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JAGUAR CUB INVERTERS Performance Inverters

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Published by MyTimeMedia Ltd. Enterprise House, Enterprise Way, Edenbridge, Kent TN8 6HF Tel: 0844 412 2262

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EDITORIAL

Editor: Diane Carney Tel: +44 (0)1539 564750
Email: diane.carney@mytimemedia.com
Tehnical Assistant: Stewart Hart

PRODUCTION

Designer: Yvette Green Illustrator: Grahame Chambers Retouching Manager: Brian Vickers Ad Production: Robin Gray

ADVERTISING

Senior Account Manager: Duncan Armstrong Email: duncan.armstrong@mytimemedia.com Tel: 0844 848 5238

Online Sales: Ben Rayment Email: ben.ravment@mvtimemedia.com Tel: 0844 848 5240

MARKETING & SUBSCRIPTIONS

Subscription Manager: Kate Scott

MANAGEMENT

Head of Design & Production: Julie Miller Group Advertising Manager: Rhona Bolger Email: rhona.bolger@mytimemedia.com

Tel: 01689 869891 Chief Executive: Owen Davies Chairman: Peter Harkness



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Model Engineer, ISSN 0026-7325, is published fortnightly with a third issue in May and October by MYTIMEMEDIA Ltd, Enterprise House, Enterprise Way, Edenbridge, Kent TNB 6HF, UK. The US annual subscription price is 70.95GBV equaviarent to approximately 118USD). Artiregish and mailing in the USA by agent named Air Business Ltd. c/o Worldnet Shipping Inc., 156-15, 146th Avenue, 2nd Floor, Jamaica, NY 11434, USA Periodicals postage paid at Jamaica NY 11431. US Postmaster: Send address changes to Model Engineer, Worldnet Shipping Inc., 156-15, 146th Avenue, 2nd Floor, Jamaica, NY 11434, USA Subscription records are maintained at CDS GLOBAL Ltd, Tower House, Sovereign Park, Market Harborough, Leicester, LE16 9EF. Air Business Ltd is acting as our mailing agent. Air Business Ltd is acting as our mailing agent.



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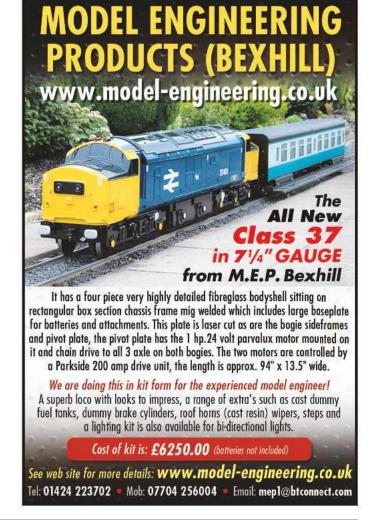


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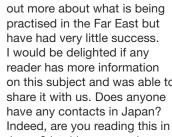
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Model engineering in Japan?

I recently visited the National Model Engineering and Modelling Exhibition at Harrogate where, as well as thoroughly enjoying looking at the models on display. I took the opportunity to catch up with many friends made throughout the twenty-odd years of being involved in this hobby. I

had many short and a few longer conversations with exhibitors and visitors and in one of these the subject of model engineering in the Far East came up. The person I was speaking with was of the opinion that 5 inch gauge locomotive building has practically ceased altogether in Japan. I remember, not too many years ago, a friend of ours went (by invitation) to Japan where he ran his 5 inch gauge LNER A3 on a track set up around the grounds of a skyscraper office block. I don't recall the reason for the occasion but whatever it was, it was well attended throughout the week and he reported back that the hobby was very much alive and well. He was very well received by the local M.E. Clubs and ran alongside many local model engineers, many of whom had built British outline locomotives. He had a thoroughly good time. I seem to recall. It was sad to hear, however, that this once burgeoning hobby has, apparently, for some (unknown to me) reason fallen into serious decline. During the



Steampunk in Germany

I am not keen on referring readers to websites, particularly Youtube, because there is always the chance that by the time you read it, it will be gone. However, I am going to make an exception just now as I have discovered a video that covers a steam model 'rally' (for want of a better word, although I think they refer to it as a 'steam festival') that took place in May in the grounds of the Hannover Colliery Museum in Bochum, between Dortmund and Essen in industrial northern Germany. I have tried to translate some of the German speaking and the information on the Museum's website and discover that this place has embraced the concept of 'Steampunk' for a weekend and put on what seems to have been a highly entertaining display with a few full size traction engines and some marvellous models including a lot of road steam machinery but also steamships, a steam powered bicycle and some rather interesting ideas in headgear! It really is worth a look. Even though it is a short video (and you will find links to others taken at the same time), I was struck by the atmosphere of the event, which included a lot of Victorian dress and makeup! If you get a chance, look up: www.youtube.com/ watch?v=-nj9RxqHZSA

MEET THE EDITORIAL TEAM



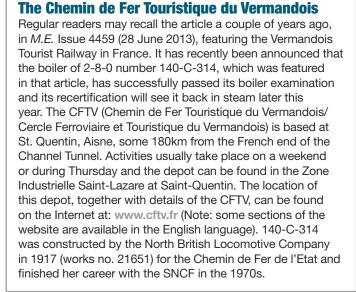
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(short) time of my Editorship I have several times tried to find on this subject and was able to Japan? In either case, please contact the Editor.

Did you advertise a **Rob Roy locomotive?**

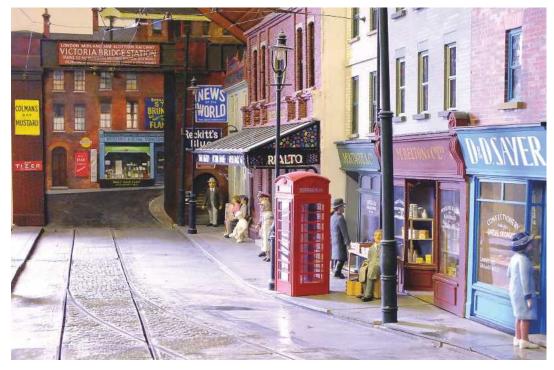
We recently had a Free Ad placed for the sale of a 31/2 inch gauge Rob Roy locomotive. Unfortunately the telephone number given was incorrect and we are not able to contact the seller who was, we believe, in Banbury. If this was you, could you please contact the editor?

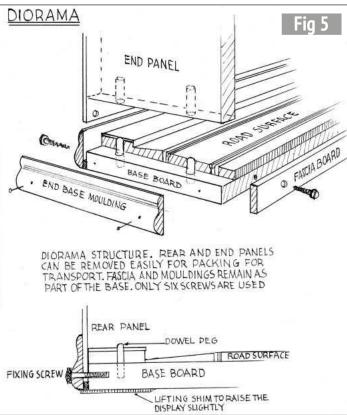
Making a Hook Green Street

Ashley Best looks at the infrastructure and environment.



Continued from p.737 M.E. 4508, 15 May 2015





This article is concerned with the environment in which tramcars operated. It is intended as no more than a rough guide and stimulus to everyone with a nostalgic wish to re-create a little of the past and to enhance the display or operation of their models. It is based on my own working street layout and the problems encountered over the many years of its construction.

he diorama was
designed and made
to be portable and
therefore easily taken to pieces
for transport. The structure
consists of a baseboard,
a back panel and a pair of
end panels; just four pieces.
The base and the ends are
18mm pine shelving boards

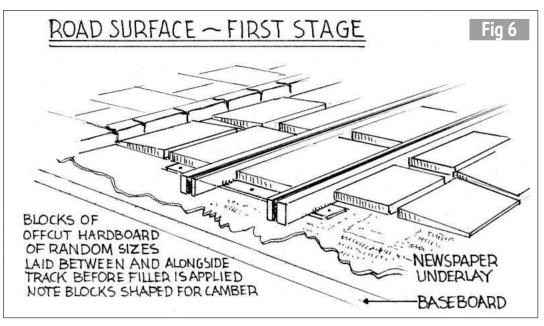
and the rear panel a piece of 3mm MDF, the wood is well seasoned to prevent any tendency to warp. Once assembled, it is a robust structure. It was necessary to strengthen the rear panel with a moulding strip top and bottom and to put in a total of six screws to hold everything firmly in position. Figure 5 makes the construction clear. A length of track was made and placed on the base and pinned down. A check wire was included. Next, the pavement was laid out along the rear using wooden blocks topped with an MDF strip marked out and painted to represent paving slabs. The road surface is made of Polyfilla and is painted and marked to represent a typical tram street with granite setts for the area round the track and tarmac over old setts for the rest as was often seen. Such a road

was likely to have a worn surface with areas of setts showing through in places.

Before laying down the Polyfilla and to lessen the expense, I placed infill blocks of scrap hardboard over much of the road surface. These blocks fall short of the final depth. On a working layout it is advisable to lay sheets of newspaper on the baseboard beneath the tracks. This prevents the filler adhering to the baseboard and makes it possible to lift whole sections easily if alterations and maintenance are required subsequently. The blocks should be laid in random fashion with gaps between them to help the filler adhere properly (fig 6).

Road surface

The application of Polyfilla is quite tricky and requires some time to be set aside without interruptions. I find that a fairly stiff mix is most satisfactory and can be applied with an artists' broad painting knife. After the initial laving down. a wide piece of stiff card or plastic can be drawn carefully along the tracks to ensure a smooth finish - level with the top of the rails. The road surface can be treated in a similar fashion taking care to reproduce a slight camber down to the gutter. This is just the first stage and, of course, it will accommodate the metal inspection covers and point rod runs. The Polyfilla dries quite slowly and should never







Points and cover plate.

Sett roller.

stage that it should be worked

be hurried by trying to shorten the drying time as that leads to incomplete chemical action and a failure to set properly.

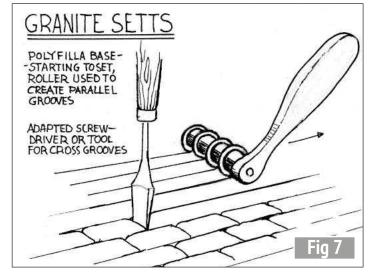
The granite setts

As the surface dries it slowly becomes harder and slightly more plastic and it is at this

on to create the simulated granite setts. These present a few problems but it is worth the effort as a realistic street surface is an asset. Amongst all the possible methods, I shall confine myself to describing what has worked well on my layout and for the diorama. First though, a few remarks about short cuts that should be avoided. It is possible to apply a printed paper surface of setts as is often used by small scale modellers. In 1:16 scale, this should be avoided. The setts, if properly simulated really do look better. In part, this is because it is possible to replicate some of the irregularities and patterns of prototype surfaces and fit them around the tracks in a way impossible with a printed paper surface. There is a wealth of detail to be found in photographic reference and,

indeed, in real examples and these can all be incorporated in the model road. Most setts were laid at right angles to the side of the road, except in the gutter where usually they were parallel to the pavement.

The tramway tracks, being the responsibility of the operator, had their own setts which extended to the regulation 18 inches each side and often a separation line could be seen where the two authorities joined, as seen in photo 11. The setts would be laid brick fashion with staggered joints (photo 16). To achieve this effect. I tried several methods, eventually devising a jig derived from a pastry cutter - at first, I borrowed one from my wife but it was not quite up to the job. The jig is a roller used to form the cross-street lines of setts pressed gently into the setting Polyfilla (photo



17). There is no easy way to establish the length of each sett, although I suppose a jig tool could be made that would do it. I use a tool like the end of a screwdriver exactly the right width and carefully pressed into the road surface to mark each sett length (fig. 7). This is of course a long and rather tedious operation but it is, in the end, rewarding as it makes possible reproduction of irregularities, special sizes, separation of tramway and road and also what happens alongside curved track and pointwork; all these features can be seen in the photographs. It is important to lav only enough Polyfilla that can be worked easily as it sets but practice increases speed so even quite a large layout can be so equipped without much difficulty. After all the setts have been made. it will be likely that some final smoothing of the surface will be needed as the Polyfilla might have lifted a little on the edges as the grooves are formed. A damp rag should be drawn over the surface right at the end of the setting period. The Polyfilla will take several days to dry and even when it looks dry, it might contain internal damp. One last task is to make sure that the rails are cleaned and the groove cleared of obstruction. This requires a profile scraper made from mild steel or ground from a surplus screwdriver: shown earlier in fig 3. All the tools described, particularly the roller should be thoroughly cleaned and lightly oiled immediately after use.

Painting

Road surfaces have a large variety of colours and variations within any given area. It is worth having a good look at as many examples as possible before attempting to apply paint. Avoid an absolutely uniform colour, allow for repair patches, differences between setts and tarmac, for example. There is even the problem of whether the grout between setts should be darker or lighter than the setts



A misty night.

themselves. Some examples can be found in which it is all mixed up. As laid, setts had tar run into them but time soon caused dirt and road dust often to lighten the grout. The surface can, with advantage, be sealed and primed initially – I use grey automotive primer having just masked out the rail heads, or immediately after

Atmosphere

I have always considered street scenes to be enhanced by the mysterious atmosphere typical of twilight and dampness where shadows and reflections add romance to otherwise prosaic surroundings. Although the originally painted road surface will almost certainly be in matt colours, a coat of

I have always considered street scenes to be enhanced by the mysterious atmosphere typical of twilight and dampness where shadows and reflections add romance to otherwise prosaic surroundings.

painting, wiping the rail heads with a cellulose-soaked rag. The choice of paints after that is very wide and can be of more than one type according to the area to be covered. I have found artists' acrylics most useful as they are watersoluble until dry when they become fixed. The setts can be painted in granite/grey tones and then, after drying, a wash of dark colour slopped over the surface and immediately wiped off with a rag will leave a realistic grout effect.

varnish will turn the street wet and puddles can be simulated by careful application or clear resin. It is amazing how effective this treatment can be when lighting is incorporated in the vehicles and the surrounding street. It opens up opportunities for keen photographers (photo 18).

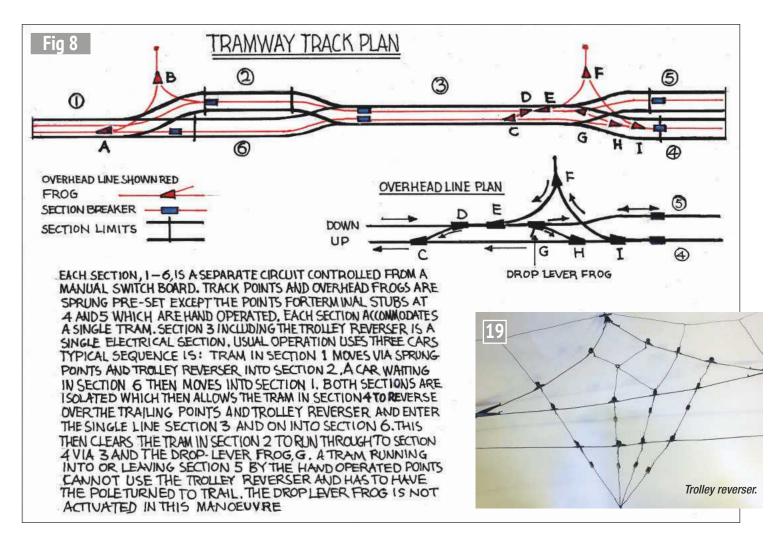
Overhead equipment

Overhead line equipment is one of the really interesting aspects of tramways and provides a mass of opportunities, especially in the larger scales, for developing a realistic and working representation of a real street tramway. Small scale models often avoid overhead work and use insulated two-rail current collection, but in the larger scales, prototype practice should be replicated to facilitate realistic operation.

Described here are some of my own ways to provide satisfactory working overhead equipment. Readers will probably be able to develop their own different ways of solving some of the special problems encountered in this fascinating area of tramway modelling.

Working 1:16 scale electric trams draw their power from an overhead line. This requires quite a lot of rather fiddly work and in it simplest form, very basic electrical knowledge. On my layout the principles are much the same as most other model tramways except that the polarity change is made by the controller and not by a switch mounted on the car. The overhead equipment is the same, however.

My own model tramway layout is a basic end to end track some 19 feet in length. It



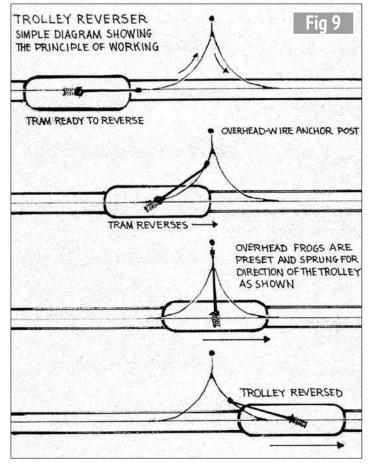


Reverser and frog.

is constrained by a maximum width of baseboard of two feet and a background height restricted by a sloping roof to 20 inches. The plan of the track layout and electrical sections is shown in fig 8. The electrical sections are in the overhead so the track is continuous. Trams are operated by the old fashioned method of switched live and dead sections allowing four trams at a time to be on the layout with three operated individually while one is in reserve.

