taken on the corner of the jaw face, not the flat. Once that happens, Mr. Lockley's calculation no longer applies but Tubal Cain's calculation in his Model Engineer's Handbook does.

Tubal Cain's method is in fact incorrect if the eccentric is being gripped by the flat of the chuck jaws; it has the un-stated

The big advantage of these methods is repeatability, once you have found the correct packing to use with a particular

In any case, model engineers don't abuse their 3-jaw chucks by putting sideways loads on the jaws in this way, do they? **Ed.**

SIRS, - I would like to reinforce the comments of Bob Cooper (M.E. 4332, 15 August 2008) regarding the Shell ECO-Marathon.

It is a theory and a practical skills competition where the engineering is of a size we might think of as modelling, although the vehicles must carry their own driver, usually the most diminutive team member.

Many branches of engineering are brought together from engine design and construction through chassis engineering to aerodynamics. The standards are high although entrants are encouraged from many levels of age and skill.

The current record holders are team **Microjoule** from St.



Sebastien/Loire in France who have achieved a staggering fuel consumption figure of 10,705 miles per gallon with a hugely optimised gasoline fuelled I/C design. Typical engines are of less than 50cc and may run on a variety of fuels including gasoline, diesel, ethanol, LPG, hydrogen and so on.

At the last event I attended I was particularly impressed by a student made hydrogen fuel celled vehicle and the innovation in many of the designs is very refreshing and shows a wide range of ideas well carried out in practical designs with good mechanical implementations.

The ECO marathon is a growing set of events with competitions now held in the USA, Europe and the UK. Information and rules are available from www.shell.com/eco-marathon/ and I can certainly commend interest in the activity to any model engineer.

Leafing through some Model Engineers from the 1930s the other day I noted several designs of variously powered light cars so the experimental vehicle engineering of the ECO Marathon (I have no commercial connection) should not be outside of M.E. reader's scope.

Paul J. Weighell, Surrey.

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Tim Coles' gas turbine powered locomotive, a model of the BR experimental GT3, was run on the Sinsheim track at Ascot during the Model Engineer Exhibition. (Photo by Michael Jones)



Barry Hares' magnificent
Rolls Royce Eagle 22
Supercharged Aero Engine
* Gold Medal winner and
winner of the Bradbury
Winter Trophy, at the Model
Engineer Exhibition 2008.
(Photo by Roger Bunce)



Old Wine in New Bottles

John Wilding MBE

FBHI describes how to convert a pigeon racing timing machine into a high quality domestic timekeeper.

A Toulet Imperator

Some years ago I did a series called *Old Wine in New Bottles* for one of the horological journals. It dealt with the problem of clock movements which had lost their cases, especially the good quality French drum clocks which often were housed in plaster or stone cases, which used to break easily and then the owner would be left with a good quality movement without a case. I produced several designs for giving these movements a new lease of life (ref 1).

1 & 2. Finished conversion fitted with the Daisy Wheel Motion Work



Recently a friend of mine, who is a pigeon fancier and involved in pigeon racing, brought me his timing machine which all racing members must have. He told me that these clock movements have now been declared obsolete and replaced by modern quartz digital movements plus some other sophisticated modifications. When my friend gave me his timer he said, "If it is any good to you, you can have it, otherwise put it in the dustbin." On opening up the

timer, I found that the actual clock was a beautiful Swiss movement of the highest quality in all respects. I decided that on no circumstances could this clock be 'put in a dustbin'; all it needed was a new 12-hour motion work, and then mounting between two vertical supporting pillars under a glass shade to give it a new lease of life as a domestic timekeeper.

Photographs 1 and 2 show the finished clock fitted with a silvered dial and four brass numerals. In **photo 3** you can





you are thinking the movement was French is more likely to be because of the platform escapement. The original was an 18 train, where as we had to resort to a French manufacturer who only produced a platform escapement with a 32 train - a very quick ticking action.

I hope this information is of some help. I will be interested in hearing how your efforts to use the movement for an ordinary clock turn out."

David Carpenter

"How were they used?

For each race a rubber ring is placed on the leg of the pigeon at the local club, using a machine called 'a ringer'. The pigeons are then all placed in baskets and sent to the race point. Distances are up to 200 miles for a sprint, 200-400 miles is middle distance and beyond that, even to more than 700 miles, is long distance. The pigeons are liberated together, and fly home. Speeds can be up to 60mph, local club races may have a few dozen pigeons racing but Combines such as the Up North Combine may have tens of thousands racing.

On arrival at its home loft, the rubber ring is pulled off the pigeon's leg and placed in a 'thimble' which usually has a lid. The thimble is placed in a hole in the clock case, and the clock is 'struck' by pulling a lever. That has two effects. The thimble is drawn into the clock where it is held securely so that it cannot be tampered with. Secondly, an arrangement of levers with a pin on the end is depressed and punches a hole in a printed circular paper dial. A new set of dials is used for each race. Your Toulet clock had two dials. Some clocks had three. Your clock could time in up to 12 birds. I would think tens of thousands were sold in the UK, Belgium and elsewhere.

Before the race the clocks are 'set'. Keys are usually held at the club organizing the race, and clocks were wound before the race. They were then 'struck' in unison to perforate the dials to be used in the race. In days gone by clocks were struck to coincide with the



movement with its two dust covers: one for the movement and the smaller one for the balance assembly.

Finally, in **photo 6** you can see the movement together with the 24-hour motion work, not required in this conversion.

Before I started work, I wrote to the Editor of the *British Homing World* asking for more information on how these clocks were used. He published my letter and I had two most helpful replies: one from Major Claude Hill, who was very much involved with the manufacture and servicing of the original clocks, and the other from David Carpenter, editor of *Model Engineer*. These letters give so much information that I thought I would include them both in this article:

Major Claude Hill

"The Clock is a Toulet Imperator 12 Bird Puncture Clock in a Brass case. The clock was manufactured in Belgium in the 1920s, by a Mons Henri Martens. The Automatic Timing Clock Co was established in the 1920s for the sole purpose of importing, distributing and repairing these clocks. I have to tell you your movement is 100% Swiss made. The movement is for eight days but does run beyond this. It is more likely that the movement you have was at some time in its life sent to the ATC for repairs or cleaning. In 1972 I took over the management of the ATC. Gurrard Bros, the manufacturers of the movement, indicated their intention to retire. Since we had taken over the manufacture of the Toulet Clock, the Gurrard Bros agreed and offered to produce sufficient movements to cover the new stainless steel case we were introducing. The reason

3. Paper dial glued to a brass backing ring.

4. Case into which the clock movements were fitted.

see a paper dial cemented to a brass backing disc, but this is generally too large and not aesthetically pleasing.

Photograph 4 shows the case which contained the movement and other operating components, and in **photo 5** the actual

'pips' giving the time on the radio. Clubs have a 'master' clock; a highly accurate version of a pigeon clock minus the striking mechanism and with a conventional dial. Once struck the clocks are sealed using a lead seal so that they cannot be tampered with.

After the race, the clocks are 'struck' again, to give two references to permit adjustments to be made to the calculations to allow for any slow down or speeding up of the clock during the race. The dials are removed and the pin pricks are matched to the appropriate rubber ring numbers giving the time for each bird.

Of course the distances flown vary from loft to loft. It is the role of the Royal Pigeon Racing Association to determine distance from flown race points to individual lofts. Until recently this was done by locating loft positions precisely using the largest scale Ordnance Survey maps. GPS is being used now for new distances, though it is not quite as accurate as the old map method.

Knowing the exact distance flown (within a yard or so) and the exact time taken, the speed is calculated in yards per minute. Quickest wins.

Early clocks were quite crude, had no dials and the clock was simply stopped when the pigeon arrived home.



5. Movement after removal from the case with its two dust covers.

6. Movement with the original motion work removed.

Cheating was not unknown, and clocks became more and more sophisticated to thwart the cheats. Various methods were used, including standing the clock at different angles before and after the pigeons were timed in, using magnets, heating and cooling the clock, and more. So these movements had to be pretty good to beat the cheats. Each clock is tested before the start of the racing season to make sure that it cannot be speeded up/slowed down. The Royal Pigeon Racing Association publishes a Clock Setter's Guide for anyone interested in the complexities. Setting regulations vary for

each type of clock produced by each type of maker.

I remember my father telling me in the 1950s that the movements were sufficiently good when properly adjusted, to be taken by some unscrupulous people and converted into fake marine chronometers. They, of course, were worth a multiple of the value of a pigeon clock.

The Toulet Emperor was THE clock of its day. They were produced in tens of thousands either side of the War and right up to 1972. In those days not all individuals owned their own clocks, I guess a new Toulet would have cost at least a week's wages for a working man, and generally not affordable. Indeed before the war it was quite usual for one fancier to use another's clock, and was allowed a 'running time' to sprint from his loft to the other.

Fortunately they are so good that during a clock's lifetime it would have several owners so that you have the strange situation where most clocks were second hand. They continued to give good service, with overhauls by specialist firms, for decades. Now they can be picked up for £10 or so, usually in full working order in its original wooden case. I think the last price for an overhaul was about £70 for a mechanical clock like the Toulet.

There were dozens of other makes of pigeon clock, and the

vast majority can be found on the website www.pigeonclocks.com run by a young man called Gerwin Basch who has a massive collection in Holland. There are two basic types, the puncture clock and those that print on paper rolls. In recent times clocks have been electronic, and just this year the RPRA has started to allow the use of computerised electronic timing systems in which the rubber ring is replaced by an electronic one. This move is not popular with many fanciers who cannot afford them and who are disadvantaged through time lost using conventional clocks."

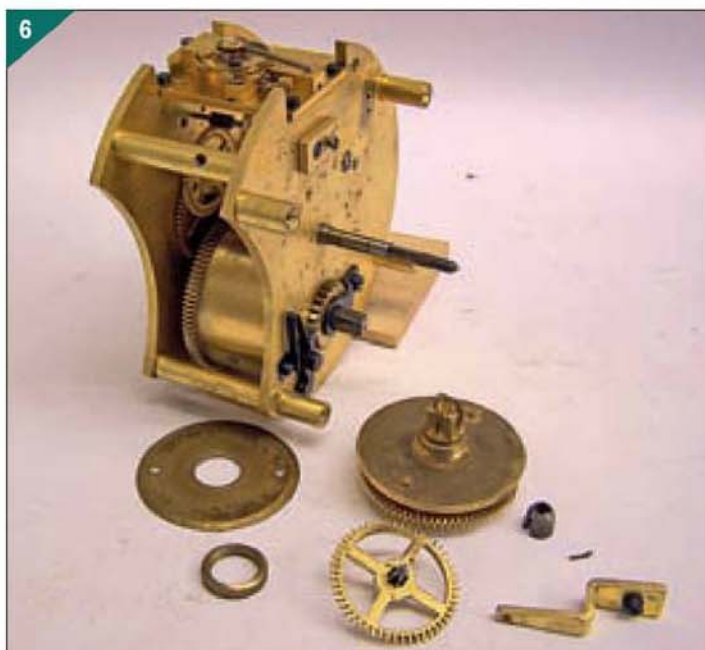
Next article

In my next article I will begin to describe how to convert the Toulet Emperor into a domestic timekeeper.

●To be continued.

Reference

1. The book covering these conversions is entitled *Clock Reconstruction and the Rehousing of Discarded Movements*, available from Ritetime Publishing Ltd, T. 01420 487747.



LBSC's *Tich* has introduced more people to model locomotive building than any other design. Although not taking part in the competition, on display was this fine example - *Maid Marion* made by J. H. Balleny of Birmingham. This is the actual model that appears on the dust cover of LBSC's book: *Simple Model Locomotive Building... introducing LBSC's TICH*, first published in 1968.



The LBSC Memorial

Roger Bunce reports on the annual event that celebrates the life and work of LBSC.

1. Although not taking part in the competition, there was a guest appearance of LBSC's most famous locomotive - Tich. This historically important example - Maid Marion was made by J. H. Balleny of Birmingham.

2. Judge Peter McMillan inspects Hielan Lassie.

3. Carl Jones driving Hielan Lassie.

4. Richard Smith raising steam on P V Baker.

5. Richard Smith driving P V Baker.

The LBSC Memorial Bowl, or 'Curly Bowl', is a Light-hearted celebration of the legacy of Curly Lawrence (LBSC), the most prolific and famous small locomotive designer of the 20th century.

This year's competition was held on Sunday 7 September and was hosted by the **Sutton Coldfield Model Engineering Society** at their Balleny Green Track. The day before there was torrential rain and many areas of the West Midlands were flooded. Thankfully, by Sunday, the rain had stopped and most of the floods had subsided.

There were six competitors with four 3½in., one 5in. and one 2½in. gauge locomotives.

In addition, although not in steam, we were very pleased to see LBSC's *Tich* - *Maid Marion* (photo 1). This is the locomotive that appears on dust cover of his book: *Simple Model Locomotive Building... introducing LBSC's TICH*. This fine locomotive was made by local man, J. H. Balleny of Birmingham.

The judges for this year's competition were: Steve Eaton - Chief Judge, assisted by Michael Law and Peter McMillan. Just to remind readers about the competition: the locomotives must all have been designed by LBSC. Each locomotive is inspected by the judges 'cold' and during steam-up and the

judges chat informally to the driver. The driver then takes the locomotive around the track for a few laps to make sure everything is in order. He then hands the locomotive over to each judge in turn who drives it around the track. The Bowl is awarded to the entrant whose locomotive best meets the aims and objectives of LBSC's design. The competitors in running order were:

Carl Jones

Carl was the first competitor and the youngest driver in the competition - good to see the young folks. Carl belongs to the **Birmingham Society of Model Engineers** and was driving a 3½in. gauge *Hielan*



Bowl 2008

Lassie, 4-6-2 (photos 2 and 3). The locomotive belongs to Carl's niece. It was partially completed in the 1950s but ran without a tender. Carl was asked to 'do it up'. This involved making the tender body and fitting it onto the frame. Carl is currently building his version of *Grosvenor*, the tender is finished - the rest is still in his computer. In contrast, his lathe is a 1902 Drumond which was originally treadle driven. As he said, "does the job." For his day job, Carl designs special purpose automatic machines. A recent project was a machine that makes 1,000 tea bags per minute!

Carl was awarded Second Place in the competition.

Richard Smith

Richard belongs to the **Wolverhampton and District Model Engineering Society** and was driving his 3½in. gauge *PV Baker*, 0-6-0 (photos 4 and 5). He was delighted that the locomotive performed just as well for the judges as it did for him, and said, with a grin, "see, it wasn't just a fluke!"

His interest in locomotives began after reading an article by LBSC in an old magazine about making a garden railway. He bought a set of castings for the locomotive about 20 years ago and, with no engineering





6. Judging Mona, left to right: Michael Law, Steve Eaton and Peter McMillan.

7. John Prichard driving Mona.

8. Bob Bates in conversation with Steve Eaton and Michael Law over Speedy.

9. Bob Bates driving Speedy.



and built a 5in. gauge *Mogul* and then a 7½in. gauge *Dart*. Richard resurrected the *Baker* earlier this year and 'hey presto' it worked! His parting words, "at least I can pick it up and put it in the back of the car."

John Prichard

John also belongs to the Wolverhampton and District Model Engineering Society and was driving Mr. Ron Haddock's 3½in. gauge *Mona*, 0-6-2T (photos 6 and 7). John admits to being a novice with 3½in. gauge, but thought the engine performed very well in spite of that. The drawings and castings for the locomotive were found amongst some workshop equipment about 30 years ago. A club member began the work

and Mr. Haddock finished it off. Sadly, Mr. Haddock is ill, but very pleased that *Mona* was competing in Curly Bowl. *Mona* has not had many outings and was taken out of mothballs especially for the competition.

John considers himself a 'tinkerer'. He couldn't wait to get on and drive a locomotive so he bought a 7½in. gauge *Bridget* which he recently overhauled, including fitting a new boiler. He is currently building two 7½in. gauge *Sweet Williams*. 'In a previous life', John worked for BR as a fireman, out of Stafford Road - a job that he loved immensely.

Bob Bates

Bob is a member of the home club the Sutton Coldfield Model

Engineering Society and was driving his 5in. gauge *Speedy*, 0-6-0T (photos 8 and 9). He had no problem raising steam, did two laps and handed it over to the judges. Bob bought the locomotive about three years ago and had to replace the superheaters, which had blown. This was a major job and involved taking off the boiler and removing the smoke box. The wet header was a problem to remove because the studs were 'frozen solid'. Bob fitted stainless steel superheaters in the hope that these will last longer. These have been extended into the firebox to form radiant superheaters. He has also replaced the 'waxed' cotton piston packings and glands with square section

experience, soon realised he needed a lathe!

