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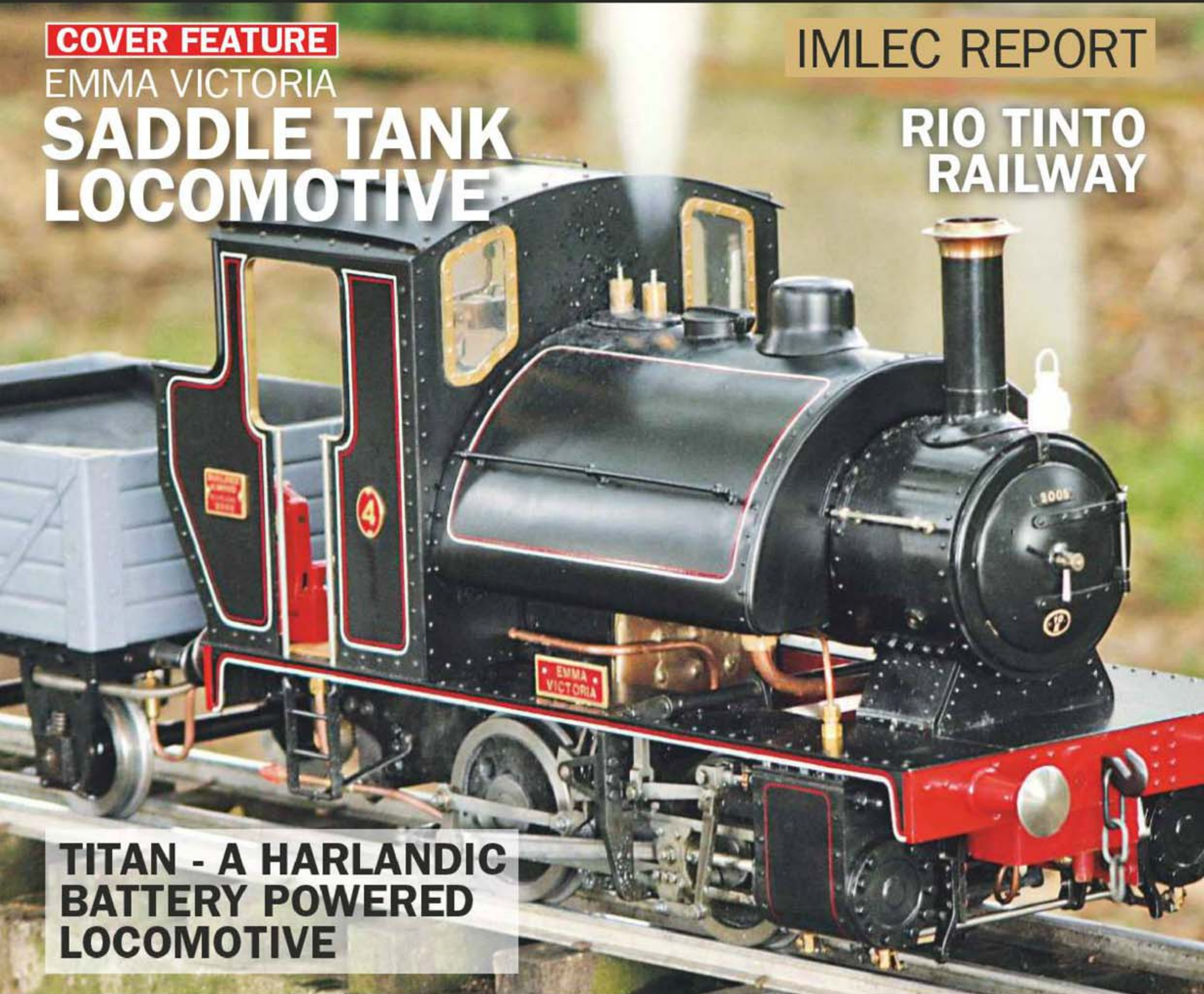

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IN THIS ISSUE

Vol. 209 No. 4444 30 November - 13 December 2012

775 SMOKE RINGS
News, views and comment on the world of model engineering.

776 FAIRLIE COMPLEX: A BEGINNER'S PARADOX
Terence Holland looks at locomotive outlines.

779 BANTAM COCK
LBSC continues with his 3½ inch gauge V4 locomotive.

782 ROEDEAN
Schools class 4-4-0 locomotive from LBSC.

785 CONSTRUCTING THE NEMETT *BOBCAT* AND *JAGUAR*
The series from the pen of the late Malcolm Stride continues.

792 RIO TINTO - A TALE OF COPPER MINING IN SOUTHERN SPAIN
Terrence Holland indulges in some industrial archaeology.

798 DATE-WORK FOR THE PARSLOW BRACKET CLOCK
John Parslow adds a new feature to his bracket clock design.

802 EMMA VICTORIA
Henry Wood introduces his freelance locomotive in 5 inch gauge.

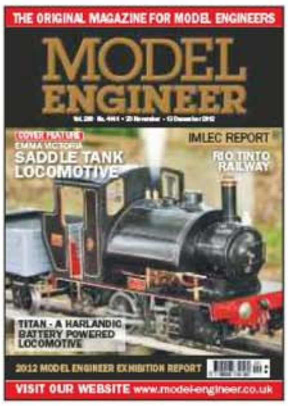
806 THE 2012 MODEL ENGINEER EXHIBITION
Diane Carney's first report covers the DOE and Gold Medal winners.

810 IMLEC 2012
Diane Carney concludes the report on this year's competition.

814 THE HARLANDIC TITAN
Ray McMahon describes a new 7¼ inch gauge battery electric locomotive.

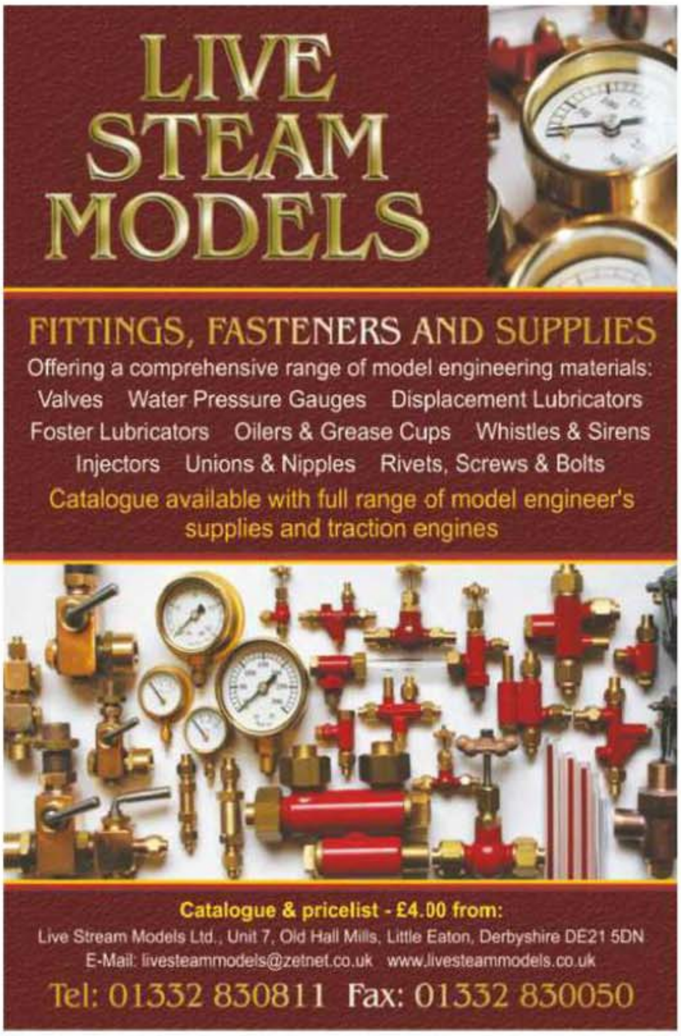
816 CLUB NEWS
Geoff Theasby takes a look at what is happening in the clubs.

819 DIARY
Forthcoming events.



ON THE COVER...

Emma Victoria hard at work. Photo by Henry Wood.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SMOKE RINGS

DAVID CLARK
Editor

DIANE CARNEY
Deputy Editor

Tracey Tools

I am in my early sixties and have just experienced the best bit of customer focussed care I have ever had. It was from Tracy Tools, one of your advertisers.

I am developing an interest in astronomy and wanted to connect a 'C' lens mount camera to something called a 'Polar Scope' which is used to align a particular type of telescope mount. I needed an adapter, it's precision engineering and having seen the prices I decided to make one myself. For that I needed to form some 1 inch by 32 tpi threads. I saw Tracy Tools had the taps and dies; I'd have liked HSS but quite understandably in this large size they were far too expensive for me, so I settled for carbon steel. I've just had a phone call from Tracy Tools to tell me the carbon steel ones are out of stock and offering the HSS versions on next day delivery for a very minimal extra cost. This is superb and caring customer service and I would like to thank them for it through your *M.E.* pages.

Robert Hawtin, Suffolk

Singapore

Tony Brown has now retired and is no longer working in the foundry/castings world. He has passed his patterns for Martin Evans 7¼ inch gauge saddle tank locomotive *Singapore* on to Geoff Stait at GS Supplies who intends to market the castings in future.

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Wiltshire Exhibition

There will be a model engineering and hobbies exhibition on the 16th and 17th March 2013 at the Michael Herbert Hall, South Street,Wilton, Wiltshire.

It will be on Saturday and Sunday between 10am and 5pm. This event always has a large model fairground section. There will also be a wide, varied selection of quality models.

All enquires to Peter and Anne Parrish.
T. 01980 610346.

Micro Screwdriver from Britool

Britool Expert has launched a new professional quality, mid-price range multi-bit micro screwdriver.

Perfect for working with small components, the new Britool Expert E161109B is a multi-bit micro screwdriver aimed at the mid-price-point sector.

The set includes a bit-holder and eight bits; six slotted and two Phillips. The slotted bits range in size from 1 mm to 2.5 mm and the Phillips bits comprise PHS000 and PHS00 sizes. An ergonomically-designed handle provides a comfortable grip and precise turning action which allows speedy and accurate fastening times.

The UK Marketing Manager for Britool Expert, says, "We've been working hard to expand the cost-effective Britool Expert range in order to serve the needs of our customers in the automotive, industrial and engineering sectors. This micro screwdriver is just one of many exciting new products to be launched in the second half of 2012 which have been designed to meet the growing demand for reliable tools at an affordable price."

Britool Expert, part of the Industrial and Automotive Repair division of Stanley Black and Decker, is supported by more than a century of heritage and proven reliability. In 2011 the brand underwent a state-of-the-art transformation courtesy of the award-winning product design team at Facom, Europe's leading hand tool brand. The extended range sets market standards for quality and reliability in the competitive medium-price-point sector.

For information on Britool Expert, visit: **www.britool-expert.co.uk**

Winter Workshops

Following on from a successful summer school last August, recently reported in the *Model Engineer* magazine, Meridian School in Royston, North Hertfordshire will be holding a series of fortnightly Saturday workshops in 2013, commencing on Saturday 12th January and running through to Saturday 9th March.

These have been organised in association with two of our local model engineering societies, and will take place in Meridian's well equipped metalworking and woodworking shops. These will be informal one day sessions with skilled help and tuition available if the participants so wish or they can feel free to bring what they are working on and use the school's equipment, or obtain practical advice on how best to achieve the perfect result that they may be looking for. The cost will be £20 per day.

Any readers who are interested should write to Alan Petri at 21A Lotfield Street, Royston, Hertfordshire SG8 5QT or E. alanpetri@btinternet.com for a leaflet giving further details and an application form.

Alan Petri, Royston and District Model Engineering Society.

Fairlie Complex: A Beginner's Paradox

TERENCE HOLLAND

Terence Holland looks at locomotive outlines.

PART 23

Continued from page 643 (M.E. 4442, 2 November 2012)

I made my petticoat pipe from a piece of 2⅛ inch copper pipe, but the obvious way is to roll up a piece of 1/16 inch copper sheet. If you use tube, remove a parallel piece 1 5/16 inch wide, bend it round a former and silver solder the joint. Draw out the flare on the horn of a small anvil using a ball pein hammer. Incidentally, did you know that a hammer in Hampshire is sometimes known as a 'Podmore'? Apparently it's named after William Henry Podmore who was hanged in 1930 for killing his boss with a hammer. Another piece of useless information unless you intend to appear on Eggheads!

To finish off the petticoat pipe, cut it to the required length. Solder on a couple of ⅜ x ⅜ inch tabs at the plain end, drilled for 4BA bolts to suit two corresponding holes drilled in the top of the smokebox. Fit to the inside of the smokebox and then fit the chimney. Seal it with a suitable sealing compound.

The blower system follows typical narrow gauge practice in that the steam supply pipe runs externally to the boiler. I have built several locomotives with external blower pipes and have had no problems with this arrangement. And, of course, it looks the part. For the blower jets, one can't beat the design of Laurie Lawrence published in these pages in December 1958. Make up an annular, hollow manifold by silver soldering together the components shown in fig 59. The central hole should be an easy fit over the blast pipe. Drill and tap the top ⅛ inch x 40tpi on a ¾ inch PCD to take the four jets and silver solder a ¼ inch x 40tpi male connection in the side for the steam inlet. Note that in the original article, the holes for the jets are inclined inwards at 2 degrees, however, in practice I have not found this to be necessary so have used vertical holes. The jets are drilled 0.5mm or No.76 to give a 20 thou orifice. The chimney and the blastpipe components are shown in photo 79.

During operation things get a bit dirty inside the smokebox - to say the least! With this type of blower it's easy to unscrew the union nut and then slip the blower ring off the blast pipe and remove it for cleaning. Each jet can be unscrewed and cleaned through with a suitable 'pricker' from the inside out. As Laurie points out in his article, if you simply clear the jets from the outside you will push the muck inside ready to cause problems at a later date. For me these blower modifications were a revelation. I spent many a happy hour with my young children on the rally field in the seventies and getting a locomotive or traction engine into steam quickly was a definite advantage; and once the fire was lit, with this design it was easy to keep the engine in steam for the rest of the day. These blowers will pick up with just a few pounds on the pressure gauge and there's nothing worse (especially if one has an audience!) than trying to light up an engine on the rally field and realising you're fighting a losing battle and have to start again relaying the fire etc. Ah well - halcyon weekends spent outside the model tent with puffs of live steam leaking everywhere. Those were the days!

A correction

Before moving on I must deal with an error made in Part 17 (*M.E.* issue 4432) which was spotted by Don Ashton, who also noted that a better description would be of help to the beginner. This concerns fig 41 where the crankpin is set to its lowest position and not 'bottom dead centre' as labelled. The method advocated by both LBSC and Martin Evans is different from that described in 4432 and is worth reiterating here. It sets the crankpin position and determines the length of the eccentric rod centres simultaneously; note that this is carried out on completion of most of the valve gear components and that each side of the engine should be dealt with separately. The procedure is as follows:

1. Clamp the expansion link firmly in its mid position so that the die block can be moved up and down without causing any movement of the combination lever;
2. Set the main crank to front dead centre, FDC (i.e. the piston is as far forward in the cylinder as possible);
3. Position the return crank (leading the main crankpin as shown in fig 41) 35/64 inch from the centre of the axle to the centre of the return crankpin; tighten the bolt (use the setting pin here as shown in fig 41). In this position the return crank will describe a circle of 1 3/32 inch (1.094 inch).
4. With dividers, measure the distance from the centre hole in the expansion link to the centre of the return crankpin.
5. Now move the main crank to back dead centre, BDC (i.e. the piston is now as far back in the cylinder as possible).
6. Apply the dividers set with the previously made FDC measurement and check.
7. If the measurement is the same the return crank is set correctly; if not, move the return crank half the amount of the difference and repeat at FDC; reset the dividers and recheck until both measurements are the same.

This series will take a short break until the New Year when it will return with details of boiler construction.

The final setting on the dividers is the correct measurement for the centres of the eccentric rod for that side of the engine and the eccentric rod can now be made. Repeat the above procedure for the other side and make the other eccentric rod. Finally pin the return cranks to their respective crankpins with taper pins.

80

AB Well Tank John Thomas.

Freelance design

As far as I am concerned, one big advantage of freelance design and the making of a working engine is that, within reason, components can be specified and made to suit the parts on the engine that already exist. For example, once the motion and boiler are complete, the superstructure of side tanks, cab etc. can be fitted around the existing work and the freelance option will allow more freedom in the use of fabricated components, recycled items etc. Obviously a general arrangement drawing needs to be followed to some extent, if only to get the proportions right so the finished engine looks 'half-way decent'. That is, the finished locomotive needs to look like it could have existed as a prototype. The bonus is that this freedom makes my job a lot easier than that of those designers who are following a prototype; i.e. to produce a working engine which is as close to scale as possible. Apart from the appearance, the only main constraints for freelance design are that the engine must fit within local track loading gauge restrictions imposed by tunnels, bridges and platforms etc. and these are of minimal impact on the smaller gauges.

Because of the relatively small diameter of Simplex wheels (4⅜ inch) and the 4¾ inch diameter of the Simplex boiler, most of the variants described herein are unlikely to be as large as they could be, based on 5 inch gauge and a two foot gauge prototype. A 5 inch gauge scale version of the Hunslet Gowrie from the North Wales Narrow Gauge Railway (NWNGR), for example, should have 6 inch driving wheels and a 7 inch diameter boiler barrel. Therefore, based on the Simplex wheel diameter, a Complex version with two power bogies would be physically 25% smaller than the true scale version. Similarly, basing Complex on the look of the War Department Hunslet 4-6-0 one ends up with an engine which is only 87% of the prototype size.

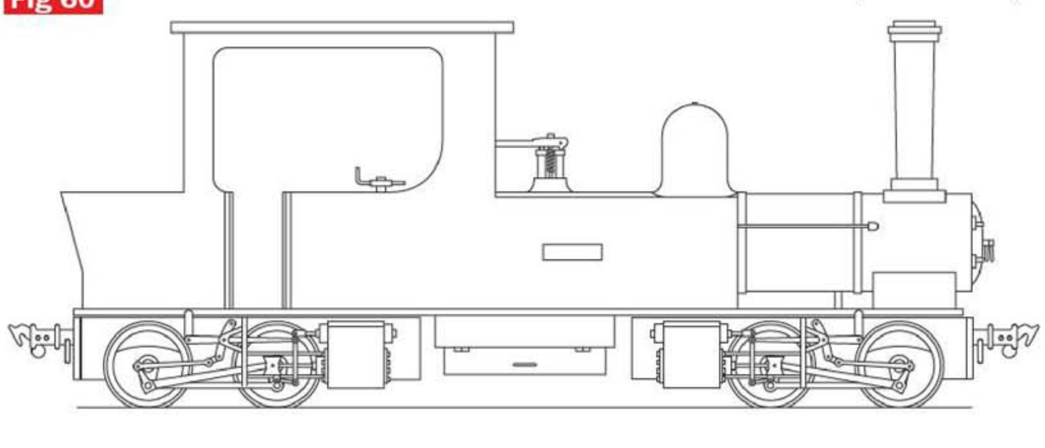
If the Kitson-Meyer in **fig 60**, for example, had a cab height of 16 inches based on the proportions of Gowrie, it comes out looking like a main line locomotive. With a cab height of 22 inches, which is the same as my 5 inch gauge Andrew Barclay Well Tank 0-4-0 (**photo 80**), the design starts to look unusual and enters the realms of miniature narrow gauge locomotives which are full-sized engines in their own right. The locomotive in photo 80 is a scale model (approximately ⅕ of full size or 2.5 inches to the foot) of an Andrew Barclay 0-4-0 well tank but is fitted with a 'non-scale' tender which acts as a driving trolley and is complete with extra water and a coal supply. Again, freelance design creeps in to provide a practical solution to an operational problem!

To return to the current description of the Kitson-Meyer, a compromise however, with a cab height of 20 inches, has a definite 'narrow gauge' look and these are the proportions I have used in fig 60.

Locomotives with oversize cabs and chimneys are to be found on many ground level 7¼ inch gauge tracks in the UK. **Photograph 81** shows such a locomotive operating on the 7¼ inch gauge Moors Valley Railway near Ringwood in Hampshire; in this case a 2-4-0 engine named *Horton*, No.14, which was built in 1991 by Narogauge Ltd. in the Moors Valley workshops. The engine has Hackworths valve gear, a 10¼ inch diameter boiler barrel and 2½ inch cylinders with 4¼ inch stroke. The driving wheels are 8½ inch inch diameter. An interesting link with Simplex/Complex is that two power bogies based on the Horton design were used to construct the 2-4-0+0-4-2 Garratt locomotive No.15 *William Rufus* which also runs on the line.

With this railway, the departure from 'normal' appearance results, of course, from the need to accommodate the driver in the cab/tender and to carry out a specific task. Consequently,

Fig 60



Complex as Kitson-Meyer.

>>

Moors Valley Locomotive, Horton.

there is no requirement to reproduce the look of a big sister. An example of this design concept for 5 inch gauge track was presented as the 'almost-driveable locomotive' illustrated in fig 6 of this series.

A comparison of the three cab/chimney sizes is shown in **fig 61** and this shows how dramatically the appearance/type of locomotive can be changed by simply altering the cab size and chimney height. It should be noted however that, under the lack of constraints associated with freelance work, any of the options in fig 61 would be acceptable. And, at the end of the day, the bigger the cab the easier an engine is to operate.

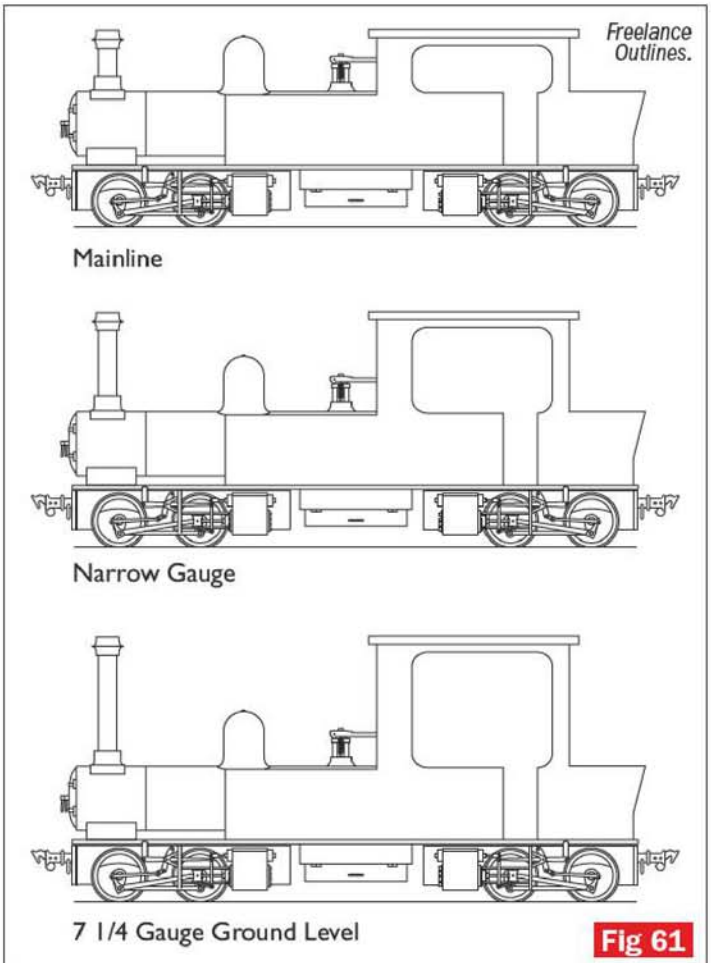


Fig 61

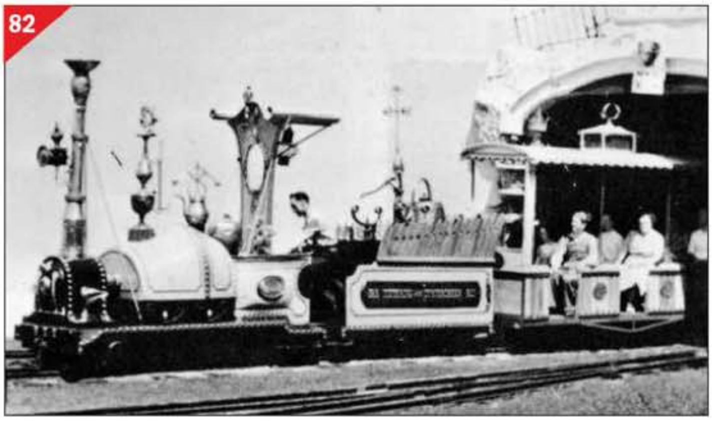
The Far Tottering and Oyster Creek Branch Railway

The ultimate departure from normality, as far as railways and freelance locomotive design goes, must surely have been Rowland Emett's Far Tottering and Oyster Creek Branch Railway, which was constructed in Battersea Pleasure Gardens for the South Bank Exhibition as part of the Festival of Britain in 1951. The railway began as a series of Emett cartoons in the pre-war *Punch* magazine of 1939. It was arguably the most successful railway ever, only 500 yards long, it was completed in 10 months and it carried two million passengers during its two years of operation. Furthermore, it paid off all its costs in the first three weeks of operation!

I remember seeing the railway (and the Guinness clock!) as a child in 1951 whilst on a visit to the Festival site in London with my parents. Unfortunately, we did not get to ride on it as there were massive queues and we were only there for the day, with lots of other things to see. My memories of the railway are vague but I was only nine years old at the time! No photographs I'm afraid; apart from being too young at the time, very few people had a camera then and telephones didn't double up as cameras and weren't portable as they are now - big, old black things were bolted down in big red boxes on street corners, if you were lucky enough to live near one! It's amazing now to think that the festival took place only six years after a major world war and equally sad that the optimistic sentiments of the time were not realised.

The railway, which was of 15 inch gauge, operated with three locomotives; *Nellie*, *Neptune* and *Wild Goose*. *Nellie*, No. 1, had a bulbous boiler with a spindly chimney and was covered with various copper and brass fittings. *Neptune*, No. 2, was constructed to look as if it had been built using parts from an old paddle steamer and *Wild Goose*, No. 3, appeared as a captive hot air balloon! They were built by Harry Barlow who was the owner of Southport's Lakeside Miniature Railway which he had purchased in 1945, and they had a 4-6-2 wheel arrangement (the strangest Pacifics ever?). They were powered by diesel-electric units salvaged from war-surplus searchlight generators; somewhat indicative of the economic situation prevailing at the time. *Nellie* is shown in **photo 82**.

To be continued.



Far Tottering Locomotive, Nellie.

Bantam Cock

A 2-6-2, L.N.E.R. V4 - 3½ inch gauge engine

LBSC continues his new locomotive.