Operation

All the points except the facing points into the double track terminus are sprung. The terminus points are hand operated double tongue. It's all basic and straightforward. The overhead is more complicated and includes an automatic trolley reverser (fig 9) at each end with one being equipped with a drop lever frog. Photographs 19 and 20, taken from above against a white background, show the two systems and fig



10 is a diagram of the 'drop lever frog' (photo 21), which is a feature which was used on many tramways. It is an overhead line switch used to guide a swivel head trolley wheel onto the correct wire at a junction. The points at rail level quide the tram and as the trolley pole follows its direction, the top of the pole brushes against the drop lever which is connected to a cam which operates the overhead line frog which directs the wheel to follow the correct wire. The drop lever and cam fall back into the original position as soon as the manoeuvre is completed. If following the other, straight ahead, route at the junction. the pole does not make contact with the drop lever and so the overhead point is unmoved. It is a most elegant solution to a problem, but to make it work in 1:16 scale can be a bit tricky as it requires absolutely precise location in relation to track.

Sections and insulation

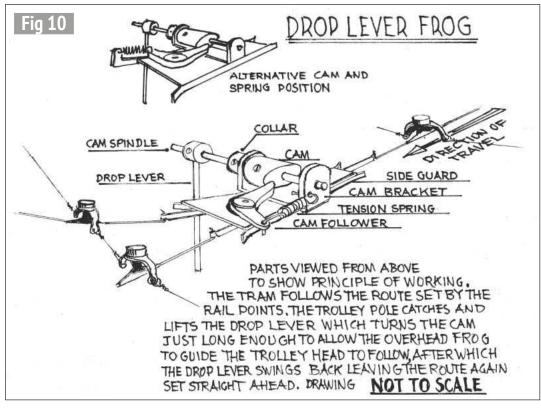
Dividing the overhead line into sections requires a means of joining the contact wires with insulated section breakers,

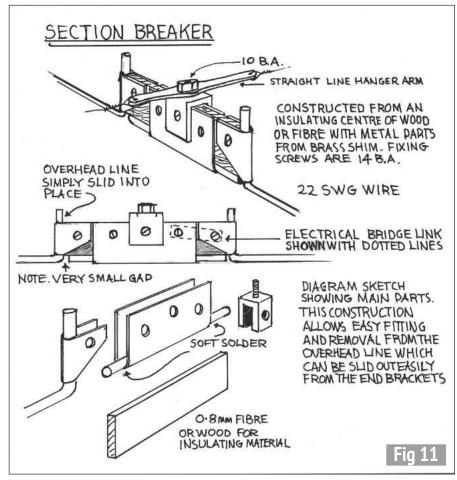
each with as small a gap as possible (fig 11). Insulation of all the overhead lines from each other is also a requirement.

Feeder wires for each section

can be run up nearby poles or the metal pole itself and carried to the overhead line and soldered in place (**photo 22**).

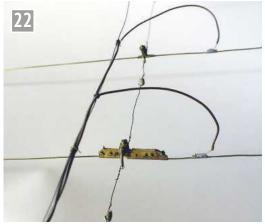
To be continued.







Drop lever frog.



Overhead feeders.

Patriotism The Royal Army Ordnance Corps

Alan
Crossfield
describes
his much
admired,
DOE winning Patriot
in 5 inch gauge.

Continued from p.726 M.E. 4508, 15 May 2015



The author's 5 inch gauge locomotive.



Early days in the production of the ejector body.



The model does not create a vacuum but does play a part.

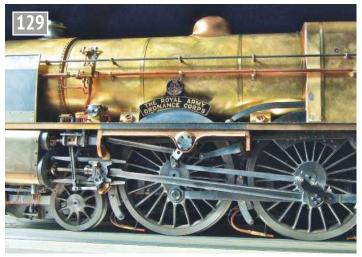
Following the successful introduction of the Royal Scots in 1927, the LMS locomotive department turned its attention to improving the Claughtons. This latter class of locomotives consisted of one hundred and thirty LNWR designed 4-6-0s. Since their introduction in 1912, the Claughtons had been the flagship express passenger locomotive of the 'Premier Line' and, until the introduction of the Royal Scots, used on the fastest and heaviest trains.



Modelling the Dreadnought vacuum ejector

This highly prominent component was the subject of much research into both its operation and external appearance. Fortunately several working examples have survived on other preserved examples of LMS locomotives and whenever the opportunity presented itself, I would go along to take close-up photographs from as many angles as the situation would permit. At first glance the complexity of parts and related pipes tended to bewilder the eye, but I was fortunate in having the workings explained by a fellow member of LSME, who also happened to be an ex-footplate man.

Photographs 126, 127 and 128 show various stages in modelling the ejector body. Although not serving its original function as a creator



The vacuum ejector in situ.



Soldering a rain strip into position; a tricky operation.

of vacuum, the ejector does, on the model, form part of the live steam supply to the blower. Photograph 129 shows the layout and location. On a full sized example steam is supplied to the ejector by way of the driver's control valve positioned directly above the main body of the ejector. Just to complicate matters, the body of this valve also has a connection point for a steam lance (for use within the smokebox). The driver's control valve is operated by the vertical lever, which is in turn connected to a rod or cable activated from within the cab. This rod or cable works within a tube situated behind the larger diameter 'train pipe'. Vacuum created by the action of the steam through the ejector cones would be transmitted via the 'train pipe' to the flexible connections

situated at the buffer beams of locomotive and tender. On the model the 'train pipe' is of copper and supplies steam to the locomotive's blower.

Constructing the cab

First impressions were of a simple sheet metal structure with lots of visible rivets. This proved to be correct regarding the rivets, but several other items of external detail determined that this was never going to be a simple fabrication. Construction began by shaping the side-sheets and rolling the roof to the correct profile. Photographs of the full-sized Patriots showed a complex pattern of rivets on each of the side panels - left and right-hand sides both being slightly different from each other. These were established, marked and drilled as one of the first operations.



The main panels of the cab.



The cab roof and the addition of further rain strips.

Photograph 130 shows the main panels. These were cut from mild-steel plate of 1.5mm thickness. Because of the over-scale thickness, some of the more visible edges were reduced by machining on the inside. This was carried out at an early stage and was mainly applied where the roof and side-sheets join the spectacle plate. The picture also shows the first application of doubler strips (additional strips of thin metal) to the side panels. These were to be found in abundance on locomotives and tenders of the Fowler era. The strips on the model were soft-soldered in place prior to the addition of rivets. The plan was to prevent the ingress and more importantly, the retention of solvent prior to painting.

A tricky operation was the attachment of the rain-strips by soft-solder. Thin brass L

section of the correct size had been acquired from a commercial supplier to the model railway hobby (Eileen's Emporium). I mention the latter because few of the suppliers to the model engineering hobby appear to stock smaller sizes of L section. The difficulty in attaching it to the model was caused by the differential in mass between the cab structure and the brass angle. Great care was needed in order to avoid either distortion of the brass or disturbance of the previously soldered joint between the side sheet and the roof (photo 131).

The cut-away portion of the cab roof was the subject of much pondering. Convenience of accessing the footplate controls (once completed) being weighed against that of the detrimental



The completed cab.

effect on the locomotive's overall appearance. As the full-size Patriots had no form of cut-away except for the roof ventilator, I was anxious to make any such deviation as discreet as possible.

Photograph 132 shows the position of the cut-away section in another operation to secure more rain strip to the cab roof.

Photograph 133 shows the completed cab. Much detail has been added and the windows glazed using microscope slide glass (0.048 inch thickness). The floor was the product of individual hardwood pieces, mounted on a sheet metal sub-structure. Beneath the floor, a steel cross beam connects the lower portions of the cab side sheets and provides a convenient means of securing the cab in position: 2 x 6BA setscrews pass through the cross beam and engage with brackets secured to each side of the mainframe. With the screws removed, the cab may be lowered or lifted vertically to clear the boiler.

Footplate fittings

A key focal point on any locomotive, large or small, is the internal area of the cab. I say this having, on many

occasions, witnessed queues of people awaiting access to footplates of locomotives at the NRM. Backhead fittings seem to hold a special fascination, likened in many wavs to the dashboard of the car vou'd love to own or the power console of the 'TARDIS' (depending on your destination). The problem for the model engineer working to a scale of 11/16 inch to a foot is that of dealing with the concentration of over-scale fixtures and fittings. For this reason I produce all my own boiler fittings in an attempt to keep the overall dimensions to a minimum. Although one of the benefits of a Belpair boiler is that it offers the model engineer a larger area of backhead, I thought it wise to plan the sequence in which the fittings for 45505 would be secured in place: those requiring to be screwed into their respective bushes were, of necessity, fitted first so as to allow their unobstructed rotation. In full size practice most fittings were secured in place by nuts and studs, therefore eliminating the need for rotation. For the model engineer, the problem here is one of accessing the screw or nut with the relevant driver or nut-runner



The locomotive backhead.

Water gauges

I normally start by establishing the diameter of the sight glass. Once this is done, I produce the seals then work out the minimum size for the gland nuts. On 45505 I used a glass diameter of 0.220 inches with a gland-nut size of 5/16 AF. To achieve this, extremely fine seals were needed which I produced from silicone tube. In order to keep the overall size to a minimum the tube was pushed onto a mandrel and reduced in diameter by turning. High speed and a sharp tool were the prerequisites but the results I knew from past experience would be unpredictable, so once I was happy with the diameter, I breathed more easily and sliced off several sections (around 0.040 inch width) using a special adaptation that mounts a Stanley knife blade into the Myford tool holder. The glass itself was commercially obtained from a supplier offering a choice of several diameters from 4mm upwards. This type of glass is normally supplied in lengths of 6-inches and is easily cut using a fine Swiss file. I gently score around the outside diameter with a sharp file of triangular section and then apply pressure to create the break. If the break looks ragged, it can be dressed using a fine oilstone or it can be heat-fused over a small flame (no bigger than that of a Bunsen burner). This latter operation only takes

a few seconds; the end of the glass is offered into a small blue flame whilst being rotated between finger and thumb. As the end of the glass fuses the flame will turn yellow. End of process. Glass tube treated in this way is far less likely to crack in service.

Photograph 134 shows the major fittings including water gauges, injector steam valves and the general pipe arrangement on the NRM Crab. On this full sized example, the previously mentioned train pipe passes through the spectacle plate just below the window and can be seen running along the outside of the boiler. Also visible is the combination control valve for vacuum and steam brake, another example of a standardised fitting that made the L.M.S. footplate so distinctive.

Photograph 135 shows an early operation in modelling the combination brake valve.



Cross drilling the combination brake valve.

The part is being cross-drilled in the lathe. The set-up utilises the headstock of a Unimat SL for the actual drilling. In order to obtain accurate rotational division, an indexing peg has been set to engage the teeth of the Myford bull-wheel and lock the spindle. As the bullwheel has 60 teeth there are many divisional possibilities and the part is shown being drilled for the numerous air intake holes. As the model is equipped with steam-brake only, the vacuum components of this valve are dummy. The steam-brake operation however is functional and relies on a rotating disc made from PTFE (photo 136).

Photograph 137 shows the almost completed component. In full size operation, the brakes were applied by the rotational movement of the control handle: this worked within the confines of a gated quadrant and was connected directly to the valve face (disc with lots of holes). Action of the movement would allow air to enter the system and either reduce or destroy the vacuum within, thus applying the train brakes. Steam brakes on the locomotive and tender would be applied simultaneously by the action of a cam that was cast into the upper circumference of the valve face (not fitted when the picture was taken). Steam braking could also be activated independently by movement of the vertical lever.

Injector steam valves

These were of the simple screw down type stop valves but owing to their position between the water gauges and the feed-water clacks these valves again had to be of minimal proportions. The main criteria for this type of valve is that they can be opened quickly to pass the full amount of steam required by the injector and that they remain absolutely steam tight when shut. This latter criterion can be difficult to achieve especially if a blunt cone angle has been provided on the valve spindle. Several members of LSME have been



The fully functioning steam brake valve.



Injector steam valve hand wheels were made to be true to scale.

experimenting with valve seatings made from PTFE - and with some success.

Photographs 138 and 139 show two stages in the production of hand wheels for the injector steam valves. These worked out at around 7/16 inch in overall diameter, and were smaller than any that were commercially available at the time. In the past, I have

The wheels are 1/16 inch overall.



The valve almost completed.



produced hand wheels as small as $\frac{1}{8}$ inch OD by this method.

Photograph 140 shows an interior view with more items of footplate furniture including the previously described injector steam-valves, reversing wheel and driver's combination brake valve. Still to be fitted

is the steam supply pipe for the whistle. This will take the position of - and be disguised as - the train heating pipe. It will run down the right-hand side of the backhead taking its steam from a valve situated on the pressure gauge manifold.

To be continued.



The cab interior with more features now fitted.

Otto Four Stroke Engine

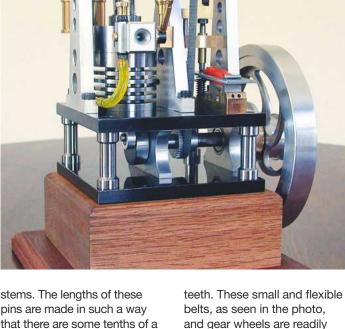
Jan Ridders designs and illustrates a well behaved four stroke engine.



This four stroke engine is intended for the model engineer with moderate skills. Whilst not a step-bystep construction series, the drawings and associated clear illustrations are the focus of the article, with simple explanations given where required.

The camshaft and its driving system

I decided to employ an overhead camshaft for the reason that, with this design, the cams can drive the valves in the most direct way (figs 5, 6, 7 and 8); there are no intermediate cam lifter arrangements with push rods and oscillating tumblers - only short pins in gliding bushes between the cams and valve stems to avoid transverse forces on the valve



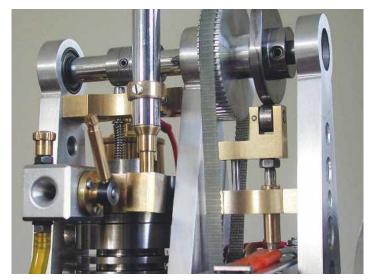
stems. The lengths of these pins are made in such a way that there are some tenths of a millimeter left between the pins and the cams when the valves are closed. This may not be a conventional construction but it works very well!

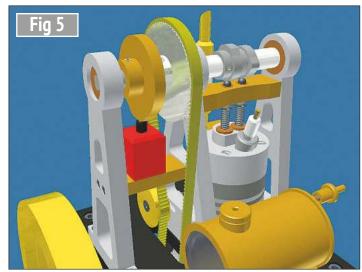
The ignition cam is also on the same camshaft and all three cams are fixed with screws on the shaft, so they can be adjusted in every position within the four stroke cycle. The camshaft is driven by the crankshaft with a synthetic tooth belt (**fig 5**). The wheel on the camshaft has 70 teeth, the wheel on the crankshaft has 35

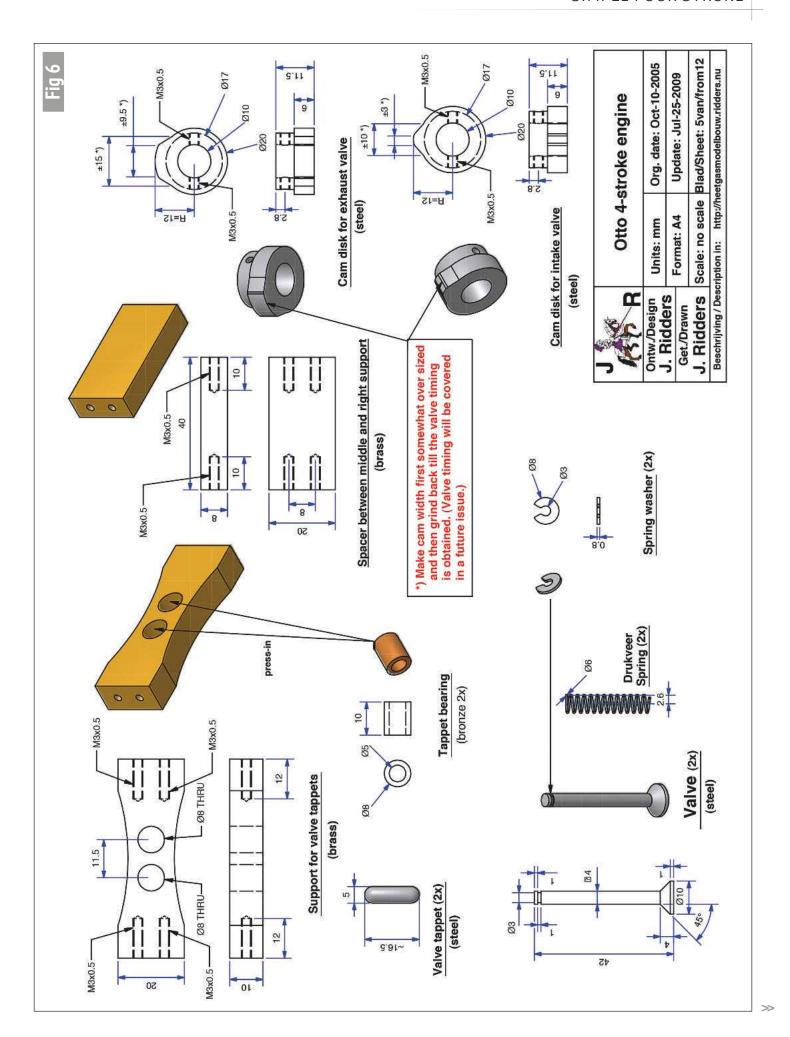
teeth. These small and flexible belts, as seen in the photo, and gear wheels are readily available. Any other flexible tooth belt is okay as long as its circumference is anywhere between 400 and 450mm. The same applies to the gear wheels as long as they have about similar diameters and the ratio of teeth is exactly 2 to 1.