The *Baker* was originally designed as a tank engine. However, at the end of the series it mentioned that, if one wanted a tender engine, one needed to cut 1½in. off the length of the frames and build a tender and cab to suit! The *Baker* took about seven years to complete but when it was finished it didn't work very well so he shelved it



PTFE and is just a bit concerned about the effect of the higher temperature superheat on the packings. However, it is eight months since he first began to run regularly for birthday parties so it's probably not that much of a problem. Bob commented that the chap who built the locomotive did a splendid job and had incorporated additional features from the start rather than fitting them later as 'add-ons'. Bob's interest in locomotives runs in the family; his son works for the Hunslet Engine Company who make narrow gauge 'full-size' locomotives. This gives Bob the opportunity to drive 'the big stuff'.

Bob was awarded Third Place in the competition.

Peter Wardropper

Peter is a member of the **Society of Model and Experimental Engineers** and was driving his 3½in. gauge *Maisie*, 4-4-2. There were a couple of minor problems on the day: the axle pump refused to work (probably a stuck ball valve), and the regulator was stiff (**photo 10**). Nevertheless, the locomotive made lots of good runs for Peter and the judges. After the official judging Peter was seen 'whizzing' around the track with his wife as passenger (**photo 11**).

The engine was begun in 1938 by Dudley Harris and his son Ron continued the work (better known for his model I/C engines). Peter bought it from Ron in 2000. There were some

pieces to be finished off, and the boiler was not fitted, but it was a running chassis. Asked if he had made any changes to the original design, Peter pointed out that there was a mistake on the original drawings - the boiler length is about ½in. too long! This makes the smokebox very crowded. Peter could have extended the smokebox forward but didn't think that looked right. Instead, he kept it back and used a cranked blast pipe. In order to improve accessibility, he split the smokebox horizontally so that the top can be removed.

John Baguley

John is a member of the **National 2½in. Gauge Association** and was driving his 2½in. 3-cylinder, *Helen Longish*,

10. Peter Wardropper in conversation with Michael Law and Steve Eaton over *Maisie*.

11. Peter Wardropper and his wife take to the track after judging.

12. John Baguley aboard *Helen Longish*, cheered on by fans!

13. John Baguley with *Helen Longish* - winner of *Curly Bowl*, 2008.

4-8-4T (based on *Helen Long*) (**photos 12 and 13**). John said he was very please with the way the locomotive performed and said it ran just like a little sewing machine!

The original design was by James Joslin (Canada). He drew out quite a few 'larger' 2½in. gauge locomotives, but he hadn't a workshop of his own



LBSC MEMORIAL BOWL



14. The competitors left to right: Bob Bates, John Baguley, Carl Jones, Richard Smith, Peter Wardropper and John Prichard.

15. A Joyous John Baguley - Winner of Curly Bowl, 2008.

16. Time to celebrate!

so LBSC built it for him. LBSC first built the chassis and sent it to Joslin. Then he built the boiler and sent that over. Joslin put the 'bits' together.

John began the locomotive about three years ago. *Helen Long* had been described in *M.E.* in 1930, but John said that trying to make it from the old article was 'a bit hit an miss'. The original drawings had been lost over the years so John's first job was to make new drawings. John intends to publish these in the *National 2½in. Gauge Association*.

The firebox is 6in. long - half as long as the boiler. The reason for this was to maximise

the heating effect without use of a combustion chamber. John wasn't sure if there would be sufficient steam because the three cylinders are each ⅞in. dia., which is large for a 2½in. gauge but, in fact, there is plenty of steam. For John's next project he fancies something a little more substantial and is building a 5in. gauge *Simplex* for passenger hauling at his local club. He says 2½in. gauge are very nice but 'fiddly', and particularly demanding on the eyesight.

John was awarded First Prize and the LBSC Memorial Trophy, 2008.

A word from Steve Eaton - Chief Judge

"After my 10 year apprenticeship with Denis Monk, this was my first Curly Bowl as Chief Judge. We were very pleased by the turn out and the quality of the engines - they just seem to get better and better. We had no problem finding a winner - it was a unanimous decision. Incidentally, there have only



been four 2½in. gauge winners since the competition began in 1969. The second and third places were more difficult, with only a few marks between them.

Our judgement must obviously be guided by the legacy of LBSC. He wanted to design model locomotives that were simple to build and enjoyable to drive. 'The drive' was particularly important when we came to assess the locomotives. As far as the 'hardware' was concerned, we were not looking for exact compliance with 'the words and music'. LBSC built the locomotive and then did the drawings for *M.E.*, so there were differences between 'his own locomotives' and the published designs. In short, we were looking for outstanding models in the spirit, but not necessary 'to the letter', of LBSC."

Winners

The competitors are shown in **photo 14**. The winners were announced by Neal Harrison, President of the Sutton

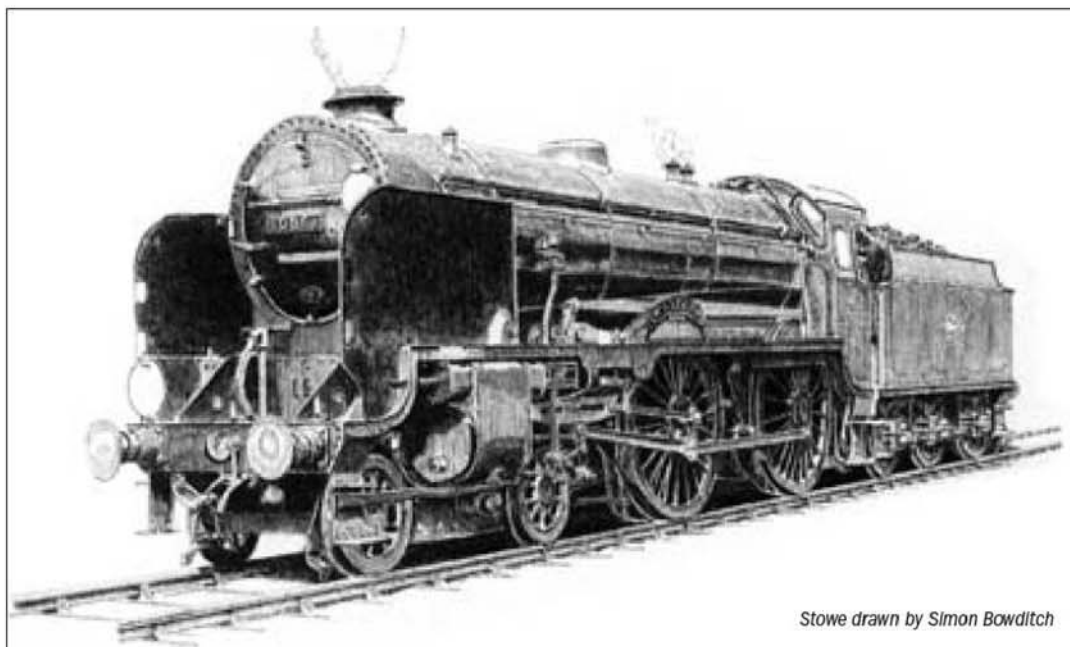
Coldfield Model Engineering Society. Third Place went to Bob Bates with *Speedy*. Second Place went to Carl Jones with *Hielan Lassie*. First Place, and winner of the LBSC Memorial Trophy for 2008, was awarded to John Baguley with *Helen Longish*. Roger Bunce (Technical Editor) presented the 'Curly Bowl' to John on behalf of *M.E.* (**photo 15**).

Model Engineer wishes to congratulate the winners and thanks all who took part (**photo 16**). Thanks go to SCMES for hosting this year's competition and making it such an enjoyable occasion. Special thanks go to the catering team for sustenance throughout the day, and to Neal Harrison who was largely responsible for organising the event.

Once again, the legacy of Curly Lawrence was celebrated in style: little locomotives, coal, steam, oil, chatter, laughter... all washed down with steaming mugs of engine driver's nectar!

ME

STOWE - Southern Railway Schools class locomotive



Stowe drawn by Simon Bowditch

Neville Evans considers the merits of tanks and tenders before describing the model tender.

Continued from page 328 (M.E. 4334, 12 September 2008)

The provision of a suitable tender is an obvious necessity with any locomotive that doesn't carry its own fuel and water. Unfortunately, said tender is an almost unmitigated nuisance. It is heavy, which reduces the revenue-earning payload that the locomotive can pull. It adds nothing to the adhesive weight of the engine and extends its length, so that far longer turntables have to be provided. It is also a rather expensive item, with its complex springing and braking systems. The alternative, which is of course the Tank Engine, carries its own crop of problems. The most obvious of these is the fact of limited capacity, which means limited range. Not really such a bad thing in itself as the local trains for which most Tankers were intended ran on shortish lines with adequate refueling facilities, and the trains were quite small and slow moving.

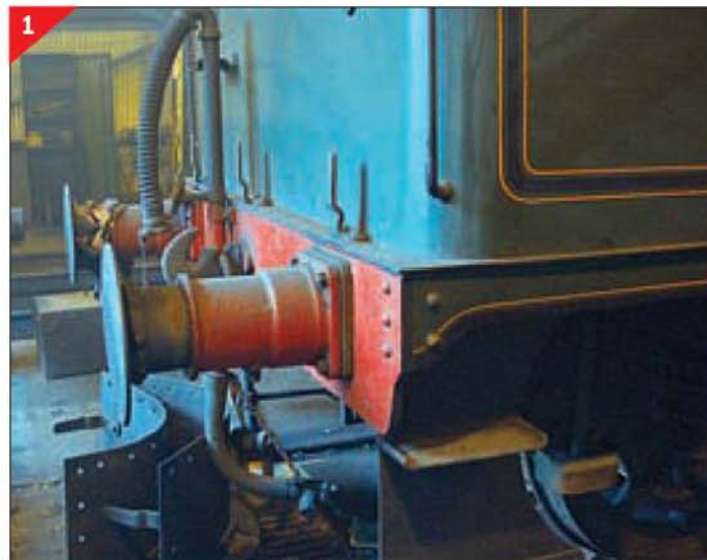
The main snag with a self contained engine was that the adhesive weight varied as

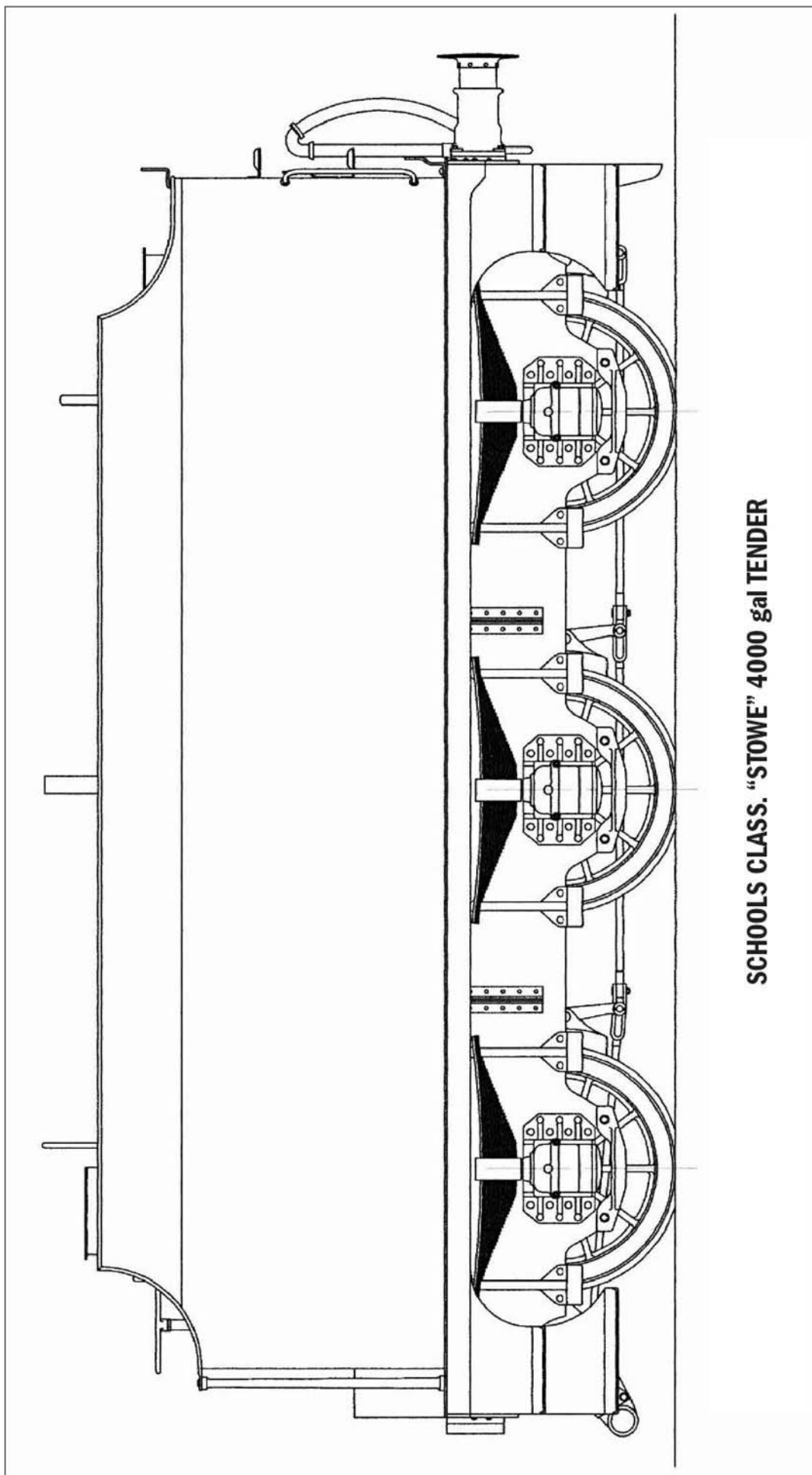
the water in the side tanks and the coal in the bunker was used up; the locomotive then became lighter and more slippery. When the water tanks and coalbunkers were full however, the engine could become too heavy, which meant that the boiler had perforce to be reduced in size, in order to reduce the weight of the whole to accommodate the lighter loading gauge of a secondary

line. This simple fact led to all sorts of problems, for instance the early LMS 2-6-2 tanks were very poor compared to the 2-6-4s which were built simultaneously and designed in the same drawing office. The difference was that the larger locomotives were designed by the forward-looking team, of which E. S. Cox and the redoubtable E. A. Langridge were members. The 2-6-2s, however, were designed by the Derby inspired short valve travel clique, who for weight reasons had to make things worse by fitting too small a boiler. The GWR of course, with their comprehensive stock of boilers of all capacities, were able to mix and match boiler with duty, so that for instance when Harold Holcroft was given the task of assembling the 4300 class Moguls from spare parts, he was able to choose the No. 4 boiler for the job instead of using the smaller No. 2 from the 6100 class, on which, despite his assurances to the contrary, the Mogul must have been based.