PART 3

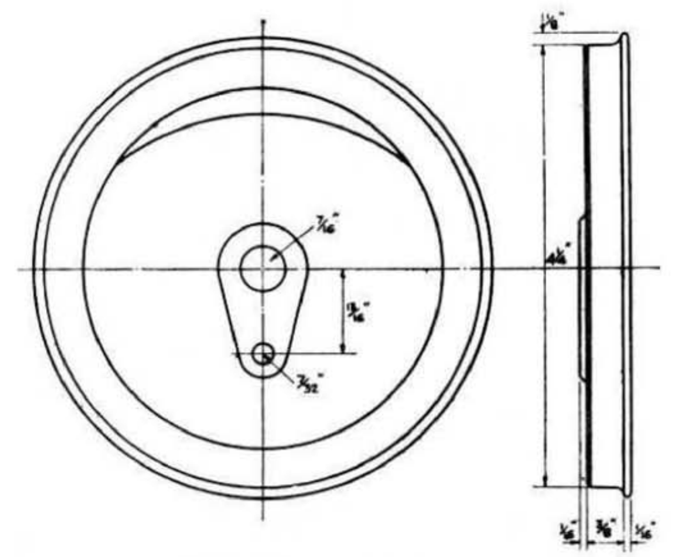
Continued from page 743 (M.E. 4443, 16 November 2012)

The spring pins are 1 5/16 in. lengths of ⅛ in. round silver steel; twelve are needed. Chuck each in the three jaw chuck, and using a die in the tailstock holder, put 3/16 in. of either ⅛ in. or 5BA thread on one end, and about ¼ in. of the same pitch on the other. Use plenty of cutting oil when screwing the pins, and work the lathe mandrel back and forth by pulling the belt by hand; otherwise you will probably have torn threads. The shorter screwed end of each pin is then put through the hole in the hornstay, and screwed tightly home into the axlebox. I use a home-made steel driver for this job; it is simply a 2 in. length of ¼ in. brass rod with a tapped hole about ⅛ in. deep in one end; the other has a cross handle like a chuck key. This is screwed over one end of the pin, and by its aid, the pin is easily screwed right home; to release the key, simply grip the pin with a pair of pliers, and unscrew the key. With all the pins right home, the axleboxes should have perfectly free movement up and down in the hornblocks.

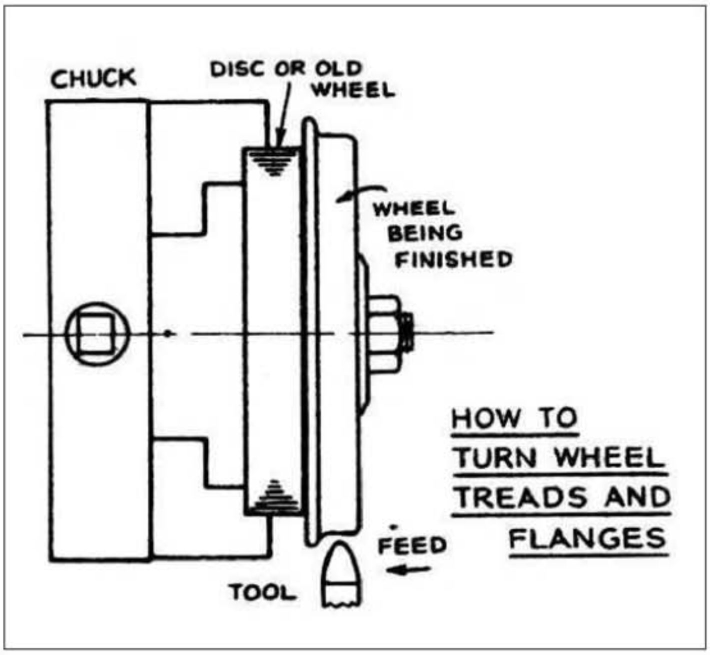
The spring plates are ¾ in. lengths of ¼ in. by 3/32 in. steel strip, each having two No. 30 holes drilled at ½ in. centres. They may be rounded at the ends, or left square; it makes no difference. The springs are made from steel wire, tinned for preference, as the tin coating prevents rusting. Use 20 gauge wire, and wind them in the lathe. Put a piece of ⅛ in. silver steel in the three jaw chuck; bend the end of the spring wire at right angles for an inch or so, and poke it between the chuck jaws. Then pull slowly on the belt by hand, guiding the spring wire on to the ⅛ in. mandrel with your thumb and finger. If after winding on about four turns evenly, you press your thumb tightly on the coils and continue to pull the belt steadily, your thumb will act as a kind of feed nut, and the rest of the spring will automatically wind up with even coils. Pieces of the coil, a bare 1 in. long, are cut off, and each end squared by lightly touching against the side of a fast-running grinding wheel. Then put a spring on each pin, followed by a plate and two ordinary commercial nuts, as shown in the assembly drawing. As it is an advantage, and a great aid to correct erection of the motion work, to have the axleboxes in the correct running position, put a little piece of brass ⅛ in. in thickness between each axlebox and hornstay, between the two spring pins, and tighten up the nuts sufficiently to prevent it accidentally slipping out.

Coupled wheels

The six coupled wheels are 4¼ in. in diameter on the tread, with flanges ⅛ in. deep and 1/16 in. wide. The treads are not coned, as was usual in big practice until Sir W. A. Stanier carried out the experiments on the L.M.S. which proved that there was no advantage in coning treads. On small engines, which traverse sharp curves, coned treads are the cause of excessive slipping of driving wheels, as the centre >>



COUPLED WHEELS



pair of wheels have their flanges forced over to the inside rail of the curve, and the largest diameter of a coned tread then runs on the shorter rail, the very reverse of what should be the case. It is impossible to prevent one wheel slipping on a curve, when both wheels are rigidly mounted on the axle, because the wheel on the outer rail must travel farther than the inner; but parallel treads minimise the amount of slip.

To turn the wheels, first file off any superfluous knobs and excrescences which might have been left by the foundrymen; some of them are very fond of leaving a piece of the 'gate' attached to the flange, and if left on when starting to turn the wheel, it would probably break the tip off the turning tool. Then chuck in the three jaw chuck, gripping by the tread, and setting to run as truly as possible. With a round nose tool set crosswise in the rest, at centre height, face off the back of the wheel, and true up the flange, using slow speed and back gear for the back of the rim and flange, and cutting out back gear for the boss. Then centre drill right through the boss with 27/64 in. drill, and ream 7/16 in., using the reamer held in the tailstock chuck. Next, turn the wheel around in the chuck, and grip it, face outwards, by the flange.

Turn the face of the rim, and face off the boss, with a round nose tool as above; back gear for rim, and direct drive for the boss. Then put a parting tool, or a knife tool, in the rest, and cut a little step about 1/16 in. wide and deep, at the point where the spokes join the rim, representing the joint between wheel centre and tyre on a full-sized locomotive. Note that the thickness of the boss should be ½ in. exactly, from the back to the front of the wheel. Some castings are excessively thick, goodness knows why, and any excess should be turned off the back of the wheel. If the front is reduced, the spokes may come flush with the boss, and completely spoil the appearance.

Beginners sometimes have difficulty in getting all the coupled wheels to exactly the same diameter; they won't, if they carefully observe the following simple instructions. Chuck a spare wheel casting, or an old chuck backplate, or something of similar dimensions, in the three jaw chuck; this should be slightly less than 4¼ in. diameter. Face it truly, and recess the centre about 2 in. diameter and 1/32 in. or so deep. Centre and drill a 13/32in. hole in the middle, and tap it. 7/16 in. by 26 or any other fine pitch. Screw into this a stub mandrel, made from a piece of ½ in. steel rod 1½ in. long, previously turned down to 7/16 in. diameter for ½ in. length, and screwed the same as the hole in the disc or wheel just mentioned. It must fit very tightly. Carefully turn this down until a coupled wheel can be slid onto it without any shake; then screw it 7/16 in. by any fine thread for about half its length, and fit a nut. Take a final slight cut over the face, to make certain it is quite true. Put a coupled wheel on the stud, face outwards, and tighten the nut. With an ordinary round nose tool, using slow speed and back gear, the tread and flange can now be rough turned to within about 1/64 in. of finished size. When the last of the six has been roughed, regrind the tool, and carefully take off the last sixty-fourth, keeping the speed very slow when the tool cuts the root of the flange, otherwise you will get chatter marks all around the radius. Now, without altering the setting of the cross slide, mount each of the rough turned wheels and take the finishing cut; they will all be exactly the same diameter when finished. The tips of the flanges can be rounded off before removing the wheel from the improvised 'faceplate'. Some folk advocate turning the wheels on their own axles, but I never use any other method than that described in full above, for beginners' and new readers' especial benefit. If the wheel is not adequately supported at the rim, where the turning tool is operating, you are bound to get chatter marks. The treads and flanges of turned wheels should never be polished with emery-cloth, or by any other means; they smooth off pretty soon enough on the railheads in service.

Crank and coupling pins

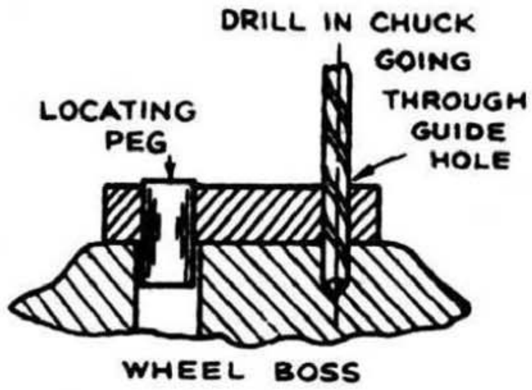
First, drill the wheel bosses for the crank and coupling rod pins. This is easily done by a jig, as it is absolutely essential that all the throws should be exactly the same length. The jig is made from a piece of steel about ¾ in. wide, ¾ in. in thickness and 1½ in. long. Scribe a line down the middle, and set off two points 13/16 in. apart, making heavy centre-pops. Drill two 7/32 in. holes through the pops, either on a drilling machine, or in the lathe, with the drill in the three jaw chuck, and the work held against the tailstock barrel, the centre being removed. Open out one of the holes to 27/64 in., and slightly reduce the end of a ½ in. length of 7/16 in. round rod, until it can be driven halfway in. The jig is then complete. To use it, scribe a line down the centre of each wheel boss; insert the projecting bit of rod into the hole in the centre of the wheel boss, and adjust the jig until you can see the line crossing the centre of the 7/32 in. hole. Then clamp in position with a toolmaker's clamp; put a 7/32 in. drill through the hole in the jig, and drill right through the wheel boss, the hole in the jig guiding the drill truly. Repeat the process on each wheel, and each throw cannot help being identical.

The leading and trailing crankpins can be turned from 1/4 in. round rod, silver steel for preference, and the driving crankpin from 3/8 in. ditto. For the leading pins, chuck the rod truly in the three jaw chuck, and turn down 7/16 in. of the end to a drive fit in the crankpin holes in the wheel bosses; the modus operandi is exactly the same as when turning the wheel seats on the axles, as described below. Part off to leave 3/16 in. of full diameter beyond the shoulder. Reverse in the chuck, centre, and drill a No. 40 hole about 7/16 in. deep; tap this 1/8 in. or 5BA, and repeat the process for the second pin. The retaining washers are turned from 7/16 in. rod, or 1/2 in. rod turned down to 7/16 in. in the three jaw chuck. Centre, and drill a No. 40 hole about 3/8 in, deep; countersink it, and part off a washer 1/16 in. in thickness. Countersink again and part off the second washer. Ordinary commercial countersunk screws are used to fix the washers in place after erecting the coupling rods later on.

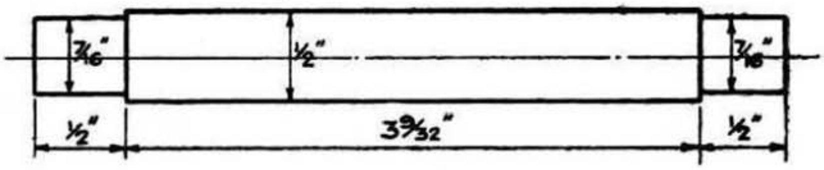
For the driving pins, chuck a length of 3/8 in. round silver steel truly in the three jaw chuck. Turn down the spigot as described above, and part off at 7/8 in. from the shoulder. Reverse in the chuck, and turn down the outer end to 3/16 in. diameter, to form the spigot on which the return crank is fitted.

The trailing pins are made from 1/4 in. rod; chuck truly and turn down the spigot for the wheel boss, as described above. Part off at a bare 1/2 in. from the shoulder. Reverse in the chuck, and turn down about 3/16 in. of the outer end to 5/32 in. diameter, leaving 9/32 in. of full diameter for the coupling rod to run on. Screw the end either 5/32 in. by 40, or else reduce it a shade more and screw 4BA. The crankpins can now be carefully pressed into the wheels between the vice jaws; if they go hard, reduce slightly with a file, and don't over force them, or the cast iron bosses of the wheels will soon split.

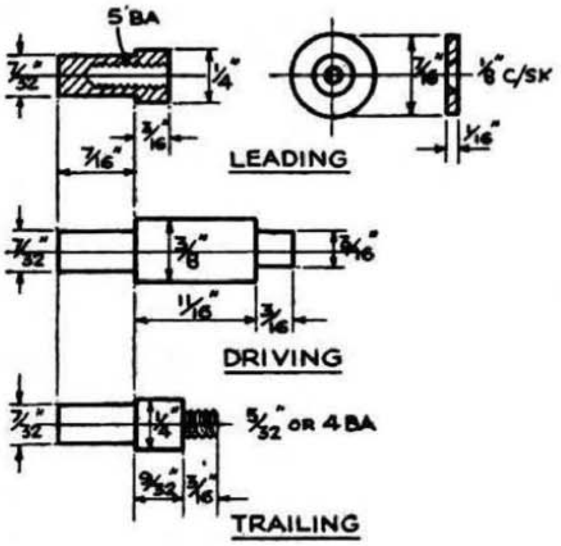
To be continued.



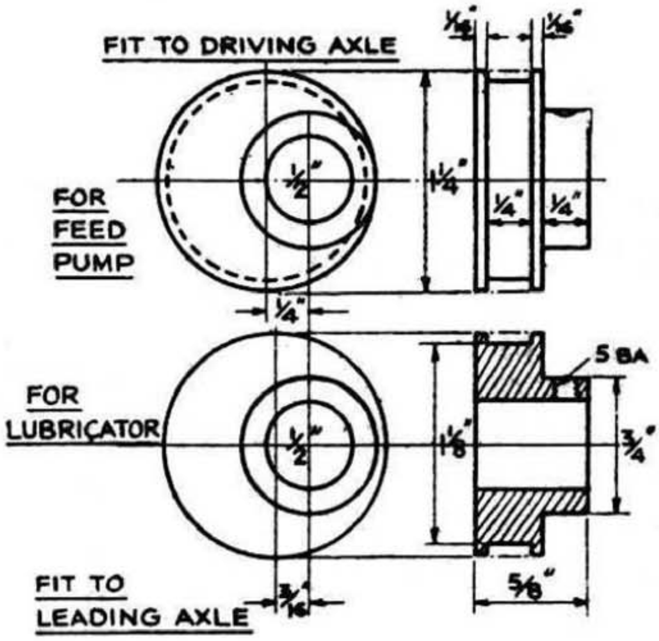
HOW TO DRILL CRANKPIN HOLES



COUPLED AXLE



CRANK PINS



ECCENTRICS

LBSC's 'Roedean', a Southern 'Schools' 4-4-0

LBSC makes and fits an ashpan.

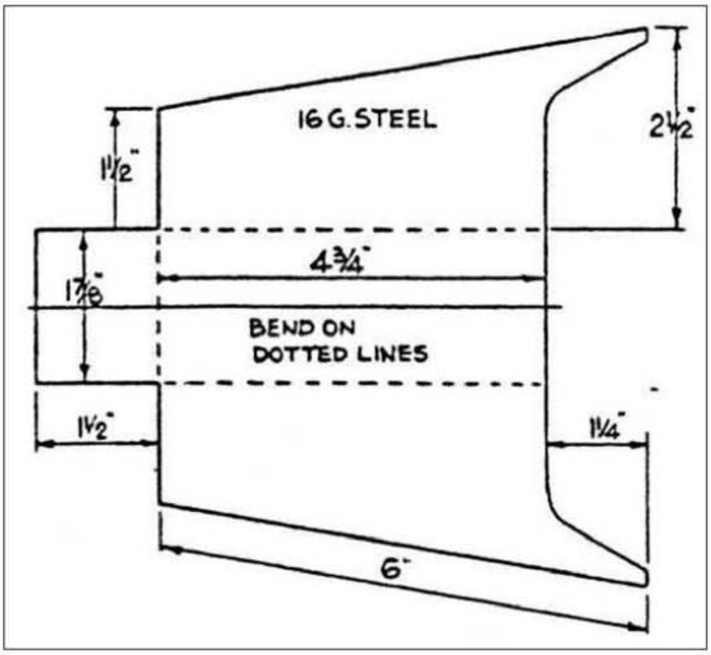
PART 31

Continued from page 715 (M.E. 4443, 16 November 2012)

A full set of drawings for Roedean is now available from MyHobbyStore Ltd. Visit **www.myhobbystore.co.uk** for details or phone 0844 848 8822

The grate and ashpan on Roedean are arranged a little differently inasmuch as the grate is composed of straight bars, and permanently attached to the ashpan. It can be replaced, after dumping the residue of the fire after a run, without lifting the engine off the rails. An 'ashpit' should be formed at any convenient point in the railway, by removing the cross sleepers and substituting a couple of longitudinal sleepers extending about the length of the engine, giving a clear open space between the two running rails.

It is quite possible that our advertisers supplying materials for Roedean will be able to offer the grate as a casting; this will not only save work, but be a better job, as cast iron is much more resistant to burning than cut steel firebars. However, if for any reason a casting is not obtainable, make up the grate from ⅛ in. by 5⁄16 in. black mild steel strip, seven 6 in. lengths being required. Drill one of them with No. 20 drill at 1 in. from each end, and use it as a jig to drill the rest.

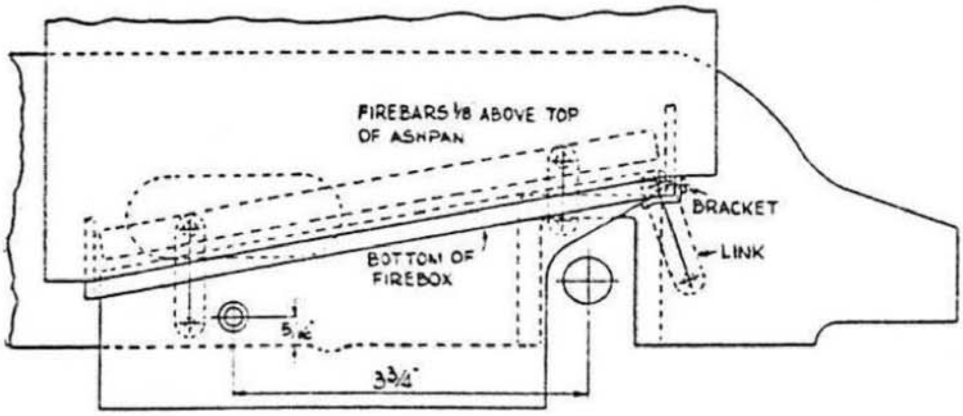


The bearers are made from two 1⅞ in. lengths of 5⁄32 in. round steel, rustless for preference, as this does not deteriorate from the effects of condensation in the firebox when the engine is cold. The spacer washers are made from 5⁄16 in. round mild steel. Chuck, in the three jaw chuck, centre, drill down about 1 in. with a No. 20 drill, and part off ⅛ in. slices until you reach the end of the hole. Ditto repeato until you have eight spacers.

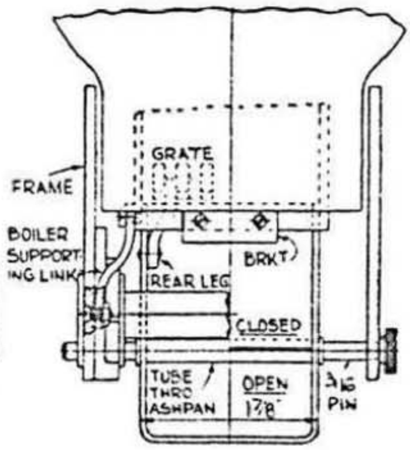
The legs are made from bits of the same steel as the bars, dimensions being given in the drawing of the grate. Put a few threads of 5⁄32 in. by 40 pitch on the end of each bearer. Nuts of this pitch are not made commercially, but ordinary 4BA nuts can he used, if the 5⁄32 in. by 40 tap is run through them. Put a nut on one end of the bearer, then a fire bar, then a leg, then another bar, and spacers and bars alternately, putting another leg between the last two bars, and securing the lot with a nut. Serve the other end in the same way. Slightly burr the ends of the bearers over the locknuts so that they cannot come loose. File if necessary to fit the firebox.

If a cast grate is used, fit the legs between the outermost bars, drilling a No. 40 hole through the bars and legs, tapping ⅛ in. or 5BA and inserting either a screw, or a stub of ⅛ in. steel rod or wire,

A 'Schools' class locomotive.



HOW GRATE AND ASHPAN IS ERECTED

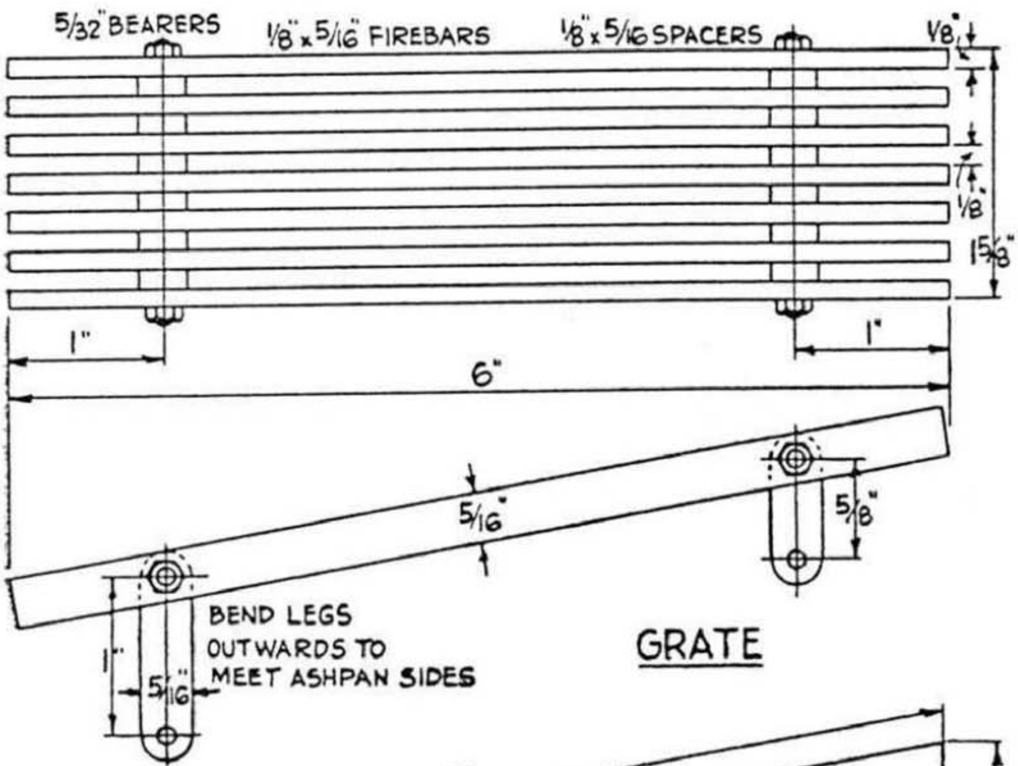


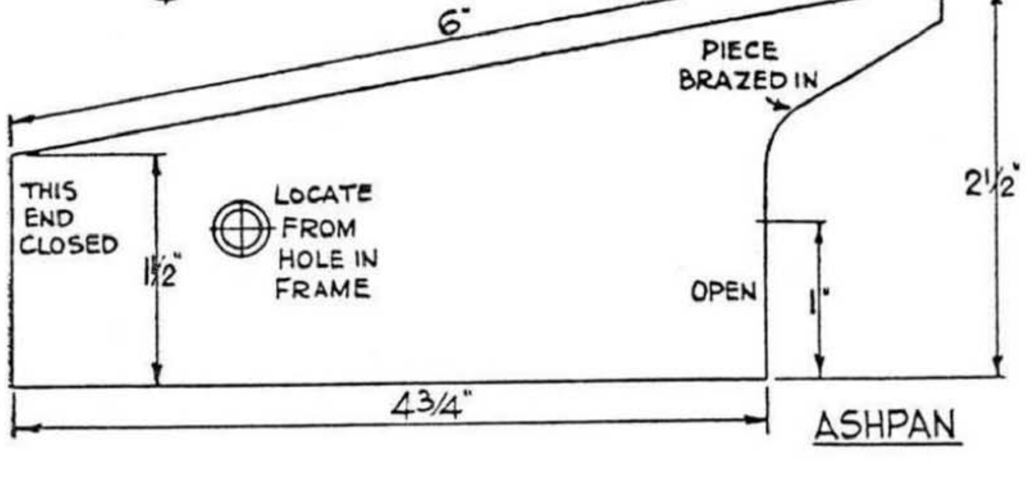
BACK VIEW OF ASHPAN ERECTED

screwed to fit, and cut off flush with the outer bar. Bend the legs outward, in either type of grate, to meet the ashpan sides.

The ashpan is made from 16 or 18-gauge sheet steel, the sides, bottom, and front end needing a piece measuring roughly 7½ in. by 7 in. Mark out as shown in the illustration of the ashpan in the flat, and bend on the dotted lines to a box shape. The front corners should be brazed up. Only an inch of the back end is left open, at the bottom. Above this, a piece of sheet steel is fitted between the sides of the ashpan, bent to the contours of the upper part, looking something like the stern of a ship; this is also brazed in position.

Anybody who owns, or has the use of an oxy-acetylene blowpipe, can do these small sheet-metal brazing jobs, using Sifbronze rod, and a 100-litre tip in the blowpipe, easier and quicker than soft soldering. I have been using an 'Alda' blowpipe for the past 18 years; and can say without hesitation, that it is one of the greatest time-savers I ever had the pleasure of using. The metal doesn't even need cleaning; I recently Sifbronzed a patch on a rusty coal pail, and stuck a couple of patches on a rusty car silencer for a friend, the metal amalgamating perfectly; it forms a surface weld. Note: the upper part of the completed ashpan must fit easily into the bottom of the firebox.