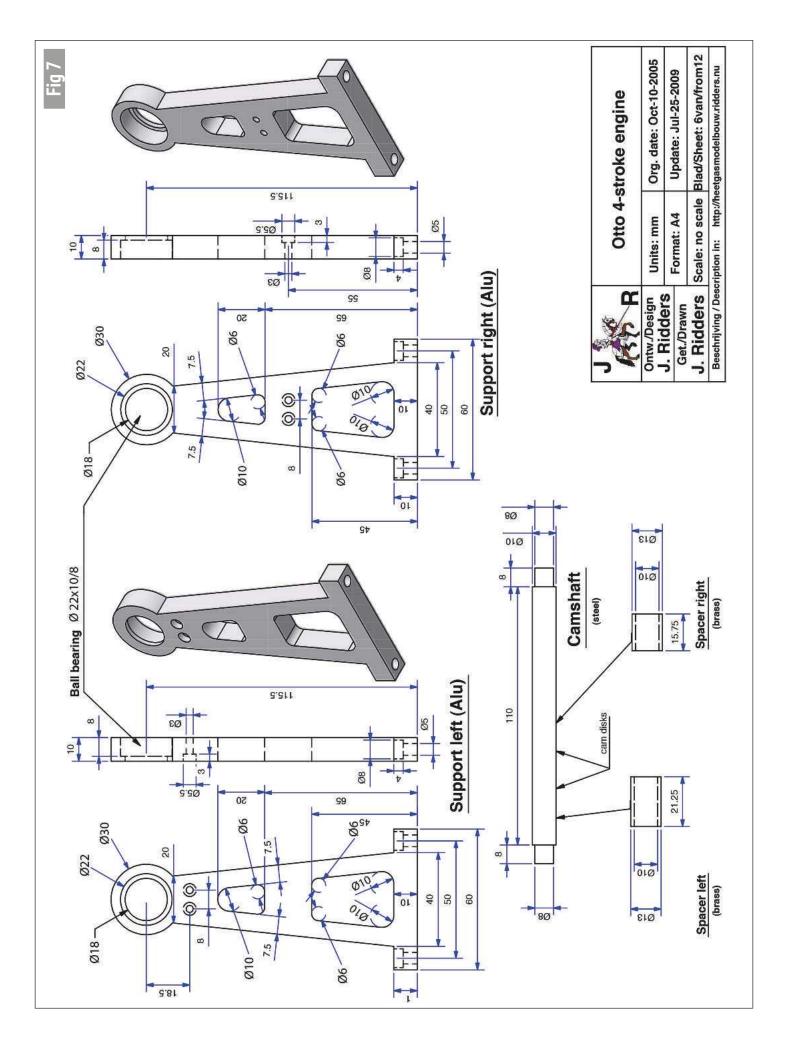
With such a tooth belt it is easy to bridge the distance from crankshaft to camshaft. Furthermore it provides for a very smooth and noiseless drive without the need for any lubrication.

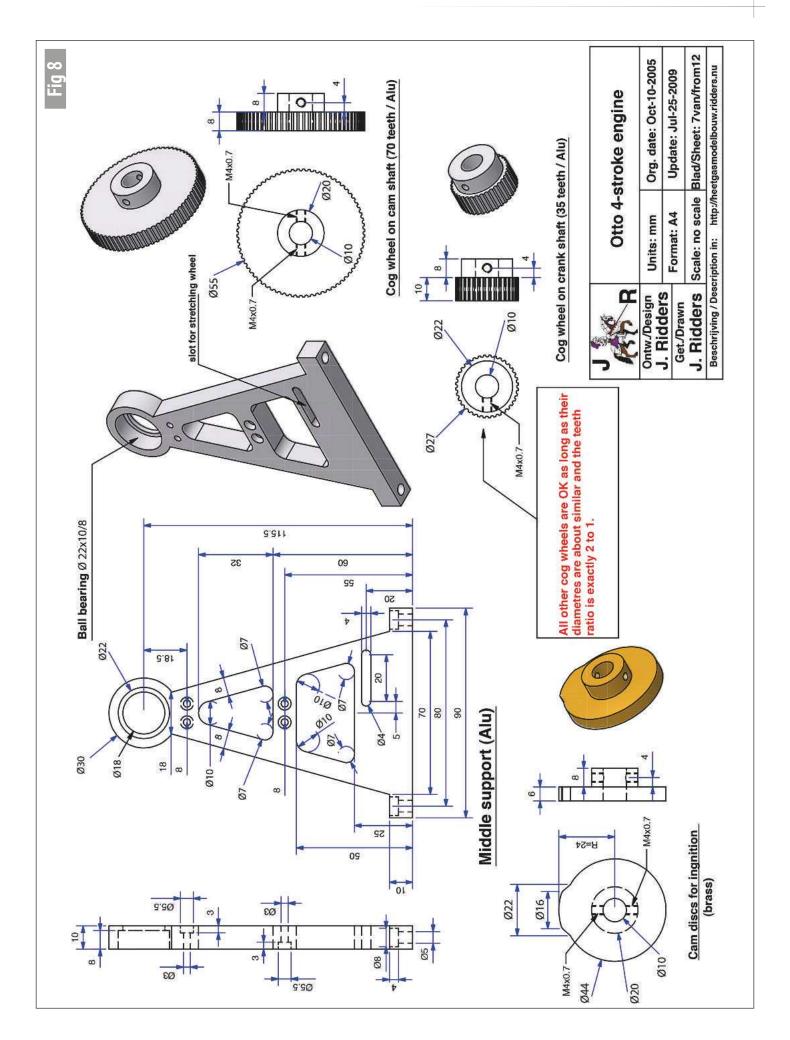
To be continued.











Martin
Ranson,
an award
winning
maker of
steam launches, turns to
locomotive building.

Continued from p.747 M.E. 4508, 15 May 2015



A 16mm Locomotive for a Novice Engineer

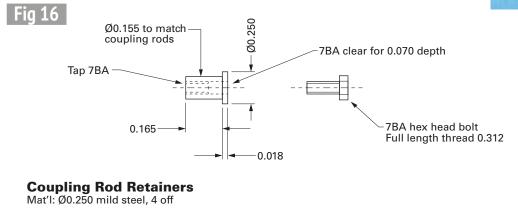
A suggestion was made to me, at a Model Engineer Exhibition some time ago, that after about 50 years of building steam boats it was time I considered building something different and that I might try a small locomotive. After some considerable thought was given to moving into what was, for me, new territory, *Idris* came into being. My hope is that this article will provide some inspiration to my fellow 'beginner' locomotive builders.



Coupling rod retainers.

Coupling rod bearings and retainers

The axles and crank webs supplied by Brandbright did not have any bearing bushes with them. I had several ideas for holding everything together and finally decided on the assembly shown in **photo 29**. This was because the 6BA bolts I now possess are made from small size hexagon, which do not leave much surface to



rub against the outside edge of the coupling rod. This method also permits the 6BA thread to go right up to the shoulder (fig 16). I no longer have any dies with a thread almost up to one edge of the die but they were extremely useful for working into a corner. The four bushes are easy to machine and then part-off from stock 1/4 inch mild steel bar.

Geared engines

Having built a few boats over the years I knew that many small steam engines and small electric motors ran best at a higher speed than the propeller needed to turn. So obviously this meant the engine crankshaft had to accommodate a small spur gear which drove a larger gear on the propeller shaft. Typically this ratio was about 3 to 1, and I was hoping a similar situation might apply on the locomotive. I already possessed various spur gears which would be useful for several experiments, so this gear ratio was originally used when the engine was a twin-cylinder with only one stage of reduction gearing. Because only one cylinder would now be in use the ratio would have to be increased and would need a second stage. My available gears gave me a possible total ratio of 6.6 to 1. The first reduction was 2.2 to 1 and the second reduction was 3 to 1, giving a total of 6.6 to 1. The final pair of gears were used as a 1 to 1 idler to take the drive downwards onto the front axle. Using fairly large gears for the idlers also gave me space to fit an eccentric with a nominal 1/4 inch throw, which could drive a future water pump, when needed (photo 30).



Idler and eccentric.

Single cylinder engine speed is assumed to be 2000 RPM. The tread diameter of the wheels measured as 1.323 inch. Assume slow walking pace = 1 MPH or 1.46 ft/sec or 17.5 inches per second.

The circumference of the wheel = π x D = 4.156 inches assuming no wheel slip, so for a driving wheel to cover 17. 5 inches in 1 second it must rotate at 17.5 / 4.156 = 4.2 revs in 1 second or 252 RPM.

If the engine runs at a nominal 2000 RPM, then the gear ratio would be 2000 / 252 = 7.94 to 1.

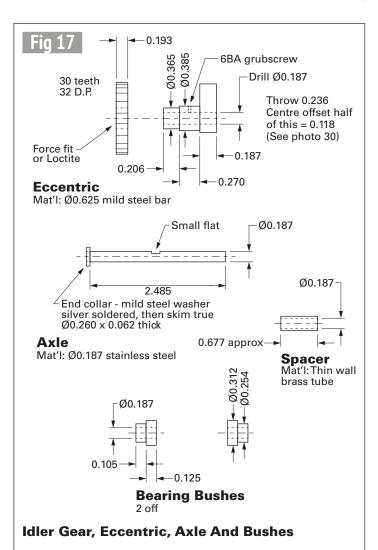
Using an available ratio of 6.6 to 1 should be okay for a start: maybe the next experiment would be to increase the ratio to be 8.6 to 1 with some new gears. The first pair of gears from the crankshaft are 48 DP, the first experiment used an 18 and a 40 tooth gear, the second experiment could be 15 and 43 teeth. (Note: having now used the engine on the track, the ratio of 8.6 to 1 is definitely better: it slows the locomotive down.) This would give more torque at the driving axles so possibly the engine cylinder size could then be reduced slightly, also a smaller engine could be put back as a twin cylinder and then stopped and reversed easily using radio control. I know this may not be the best way to design engines but I am learning about locomotives from scratch and it is a worthwhile challenge. Might it stop my grey cells from turning to porridge too early?

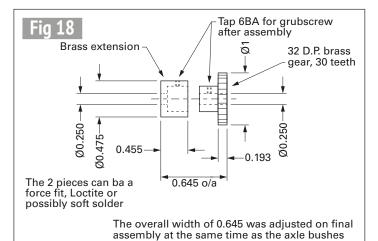
Drive gears and pump eccentric

(Figs 17 and 18)

The water pump eccentric is mounted on the same shaft as the idler just in case it is needed in the future.

At the time of construction I could not decide whether the engine should be a tank or tender type; it eventually turned out to be very easy to convert the engine to either a tank or a tender type. If a tender engine was used it would be much simpler to





Final Drive Gear

put a very large water tank in the tender (possibly 400ml capacity) and run a flexible water pipe to the pump under the engine frames. I will come back to this later.

To determine the position of the idler gear, it and the axle gear were placed firmly into mesh with each other, a very, very thin piece of paper was placed between the teeth to give a tiny amount of clearance. A piece of silver steel was machined to a sharp point and placed inside the bore of the idler. This point was pushed onto the frames, leaving a clear mark to indicate the drilling for the bearing bush



Using pointed steel rod to mark gear centres.



Eccentric and final gear.

(photo 31). This produced a clear mark on the frame and was used for a centre-pop that was drilled out as a pair with the other frame (photo 32). A similar method to this was used for the other two shafts. The actual spur gears were some I already possessed. Both the idler gear and the final gear assembly are two pieces fastened together (photo 33). The final gear was soft-soldered to an enlarged centre bush so it could be carefully bored out to 1/4 inch diameter to match the axle. Beware when soft-soldering some types of gear that look like bronze as they possibly contain a percentage of aluminium; the solder will flow



Frame drilling and spacers.



Spacer for idler.

inside the joint but will not make a smooth fillet externally (!). Because of this the gear attached to the pump eccentric was located with Loctite 603 the final fit was a tight sliding fit together. Some people might prefer to make a tight interference fit between the two items, then use the bench vice to squeeze them together. This idler determines the position of the gear train and the engine. The size of these final gears is 32 DP in imperial sizes and a close match in metric would be 0.8 MOD. Please note they are similar, but definitely not identical. The types of gear used are rather heavy but they were sat in the spares box just waiting

to be used. If I were building a second engine I would aim for gears which were a bit lighter in construction. Maybe 40 DP or 0.6 MOD all the way through. Even old Meccano gears - which I believe were 38 DP or 0.668 MOD - would probably be okay. The other advantage to smaller gears would be smaller spindle sizes, possibly the idler shaft could be reduced to 5/32 inch diameter and the engine crankshaft could be reduced to 1/8 inch diameter. I know this small size works okay on a marine engine. Lots of other measurements would change, particularly the distance between some of the gear shafts. If this was done,

possibly the idler gears would need to be larger to span the necessary gap. Photograph 34 shows the idler gear and shaft with a spacer made from thin wall brass tube to keep the idler in its right place. The collar shown on the left end of the shaft is a piece of mild steel silver soldered into place and then skimmed to run true.

Soldering main frame assemblies

Hopefully all necessary holes are now drilled in the frames. All of the 7BA bolts were loosened slightly including the boiler plate bolts. The frames were then pressed gently onto a flat surface and all bolts retightened, this ensured that the frames ended up parallel. One end of each of the three lower spacers was then soft-soldered into place (photo 32). I left the buffer beams and the boiler plate removable, however, it may be better to solder these into position permanently. I do not know yet if everything is as solid as it appears at the moment. The coupling rods were assembled onto the crank webs to see how free-running they were when assembled into the frames and yes, there was a bit of stiffness in one place but this slowly disappeared when I applied a drop of black Molyslip to all the bearings and kept on spinning the wheels. All the components will be marked to ensure they are fitted back in the same place.

To be continued.

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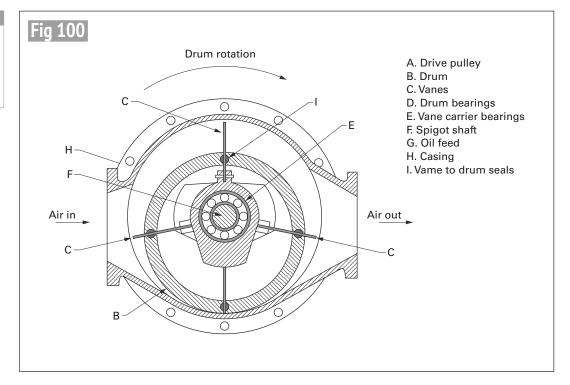
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Internal Combustion Theory and Practice

Ron Wright, a retired technical college teacher, provides an in-depth course in I/C.

Continued from p.740 M.E. 4508, 15 May 2015



I've always thought that one of the most significant sayings in model engineering is that originated by the late L.B.S.C.; 'you can't scale nature' and I've come to regard this as being

Fig 101

of special importance in the design, construction and operation of small I/C engines, where the working principles are exactly the same as those applying to full size engines. This forms the basis of this article which I hope will be useful and informative to readers who have a particular interest in I/C, especially those just starting out in our hobby.

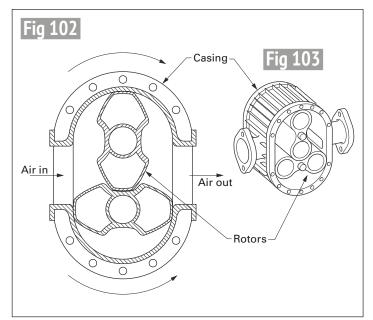
SURVEY OF POSITIVELY DRIVEN SUPERCHARGERS

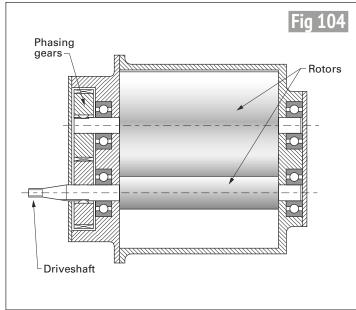
1) Sliding vane type
Figures 100 and 101 show
cross and longitudinal
sections of a sliding vane
supercharger of the Shorrocks
design in which the hollow
drum B rotates on ball
bearings D, carried in each

end of the case H, and is driven by a Vee belt from the crankshaft to pulley A.

Supported in the end case opposite the drive is a stiff spigot shaft F which extends along the length of the casing and supports a number of small ball bearings E, which in pairs carry a set of four flat vanes C. Each of these protrudes through slits in the drum where they are closed against air leakage by the seals I. The blades extend to the circumference of the casing where they have a very fine clearance; they do not rub against the casing.

Shaft F is co-axial with the casing but the drum is eccentric to such an extent that at one point it nearly touches the casing inner surface (the lowest point in the diagrams). This arrangement results in there being air volumes of varying capacities





between the drum outer surface, the vanes and the casing inner surface.

Consequently, as the drum rotates, these volumes are carried round with it, clockwise in the first diagram, thereby creating an increasing volume at the air inlet, left hand in fig 100 and a decreasing volume at the outlet which is on the right and diametrically opposite the inlet.

Hence at the inlet the increasing volume creates a depression which causes outside atmospheric pressure to push air into the vane-casedrum volume.

From here the air is carried round by the vanes with the volume gradually reducing and the pressure rising, until at the outlet the decreasing volume expels the air under pressure towards the engine's inlet manifold.