The SECR under the leadership of Maunsell, built a series of 2-6-4 tank engines, >>

1. Rear buffer beam. Note 1in. thick wooden backplate behind buffer stock.





SCHOOLS CLASS. "STOWE" 4000 gal TENDER



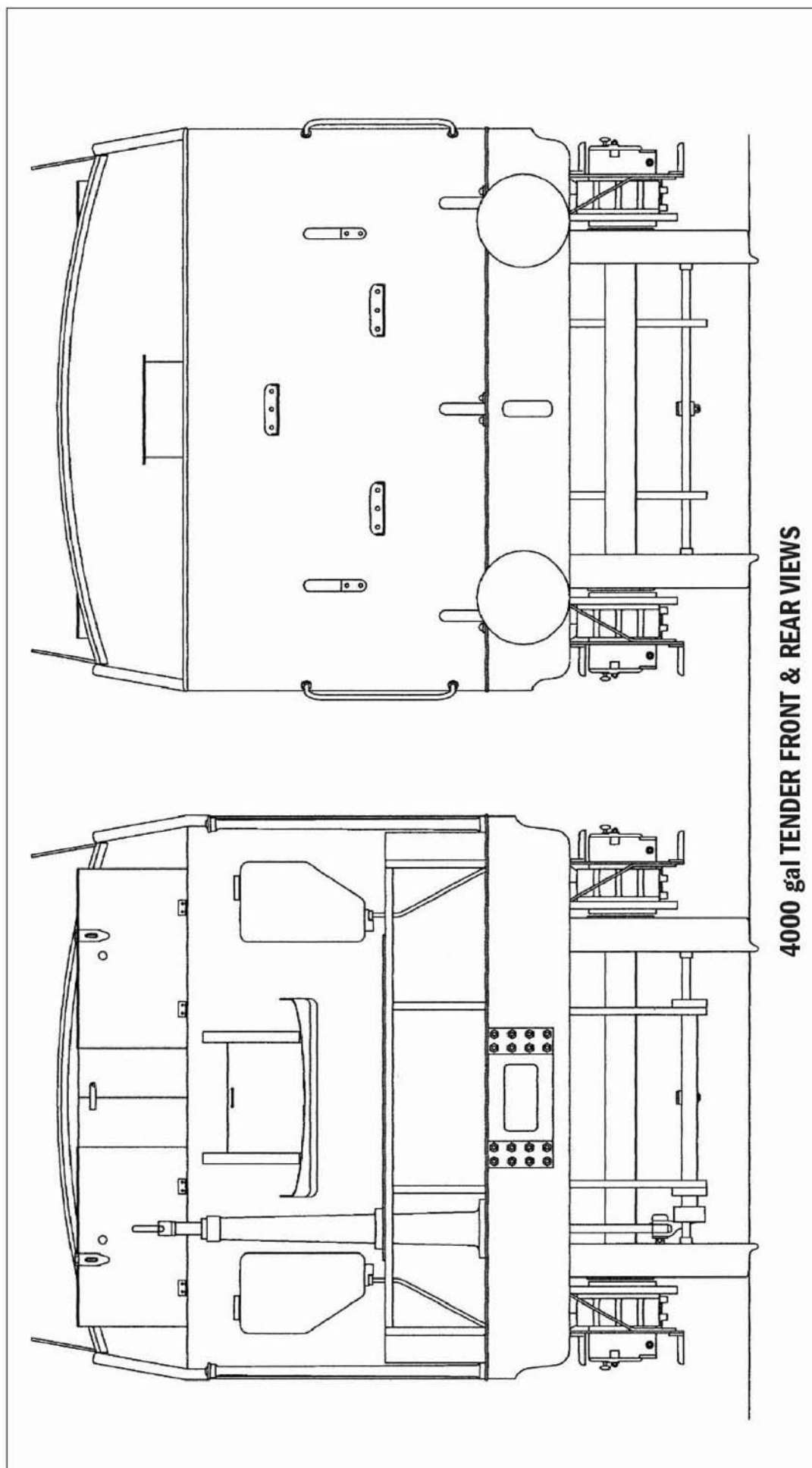
2. Tender front. This is a high-sided tender as fitted to Repton on the North Yorkshire Moors Railway.

the K class, named after Rivers, to the design of James Clayton who had arrived at the SECR via Derby. In my opinion they were among the best-looking locomotives ever built in Britain. Sadly a combination of poor track and suspect pony truck suspension proved to be their undoing, and after the Sevenoaks disaster, when No. 800 River Cray left the track at speed with heavy loss of life, they were converted to tender engines, forming part of the 'U' class. The solitary 3-cylinder Tank No. 890 River Frome became the prototype of class U1, the numbers of which were expanded to become 21 strong. This class was obviously rather hampered by the fact that they had boilers in common with the K class tanks which were limited to 53 tons of adhesive weight, therefore their boilers were too small for continuous steaming at speed, or with a heavy load. The U1s were tried on the Portsmouth line prior to the arrival of the splendid 'Schools' class, and were found wanting. The boilers, which looked very Great Western, were in



fact straight Midland, being a development of the taper boiler designed but not built for the Lickey Banker in about 1911. This boiler despite its appearance was in fact domeless, and what seemed to be a dome cover concealed a top feed. I seem to remember that this apparatus was known as the 'helter skelter water tower'. Compared to the 'Schools', which had a LSWR based boiler similar to that of the splendid 'King Arthurs', the U1s were inferior in pressure and heating surface, while their grate area at 25 sq.ft. was quite a lot smaller than the 28.3 sq.ft. of the 'Schools'. Their leading bissel trucks were connected at the front end by a Cartazzi slide, a device with two opposite-sloping wedges on each mating surface which provided a self-centering action. It also allowed the Moguls to sway rather freely at the front end, which, we are told, could be rather disconcerting. Actually, the solitary 3-cylinder 2-6-4 tank was by far the worst rider of all the Maunsell tanks. Possibly this was due to a heavier front end, because of the inside cylinder block, crank axle and motion.

The side tanks and bunkers from the rebuilt 2-6-4 tanks were stored at Ashford, and were later used on the



4000 gal TENDER FRONT & REAR VIEWS



3. View of axleboxes plus a good photograph of the rear steps.

4. I can find no evidence of rivets on the original build.

3-cylindere W class of 2-6-4 tanks which were built for and used by the Metropolitan railway, and later assimilated into the LNER. These locomotives were used for heavy freight duties in and around London. Their quiet exhaust, due to the 3-cylinder layout, made them especially suitable for the task of working in a heavily populated area.

The Schools tenders were designed specifically for that engine, and were modifications of the 4,000 gallon tenders that the SECR built for their Moguls. The upper part of the side panels was turned inwards at the same angle as that of the engine cab to clear the restricted loading gauge on the south eastern section. There is only one brake standard, as no water pick up gear is fitted. Note that the rear corners of the tender are rounded. The first five tenders were fitted with spoked wheels, but disc wheels were used from Number 905 to

the end of the series, together with modified lockers. Tenders No. 700 - 704 running with engines 900-904 were of new construction, while the other five were the tenders fitted temporarily to a Nelson and four King Arthurs for work on

the eastern section. These five could always be distinguished from all other Schools tenders by their slender straight steps, as will be seen from the drawing which will be published at a later date. The five second-hand tenders were built with

straight sides and so were modified with turned in tops for the Schools.

The model tender

The Maunsell tender is pretty straightforward as compared to the GWR tender, in that we are not faced with row upon row of tightly spaced rivets.

I've tried to simplify the construction as much as possible by supplying Laser cut frames and buffer-beams. We are also working on lost wax castings for the axlebox assemblies, which it is hoped will include such items as the spring hangers and buckles, as well as the rather complex axleboxes, which on the prototype were made in three pieces. It will be noted from the drawings that, as with all my tenders, the all important internal sub-frames are included, and the drag boxes at either end take the form of solid brass or (preferably, for the sake of lightness) aluminium blocks. These frames and their associated stays take the pulling stresses of the locomotive, leaving the outside frames to support the axleboxes and brake gear.

● To be continued.



EDWARDIAN ELEGANCE: THE HIGHLAND RAILWAY AND PETER DRUMMOND'S 'SCRAP' TANK ENGINES

Ron Isted describes a trio of Scottish Highland Railway shunters that were thriftily built from scrap parts!

The Highland Railway's 'direct' main line from Perth to Inverness and thence to Wick, the northernmost station in the British Isles, was slightly less than 280 miles long and when it became part of the LMS in 1923, the company owned a total of just 173 locomotives. The London and North Western Railway main line from Euston to Carlisle is barely 20 miles longer and at the end of 1921, the Premier Line owned 3,336 locomotives, together with a substantial number of electric motor coaches and a few railcars. You will probably say such figures are misleading, since they do not take into account all the other lines belonging to the two companies. Very well, let's put it another way: suppose for a moment that we could wave a magic wand and instantly position the North Western's entire stock of almost 3,500 glossy black steam locomotives and other forms of motive power at an equal distance from each other over the whole of the company's rail network. Next, imagine you are about to set out on a sponsored walk along those superbly maintained tracks, having been promised £100 for every locomotive you pass. You would in fact need to walk less than a kilometre from one engine to the next, so you could probably make £600 per hour for your chosen charity. However, if you tried the same act of prestidigitation with the locomotive stock on the Highland Railway, you would have to trudge almost five kilometres between each engine, and you would be lucky to raise £100 per hour, taking into account the fearsome Scottish gradients. The main reason for this violent

contrast between the two railway companies was primarily a simple lack of customers - the average population density in England is about six times that of Scotland, while the Scottish Highlands are probably the most sparsely populated area in the whole of the British Isles mainland. But whether you run 30 trains an hour or one a week, the track and infrastructure still have to be maintained, the stations and signal boxes still have to be manned, so small wonder then that the Scottish concern was never quite as prosperous as its English counterpart.

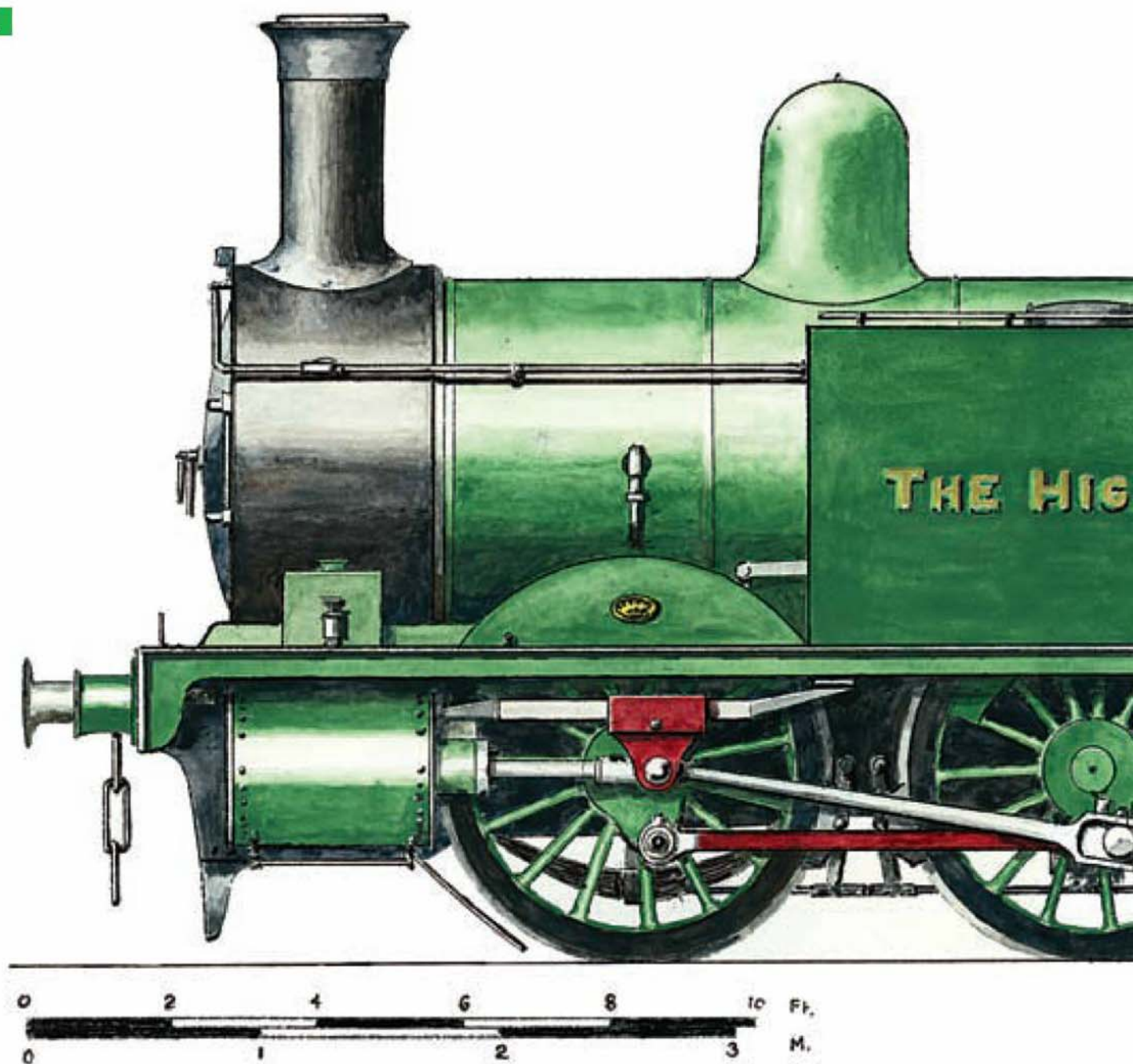
Considering the remoteness of most of the Scottish Highlands, the speed of track construction by the companies that combined to form The Highland Railway in 1865 was quite extraordinary. The first so-called 'direct line' to Inverness ran for 103 miles from Dunkeld, just north of Perth, to rejoin the original route at Forres through really wild, desolate country over the Grampians and included the highest main line railway summit in the British Isles at Druimachdar, 1,484ft. above sea level. Despite the lack of roads and general inaccessibility of much of the area, the entire line was completed less than two years after the ceremonial digging of the first sod. A century and a half later, I will leave you to reflect on the present day construction rate for motorways, taking into account all our mechanised transport, computerised planning, instant communication and so on. (And did I hear mutterings of Channel Tunnel, Millennium Dome, Wembley Stadium and 2012 Olympics? How tactless can you be?)

The Grouse Season

Although traffic through the Scottish Highlands was for most of the year somewhat sparse, to put it mildly, every summer the Highland Railway was regularly and totally overwhelmed for a brief period by a phenomenon that could only happen in these eccentric islands of ours - the grouse season. Towards the end of July, everybody who was anybody, together with an impressive assortment of relatives, servants, horses, dogs and not least as far as the railway was concerned, mountains of luggage, journeyed north to take part in these strange, gun-toting activities. And naturally, because what goes north must come south, a month or so later there was a sort of mirror-image repeat performance of the chaos when they all returned home. Some idea of the quantities of people, animals and impedimenta involved in this massive migration can be gained from a record of the rolling stock forming the 7.50am train north from Perth, the main service of the day, on 7 August 1888. The train, or perhaps I should call it the procession, comprised no fewer than 36 assorted vehicles belonging to nine different railway companies, and sallied forth from Perth behind two engines, just 20 minutes late. Now I must say that strikes me as pretty good going: just think of the amount of time needed merely to marshal and couple up that number of vehicles, many of which had travelled several hundred miles from the furthest outposts of Sassenach country - the front one, for example, was a horse-box belonging to the Brighton Line. Incidentally, the strain on the couplings of that leading vehicle must have been pretty substantial, although matters



Fig 1



were eased at Blair Atholl by the addition of a third engine at the rear of the train, to render much needed assistance for the 1 in 70 slog up to Drummachdar. In spite of the all out efforts by three locomotives, this multi-coloured, multi-shaped cavalcade was nearly an hour and a quarter late by the time it crept into Kingussie, 71 miles from Perth, and still barely halfway to Inverness. But by this time our observer presumably had had enough and disembarked - question: in view of the season, did he have a legitimate grouse about the service provided by the Highland Railway?

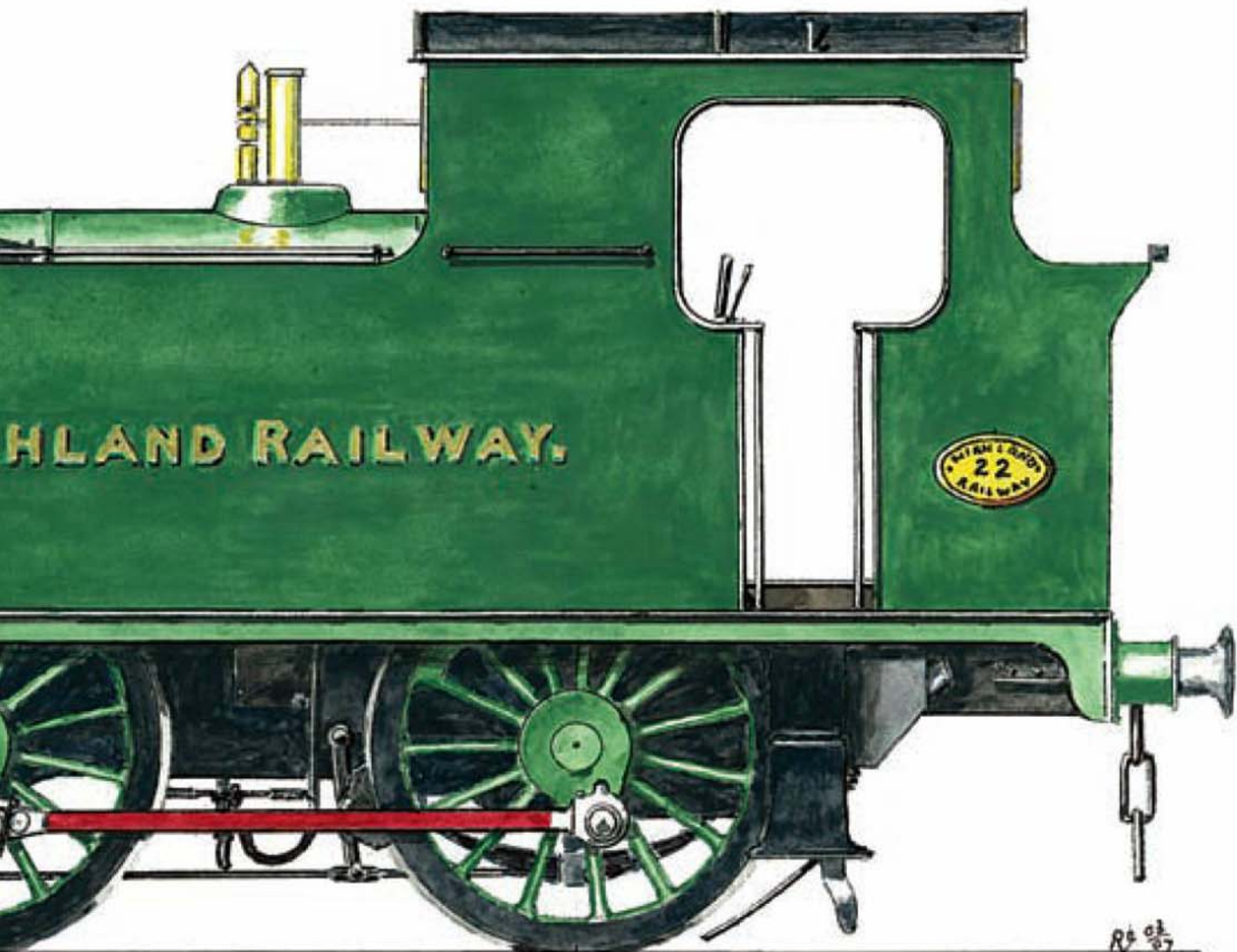
Distinguished engineers

In spite of its isolated position and severe financial restraints, the Highland was able to attract some very distinguished engineers to take charge of its locomotive department and I find it interesting that at least three of the seven holders of that office between 1865 and 1922 were born south of the border. Cynics might say they did not realize what they were letting themselves in for until they got there, but David Jones, who hailed from Manchester, stayed for more than 40 years, including a quarter of a century as Locomotive Superintendent,

so he could not have been too unhappy. During that period, he served his Scottish masters very well indeed, producing a series of excellent locomotives that were built in quantity straight from the drawing board, and generally keeping well ahead of traffic demands. He was responsible for the first 4-6-0s in the British Isles, the famous Jones Big Goods, one of the most successful designs of all time and recently the subject of a 5in. gauge constructional series by Neville Evans in this magazine. Jones' predecessor, the redoubtable William Stroudley, was born in Oxford,

while the third Englishman to preside over Highland locomotive affairs was one Frederick George Smith. Smith was a Geordie who unfortunately departed under a very large cloud after losing a battle with the company's Chief Engineer over turntable sizes and engine weights, neither the first nor the last example on various railways of a fight to the death between these two departments.