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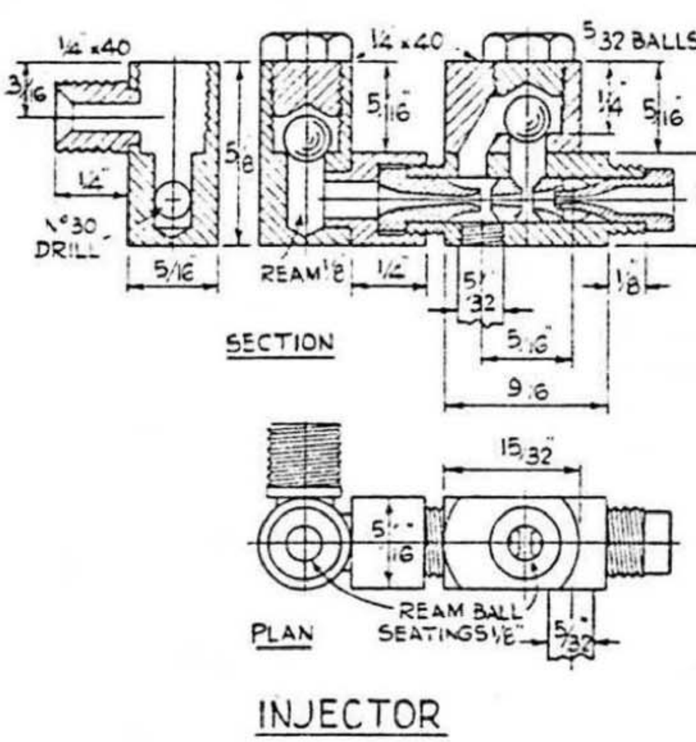

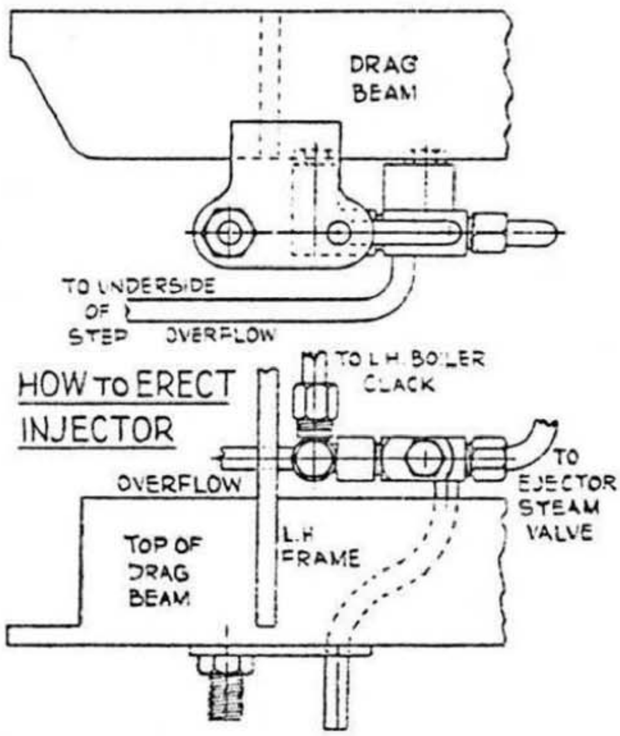

The grate can now be permanently erected in the ashpan by riveting or screwing the legs to the sides of the pan; see back view of the complete assembly, also the dotted lines in the side view. The grate is erected parallel with the sloping top of the ashpan, and the height is such that there is approximately ⅛ in. between the top of the ashpan and the bottom of the firebars. This can also be seen in the side view. The whole issue is supported in place by a bracket at the back, and a pin near the front end.

The bracket is made from a piece of 16 or 18-gauge, sheet steel, 1 in. long and ¾ in. wide; this is bent up in the bench vice to an irregular angle, as shown in the side view of the complete assembly, and attached to the projecting bottom piece of the firebox doorplate by two screws (4 or 5BA) as shown in both side and end views.

Now be careful over this bit. At 3¾ ins. ahead of the centre of the trailing axle, and 5/16 in. above the bottom line of the frame, drill a 3/8 in. clearing hole through the frame at each side (No. 11 drill). Both holes should be in line, so beginners had better drill No. 30 first, and test with a straight bit of rod put through both. If the rod isn't square and level across the frames, correct with a rat-tail file before opening to the right size. Now insert the grate and ashpan assembly into the firebox, 'stern first', letting the rear end drop down on to the angle bracket, whilst the front end projects up just inside the firebox; then set the bottom of the ashpan quite horizontal and level. If the engine is standing on the bench, or on a bit of rail, a piece of packing at each end, of the same thickness, will do the needful.

Next, more care is needed; holding the drill brace level, and square with the frame, put the drill through the No. 11 hole in the frame, and drill right through the side of the ashpan, at each side. Remove the ashpan; open out the holes to 5/16 in. diameter and fit a piece of 5/16 in. tube or better still a piece of 5/16 in. round steel with a No. 11 hole drilled right through it. This should be brazed in; and the ends, if tube, belled out a little, or if drilled steel, countersunk, to give the fixing pin an easy start. Replace the ashpan, and secure it with a pin made from a piece of 3/16 in. round steel rod, approximately 3½ ins. long, slightly rounded off at one end, and furnished with a turned steel knob or button at the other.

If the engine is run over the ashpit, and this pin pulled out, the whole grate and ashpan will fall out, and discharge the residue of the fire; the grate and ashpan is replaced, without moving the engine, simply by inserting it in the firebox as mentioned above, rear end first, letting the 'stern' rest on the bracket, then lining up the cross tube with the holes in the frame, and pushing in the pin. The curved plate at the rear end of the ashpan, above the opening, protects the trailing axleboxes from grit.

Injector

The injector is of the well-known 'Vic' type with my own pet sizes and arrangement of cones or nozzles, and is similar to others which have been described in these notes, for other engines. For the information of beginners, I might say here that the injector is, in effect, a small copy of the Holden and Brooke automatic lifting and restarting injector at one time widely used on full-sized locomotives before the modern exhaust steam injector came into general use. The only fundamental difference is that a ball valve is used for the air release, instead of a flap valve as in full-size.

As so many silly tales have been put about by various people that injectors are unreliable, difficult to make, and so on, and should only be purchased from 'specialists' (who do not hesitate to charge 'special' prices!) I will state right here that anybody capable of drilling holes to given sizes, and doing a little plain turning, can make a satisfactory and efficient injector. If made exactly to the given dimensions, it will work, and as long as it is kept clean, it will continue to work every time steam and water are turned on. Unlike many 'specialist' and commercially-made injectors, this one uses very little steam, and as long as the fire is all right, it will make no difference to the steam pressure whether used running or standing.

One more point; if the injector doesn't work, then either it is not made to specification, or there is something amiss with the steam and water supply, or the delivery. I will give a few likely causes of intermittent or faulty working when we come to the running hints and tips later on.

To be continued.

Constructing the Nemett *Bobcat* and *Jaguar*

MALCOLM STRIDE

The late **Malcolm Stride** describes his Bobcat and Jaguar engines.

PART 8

Continued from page 725 (M.E. 4443, 16 November 2012)

This series has been adapted from Nemett's (now known to be Malcolm Stride) construction manual for the NE15 IT in-line twin cylinder, overhead valve petrol engine which Malcolm subsequently renamed Bobcat*. The series will also include details of the NE7.5 S* Jaguar*.*

Part 20 – Cylinder head

An important point to make about the cylinder heads is that there are many holes, at various angles, and clearances are very small in some cases so care should be taken to stick to the designed layout, sizes and depths to avoid breaking through into undesirable places.

The heads are machined from HE30 aluminium alloy. I had some 15mm plate so I cut two square pieces from that and milled them to slightly over the 38mm square final size.

I then mounted them in the self centering four jaw chuck in the lathe and faced off one side. I then used a boring bar to bore the 0.5mm deep cylinder liner recess (**photo 118**). In fact, I found it easier to bore this slightly deeper than needed before facing the front face to get the correct depth. I found measuring the diameter of the recess to be easier using a vernier gauge and looking for the maximum reading. Final finishing was by trial fit on the liners.

In order to machine the heads to the correct thickness, I continued by setting them up again in the self centering four jaw chuck, using parallels against the chuck body to set them true. I then faced them to 11.5mm thickness. This could also be done in the milling machine; the choice is yours.

The next operation is to drill and ream the valve holes and the cylinder bolt holes.

The valve holes have a very shallow 10mm diameter counterbore on the cylinder face and I did this with a counterbore I have in my collection. This is a 10mm diameter cutter with a 5.5mm pilot so I drilled the valve holes 5.5mm first.

Centre the head, cylinder face up, under the milling spindle with one edge parallel to the X axis and zero the indexes. Then offset 6mm to one side and centre and drill one valve location (**photo 119**). After drilling 5.4mm I used the counterbore to cut the shallow recess (**photo 120**) before finishing the hole by drilling in stages to 7.9mm and reaming 8mm (**photo 121**).

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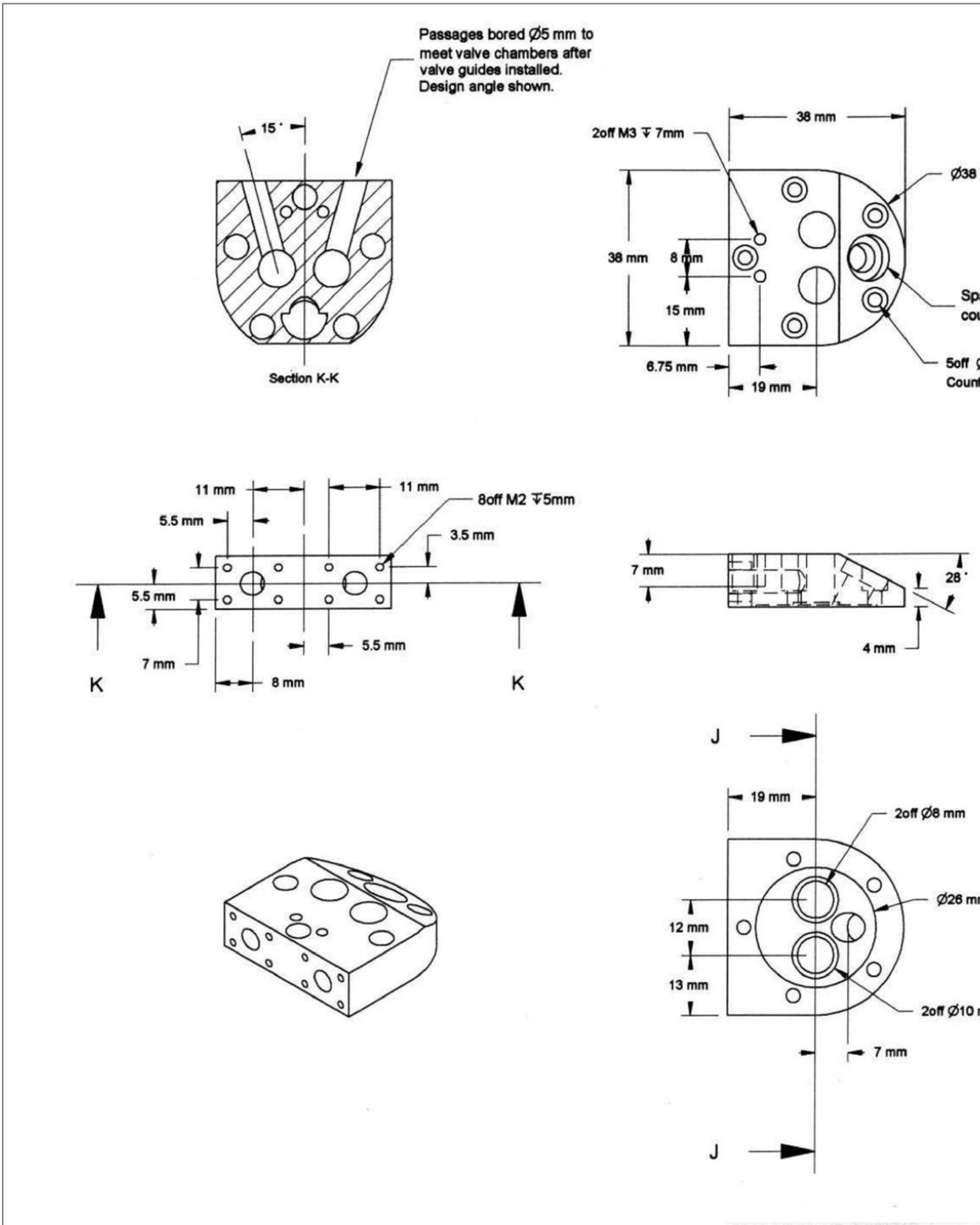
118

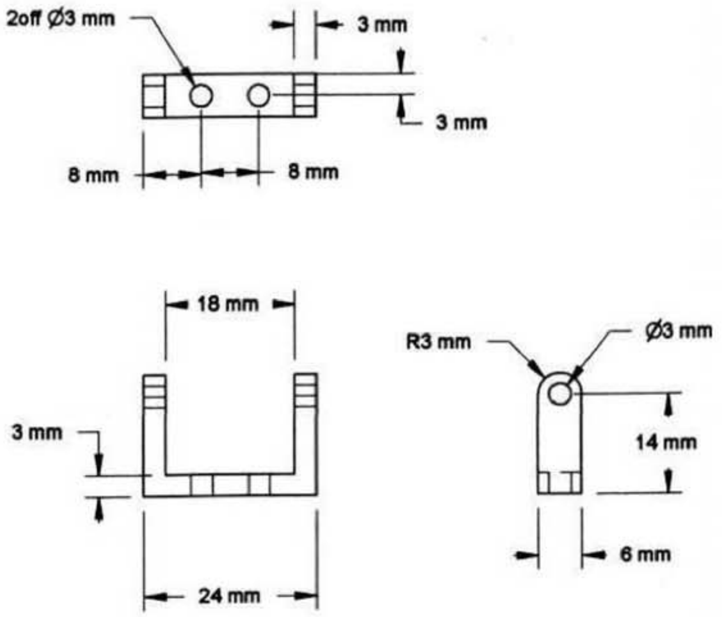
Boring the cylinder head.

119

Drilling for a valve.



20 - CYLINDER HEAD

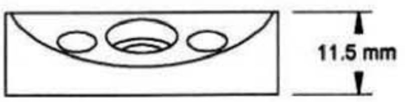


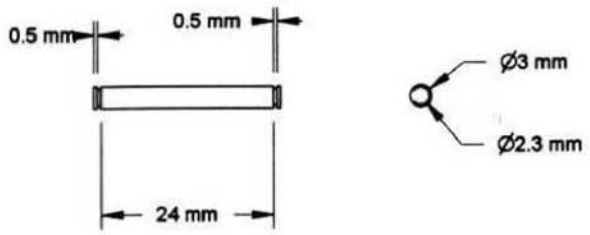
mm

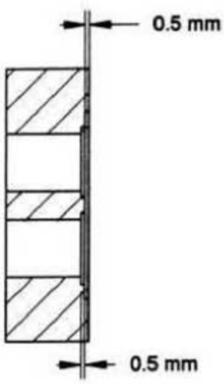
ark plug hole.tap 1/4in. x32 tpi
unterbore Ø10mm ∓3mm (check from plug reach)

Ø3 mm PCD 31mm
ter-bore Ø5.4mm ∓8mm

21 - ROCKER SUPPORT







m ∓0.5mm

22 - ROCKER SHAFT

mm ∓0.5mm

Section J-J

Size A3	Dwg. No. NE15-IT001	Rev. 1.0	Date 28/04/2009
Scale 1:1	Sheet 6 of 16	Malcolm Stride 2008	
Project Bobcat - 15cc twin cylinder 4-stroke engine			
Title Cylinder head & rocker support			
3rd angle projection			

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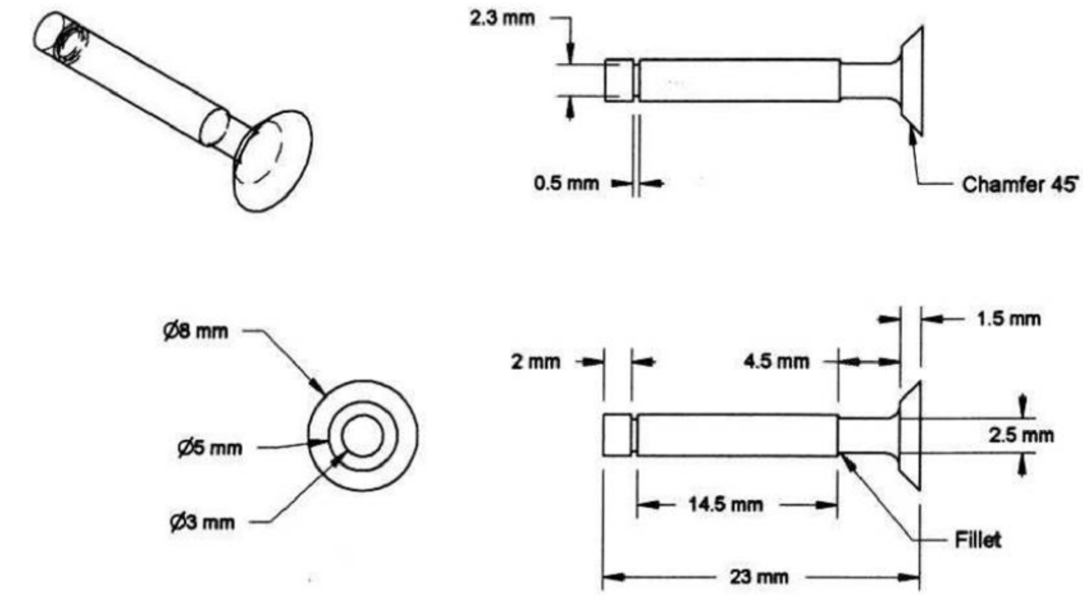
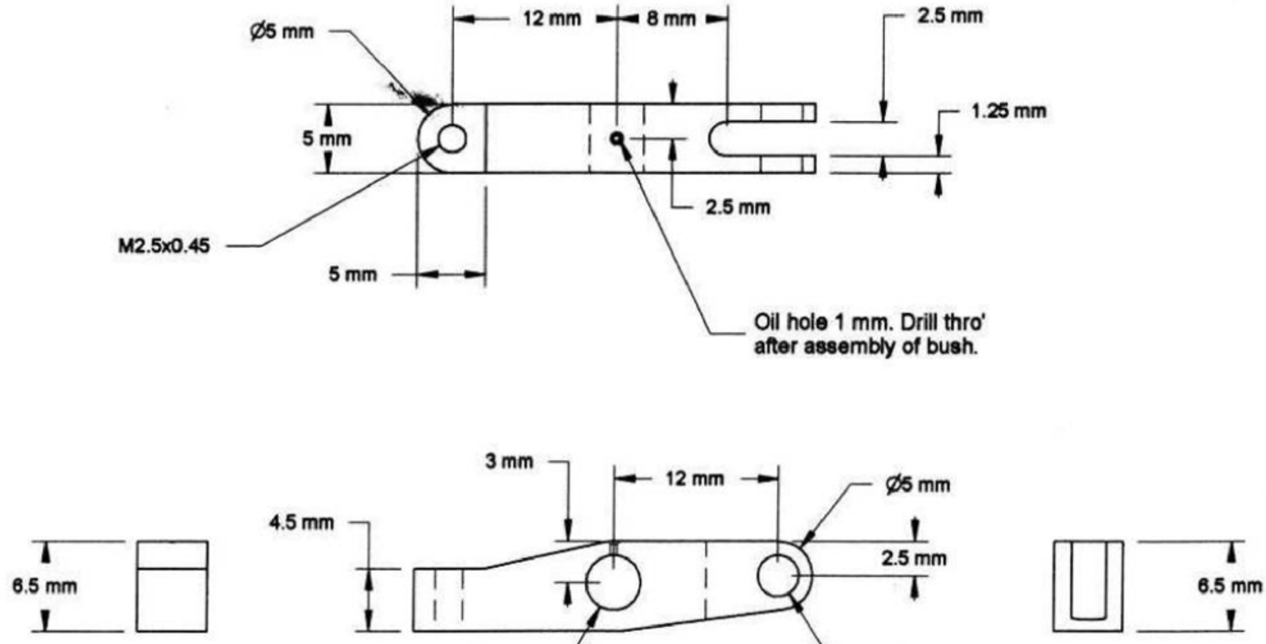
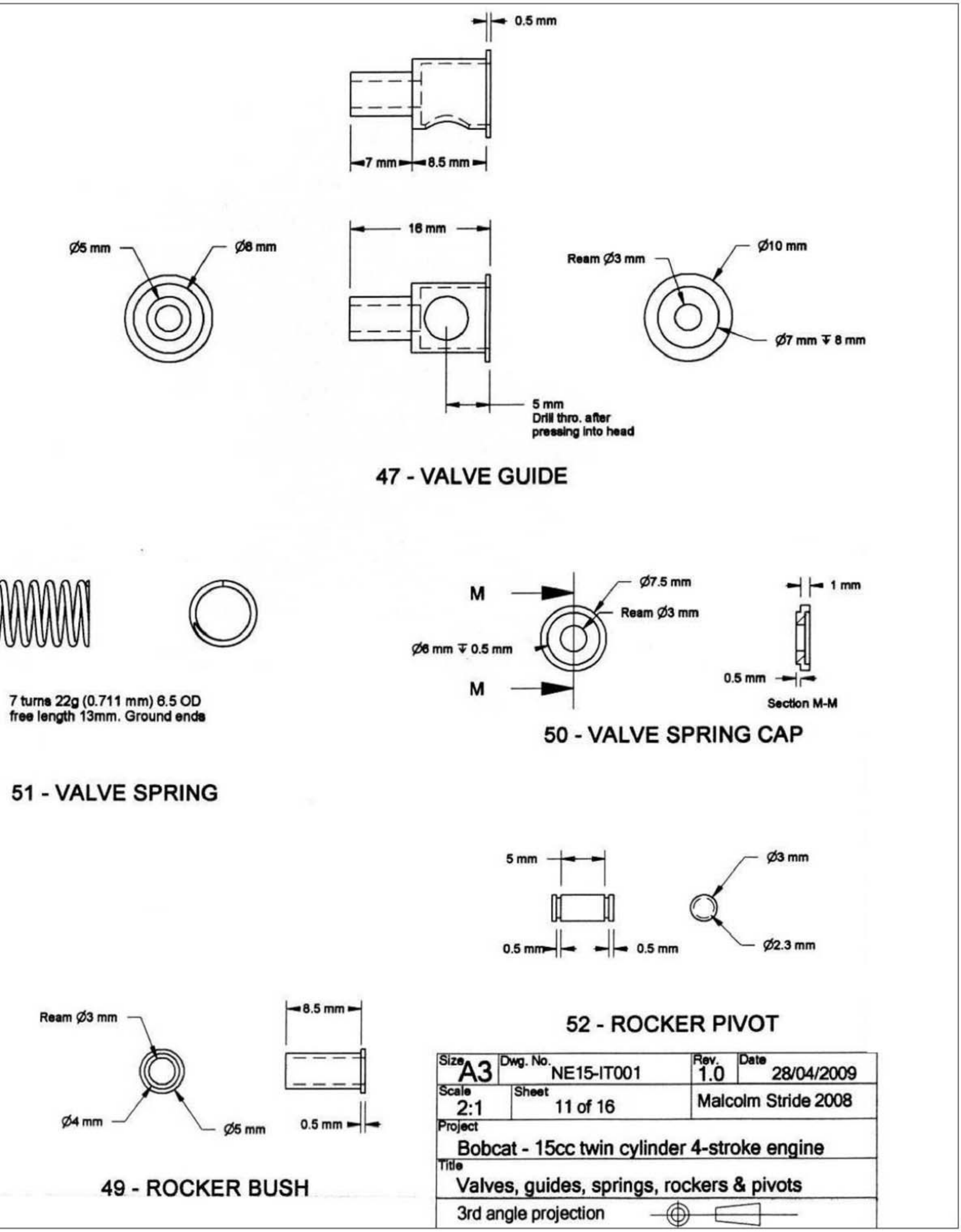


46 - VALVE



Loctite bush in place to
make two handed pairs

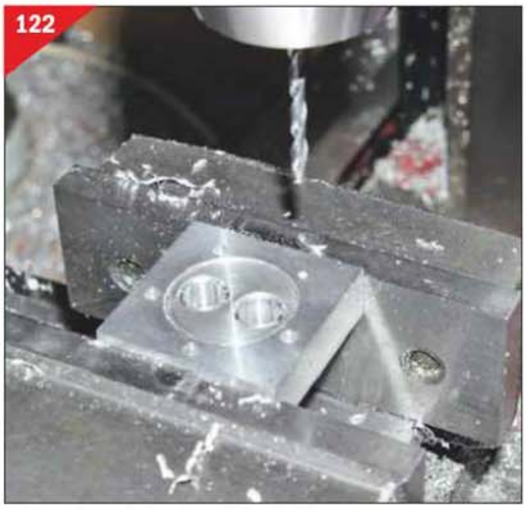
48 - ROCKER


0.5 mm
7 mm
8.5 mm
16 mm
Ø5 mm
Ø8 mm
Ream Ø3 mm
Ø10 mm
Ø7 mm ↧ 8 mm
5 mm
Drill thro. after
pressing into head
47 - VALVE GUIDE
M
Ø7.5 mm
Ream Ø3 mm
Ø6 mm ↧ 0.5 mm
M
1 mm
0.5 mm
Section M-M
7 turns 22g (0.711 mm) 6.5 OD
free length 13mm. Ground ends
50 - VALVE SPRING CAP
51 - VALVE SPRING
5 mm
Ø3 mm
0.5 mm
0.5 mm
Ø2.3 mm
Ream Ø3 mm
8.5 mm
52 - ROCKER PIVOT
Ø4 mm
Ø5 mm
0.5 mm
49 - ROCKER BUSH
Size A3
Dwg. No. NE15-IT001
Rev. 1.0
Date 28/04/2009
Scale 2:1
Sheet 11 of 16
Malcolm Stride 2008
Project
Bobcat - 15cc twin cylinder 4-stroke engine
Title
Valves, guides, springs, rockers & pivots
3rd angle projection

>>

Counterboring the recess.

Reaming the valve guide holes.



Drilling the cylinder head fixing holes.

Centering the spark plug hole.

Lining up the cylinder heads.

Counterboring the bolting holes.

Centering the rocker bracket holes.

If you do not have a suitable counterbore you could use a 10mm milling cutter after drilling and reaming. Repeat this for the other side.

I chose to drill the cylinder head fixing holes next. I have provided two sets of dimensions: one a PCD for those who wish to drill these holes using the rotary table and a set of offsets (on the cylinder jacket drawing) for those who prefer to index such things. I chose the latter method and just carried on drilling with the existing set-up (**photo 122**). The five holes are drilled 3mm and will be counterbored from the other side later.

The last operation I carried out was to locate the spark plug hole and use a very small centre to put a small locating dimple on the head face (**photo 123**). This makes setting up to drill the hole much easier later on.

The above operations are then repeated on the other head.

The next operation I carried out was to drill and tap the head bolt holes in the cylinder jackets. To do this I assembled the jackets and cylinder liners on the crankcase and clamped the heads on the top (check the orientation - the spark plug is opposite the camshaft) and clamped the whole lot down on the milling table. I used two toolmakers' clamps and a piece of bar - to ensure the heads were lined up correctly - and some threaded rod through the valve holes to clamp the assembly down (**photo 124**).

Once this was done, the 3mm drill is used to spot the jacket holes before drilling 2.5mm. After all the holes are drilled, remove the heads and tap the jackets M3.

Now set the heads up in the milling vice, top upwards, ready to counterbore the head bolt holes and to drill and tap the two rocker support bolt holes in each head (**photo 125**).

I set both heads up at once and used the 3mm drill to locate each hole before counter-boring 5.4mm to a depth of 8mm. You may need to use a 5.5mm drill if your socket screw heads are slightly large; some of my screws are.

The two rocker bracket holes are then positioned using the indexes before drilling 2.5mm, 7mm deep and tapping M3 (**photo 126**).

The next operation I performed on the head was to mark the position of the inlet and exhaust passage holes on the manifold face and to drill and tap the eight M2 holes in each face. I centred the face under the milling machine and then indexed 11mm to the side to mark the gas passage with a small centre dimple before indexing the four M2 holes and drilling those 1.6mm diameter, 5mm deep. This was repeated for the other side (**photo 127**). The M2 holes were then tapped.