Note: all fluid pumps function in this general way, whether rotating or reciprocating - they create an increasing volume at the inlet and a decreasing volume at the outlet.

Lubrication is by a simple oil spray from the engine's lubrication system via the connection G where an oil mist is sprayed to the vane carrier, and drum bearings, but of course this eventually finds its way, with the air, into the engine combustion chambers where it burns to form a slight blue haze in the exhaust gas.

This design tends to lose efficiency at low speeds owing to the air leakage from between the blade outer edges and the casing surface, and from between the blade end edges and the end casings where there is also a fine clearance.

2) Roots twin rotor type
Figures 102, 103 and 104
show details of this design in
which two rotors, two lobed or
three lobed, rotate in 'mesh'
with each other inside an
oval casing and are held in
correct rotational alignment
by a pair of fine tooth phasing
gears which are housed in
a separate compartment at
one end of the case. One of
these gears is belt driven from
the crankshaft or, in the case
of early 'blower' Bentleys,

directly from the crankshaft nose.

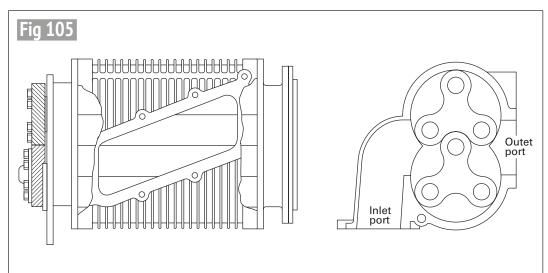
Fine clearances exist between the rotors and the case and the gears are lubricated from the engine's system but the rotors do not need lubrication and clean air is delivered.

Operation is similar in principle to a gear type oil pump and air is carried from one side to the other (left to right in the diagram) being 'pushed' along by the leading flanks of the rotors. Hence it could be said that the air is 'paddled' through the mechanism resulting in there being no compression; this only occurs as air is propelled out of the casing and into the inlet manifold where it 'piles up' to raise the pressure above atmospheric.

The output flow tends to be pulsating as then rotor edges proceed across the outlet port opening and one way of minimising this is shown in **fig 105** in which straight rotors are employed with angled or skewed ports. An alternative is to employ skewed rotors with conventional ports; however rotors of this type are a good deal more complex to machine.

Roots blowers are widely used as scavenge blowers on two stroke Diesel engines where the function is merely to blow the cylinders clear of exhaust gas when both the Inlet ports and the exhaust valves are open, which is not strictly speaking supercharging as the final cylinder pressure is only slightly above atmospheric.

To be continued.





Am uncommon compound Foster traction engine by T. Baldwin.

Diane Carney reviews this popular Northern show.



ood weather is always welcome at the Harrogate show so the outdoor steamers get a chance to show off their magnificent models at their best. On our cover this issue is a 4½ inch scale Foden wagon owned by J. Fearnely of Castelford. This family name is well known in road steam circles having

Perister de la contraction de

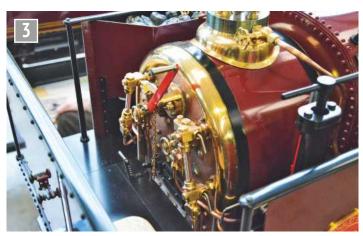
Adrian Hinchcliffe's award winning Quarry Hunslet, Bernstein.

been involved in the hobby for generations. This year seemed to be the year of the Foden at Harrogate! There were no fewer than six listed in the programme. Amongst the other exhibits outside was this Foster compound traction engine, *Shirley B* by T. Baldwin (photo 1).

Best in Show

Indoors the sun was shining on the 71/4 inch Gauge Society stand as usual (I often think they have the best spot in the building!) and it was here that the winner of the Barry Jordan Trophy for Best in Show was to be found, centre stage. Adrian Hinchcliffe's Hunslet saddletank Bernstein also won the Myford Shield for Best Locomotive (photo 2). This model was built by Adrian - a member at Leyland SME - to works drawings over a period of eight years and is a particularly fine example beautifully finished. Hunslet No. 678 of 1898 worked at Port Dinorwic initially,

along with its sister, Covercoat until 1923 when she was transferred to the quarry itself where she worked for the next 33 years at Pen Garret level. This locomotive differs from the more commonly seen Alice Class type in having sanding gear, centre spring buffers and slip gear, designed for its time working on the quayside. The valve gear on the model deviates from the original locomotive; Don Ashton's formula for an improved Stephenson valve gear was employed and the model has balanced slide valves, ball race eccentrics, needle bearings in the links and ball race die blocks in the expansion links. Contributing much to its accolades must have been the quality of the backhead (photo 3) and the general paint finish. The original locomotive is now named Jonathan and resides as a static engine at the Spring Technology Co. museum at Lytham St. Anne's. Congratulations to Adrian.



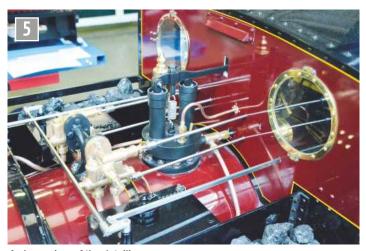
The drivers footplate on a brand new locomotive.

Alongside Adrian's Dinorwic Hunslet was a superb model of another locomotive by the same maker: Russell by Chris Farrar (photos 4 and 5) is a superbly finished engine representing the full size 1909 Welsh Highland locomotive as it was in about 1922. Working only from a GA and hundreds of photographs, Chris had made all patterns and done almost all the castings himself - only the very biggest being put out to a local foundry and constructed the engine around laser cut frames. He had designed and built the copper boiler himself, apart from the TIG welded longitudinal seam, using traditional silver-soldering methods. The flanging formers he had cast himself in aluminium. The engine features a fully working Westinghouse airbrake system, as per the full

size. The brass water tanks demonstrate Chris' apparent skill in riveting - there are over 800 of them in each tank and they look just about perfect to me! The prototype had a very chequered history, enduring many unhappy years towards the end of its career running on railways for which it was totally unsuited and suffering endless derailments. It came close to being scrapped in 1953 but was saved by the Birmingham Locomotive Club and was taken to Tywyn Wharf station on the Talyllyn Railway. From then on the story is even more complicated but, fortunately, Russell now runs regularly on the Welsh Highland Heritage Railway at Porthmadog. The model is the product of about fourteen years' work and Chris took the Precision Paints Award for Best Finished Model. Well done!



Russell, by Chris Farrar. Another magnificent Hunslet.



A closer view of the detailing.

Stationary Engines

Richard Simpson exhibited a marine triple expansion engine, 1:25 scale (**photo 6**). I could see no notes with the model so it may be a freelance design but it was very nicely made conforming very much to traditional marine practice.

Richard won a Second Certificate and the Warco Trophy for Best Stationary Engine.

Adjacent to this was a very elegant model by L. Nelson (photos 7 and 8) to an Anthony Mount design. The prototype was a French engine - Farcot's Table Engine



A typical triple expansion marine engine by Richard Simpson.



Farcot's Table Engine by L. Nelson.

- and was discovered by Anthony in a book dating from the 1860s. The design of the governor mechanism is most intriguing although, arguably, not particularly successful in engineering terms. It works more like a differential gear, the drive varving via bevel gears as the speed alters. It would seem to be a condensing engine as there is a non working air pump featured, although the mechanism of this is not clear as the steam exhausts to a cylinder 'wrapper' which forms an insulating jacket around the cylinder. The original was apparently double jacketed so this may be a clue. Something for further investigation.... Fabricated entirely, a nice model nonetheless, possibly only improved by a six spoke flywheel (purely personal preference). There are no castings and the drawings are available from Polly Model Engineering.

Moving across to the I/C engines table, Tom Pasco had a 30cc Vee Twin Supercharged sleeve valve two stroke engine in competition (**photo 9**). The notes beside the engine informed us that the sleeves are driven by an eccentric on the crankshaft and a small





Tom Pasco's 30cc Vee twin supercharged sleeve valve two stroke engine.

You may be able to make out the unusual governor arrangement.

open ended piston between the sleeves acts as a guide to prevent rotation. Ignition is transistorised and uses two 6V motorcycle coils. It will run to approximately 5000 revs on a 22 x 8 inch propeller. Tom took a Second Certificate for this entry. Our friend Ray McMahon was awarded a Commended Certificate for the 'tamed' Centaur (as featured in *M.E.* issue 4508) (**photo 10**).

Joe Holdsworth exhibited a Bodmer Sliding Cylinder Engine for which he won a Commended Certificate (photo 11). Another curious porotype discovered and modelled originally by Anthony Mount, this one had a stationary piston and the cylinder slides up and down. Johann Georg Bodmer is one of those engineers in history about whom we hear very little - he was consistently ahead of his time - but whose achievements, when analysed, were actually quite breathtaking! If you would like to find out more you will find his obituary on Grace's Guide of great interest.



Ray McMahon's Centaur in a working environment.



Bodmer sliding cylinder engine by Joe Holdsworth.

Model Wheelwrights

The Guild of Model Wheelwrights always put on a tremendous show at Harrogate. This year First, Second and Highly Commended certificates were awarded to John Castle, Brian Young and Alan Hartley respectively. The First was for a London Pattern Coal Van to 1:8 scale, (photo 12). John Castle scratch builds models very much in the traditional style using the traditional range of materials and methods of construction in miniature form. The model is based on a delivery waggon type of which there's only one known survivor.

The Second Certificate was for a 1:12 scale Bamford RS10 Swath Turner (photo 13). I am guessing the design is from the 1940s but I didn't see any notes so I may not be correct.

The Highly commended Certificate went to Alan Hartely but I am sorry to say I have no photo of his Spanish Ox Cart.

Around the clubs

There is always something new to see on the club stands so I thought I would show a few of the things that caught my eye this year. Firstly a couple of exhibits on the Bradford stand: a George Thomas Dividing Head and Tailstock by D. Watts sat proudly on the shelf (photo 14) and below it the beginnings of a new engine by John Mills, a 71/4 inch gauge 0-4-0 locomotive of Danish origin (photo 15) with a very interesting story - but one I think I will leave until it comes time to report on its completion!





Alan Castle's 1:8 scale coal delivery wagon.



A Bamford RS10 swath turner by Brian Young.



Well made tooling on the Bradford stand. This by D. Watts.



John Mills' work in progress; an engine of Danish origin.

Refining a Combination Sheet Metalwork Machine

Graham
Astbury
improves
a 3 in 1
combination
machine of shear, press
brake and roll.

Combination machines for sheet metal working consisting of a shear, a press brake and a set of bending rolls are available from several UK suppliers but despite differing sizes and paint colours, they all appear to made to the same design by any one of many manufacturers in mainland China. On inspection of the machine as delivered. there appeared to be some anomalies and shortcomings to the design so I decided to modify my machine.

he modifications that I made to mine would probably apply to all similar machines but the dimensions of the modified parts may well differ between the different sizes of machine and possibly different suppliers. However, if you decide to modify your own machine, please bear in mind that this article is written in good faith and I cannot be held responsible for any errors made.

Introduction

Whilst my wife and I were at the Harrogate exhibition some years ago, I looked at a three-in-one sheet metal working machine (photo 1) which consists of two substantial cast iron side frames connected by a fixed beam and work table at the bottom and an adjustable beam at the top holding the dies for box and pan forming. There is a horizontal shaft across the top that has an eccentric at each end – with



The three-in-one combination of shear, press brake and roll.

the eccentrics having crank arms connecting to the moving shear blade. Rotation of the handle moves the shear blade down to shear sheet placed on the work table at the bottom and further rotation brings the shear blade up again to bend sheet placed between the shear blade top and the bending dies. The main shaft is made as one of the rolls for bending, with a top roll used to nip the sheet and a third pressure roll behind, which can be adjusted to roll the sheet into a tube when fed through the nip.

As it was my sixtieth birthday on the day we visited Harrogate, my wife suggested that I buy the machine for a birthday present. I decided that the 24 inch model would probably be the optimum one for me as it would cut thin gauge sheet and wire meshes and then roll them for making the displacers

and regenerators for hot-air engines. I could also shear and fold aluminium sheet for boxes to house electronic equipment and cut and fold sheets of aramid paper for use as slot insulation for rewinding motors.

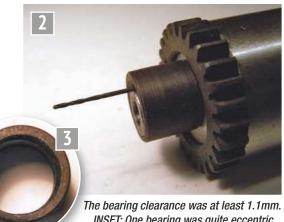
An order was duly placed and I was advised that there was about a three month delay as it was out of stock, but the suppliers had just placed an order with China. Eventually I was notified by the suppliers that the machine was in the UK and the carriers would phone me to arrange a delivery. This they did and the machine arrived within five minutes of the arranged time. After a quick inspection that all was present and correct, I had the crate on its pallet placed in the garage to await installation in the workshop.

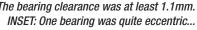
However, as we had moved house recently, my workshop was still at the planning stage and, as usual, domestic events took precedence and the workshop building was inevitably delayed. A former colleague of mine once said that when estimating how long something will take, it is best to take the estimate, double it and change the time units to the next higher one. so something that you estimate will take two days will actually take four weeks! I estimated that the workshop would take about three months to build, so it was no real surprise that it took almost three and a half years to get it finished and ready to install the sheet metal machine.



Eventually, I removed it from the packing crate and retrieved the instruction booklets. A most unusual habit of mine is to read the instruction book before doing anything else (am I alone in this?). I read both the instruction booklets - one written in Chinglish (Chinese English) and the other in English. The one in Chinglish had such gems as '...when you are getting rid of this king of rust inhibitor, you can unset the yellow coat with varnish diluent and paint flux for machine oil...'. To be fair, I am sure that their English is better than my Chinese! Even the one written in English was not particularly well written and it appeared that whoever had written it had never set up or used the machine - it was merely a re-written form of the Chinglish one. In the end I scoured the Internet and found manuals for two other rival machines - both of which were similar but not identical machines - which were very clear and well written, including very good descriptions of adjusting the blades.

The machine itself was well protected from corrosion and after all that time in a damp garage there was no sign of rust at all. In fact the anti-corrosion protective coating resembled treacle toffee, it was so hard and tenacious. I could not turn the handle of the machine at all and thought that this was due to the anti-corrosion coating







sticking things together. Despite using plenty of white spirit, the protective coat remained so adherent that I ended up having to dismantle the whole machine to remove it. I used cotton rags and white spirit to soften it and plenty of elbow grease to actually clean it off. A lot of the smaller parts I soaked in white spirit before scrubbing with an old toothbrush, which is useful to get into the corners.

Bearings

When I removed the top roll to clean it. I noticed that the bearings ('jackets' in Chingish) were a really sloppy fit on the shafts. In fact, the worst one was so bad that I could insert a 1.1mm twist drill between the bearing and the shaft (photo 2). One bearing was machined eccentrically (photo 3) and all the bearings were a really sloppy fit in the

Once I had cleaned everything, it became apparent that there were several shortcomings with the machine. The most obvious was the quality of the machining of the components and the attendant poor standard of construction and assembly.

Once I had cleaned everything, it became apparent that there were several shortcomings with the machine. The most obvious was the quality of the machining of the components and the attendant poor standard of construction and assembly. I spoke with my daughter, who is a solicitor, about formally rejecting the goods but she advised me that goods have to be rejected within a 'reasonable time'. Like so many legal things, 'reasonable' can be interpreted in several ways but three and a half years would be deemed by anyone to be long enough for me to have accepted the goods by default. Consequently, I was stuck with it so decided to modify the machine and put right all the problems.

side frames (photo 4). It is necessary for the bearings to have some freedom, as when the pressure roll is adjusted to roll tapered shells, the bearing must be able to tilt sufficiently to allow the roller to move to an appropriate angle. However, calculation showed that for the maximum taper, the bearing only needed about 1mm of freedom in the slot to do this, so the amount available was clearly excessive.

All four of these moveable bearings - one each end of both the top roll and the pressure roller - were made of steel and since the shafts were also steel, I thought that the best course of action was to re-make the bearings to be a better fit on their shafts and in their housings and be made of

another material so that steelon-steel rubbing was avoided. I used some hard brass that I happened to have in my odd bits box. This then led onto the question of lubrication.

Lubricant

In both the manuals that accompanied the machine, it stated that oil should be used as the lubricant for the two nipples located on the crank arms - '...oiling the machine oil into eccentric mechanism and clearance once for a day...'. Neither version stipulated a viscosity or grade. I looked at the bearing design and found that the bearing was steel on the eccentric with a bronzelined bearing in the cast iron crank arm. As the speed of rotation was very low, it was almost certain that the form of lubrication would be boundary lubrication where the two surfaces rub together with only the thinnest film of lubricant in the gaps between the asperities (tiny ridges and hollows on the surface). This form of lubrication is only acceptable for slow velocity oscillating or sliding surfaces. Consulting my mechanical engineering textbook on lubrication and bearings (ref 1), it seemed that the best lubricant would be a grease with a solid lubricant in it, such as graphite or molybdenum disulphide. In the end I chose a NLGI Grade 2 molybdenum disulphide grease which I already had in stock. This is similar to the type of grease used in constant velocity joints on car drive shafts, which seem to survive well under quite severe conditions. A manual

for a similar machine from a different supplier suggested that a 'No. 2 lithium tube grease' be used for lubrication once a month, so I felt that my decision for grease rather than oil was at least justified.