But the Highland Railway, the northernmost system in the British Isles, also had other connections with companies in the English deep south, in particular the London and South Western, since two



further Highland Locomotive Superintendents, Peter Drummond and David Urie, were respectively the brother and the son of holders of that office on the LSWR. So, while on the one hand Highland type locomotives (in Highland colour scheme) could be seen dashing(?) up and down the Brighton Line, where Stroudley's famous Terriers were a slightly larger version of his earlier design for the Scottish company, the designs of Dugald Drummond on the English London and South Western Railway were assiduously copied in the far north by his younger brother, Peter. As an example,

the Highland Railway's famous Ben 4-4-0s, produced by Peter Drummond in both small and large versions, were variations on two equally well-known LSWR designs built by his elder sibling at Nine Elms and Eastleigh. And several years later, when Robert Urie brought out his very successful 'Eastleigh' superheater to replace his predecessor's questionable so-called steam drier, lo and behold, 600 miles to the north, his son David Urie fitted a similar device to Peter Drummond's Big Ben 4-4-0s, so ensuring that they remained virtual replicas of the LSWR S11 class. But perhaps

the most surprising of all these Highland Railway look-alikes were Frederick Smith's River class of 4-6-0s, whose weight was the unfortunate cause of his premature departure from Inverness - although it's perhaps worth recording that after he'd gone, the canny Highland managed to sell them off to the Caledonian Railway at a profit! The similarity of these magnificent locomotives to the London and South Western Railway's H15 4-6-0s, built at Eastleigh 18 months earlier is really quite remarkable, many dimensions being identical, although as far as I know, Smith

had no direct connections with the English company.

A thrifty idea!

Like every railway, the Highland had its little eccentricities. One of them was an enduring affection for four-coupled goods engines, elderly examples of which puffed and wheezed their weary way with ever increasing loads, and at an ever decreasing pace up the ferocious gradients, until the advent of the superb Big Goods in the 1890s. Several other far less hilly systems had been using six-coupled engines for 40 years. Another of the Highland's foibles was



a lack of specially designed shunting engines, except for three Stroudley designed 0-6-OTs, fore-runners of his famous Terriers for the LB&SCR. Apart from this trio, the design of which dated back to the 1860s, even more ancient specimens of the company's mobile museum pieces had to be press-ganged daily into this mundane but very necessary work. At last, in the early years of the 20th century, Peter Drummond decided that enough was enough and, after a great deal of effort, managed to extract from the Highland Railway Locomotive Committee authorisation for just three more 'yard engines'. His only difficulty was that a few hundred miles down the road at Eastleigh, elder brother Dugald had not designed any! However, the problem was solved in novel fashion: in the days when withdrawn engines were broken up by arduous hand labour, a miscellaneous collection of locomotive components had gradually accumulated in various sidings around the Highland's Lochgorm Works at Inverness. These grisly remains included a large and motley collection of wheels, mostly from 2-4-0s, many of them dating back to the earliest days of Scottish railways. Although David Jones had fitted new and larger boilers to a few of them in an effort to increase their power rating, the frames of these elderly puffers had registered their objections to the extra weight by severe fracturing, so the scheme was shelved. As a result, Lochgorm found itself the proud possessor of some nearly new boilers, but nowhere to put them.

Someone in the Lochgorm Works, and we shall probably never know whether it was Peter Drummond himself or some lesser minion, had the brilliant and thrifty idea of utilising some of the redundant wheels and other bits and pieces off the scrap sidings to produce a locomotive chassis capable of carrying the spare boilers. The result was a trio of pugs with surely the largest diameter coupled wheels ever seen in the shunting business (**fig 1**) - in my opinion, they are also one

of the most handsome designs intended for such humble duties, but that is obviously a purely personal judgement. By the way, although the term 'pug' was used by footplate crews throughout Britain, its precise meaning varied, depending on whether you were north or south of the Anglo-Scottish border. In England, a pug was invariably a small tank locomotive, usually an 0-4-0T, normally employed only on shunting duties, whereas a Scottish pug could be any size of engine without a separate tender - even the massive Caley pacific tanks were known as the 'Big Pugs', or sometimes 'Wemyss Bay Pugs' because of their association with trains to that particular destination.

Reborn triplets

To return to the Highland Railway's unique reborn triplets, assembly of the various bits and pieces must have begun at the latest during the spring of 1901, because a visitor to Lochgorm in the summer of that year observed all three under construction. However, they were obviously regarded as a stock job, and the first completed engine, Number 22 did not emerge from the Works until the autumn of 1903, to be followed by No. 23 in December and No. 24 in May 1904, at an official cost of £1,650 per locomotive. I have my suspicions that this amount was purely a figment of some accountant's imagination and probably bears little relation to the true figure, since each of the brand new 0-4-4Ts built at Lochgorm a year later cost nearly £400 less than one 'Scrap Tank' assembled almost entirely from components on hand. Unfortunately, no works drawings of these engines appear to have survived, so my side elevation drawing has been produced entirely by scaling off various photographs, although I am reasonably confident of its accuracy. Almost all extant pictures of these locomotives are either broadside or three-quarter front or rear and I must therefore apologize for the lack of a front elevation, due to the lack of basic information such as the width of cab, sidetanks, footplate

and so on. However, there is an outline drawing of the front of No. 23 in an excellent book *Highland Railway Liveries*, detailed in the list of references at the end of this part.

Exactly what was new and what was second-hand - or pre-owned, to use today's ridiculous pussy-footing expression - on the Highland's 'yard engines' (their official title), we shall never know, but the wheels and cylinders, together with at least part of the motion, probably came from some recently withdrawn 2-4-0 goods engines dating back to 1863. The boilers of all three 0-6-OTs are believed to have been previously fitted for a short time to some passenger engines of the same vintage, but as mentioned above, the 40 year-old frames had proved incapable of carrying the extra weight. There remain, however, a large number of question marks about these very attractive 0-6-OTs, whose birth (or re-incarnation) as far as I know received not a single mention in any of the technical journals at the time. First and foremost is the type of valve gear: in its earlier years, the Highland Railway had been a staunch supporter of Allan straight link motion, which comes as no great surprise, since its inventor, Alexander Allan, had been a power behind the throne of locomotive affairs in that part of the world until the mid 1860s. David Jones also fitted Allan gear as standard during his reign of office, but when Peter Drummond arrived at Inverness in November 1896, he generally specified Stephenson gear, apart from the Castle 4-6-0s, which were basically a Jones design anyway. All the many modern technical publications I have consulted are unanimous that our three shunting pugs were equipped with Stephenson gear, as one might expect, since they were built during the reign of Peter Drummond. So far so good, but some of these very same publications also claim that the valve gear was one of the components salvaged from the old 2-4-0s described earlier, which were definitely Allan straight link engines! So I'm sorry, but I cannot tell you

for certain which valve gear was fitted, as it is obviously not discernible from photographs, while it is highly unlikely that there is anybody still alive who can enlighten us, since all three locomotives were scrapped three quarters of a century ago. If by any chance someone does have definite information on the subject, please write in! The main frames were presumably new, but the cylinders, 18in. x 24in., were almost certainly taken from the old 2-4-0s, having been fitted by David Jones during rebuilding in the late 1870s. On the 'new' 0-6-OTs, they were fitted with single slide bars instead of the original twin slide bar design, thus requiring a new crosshead, although the original connecting rod, of circular cross-section, seems to have been re-used, judging from several photographs and also the appearance of the big end. The wheel centres were definitely second-hand, but were fitted with new tyres, which increased the diameter by an inch to 5ft. 2½in. The platework, i.e. side tanks, cab and so on, appears to have been completely new and was typical Drummond, as was the shapely flared chimney. All in all, the engines are a fascinating synthesis of the designs of Alexander Allan, David Jones and Peter Drummond, a combination that could so easily have resulted in a horrible hotchpotch, but instead produced a very attractive locomotive.

One detail I have deliberately omitted from my drawing of No. 22 is a toolbox inside the rear of the cab, clearly visible on various photographs of Nos. 23 and 24. This item is, however, not apparent on pictures of No. 22, partly, I have to admit, because the cab entrance is obscured by the crew in every photograph I have seen, but in any case, on a miniature version it would be less than convenient to the out-of-scale driver/fireman. This engine, the first one built and subject of my fig 1, spent her entire life of 27 years at Inverness on shunting duties. She was, however, fitted with a vacuum brake in addition to the original steam brake shortly before the First World War, when the Highland had desperate need

of anything that could turn a wheel and there was a possibility that the yard engines might be required for branch line duties. The apparatus was removed again a couple of years after the end of the war. The other pair also received the same equipment, but No. 24 is the only one of the trio known to have managed to escape from the confines of the shunting yard, being spotted waddling along the Black Isle branch line between Muir of Ord and Fortrose in 1912. The combination of outside cylinders and relatively short wheelbase must have given the crew a pretty lively ride. Otherwise, No. 24 spent the first 15 years shunting at Inverness, while sister engine No. 23 was similarly engaged at Perth. In 1919, the pair swapped sheds, after which brief moment of earth-moving ecstasy, both were so exhausted that they never again ventured out onto the main line - apart from trips to the works for overhaul - until withdrawn in 1930-32.

Livery

The original colour scheme of all three engines was 'dark olive green' (see fig 1), completely unlined, and even the buffer beams and buffer shanks were painted the same colour, rather than the well nigh universal vermilion. Wheel centres were also green, while smokebox, frames, wheel tyres, cab roof and upper surface of footplate were black. I believe the footsteps on these three engines were also black, although it is possible that they may have been green as on other Peter Drummond designs. The only splash of colour was provided by the crossheads and coupling rods, which were painted red, although please note the connecting rods were left bright. The reason for this very basic scheme, introduced in 1902, was one of the Highland Railway's periodic economy drives and it replaced an extremely complicated scheme with intricate double lining,

devised by Peter Drummond when he first came to Lochgorm six years previously. In spite of the professed burning desire to save cash, these three humble shunting engines triumphantly carried 'The Highland Railway' in full on the side tanks (fig 2). The lettering was in gold, outlined in black, shaded to the left and below in light and dark green respectively, with the two hues separated by white flashes, and blocked to the right in black. I initially presumed that they must have used transfers but, according to the excellent book *Highland Liveries* (see references), the standard size for these letters was 9in. for the initial consonant of each word, i.e. T, H & R, and 7in. for the rest, a figure that, although obviously correct for contemporary tender engines, most definitely does not agree with my calculations from scaling off several photographs of the Scrap Tanks. According to my reckoning, the initial letters on the 0-6-0Ts are 6in. high and the remainder either 4½in. or 5in. high, the photographs being too small to be certain of this last figure, although I'm quite sure that all are smaller than the standard size. So, was the lettering painted by hand after all, or were six sets of transfers, each requiring 18 letters of the alphabet, produced specially for these three shunting engines? I would have thought that either alternative would have knocked a hefty dent into the railway's economy drive. In later years, all three locomotives were lettered simply H · R - note the full stop hovering in mid-air between the two letters - and at least two of the three engines were repainted in a slightly lighter shade of green, referred to officially as 'moss green' - I can give a personal guarantee that this is a totally meaningless description, because I have at least a dozen different coloured mosses in my front lawn.

When the Highland Railway became part of the London, Midland and Scottish Railway in

1923, the basic colour scheme for our trio of shunters became unlined black, with vermilion buffer beams and buffer shanks. This funereal scheme was relieved by the elegant 14in. high Midland Railway style gold numerals, actually shaded to the right in black, although the shading was not visible for obvious reasons, positioned in the centre of the sidetanks and by the initials LMS on the side of the bunker. These three letters were 7in. high, also in gold shaded to the right in black, and were encased in a vermilion panel outlined in gold, overall dimensions measuring 32in. x 11 in. For the first three years of grouping, the 'corners' of the vermilion panel consisted of concave curves of 2in. radius, but in 1926, they were simplified to the more usual convex curves of the same radius. Number 23, renumbered 16381, certainly received the concave version and No. 24, alias 16382, received both styles of panel, but I have not seen a photograph of No. 22, (16380) in this scheme. All three engines were fitted with smokebox number plates which they retained until withdrawn. In 1928, the LMS changed its collective mind yet again, and the official standard scheme for locomotives of such humble standing as yard engines remained unlined black as before, but with 10in. high plain (i.e. unshaded) gold numerals just in front of the cab entrance, and 14in. high letters centred between the numbers and front end of the tank. However, the spirit of Scottish independence was alive and well and living at Lochgorm works, so at least two of the trio, the former Nos. 22 and 23, were fully lined out in red.

● *To be continued.*

References

1. *A History of Highland Locomotives* by M. C. V. Allchin, pub. Railway Hobbies Ltd., 1947. An excellent little book, years ahead of its time, with several

photographs of the Scrap Tanks, some of which are unique to this book. Also contains side elevation drawing by Kenneth Leech of No. 23, which contains minor errors, e.g. boiler bands incorrect, while dome appears too fat compared with photographs.

2. *A History of Highland Locomotives* by Peter Tatlow ("based on the original book by M. C. V. Allchin"), pub. Oxford Publishing Co., 1979.

A super- deluxe version of ref. 1, printed on excellent quality paper containing much more information and additional photographs, but also the same K. Leech drawing, uncorrected.

3. *Highland Railway Locomotives Book 2* by J. R. H. Cormack and J. L. Stevenson, pub. RCTS, 1990. Includes broadside photograph of No. 23, obviously the basis for the K. Leech drawing, together with three more photographs, reproduction not quite up to the standard in other RCTS publications.

4. *Highland Railway Liveries* by Howard Geddes and Eddie Bellass, pub. Pendragon in association with the Historical Model Railway Society, 1995. This well-researched and superbly produced volume is a model of what a book of this sort should be, my only criticism(?) is that it covers far more aspects of the Highland Railway than the title implies. Photographic reproduction is as good as it gets, aided by a large number of excellent drawings and diagrams, including a front elevation of a Scrap Tank. Essential reading for anyone modelling the Highland Railway.

5. *The Highland Railway* by H. A. Vallance, 1972 edition pub. Pan Books. Originally published in 1938 with revised versions in 1960s by David & Charles. A good general history of the Highland Railway, but minimal reference to the Scrap Tanks.

6. Postcard of unknown origin of No. 22, shortly after construction. Photographer unknown. This was the main reference for Efty drawing, fig 1.

THE HIGHLAND RAILWAY.

Fig 2

A practical approach to injector making

Terence Holland begins the description of making his design for an injector.

*Continued from page 337
(M.E. 4334, 12 September 2008)*

In this design only one cone angle is used, that is an angle of 9 degrees. In the section describing the production of the nine-degree taper reamer, a fairly involved procedure is detailed (from work published by Laurie Lawrence) to ensure that an exact 9deg. angle is produced on the silver steel tool. I suspect that, in reality, it may be sufficient to simply set the topslide over to 4.5deg. and produce reamers with an approximate angle. If this is indeed the case it would, of course, further simplify manufacture. However, I have not tested this theory by making working injectors with cone angles of 8 and 10deg. and until such work is carried out I am not prepared to 'stick my neck out'.