Before cutting the top angle of the head, I decided to make the valve guides and press them into place. My reason for this is that I could then drill the gas passages whilst still having a totally flat head to set up in the milling machine.

Part 47 – Valve guides

These combined valve seat and guides are made from phosphor bronze or cast iron to be a press fit in the head. A collet chuck is best for these.

The outside surfaces are turned first before reversing the guide in the chuck and then drilling and reaming the bores and facing the flange to thickness.

Put a suitable piece of bar in the chuck and turn down a length of at least 17mm to 10mm diameter. Check this from the head; it must be an easy fit in the valve hole recess.

Now turn down a length of 15.5mm to be a good press fit in the head. I took my dimension from the reamer used for the valve holes.

Once this is done turn down the end 7mm to a diameter of 5mm. Now part off the flange leaving it a fraction oversize for facing later (**photo 128**).

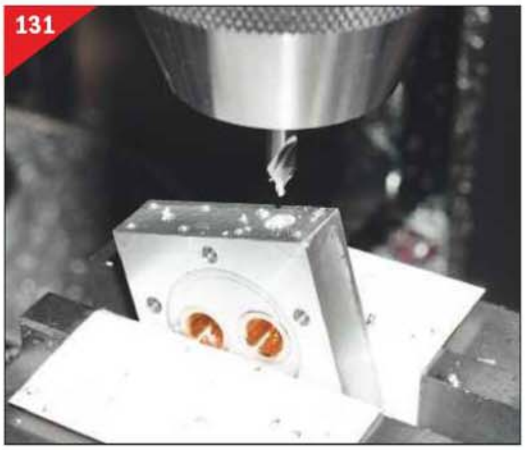
Reverse in the chuck and face off the flange to the correct thickness. Again check from the head, the flange must not stand proud of the head surface when installed, so a fraction thin is best.

Centering the inlet and exhaust holes.

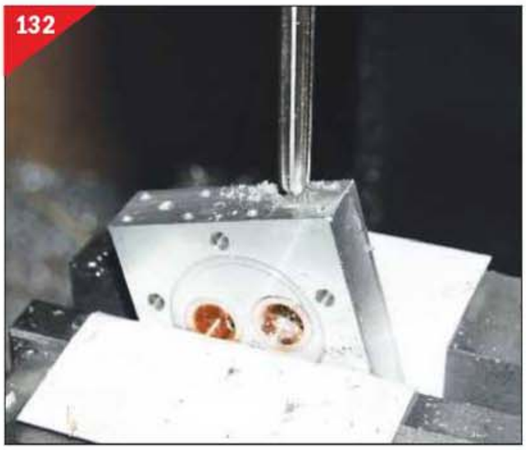
Turning the valve guides.

Reaming the valve guides.

Fitting the valve guides.



Centre drill into the flat.



Reaming 5mm.

Centre and drill 2.9mm right through before drilling 6.9mm for a depth of 8mm.

Ream the large hole 7mm (**photo 129**) and the small hole 3mm before removing the guide and cleaning up the valve stem hole.

The gas passages in the guide and head will be drilled as a unit once the guide is installed.

I pressed the guides in using the milling machine with a special press tool (**photo 130**). Make sure that the edge of the tool that presses on the guide face is flat and is undercut to ensure that the force is taken on the flat front face. I also used a smear of Loctite when pressing the guides in.

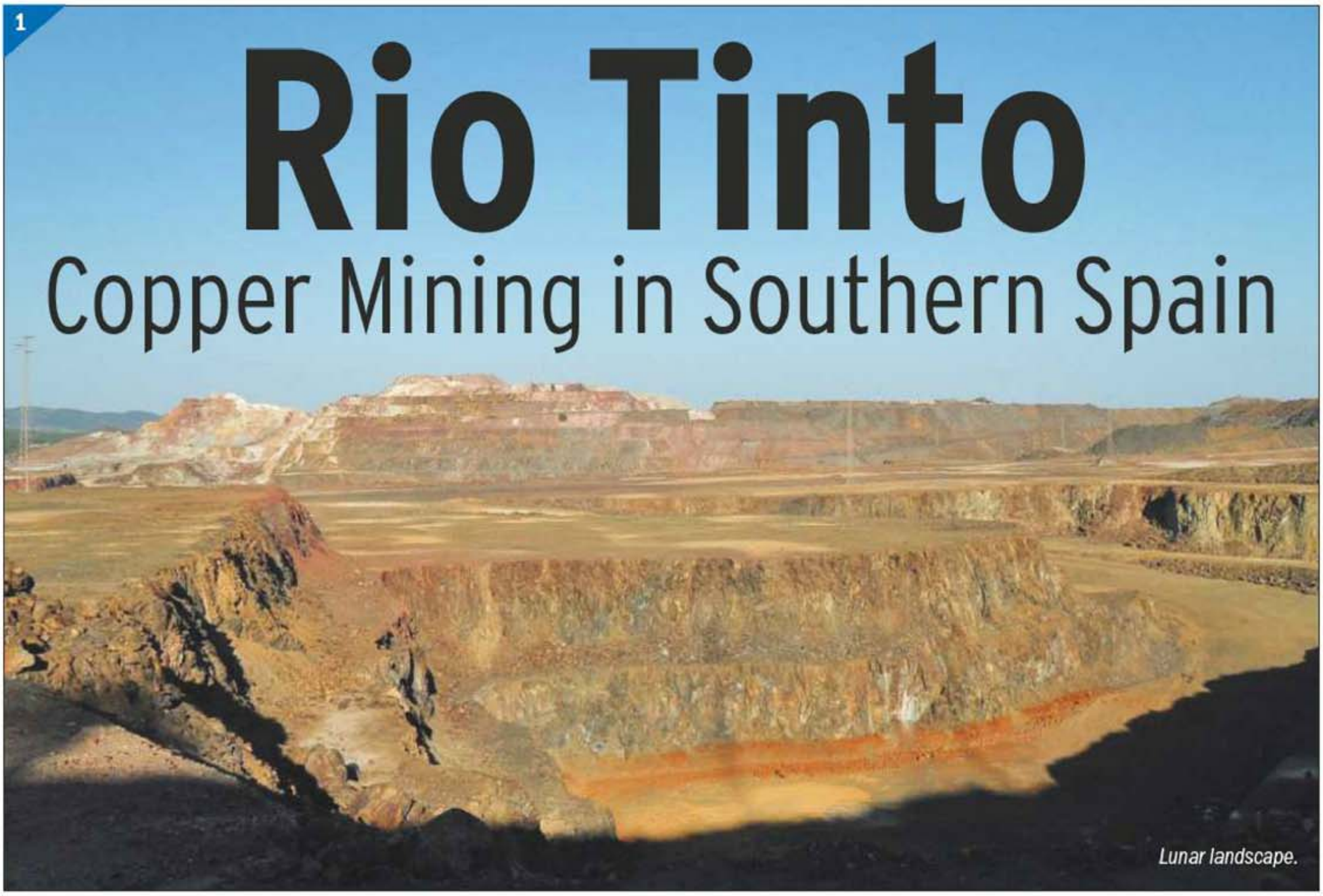
The next operation is drilling the gas passages through into the valve chamber. I lined up the heads in the vice using the centre spot on the face, with a drill as a guide for the valve end. It is quite easy to get things lined up. If you wish, you can set the angle using a tilting table but check that the drill will break through into the centre of the valve chamber. Before starting to drill, use a 4.5mm slot drill to mill a small flat so that the centre and drills do not wander at the start. Centre (**photo 131**) and then drill in a couple of stages to 4.9mm before reaming 5mm to leave a nice clean passage (**photo 132**). Take care when the drill breaks through into the guide. If needed, remove any burr on the inside of the guide with a small triangular scraper.

●*To be continued.*

Rio Tinto

Copper Mining in Southern Spain

1



Lunar landscape.

TERENCE HOLLAND

Terence Holland looks at copper within a Spanish mining context.

Living in southern Spain is, in many ways, an idyllic existence with plenty of sun (and by default almost as many moonlit nights), a cheaper way of life and plenty of barbeques throughout the year (if that's a yardstick of quality lifestyle!) but the one thing missing, for me, is access to working industrial archaeology - for want of a better phrase - of the sort that is available in the UK. By that I mean live steam railways and industrial museums in general. However, all is not lost as within a few hours to the northwest of where I live near Marbella is the Rio Tinto mining area, which has enough industrial archaeology to keep me amused for days and 'er-indoors bored for an equally long period!

Introduction

The Rio Tinto area and the town of Las Minas de Riotinto are situated almost due north of the city of Huelva, to the northwest of Sevilla and not far from the Spanish/Portuguese border (**fig 1**).

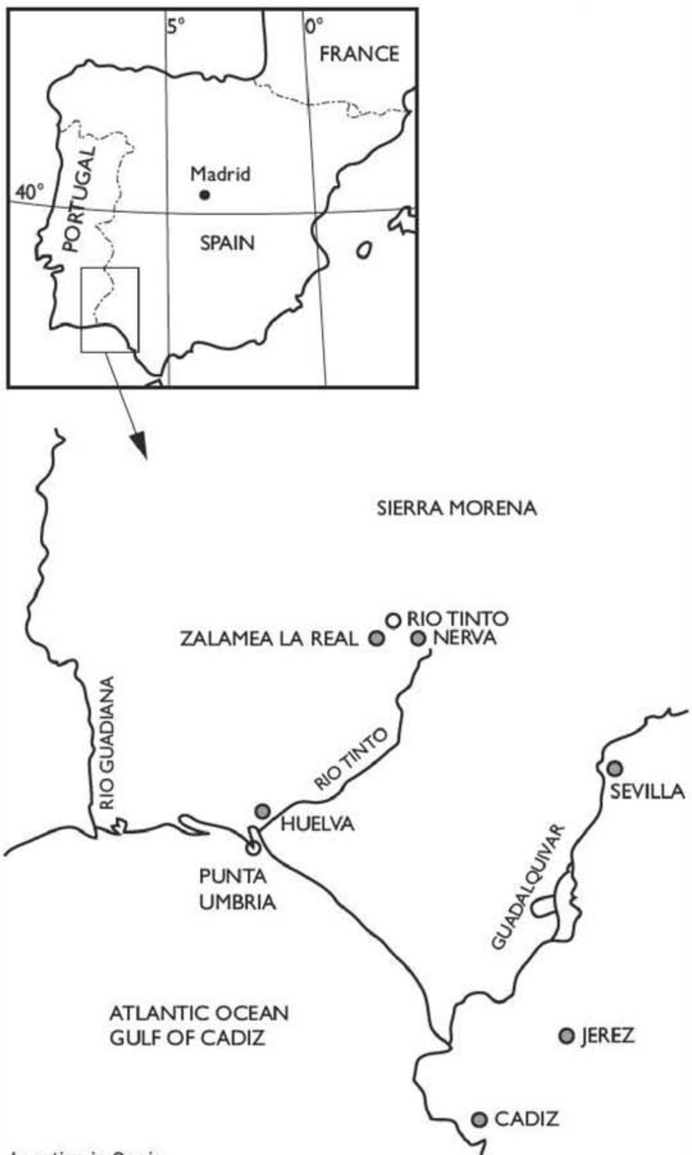
The town is situated on the Iberian Pyrite Belt which runs across Spain at that point, as far as the coast of Portugal. In fact it extends 80 miles from Aznacollar near Sevilla to Aljustrel in Portugal and forms one of the greatest such belts in Europe where copper, silver and gold have been mined for thousands of years.

Arriving in this part of Huelva Province, one is struck by the bleakness of the countryside; hundreds of acres of cork oaks and pine trees and very little agriculture. Mind you, having said that, cork oaks can't be all that bad as they can provide a thriving industry. For example, Portugal, just over the border from Riotinto, is the world's largest cork producer with 2,700 square miles under cultivation and the country manufactures some 30 million corks a day – that's a lot of *vino*!

The terrain around the mining area, reminiscent of open heathland in the UK, is broken in the vicinity of the town called Las Minas de Riotinto by enormous open pits and extensive waste heaps. A simplified layout of the mines is shown in **fig 2**. Compared with most of Andalucía in southern Spain the surroundings seem bleak and it would appear that if the local inhabitants were not involved in mining and its associated activities, there would have been little other work available. At the peak of production in the 1930s there were some 14,000 workers involved in mining, 150Km of railway track and a dedicated loading facility at the port of Huelva, where metallic copper and pyrite ores were loaded for export.

The quarries are generally huge open pits which give the impression of lunar or Martian landscapes (**photo 1**). This photograph is of the Cerro Colorado open pit which is adjacent to the processing plant at La Dehesa shown in **photo 2**.

Fig 1



Location in Spain.

Fig 2

The mines area.

Processing plant.

Cerro Colorado Open Pit.

Mineral extraction of mainly copper ores from the Cerro Colorado is suspended at present but the Spanish company, EMED Mining plc, which is the successor to the Rio Tinto Company, is currently negotiating with the Spanish government to restart the mining of copper-bearing minerals. The open pit at Cerro Colorado last operated in 2001 and, along with processing machinery, is currently under care and maintenance. The current proposal is to mine a total of 123 million tonnes of ore at the rate of approximately 9 million tonnes per year. The ore has a fairly low copper content of approximately 0.5%. **Photograph 3** shows the processing plant

>>

Fig 2

The main line to Huelva.

shown in close-up in photo 2 above part of the Cerro Colorado open pit.

Perhaps the word 'pit' doesn't do justice to the scale of operations here; **photos 4** and **5**, for example, show another open pit, the Corta Atalaya, which is 1,200 metres across and 300 metres deep and was once the biggest open-cast mine in the world. In photo 4 a small black dot can be seen on the right-hand side of the picture on the fourth level above the water and, believe it or not, this is a fairly large steam locomotive trapped in the quarry many years ago by a rock fall in one of the access tunnels. A close up of the white box in photo 4 is presented in photo 5 which shows that the black dot is, in fact, Rio Tinto Railway locomotive No.50. This is a large 0-6-0 tank engine built by Dübs in Glasgow in 1881 and comparison of the two photos give a startling appreciation of just how big the open pit is.

It would be of interest to estimate the volume of this quarry and get some idea of how much rock has been removed over the years. If the quarry was a hemisphere with a depth of 300 metres, the top dimension would be only 600 metres in diameter, but as it is twice this dimension it is a lot bigger and more closely resembles a spherical cap and the formula for calculating the volume is as follows:

$$V = \frac{\pi h}{6}(3a^2 + h^2),$$

where h is the depth and a is the radius across the top.

The volume works out at almost 200 million cubic metres and, if we assume a rock density of 2.5 metric tonnes per cubic metre, from the year dot an estimated half a billion tonnes of material have been removed from the Corta Atalaya. No wonder the locomotive looks so small in photo 4! The overall removal of material - mineral and overburden - in the Rio Tinto area has been estimated as 1.6 billion metric tons.

The name *Rio Tinto* in Spanish means red river (or strictly speaking a river the colour of red wine, *vino tinto*) and the *Rio* and its tributaries run blood-red for miles; mainly due to its low pH and iron content (**photo 6**).

The river starts in the Sierra Morena Mountains (once a domain of the Knights Templar and another possible link to King Solomon via his temple in Jerusalem) and runs in a south-westerly direction to finally discharge into the Gulf of Cadiz at Huelva.

Early history

By all accounts, the mines at Rio Tinto have been worked, on and off, for some 5000 years and the area is thought to have been the site of the famed 'King Solomon's Mines'. This possibility is reinforced by local names such as Cerro de Saloman (Solomon's Hill) and Zalamea La Real (Royal Solomon). However, it should be remembered that the phrase 'King Solomon's mines' was popularised by a work of fiction by the Victorian author Sir Henry Rider Haggard and current thinking is that the mines of King Solomon were probably copper mines located in Jordan. Other legends connect the Rio Tinto area with the lost island of Atlantis, which, according to Plato, lay in the Atlantic not far from the Pillars of Hercules at the entrance to the Mediterranean around about 10,000 BC.

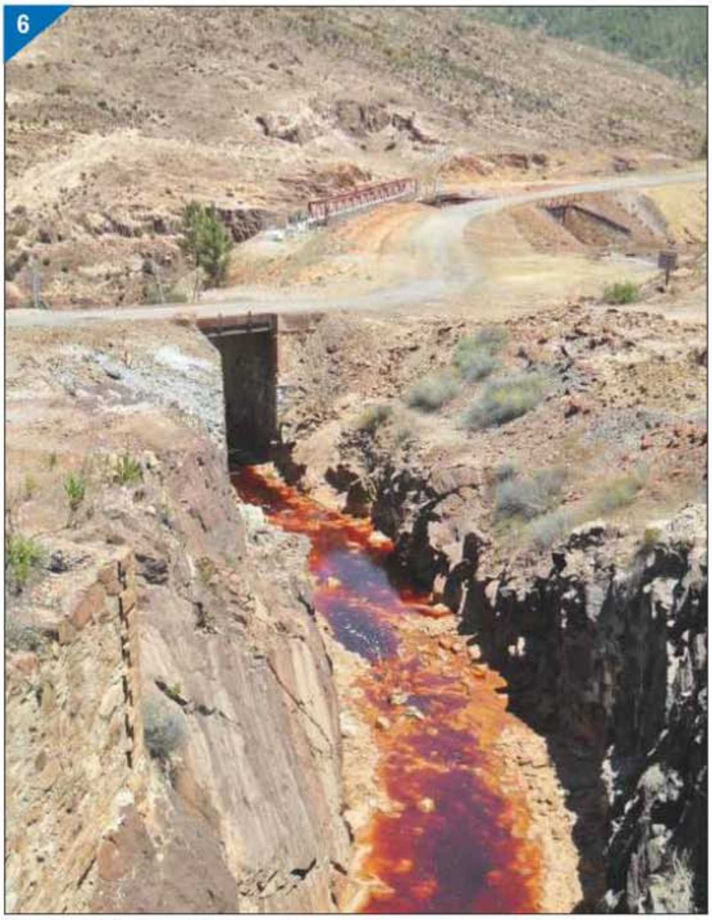
The province of Huelva is reputed to be the site of ancient Tarsessus, mentioned in the Bible as the legendary kingdom rich in minerals that attracted the Minoans, Phoenicians and Greeks to the area some 3,000 years BC. Not surprisingly, the Tartessians were rich in metal and supplied Mediterranean traders with tin, silver, gold and copper. Trade in tin, which was probably panned as alluvial cassiterite (metal oxide) from the river, was particularly lucrative in the Bronze Age since it is an essential component of bronze and a comparatively rare element. Pre-Roman slags are found in the area where Phoenician metalworkers produced some 15 million tons of pyrometallurgical residues

4

Corta Atalya. (Photo courtesy James Waite.)

5

Abandoned locomotive in Corta Atalaya. (Photo courtesy James Waite.)



Blood-red tributary of the Rio Tinto.

at the vast dumps of Rio Tinto. Originally, weathered outcrops would have occurred of brightly coloured copper-bearing minerals such as the hydrated copper carbonates, malachite (bright green) and azurite (deep blue) and these would have been easily mined in ancient times and metallic copper then produced by smelting with charcoal. The silver-rich ores, produced by weathering, which generally lay above the pyrite minerals, would eventually have been discovered and exploited.

During the Roman period, when the area became part of the province of Lusitania (which approximates to modern-day Portugal), underground mining continued for some 400 years from the 2nd Century BC and resulted in another 50 million tons of slag wastes which can be still be seen locally. The Romans, however, were mainly interested in silver extraction and operated in underground tunnels at depths up to 100 metres. They used slave labour and their brutal technology included slave-operated water wheels which were used to combat flooding where mining was carried out below the water table. In some workings multiple wheels were used in series to bring water up from the depths. A full-sized reproduction of a section of Roman silver mine, complete with water wheel, can be visited in the museum at Las Minas de Riotinto. These early miners exploited the gossan deposits in the Dehesa area, where the mineralogy was enriched in copper, silver and gold.

After the Roman period mining operations declined and eventually the mines became virtually abandoned. The mines were rediscovered in the 16th Century but the importation of cheap minerals from the New World, after the Spanish conquista, caused further decline, along with inefficiencies caused by lack of government investment and poor management. During this period, under Spanish government ownership, the main product of the mines was metallic copper, the sulphur component of the pyrites being burnt off to provide sulphur-free feed for the smelters. Eventually, the mines were sold off in 1873 at bargain prices to a consortium of British and German bankers resulting in the formation of the original Rio Tinto Company.

The British connection

The Rio Tinto Company was quintessentially British. At Rio Tinto a British enclave, complete with a Presbyterian church, was built to house the management and engineering staff, the buildings of which still exists today as the Barrio de Bella Vista (which translates as the 'neighbourhood of the beautiful view'). Despite the fact that many of the British workers were Scottish, the locals referred to this as the 'English colony'. In Victorian times the estate was protected by a high wall with guarded gates to keep out the 'natives' as the local Spanish were disdainfully described. Indeed, company policy prevented any 'colonialists' from living at Bella Vista if they dared to marry a Spanish woman. A comment in the Rio Tinto Railway timetable said that passenger trains did not run 'on Sundays or on Queen Victoria's birthday'. This remark was not understood or appreciated by the Spanish and serves to highlight the differences that separated the two communities during the years of British 'occupation'.

Other British-style buildings have survived in the town itself such as the company hospital (which now houses the museum) and the company headquarters, which is now the town hall or *ayuntamiento*. A view of a typical Victorian terrace at Bella Vista is shown in **photo 7**.

At the coast, British staff on their vacations from the mines made the trip from Huelva to the beach at Punta Umbria in a small paddle steamer - long before the construction of the modern access road across the salt flats. Eventually, a *barrio* was set up here for British management and engineers to take their holidays on the *costa*. Similarly, British-style houses were built in Huelva itself for British staff whose work was associated with transhipment of the ores for export, after delivery by the Rio Tinto railway to the large company pier and storage buildings. Export of pyrite minerals was mainly to the UK where it was processed to make copper, iron and sulphuric acid. This 19th Century iron pier has recently been restored as part of the city's architecture. It is interesting to note that both football and golf were introduced into Spain via the Rio Tinto company in Victorian times.

Due to the strong connection between Rio Tinto and the UK from the 19th Century until recently, it is likely that much of the copper used in the UK came from the Rio Tinto mines – it is interesting to speculate that LBSC's boiler copper was >>

Victorian terraces at Bella Vista.

probably sourced from these mines in Spain.

By the 1950s, General Franco (who had referred to Rio Tinto as 'Spain's economic Gibraltar') and his nationalistic government had made it increasingly difficult for the Rio Tinto Company to exploit Spanish resources for the profit of foreigners. Eventually, the company, supported by its international investments, sold off two-thirds of its Spanish operations in 1954 and the remainder over the following years.

The original company has progressed to greater things and now, after a long series of mergers and acquisitions, it has diversified to become a huge multinational operation and can place itself among the world leaders in the production of many commodities. Rio Tinto Zinc, or RTZ, is probably remembered by people of my age group but things have moved on and the company now goes by the name of the Rio Tinto Group. Rio Tinto's main international business is the production of raw materials - not just copper but iron ore, coal, bauxite, diamonds, uranium, and industrial minerals including titanium dioxide, talc, salt, gypsum, and borates. Rio Tinto also processes some of these materials, with plants dedicated to processing bauxite into alumina and aluminium and smelting iron ore into iron. The company also produces other metals, minerals and chemicals as by-products from the processing of its main resources, including gold, silver, molybdenum, sulphuric acid, nickel, potash, lead, and zinc. The headquarters of the company is in London but it operates on six continents, mainly in Australia and Canada.

Expansion under British management

From the start of mining operations by the Rio Tinto Company in the 19th Century, in addition to the lucrative copper trade, the export of pyrite ores became one of the main products, as it was an important precursor in industry for sulphuric acid manufacture.

Table 1 - Rio Tinto ore bodies

Lode	Mine	Notes
San Dionisio	Corta Alalaya	Open pit started in 1907 on site of San Dionisio mines
South Lode	Cerro Colorado	Cerro Colorado open pit formed from merging of north and south lode mining operations
North Lode		
Los Planes - San Antonio		Discovered in 1962 as a result of electromagnetic surveying and magnetic anomalies
All exposed lodes	Gossan deposits	Weathered material containing up to 40 gram per ton of silver and 2.5 gram per ton of gold. Also lead, antimony and bismuth.

By 1884, Rio Tinto had become the greatest mining company in the world, with 30,000 employees and an annual output of almost 13,000 tons of copper.

At Rio Tinto there are four mineral lodes which consist mainly of copper pyrites and iron pyrites with a high sulphur content (**table 1** and fig 2).

Before the company took over in 1872, mineral extraction had been carried out underground using ancient mining techniques via shafts and adits. However, after many years of uncontrolled mining, the lodes had become rabbit warrens with regular problems associated with miners breaking into old, uncharted workings (some complete with skeletons from long-forgotten mining accidents). In addition, oxidation of the sulphide minerals and water damage within the old workings had caused break-up of the original pillars supporting the roof on many levels and this resulted in frequent, dangerous roof falls. This oxidation process is hastened by the action of *acidithiobacillus* bacteria and the sulphate released combines with water to produce sulphuric acid, leading to further damage. The bacterium, full name *acidithiobacillus ferrooxidans* (sounds a bit like a railway station in north Wales!) is a major microorganism involved in the industrial recovery of copper; a process now recognised and known as bioleaching or biomining. This bacterium would have played a significant role at Rio Tinto in both degradation of the underground mine system and also in the later, natural leaching processes adopted at the mines after calcination operations ceased at the start of the 20th Century. This specific bacterium utilises energy from the oxidation of mineral sulphides for growth. It thrives at the extremely low pH values of between 1 and 2. It dissolves copper and other metals from rocks and plays an important rôle in heavy metal pollution in acid environments.

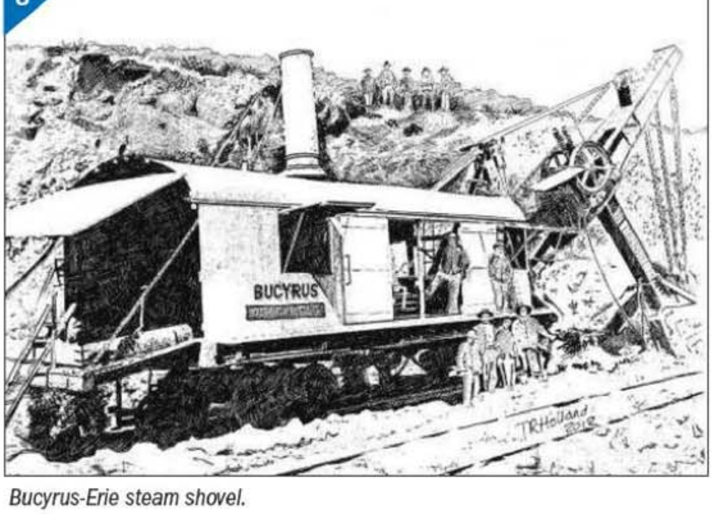
Important research work called MARTE (Mars Analog Rio Tinto Experiment) is currently underway at the mines, sponsored by NASA, to study these biological mechanisms in relation to possible similar extra-terrestrial, biological processes occurring in the environment of Mars.