I also estimated the maximum load to which one of these bearings would be subjected. At the start of a cut of steel sheet 1mm thick (the maximum capacity of the machine), almost all of the load would be on the right hand bearing, with the load gradually transferring to the left hand side as the cut was completed. The shear blade is angled and has a slope of 16mm over its length of 640mm - 1 in 40 - so the area of sheet actually being sheared at any one time would be a triangle of base width 40mm and height 1mm - an area of 20mm². According to Machinery's Handbook (ref 1), a typical low carbon steel sheet will have a shear strength of about 75% of its ultimate tensile strength. A typical sheet steel to BS 1449: 1972 Part 1 (ref 2) would have a minimum tensile strength of around 280 to 290 N/mm², so a typical strength might be 300 or so. Thus the load on the blade shearing it would be 0.75 x $20 \times 300 = 4500$ Newtons, or almost half a tonne. This would be transmitted to the bearing which has a width of 15mm and a diameter of 57mm, giving a projected area of $15 \times 57 = 855$ mm², so the pressure would be 5.26 N/mm² or for those more used to imperial units, about 760 psi, which is far too high for an oil to form a film under slowspeed sliding conditions.

Having selected a grease, I realised that the only bearings which were fitted with lubrication nipples were those on the eccentrics. This seemed rather odd to me as the bearing area on these bearings was actually larger than those on the bearings for the shaft in the side frames, which had no provision for lubrication at all. Similarly, there was no provision for lubricating the slip-roll bearings and the pressure roll bearings, not to mention the bearings where the crank arms



The main bearing with the roll retainer socket machined into it.



The grease nipples for the right-hand side showing the hole for greasing the gears.

pivoted on the shear blade. The main shaft bearings had a projected area of 25 x 19 = 475mm² which meant that the pressure on these was almost twice as much.

Therefore I decided to fit grease nipples to the main shaft bearings by drilling through the frames with a 2mm drill and opening up and tapping M6 for a grease nipple. This was not as simple as would be first thought because the socket for the pin used to retain the top roll had been machined too deep and had broken through into the main shaft bearing (photo 5). The best solution was to drill up into the frame at an angle of about 45 degrees so that the grease nipple did not foul the adjustment screw for the bending dies (photo 6). This position could be duplicated on the right-hand side where the gears were located and by so doing, it left an ideal location on the front of the right hand frame to fit a nipple to provide for greasing the gears,

with a small 2mm hole drilled into the frame on the pitch circle of the gears (**photo 7**).

The final bearings were those at the bottom end of the crank arms which had a projected area of only 19mm by 19mm, equating to 361mm², thus having a pressure well over twice the pressure on the eccentric bearings, so I decided to fit grease nipples to them as well. However as these bearings are there to allow the crank arms to pivot only slightly, the bearings are fastened tightly by cap-head screws with the crank arms pivoting on the outer surface and not rotating, merely rocking. Therefore provision was needed to distribute the grease throughout the bearing, as rotation could not be relied upon to spread the grease. Therefore I machined a shallow (about 0.5mm deep) groove around each bearing's outer surface (photo 8) and fitted the nipple half way across the width of the crank arm so as to line up with the groove machined in the bearing (photo 9).



The grease nipple on the left hand side for the main shaft bearing and the top roll retainer.

The bearing at the lower end of the crank arm with the groove machined in.

Roll adjustment

On the basic machine, the rear pressure roller is adjusted by means of long screws which push the bearings of the rear pressure roller upwards in their slots. Each screw had a plain black 25mm diameter ball knob on the end, so the lack of markings made it difficult to turn each screw by the same amount to keep the pressure roll parallel with the top roll and make a perfectly straight rolled shell. Also, as the bearings of the rear pressure roller move up the slot with the roller, it would



The crank arm lower bearing grease nipple.



The 'pip' machined on the screw to stop the bearing rotating.



The new top roll retainer lever.

shaft bearing on a regular basis. Two solutions sprang to mind – do a 'once for life lubrication' on assembly or make a new screw with a hole down the centre and a grease nipple at the end. This new screw could also have a cross-bar so that 'half a turn' could be added easily and maintain the parallelism of the pressure roller.

I decided that trying to drill a

200mm deep 1.5mm diameter hole right through the original screw would be asking too much, even if I followed the excellent advice of Frank MacCafferty on deep hole drilling (ref 3). Consequently I deemed it better to take the easy way out and make the screw in three parts silversoldered together. The central part was a length of 1/4 inch o.d. by 18 swg wall thickness cold drawn seamless steel hydraulic tubing that I just happened to have in my short ends box. The screwed part was simply an M10 setscrew with the head turned down to form a locating 'pip' to prevent rotation of the roller shaft bearing. I have not given a drawing, as anyone doing these modifications will have to check the dimensions from their own machine. The original and the new adjusting screws are shown in photo 10, with the new bearing and the turned locating 'pip' on the end shown in photo 11 with the original bearing and adjusting screw for comparison.

I made similar shorter screws to adjust the 'nip' on the top roll as well but made these from 12mm diameter bar and drilled them right through at 2mm to allow the grease to pass into the bearings. I would advise anyone contemplating carrying out these modifications to

measure up their own machine very carefully to ensure that the 'pip' on the end is short enough not to protrude into the bore of the bearings and also to ensure, particularly with the top roll screws, that the slots in which the bearings slide are long enough so that the new bearings still allow the top roll to open up enough to roll material that is slightly thicker than that stated in the specification. I will describe more about the use of thicker materials and 'pushing the design limits' later.

When I made my new bearings for the top roll, one would not fit into one side frame because the slot had not been machined quite as long as the other side frame. As the side frame is far too big to fit onto my lathe when set up for milling, I had little option but to extend the slot by the required 3mm by using a 1/8 inch hole saw in the electric drill with a piece of steel plate drilled 1/8 inch clamped to the side plate to act as a guide. Whilst rather crude, it did allow me to remove almost all the cast iron required, with just a crescentshaped sliver left, which I removed with the old fashioned method of a very small cold chisel and a light hammer.

After final assembly of the rolls, I then discovered a lack of foresight on my part – the cross pin on the new adjusting screws for the rear pressure roll caught the roll guard when the guard was open, making it a bit of a nuisance as the guard had to be lifted slightly to allow the screws to be rotated easily. Not a great problem and as it only happens

when rolling material, I can live with it. I also made a new top roll retainer, as the original one was a bit awkward to use to release the top roll, so the new one was just a bit longer with a ball knob on a lever to make it easy to use (photo 12).

Re-assembly

Having done these modifications, I re-assembled the machine and again had problems. My newly installed grease nipples to grease the bearings on the main shaft allowed the shaft to spin freely. until I tightened up the caphead screws securing the cross beam to the side frames. As I tightened up the screws, the shaft locked solid and would only turn freely if the screws were slackened off again and the frames moved slightly. The locking of the shaft when first

bought was not, as I thought initially, due to the anti-corrosion coating but due to poor machining of the frames. It was clear that the seat machined onto the side frames to allow the cross beam to fit had not been machined square and I resorted to having to fit 0.2mm shims

(did you know that a 200 gram baked bean tin is made from 0.2mm tinplate?). I had to fit them at the right hand side of both frames to allow them to be tightened up square – an error of only about 0.6 degrees but enough to lock the shaft solid.

As I placed the work table (the flat base that has the sheet placed on it for guillotining) onto the frames, I realised that the original assembly had not used washers under the caphead screws, so the heads of the screws had bitten into the relatively soft cast iron, making fine adjustment difficult. When the base securing screws were tightened, the heads tended to go to the depression left by the previous tightening. This was easily cured by the use of heavy grade washers, filed to fit into the adjusting slots (photo 13).

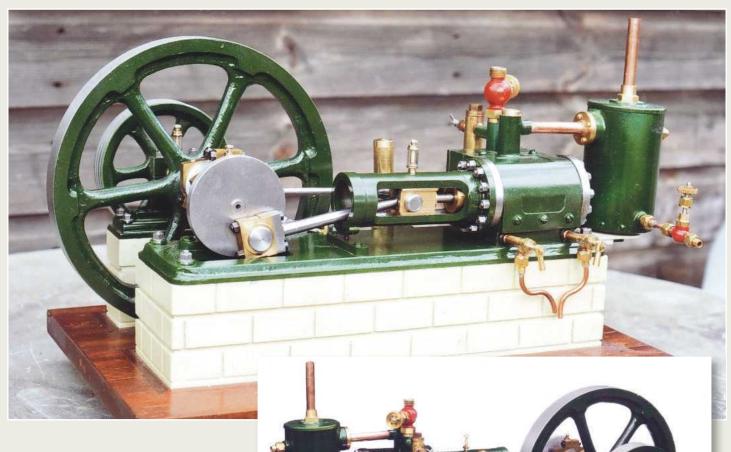
To be continued.



The filed-down washer and the table clamp screw.

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- 2. British Steel Corporation, *Iron and Steel Specifications*, 4th Edition (1974)
- **3.** MacCafferty, Frank, *Drilling Deep Holes*, published in Model Engineer, 213 (Issues 4491 & 2) pages 436-7 & 494-5 (2014).



In a recent Smoke Rings (M.E. 4507) I made the suggestion that a Gallery of Readers' Work might make a welcome feature in the pages of this magazine. So many talented model engineers complete wonderful work and it is rarely seen by anyone other than family and close friends. I would like to encourage those who may be reluctant to display their work at exhibitions to consider sending me some photographs.

Gallery The Croft Mill Engine Mk II by Gordon Barber.

appily I have had some response to this idea; for the first of this occasional series Mr. Gordon Barber of Great Yarmouth has submitted photos of a recently completed model. This is a model of the Croft Mill Engine as described by John Bertinat, starting in Model Engineer, Vol 188, Issue 4165 (2002). John had, in his retirement, become involved with the local school

in Ludlow where there was a modestly equipped workshop and a group of enthusiastic pupils. He designed this simple horizontal mill engine for the group with the intention of introducing them to some basic pattern making and aluminium alloy casting (the engine bed was not hollow on the underside and the cylinder was not cored for simplicity). The design follows

traditional late 19th Century small mill engine practice; the engine has slide valves and a drive pulley beyond the main crankshaft bearing.

Mr. Barber tells me, however, that the only casting he used in his model pictured here was the 7 inch flywheel. The cylinder bore is 13/16 inch and the stroke 11/2 inch. The plinth is MDF, scribed and painted to represent a stone bed.

Please submit your photographs to the editor, either electronically or as prints by post. (Please telephone me for my address.) Any item of model engineering, be it a steam engine, I/C engine, item of workshop equipment, clock, boat or aeroplane is of interest.



Durango; a full size 4-6-0 model.

An American Journey of Discovery

Rhys Owen looks at how the Americans do things.

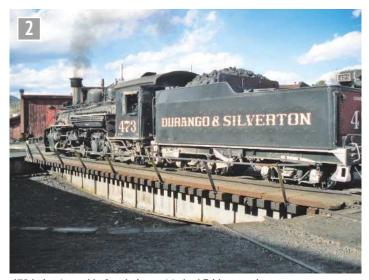


A visit with my other half' to see her extended Chinese family in California early in 2015 allowed me to indulge my interest in American railways. After a few days of munificent Chinese hospitality I set off and, over two days, drove to the Durango & Silverton Narrow Gauge Railroad in Colorado.

he D&SNGRR is one of the remnants (the other is the Cumbres & Toltec Scenic Railroad) of the narrow gauge railways constructed in the mountains of Colorado, initially under the leadership of General William Jackson Palmer and Dr. William Abraham Bell. Built in 1881-2 by the Denver and Rio Grande Railway (later Railroad) to serve the flourishing mining industry, the line operated as a normal

railway under the aegis of the Denver and Rio Grande Western Railroad until 1980 after which the railway was sold, eventually becoming the property of American Heritage Railways.

The first sight to be seen as I walked from the Super 8 hotel into the town was a full-sized model of a 4-6-0 locomotive near the Durango tourist office. Apparently this model was constructed for a film and is very realistic indeed (**photo 1**).



473 being turned before being put to bed Friday evening.

At Durango station I first visited the museum, which has an extensive collection of technical memorabilia including an early aeroplane, cars and a large model railway layout. Also present were class C-17 2-8-0 No. 42 (Baldwin Locomotive Works No.8626 of 1887). This locomotive has inside Stephenson's valve gear, is in fairly good condition but is too weak to be worth putting back into full working order. Nearby was class K-28 2-8-2 No. 476 which will require some work to become operable.

After a little while sister locomotive No. 473 drifted in with the day's train. After a

quick look at this engine. I was able to tag on to a visit to the works guided by the museum's curator and long-serving D&SNGRR employee, Mr. Jeff Ellingson. The works aims to totally overhaul one locomotive per year as well as to undertake other repairs. Much re-tubing and other boiler work is done and the boiler of one of the K-36 engines could be seen with the cladding removed - it seemed that guite a number of flexible stays were fitted to the boiler's firebox.

The machine shop is of mid-20th Century vintage, the latest lathe dating from the 1980s, with no digital read-outs to be



D & S coach interior showing the clerestory roof.



473 standing at Durango while the brakes are tested.

seen. All the machine tools are American with one exception, this being a British quartering machine. We also visited the coach works where workers were busy refurbishing the line's coaches.

Finally we were able to see 473 (or 'the 473' as the Americans would say) move onto the turntable before being turned a few degrees so that she could reach her stall in the roundhouse. This was rebuilt in 1989 after a disastrous fire (photo 2).

Next day, Saturday, I returned to ride the train to Cascade - winter trains do not go all the way to Silverton (photo 3). The ten coach train trundled along the side of Narrow Gauge Avenue (!) then over a complicated road intersection. Here, as elsewhere in the USA, when a train is approaching a grade crossing (American for 'level crossing'), the locomotive gave a 'long-long-short-long' series of whistles.

After crossing a river bridge the train headed along the valley floor then started to climb into the hills. Incidentally, my coach had a clerestory roof and seemed to be a genuine period piece (**photo 4**). For those worried about these matters, the coach had two toilet cubicles - or, 'rest rooms' as they are referred to in the USA.

After a while the train ran along a ledge hewn into the side of a gorge. As we crossed a bridge to the opposite side the engine crew

used the blow-down cocks on each side of the fire-box to expel some of the water above the foundation ring (this expels impurities and thus decreases the frequency at which the boiler needs to be washed out). Eventually the locomotive took water at a wayside water column after which it was a short distance to Cascade where the entire train was turned by being backed into a 'wye' - i.e. a triangular junction.

Here the passengers got off, some to explore their surroundings and others, like me, to have a good look at 473, which is one of a batch of 10 locomotives built in 1923 by the Schenectady works of the American Locomotive Company (works Nos. 64981-90). Seven of these locomotives were requisitioned by the US Army in the Second World War. These were sent to the 3-foot gauge White Pass & Yukon Railroad in Alaska and were scrapped after the war. Fortunately Nos. 473, 476 and 478 remained in Colorado (photo 5).

Although of 3 foot (914mm) gauge these locomotives are, by British standards, not small. The engine has a mass of 156,000 lbs (69.6 long tons) and the tender a mass of 98,500 lbs (44 long tons). As with most American locomotives, 473 has bar frames - in this case outside the wheels - the cylinders acting on connecting rods, cranks and coupling rods which, together with the valve gear, are all

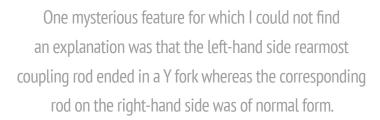


473 standing at Cascade.

outside the frames (photo 6). The piston valves are stated to be 11 inches in diameter and serve cylinders that are 18 inches in diameter with a stroke of 22 inches. A snifting (antivacuum) valve is located on top of each steam chest.

As is normal with most American locomotives of this generation, the cylinder and the piston valve chest for each side are formed together in one large casting. These left-hand and right-hand castings are hand side rearmost coupling rod ended in a Y fork whereas the corresponding rod on the righthand side was of normal form.

The K-28 engines are reputed to ride well and to run freely, the 44 inch drivers allowing a fair speed to be attained under favourable circumstances. When I commented on what appeared to be the minimal use of the cylinder drain cocks I was told that these are very large so that the engine loses a lot



then bolted together under the smokebox, the bar frames being then attached to the cylinder and valve chest assembly thus formed. At the rear, bolted extension frames support the cab and the wide firebox.

Another normal feature of American locomotives is the equalised suspension, the most prominent feature of this being the substantial bar between the rearmost driving wheel and the rear truck. This system helps the engine's wheels to follow the track, thus aiding adhesion (photo 7).

One mysterious feature for which I could not find an explanation was that the leftof power if they are opened when running but that they are certainly left open when the engine is standing.

Most of the lubrication seemed to be by grease with some use of oil. The cylinders are lubricated by oil from a hydrostatic lubricator in the cab.

Other features include the small smokebox door next to the compound air pump, both of which are mounted on the front of the self cleaning smokebox. The chimney is fitted with a spark arrestor. At the time of my visit the engine was carrying a snow plough (photo 8).

■To be continued.



473 left hand side showing springs, frames and Y shaped end to the rear coupling rod.



473 left hand rear truck assembly and bolted frame extension.



473 front end showing the snow plough and white painted points for applying pushing pole.

LBSC Honoured Blue Plaque Unveiled

Mike Chrisp describes a recent event masterminded by LBSC enthusiast Geoff Gillett.

eoff Gillett is one of a legion of model engineers who owe their enjoyment of our hobby to the writings of a long term and prolific contributor to Model Engineer magazine. This contributor wrote under the pen name of LBSC, often called himself Curly and had the enviable gift of writing in a way that guided any novice through the building, assembly and operation of miniature steam locomotives.