Overflow ball control

Control of the overflow ball is essential. My first pair did not work until I prevented the ball from lifting and obstructing the outlet hole and the best way to do this is by incorporating a simple cage in the base of the retaining screw. As Eric Rowbottom commented, without control the ball 'follows the traffic and bungs up the outlet hole'.

Combining cone gap

The combining cone gap in my set of injectors varied somewhat from the theoretical value of 0.065in. and the actual gap details are

presented in **Table 2**. This was not intentional but due, I'm ashamed to say, to sloppy workmanship! In practice, gaps between 0.041 and 0.071in. performed perfectly well (once the steam cone dimensions were correct), indicating that the dimensions of this gap are not critical. Injector No. 6 with a combining cone gap of 0.089in. did not perform well, despite a range of changes to the steam cone parameters. Eventually good performance was achieved by fitting a new combining cone pair with the smaller gap of 0.071in. This may give some indication of the upper limit for this dimension.

Combining cone - delivery cone gap

As with the combining cone gap, the gap between the outlet of the combining cone and the delivery cone does not seem to be too critical. The Keiller data indicates a zero gap, but 0.005in. is recommended by Rowbottom and I used this figure in my injectors. In fact, this is the easiest dimension to get right, particularly using the method used by Rowbottom of fitting the delivery cone in situ to the combining cone outlet. Incidentally, inspection of all the commercially-made injectors in my scrap box (I have at least five that are now in poor condition) show a gap considerably larger than five

thousandths of an inch. I did one trial with a gap of 0.015in. and, while it did not alter the injector parameters of feed range etc., it did result in an injector performance that was noticeably less stable.

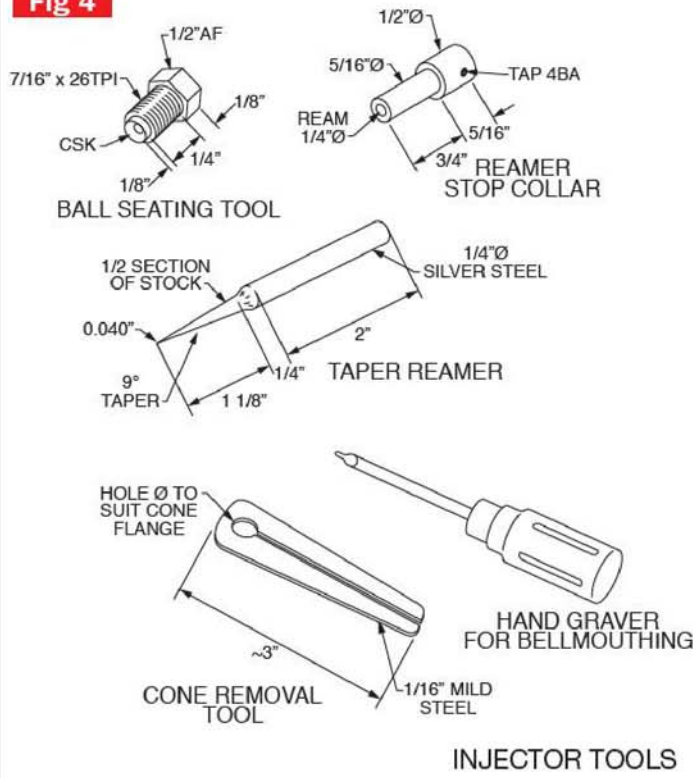
Combining cone type

Current practice is to use a two-piece combining cone as shown on the drawings in this article. This type of cone was referred to by LBSC as the 'Holden and Brooke' type. One injector (No. 6) was constructed with a one piece 'Sellers' cone, which, while performing acceptably, was impossible to fine tune to give first-class performance as was achieved with the other three units. Removal of the cone followed by re-machining as a standard split cone did not improve matters and this was eventually resolved by fitting a split cone with a smaller gap (see 'Combining cone - delivery cone gap'). The general inference is that if the length of the opening in the unsplit cone had been closer to the ideal 0.065in., it might have functioned satisfactorily and either cone type would therefore seem to be acceptable. In practice, setting the separate cones with the aid of a 9deg. taper former is so easy that there is little advantage to be gained from using the Sellers-type cone.

Table 2: Combining Cone Gaps

Injector No.	Combining Cone Gap - Inches	Comments	Performance
4	0.055	Performance optimised with correct steam cone dimensions	Good
5	0.041	Performance optimised with correct steam cone dimensions	Good
6	0.085	Sellers Cone - two slots filed in centre of single piece combining cone	Poor
6a	0.089	Sellers cone removed and split	Poor
6b	0.071	New split cones fitted	Good
7	Zero	Originally constructed as 'Cert' type	U/S
7a	0.071	Overflow system added and cone split and refitted	Excellent

Fig 4



Cone polishing

With one unit, I tried polishing the internal surfaces of the cones with 'Brasso', but this did not seem to improve performance, so the remainder of this work was carried out with cones 'as reamed'.

Bell mousing

All my cones were bell mouthed by hand as recommended by Keith Wilson. The ultimate performance of the injectors constructed indicates that bell mousing is not a critical dimension during manufacture. However, it is handy to have a few special reamers for this job - particularly for the inlet to the delivery cone. These, of course, are easy to make from silver steel using the same technique as that used for making taper reamers. An example is shown in fig 4.

Feed restrictions

In all cases, the injectors tested during the preparation of this article were subject to minimal feed restrictions. The delivery pipe on the locomotive is short (approximately 4in. long) and of standard 1/4in. dia. copper tube and feeds into a clack valve fitted with a 3/16in. dia.

ball. However, previous work carried out by Martin Rickers in conjunction with the design of an injector for a 7 1/2in. gauge Kerr Stuart 'Wren', indicated that severe restrictions were possible. In his article published in *Model Engineer* December 1982 he states that "you can put as many bends, clacks and other impedimenta in the feed line to the boiler without the least distress to the injector".

Manufacture

At risk of being repetitive, I have given full instructions so that each operation can be worked through, stage by stage, to completion. Anyway, enough of this pontificating and speculation - so here goes with the practical bits!

Injector body

The dimensions of the body are shown in fig 5. Fittings for the body, i.e., the water inlet, the ball cage, the drilled passageway plug and union nuts are detailed in fig 6. Proceed as follows:

1. Cut off a 2 1/2in. length of 1/2in. or 3/4in. square brass. Mount in a 4-jaw chuck using a dial test indicator (DTI) and face one end for the reference point.
2. Remove from the chuck and mark, at 3/16in. from the faced end, with a letter punch 'S' as the reference point.
Note: When chucking in the 4-jaw, replace the reference point 'S' opposite jaw No. 1 and only use jaws 1 and 2 when removing and replacing the body. This will make setting up much easier.
3. Scribe from the reference end at 0.677in. (water inlet), 1.099in. (ball chamber), 1.552in. (overflow) and 2.326in. (full length), using the points of a digital calliper (or if you have one, a surface

plate and height gauge). Centre punch the body for the attachments.

Note: These dimensions, apart from the overall length, are not critical; plus or minus 5 thousandths of an inch is sufficient. See 'Injector body dimensions'.

4. Replace in 4-jaw. Turn down the faced end to 3/16in. diameter (dia.) for 1/4in. in length. Undercut 1/16in. wide with a narrow parting tool 0.020in. deep next to the square body for the thread run out. Screw cut, if possible, 3/16in. x 32tpi and finish with a die.
5. Reverse in the 4-jaw, turn the overall length to exactly 2.326in. Turn down the faced end to 3/16in. dia. for 1/4in. in length. Undercut 1/16in. wide with a narrow parting tool 0.020in. deep next to the square body for the thread run out.
6. Screw cut 3/16in. x 32tpi and finish with a die as in 4 above.
Note: A standard Whitworth (55deg.) screw cutting tool will just take the edge off the square, but this tidies up the body quite neatly by rounding off the square ends.
7. Centre and drill with a 2.5mm dia. pilot for as deep as it will go. Finish with a 6mm drill right through.
Note: I'm not mixing my

Fig 5

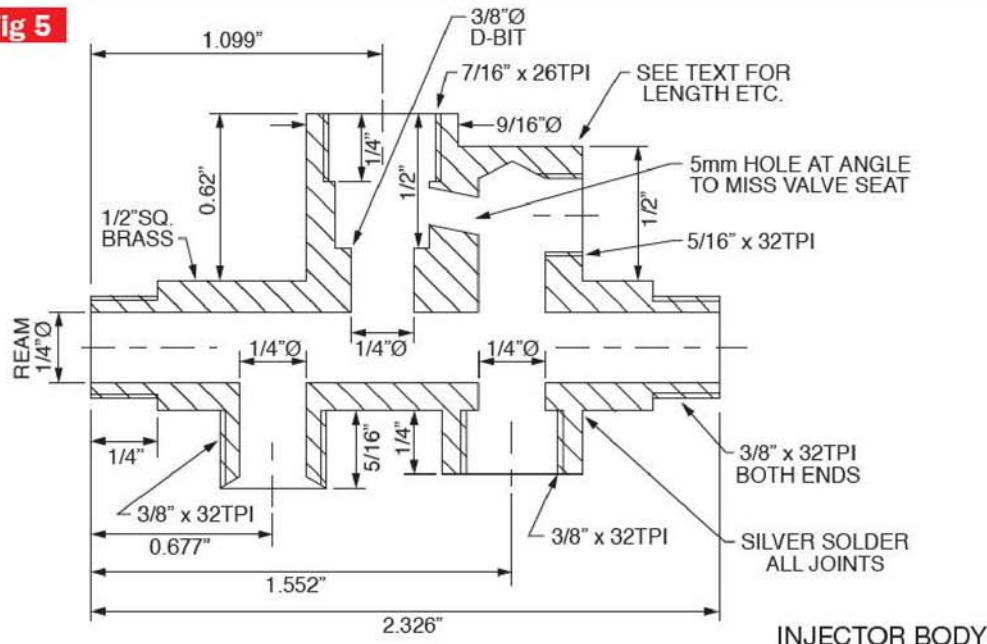
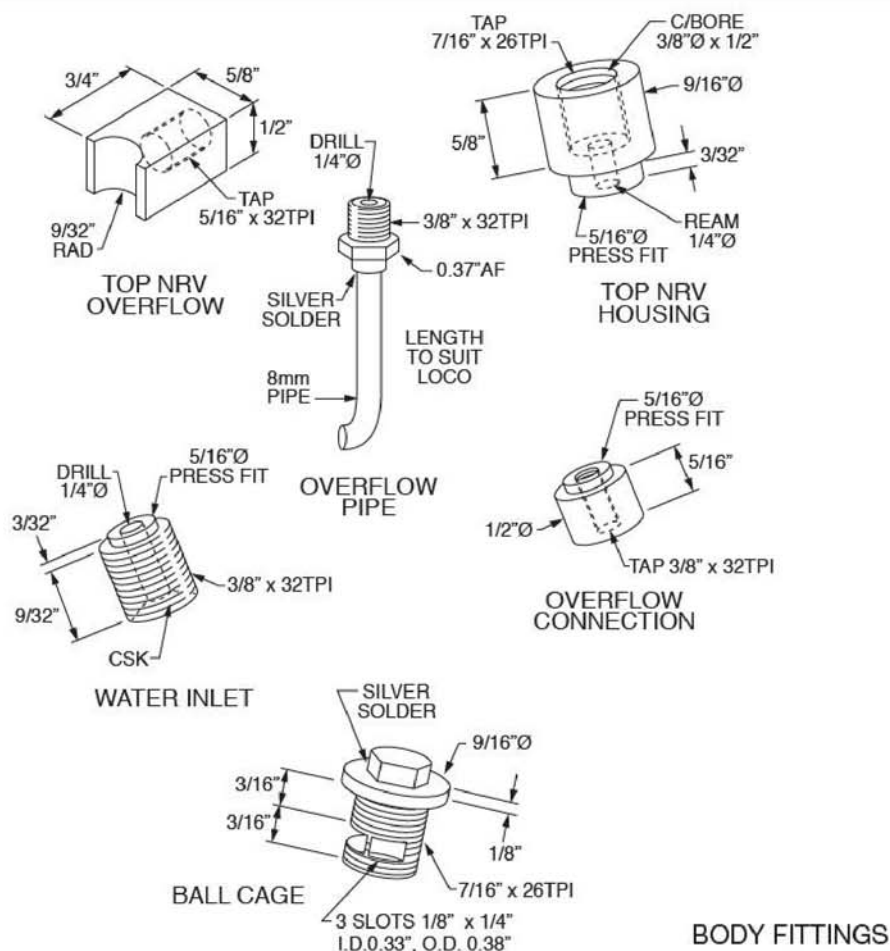


Fig 6



3. Part off a $\frac{3}{16}$ in. length.
4. Reverse in 3-jaw and turn down a $\frac{1}{32}$ in. length to a $\frac{1}{16}$ in. press fit in the body.

Water inlet

1. Chuck a piece of $\frac{3}{16}$ in. or 10 mm brass in the 3-jaw, turn down a $\frac{1}{32}$ in. length to a $\frac{1}{16}$ in. press fit in the body.
2. Centre and drill $\frac{1}{4}$ in. dia. x $\frac{3}{16}$ in. long. Thread $\frac{3}{16}$ in. x 32tpi. Part off just over $\frac{3}{16}$ in.
3. Next to the spigot relieve $\frac{1}{32}$ in. of thread, approximately 20 thou deep for neatness.
4. Reverse in a threaded bush and cut a tapered seat using a large centre drill. If it chatters, pull the lathe chuck round by hand.

Overflow pipe

1. Chuck a piece of 0.37in. AF brass, face, centre and drill 7mm for a depth of about $\frac{1}{2}$ inch.
2. Relieve the hexagon for $\frac{1}{16}$ in., centre and drill 8mm for $\frac{1}{16}$ in., part off $\frac{1}{16}$ inch.
3. Reverse in the chuck, turn down about a $\frac{1}{32}$ in. length to $\frac{3}{16}$ in. dia. and thread $\frac{3}{16}$ in. x 32tpi.
4. Silver solder a length of 8mm copper pipe in place to suit the locomotive.

NRV cap and ball cage

1. Chuck a piece of $\frac{1}{16}$ in. dia. brass in the 3-jaw, turn down a $\frac{3}{16}$ in. length to $\frac{1}{16}$ in. dia.
2. Turn down a $\frac{3}{16}$ in. length of the $\frac{1}{16}$ in. dia. to 0.38 inch.
3. Thread $\frac{1}{16}$ in. x 26tpi (BSB) and with a narrow tapping tool relieve the last 50 thou of thread.
4. Drill $\frac{1}{16}$ in. dia. for $\frac{3}{16}$ in. deep.
5. File three slots about $\frac{1}{16}$ in. x $\frac{1}{16}$ in. using the chuck jaws as a guide.
6. Deburr and clean up to leave three small pillars about $\frac{1}{16}$ in. wide.
7. Part off a $\frac{1}{2}$ in. length and reverse in 3-jaw.
8. Face, centre and drill $\frac{1}{16}$ in. dia. right through.
9. Fit a 0.31in. A/F brass hexagon plug to the top and silver solder in place.

● To be continued.

'metawhatsicals' here by using a mixture of metric and imperial measurements - it's just that metric drills are cheap and easy to come by and may as well be used in certain applications. Also, metric brass sizes are often available in the bigger DIY stores. Ironically, the 8mm material (purchased in the local DIY store) that I have is closer to $\frac{5}{16}$ in. than nominally $\frac{1}{2}$ in. material obtained from model engineering suppliers.

8. Set up in the 4-jaw to drill the holes in the body for the connections, using a 'wobbler' or centre finder (protect the threaded ends with nuts made from 0.44in. AF brass) Drill 2mm pilot holes $\frac{1}{16}$ in. deep from the point of the drill, followed by 5mm dia. holes and ream each one $\frac{1}{16}$ in. The last hole on the delivery end goes right through.

Note: The water inlet at the steam end is on the underside, with the ball chamber on top and the

overflow hole is drilled right through from top to bottom. If desired the water inlet can be positioned on the side, but in this case left and right-handed bodies will be required, unless of course this hole is also drilled right through and the unwanted side plugged.

Top overflow chamber

1. Chuck a piece of $\frac{1}{2}$ in. x $\frac{5}{16}$ in. x 1.5in. long brass in the 4-jaw. Centre drill at $\frac{1}{4}$ in. from one end on the $\frac{5}{16}$ in. flat.
2. Pilot drill 2.5mm and open out to $\frac{1}{16}$ in. dia.
3. Saw in half through the $\frac{5}{16}$ in. hole to produce two potential non-return valve (NRV) housings (save the other one 'cause when you make your first successful unit you might, like me, catch the injectoritis bug and won't be able to stop makin' 'em!).
4. Mark the centre of the $\frac{5}{16}$ in. x $\frac{1}{2}$ in. end and chuck in the 4-jaw. Drill $\frac{3}{32}$ in. x $\frac{3}{16}$ in. deep and tap $\frac{1}{16}$ in. x 32tpi by $\frac{1}{4}$ in. deep. Deburr and clean up with a file.