The oxidation of pyrite minerals is sufficiently exothermic that spontaneous combustion can occur in the mine. This continuous oxidation taking place also results in working temperatures of up to 100 degrees Fahrenheit and a sulphurous, suffocating atmosphere. No surprise then that the miners wore only a pair of boots and a leather apron! Despite these conditions, however, each miner was expected to shift some 15 tons of ore a day into esparto grass baskets for loading into narrow gauge wagons, prior to removal from the mine.

Due to the appalling conditions underground, the decision was taken not long after the start of operations to shift from conventional mining to open pit operations. The first open pit was made on the south lode on the slopes of Cerro de Salomon between the pueblos of Rio Tinto and Nerva (fig 2). Over a period of three years, four million cubic yards of waste was removed by large numbers of labourers, mainly by hand, with women working alongside the men. Railway access to the pit was provided via a 500 yard tunnel which took two years to complete.

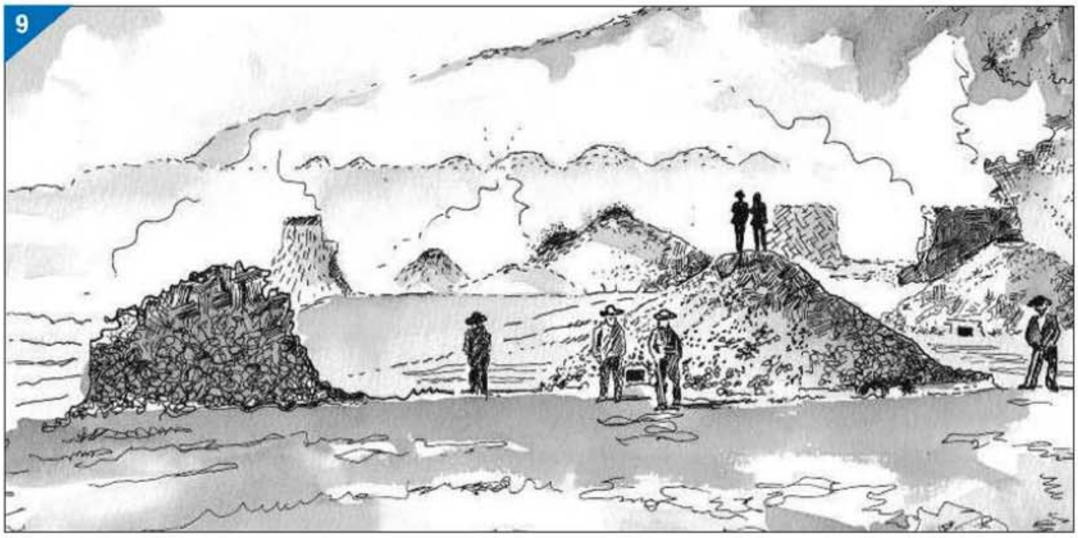
In 1889, investigations started on the Dionisio lode in the north-west and these resulted in the opening of the Atalaya open pit which started production in 1907. Again, armies of men and women initially carried out the work of removing the overburden but, at the end of the 19th Century, rail-mounted Bucyrus-Erie steam shovels were imported from the USA (**photo 8**).

8



Bucyrus-Erie steam shovel.

They ran on 3 foot 6 inch gauge track and were operated by a seven man team. The bucket capacity was 3.5 cubic yards which is approximately equivalent to seven imperial tons of rock. These steam shovels were so successful that further Bucyrus machines were purchased that had been previously used during construction of the Panama Canal, which had been completed in 1914. The Panama machines were still in use at Rio Tinto in 1945.



9

Open-air calcination.

The processing of pyrites

For the technically minded (and according to Wikipedia scriptures) the deposits were formed by volcanic action and are sulphide ore deposits in the form of pyrite or iron pyrite (iron sulphide, FeS2 known as Fool's Gold) and also chalcopyrite or copper pyrites (copper iron sulphide, CuFeS2), sphalerite (a zinc sulphide mineral containing variable amounts of iron, known as Zinc Blende or Black Jack), galena (lead sulphide, PbS) and cassiterite (tin oxide, SnO2). In general, the metals of greatest value were copper, zinc, tin and lead. However, in some cases, precious metals like gold and silver were mined. These occur in the Gossan deposits, a layer of eroded and weathered mineral on top of the main lode where copper and iron have been removed by weathering, leaving the less soluble silver and gold minerals.

One of the most valuable materials at Rio Tinto was, surprisingly, the non-metallic element sulphur, produced as a gaseous by-product during processing when the various pyrite minerals were roasted prior to smelting. Both iron and copper pyrites are high in sulphur content; 55 and 37% respectively by weight. Before the formation of the Rio Tinto Company sulphur was not recovered and the copper-bearing ores were roasted via open-air calcination to remove most of the sulphur as sulphur dioxide, prior to smelting to obtain metallic copper. This burning of pyrite minerals in the open air caused many problems locally, with the release of sulphur dioxide gas and quantities of other toxic materials such as arsenic (**photo 9**).

When the Rio Tinto Company was formed in 1872, the sulphate content of the ores was of primary interest and a ready market existed in northern Europe for sulphur-bearing ores for sulphuric acid manufacture. The original intention of the company was to export all ores for processing elsewhere, but the mines proved so productive that production exceeded sales and so the company therefore commenced the smelting of ores and the production of metallic copper on site.

The lower grade copper ores at Rio Tinto, which would, however, have been high in iron sulphide, were dispatched from the mines via the railway to Huelva from where they were shipped to Northern Europe and elsewhere. After treatment by the acid producers to remove sulphur dioxide (which was then further oxidised and dissolved in water to produce sulphuric acid), the clinker by-product was dispatched to other manufacturers for metal recovery. One example of this use of pyrites was in UK munitions factories where sulphuric acid was often made on-site using pyrites as a raw material in the Contact process. The iron-bearing clinker residues were sold back to the supplier for use in iron smelting. In fact, to be able to use pyrite as a feedstock for iron smelting it is necessary to first remove the sulphur.

At the mines, the Rio Tinto Company continued to process high grade copper ores using open-air calcination as had happened under earlier Spanish management. However, once the new company took over and the open pits came on line, production at the mine expanded dramatically and the increased amount of open air calcination started to cause many serious problems of environmental pollution. The sulphur dioxide fumes and other toxic materials released, such as arsenic compounds, killed all trees and vegetation in the area of the mines and caused problems of social and industrial unrest for many years. In February 1888 these activities eventually prompted a riot of striking workers and local people. This was suppressed by troops and the civil guard, with civilians being killed and a number of soldiers injured. Official figures put the total as 48 dead and wounded, with 13 dying at the hospital. Local tradition, however, has it that some 100-200 were wounded but taken away by their families and concealed. Those that subsequently died were buried clandestinely in local waste tips, so no official data exists as to the actual number of deaths.

The process of open-air calcination was carried out by stacking quality pyrite ores in large pyramids called *teleras*; each containing up to 200 tons of ore. A *telera* was built with about 14 tons of brushwood to start the fire which then burnt for five or six months. The calcined ore was then transferred to tanks for leaching copper and iron salts into an aqueous solution and pig iron ingots were added which precipitated the copper as a black precipitate containing approximately 55% copper. In this process the iron reacts with the copper sulphate solution to produce finely divided copper solid and a solution of ferrous sulphate, known as 'copperas', from which the iron is recovered.

By the start of the 20th Century, the *teleras* pyramids had been increased in size to 1,500 tons and some 300 tons of sulphur, as sulphur dioxide, was being released into the atmosphere on a daily basis. By 1907, open-air calcination had been replaced by a new process, known as the Rio Tinto process, where 100,000 ton piles of ore were fed with controlled quantities of water and allowed to oxidise. Copper was obtained from the copper sulphate leachate by precipitation, as before, with pig iron ingots.

By 1912, the mines were producing 1,000 tons of copper a month, and 4,000 tons of pyrites a day were being removed from the open pits, of which half was exported for sulphuric acid manufacture.

● *To be continued.*

Date-Work for the Pa

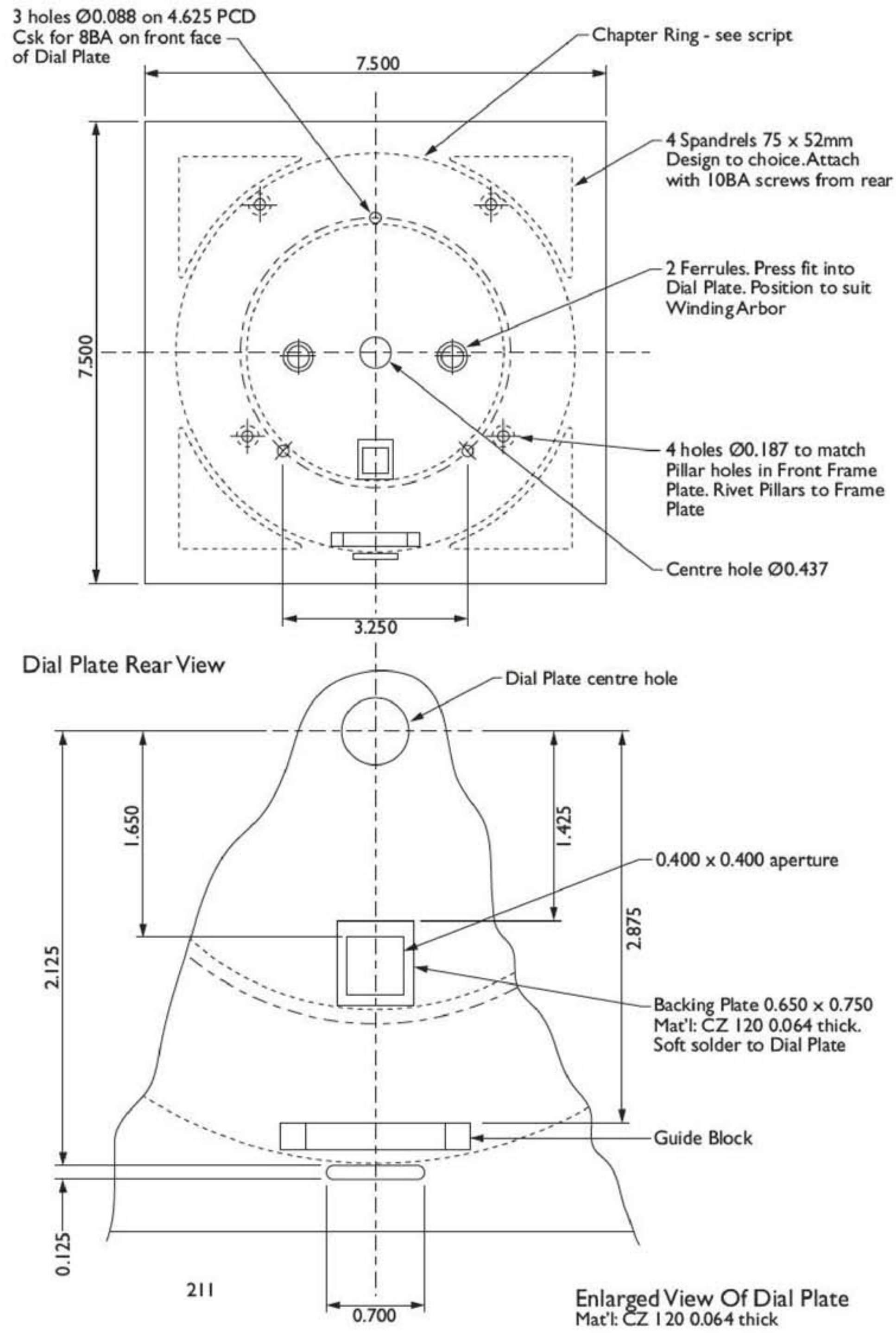
JOHN PARSLOW

John Parslow adds a new feature to his recent clock design.

PART 2

Continued from page 735 (M.E. 4443, 16 November 2012)

Fig 211



rslow Bracket Clock

The date is clearly displayed.

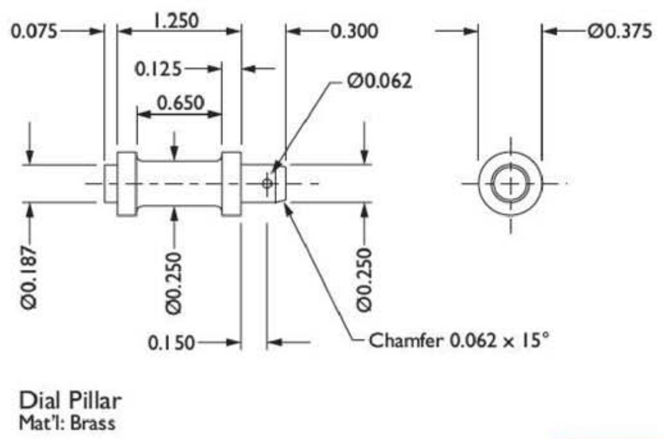


Fig 212

The Bracket Clock described in Model Engineer *from No 4400, 25 March 2011 to No 4425 9 March 2012 was built in 1999 and did not feature any date-work.*

Dial plate
Figure 211
The dial plate has the same overall dimensions and dial fixing pillar positions and winding arbor holes but requires longer dial pillars. A small plate is soft soldered to the rear of the dial plate at the date aperture to add thickness to the plate so that the aperture on the front face of the dial plate can be shaped as shown in **photo 1** and also to fill in the space between the rear of the dial plate and the date ring, the position of which is controlled by the wheels on which it rotates.

Dial pillar
Figure 212
The dial pillar is increased in length by 0.350 inch but is otherwise unchanged.

8BA bush
Figure 217
The 8BA bushes provide pivot points for the date ring wheels at the three positions shown in fig 211. They are attached to the rear of the dial plate with 8BA screws countersunk flush with the front face.

Date ring
Figure 215
The outer diameter of the date ring is best turned in the lathe as it needs to revolve smoothly in the date ring wheels. The 31 cut-outs are cut by hand.

Pawl
Figure 221
Leave a little extra length on the end of the pawl to allow for trimming on assembly to centralise the date numbers in the date aperture.

Date ring wheels
Figure 216
These are a simple turning job.

Washer
Figure 218
A simple manufacturing job.

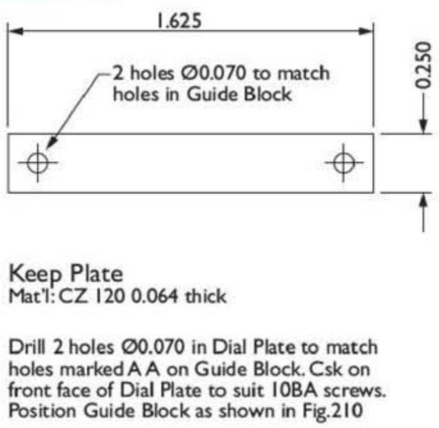
Lever arm bush
Figure 220
Another simple turning job.

Pawl screw
Figure 222
This is a simple turning job.

Control pin
Figure 223
Another simple turning job.

Lever arm
Figure 219
A simple manufacturing job but check that the distance between its pivot point and the control pin matches the dial plate.

Fig 213



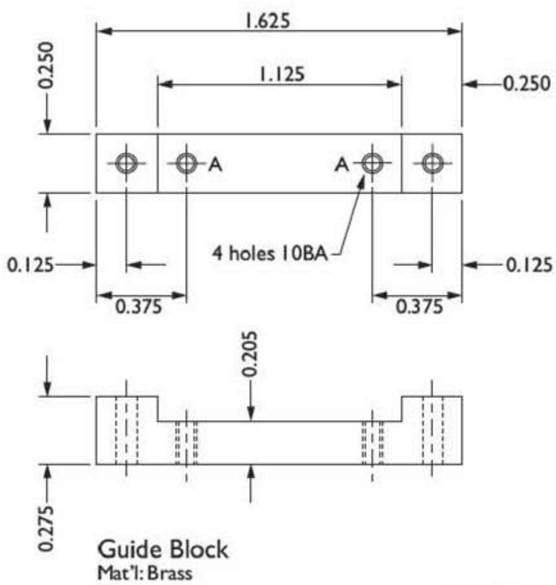
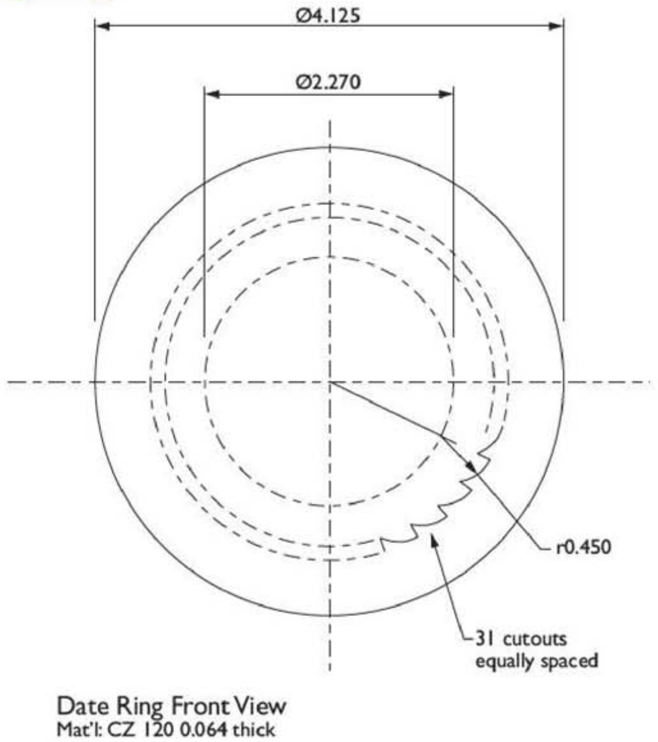


Fig 214

>>

Fig 215



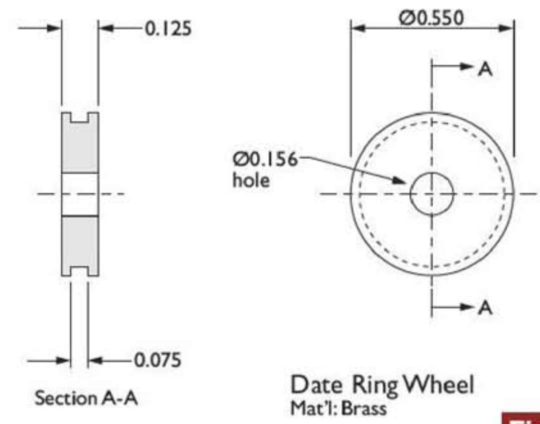


Fig 216

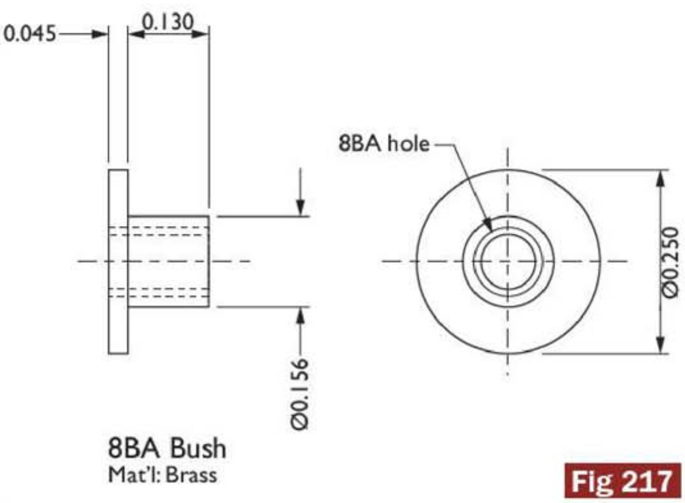


Fig 217

Guide block and keep plate
Figures 213 and 214

These are simple manufacturing jobs. The guide block is attached to the rear of the dial plate with 10BA countersunk screws.

Assembly of the date-work

Start by assembling the clock movement and ensuring that everything is in order. Timing of the date wheel can be left until later.

Assemble the dial plate by attaching the 8BA bushes to the rear of the dial plate with 8BA countersunk screws about 5⁄16 inch long for the two lower bushes and 7⁄16 inch long for the upper bush.

Fit the date ring and date wheels, fixing the wheels with washers (**fig 218**) and 8BA nuts and check that the date ring revolves smoothly. The lever arm can be left until later.

Attach the dial plate to the movement and operate the movement so that the blade on the hour wheel boss turns the date wheel and advances the date ring one space. Depending on manufacturing tolerances it may be necessary to trim the outer edge of the blade to obtain smooth movement. Check throughout the full range of the date ring and if there is a problem correct it now.

When satisfied with the operation of the mechanism carefully rotate the movement to move the date ring one space and with a sharp pencil draw the outline of the date aperture on the date ring. This is to mark the position where the date number will be engraved. Repeat for all 31 positions of the date ring.

When the date ring has been engraved it can be waxed and silvered as previously described and refitted to the dial plate.

Now fit the guide block (**fig 213**) to the rear of the dial plate with 10BA countersunk screws.

Looking at the rear of the dial plate, the lever arm and pawl can now be fitted with the cranked part of the lever arm to the right-hand side of the dial plate and the pawl pointing to the left.

Attach the pawl to the knuckle of the lever arm with the pawl screw (**fig 222**) and an 8BA nut and check that the pawl moves freely. Fit the control pin to the lower end of the lever arm with an 8BA nut so that it protrudes through the front of the dial plate. Fit the lever arm to the upper date ring wheel screw with the lever arm bush (**fig 220**) and an 8BA nut and its lower end resting in the guide block and then fit the keep plate (**fig 214**).

Now try the operation of the lever arm by moving the control pin the full length of the slot in the dial plate. When moving the control pin from right to left viewed from the front the pawl should 'free-wheel' over the edge of the cut-outs in the date ring and drop into the next space behind the radial edge of the cut-outs.

Operate the control pin to advance the date and check that the date figures sit

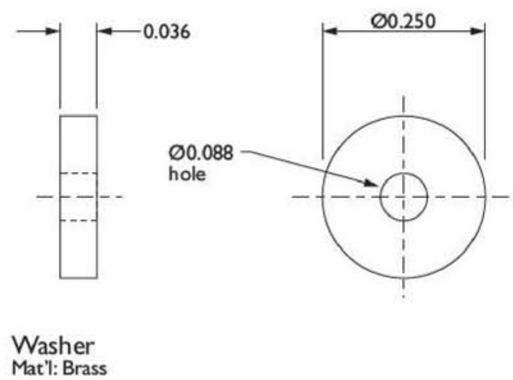


Fig 218

centrally in the date aperture with the control pin at the right-hand of the slot in the dial plate looking at the front. The figures will probably be advanced too far. Trim the length of the pawl to centralise the figures in the date aperture.

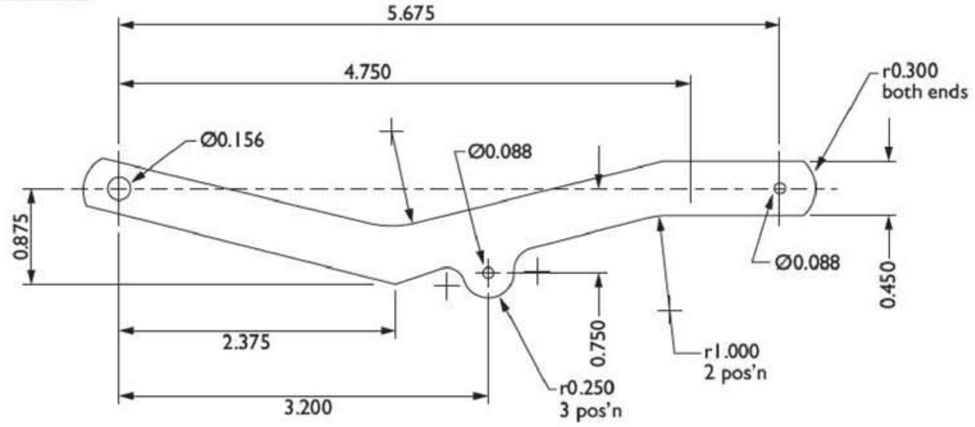


Fig 219

Lever Arm
Mat'l: CZ 120 0.064 thick

Chapter ring

A new chapter ring will be required with an increased internal diameter to clear the date aperture. The outside diameter remains unchanged at 6.5 inches but the inside diameter is increased to 4.250 inches. This will be available from the sources quoted in the 'References' section of the original series.

Attachment to the dial plate is as for the previous chapter ring but the chapter ring foot (fig 54 in the *ME* Series) at the 12 o'clock position will have to be moved to the 1 o'clock position to clear the date-work. Similarly the foot at the 6 o'clock position will need to be moved to the 7 o'clock position.

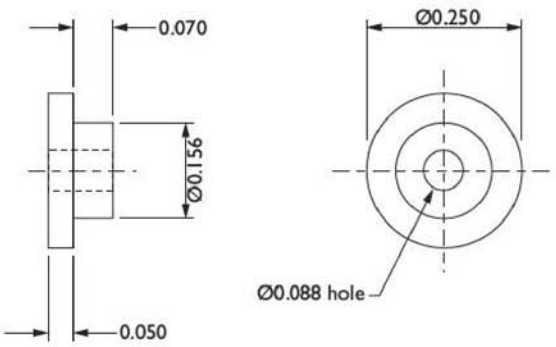
The hour hand will need to be increased in length to 2.250 inch to match the new chapter ring.

Timing the date ring

On the existing clock the change in date commences just before midnight. The timing of the date ring is controlled by the meshing of the 32 tooth wheel on the hour pipe and the 64 tooth date wheel. It may be necessary to experiment with the meshing of these two wheels to obtain the correct result. Once this has been achieved mark the relative position of the two wheels for future reference.

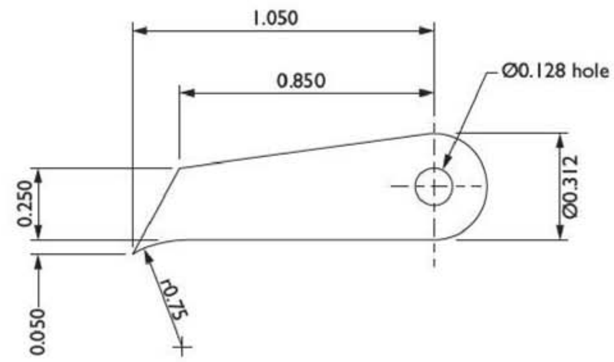
Finally, I wish all constructors 'Good luck with your efforts'. **ME**

You can email John at
johnp20@virginmedia.com



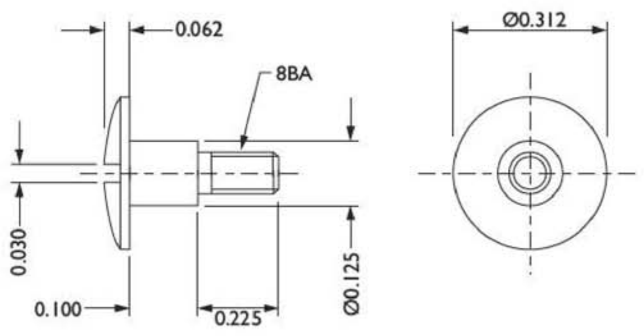
Lever Arm Bush
Mat'l: Brass

Fig 220



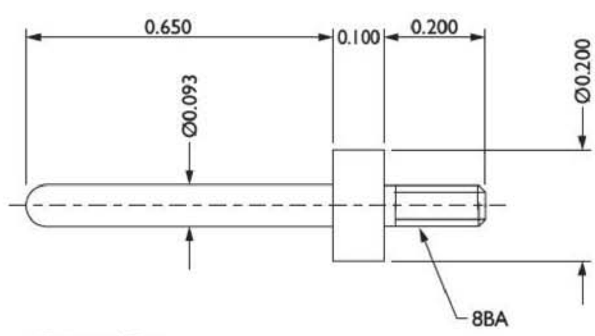
Pawl
Mat'l: Brass 0.093 thick

Fig 221



Pawl Screw
Mat'l: M.S. or silver steel

Fig 222



Control Pin
Mat'l: Brass

Fig 223

Emma Victoria
A 5 inch gauge freelance 0-4-0

Drawn and described by **Henry Wood**.