Many years ago, from the back of a van on a rally field, Geoff bought the drawings and some bits and pieces for Pansy, one of LBSC's few 5 inch gauge designs. Soon after this purchase and a false start, he was given copies of *Model Engineer* with the 'Words and Music', as LBSC liked to call them, describing Pansy's



Mavis Harriott unveils the plaque while Geoff Gillett looks on. Mavis once lived in the house, now painted yellow, next door to LBSC and his wife Mabel.



LBSC was Patron of North London SME for many years; the locomotive shown is Pansy and 'Nuff Sed' was an expression LBSC liked to use when he'd made his point!

construction. By reading and following the step-by-step instructions, Geoff quickly discovered the enjoyment and satisfaction to be gained from building a miniature locomotive. His pleasure was greatly enhanced some three years later when Pansy was steamed for the first time. It has run successfully ever since.

Punctuating his construction series, LBSC's articles regularly included anecdotes and reminiscences. It was in such a feature published 19th October 1944 that he wrote about returning home from a stay at a chicken farm to which he and his wife Mabel had been evacuated. The owner, a fellow miniature railway enthusiast, had built a raised 21/2 inch gauge track on his land and LBSC wrote about it and the locomotives. The Smith family included two small children, Geoffrey and Jean, who were fascinated by what he was able to achieve with the minimum of basic tools. In the article LBSC describes a simple locomotive

he planned to make for the then six year old boy on his return to his workshop at home.

Readers with access to The Journal of The Society of Model and Experimental Engineers may care to look at the splendid Centenary Issue published in January 1998. In this issue is my own photograph of Dr. Geoffrey Smith when he visited Marshall House, SMEE headquarters, with the story and the locomotive LBSC had made for him fifty-four years previously. Also visible in this photograph are Ayesha and Challenger, protagonists of an infamous 'Battle of the Boilers' prompted by a letter from LBSC published 9th February 1922 in Model Engineer. Both 2½ inch gauge designs, Challenger was by Henry Greenly and spirit fired while Ayesha was by LBSC and one of the first coal fired miniature locomotive in this gauge. Much was written about the contest and the outcome was never conclusive, but understandably LBSC claimed his locomotive to be the winner.

It was when my wife, Jean and I visited to borrow Ayesha for that SMEE meeting that we first met Mavis Harriott, LBSC's next door neighbour who has since moved away. We were made very welcome and heard many stories about LBSC that revealed her fondness for him and for Mabel. Mavis took us to view what then remained of the raised track that LBSC called the Polar Route - Purley Oaks Light Railway - on land between the houses and the nearby railway main line.

Visitors to the Polar Route were welcomed by arrangement. Among others, some members of North London SME ran on this raised track. One was Geoff Cashmore, with whom a special friendship developed to the extent that largely due to this friendship LBSC agreed to be Patron of North London SME, a role he held to the end. In 1977, ten years after LBSC's death, Geoff organised a Commemorative Rally at the North London SME tracks involving as many of LBSC's locomotives as could be assembled. A truly memorable event, it was reported in the 16th December 1977 issue of Model Engineer.

It is argued that without LBSC's contribution, the hobby as we know it today would most likely be a pale shadow of what it has become and there would be many fewer clubs and societies. While accepting that there are a few modern critics who may have lost sight of the fact that he was very much a man of his time and that modern equipment, materials, techniques and expectations have advanced beyond imagination, many model engineers - myself included, with his design for Titfield Thunderbolt - became involved in the activity through LBSC's 'Words and Music' as published throughout the years in Model Engineer magazine. Although LBSC and Martin Evans, a later contributor and one time editor of the magazine, never saw eye to

eye, it must be recorded that Martin also published a great many locomotive designs and should share at least some of the accolade for our interest in the hobby.

While he never met his hero, it was as a gesture of gratitude that Geoff Gillett decided to arrange for a plague to be mounted upon the house in which LBSC lived and worked for so many years. Geoff's endeavours required official sanction and he is indebted to Kathy Power of English Heritage for her strict but helpful guidance in this. Geoff also wishes to record his thanks to the present owner of LBSC's house and the folk living in the house next door for their forbearance and friendly cooperation in realising his ambition.

At midday on Saturday 25th April 2015 a small group assembled to watch Mavis Harriott unveil a blue plaque commemorating LBSC's occupation of the property. The



Those able to attend the unveiling of the plaque included members of Sutton MEC as well as Ann Hatherill (third from left). Geoff Gillett and his wife are standing next to Des Adeley (extreme right). Mike Dean (second from left) was a visitor to the Polar Route.

plaque shows LBSC's name as Lillian (Curly) Lawrence. Puzzled readers unfamiliar with the man will learn much from Geoff Johnson's and lan Pollard's diligent research published in the January 2006 issue of *Engineering* in



All that now remains of LBSC's Polar Route on land between the houses and the railway are these concrete posts.

Miniature with the title of 'Who was LBSC?' and to be found with the title 'A Celebration of LBSC' on the club website www.mcsme.co.uk Their studies reveal that LBSC was born William Morris Beniamin on 27th September 1883 at 31 St. Peter's Road, Mile End Old Town. It appears to have been LBSC's own decision to adopt the name Lillian Lawrence some time between 1902 and 1908. In this and a few other details Geoff's and lan's research differs from information published in Brian Hollingsworth's otherwise splendid and comprehensively illustrated biography, LBSC, His Life and Locomotives published in 1982 by Croesor Junction Press, long since out of print and regrettably now very difficult to find.

It was with great regret that as a long standing member of North London SME and brief custodian, following his death, of LBSC's locomotive, Mona, a pressing alternative engagement prevented me from attending the unveiling. I wish to record my thanks to Ann Hatherill of SMEE, Des Adeley of the National 21/2 Inch Gauge Association, Geoff Johnson of Mid-Cheshire SME and, of course, Geoff Gillett of Surrey SME for providing information and photographs for these notes.

ME

The Centaur engine

Dear Diane; For me personally, Mr. McMahons article about his Centaur engine was very fortunate in timing. At the moment I am building a carburettor/mixing valve, originally based on the Centaur pattern which I hope will prove to be the solution to running a small engine on LPG. I had also reached the stage of pondering the relevance of a light spring. Thanks to Mr. McMahon I can forget this and will adopt his modification. Thanks!

There are a few other thoughts about this engine though. The Centaur was designed back in the 1950s as a dual fuel engine, both petrol and our old friend - the very forgiving Coal Gas. There have been a couple of past M.E. articles from builders of this engine who both seem to imply that there was little problem about reliable running on petrol but one had considerable difficulty in steady running with 'gas', whatever that fuel may have meant.

The late professor D. H. Chaddock also thought that the Induction passage on this engine was somewhat larger than really necessary for the swept capacity. As legend has it that this engine was at least partly scaled down from a full sized Gardner engine, perhaps an error did creep in.

Referring again to Mr. McMahon's article there is still one aspect not clear, to me at least. Is his engine running only on petrol or is there also provision for running on some sort of gaseous fuels?

Perhaps I could also offer a couple of comments about Ron Wrights highly interesting articles detailing internal combustion.

The late Edgar T. Westbury carried out a long series of experiments with supercharging model engines and admitted that he was unable to prove any gain in performance with his supercharging efforts. As far as I can recall only one reader submitted an article about a model supercharged engine

Exercise caution with spark plugs

Dear Diane; I am enjoying Ron Wright's series on Internal Combustion Theory and Practice thoroughly. I do hope that he gets it published in a stand-alone form as soon as practicable. One of my reasons, for instance, is that I have now had to explain carburetion to students and to some adults who have been brought up solely on fuel injection.

There is one point in his cylinder condition check (M.E. 2546, p. 575) of which I am somewhat leery. Apart from the risk of getting a shock when removing an elderly plug lead on a running engine, there is possibility of damage to the ignition system when the spark energy cannot follow the normal path through the sparkplug. I was warned about this when electronic ignition systems first appeared. Breakerpoint ignitions are not so susceptible but burned points or a shorted coil are possible. Lastly, care is indicated when dealing with transistorised flywheel magneto systems on equipment like lawn mowers.

To carry out the check I would suggest removing the sparkplug boots and, when replacing, trapping a thin wire between each boot and the upper connection of the spark plug. After bending the wires away, each spark plug can be shorted in turn with another well-insulated wire lead grounded to the engine.

John Bauer Manotick, Ontario, Canada

and that was a two stroke. Sadly this engine seems to have disappeared but may still be 'out there' some where.

Which leads into my submitting a request to Mr. Wright and that is for more details about the combustion process in two strokes. The last published details about this seem to be again those published by E.T.W. in the 1950s and 60s and now well overdue for revision.

Best regards James Wells MRINA

Tender detailing

Dear Diane; although not building a Britannia kit I have found Doug Hewson's articles interesting and helpful in the building of my own locomotive, however with regard to the tender GA appearing in Model Engineer No. 4506 there are a couple of errors. On the Britannias the tender front buffer beam went right up to the coal fall plate, on other BR Standards it stopped short, as shown on Doug's drawing.

Behind the tender spectacle plate on the Driver's side and located on the sloping face of the tank is a rectangular plate held on with several bolts. On Doug's GA this is shown on both sides of the tender; this, in fact, is incorrect and appears on the Driver's side only. I assume the plate gives access to the water level gear since on the locomotive side of this spectacle plate is the tender water level gauge. Both these points can be seen on pictures of the Britannias.

BR added briquette feeders for water softening and I have a photograph of a Britannia tender showing this feature exactly where Doug has drawn it on his GA, however I also have two pictures of tenders showing it diagonally opposite and located near to the tender step and adjacent to the short handrail on the tender top. The fitting of this item seems very arbitrary and it is doubtful if any official information exists on this - so is a case of builder beware.

Regards David Spooner, Worksop

Write to us

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Model Engineer. MyTimeMedia Ltd. Enterprise House, Enterprise Way, Edenbridge, Kent TN8 6HF F. 01689 869 874 E. diane.carnev@

mytimemedia.com

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

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

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Pre-loved machinery? Be very wary ...

Hi Diane; I was wondering if I might appeal to the readership for assistance in a Third World charitable water-aid project I am involved with. Much of the necessary work involves building machinery and my current priority is to obtain donations of surplus/salvaged electrical industrial switchgear for custom machine builds, pump controllers and the like. I would like to find a few 'pointmen' to be my 'eyes and ears' to locate required equipment, probably industrial electricians/ engineers or those working in the salvage/recycling industries, not only in the UK but also the larger European industrialised countries - Germany, France, Switzerland, Holland, etc. Any offers of help would be most gratefully appreciated (contact e-mail, below).

Still on matters electrical, I read Chris Hazel's response (Postbag, Vol. 212, No. 4478) to a reader's correspondence regarding his three phase inverter milling machine conversion and although he light-heartedly says that his completed project may void a few of the stricter industrial safety compliance regulations, there are a few important caveats to that. It is easy to forget (some will disagree!) that we are not immortal. So what happens when we die? Our improvised, converted machine gets flogged off at the next auction or clearance sale to be inherited by the unwitting proud new owner. Now, from what I saw of Chris' original article he struck me as a quite competent installer and (in spite of some of the criticisms) the job was well finished in a workmanlike manner. The problem is that not everyone is like Chris Hazel. There are some unbelievable walking horror stories out there whose weapons of choice are baldfaced ignorance and stupidity. My experience has been that many otherwise competent machinists are completely pig-ignorant when it comes to matters electrical. Many are so blinded by their own

egos that they think they can get away with thumbing their noses at hundreds of amps at mains voltages and undertake whatever mickeymouse lash-up that they can get away with. However, in the real world, if that newly acquired 'ticking time bomb' happens to electrocute the new owner then the seller is up for culpable manslaughter - no longer something to thumb your nose at! Even though we might be dead I am sure that most of us would not want our reputations sullied by being remembered as 'that bl--dv low-life so-and-so that killed that innocent young guy who bought his hand-me-down miller in good faith'.

There is a simple solution: have your solicitor insert into your will a clause to the effect of requiring the estate manager or their appointed agent charged with disposal of the machinery to be under obligation to inform the purchaser that the machinery has been modified and that they should obtain a safety inspection certificate from a suitably experienced and qualified electrical trades worker.

Likewise, when it is you who are the buyer, be suspicious and cynical of assurances of safety and have it independently checked prior to switching on. Something to think about.

I can already hear the armchair critics sniggering 'don't buy dodgy used machines then!' Well, I've got news for the hecklers; you don't have to search long and hard to hear stories of people who have purchased even brand new machines (usually of Far East manufacture) who report 'near death' experiences of earth wires floating free, switches falling apart in normal use, etc.

So what's the lesson? New or old - better to spend a small amount of money having a qualified electrician give the machine a 'once-over' than to incur a whole lot grief later.

Kind Regards, Andre Rousseau, Auckland South, NEW ZEALAND. pyralog@yahoo.co.nz

Predicting the demise of model engineering as we know it

Dear Diane; My concerns below may have been aired before but I have not seen an article pulling together all the current trends in model engineering and predicting the demise of model engineering as it used to be known.

I was fascinated and intrigued by the very interesting article, *The Mastiff Plus* by Mick Knights (*M.E.* 4507) particularly when he describes that the majority of the parts for the first build are CNC based.

Ah! I thought, just buy the billets of aluminium, download and run the G code and out pops the component (crank case etc.). An easy way to make a model with guaranteed accuracy and finish and also to get into CNC at the same time.

Developing this concept a little in my mind I became a bit alarmed as to where model engineering seems to be heading these days.

Almost all the parts of a working model (except perhaps the boiler) can now be created without the builder actually making anything - and I'm not referring to the model kits already available. Imagine this scenario:-

Dennis takes his gleaming brand-new self-built model to the track for it's first steaming.

Spectator: "That's a lovely model, did you build it vourself?"

Dennis replies proudly "Yes and it only took me three weeks"

Spectator: "Those coupling rods are superb - how did you machine those blended curves?"

Dennis: "Oh, I didn't machine those - they came as water-cut parts"

Spectator: "And the cylinder castings - this is an unusual prototype - did you make the pasterns yourself?"

Dennis, proudly: "Yes, I downloaded the RepRap code and printed out the patterns on my 3-D printer"

Spectator: "Well, what about the dome and chimney, did you make those yourself?" Dennis: "Yes, I put a billet of bronze in the CNC mill and then ran the G Code I had downloaded, all on my own"

Spectator: "And the boiler?"
Dennis: "Bought ready made complete with all certification - under the new legislation boilers have to be made by certified and registered boiler makers"

Spectator: "Those tiny bolts in the frame stays look like they are to scale. Are they strong enough for a passenger hauling engine?"

Dennis: "Oh, they are just decorative. The frames are held together with water-cut tabs that slot into holes and then the tabs are welded using TIG."

Spectator: "I suppose the paint job was done by hand, though, seeing as this is a one-off prototype?"

Dennis: "Computergenerated Transfers, actually"

Spectator: "But you said you built this model yourself."

Dennis: "I did. I assembled all the computer-generated components myself"

Can you see where all this is leading?

Model Building Instructions

In the old (e.g. LBSC) days models were built from drawings and instructions (the Words and Music as LBSC used to say). Instructions were 'chuck a piece of ½ inch steel and turn the end down...' and 'put the dome casting in the four jaw chuck and square off the chucking piece...', 'silver solder the crank webs..'

In future models will be built merely from photos and computer generated components:-

Introducing a New Model To Build At Home: the Digital Age Express Locomotive.

Drawings: None - see photos. Instructions: Download the videos.

Castings: None - download and run the RepRap code to make the patterns.

Machining castings:
Download and run the G code
for the CNC mill and lathe.

Flat metal parts: Download the .dxf files and send to the water cutting company.

Painting and finishing: go to the digital transfers website and download the print file to make the transfers on your laser printer.

Model classifications

I fear that modern (or at least near-future) models will be nothing more that metal versions of the old Airfix kits assembled by the builder. Even gluing the parts together is now commonplace instead of silver soldering and press fits.

Do we now have to differentiate (especially for competitions) between 100% scratch-built models and models 'built' from kits of ready-made components and even from models incorporating computergenerated components? There would be too many classifications to keep track of.

Too early yet?

I noted that Mick Knights said he did not intend to provide the G code for The Mastiff Plus. I can understand why; G code is currently sometimes unpredictable and there could be serious implications if a user ran G code prepared by the model publisher and it ran havoc on his milling machine and cause expensive damage. For example, see the article in the same issue of M.E. by Andrew Johnston: Worm Wheel and Worm; Design and Manufacture where the G code radius correction

feature is described 'a bit of a hack'.

Is it a bit premature for the above scenario to happen today? I don't think so. All the technology is there - it just hasn't all been brought together in a single project yet.

Agreed, some of the advanced technology is not as stable as would be required for inexperienced user application. But gradually stability and performance will improve and I can readily foresee the above scenario occurring in my lifetime and I'm no youngster.

Please note that although I do bemoan the de-skilling of traditional workshop practice in model engineering (long gone are the days of cutting out locomotive frames with the hacksaw guided by the top of the vice jaws - a la LBSC - and the chiseling to shape of traction engine spokes as described in the Allchin book by W.J. Hughes), I am not sitting in judgment about how people should build their models.