5. Make a 0.31in. brass hexagon plug to fit in the $\frac{1}{16}$ in. hole.

Note: All remaining operations on the overflow chamber will be carried out after silver soldering to the body.

Top non-return valve housing

1. Chuck a piece of $\frac{1}{16}$ in. dia. brass in the 3-jaw chuck. Face, centre and drill down $\frac{1}{16}$ in. with a 6 mm drill, ream $\frac{1}{16}$ in.
2. Open out with a $\frac{3}{16}$ in. x $\frac{1}{4}$ in. counterbore or d-bit to $\frac{1}{2}$ in. deep.
3. Drill with a 10 mm drill $\frac{1}{4}$ in. deep. Tap $\frac{1}{16}$ in. x 26tpi (BSB). Part off $\frac{1}{16}$ in.
4. Reverse in the 3-Jaw chuck, turn down a $\frac{1}{32}$ in. length to a $\frac{1}{16}$ in. dia. press fit in the body.

Bottom overflow connection

1. Chuck a piece of $\frac{1}{2}$ in. or 12mm brass in the 3-jaw chuck, face, centre and drill $\frac{1}{4}$ in. dia. for $\frac{1}{16}$ in.
2. Open out to $\frac{1}{2}$ in. for a depth of $\frac{1}{16}$ in. and tap $\frac{3}{16}$ in. x 32tpi.

McONIE'S OSCILLATING ENGINE

Anthony Mount completes the steamchest and describes various cylinder parts.

*Continued from page 334
(M.E. 4334, 12 September 2008)*

With the main cavity complete, set the casting at an angle so that the end wall of the cavity can be machined with the side of the cutter (**photo 42**). Still in the machine vice, drill the 4mm hole for the steam entry passage. Angle the casting in the vice and drill the connecting hole from inside the cavity to steam entry hole you have just drilled. Since the drill is starting against an angled face, you may find that the drill will try and wander 'down hill'. So start very lightly to let the corners of the drill cutting edges make a start in the angled face. Better still,

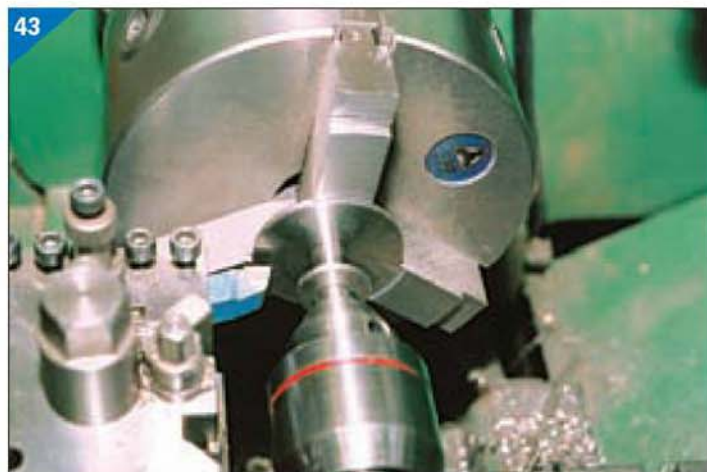
use a long centre drill to start the hole. Ordinary sized centre drills are too short to reach the angled face. Alternatively, you can machine a slot on the inside face of the steamchest to intersect the steam entry hole by using a Woodruff cutter.

Hold the casting in the machine vice with the bolting face upwards and use a 6mm end mill to machine the flange edges to give the final shape shown in the plan view. Now use co-ordinates to spot for the stud holes and drill through 10BA clearance. Upend the casting in the machine vice and use co-ordinates to spot the holes for the top flange and the valve rod clearance slot, then drill the holes.

tapped holes for fixing the rocker bearings. This obviates the need for silver-soldering the bearings to the cover. However, this cover is much more difficult to make. Instead of round bar you will need square section material. The spigot at the bottom and the flange for the gland can be turned as normal, although there will be intermittent cutting due to the square section. To machine the profile of the flange and form the two ears, the part is mounted in the rotary table and the edge machined using an end mill. The holes for the studs can be drilled either in the rotary table directly, by using a pre-drilled template/washer, or by co-ordinates.

42. Machining the angled wall of the Steamchest cavity.

43. Skimming the main flange face using the tailstock for support.



Cylinder top cover (Part 11)

After a spell on the milling machine comes some nice restful turning. For the cylinder covers I have specified stainless steel. This might seem a bit lavish as the original covers would have been cast iron. You can use cast iron if you prefer. However, stainless steel is a clean material to work with compared to cast iron and there is no danger of the covers rusting. Of course you need to use a free cutting type such as 306. These larger sections are available from, amongst others, M. Machines T. 01325 381 300 (usual disclaimer) - ask for their catalogue. They have a tremendous range of sizes and can supply some quite exotic steels, bronzes and other materials.

Choice of cover

You will notice on the drawing for the top cover that I have shown an alternative design that includes two ears with

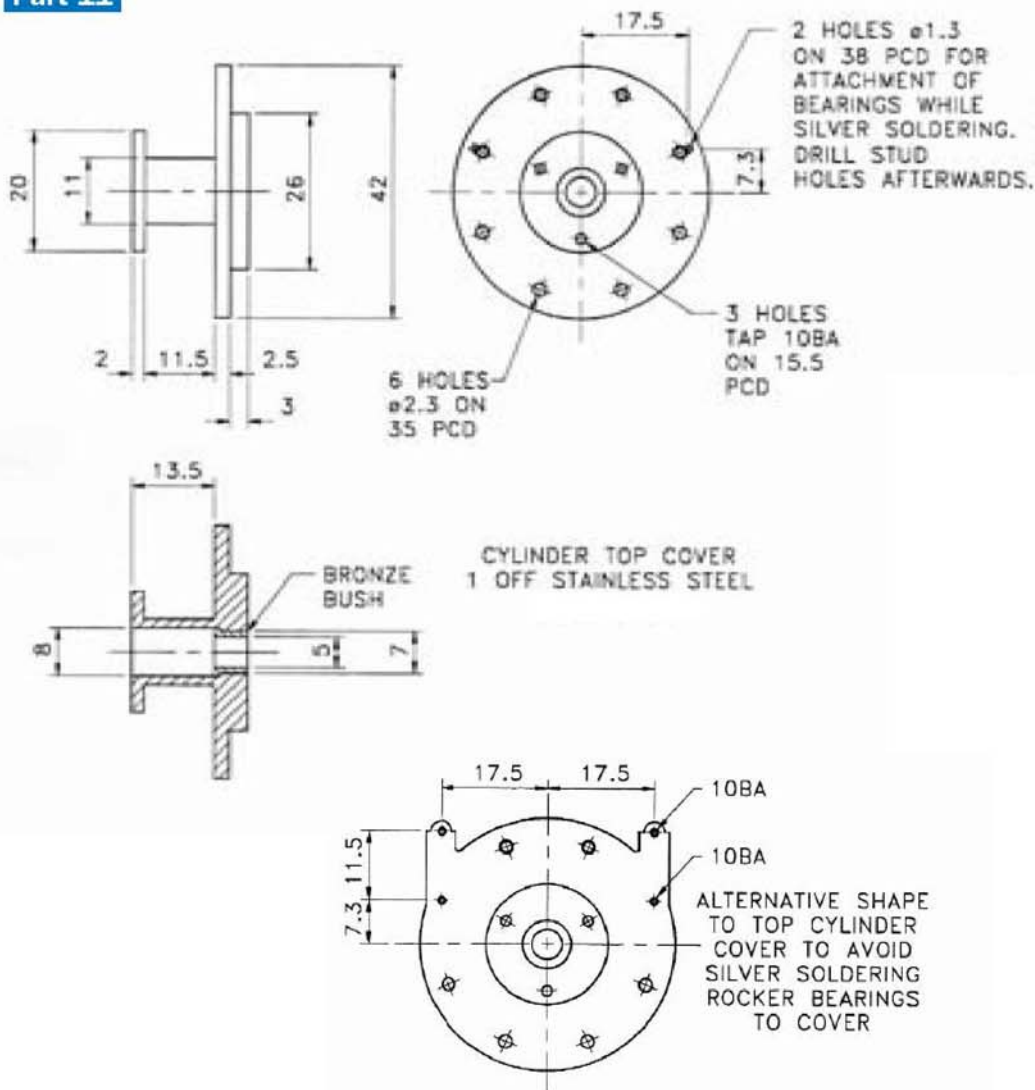
Easier option

If you decide on the easier to machine option, involving soldered-on rocker bearings, then procede as follows:

Chuck a short length of bar in the 3-jaw chuck and face off the end; then turn the register to fit into the cylinder counterbore. Use a parting tool to form the neck behind the face; a knife tool can then be used to turn the flange edge. Centre and drill through 7mm diameter. The cover can then be parted off.

Reverse the cover in the chuck and hold the flange in bored-out soft jaws. The counterbore to take the gland needs to be concentric with the drilled hole and most chucks are not accurate enough using ordinary jaws. As well as achieving greater accuracy, the soft jaws will grip the flange better. Face off the top and then bore and ream the counterbore; also take a skim off the main flange face to clean it up and leave a good finish, using the tailstock for support (**photo 43**). ➤

Part 11



Turn up a little bronze bush to go in the bottom of the counterbore; this is to give a bearing surface for the piston rod to slide in. As the piston rod is also stainless steel, it is not good practice to have similar metals running together.

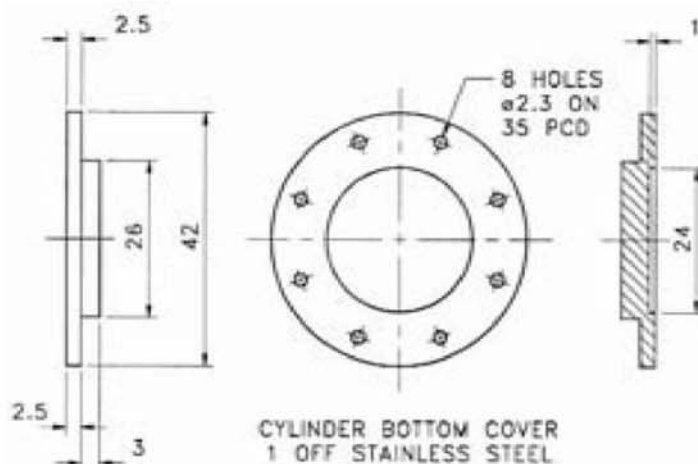
Mount the cover in the dividing head or rotary table and index around for the stud holes. Note that two are smaller and on a larger PCD, but at the same 45deg. spacing. These holes are for locating the rocker bearings ready for soldering. That is all that can be done on the Cylinder top cover for the moment. After I have described how to make the Rocker bearings (**part 21**), I will explain how to silver solder these to the Cylinder top cover.

Cylinder bottom cover (Part 12)

Like the top cover, the bottom cylinder cover can be made from stainless steel and is even simpler to machine: just a slice of metal with a register to locate in the cylinder counterbore. The outer face is also recessed to lighten the cover as would have been done on the full-size casting.

Indexing for the stud holes is straightforward with all the holes the same size and on the same PCD. **Photographs 44** and **45** show the finished top and bottom covers.

Part 12



1st ANGLE PROJECTION

44. Top and bottom end covers (outside view).

45. Top and bottom end covers (inside view)



Piston (Part 13)

The piston can be made from bronze or brass and, unlike an I/C engine, need not be a tight fit in the cylinder for a steam engine, a 0.025mm clearance all round is quite okay, the difference being made up by the packing.

There are all sorts of packing that can be used, the traditional graphited yarn is an old favourite. A similar but more modern material is yarn impregnated with PTFE. Solid PTFE can be used, as can real piston rings and, because the cylinder casting is gunmetal, the rings could be in Nylon. O-rings can also be used and are 'kind' to the gunmetal. However, if O-rings are used then the diameter of the cylinder bore and the depth of the groove in the piston must be correct for the O-ring to work properly. You need to use a grade of O-ring which will withstand the high temperature of steam.

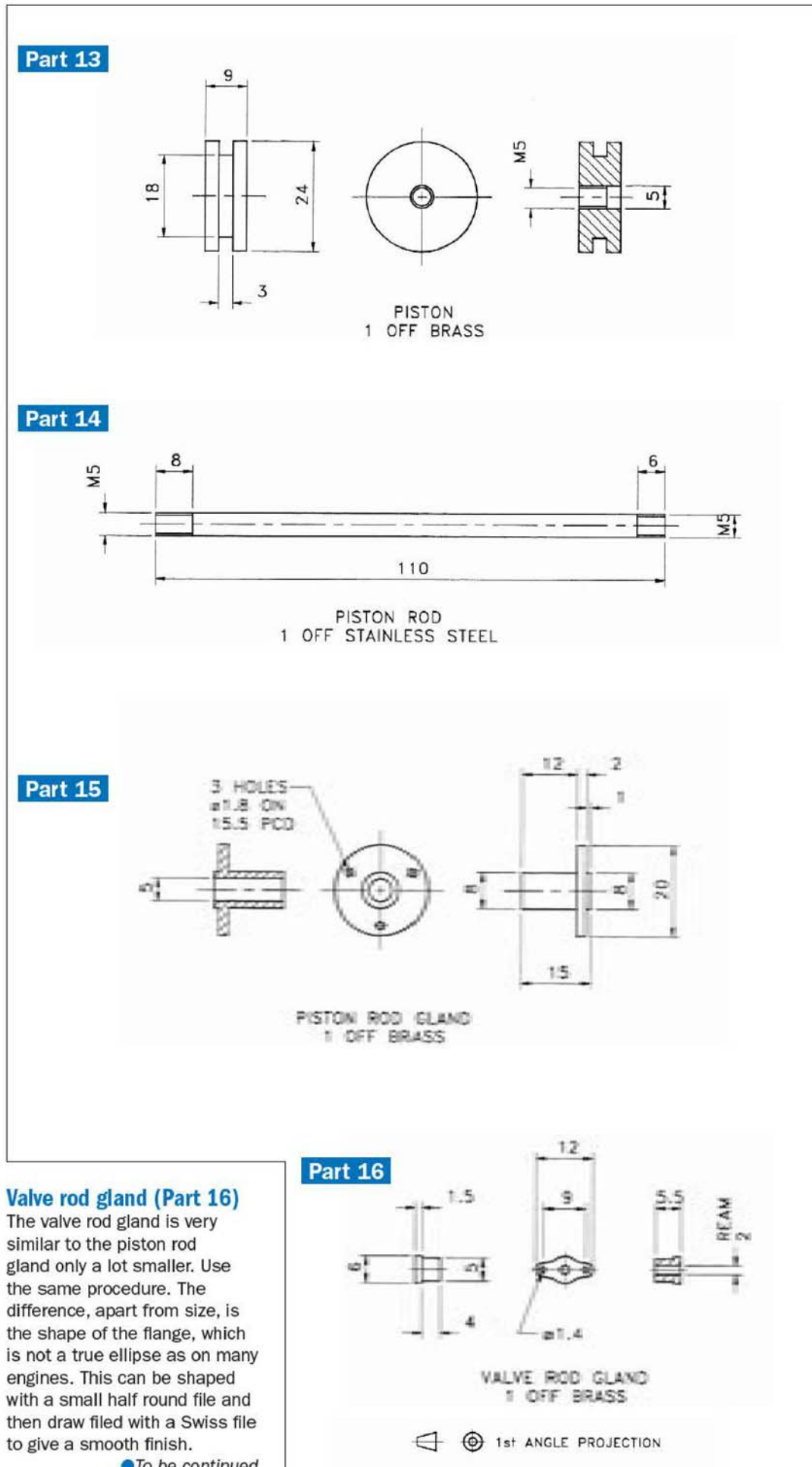
Turn the piston material down to fit the cylinder, form the packing groove, then centre and drill for the piston rod. Counterbore to give a tight fit on the piston rod and tap using a tailstock tap holder for accuracy and concentricity. Finally, part-off, reverse in the chuck, and face the other side.

Piston rod (Part 14)

The piston rod is a straight length of stainless steel threaded each end. Set the die for a tight fit in the piston. Do be careful in your selection of piston rod material and get the smoothest ground material you can find. The finish of stainless steel can vary enormously. I usually get mine at a big exhibition where I can go around all the suppliers and pick the best. For a small item like this the price differences can be ignored.

Piston rod gland (Part 15)

The piston rod gland can be in brass but bronze would be better. Drill and ream for the piston rod preferably using a machine reamer. The stud holes are best positioned using the dividing head.