What brought about the design of this locomotive was a requirement to build a locomotive that could be lifted in and out of a car boot and onto the track relatively easily by one person. It also had to be capable of giving a reasonable performance on the track, have the power to haul at least four adults and be of well-proven construction at a modest cost.

With these requirements in mind, this would fix the overall dimensions, i.e. the length over the buffers and the size of the boiler and cylinders to meet the design specification. The obvious choice was to go for a four-coupled wheel arrangement as this would keep the length down and either a side or saddle tank arrangement with easily-maintainable Walschaerts valve gear and slide valve cylinders. Another thought was to go for a construction that required no castings, the locomotive being constructed from readily available materials that could be either fabricated or machined from the solid, possibly after visiting one's surplus materials box.

After considering the above criteria, I set to work on some sketches to sort out the proportions and eventually opted for a saddle tank design. Through the winter months, when it was too cold to go into the workshop, I started to produce some drawings that allowed the construction to be started. The engine took approximately six years from start to finish with a number of other projects going on between, finally being ready for its first run on the track in August 2005. The engine met all the design requirements and performed very lively on the track, being a free steamer and weighing in at only 58lbs. My own locomotive has cylinders fabricated from brass with phosphor bronze liners. The locomotive has pistons fitted with silicone O rings and runs on cast iron disc type wheels.

My drawings, however, cover either fabricated or cast cylinders and also for disc or spoked wheels. If preferred, the cast version for cylinders and spoked wheels can be adapted from Don Young's Rail Motor castings.

As a model engineer, I believe in making as many parts as I can, therefore my drawings and description will cover all the boiler fittings including an adjustable output mechanical lubricator. The only two items required that will not be covered by my articles are the boiler pressure gauge and the boiler feed injector. I do make my own pressure gauges, and over the past thirty years I have made at least six at 1 inch diameter and two at ¾ inch diameter with a pressure range of 0 to 150psi. As regards injectors, again I have made these and if the builder wishes to tackle these I can do no better than to recommend the first class articles in *Model Engineer* by D. Lawrence in 1975 on their construction and testing.

Frames

For the frames I have chosen a slightly thicker material, being 5/32 inch (4mm). This is to give the rigidity required with a minimum number of cross stays. Two lengths will be required 5/32 thick x 3¼ wide x 19⅜ inches long. These are finished sizes. It is important that these are flat and true over their length; if not this must be put right before proceeding further by gentle persuasion using the bench vice as a press etc. Once satisfied with this, one of the frames can then be marked out for the holes and its profile as shown on the drawing.

Most of the holes required to retain the cross stays and buffer beam fixings are drilled No. 27, for 4BA screws. There are a group of four at each end of the frame to take the angles that bolt up the buffer beams. The eight or six No 22 holes (depending on which type of cylinder is used, i.e. fabricated or casting) at the left-hand end are for the cylinder

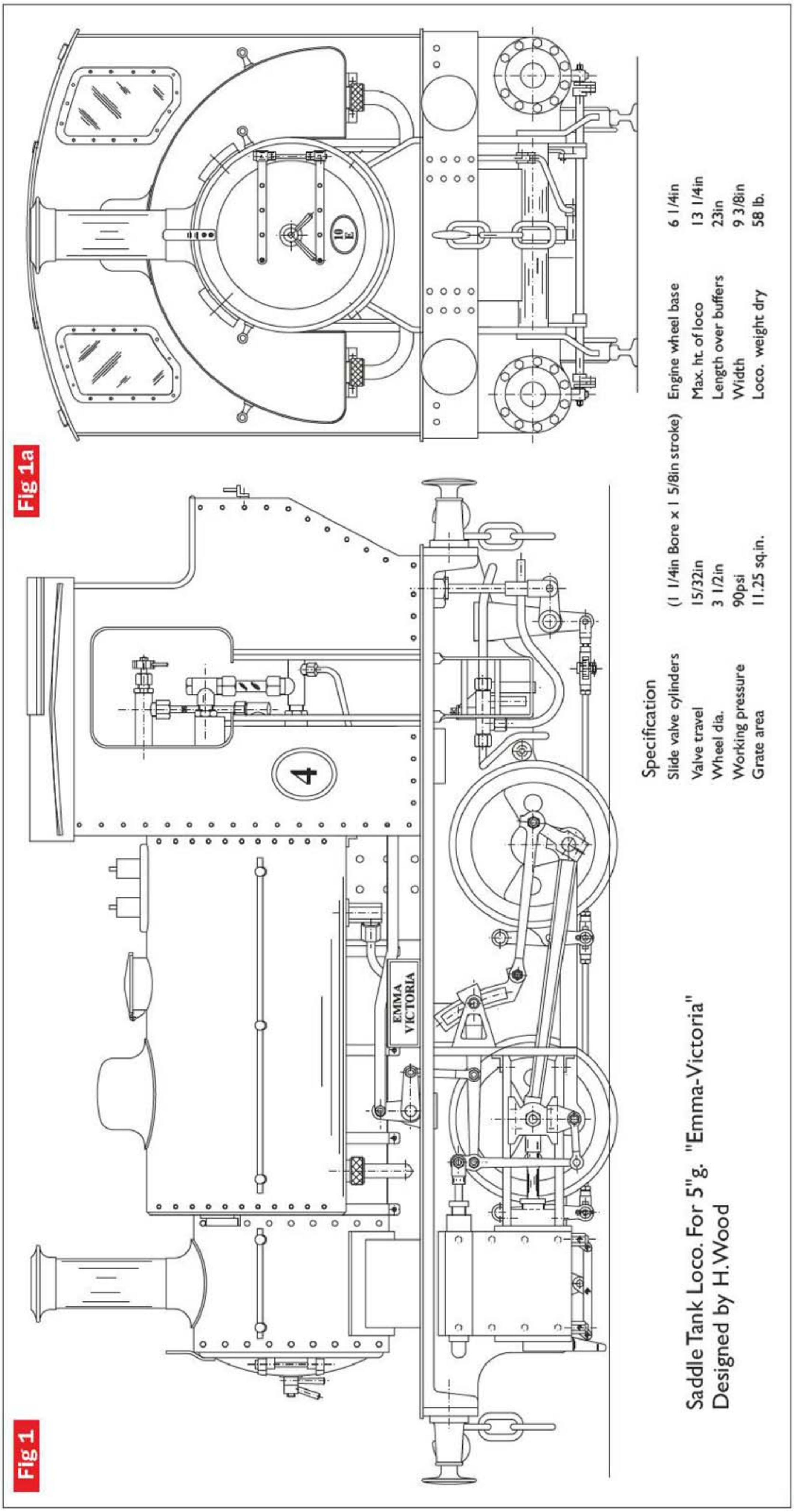
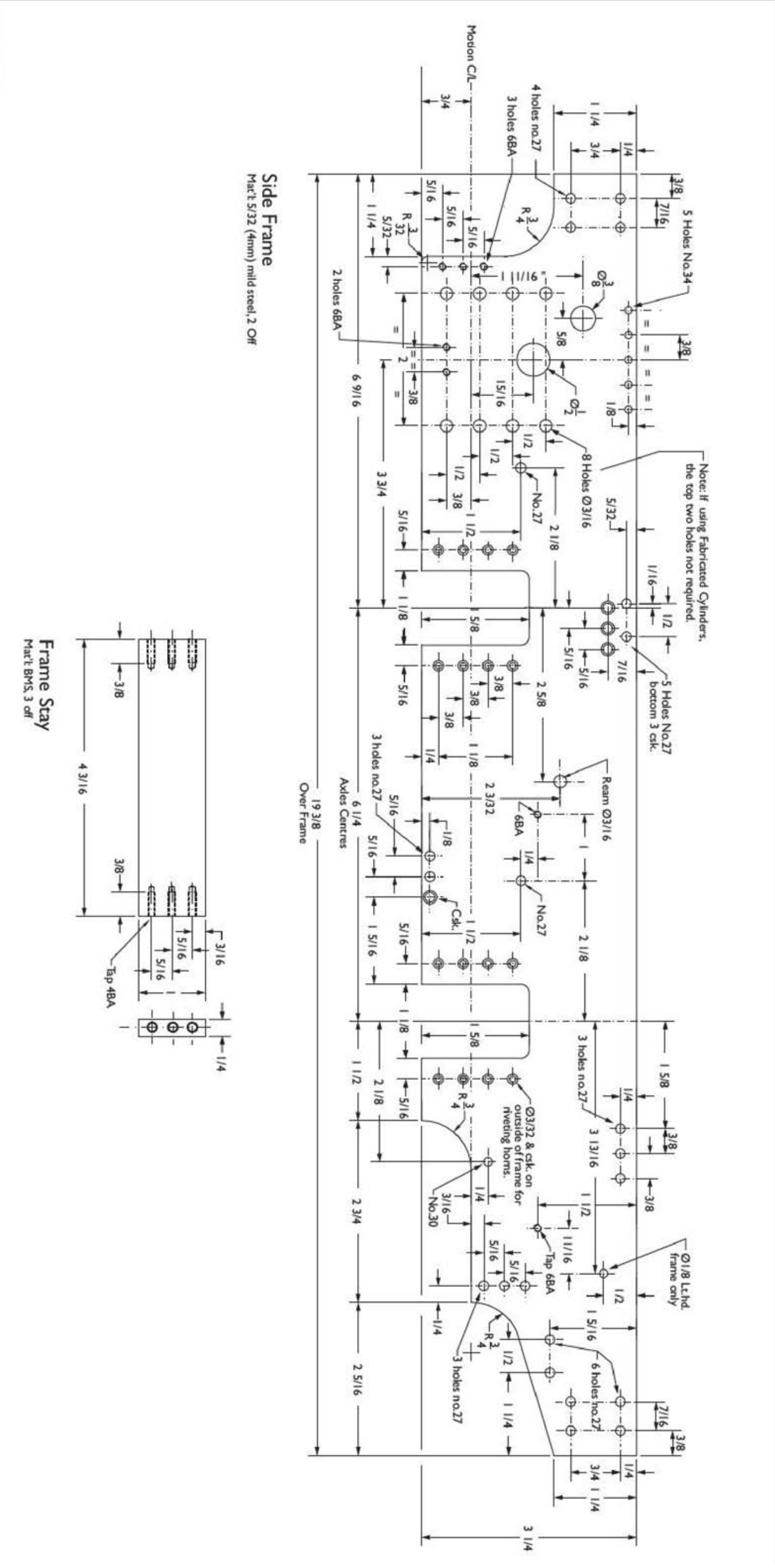


Fig 2



fixing screws (2BA x ½ inch long). The five No 34 holes immediately above are to hold the smokebox saddle with 6BA screws. The 3⁄16 inch diameter reamed hole approximately in the middle of the frame is for use when 'lining up' the expansion link brackets. The single group of three No. 27 holes at the right-hand end are for the rear cross stay, while the other group of three No. 27 holes above are to carry the reversing stand. Two more No. 27 holes close to the frame end are to carry the drop bracket for the brake cross shaft. At the bottom edge between the horn openings are three No. 27 holes, two plain and one countersunk. These are to carry the pump cross stay. There are a group of five No. 27 holes near the top edge above the front horn opening, the top two are for the weighshaft brackets, the lower three countersunk holes are to carry the cross stay. The two single No. 27 holes, one in front of each horn opening are for the brake hanger pins.

The ⅜ inch diameter and ½ inch diameter holes at the left-hand end are for the steam and exhaust pipes to pass through respectively. The two 6BA tapped holes on the cylinder centre line are to carry the drain cock cross shaft brackets. The single ⅛ inch diameter hole towards the rear of the frame is required in the left-hand frame only to carry the pivot pin for the drain cock lever. The two 6BA tapped holes, one at the rear and the other about the middle are required to carry the clips that support the drain cock cable. Then we come to the sixteen 3⁄32 inch diameter holes that are countersunk around the horn openings. These are to accept 3⁄32 inch diameter soft iron rivets to carry the angles that form the horns. The three 6BA holes at the front bottom corner are to secure the guard irons. Finally, drill No. 30 for the grate dumping pin hole.

I suggest that once marking out is complete the two frame plates should be clamped together by utilising probably three of the existing holes (one each end and one in the middle of the frames). The two frame plates can be held together using rivets while carrying out all the drilling and cutting to guarantee both frames finish up identical, these rivets being easily removed later.

To cut out the horn openings I suggest that a ⅛ inch diameter hole is drilled in each top corner and then chain drill across with the ⅛ inch diameter drill. The holes can be cut through using either a cold chisel or, as I prefer, by using an Abrafile once the sides have been cut by sawing. If careful filing is carried out, the slots can be finished to size using a piece of 1⅛ inch wide BMS as a gauge. The gauge, if made of say ½ inch thick material, can be used later when we come to rivet the horn angles in place.

To form the ¾ inch internal radii on the lower edges of the frames, again I suggest using the chain drilling method as carried out on the horn openings.

Before splitting the frames, countersink the holes around the horn openings and also the ones shown countersunk for the cross stays, then turn over the frames and repeat the countersinking on the other side. This will ensure that you end up with a pair, i.e. one off of each hand. With all the drilling and profiling completed, the temporary rivets can be removed and the frames separated. All the holes should then be deburred to give a good clean finish; also any sharp edges on the frames should be dressed clean.

Horns

The horns are a very simple arrangement being made up from pieces of ½ x ½ x ⅛ inch BMS angle. Cut eight lengths at 1¹³⁄₁₆ inch long, mark out and cut back one flange at ³⁄₁₆ inch from one end as shown so that you finish up with four pairs of horn angles. It is a good idea to check the squareness of these angles before they are riveted to the frames as experience has shown the BMS angle is not always a true 90 degrees. If not, correct this by carefully bringing square in the vice. Before they are riveted to the frames, the No. 32 holes should be drilled that will eventually fix the horn keeps in place. The piece of bright bar sized to 1⅛ inch that was used as a gauge when cutting the horn openings can now be used to aid the positioning of the horn angles. This can be done by simply clamping two horn angles to it when positioned in the horn openings in the frame. The four ³⁄₃₂ inch diameter holes can now be drilled in each angle from the frame holes, followed up by riveting using ³⁄₃₂ inch diameter soft iron snaphead rivets, heads on the inside of the frames, and dressed flush in the countersinks on the outside. Constructing the horns in this manner means that no machining is required after riveting the angles in place. However, if it is found that any squaring up or sizing is still required, this can be done by filing.

Buffer beams

The beams are made from ³⁄₁₆ inch BMS 1¼ wide x 9¼ inchs long. These are fixed to the frames by using four pieces of 1 x 1 x ⅛ inch BMS angle. Check this angle for being square, i.e. 90 degrees and correct if required as for the horn angles mentioned previously. I would suggest that the best way of picking up the fixing holes from the frames for these angles is as follows; with angles cut to a length of 1¼ inch, clamp one to the frame in the position shown and spot through with a No. 27 drill, remove the clamp and angle from the frame and drill right through No. 27, this angle becoming the outer angle. Please note that the inner angles are tapped 4BA.

To pick up these centres, clamp the outer angle to the inner angle and spot through with a No. 27 drill, then drill right through with a No. 31 drill (4BA tapping), then, finally tap out these holes. Repeat this procedure for the other three fixing points of frames to buffer beams. With all the four ends of the frames fitted with fixing angles using 4BA hexagon head screws, we can now mark out all the holes required on the buffer beams. There are a total of thirty-four hole positions required for ³⁄₃₂ inch diameter rivets, noting that four of these holes require to be countersunk at each buffer position to allow the buffer stock to sit down. The two ⅜ inch diameter holes being drilled through both the beam and angle after riveting has been completed. The rectangular hole in the centre of the beam is to carry the draw hook; this can be formed by drilling two ⁵⁄₃₂ inch diameter holes touching each other and then being filed to the shape shown using a small, square file.

Clamp both beams together and drill ³⁄₃₂ inch diameter for all the rivet positions. While still clamped together countersink the four holes at each buffer position as shown, then turn the beams over and countersink again. This will then make a pair of beams. The four ½ x ½ x ⅛ inch BMS x 1⅛ inch long angles can be cut, drilled and riveted in place, the hole centres being picked up from the beams. These are to support the running boards.

Frame stays

Before the frames can be put together, the three frame stays (or stretchers) will be required. These are made from ¼ x 1 inch BMS. To ensure that the frames are kept true and square it is important that all three are of the same length and machined square at the ends. The best way of dealing with these is to cut three lengths off at, say, 4⁵⁄₁₆ inch long. These are then clamped together and mounted in the four jaw chuck and a ¹⁄₁₆ inch skim taken off to square up the ends, reverse in the chuck and take down to a finished length of 4³⁄₁₆ inch. If preferred, these can be finished on a milling machine if available. The fixing holes should be drilled No. 31 and tapped 4BA as shown, again these centres can be picked up from the frame holes.

With all the rivet holes drilled in the beams and the fixing angles bolted in place on the frames, the three frame stays can be loosely bolted in place. The frame assembly can now be turned upside down and laid on a surface plate or an equally flat surface and the frame stay fixings tightened up to pull up the frame square. A diagonal check should be made to confirm all is well. If not then some adjustment must be made to correct this as this could give trouble later on. With the frames still upside down on the surface plate, the buffer beams can be offered up and centralised on the frames. These should be clamped and at least one hole in each angle fixing drilled and temporarily bolted up with 8BA screws. Once you are happy with the squareness of the assembly, complete the drilling and riveting up of the beams to the angles. The beams are riveted to the angles using ³⁄₃₂ inch diameter soft iron snaphead rivets with the heads on the outside of the beams. To complete, the ⅜ inch diameter holes can now be drilled through to carry the buffers.

Horn keeps

The last items required to complete the frame structure are the horn keeps. These again are of a simple construction, being made from BMS bar. Cut four pieces from ½ x ¼ inch BMS 1⅜ inch long, and mark out as shown. The important dimension here is the 1⅛ inch over the shoulders of the keep. This should be made a nice location fit in the horn openings. In case there is a variation in the horn openings it is best to treat each one individually and once fitted, stamp up so as to keep each to its own. The shoulders on the keeps can be milled either in the lathe using the vertical slide or, if available, on the milling machine, or simply by sawing and filing. The ⁷⁄₃₂ inch diameter hole is clearance for the spring pin and is counterbored ¹³⁄₃₂ inch diameter to accept the compression spring. The two 6BA tapped holes are marked through at assembly with the horns. At this stage you should have a frame assembly that is square and true and a relatively strong structure.

●*To be continued.*

The 2012 MODEL ENGINEER EXHIBITION

1907-2012

DIANE CARNEY
Deputy Editor

Diane Carney's first report: the competition.

The 2012 Model Engineer Exhibition closed a couple of days ago (as I write) and was, once again, a tremendous event showcasing some of the very best of the model engineer's craft.

When compared to last year there were more club stands and more models. There were no fewer than seven entries in the Duke of Edinburgh Challenge Trophy making for a very healthy competition and a number of severe headaches in the Judges' Room! **Photographs 1** to **7** show the seven entries, in no particular order other than photo 1 being the winner.

DUKE OF EDINBURGH

The winner, David Bretten, was featured in *M.E.* issue 4428 (20 April 2012) and if you have access to this issue it is worth looking back to remind yourself of the work that went into making this model, a quarter scale Fordson Model F. It is a model of a tractor owned and restored by David from which all measurements were taken. Chief judge, Ivan Law, explained the reason for the decision to award David the trophy.

This project is highly original and encompasses many disciplines including design work, preparation of drawings, pattern making and casting and many methods of machining including gear cutting. The builder successfully overcame many difficulties during the construction process. It is a fully working model and the standard of finish is extremely high.

Several observers noted that, of the seven entries into the DOE, it is not, perhaps, the model that would first entice

Cherry Hill presenting David Bretten with the Duke of Edinburgh Trophy.

you across the room for a closer look. However, when one evaluates the workmanship closely and considers how much detail there is within the model and out of sight, this entry is a clear winner. David

Andrew McLeish's completed 1½ inch scale Allchin to the Bill Hughes design. (Photo by Mike Chrisp.)

HMS Warspite *by Colin Vass. (Photo by Mike Chrisp.)*

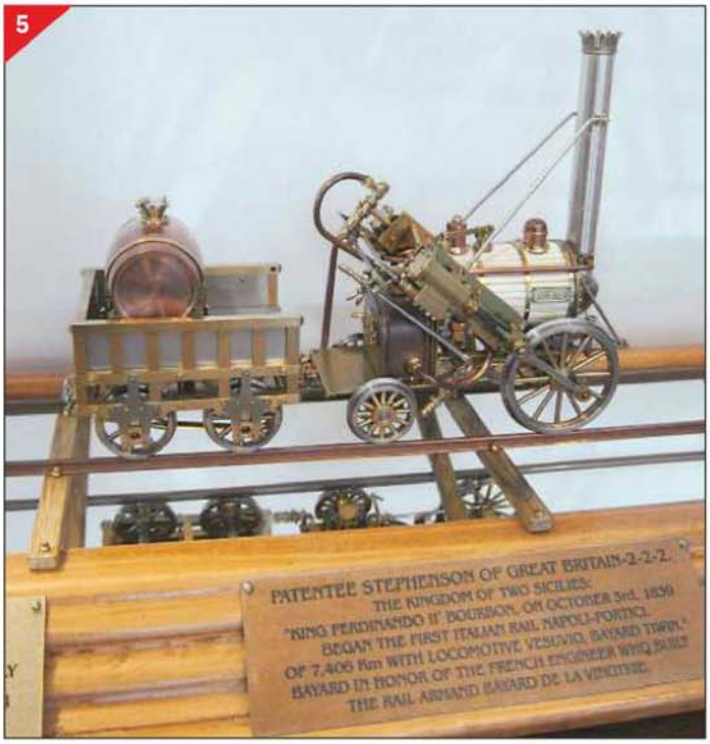
Duke of Edinburgh Trophy winner, David Bretten's quarter scale Fordson Model F. (Photo by Mike Chrisp.)

had prepared a very interesting, illustrated booklet and also displayed a large number of his own patterns. Once you start to look closely you begin to appreciate the outstanding quality of this model.

There was some stiff competition, however. Four of last year's Gold Medal winners were entered: a 1½ inch scale Allchin by Andrew McLeish (photo 2) built and finished to an extremely high standard; the huge and finely detailed model of *HMS Warspite* by Colin Vass (photo 3) and a very original model of a Bristol Mercury (photo 4) by Mike Tull. Three other entries, Mr. Mastrini's 1:32 scale model of Stephenson's *Rocket* (photo 5), the magnificent compound marine engine to the Arthur Leake design by James Lauder (photo 6) and an eight-wheel tram (photo 7) by Ashley Best had also been Gold Medal winners in previous years.

We are anticipating an article from James Lauder, some time in the New Year. I'm sure I am not alone in looking forward to that very much.

A half scale Bristol Mercury 'exploded' assembly by Mike Tull. (Photo by Mike Chrisp.)



Stephenson's Rocket *by Giancarlo Mastrini.*

James Lauder's compound condensing marine engine to Arthur Leake's design.

An eight-wheel Rochdale tram by Ashley Best. (Photo by Mike Chrisp).

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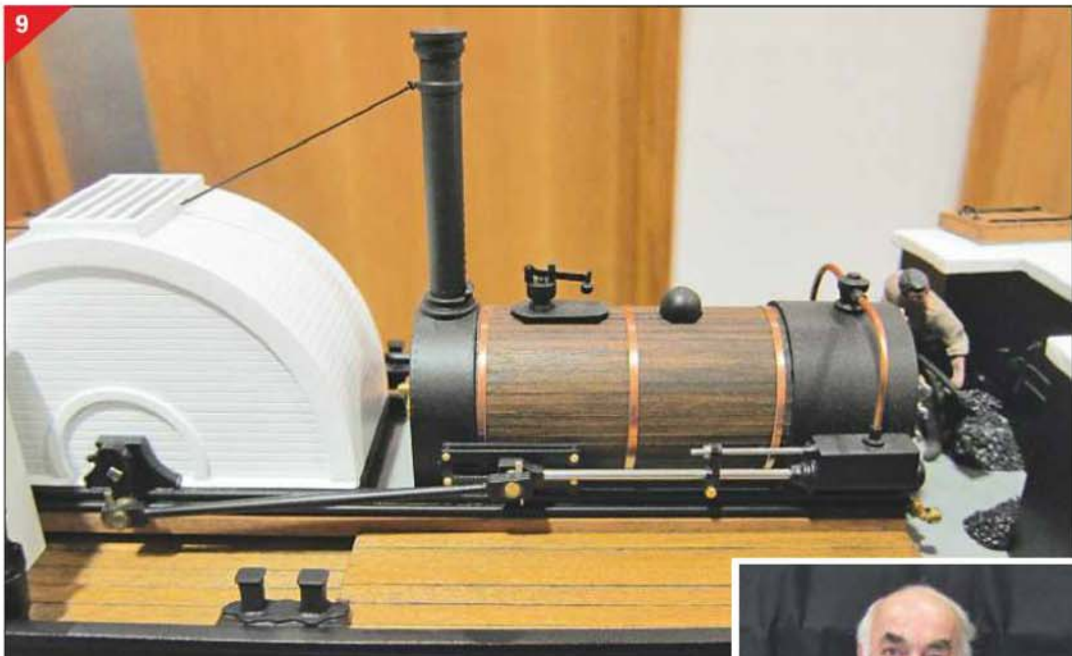
GOLD MEDAL WINNERS

8

Lord Dundas, *an 1831 iron 'twin boat' steamer. (Photo by Mike Chrisp).*

LORD DUNDAS

The fact that only three Gold Medals were awarded this year gives credence to the fact that it is a competition of the highest caliber. **Photograph 8** shows a rather diminutive but utterly charming model of an 1831 river vessel – or rather, 'canal' - as the prototype was built for the Forth and Clyde canal by William Fairbairn of Manchester. The model, a 1:32 scale iron twin boat steamer is by Graham Castle of Truro, Cornwall. Materials used in its construction are copper sheathed timber, brass and silver steel and it is a fully working model, although it was on static display. The superstructure is largely of styrene. It is about 27 inches long overall. Graham was also awarded the H. C. Evans Trophy for the best researched model ship. In **photo 9** you can just about make out the tiny rivets in the hull.



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A locomotive type boiler and two cylinder engine drove Lord Dundas.