I am, however, making the point that the meaning of 'Model Engineering' and what actually comprises an engineering model is rapidly changing. The proportion of actual home made content in models should be declared, particularly where competitions are concerned and the judges should take this into account. (This may already be the case.)

Khon Ban Nok, Thailand.

I am grateful to Khno Ban Nok for sharing his thoughts on the future of model engineering. I would like to ask readers to consider the following question and we will publish the best of the responses.

Why is it essential that the ability to make two components fit together perfectly, by human hand alone, is preserved in an age when technology now facilitates machines to ensure perfection, more quickly and, arguably, more efficiently?

In asking this question I am not expressing a view, but am simply intrigued by readers' thoughts on the subject. *Ed.*



Billy Stock drives Roger Holland's LENR/ER A4, Wild Swan.



David Kerry prepares to join the running line with his 9F, Evening Star. (Photo by Dave Roberts.)

Urmston &

Billy Stock organises a three day event.

e so often hear about the ageing population at the average Model Engineering Society. I am delighted to report, however, that at UDMES Ltd there is a young member who has been an inspiration to all since he wandered into the park as a youngster and was captivated by what he saw. Billy Stock has rarely missed a Sunday at the track and, under the guidance of one or two mentors, has completed his first locomotive, become a passed out driver of passenger trains and even competed in IMLEC.

UDMES has provided a public service every single Sunday - summer and winter - for many years. Occasionally the most severe weather has been known to force them all to retreat to the clubhouse but that's a very rare event! For many years the May

Day Bank Holiday weekend was by far the busiest of the year as the park was given over to a steam fair, 'May Day Steam' and the track - a half mile running around the perimeter - hauled thousands of passengers over the three days. Since the demise of May Day Steam, however, the club have held an open day and this year Billy, along with a handful of helpers, decided to make sure it was to be another great success and a hugely enjoyable weekend, indeed visitors came from as far afield as Scotland. As it turned out it became something of a 'big engine' weekend. Unfortunately Saturday's weather was not kind, raining heavily all afternoon, but Sunday and Monday were fair and several of us went home having caught the sun! These few photographs tell some of the story.



What a character! The late Arthur Eve's freelance American engine is now in the care of Keith Tilbury.



No less than four Duchesses! The nearest, Duchess of Sutherland was built by Geoff and Nigel Gregson of Sale in the mid 1990s but had been a glass case model until purchased recently by Jason Pattinson.

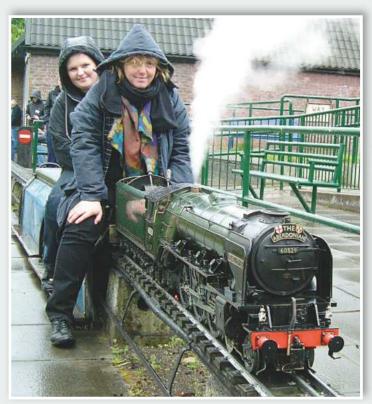


Saturday's overcast skies looked ominous but the turn out was great!



Duchess of Abercorn was the Gregsons' first of five built; this one they kept and ran themselves - the next four were built for customers.

District MES Open Day



Your Editor seems to have drawn the short straw and got the afternoon turn (in the rain!) Loco: 60529 Pearl Diver by Peter Walker. (Photo by Dave Roberts.)



A static display adorns the coal shed.



Young Jeanie Walker (17) prepared and ran her engine unsupervised on a much busier, sunny Bank Holiday Monday.

Garrett 4CD Tractor

Chris Gunn makes the remaining valve gear components.



Continued from p.757 M.E. 4508, 15 May 2015



6 inch scale Garrett 4CD built by Bob Whitehead and presently owned and rallied by Rob Bailey of Rushden.

This article has been written to guide the builder through the construction of the 6 inch scale Garrett 4CD tractor designed by Chris d'Alquen. The writer has previously built a 4 inch scale Garrett and a 6 inch scale Foden wagon so has the benefit of considerable experience in larger scale modelling. Most machining can be done in the average home workshop but the supplier from whom the castings and drawings are currently available is able to provide a machining service for the largest items if required.

Valve gear

Having completed the eccentrics and straps in the last episode, I will continue with the rest of the valve gear parts this time.

I decided to make the expansion links next so I could make sure the eccentric rods would fit when they were made after the links. The drawing of the expansion links is available as part of the set of drawings from A. N. Engineering as usual.

I managed to locate a piece of ½ inch thick gauge plate for the links, split it in two and then marked it out for all the holes. I also put ¹³/₁₆ inch diameter holes at either end of the slot, as the run-out for the die blocks. The holes were all

drilled in the Bridgeport, using the DRO to ensure accuracy. Once the holes were done, the slot was next and this was shown as being set on an 11% inch radius. This was way out of range of my rotary table, but not of the steel plate I have that fits on top (the one I used to assemble the wheels). That said, I could only just squeeze the expansion links on a diagonal and I just had room to tap a couple of holes that were in line with the expansion link pivot holes, to hold the link while I cut the slot.

As the expansion links were rectangular at this stage, this made setting up a little easier. I could set the centreline of the blank on the diagonal

centreline of the plate and set it at the right radius and then it was easy to spot through the expansion link pivot holes and bolt the link to the corner of the plate. I moved the table so the slightly undersize sharp cutter was on the centreline and started machining the slot in 1/16 inch steps.

I tightened everything up as much as possible, used plenty of suds and it went better than I thought, with minimal chatter. When I was through I could move the table up a few thou in each direction and clean up the edges of the slot to size, taking care to cut against the direction of rotation of the cutter. The DRO came in handy here, as I noted the amount

Drawings, castings and machining services are available from A. N. Engineering: Email: a.nutting@hotmail.co.uk

I moved the table, so I could use the same settings for the second one (photo 125).

Once the slots had been cut, the two blanks were held together in the vice and the height reduced. I had deliberately left the blanks well over size so there was plenty to get hold of if needed during the cutting of the slot (photo 126).

The links were returned to the rotary table again, with the minimum amount of metal to be removed to generate the radius, using exactly the same set-up, only this time the back of the link was radiused (photo 127).

The rest of the profile of the links were then milled out. holding them vertically in the vice and the oil holes drilled.

I made the die blocks from a high tech Tufnol like material, made from textiles impregnated with a lubricant, called Orkot. I had used this at work as guide blocks fitted to a fast moving chain. Everything else we used did not stand up to the wear until we used the Orkot. I felt if it was good enough for that application, it was good enough for this one. I had used this on my 4 inch Garrett and it was still as new after 10 years. I was lucky - I had taken a scrap component home about 15 years ago whilst still working and now its time had come. I was just able to get a piece big enough for the two die blocks, so that was drilled and sawn to shape with a hacksaw and finished with a file. I did not need to harden the expansion link as I was using this material, although I was conscious that a hardened link would mean it would not wear around the pin holes. As I write this, the link remains unhardened but that may change on final assembly.

Next came the four eccentric rods: the Tee ends of the rods had already been made and attached to the eccentric straps. For the main part of the rod, I had some 1 x ¾ inch bright bar to use, so cut four pieces slightly over long to allow for the bends in some of the rods. These were then drilled with not only the pivot hole being put in, but also holes at the bottom of



Cutting the slot in the expansion link.



Profiling an expansion link.



The completed lifting links.

the fork and on the outside of the fork, which would become a precise radius between the fork end and the main part of the rod. Once the holes were done, the blanks were held in the vice on the Bridgeport and the fork end machined out down to the cross hole, using the expansion link as a gauge. I made sure the slot was deep enough to allow the pivot pins to go in and the rod swivel enough to cope with the expected movement in service. The rods were turned through 90 degrees in the vice and the bulk of the material machined away to leave the rod. As expected the back of the rod had a bend in it as the stresses in the bar were relieved.



bin marked 'Happy drilling jigs'. I stayed with links and did the lifting links next. These too were

for split pins. I keep the jigs in a

jigs'. After a comment from my

plastic bin labelled 'Cross drilling

grandchildren, I now also have a



Milling down an expansion link.



Machining the lifting links.



The completed lifting link levers.

made from bar stock, the holes drilled in the Bridgeport using the DRO to make sure all the hole centres were exactly the same, which is important with these parts. Then the waste was milled away (photo 128).

The upstanding bosses on each end of the lifting links were rounded on the rotary table and finished off on the linisher. Photograph 129 shows the completed lifting links.

The lifting link levers were next, also shown on the same drawing as the lifting links. Four levers were made to finish up as two pairs of forked levers. These were made from the solid in the same way as the lifting links (photo 130).



Machining a radius in the reversing lever.



The remainder of the valve gear was completed at this stage. One more lever was required, which was more difficult to make as it has a severe off-set in it over a short centre distance. I decided to make this in two pieces. One was the boss at the big end - a simple turning job which was made first - and the other was the lever with the bend in it. This part is crying out to be made from a casting but as none was on offer (probably as making a pattern would not be very easy either) it had to be fabricated.

I took a piece of bright bar, the correct thickness for the small boss, and thinned the bulk of it down leaving just a rectangle where the boss would finish up. I drilled the hole in the boss and then tapered the sides. The next step was to put the severe bend in the lever so I heated it up to red heat and beat the bend into it. I had to have several goes at it to get it right but I was pleased with the result. Once I had got the right off-set in the blank, the next step was to mark out the position of the large boss at the correct centres. Once this was completed I had to hold the bent lever to cut the radius for the boss. I did not have a lot to hold onto now the sides of the lever were tapered. However I did not have much choice in the matter as I felt



Profiling the lifting lever.

I felt it would be easier to make
the shaft of the valve rod fit the bore
of the guide, rather than the other way
round, especially as the valve guides
were to be made from bronze.



The completed reversing lever.

that bending the flat bar with the equipment I had would have been a problem.

In the end I held the lever down onto the table of the Bridgeport with a bolt through the hole in the small boss, set a jack under the big end and put a clamp over that. I was still not happy the lever would stay put under the interrupted cut when I cut the radius with a boring bar. I decided to clamp a couple of pieces of round bar either side of the lever to stop the lever moving sideways (photo 131).

The radius was cut with a boring bar. I gradually

increased the diameter of the cut until the radius matched that of the boss and then advanced the table until the radius was in the right position to give the correct centres (photo 132). Once I had finished off the cutting of the radius in the lever end, I set the lever and the loose boss up on a piece of plate, holding the parts with bolts through the bosses, thus holding both bosses parallel. The boss was then welded.

All that remained was to finish off the small boss so I made a suitable centre pin to locate the small end on the centre of the rotary table and clamped the lever onto it. I centred the table in relation to the spindle and took the waste material from the lever end and also machined the boss round as well (photo 133). Photograph 134 shows the finished lever.

The drawing called for a % inch diameter lifting link shaft and I was lucky enough to find a bit of % inch material so it was a moment's work to cut this to length and face off the ends.

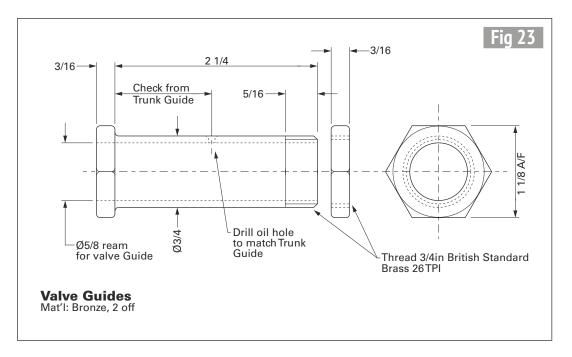
I also needed to make a reach rod to connect the

reversing stand lever but this could only be completed when the tender was fitted and the cylinder block fitted. The drawing shows a machined clevis at each end of the rod, but a more practical method of building the rod is to make the clevis from a pair of straps to go either side of the lever, bolted through the reach rod. I had some stainless steel strip earmarked for this, (of unknown provenance), so these were drilled with my drill running at a slow speed, as I already knew the hard way that running the drill fast and un-lubricated would burn the drill tip out. I made a suitable shouldered pin to suit. The finished clevis can be seen in photo 131.

I then carried on with the rest of the valve gear parts, as well as the valves themselves.

I decided to start with the valve guides so I could make the valve operating clevis a good fit in the guides. I felt it would be easier to make the shaft of the valve rod fit the bore of the guide, rather than the other way round, especially as the valve guides were to be made from bronze. The drawing of the trunk guides shows the valve guides and some of the dimensions, so for clarity I have produced a detail drawing of the valve guides as shown in fig 23.

It should be noted that this is my interpretation of the assembly drawing and also takes into account the tooling I had available for the threads. The valve guides fit inside the valve guide boss on the outside of each trunk guide. This is drilled with a 1/8 inch hole, which is 1/8 inch bigger than the outside diameter of the bronze valve rod guide and this difference allows the guide to be moved around within the boss and exactly aligned with the valve rod. This way the alignment can be spot on, yet allow the individual components to be machined without worrying about trying to get them exactly in line which would not be an easy task bearing in mind all the variables involved.



I needed some good chunks of 1.5 inch AF bronze hexagon from which to machine these but I could not find a suitable bar end at my local non ferrous stockist. I managed to find, however, an off-cut of round bronze from which I could get the hexagon. It was not difficult to make a choice between buying a full bar of hexagon, or buying a short piece of round and machining the hexagon on one end.

The valve guides consist of what looks like a bronze nut and bolt, with a hollow shank, in which the valve rod slides. I needed a large fine thread on the nut and bolt and I had a carbon steel ¾ inch BSB tap and a die I had used just once before. It is always advisable to use a new or newly sharpened cutter when machining bronze as it will snatch at any opportunity. I felt the tap and die would be suitable having only been used the once.

I decided to turn the shank of the 'bolt' first and cut a piece of bronze long enough to make it and a nut as well - and enough for the parting tool. This was centred and a live centre used to support the shank whilst it was turned down to the right diameter for the thread using a new tip edge in my knife tool. The partly worn edge of the tip can be reused again on some more forgiving material if not totally

worn. I only ditch the tips when they are well worn, or chipped.

Once the shank of the bolt was down to ¾ inch diameter, I cut the thread, then removed the 'bolt' and put it in the chuck of my spin indexer mounted on the Bridgeport. I marked the graduations for six divisions and then cut the hexagon on the 'bolt' (photo 135).

Once the hexagon was cut, the bolt was returned to the lathe and carefully drilled with a ¾ BSP tapping drill, just deep enough to take the hole to the centre of where I would part off the nut to go with the bolt. The hole was tapped and then the nut was parted off, using my rear tool post. This left sufficient material on the bolt to be faced off and cleaned up leaving no remnant

of a hole. Next I could drill and ream the hole through the bolt starting afresh. Doing it this way round meant every hole was drilled in virgin material and I did not have to drill one size and then open up the hole with a second drill for as sure as anything, the second drill will snatch and dig in. Once drilled 39/64 inch the hole was reamed. It was hard work reaming the hole 5% inch diameter for the valve rod clevis, as I did not have a new reamer, so I just had to take it steady with plenty of coolant and I got them both done. All that remained was to drill an oil hole in the 'bolt', to line up with the oil hole in the trunk quide boss.

■To be continued.



Milling the hexagon on the valve guide head.



Roy Simmons' Canadian Switcher. (Photo courtesy of Gerald Chandler.)

and preparations were well

Geoff **Theasby** reports on the latest news from the Clubs.

new company called Deciwatt is manufacturing a lamp powered by gravity. Sold for £5 in the Third World, it generates power for a high-brightness light emitting diode by using a descending weight. It is estimated that it will save its purchase price within three months by reducing the use of paraffin (Kerosene), limiting CO2 emissions, cutting poisonous fumes by the equivalent of smoking 40 cigarettes fewer a day and reduces the great fire risks. It takes seconds to wind up and gives 30 minutes light. Despite an internet search, there seems to be no mention anywhere of Trevor Bayliss and his clockwork radio, which must surely have inspired it. One source said that paraffin was a biomass fuel, which it isn't, of course: it's a fossil fuel, derived from petroleum. I wonder if the writer was thinking of Methanol (wood alcohol) but that is not an 'illuminating oil', i.e. its flame emits little visible light. http://en.wikipedia.org/wiki/ GravityLight

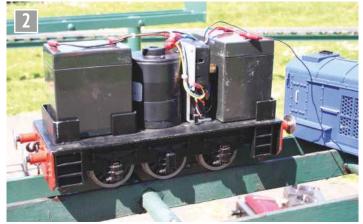
All this talk of drones, under direct control or autonomous, has thrown up the information that the Royal Navy is thinking of sea-going drones, for oceanographic surveying, enemy surveillance, etc. Having no crew means needing no space for sleeping, eating, food stocks and so on, meaning they could be small, which reduces power requirements, and/or extends mission endurance. Running on fuel cells, or solar power, they could be at sea for months. Also, in another thought about autonomous fighting robots, no-one has mentioned the unpredictable results if they are damaged but still functional in some way. How could we then rely on their integrity, or likelihood to fire off armaments unpredictably, even if there are safeguards built in during design and construction?

In this issue: a rolling road, mouldiwarp, expanding the Navv. Lignum Vitae, more on the modern Royal Navy and repainting locomotives, or not.