Valve rod gland (Part 16)

The valve rod gland is very similar to the piston rod gland only a lot smaller. Use the same procedure. The difference, apart from size, is the shape of the flange, which is not a true ellipse as on many engines. This can be shaped with a small half round file and then draw filed with a Swiss file to give a smooth finish.

●To be continued.

Which gear and flywheel puller?

David Stokes takes a look at what's on the market for this important piece of workshop equipment.

All those who like to carry out anything to do with mechanical engineering know that to complete a task properly and efficiently one needs to use the correct tool. We are looking at pullers and to pull off a flywheel, shall we say, cannot be done without one. Having the right tool for the job, however much the tool

might cost, saves in the end money, heartache and damage to whatever is being worked on. To remove a gear, flywheel or a pulley, a puller is an essential tool and nothing can be used instead.

All the main suppliers were asked for their wares. The only type we looked at were the three-legged variety; some come to bits and slot tidily into

a special box, others come in pieces which are just placed into a cardboard box, while others come in sets of three or four.

The pullers were examined and used to remove the flywheel from my ancient Honda (duff oil seal). In that application, I found the hydraulic sort more effective than the screw type.

ME



DRAPER 56177

Guide Price	£32.38
Screw or hydraulic	Screw
Size	100mm Max Spread, 150mm Max Reach
Reversible?	Yes
Single or a set?	Single
Case?	Yes
Contact	01284 757500

Puller with two reversible legs for external and internal pulling of gears, bearings, etc. Legs are forged carbon steel and have long and short reach facility. Yoke and thrust bolt are manufactured from carbon steel. Screw has a rolled thread with chemically blacked finish. Supplied with twin and triple yoke that will take either two or three legs.

DRAPER 13909

Guide Price	£24.26
Screw or hydraulic	Screw
Size	100-108mm Spread, 82-100mm Reach
Reversible?	Yes
Single or a set?	Single
Case?	No
Contact	01284 757500

Puller with three reversible legs for external and internal pulling of gears, bearings, etc. Legs are forged carbon steel and have long and short reach facility. Yoke and thrust bolt are manufactured from carbon steel. Screw has a rolled thread with chemically blacked finish.



DRAPER 50094 10 Tonne Hydraulic Puller Kit

Guide Price	£119.48
Screw or hydraulic	Hydraulic
Size	100-240mm Spread, 0-150mm Reach
Reversible?	Yes
Single or a set?	Single
Case?	Yes
Contact	01284 757500

Six position multi-function puller with adjustable two or three leg function. Allows bearings, gears, etc. to be removed with minimal effort by use of the hydraulic puller. Supplied complete with instruction manual. Packed in blow mould carrying case. Contents: hydraulic pump; 3 x puller legs; 6 x nuts and washers; 6 x link plates; 2/3 leg puller yoke; nose adaptor; Min/Max Reach 0-150mm, Min/Max Spread 100-240 millimetres.



LASER 3851 7-Ton Capacity Puller

Guide Price	£143.88
Screw or hydraulic	Screw
Size	Large 224mm reach, 280mm spread Small 127mm reach, 267mm spread
Reversible?	Yes
Single or a set?	Single
Case?	Yes
Contact	01926 815000

High quality sturdy puller suitable for bearings, pulleys, wheel and sprockets etc. A capacity with a maximum of 224mm (8¾in.) reach and 280mm (11in.) spread with long jaws and 127mm (5in.) reach and 267mm (10½in.) reach with standard jaws.

LASER 3848

Guide Price	£60.04
Screw or hydraulic	Screw
Size	100, 150mm (4 and 6in.)
Reversible?	Yes
Single or a set?	Single
Case?	Yes
Contact	01926 815000

High quality screw type puller with two sets of legs, 4in. and 6in., (100/150mm), gear puller that can be used in either 2/3-jaw format giving a variety of options. Comes in a case that can fit in a draw in a tool tray system.



SEALEY PBS800

Guide Price	£66.92
Screw or hydraulic	Screw
Size	75 and 100mm
Reversible?	Yes
Single or a set?	Single
Case?	No
Contact	01284 757525

Sealey do not supply cases with their three and two-legged pullers, which is a pity. Twin/triple-legged yoke with three drop forged, chrome vanadium steel legs. Legs may be used for internal or external pulls. Spring-loaded mechanism allows for fast leg changes. Removable thrust plate prevents damage to shaft end.



SEALEY AK79

Guide Price	£61.04
Screw or hydraulic	Screw
Size	75, 100, 150, 200mm
Reversible?	Yes
Single or a set?	Set
Case?	No
Contact	01284 757525

Four pullers in a cardboard box made of drop forged, high carbon steel reversible legs and body. Legs are heat treated for added strength and chrome plated to resist corrosion. Swivel thrust plates on larger sizes prevent damage to shaft ends. Hex head forcing screws suitable for use with ratchet wrench or combination spanner. Alas, no case.

SEALEY AK78

Guide Price	£31.67
Screw or hydraulic	Screw
Size	75, 100, 150mm
Reversible?	Yes
Single or a set?	Set
Case?	No
Contact	01284 757525

Alas no case for this set of three pullers, like the AK79 set they are made of drop forged, high carbon steel and the legs are reversible as is the body also heat treated for added strength and chrome plated to ward off corrosion. Swivel thrust plates on larger sizes prevent damage to shaft ends. Hex head forcing screws suitable for use with ratchet wrench or combination spanner.



SEALEY PBS801 QUICK ACTION GEAR PULLER

Guide Price	£123.32
Screw or hydraulic	Screw
Size	75-175 spread, 140mm reach
Reversible?	Yes
Single or a set?	Single
Case?	No
Contact	01284 757525



Big brother to PBS800 with better reach and spread. Still no case provided by Sealey for this excellent puller that costs over £100. Consists of twin/triple-legged yoke with three drop forged, steel legs made of chrome vanadium steel. The legs may be used for internal or external pulls. Removable thrust plate prevents damage to shaft end. Well-designed spring-loaded mechanism allows for easy and quick leg changes.



CLARKE CHT227

Guide Price	£82.23
Screw or hydraulic	Hydraulic
Size	Spread 200mm, Reach 160mm
Reversible?	Yes
Single or a set?	Single
Case?	Yes
Contact	01992 565300

A pulling set for the professional mechanic and regular home mechanic. Featuring a forged steel yoke and claws with hydraulic power, highly effective for the removal of stubborn hubs, flanges, gears or bearings. Maximum spread 200mm, Maximum reach 160mm, 2 or 3-jaw configurations for pulling. Choice of centring of flat adaptors for thrust operation.



CLARKE CGP 3

Guide Price	£32.89
Screw or hydraulic	Screw
Size	3in., 4in., 6in., 8in.
Reversible?	Yes
Single or a set?	Set
Case?	No
Contact	01992 565300

A set of four multi-pivoted three-legged extractors, made from heavy duty chromed drop forged steel able to remove gear wheels and flywheels of various sizes by either internal or external pulling.

SCREWFIX 48634 LASER

Guide Price	£9.39
Screw or hydraulic	Screw
Size	100mm (4in.)
Reversible?	Yes
Single or a set?	Single
Case?	Yes
Contact	0500 414141

A small set, can be used either with two or three legs, reversible for internal or external use. Low cost and high value.



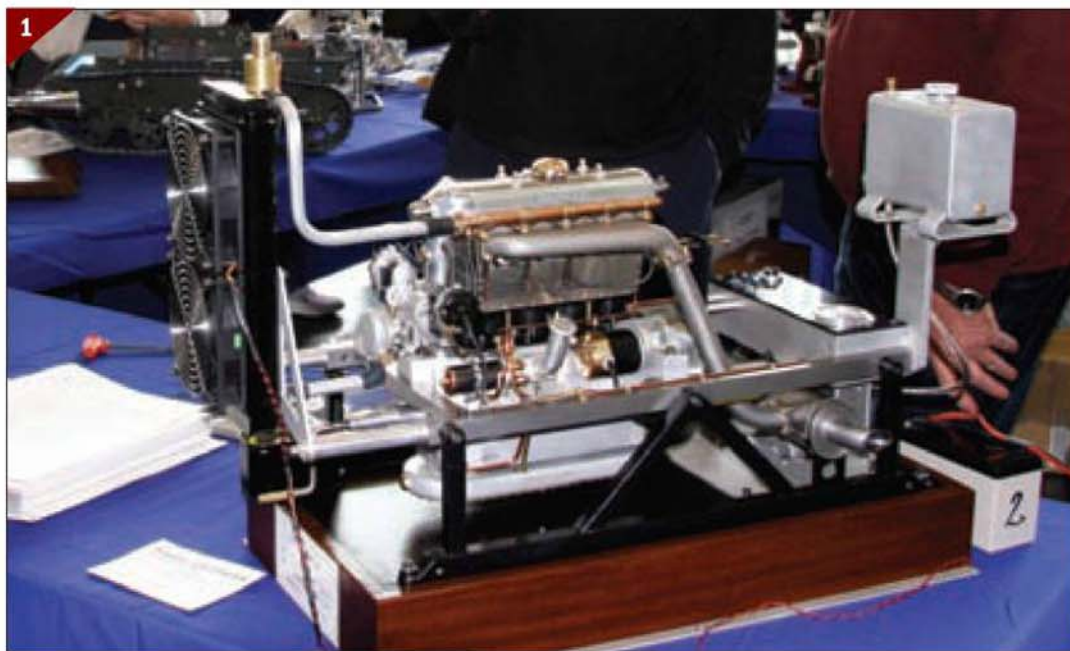
KENNEDY KE503-3500K

Guide Price	£93.99
Screw or hydraulic	Hydraulic
Size	50-250mm spread, 0-200mm reach
Reversible?	Yes
Single or a set?	Single
Case?	Yes
Contact	0116 257 2432

A quality 10-ton capacity hydraulic ram with tommy bar. Supplied with three position puller legs covering a spread of 50-250mm and a reach of 0-250 millimetres. Can be used as a 2 or 3-legged puller with the same head. Contents: 1 x Combination head; 1 x Hydraulic ram; 3 x three position puller legs; 6 x Leg connectors; 6 x Screw nuts, bolts and washers; 1 x 32mm ext. rod; 1 x Ram nut. All contained in a blow moulded storage case. A high-spec, high quality puller at a most reasonable price.



A 1923 BENTLEY 3-LITRE ENGINE



Mike Sayers provides a brief description of his magnificent 1:3 scale working model of a 1923 Bentley 3-litre 4-cylinder engine which was awarded a Gold Medal at this year's Model Engineer Exhibition at Ascot.

It cannot be said that model engineering has been my lifelong passion. Most of my time has been taken up building racing cars of one sort or another and, recently, sedate vintage touring cars. The idea to build a model Bentley engine (**photo 1**) came when I saw a photo of the inside of the test house at the Bentley Works in 1922. This showed a 3-litre engine, identical to the one in my car, fitted to a Heenan & Froude dynamometer.

The early 3-litre Bentley engine has four cylinders of 80mm bore and 149mm stroke. It has a single overhead camshaft driven by a bevel drive vertical shaft. There are four valves per cylinder and it has two spark plugs per cylinder. There is no separate cylinder head; the head and cylinder block are cast as one. To remove the valves the guides must be removed to allow the valves to tilt sufficiently for them to clear the cylinder wall.

The crankshaft is supported in five main bearings and the clutch thrust is taken on a complex double thrust bearing at the front of the crank that allows centralisation of the crank in the crankcase (**photo 2**). There is also shim adjustment of the bevel gear in order to correctly mesh the bevel drive to the camshaft. The big end and main bearings are white metal lined bronze shells and all is lubricated by a gear type oil pump low down in the sump, shaft-driven from the crankshaft at a 3:1 reduction.

Carburetion is via twin Sloper SUs on a manifold spanning all eight inlet ports. These carburettors are quite unusual in that the butterfly is in the manifold not in the carburettor body.

Altogether an engine full of character.

Scratchbuilt from solid

I believe that 30-40% of the effort involved in scratch building scale models must be in accumulating the information to make an accurate job. Here, at least, I was at an advantage in having my own 3-litre Bentley in the garage, knowing others with similar cars, and stocks of spares that could be borrowed,





measured and drawn up. In fact every part of the model was made with reference to the full-size component (**photo 3**). I wanted to make a truly accurate working model with no compromises, although, in the end, I did not quite succeed. A scale of 1:3 was chosen as one that would allow the inclusion of all the detail and still be within the machining capacity of my small workshop. All aluminium 'castings' are machined from HE30 bar and plate (**photos 4a, 4b and 5**), and all other material specifications follow the original as far as possible; bearing in mind that the original was made 85 years ago. At 1:3 scale the model has a bore of 27.5mm and a stroke of 50mm giving a capacity of 118cc. Its compression ratio is 6.3:1.

Drawings, which were little more than dimensioned sketches, were produced from full-size components as they became available (**photo 6**). I found it quicker in many cases to take tracing paper rubbings of machined surfaces which, when tidied up on the drawing board, provided surprisingly accurate drawings very quickly ready for scaling down.

Much time was spent making devices to manufacture and form relieve gear cutters, grind crankshafts, grind camshafts, produce jigs and moulds for white metal bearings, make resin mouldings for the magneto parts and carry out very small engraving. All new skills to me, but I was determined to make everything 'in house' or rather 'in shed'; since, with a scale I/C engine, all the pleasure is in the journey to completion. There is little scope for playing with it on a sunny day when it is finished.

Gears

Of all the parts produced the gearing consumed the most effort, particularly the nest of cross helical gears in the turret (**photos 7 and 8**). The driveshaft to the camshaft is taken from the front of the crankshaft via a 1:1 ratio bevel vertically to a 2:1 bevel to drive the camshaft. Midway up the shaft is mounted a cross helical right angle drive which serves the two magnetos. Below the second driven gear is a further cross helical gear driving the water pump. Having only cut a few clock gears and the spur



gear for the flywheel ring gear these gears were a daunting prospect. However, *Model Engineer* came to the rescue with an article dated 21 June 1945 by Mr. John Hellewell which, in two brief articles, gave me every piece of information required to cut these gears using a toolpost milling spindle, indexing mandrel and enormous gear ratios between lathe spindle and lead screw.

Making the cutters, relieving tools, mandrels, etc., and finally making successful gears took nine months. It is thanks to Mr. Hellewell's article and Mr. Ivan Law's book that all the gear cutting was successfully accomplished by this beginner and, if it is at all possible, I would suggest that the 1945 article is reprinted or added to Mr. Law's book as an appendix.

Before leaving the subject of gears for this model, I should mention the oil pump drive gears. These are 3:1 spiral reduction taking the drive from the front of the crankshaft down to the sump at an angle

of 81deg. to the crankshaft and rotated 21deg. to bring the pump more central in the sump. To add to these problems, with the pump mounted in the sump, whenever it is removed the mesh of these gears is disturbed. The sump has to be accurately dowelled to the crankcase. Machining the mounting for the pump at this compound angle to ensure the correct meshing of these two gears stretched my machining skills to the limit.

● To be continued.





Peter Spenlove-Spenlove provides tips for thinning drill webs and wire wheel maintenance.

Imagine this scenario: you are new to model engineering and have joined a local club to help and learn. The club's work party is improving the outdoor club railway in readiness for the new season. People are making concrete, sawing wood, painting, etc. Some steel work needs strengthening by adding stays. Nuts and bolts of $\frac{1}{2}$ in. dia. will be used; you have been asked to drill the holes. The metal is $\frac{1}{4}$ in. thick and a pistol drill on an extension lead will drive a new drill for the bolts. It is hard work!

A friendly member comments that if you 'thin the point' it will be much easier - you won't have to push so hard and the drill will cut more easily, especially if you use a cutting fluid. Point thinning, what's that?

At the tip of a drill is a short 'chisel point'. It is the web of the drill and does not cut, but only scrapes its way through the workpiece. As it does, the two cutting lips cut the hole. When you push the drill into the steel you are trying to force the chisel edge into the steel. Practical engineers reduce this force by point thinning.

Back to the miniature railway, a member announces that since he lives nearby and the club's off-hand grinder has an old battered wheel you will do the thinning on his grinder whose wheels have reasonably sharp corners.

It only takes a few seconds using off-hand methods, i.e., no machine setup, etc. The chisel point is reduced to about half its original size as new.

There is no fixed rule for this procedure, but an even shorter edge can be useful, especially on stainless steel where a rubbing chisel edge work hardens the surface layer.

Another way to ease the outdoor drilling of larger holes is to use a small stubby drill to make a pilot hole. This way, the chisel edge of the larger drill rotates in air.

After a few years, one has a few drills with broken ends but which can still be reground. Even if only half their original length, these drills in the $\frac{1}{2}$ in. dia. size range are stiff and suitable for outdoor drilling.