I have done a little reading on the prototype and have discovered that she was of rather light construction with thin iron plates riveted to Tee section iron hull 'ribs'. The paddle wheel was nine feet diameter and the whole ship, engine, wheel and all, was only 7 tons, 16 cwt. At 69 feet long she was quite slightly built. She underwent trials in the River Irwell, where she was launched, before being sailed to Glasgow via the Isle of Man; a perilous voyage by all accounts! Seemingly it was this voyage that alerted the crew, perhaps for the first time, to the incompatibility of ships' compasses and iron hulls. On one occasion they believed themselves to be off the Manx coast when they were, in fact, close to Cumberland!

I, for one, am grateful to Graham Castle for providing the inspiration, in the form of this little model, to discover something about a significantly historic vessel which I previously knew very little of.

Graham Castle won a Gold Medal and the H. C. Evans Trophy.

ROLLS ROYCE GOLD

John Heeley from Huddersfield took home a Gold Medal in Class A3 for his pair of Rolls Royce Derwent 9 jet engines to a scale of 2 ½ inches : foot (**photo 10**). These engines featured in our report on the Harrogate model engineering exhibition this year although, at Harrogate, they were displayed in two different locations. It was nice to see them together here. John was explaining to me that, after completing both models, he continues to make improvements, first to one and then the other, and so it goes on. All components are fabricated or machined from the solid. John was generously granted free access to the original engine preserved at Newark Aircraft Museum from which he took measurements and many photographs. The museum also houses a Meteor Mk XII Nightfighter, the aircraft that the Derwent 9 powered. We are promised an article about the construction of this pair of engines in the not too distant future. That's something else to look forward to!

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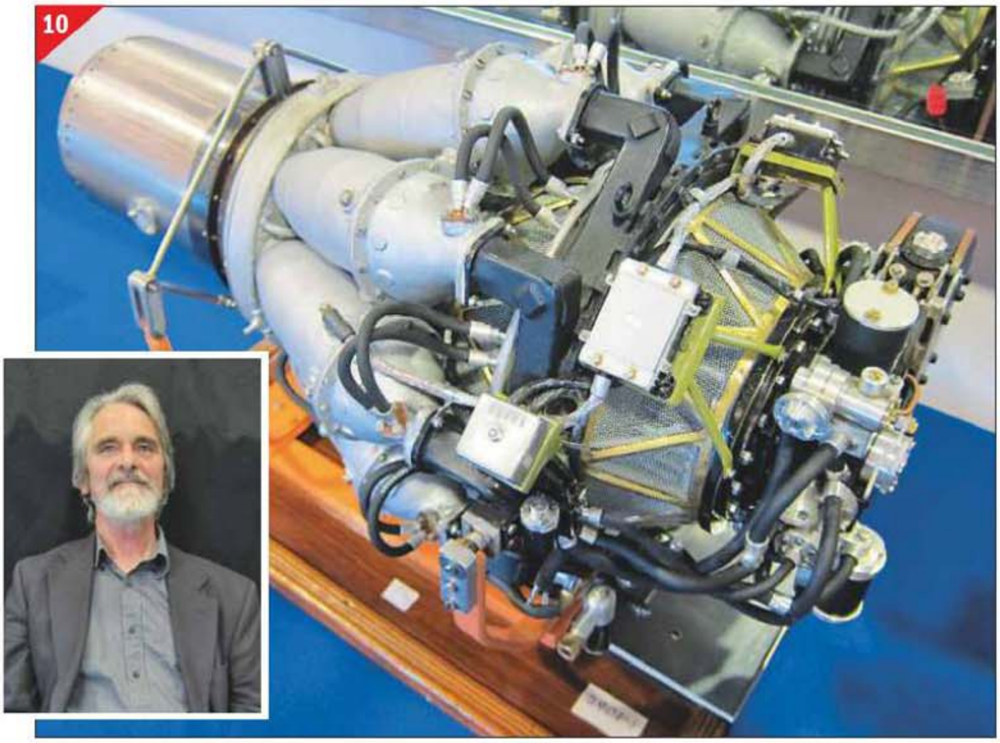
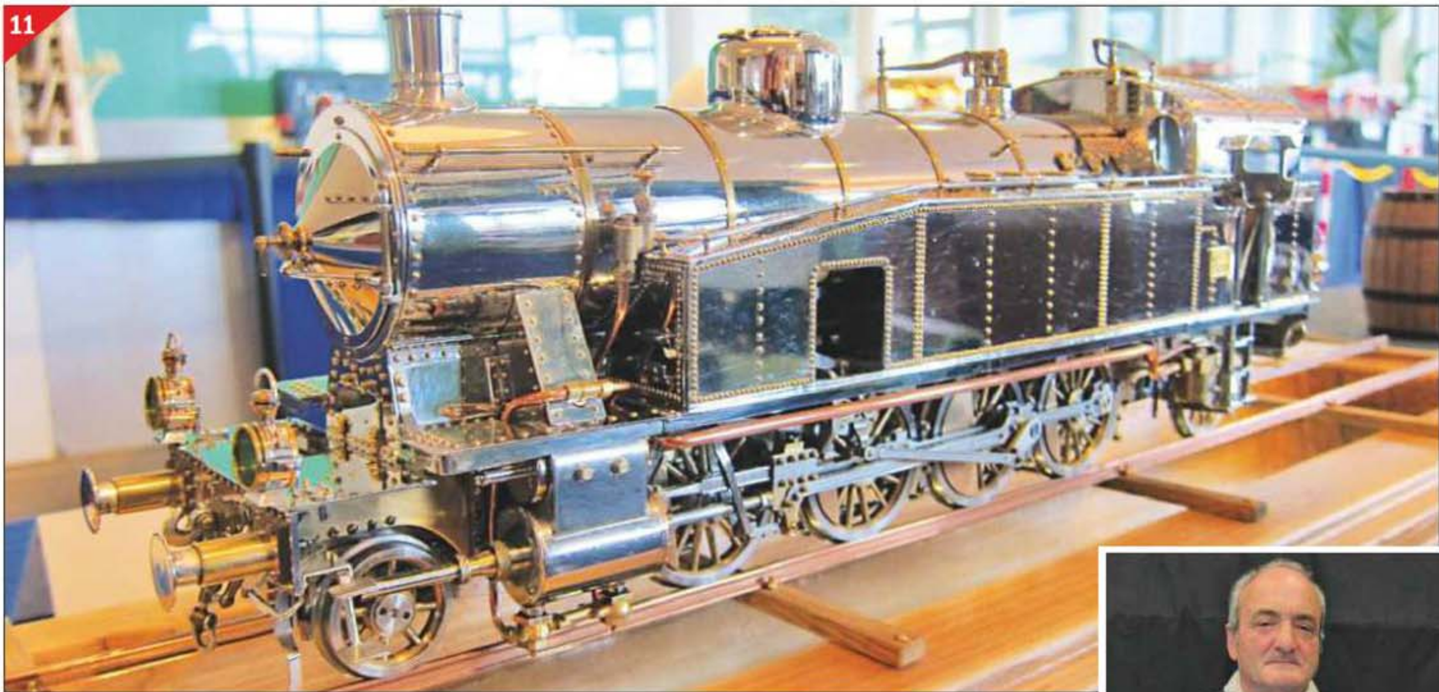


One of a pair of Rolls Royce Derwent engines. Inset: John Heeley.

11



A gauge one Italian Railways locomotive by Mr. G. Mastrini.

GOLDEN LOCOMOTIVE

The third Gold Medal was awarded to Mr. Giancarlo Mastrini, a member of the Italian Federation of Railway Modellers, for his entry into Class A7, General Engineering. He also took the Bill Hughes Cup for 'a fine example of amateur craftsmanship in a steam powered model' for his working model of an Italian Railways 'Mikado', 2-8-2 passenger locomotive of 1922 (**photo 11**). These tank engines were designed to work across the Apennine routes between Rome and Ancona with its steep gradients and severe curves, the added weight over the driving wheels affording maximum traction on the gradients. The locomotives were equally at home running in either direction and were not usually turned. The model is another masterpiece from Giancarlo whose presence at the exhibition is always a joy. This very original Gauge One model was designed entirely by the maker and materials used include stainless steel, bronze, brass and copper. Mr. Mastrini made every single part himself, including all of the fastenings and it is capable of being run under steam power.

● *To be continued.*

Giancarlo Mastrini won a Gold Medal for his Gauge 1 locomotive.

IMLEC 2012

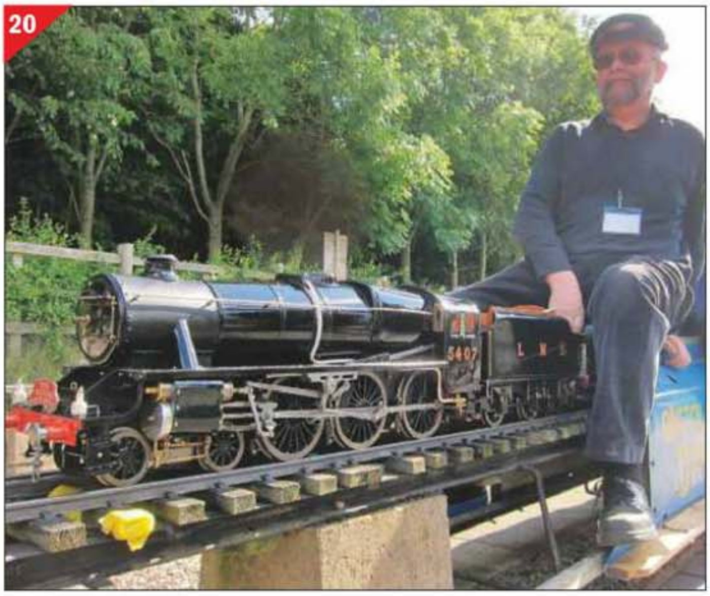
Diane Carney reports on the competition.

PART 2

Continued from page 455 (M.E. 4439, 21 September 2012)

Sunday

Another bright, sunny morning dawned and, following the pattern of the previous day, the 3½ inch gauge locomotives opened Sunday's competition. John Barr from Leyland was first to go with a Doris, LBSC's LMS Class 5MT (**photo 20**). John bravely set off with passengers but after failing to lift the train he dropped off one passenger, then after stalling on the first bank, dropped off all the passengers bar the observer. He completed four laps, however, and made it onto the scoreboard.



John Barr awaiting the right away.

Second run of the morning was a South African Class 14F, 4-8-2 (**photo 21**) entered by Bruce Hope from Guildford. I believe this locomotive is based on the prevalent South African 3 foot 6 inch gauge, which makes for a substantial passenger hauler in 3½ inch gauge. Bruce took 19 passengers plus himself and the observer and after a sticky start (i.e. after remembering to put it in gear!) and setting down five passengers travelled a faultless six laps in just over 31 minutes, figures which gave him an outstanding lead in the 3½ inch competition and a highly respectable 7th position in the whole event. **Photograph 22** is a view from the top of the tunnel.

The first 5 inch gauge locomotive to go on Sunday was a 9F from Chesterfield, recently completed and run today by David Kerry (**photo 23**). It was interesting to compare the two 9Fs in the competition; they finished nine places apart in the table (David finished 15th) but ran for almost identical times. Whereas Neil's load was only 14 adults, David took 16; Neil burned almost 3.5 lbs of coal and David only 2.8 lbs. However, Neil completed 9 laps and David only 7 so it is clear that this was the significant difference. Despite being a 'seasoned' competitor, I think David struggled for steam at times whereas Neil was on the ball for the whole run. A lovely engine, nonetheless, and only finished on 1st June this year!

Karl Midgley from Gravesend came on next with a nicely finished tank locomotive, *Tomking*, built by Ben Healey (**photo 24**). This two cylinder design is finished to represent a BR standard tank but uses LMS 5XP wheels; Ben is presently in the process of building an LMS Jubilee. Ben has used this locomotive for passenger hauling at his local park where he has raised a lot of money for the charity, *Help for Heroes*. Karl didn't have quite the run he had hoped for, declining to take the chance of a final lap which might have improved his figures. He came in in 17th place.

A virtually brand new locomotive now as Paul Pavier set off with a Great Northern O3 Class 2-8-0 freight engine (**photo 25**). None of these survived into preservation but

Bruce Hope's South African Class 14F.

Members of the NSMEE shed crew help David Kerry onto the track.

A view from the bridge.

they were strong workhorses throughout the war. Paul obviously had great faith in this engine, opting to take 16 passengers plus himself and the observer. Apart from one momentary lapse in concentration around the top bend Paul had a terrific run completing eight laps and burning only 2.33 lbs of coal and the recorded efficiency of 2.2% placed him ahead of David Gregson - the first locomotive to do so.

Following Paul came another 'old hand' at this game; Steve Eaton from Chesterfield entered a freelance 0-4-0 which is based on a Polly II locomotive (**photo 26**). Steve acquired it as a very well used engine and has rebuilt and enhanced it, improving the valve gear and adding weight (possibly with a view to entering it into IMLEC!) and renamed it *Bettina* after his girlfriend who was there to support him. Well practiced at IMLEC, Steve left with a good coal fire but attempted to keep the total used to a minimum. He completed six laps, by the end of which the fire was getting tired and he decided against a further lap. In fact, he stopped just short of the station to try to raise just a few more pounds pressure to get home! But he made it and his nine passengers (eight plus a little one), which included Bettina, his mum Betty, his son Toby and his sister and family all alighted smiling! Steve achieved a commendable tenth place, not too bad for a little engine (**photo 27**).

One more LBSC locomotive to go now and Martin Kennedy (**photo 28**) from North London was the 24th run of the competition with his Speedy, the ubiquitous 0-6-0 tank engine. Unfortunately Martin experienced some stoppage time which reduced his average speed to 3mph and consequently the distance to just under 3000 feet giving a final efficiency of 0.4%.

Next was the most powerful locomotive in the competition. Kevan Ayling from Worthing entered his semi-freelance Kitson-Meyer based on a 3 foot gauge Columbian National Railways engine. Kevan had made this from nothing more than two photographs and one side elevation drawing, taking 13 years to do so. It was completed in 2009 and named *Cartimandua*. The competition rules restrict the load to 30 adults in total so all the available trucks were marshalled for Kevan's attempt. Completing eight laps in 32 minutes his 'work done' figure, at just over 14½ million foot pounds, was the highest of the weekend ... but so was his coal consumption; it required 6.25 lbs of coal to do all that work! It was a very consistent run, though, and 6th place was the result. **Photograph 29** shows the whole train approaching the (insignificant for this engine) bank.

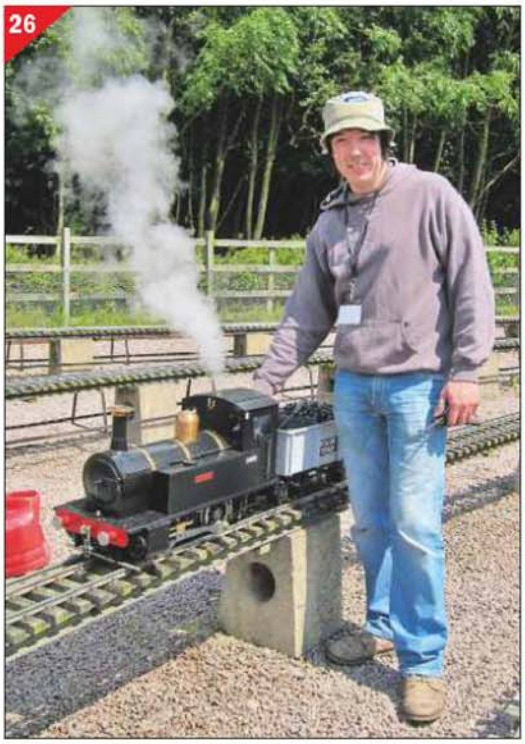
24

Freelance/BR tank Tomking *built by Ben Healey from Kent.*

25

Paul Pavier with his latest locomotive.

26

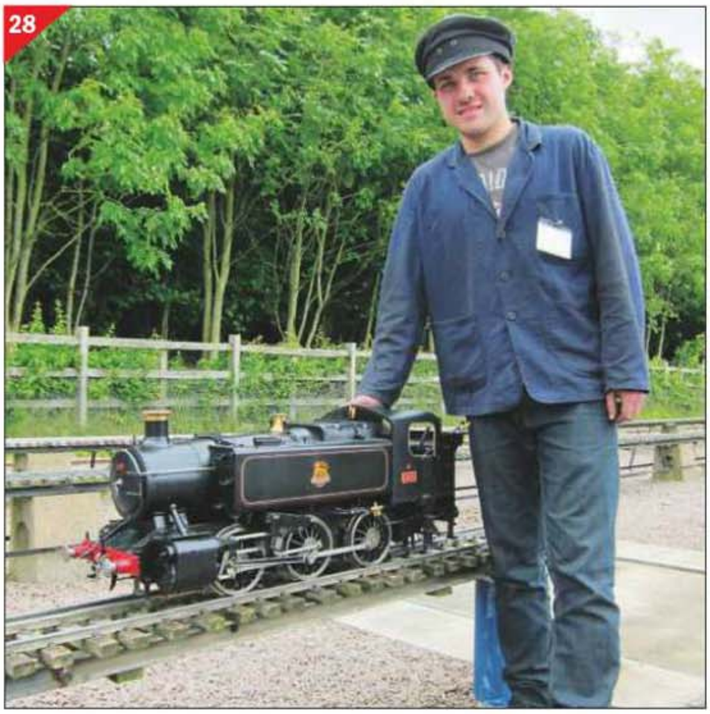


Steve Eaton with Polly II, Bettina.

27

Steve's run with a good load for a little engine!

28



Martin Kennedy from the North London club.

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More coal please!

Dave Roberts had a good run once he got going.

One more from Urmston now and Dave Roberts entered his LMS 5MT (**photo 30**). Dave was yet another who fell foul of the 2011 weather conditions. This year was rather better, however, and he set off with a total of 14 adults. By his own admittance he made the mistake of leaving with an inadequate coal fire and a very full boiler and had to stop to raise steam on the first hill. He also shed a couple of passengers here and another couple further round. Despite this, once the fire was in better condition they never looked back and the run ended with steam to spare! This mixed fortune left Dave in exactly the mid point in the table.

As the penultimate run was about to start the sense of competition really started to increase. The last run of the weekend was to be last year's winner - here to defend his title - Ben Pavier with Rod Ainsworth's Britannia, *Sir Christopher Wren*. Before him, however, was Lionel Flippance from Worthing with what has become a legendary locomotive, now 22 years old (**photo 31**). This is a model of Robert Riddles' proposed 2-8-2 based on the Class 7MT, Britannia - the locomotive that never was. Weighing about 400 lbs, this engine was built to compete ... and so it did. Lionel had been studying the 'form' for two days and with an eye on the good, dry track he requested 21 passengers making 23 adults in total. He was ready to go but even this engine couldn't quite lift the train. (The start line is certainly on a level bit of track but with a train this length the back is most definitely going up hill.) One passenger was set down and that was enough to allow them to make a start. Off they went, round the climbing curves then quickly reappeared on the far side for the long, very gentle down gradient. The locomotive was cruising, almost in mid link, but with a breath of steam it must have made a fairly continuous, if fluctuating, drawbar pull (**photo 32**). After 31 minutes running in which they completed 8 laps, averaging a speed of 6.75 mph, the average drawbar pull was recorded as 72.09 lbs. (second only to a large, 5 inch gauge narrow gauge locomotive) and the efficiency was calculated at 4.98 percent. Was this a record?

Lionel has entered this locomotive into efficiency competitions on ten occasions (including Superlec) and won in all but two, which proves that it isn't unbeatable – but it takes an exceptional combination of driver and engine to defeat them.

Finally, the Southport team; Ben Pavier took to the track with his friend, Rod Ainsworth's Britannia *Sir Christopher Wren* (**photo 33**). Last year this locomotive had a little luck with the weather – I recall his was the only dry run! - but its triumph was as much due to the skillful driving of Ben who opted to take a load of 20 adults. Comparing these last two runs in the results table (*M.E.* Issue 4440) makes for interesting reading; coal consumption was similar - the Britannia using slightly more - but the work done was significantly higher with the 2-8-0. The Britannia achieved an efficiency of 2.66 percent which afforded them a respectable second place.

Lionel Flippance struggles to start with 23 on board (photo Mike Chrisp).

Once on the move this locomotive makes light work of its load (photo Mike Chrisp).

Ben Pavier knows he's got a hard act to follow (photo Mike Chrisp).


34

John Drury with Wendy. (Photo by Ken Barrett, the new owner of this locomotive.)


35

John Drury with Sue Marquis, chair of Nottingham SMEE.


36

The Victor! Lionel Flippance takes the trophy.

John Drury

Before closing this report I would like to mention one member of the audience; Mr. John Drury who was the winner of the first IMLEC competition in September 1969 with a 5 inch gauge Royal Scot. I am indebted to Peter Stevenson of Coventry MES, a long time friend of John's, who has provided the following information.

At the time of his victory he was a member of both Coventry and Birmingham (the host club) model engineering societies. He was later one of the founding members of the Echills Wood Railway.

John is a long-standing steam enthusiast who caught the bug during his apprenticeship as a fitter turner in the steel works in Scunthorpe before the war. On the outbreak of war he transferred to Rolls Royce and also joined the Home Guard, followed by a spell in Coastal Command. After the war he returned to Rolls Royce and in 1955 transferred to their factory in Coventry working in the development shop. John has been a prolific builder of steam locomotives and other steam models including stationary engines and road locomotives. As he approaches 90 years of age, he is still making a new engine every couple of years and is a shining example to us all.

John hugely enjoyed his day at IMLEC this year and it was notable how many people knew him and approached him for a word. **Photographs 34** and **35** show John with one of his 7¼ inch gauge locomotives and during his day out at the competition at Nottingham.

Congratulations must go to the Nottingham SMEE for putting on a tremendous event. There's no doubt that this is a good competition track, as the results have shown, and the club members organised a great weekend.

Photograph 36 shows the worthy winner! **ME**

ISSUE NEXT ISSUE NEXT ISSUE NEXT ISSUE NEXT
NEXT ISSUE NEXT ISSUE NEXT ISSUE NEXT ISSUE

- Emma Victoria locomotive
- Nemett Bobcat and Jaguar
- Bantam Cock LNER V4 locomotive
- Rio Tinto
- Rodean Locomotive
- Curly Bowl Report
- LittleLec 2012
- Building locomotives from kits

2012 MODEL ENGINEER EXHIBITION REPORT

Tony Boxell won 10 medals. Is this a record?

ON SALE 14 DECEMBER 2012

Contents subject to alteration

The Harlandic Titan

RAY McMAHON

Ray McMahon introduces a new battery powered 7¼ inch gauge locomotive.

Harland & Wolff no longer build ships. They were once shipbuilders to the world but sadly the shipbuilding workshops and slip facilities for which they were famous no longer exist.

It is not so well known, perhaps, that during the 1930s, when shipbuilding orders were scarce, they built a number of industrial diesel locomotives. Some of these were for their own use in and around their own shipbuilding works and for local use around the Belfast docks and further afield.

One particular engine, of which only one was ever built, was number 17 Class X. It was one of several pioneering designs of diesel locomotives produced by Harland & Wolff under their Harlandic trademark during the 1930s and 1940s.

It had a two speed forward and reverse gearbox which enabled it to be used for branch line services if necessary. The top gear ratio was 5.76 to 1 and the low gear ratio 19.52 to 1. The maximum speed of the locomotive in high gear was 50 MPH and in low gear it was 15 MPH with a maximum tractive effort of 24,000 lb.

The locomotive was fitted with a Harland - Burmeister and Wain eight cylinder two stroke diesel engine developing 330 BHP at 1,200 rpm and

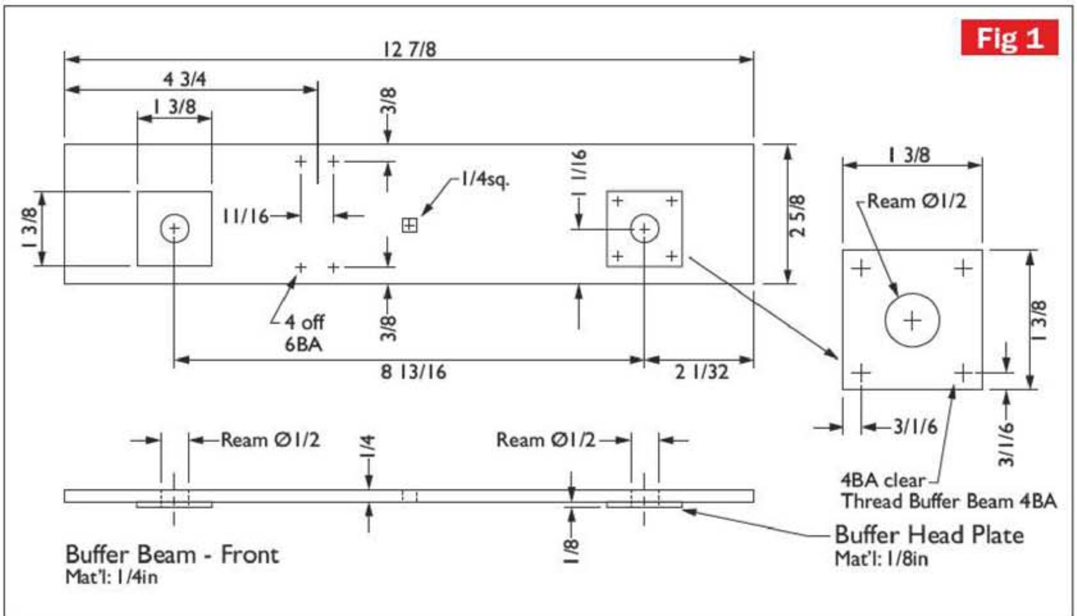


Fig 1

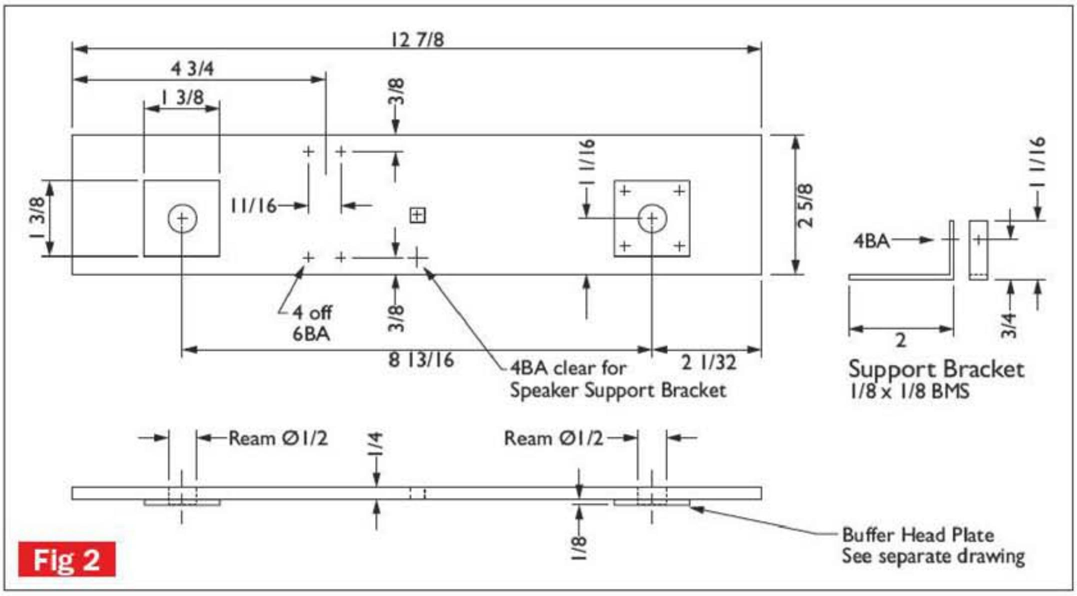


Fig 2

365 BHP at 1,245 rpm. The locomotive was eventually scrapped in mid 1970.

I was very fortunate to have been given a general arrangement drawing of this particular engine over 50 years ago for ideas when I was contemplating the construction of a small 5 inch gauge, four wheeled I/C engine locomotive. This was eventually powered by a Villiers 34cc two stroke petrol engine using Vee belts with a drive system based on a Myford Tri-lever. It was very successful and it was on this model that I cut my teeth and learnt many of the engineering skills that were required to build it, see *Model Engineer*, 19/4/74, Project 6172.