The theme this time is Gauge 3, or 21/2 inch gauge railways. As we get older, we can still lift these models, which may explain the growing interest in this standard. I received, by post, on the very same day, the newsletters of both the UK societies involved, so, selected entirely at random, we begin with Steam Chest, April, the Journal of the National 21/2 inch gauge Association, which has commissioned a special mug to celebrate their 40th year. A rally was to have been held on May 17th at Cheltenham SME

in hand at the time of writing. (We will have a report in due course; Ed.) The Association stood at the Large Scale Model Railway exhibition, at which they discovered how many people are 'out there' with 21/2 inch gauge models who are members of neither the Association or the Gauge 3 Society. Time for some recruitment! Gerry Ackroyd designed and built his own rolling road and finds it invaluable for tuning a model, learning how to run it and checking that everything works properly before taking it to a rally. Martin Barker continues his series on locomotive liveries. concentrating on military examples. Barry Purchase writes on the Westland & Yeovil DMES 'Toby' project, whilst Tim Smith reviews J. Koopmans' The Fire Burns Much Better, the development of the locomotive blast pipe from Trevithick to Porta and John Baguley describes making your own nameplates. Finally, Editor, Gerald Chandler describes the Canadian Switcher, which first appeared in M.E. in 1929, designed by Percy Hunt. Photograph 1 shows the late Roy Simmons' example, of Bristol SMEE, as shown at the Spring Rally at Cheltenham in 2009, although built 30 years before. For those who have never seen inside an electrically-powered model, this picture reveals the innards of Dave White's shunter. Plenty of adhesion there! (photo 2). W. www.n25ga.org.uk

Ryedale Society of Model Engineers have been mole



Inside Dave White's shunter. (Photo courtesy of Gerald Chandler.)

hunting. (Estimated UK population is 30 million.) Having caught many of the 'little gentlemen in black velvet', members were encouraged to rampage about in their cars in order to crush the tunnels in a bid to discourage any new tenants. One of the points mechanism and switchgear enclosures was found to be full of earth. Hmmm, further work needed. The yellow lines were renewed by Editor, Bill Putman, who found that the ground is now further away than it was when he last did the job and people ignore them anyway...

W. www.rsme.org.uk

Bradford Model
Engineering Society has
incoming President Jim
Jennings remembering
traversing the 1863-built
Highland Railway line
approaching Kingussie at 100
mph in a HST. Not bad for a
Victorian railway! Much of this
issue is taken up with AGM
reports.

W. www.bradfordmes.co.uk

The Society of Model & Experimental Engineers' Journal, April, begins with a picture of Mike Law being awarded the Kennion Shield by the Society for his service in helping to organise the MEX at Sandown Park. Much of this issue too was taken up with reports for and of, the AGM and introduces new Editor, Graeme Walker. A. B. Lyre discusses some



Dean Armstrong class by Dave Baker. (Photo courtesy of Ted Sadler.)

proposals to assist the shrinking armed forces by recommissioning HMS Belfast and HMS Warrior. The Green lobby suggests retaining the masts and sails of the latter... There are, as yet, no plans for HMS Victory or the Mary Rose. (Pity HMS Plymouth has just been scrapped! - Geoff) Furthermore, old vehicles and other oncesurplus equipment could be repossessed. Needless to say, an immense bureaucracy will be established to process this materiel. Tony Deller describes the wheel balancing necessary on his 31/2 inch gauge Schools locomotive. Neil Read describes his multipurpose (at least 15) tool, which folds up into a very compact space. Jim Cahill expresses forthright views on metrication, including suggesting that it was perhaps fortunate that the ship taking the physical metric standards from France to America foundered on the way. This

may be proof that 'there is a God'. Joerg Hugel shows how to calculate the strength of the Earth's magnetic field with the aid of two £1 coins and some fearful mathematics. A lecture on Lighthouses and the Fresnel lens was scheduled for 2 May. (Milton Jones said that his father used to be a lighthouse keeper but was sacked because he insisted on unplugging everything before going to bed.) The latest addition to the SMEE collection is a differential engine made by Robert Dunn. Finally, the new website should now be operational.

W. www.sm-ee.co.uk

The Newsletter, Spring, from the Gauge 3 Society, proclaims '25 years, 100 issues, not out!' New Chairman, Roy Horrocks reviewed the February AGM and exhibitors. This GWR Dean Armstrong class was built by Dave Baker (photo 3). Ted Sadler explained the current boiler testing requirements. Robert Miller's

G3 garden railway is nearing completion. Like the Great Central, it has had to be threaded in, through, below and between the other lines already there. Peter Lucas compares three radio control products, all designed for railway use. Charles Horsey has collected a number of G3 Metropolitan Railway locomotives, carriages and wagons, originally built from card, wood and metal by former Met apprentice Cliff Baker. This Westinghouse 'Camelback' of 1906 took my eye (photo 4). Dave Lowe scratch-builds the 1940s 'Terrible Twins', LMS diesels 10000 and 10001 and Bridget Jones discusses her and partner David's outdoor railway at Waikawa in NZ, 'building a viaduct'. Also included is this photograph of which little is known, apart from the fact that it was taken at SPUR 2 in Germany but it does make you look twice (photo 5)!

W. www.gauge3.org.uk



Metropolitan Railway 'Camelback' by Cliff Baker. (Photo courtesy of lan Turner.)



At SPUR 2 in Germany. (Photo courtesy of Thomas Muth.)

The Link, April/May, from **Ottawa Valley Live Steamers** and Model Engineers, says the club has received an invitation to attend the 50th Anniversary celebrations of Quebec Model Railroad Society, who have 2400 feet of 71/4 inch gauge track. A nearby motel is recommended and the point is made that the manager speaks English! (Zut Alors! - Geoff.) Editor, Graham Copley writes a short item on whether a messy workbench is a productive workbench, with two photo examples. Discuss. David Havman designs the tender tank of his 71/4 inch gauge switcher.

W. www.trainweb.org/ovlsme

Coate Express, April, from North Wilts Model Engineering Society, proves that Spring is here, with a good photograph of a nice shiny diesel outline locomotive almost obscured by a bunch of well-developed daffodils. The society will celebrate its 50th Anniversary on June 20th, although there is no written evidence to confirm when it started. However the current club track was officially opened in 1966 by the then Mayor. A collage of photographs contains one of a Fairford Queen adjacent to an anonymous locomotive and another young lady adjacent to not very much at all! Churchward's only Pacific, The Great Bear is described and then the use of Lignum Vitae as a bearing material. A humorous article on the new Type 45 destroyers for the Royal Navy explains that they conform to the latest health & safety standards, including disabled access to the crow's nest and ammunition replaced with paintballs, they conform to the latest directives on race, gender, sexual preference and disability and there will be a Maternity suite and a Gay Disco. ("Bonjour marin.") Saluting has been abolished as elitist and all crew will be permitted to grow beards, including women. A new 'non-specific' flag will replace the White Ensign, which is deemed offensive to



Restored r/c German tanks at Birmingham SME. (Photo courtesy of Jon Williams.)

minorities. There is much more in this vein. Excellent!

W. www.nwmes.co.uk

Stockholes Farm Miniature Railway Newsletter, March, says that currently, ten locomotives are in progress, of which six are new-builds. This is very satisfying considering how few members live locally. The goods line is almost complete, after which there will be three independent circuits to use.

W. www.sfmr.co.uk

The Prospectus, April, from **Reading Society of Model** Engineers starts with a picture of D49 4-4-0 Morayshire, which is about to be withdrawn for overhaul. Member Mike Sinclair also has a 5 inch gauge D49 model undergoing the same experience. '61249' relates that, in 1990, on the personal instruction of his CME, on the 'big railway', he had to ensure that all locomotives had to bear the same livery, according to the corporate design manual. There was no money to actually paint anything so action was limited to agreeing that the overhaul specifications included repainting as required. By the Millennium, little had happened and some 20 liveries were still visible from his office in Derby. Rob Denton writes on the LNER B17 class, whilst Mike Burke tells of taking three locomotives from Cambridge to Southall, with no BR crew!

(Not strictly true but it sounds good. As Traction Inspector he was qualified to do it and no-one ever asked how they got there.) A similar thing happened when taking a BR Standard 2-6-4 tank from Didcot to Southall. Member Fred Few was 90 in March. Well done. Sirl.

W. www.rsme.co.uk
Birmingham Society

of Model Engineers says that April's here. (She'll be in the clubhouse in the afternoon.) Meanwhile, the February/March Newsletter offers, 'Ships, tanks and tools - No trains!' but only insofar as applies to a display of members' work at a February meeting. Jon Williams is beginning his 14th year as Editor and has lost none of his sense of humour. Don Cooper gave a very interesting, illustrated talk on nuclear submarines, although constrained as you may imagine from giving full details. (He works in that field at Rolls-Royce in Derby.) The latest design of reactor does not need refuelling in its entire service life. Jon and Russell Henn have each restored a German WWII model r/c tank to working order. Jon's to 1945, battle-weary condition (photo 6). Fred Roberts of G1MRA found some photographs of BSME activities at their previous track in 1951/2. Jon

also reminds us that LittleLEC will take place at Fareham MES on June 27/28th.

W. www.birminghamsme.com

Bournemouth & District Society of Model Engineers' **B&DSME** News. advises that Guildford MFS will run a Southern Railway locomotive rally on 30th May, as it is some time since the last one took place. Sadly, I could not advise this earlier, I hope it went well. Paul Martin has recently discovered the Rowland Emett Society. They held an exhibition in Birmingham in 2014, lasting four months and displaying some of his remaining machines and many cartoons. www.rowlandemett.com

Hereford SME Summer rally is on June 20/21st, at the Broomy Hill Railway.

W. www.littledown railway.co.uk

And, that's it. Another masterpiece put to bed. As Pippa said, (Not THAT Pippa!) 'God's in his heaven and all's right with the world'.

And finally, From the BBC website, via The News Quiz on Radio 4. 'Due to bad weather, the Isle of Man ferry will not operate on Saturday. A replacement bus service will be provided'.

Contact:

geofftheasby@gmail.com

RY DIARY DIA

JUNE

- 10 St. Albans DMES.
 Richard Thomas:
 Topic to be confirmed.
 Contact Roy Verden:
 01923 220590.
- 11 Worthing & District SME. Councillor Vicky Vaughan. 7.30pm. Contact Ian Aitken: 07500 611166.
- **Sutton MEC.** Club Night: First aid. Contact
 Jo Milan: 01737 352686.
- 13 Cardiff MES. Steam up/ Family/ visiting engines day - no public running. Contact Rob Matthews: 02920 255000.
- Chesterfield & District MES. Efficiency Trials. Contact Mike Rhodes: 01623 648676.
- 13/14 East Somerset SMEE.
 Public running at the
 Classic Car Show.
 Contact Roy Lipscombe:
 01761 414357.
- 13 Frimley & Ascot LC.
 Public running for Air
 Ambulance charity.
 Contact John Evans:
 01276 34970.

13/14 Saffron Walden DSME.

Public running. Contact Jack Setterfield: 01843 852165.

- 13 SMEE. Polly
 Course Day 2.
 Contact Peter Haycock:
 01442 266050.
- 13 York City & DSME. Summer meeting. Contact Bob Polley: 01653 618324.
- 14 Bedford MES.
 Club running.
 Contact Alan Beard:
 01234 301867.
- 14 Bracknell Railway
 Society. Public running
 at Jocks Lane,
 Bracknell, 2.30 5pm.
 Contact Paul Archer:
 07543 679256.
- 14 Grimsby & Cleethorpes MES. Public running, noon 4pm. Waltham Windmill site.
 Contact Dave Smith: 01507 605901.

- 14 Harlington LS. Public running, 2 5pm.
 Contact Peter Tarrant: 01895 851168.
- 14 Sutton MEC. Track day from noon. Contact Jo Milan: 01737 352686.
- 15 Lancaster &
 Morecambe MES.
 Informal meeting.
 Contact Mike Glegg:
 01995 606767.
 - 5 Peterborough SME.
 Brian Fosh: Vintage
 Motorcycles. Contact
 Terry Midgley:
 01733 348385.
- 16 Chesterfield & District MES. Meeting with talk. Contact Mike Rhodes: 01623 648676.
- 16 Grimsby & Cleethorpes
 MES. Monthly meeting,
 7.30 at Hartley Lodge.
 Contact Dave Smith:
 01507 605901.
- 17 Leeds SMEE.

Mid summer steam up, 12.30 until late. Contact Geoff Shackleton: 01977 798138.

- 17 Salisbury DMES.
 George Ray: Stroudley
 and his Terriers. Contact
 Jonathan Maxwell:
 01722 320848.
- 18 East Somerset SMEE.
 Club Night at member's home track. Contact
 Roy Lipscombe:
 01761 414357.
- Sutton MEC. New driver training from 18.30.
 Contact Jo Milan:
 01737 352686.
- 18 Warrington DMES.

 Natter night. Contact
 Duncan Webster:
 01925 262525.
- 19 Rochdale SMEE. Bob Hill: Model Trams. Castleton Community Centre, 7pm. Contact Len Uff: 0161 928 5012.

19/20 Romford MEC.

Trackside afternoon/maintenance.
Contact Colin Hunt: 01708 709302.

19 Stockport DSME. Track Night, Contact

Track Night. Contact Dave Waggett: 0161 430 8963.

Bradford MES.
Open Day. All welcome.

Open Day. All welcome. Contact Kevin Smith: 07533 316341.

- 20 Chesterfield & District MES. Public running at Hady Hill. Contact Mike Rhodes: 01623 648676.
- 20 Harlington LS.
 Club Open Day
 (no public running).
 Contact Peter Tarrant:
 01895 851168.
- 20/21 Saffron Walden DSME.
 Public running. Contact
 Jack Setterfield:
 01843 852165.
- 20 SMEE. Digital
 Workshop Group.
 Contact Peter Haycock:
 01442 266050.
- 21 Grimsby & Cleethorpes
 MES. Public running,
 noon 4pm. Waltham
 Windmill site.
 Contact Dave Smith:
 01507 605901.
- 21 Chichester DSME.

 'Steam on Sunday' at the
 Blackberry Lane track.
 2pm 5pm. Contact
 Ben Ernshaw-Mansell:
 01243 773451.
- 21 Frimley & Ascot LC. Special club running. Contact John Evans: 01276 34970.
- 21 Oxford (City of) SME.
 Charity Day at the track.
 Contact: secretary@
 cosme.org.uk
- 21 Plymouth MSLS. Public running at Goodwin Park. Contact Malcolm Preen: 01752 778083.
- 21 Rugby MES. Public running at Rainsbrook Valley Rly., 2 5pm. Contact Ken Eyre: 01788 842709.
- 21 Warrington DMES.
 Running day. Contact
 Duncan Webster:
 01925 262525.

- 21 Welling DMES.
 Public Running 2 5pm.
 (Behind Falconwood
 Elec Sub stn.) Contact
 Martin Thompson:
- 01689 851413.

 York City & DSME.
 Special running day
 & Exhibition of Nonrailway Models.
 Contact Bob Polley:
 01653 618324.
- 25 Sutton MEC. Afternoon running from noon and chat night. Contact Jo Milan: 01737 352686.
- 25 Worthing & District SME. Club meet with Fish & Chips. Contact Ian Aitken: 07500 611166.
- 28 Cardiff MES. Public running, 1 5pm.
 Contact Rob Matthews: 02920 255000.
- 28 Chesterfield & District MES. Public running at Hady Hill. Contact Mike Rhodes: 01623 648676.
- 28 Grimsby & Cleethorpes MES. Public running, noon 4pm. Waltham Windmill site.
 Contact Dave Smith: 01507 605901.
- 28 Harlington LS.
 Public running (Teddy
 Bears' Picnic), 2 5pm.
 Contact Peter Tarrant:
 01895 851168.
- 28 Leeds SMEE.
 Public running at
 Eggborough Track,
 from 10am. Contact
 Geoff Shackleton:
 01977 798138.
- 27/28 Saffron Walden DSME.
 Public running. Contact
 Jack Setterfield:
 01843 852165.
- 28 Worthing & District SME. Public Running, 2 - 5pm. Contact Ian Aitken: 07500 611166.
- Chesterfield & District MES. Members' evening running.
 Contact Mike Rhodes: 01623 648676.

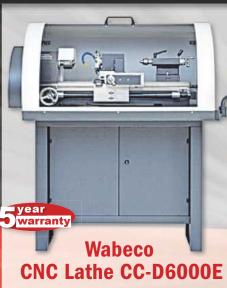
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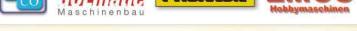
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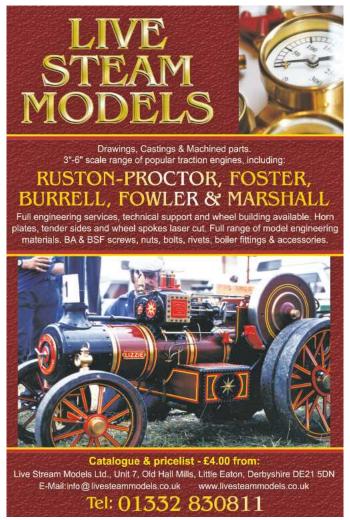


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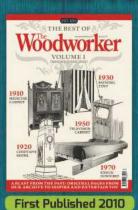




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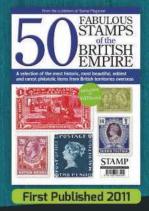


















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to end of handle grips	
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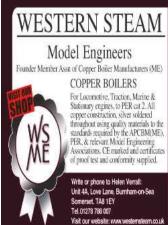


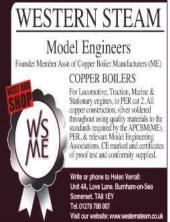
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