Don't forget to use the power tools connected through an approved fault cut-out device as advised by a local electricity supplier and don't forget to wear eye protecting in case swarf flies or a drill shatters if it jams in the work.

Wire wheel and brush revival

When you bought your double-ended bench grinder, you might have picked up a wire brush to fit in place of one of the grinding wheels. At first this brush was really sharp, it cleaned metal parts quickly and easily, but after a while, extra pressure was needed. The brush was getting blunt and maybe slightly clogged with oily dirt and old paint. It

is no good persisting, as it is. In pushing harder to make the brush work, you might slip and brush your knuckles and the dirt acts as a lubricant for the wire tips. Furthermore, the extra pressure bends the wires excessively, causing some to break and fly out.

That is why good eye goggles **MUST** be worn and a clear face mask, too, if possible.

The cure

If the brush is dirty, remove it and soak it in a solvent or strong, hot detergent. If the solvent is flammable, do this out of doors to avoid fumes in the workshop and the possibility of fire, too.

When dry, re-mount the brush (put your goggles on again). Take a piece of a broken grindstone, switch on the grinder and hold the stone against the brush. This will 'grind' the worn wire ends, giving them a sharper cutting effect.

One can buy Carborundum™ sticks (silicon carbide) specially formulated for this work. They are about 6in. long and 1in. by 1in. section and have a coarse dark grey grit structure. They are also designed for dressing (truing up) grinding wheels by removing grooves and dirty, glazed surfaces which prevent good grinding.

Wear a dust mask while dressing grindstones and remove or cover precision items nearby. The dressing dust is very abrasive and difficult to remove.

Even the humble wood-handled mechanic's brush can benefit from a re-sharpening. Either rub it on the Carborundum™ stick if it is a big one, or probably better, use it to 'scrub' a concrete paving slab! This action sharpens the wires for further use without having to apply excessive pressure which only bends wires, putting some out of use.

ME



1. Top view of a drill with a thinned web which was done on an off-hand grinder.
2. Side view of the drill showing the comparatively small 'notch' cut on the web to thin it.



Malcolm Stride reports

UK club news

Hereford SME public running and club days are doing fine this year with children's birthday parties being particular favourites. The new canopy over the elevated track is nearly complete, just requiring some groundwork and painting to finish. Thought is being given to future projects with a petrol-engined club locomotive being a favourite.

Gordon Wood is constructing a new exhibition display stand. The new design is a flat pack design for portability and will last for many years. Some smaller rolling stock is being built for use with smaller ground level locomotives. A group from **Northolt MRC** visited the track in July with some "interesting" locomotives and the day ended with a barbecue.

The 'Professor of Engineering, University of Life's Experience' at **Melton Mowbray MES** has decided things have changed after watching a video clip on the internet. It is no longer just model locomotive and traction engine drivers who ride on their models; model aircraft builders are now joining in (www.jet-man.com). Apparently, four gas turbines and a wing strapped to the body turn you into 'Fusion Man'. That sets the **Gas Turbine Builders Association** a challenge!

Norwich DSME reports that successful operation of the ground level track with plenty of passengers over the weekend of 4/5 May compensated for operation not being possible at Easter. Unfortunately no trains ran either on Sunday 6 April



1. Michael Coote (Kings Lynn) with his Sri Lankan locomotive at Nottingham.

2. Keith Merris (Avonvale MES) looking very relaxed on his Pocket Rocket tram locomotive at Nottingham.



when it was cold and snowy (again!) and Sunday 25 May when the rain was torrential and the park deserted. The society has been pleased to welcome visitors to help with public running. Notably on Sundays 30 March and 20 April. Michael Collyer from Kesgrave worked his 7½in. gauge 2-6-0 locomotive hard, hauling passengers for the whole session. On Tuesdays members have been busy. The 7½in. gauge *Warship* has recently had two tone horns fitted to replace the original single one, but the notes are not entirely authentic, so they are to be replaced by two more. Provision of hardened sleeves to the axle-ends of the 7½in. gauge bogies and refitting them to the ground level passenger cars is continuing. Work on the 7½in. gauge LNER A3 is gathering pace. The regulator has been modified so that it works efficiently, cylinder drain cocks have been fitted and partially piped preparatory to steam operation, and the boiler has been put back on the frames, the latter was a ticklish operation as fitting had to be precise. It is hoped that it will not take too long to reconnect the many pipes so that the engine can be steamed again.

Pete Thomas (of Polly Model Engineering fame) has been elected President of **Nottingham SMEE** and has the "distinct feeling of moving from the back row into the centre of activities." We wish Pete well in his additional new role. On the track, the new drop-off platform at Little Ruddington has been completed and now provides a convenient disembarking point for passengers travelling one way from Parkgate station

at the main site entrance. The Diesel Gala Day in June attracted a good collection of diesel outline locomotives, including some based on foreign prototypes, featuring very bright colour schemes (photos 1 and 2).

The annual Models Night Competition at **Rochdale SMEE** was held on the 16 May. The Harold Sutcliffe Cup for marine entries was won by John Hainsworth for a nearly complete steam launch.

The Kershaw Cup was collected by Bill Heywood for a delightful example of a freelance mill engine and David Pope's 2in. scale Showman's Engine was rewarded with both the Ashworth Ashworth Cup for Best Locomotive and the Hinchcliffe Memorial Trophy for being adjudged the Best Model in Show.

Ted Bennett was elected to the position of society President in place of the late Jack Kelly.

The 2 August was a good day out for a dozen, or so, members of the **Ryedale SME** at the York Society track. All present enjoyed the multi-

In Memoriam

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

Alan Clarke	Norwich DSME
Frederick A. J. Gough	Model Engineers & Live Steamers Association
Grace Heath	Nottingham SMEE
Alan Hill	Bendigo SME (Australia)
Alwyn Robinson	Centurion SME
Ron Whomsley	Nottingham SMEE

3



gauge ground level track. The bonus was 'train spotting' on the main line alongside, which kept the youngsters quiet! The group enjoyed an excellent fish and chip lunch provided by the hosts. About 40 engines attended for the rally weekend from many parts of the country including the very nice 0-6-0 C2X by Michael Cadiz (**photo 3**), complete with driver's bicycle. Work has been taking place at great speed on the new building with working parties moving a water pipe. The team dug out from the toilet block round the corner of the clubhouse base and installed a temporary water pipe so that the old one could be cut where it crossed the foundations. This was followed by the first big dig. The footings trench was completed ready for concrete over a weekend.

On the following Thursday morning a massive team

assembled to greet the concrete wagons in the rain and mud. Some 20 cubic metres of concrete were poured into the trenches, from four wagon loads (**photos 4 and 5**). As well as all this, passenger carrying carried on to replenish funds. David Myers sent in a selection of photographs of the various happenings.

After the indifferent summer weather the forecast sunshine for the August Bank Holiday made a welcome change for **Saffron Walden DSME** with the prospect of a barbeque, good company, and the ambience of Audley End in the sunshine. The combination ensured a good turnout of club members and their models. Newsletter Editor Jeff Dickinson steamed his Bagnall for public running duties hoping for full loads to give her a good workout, and was not disappointed. Other locomotives running included a *Bridget*, Tim Hopkins' 5in. gauge GWR pannier tank, Fred Finch's 5in. gauge B1, and Chris Stead's petrol locomotive did a few laps. Ian Couchman spent most of the afternoon getting to know his Ruston Proctor tractor.

The Bits n' Pieces evening at **Tyneside SMEE** attracted a good selection of work in progress,

Norman Eden showed his part finished Corliss single-cylinder stationary engine. This is being made from his own drawings, using books, photographs and sketches. The engine has a very efficient valve gear with a very quick American cut-off and is mounted on a simulated marble base. Garry Cooper then showed the parts of an M.E. beam engine, purchased by him recently. Additionally, Garry demonstrated a wooden jig, which he made so that he could manufacture a spherical bearing for a friend's dumper truck. Eddie Gibbons displayed two tender frames, which he is building from the original works drawings. One is a GNR Class B tender (tank capacity 3,500 gallons) for the 1920 Class H4 2-6-0; the other is a LNER group standard tender (tank capacity 4,200 gallons) for the 1937 K3 2-6-0. Eddie described making the spring hangers and his plans to make the leaf springs of steel, giving a hard but realistic ride. A jig to make 'rubber' shock absorbers from silicon sealant was passed round. Peter Lambert arrived with his part built Benson's vertical engine and showed the small parts for the governor and the jig for their manufacture. John Bolter displayed an adaptor he has made for his collet set which will allow the use of longer work pieces. John also had the jigs for making the very small horn cheeks on his 3½in. gauge N.E. 4-6-4 electric locomotive. As usual the members asked plenty of questions and the evening was adjudged a great success.

A recent windy period brought down several trees and branches at **York City DSME** recently. With some work from members and the assistance of the Inland Drainage Board

the trees were removed and the associated fence damage was repaired. The society asked for some topsoil from a local school building project and received three lorry loads free of charge. This will be used to enhance and level areas which are to be grassed later. A visit by the local council officer has now resulted in an offer of sufficient grass seed from the council and also an invitation to apply for a grant towards the establishment of a wild life area. This sound like another enlightened council helping our hobby, congratulations to all involved.

World club news

Australia

Members of the **Model Engineers & Live Steamers Association (Maryborough)** had to get all hands to work when the building being used as a clubhouse was required by the local justice department meaning that all the contents had to be moved to several different locations and the stands and turntable also had to be removed. An alternative storage area has been found.

New Zealand

At a recent meeting of **Hutt Valley MES**, member Steve Hainsworth brought two interesting tools for discussion. The first was a set of plier type handles with a set of different attachments to fit them. The other tool was a set of pliers with curved jaws at right-angles to the handles. These were for changing car lamps. The curved part gripped round the metal body and the tool comes into its own when removing broken lamps. Other subjects discussed were joining aluminium electricity transmission line cables, early postgraduate apprentice training in the UK (UK graduates had less practical training in those days), and atomic absorption spectrometers. It was obviously a very varied evening, which went on later than usual. The Editor does not include any finish times in his reports on the grounds that "Wives have been known to quote from this newsletter."

3. Michael Cadiz's 0-6-0 C2X was a visitor to the Ryedale SME rally.

4. Members enjoying themselves digging the foundations for the new building at Ryedale SME.

5. Well that's done then, Ryedale members admire their work.

4



5



At the **Maidstone MES** meeting, Peter Carr showed the back tank and man-stand he is fabricating (in brass and copper) for his 3in. scale traction engine. In an engine of this size, there is a "fair amount of sheet metal needed to make up that assembly." Both operating days in May were good and the opportunity was taken to try out the most recently built club locomotive, the 7¼in. gauge NZR TR shunter. It is being operated with a temporary plywood body structure with accessories such as lights and a horn being developed before the full bodywork is made.

South Africa

The Monday gangers at **Centurion SME** have been seriously looking at the layout of the proposed raised track and are considering some variations to the published design. The basic criteria for the track are curves with a radii of at least 12 metres, and inclines no steeper than 1 in 100, it proved to be not all that simple to make optimum use of the space available. Before actually starting any work, the various options will be surveyed using a 'dumpy' level and a final decision will then be taken. The station with its

passing line, the steaming bays as proposed and loading ramp with its traverser will remain. Some members attended an open weekend organised by the **Pietermaritzburg Model Engineering Society**. They reported that they had a wonderful time and were made to feel very welcome indeed. During the visit they renewed acquaintance with Charles Polkey, a previous member and secretary of the CMSE, now living in Pietermaritzburg.

Humour time

Two items from **MELSA** for those getting on in years:

Prior to the funeral service the undertaker came up to the very elderly widow to ask, "How old was your husband?" "98," she replied. "Two years older than me." "So you're 96." She replied, "Hardly worth going home, is it?"

I feel like my body has gotten totally out of shape, so I got my doctor's permission to join a fitness club and start exercising. I decided to take an aerobics class for seniors. I bent twisted, gyrated, jumped up and down, and perspired for an hour. But, by the time I got my leotards on, the class was over.

DIARY

OCTOBER

- | | | | |
|--|--|--|---|
| 10 Hereford SME. Stan Compton: Pumps and Clacks. Contact Nigel Linwood: 01432 880649. | 12 Leyland SME. Buffet Day. Contact A. P. Bibby: 01254 812049. | 15 Chingford DMEC. Talk & Films. Contact Ron Manning: 020 8360 6144. | 19 Pinewood MRS. Public Running. Contact Paul Archer: 0118 989 4516. |
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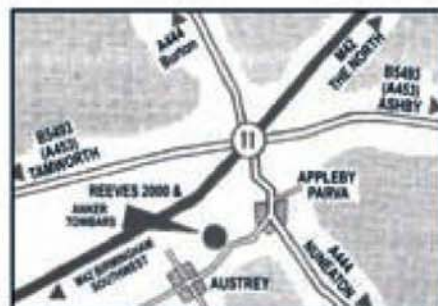


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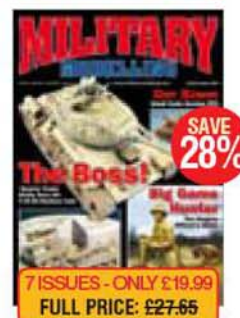
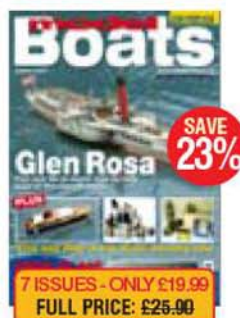
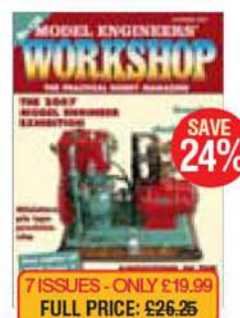
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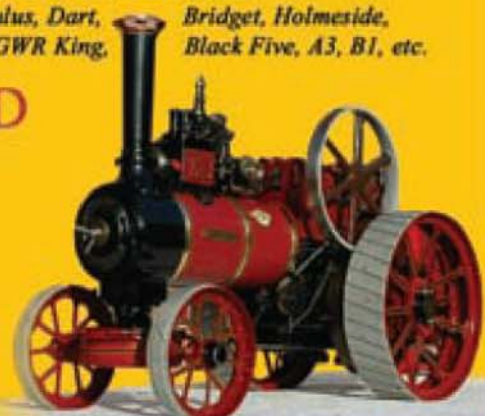
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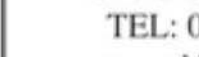
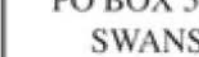
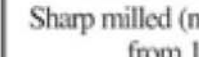
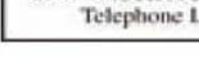
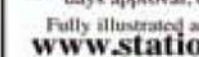
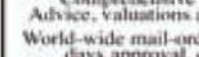
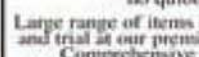
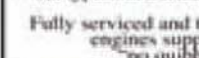
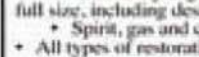
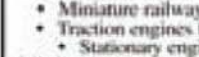
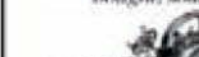
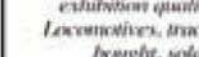
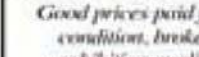
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Union pedestal grinder



'L00' face plate + we have loads more from Myford to Colchester Mascot



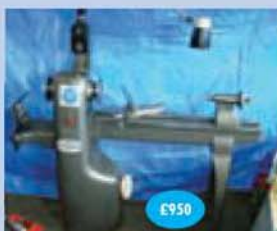
Warco lathe



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Dickson toolposts to suit Colchester Mascot (others available)



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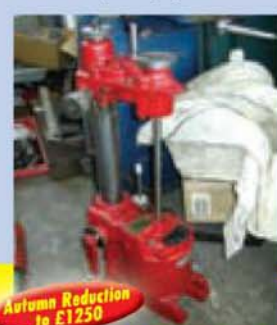
Viceroy 5" x 24" lathe



Harrison L5 travelling steady (LSA, L6, Student, Master also)



Eclipse angle plates



Van Norman 944 boring bar + tools



Colchester Chipmaster lathe



Clarke fluidised tank & blower



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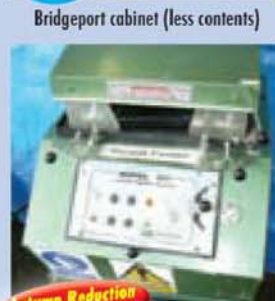
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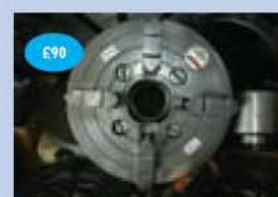
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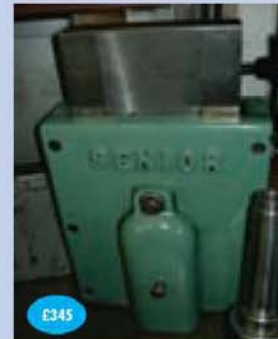
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