I recently rediscovered this drawing when I was searching around for my next project; my view at the time was that it had to be something different! I have reason to believe that this drawing may well be the only one in existence. The Museum that received much of the H&W archive material does not have a copy in their possession.

In a way it would seem that I have come round a full circle again, this time to an electric locomotive. It happened by chance when I was visiting the 7¼ inch gauge railway at Comrie.

I was given the opportunity to drive an electric locomotive, built by Graham Prestwich, for the first time. I must say I was very impressed with its performance; so much so it started me thinking 'why not electric'?

Why not indeed; no boiler testing ... just switch on and off at will! Boring? Not really - just good, instant fun without any hassle. Using modern methods of construction, laser and water jet cutting etc., it wouldn't take too long to build. In actual fact the locomotive was built in eight months except for the painting. Taking into account that this also included research and making all the drawings, I reckon that if you are with it, six months could see it running.

Having convinced myself of its good points it was just a matter of getting started. Graham very kindly supplied me with details of the motive power and chain sprockets he had used, which was of great help. Other people whom I would like to acknowledge for their help in supplying additional information in respect of photographs and various technical details are as follows:-

M. Kennedy c/o The Ulster Folk & Transport Museum, Blackgates Engineering, Milner Engineering, M. Mundell.

Blackgates will be able to supply you with the drawings should you want to get ahead of the series. There are only a few castings required so what you save there will go towards the drive system and batteries. You have the option of fitting a superb electronic control and sound system which will go a long way to enhance your engine so at the end of the day you will have a good looking and surprisingly powerful locomotive, not to mention those lovely large coupling rods and crank webs doing their stuff.

Before you commence the project it might be advisable to source the batteries and check them for size. They are of the invalid carriage type (the car type are unsuitable). Mine were labelled MK POWERED USA type no M 40-12 SLDG 12V 40 AH. An equivalent type would do but dimensions are important. They need to be 6¾ high x 6⅝ wide x 7¾ inches long with screw terminals. Anything larger and you will have to alter the body width and height dimensions slightly.

Buffer heads - vacuum pipes - hooks

Let us start with the buffer heads and stocks; there is nothing special about them except for making a bit of swarf which should keep you busy for a while. Perhaps the only things worth a mention are the buffer steps; these started off as a ring of 1½ inch diameter BMS. This needs to be bored out 1 1/16 inches in diameter after which four flats are then machined on. The ring is cut into four pieces and sweated onto the buffer body with soft solder paint. For the tread you can possibly use some of the sections that are available and stick it on with super glue or Araldite. I used a piece of builder's damp course plastic material which comes with a diamond pattern. These were offcuts which I obtained many years ago and over the years have proved to be very useful. To complete things front and rear you can make up the hooks, guard irons and vacuum pipes. With respect to the vacuum pipe body, some years ago I made the top section from one piece of brass. It had to be bent around in a tight curve; I heated it up red hot when it was not a problem. This time around it broke on two attempts. I guess it must have been a different type of brass. In the end I resorted to using copper tube and fitted inserts at both ends so that connections could be made at both ends. If you have the same problem, use copper tube for this section.

To be continued.

CLUB NEWS

GEOFF THEASBY

Geoff Theasby reports.

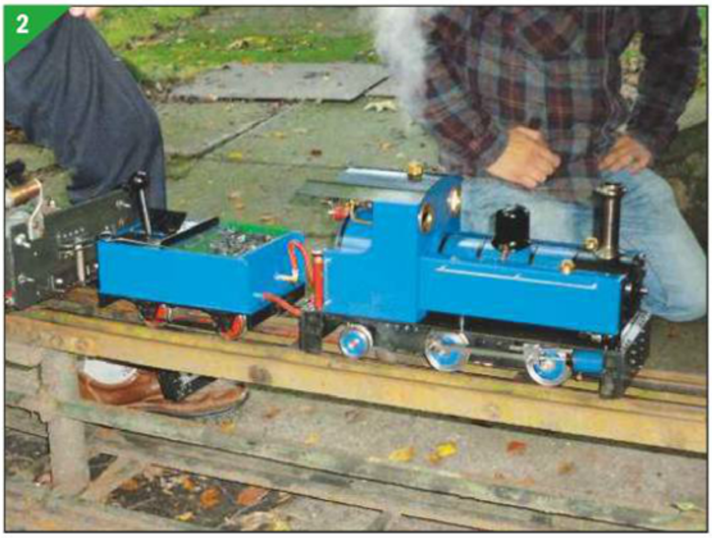
I had this column all set up and ready, together with photos, when I must have pressed the wrong key and it all disappeared! Therefore I have had to begin it all over again and, as I wrote the introduction some time ago, I can't remember what was in it.

In this issue: a rally, a visit, a flood, Lego, ignorance, a mess, a tank, a boiler, a locomotive adventure and degrees.

I went to the **Chesterfield & District Model Engineering Society** for the **2½ inch Gauge Society** Autumn Rally on October 7th and had a great time. 2½ inch gauge isn't so popular these days, as people's standard of living has risen and they build or buy bigger models, but interest is reviving and there were some decent models on display. An *Ayesha II* was running well - very sure footed, I never saw her slip on starting - whilst my favourite exhibit was the 4-8-4 *Helen Longish*, an 'LBSC' model from an idea by James Josslin and built by Peter Baguley (**photo 1**). His account can be found on the Internet by entering 'Helen Long LBSC' into your search engine. This locomotive won the Curly Bowl in 2008. Steve Eaton is the Secretary of the 2½ inch gauge association and his marine boilered design *Toby* (named after his son) was represented by two models; Steve's own and this one owned by Paul Wootton (**photo 2**). Steve's grandfather and father were members at Chesterfield so he has engineering in his blood.

W. www.cdmes.co.uk

2½ inch gauge Helen Longish *by Peter Baguley at Chesterfield on 7th October.*



A very smart locomotive owned by Paul Wootton to the Toby *design by Steve Eaton, at Chesterfield on 7th October.*

Doug Hewson writes re **Lindsey Model Society** and says the AGM went well. This year is the 30th Anniversary of the LMS so they were to hold a running day and barbecue on 13th October. This notification was received too late for a timely insert into the column but I hope it went well. An event that *is* advised in a timely manner is their running day on 28th December, timed to shake out all the Christmas cobwebs. Please tell them if you wish to attend.

Sutton Coldfield Model Engineering Society opens their newsletter *Steaming Ahead* with a nice picture of some work being done on an attractive part of their track at Pond Junction. A visit by the local Autistic Society brought 15 children and 11 adults for an enjoyable two hours. Profuse thanks and a donation followed. Eric Davies wrote a comprehensive report on the ground maintenance activities, all of which has been doubly necessary at most club tracks after this warm and wet summer.

W. www.scmes.co.uk

The Drill Press from **Wolverhampton and District Society of Model Engineers** had some difficulty with the printing this time but I noticed that Editor, Ian Priest spotted the Morgan Runabout at the Bristol Exhibition (which I mention below) and also had cause to comment on the ignorance of a few visitors to the Exhibition in that they seem to have no sense of their surroundings, standing in front of photographers and pressing so hard on his back that he thought he was being pickpocketed! There are also some photographs of their track 'then and now' which reversed the usual sequence and showed scrubland having been converted to an attractive club track and buildings with paved parking and paths. Ian also got to thinking about the Olympics and the effort over years required for success. This translates to our learning how to manage metal, wood and plastics in order to produce a decent model some years later, to say nothing of learning how to make it presentable. As he says, engineering has been around since Biblical times, as readers may remember from a few quotes I published in this column earlier in the year.

W. www.wolverhampton-dmes.co.uk

York City & District Society of Model Engineers are constructing canopies over the station area and steaming bays of the ground level track. The one most visible from the passing East Coast railway line (the station) will be constructed first. Two members attended the MoD School of Transport Mess Dinner at Leconfield with the portable track and a short train,

which was laid *indoors* and used to ferry diners to the Mess for a black tie event on the theme of steam railways in the golden era. The diners looked to be enjoying the event immensely! Mike Jones gives a formula for 'Angels Breath' - for those not wishing to use soluble oil when machining - given to him by member Arthur Eastwood. One part genuine Turpentine, two parts white spirit and three parts olive oil. Drip feed or spray when in use. Out of sheer curiosity I Googled the name and found not a machining aid but some music by Serbian musicians. 'The Angel's Share' is that bit of brandy or whisky which evaporates whilst it is maturing in the cask. Right, Theasby, stop procrastinating and get on with it!
W. www.yorksme.org.uk

Track Talk, from **Urmston and District Model Engineering Society**, reports on their Open Week in August, at which this fine Furness Railway Baltic Tank, by Peter Jeffrey of Brighouse, was produced (**photo 3**). The Urmston track was flooded out after a thunderstorm on 29th August, and water rose over the passenger carriage footboards, whilst lots of insects and slugs were seen trying to escape the rising waters, which eventually rose several feet. Alan Heywood has completed a model of 46170 *British Legion* and describes his ideas in choosing and building it. The club has fitted anti-roll bars to the traverser, to prevent locomotives from 'rolling off' as it moves. I was discussing this at Chesterfield (see opposite) when the possibility was broached. The local Cub Scout pack was entertained, although there was talk of cancelling the event due to bad weather, until it was mentioned that the lads would be allowed to drive a train, so it was 'on'.
W. www.udmes.co.uk

Con Rod, the newsletter of **Bristol Society of Model and Experimental Engineers**, mentions junior member, Jay and his liking for building models with Lego Technics bits. The front cover carried a photograph of his model of Walschaert's valve gear, built for their exhibition (**photo 4**). Dad is a mechanical engineer and is able to help a little but Jay gets most of his ideas from YouTube and has a go himself. Jay is nine years old. There are lots of photographs from the exhibition in August, including some knitted cupcakes that my wife appreciated, and a 1:3 scale Morgan Runabout by Ted Cockrell. He has a full size one too. Member Bill Burnett reached his 100th birthday in April.
W. www.bristolmodelengineers.co.uk

Furness Railway Baltic Tank by Peter Jeffrey at Urmston's Open Week. (Photo courtesy of Geoff Johnson.)

B&DSME News, from **Bournemouth & District Society of Model Engineers**, discusses 16mm modelling, with an explanation of the various gauges and scales by Gordon Miles and Dave White. Editor, Dick Ganderton reported that the two-day Junior Course went well and those at the track on the Sunday of the Air Festival were treated to several passes by the Lancaster. I can imagine it now, four Merlins in harmony! Dick begs to differ; he prefers a 1½ litre V16 BRM at full chat. The Junior Course had four attendees between eight and 12 years old. They each built an 0-4-0 diesel outline electrically powered locomotive from Jurassic Modelson, day one, and painted and tested it on day two. Then they learned to drive a 5 inch gauge battery electric locomotive and, if this was accomplished, a steam locomotive like a Sweet Pea.
W. www.littledownrailway.co.uk

At the other end of England (almost) *TSMEE News*, from **Tyneside Society of Model and Experimental Engineers** had 12 locomotives visit their Open Weekend as well as designer Michael Breeze from Peterborough. Jim Scott notes that the grounds are kept nicely mown and planted with flowers and shrubs to great effect - and all without a word of command…
W. www.tsmee.co.uk

The Adelaide Miniature Steam Railway Society *AMSRS News 142* says that members have installed a new rainwater tank on a reinforced base, which looks very businesslike and smart. They were holding events every two weeks in July/August and the weather was kind at weekends, but not during the week. How fortunate! A good photograph taken at one of the birthday parties reveals a large melon cut into the shape of a shark's mouth, complete with teeth and pieces of fruit inside, if you dared! Editor, Peter Manning, on a European holiday, visited Cork in Ireland, to see the Bury 2-2-2 plinthed there at Kent station. Peter describes the history of Edward Bury and his business, with photographs.
W. www.railwaypark.org

The **Rochdale Society of Model & Experimental Engineers** *Branch Line* has improved by leaps and bounds since it began last year, and full marks to Geoff Dowden and his team for turning it from two pages to 16, profusely illustrated with details of club activities and events. Peter Chadwick (The Bacup Hillbilly) mentioned recently in *M.E.* attended with his model Lancashire boiler on a trolley and this was coupled to Martin Harley's model traction engine and demonstrated for all to see. Before the 80th Anniversary celebrations the level standing in front of the clubhouse was improved with a load of ready-mixed concrete on a mesh base and I can say that it looked rather smart when I

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Junior member, Jay's Lego model of Walschaerts valve gear at Bristol SMEE. (Photograph courtesy of Trevor Chambers.)

5

An adventurous Class 08 locomotive at Rochdale Open Day in August.

visited a week later. **Photograph 5** is the Class 08 diesel outline locomotive D3869 belonging to the club. *Branch Line* Editor, Geoff Dowden, told me about its chequered history. He said: "No-one can remember how old it is and as I have been a member since 1987, it must be over 30 years because it was part of the scenery when I joined the society! It was built by a couple of our members and originally had a 2 stroke I/C power unit but unfortunately was lost to the society following a break in at the clubhouse in Springfield Park a long time ago. However, the locomotive had a number of unique attributes and following a photograph of it appearing on the cover of an *M.E.* issue, it was recognised by a couple of our members as being our long lost locomotive! At that time, it was then in the possession of the Ribble Valley society and following our approach they confirmed that it had been bought quite legitimately from somewhere or other but I can't remember where. The Ribble Valley society had carried out some modifications to the locomotive whilst it was in their possession and following our presentation of drawings - which confirmed unequivocally that it was ours - we reimbursed them for their trouble and retook ownership of the locomotive! Ultimately it became increasingly difficult to start and I am told that the engine had a habit of overheating, causing deterioration of the crankshaft seals that affected the compression and thus presented the starting problems. It was therefore decided to convert the locomotive to battery electric, the kit of parts being purchased from Blackgates, and I think it was member, David Kinsella who carried out most of the conversion process. The locomotive then went into service for several years but became unreliable again, Faj Collin diagnosing problems with the motors. Following his examination, (Faj is a qualified electrical engineer who worked at Ferranti's in their Transformer division for many years), it was discovered that, probably due to vibration, the windings to the commutator were less than perfect. The same member then rewound the motors, modified the controller and the locomotive went back into service but due to mistakes by the members installing the batteries and then wrongly making the electrical connections, further modifications were carried out in order to prevent a recurrence of the 'mistake'. Unfortunately, a member who decided to lengthen the electrical leads to the batteries undid this 'fail safe' procedure and we were back to square one! Consequently, Faj carried out further modifications to the electrics and the wiring loom so that it is now 'idiot proof' and impossible not to connect everything in the correct manner! As far as the choice of number 3869 is concerned, no-one can offer any suggestion as to its relevance to our locomotive and the two members who built it are no longer part of society activities. The real locomotive was withdrawn in 1998".

W. www.rsmee.com

Photograph 6 is Dick Allan and his 'D' class 2½ inch gauge locomotive recently serialised in *M.E.*, taken at **Reading Society of Model Engineers'** 2½ inch gauge rally in July. Mike Manners writes to say that this year's rally was the best yet and the track was busy all day. It was the third rally since they replaced their 2½ inch track and they also gained three new members, including Dick. He was unsure whether his model would be powerful enough to pull him and a driving truck round the track but his fears were groundless.

W. www.rsme.co.uk

And finally: the graduate with a Science degree asks, "Why does it work?"

The graduate with an Engineering degree asks, "How does it work?"

The graduate with an Accounting degree asks, "How much will it cost?"

The graduate with a Liberal Arts degree asks, "Do you want fries with that?"

6

Dick Allan and his 2 ½ inch gauge D class at Reading SME's rally in July. (Photo courtesy of Dick Allan.)

NOVEMBER

29 **Cardiff MES.** Carl Pickstone: Engineering Topics. Contact Don Norman: 01656 784530.

30 **Brighton & Hove SMLE.** Keith Carter: Seasonal films. Contact Mick Funnell: 01323 892042.

DECEMBER

1 **Bradford MES.** Display and annual competition. Contact John Mills: 01943 467281.

1 **SMEE.** 'Polly' Training Course Competition (morning) then Clive Young: Ashford Works (afternoon). Contact Peter Haycock: 01442 266050.

1 **Tiverton & District MES.** Running day at Rackenford track. Contact Bob Evenett: 01884 252691.

2 **Bristol SMEE.** Santa Specials. Contact Kevin Slater: 01275 331074.

2 **Pinewood (Wokingham) MRS.** Public Running with Santa Specials. Contact Richard Smith: 01252 371879

3 **Lancaster & Morecambe MES.** Informal meeting. Contact Mike Glegg: 01995 606767.

3 **Leicester SME.** Steve Mansfield's film night. Contact John Lowe: 01455 272047.

3 **Peterborough SME.** Bits & pieces evening. Contact Richard Cannell: 01354 654636.

4 **Romney Marsh MES.** Bits & pieces/Bring & buy. Contact Peter Lee: 01797 363466.

4 **Taunton ME.** Peter Triggs: Scenic Railways of the South West. Contact Nick Nicholls: 01404 891238.

5 **Bristol SMEE.** Ladies' night & American supper. Pam Slater: Perfumery. Contact Kevin Slater: 01275 331074.

5 **Leeds SMEE.** Christmas Dinnner. Contact Geoff Shackleton: 01977 798138.

6 **Cardiff MES.** Gavin Davis: First Successful Submarine Attack. Contact Don Norman: 01656 784530.

6 **Leyland SME.** Photographic competition night. Contact A. P. Bibby: 01254 812049.

6 **Sutton MEC.** Bits & pieces evening. Contact Bob Wood: 0208 641 6258.

6 **Warrington DMES.** Mike Turner: Signalling LNWR Style. Contact Duncan Webster: 01925 262525.

6 **Westland & Yeovil DMES.** Evening meeting. Westland Leisure, 7.30pm. Contact Ken Hockey: 01935 823700.

7 **Portsmouth MES.** Dave Bushill: Quiz night. Contact John Warren: 023 9259 5354.

7 **Rochdale SMEE.** Quiz night. Contact Len Uff: 0161 928 5012.

7 **Romford MEC.** Competition Night & Millennium and Rusty Titford Cup. 8pm. Contact Colin Hunt: 01708 709302.

7 **Wolverhampton DMES.** Quiz night. Contact Ian Priest: 01384 287571.

8 **Auckland SME.** Annual dinner & Prizes. Contact Brian Cotton: 820 3381.

8 **Sutton MEC.** Christmas party. Contact Bob Wood: 0208 641 6258.

8 **Westland & Yeovil DMES.** Track day/steam up, 11am-4pm. Contact Ken Hockey: 01935 823700.

8 **Worthing & District SME.** Annual social supper. Contact Rod Winterhalder: 01273 492709.

8 **York City & DSME.** AGM. Contact Pat Martindale: 01262 676291.

9 **Chichester DSME.** Santa Specials at the Blackberry Lane Track. 1pm - 4pm. Contact Ben Ernshaw-Mansell: 01243 773451.

9 **Frimley & Ascot LC.** Santa Specials. 11am. Contact Bob Dowman: 01252 835042.

9 **Leicester SME.** Santa Specials at Abbey Park. Leicester LE1 3EJ. Contact John Lowe: 01455 272047.

9 **Pinewood (Wokingham) MRS.** Public Running with Santa Specials. Contact Richard Smith: 01252 371879.

9 **Sutton MEC.** Track day from 12 noon. Contact Bob Wood: 0208 641 6258.

11 **Northampton SME.** Keith Hale: Cup Alloys. Contact: publicity@nsme.co.uk 07907 051388.

11 **Romney Marsh MES.** Christmas buffet, 1.00pm. Contact Peter Lee: 01797 363466.

11 **Saffron Walden DSME.** Club Night. Contact Jack Setterfield: 01843 852165.

12 **Harrow & Wembley SME.** Christmas social evening. Contact Simon Richardson. email: hwsmesecretary@btinternet.com

12 **St. Albans DMES.** Christmas Social Evening. Contact Roy Verden: 01923 220590.

13 **Cardiff MES.** An Evenging with Tony Bird. Contact Don Norman: 01656 784530.

13 **Sutton MEC.** Music & mince pie night. Contact Bob Wood: 0208 641 6258.

13 **Warrington DMES.** Hot-pot Supper. Contact Duncan Webster: 01925 262525.

13 **Worthing & District SME.** Club meeting: DVD evening. Contact Rod Winterhalder: 01273 492709.

14 **Brighton & Hove SMLE.** Christmas party. Contact Mick Funnell: 01323 892042.

15 **SMEE.** Competition and Christmas Party. Contact Peter Haycock: 01442 266050.

16 **Centurion SME.** Club Christmas Party from 10am. Contact Rudy Du Preez: 012 9986780.

16 **Chichester DSME.** Santa Specials at the Blackberry Lane Track. 1pm - 4pm. Contact Ben Ernshaw-Mansell: 01243 773451.

16 **Frimley & Ascot LC.** Club running. 11.30am. Contact Bob Dowman: 01252 835042.

16 **Harlington LS.** Mince pie run! Contact Peter Tarrant: 01895 851168.

16 **Lancaster & Morecambe MES.** Jacobs Join for Sunday lunch. Contact Mike Glegg: 01995 606767.

16 **MELSA.** Pre-Christmas Special with Santa. Contact Graham Chadbone: 07 4121 4341.

16 **Tyneside SMEE.** Christmas party. Contact Linda Nicholls: 01670 816972.

16 **Worthing & District SME.** Public running with visit from Santa! 11am - 2pm. Contact Rod Winterhalder: 01273 492709.

16 **York City & DSME.** Running day. Contact Pat Martindale: 01262 676291.

17 **Leicester SME.** David Bell: Down the Garden Path; Leics & Rutland privies. Contact John Lowe: 01455 272047.

18 **Chesterfield & District MES.** Meeting: Photo competition & Trophies. Contact Mike Rhodes: 01623 648676.

18 **Northampton SME.** Christmas Social evening. Contact: publicity@nsme.co.uk 07907 051388.

18 **Nottingham SMEE.** Christmas Get-together. Contact Cliff Almond: 07595 284874.

18 **Taunton ME.** Mince pies and natter. Contact Nick Nicholls: 01404 891238.

19 **Bristol SMEE.** Mike Horler: My Life as a Wheelwright and Carriage Builder. Contact Kevin Slater: 01275 331074.

19 **Leeds SMEE.** Quiz Night. Contact Geoff Shackleton: 01977 798138.

19 **MELSA.** Monthly meeting. Contact Graham Chadbone: 07 4121 4341.

20 **Cardiff MES.** Club Chat. Contact Don Norman: 01656 784530.

20 **Leyland SME.** Project night. Contact A. P. Bibby: 01254 812049.

20 **Sutton MEC.** Chat with videos and photos. Contact Bob Wood: 0208 641 6258.

21 **Rochdale SMEE.** General meeting. Contact Len Uff: 0161 928 5012.

21 **Romford MEC.** Bring & Buy Sale (Members only). 7.30pm. Contact Colin Hunt: 01708 709302.

22 **Chesterfield & District MES.** Public running, Hady Hill. Contact Mike Rhodes: 01623 648676.

23 **Taunton ME.** Public Running with Santa Specials at Creech St. Michael. Contact Nick Nicholls: 01404 891238.

26 **Cardiff MES.** Steam up and family day (morning). Contact Don Norman: 01656 784530.

26 **Leeds SMEE.** Boxing Day steam-up. Contact Geoff Shackleton: 01977 798138.

26 **Leyland SME.** Boxing Day Mince Pie Steam Up. Contact A. P. Bibby: 01254 812049.

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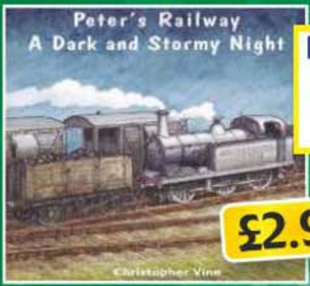

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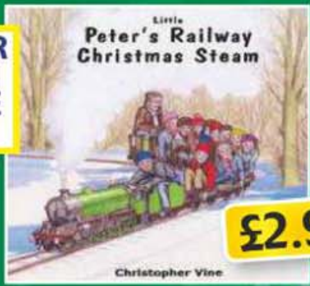

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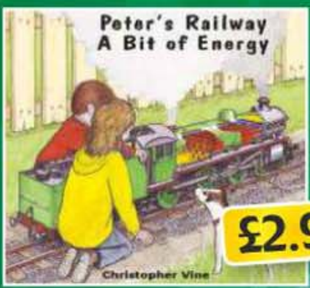

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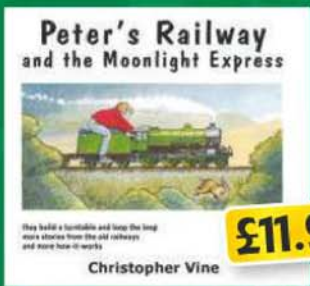

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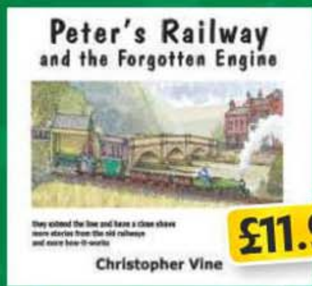

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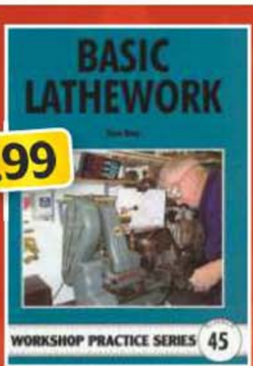

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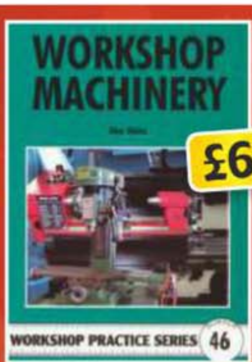

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Visit us at The London Model Engineering Exhibition, Alexandra Palace. Friday 18th Jan 2013 - Sunday 20th Jan 2013

CHAMPION 20VS MILLING MACHINE

Drilling Capacity 20mm
Table 700 x 180mm
MT2 Spindle
113Kgs

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Electronic Variable Speed
H / L Gear
Head tilts L / R
Quill Feed with Digital Measurement

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'Saturday Sale Days'

Next Saturday Sale days are: 26th January 2013, 23rd February and 30th March at Midlands Showroom 10am - 4pm.

All prices are including vat and excluding delivery. Call for delivery charges or buy online. All items also available for collection at below locations while stock lasts.

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