THE ORIGINAL MAGAZINE FOR MODEL ENGINEERS

Vol. 224 No. 4632 • 14 - 27 February 2020

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PC40	3.5HP	20Amps	£269.00	£322.80
PC60	5.5HP	32Amps	£319.00	£382.80

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- Efficient inverter technology
- Variable output current

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MODEL	MIN/MAX OUTPUT CURRENT	ELECTRODE DIA. (mm)	EXC. VAT	INC. VAT
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MMA140	20A-140A	1.6-3.2	£119.00	£142.80
MMA200	20A-200A	1.6-4.0	£159.00	£190.80
AT133	10A-130A	2.5/3.2	£129.98	£155.98
AT135	10A-130A	2.5/3.2	£169.98	£203.98
AT162	10A-160A	2.5/3.2/4.0	£149.98	£179.98
AT165	10A-160A	2.5/3.2/4.0	£199.98	£239.98

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Devil 4000	131kW	£429.00	£514.80

Clarke MILLING DRILLING MACHINE - CMD300

- Bench mountable, tilts 45° left & right from vertical
- Table travel 100x235mm
- Table Effective Size LxW: 92 x 400mm

CMD10

£599.00 EXC.VAT £718.80 INC.VAT

Clarke MICRO MILLING & DRILLING MACHINE

- Bench mountable
- MT2 Spindle Taper
- Face mill capacity 20mm, end mill 10mm
- Table cross travel 90mm, longitudinal travel 180mm

£399.00 EXC.VAT £478.80 INC.VAT

MODEL	MOTOR	SPINDLE SPEED	EXC.VAT	INC.VAT
CMD10	150W/230V	100-2000rpm	£399.00	£478.80
CMD300	470W/230V	0-2500rpm	£599.00	£718.80

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CV100B	100mm	Fixed	£20.99	£25.19
CVR100B	100mm	Swivel	£24.99	£29.99
CV125B	125mm	Fixed	£31.99	£38.39
CVR125B	125mm	Swivel	£36.99	£44.39
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CMV140	140mm	Swivel	£79.98	£95.98

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CDP202B	450 / 16	£189.00	£226.80
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7/250	2 HP	7	24ltr	£94.99	£113.99
11/260 NEW	2.5HP	9.5	24ltr	£109.98	£131.98
8/550 NEW	2HP	7.5	50ltr	£119.98	£143.98
11/550 NEW	2.5HP	9.5	50ltr	£139.98	£167.98
16/510	3 HP	14.5	50ltr	£209.00	£250.80
16/1010*	3 HP	14.5	100ltr	£259.98	£311.98

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BEST SELLER

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DEVIL 6003

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DEVIL 7003	230V	3	£59.98	£71.98
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DEVIL 7005	400V	5	£84.99	£101.99
DEVIL 6009	400V	4.5-9	£109.00	£130.80
DEVIL 6015	400V	5-10-15	£169.00	£202.80
DEVIL 7015	400V	15	£199.98	£239.98

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SBR760	760mm (30")	£529.00	£634.80

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3/4	4 pole	£79.98	£95.98
1	2 pole	£79.98	£95.98
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3	2 pole	£119.98	£143.98
4	2 pole	£139.98	£167.98

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MODEL	DESCRIPTION	EXC.VAT	INC.VAT
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CM180	0-25mm Micrometer	£10.99	£13.19
CM145	150mm/6" Digital Vernier	£17.99	£21.59
CM265	300mm/12" Digital Vernier	£34.99	£41.99

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CFC1000LR	1 ton long reach	£219.00	£262.80

BEST SELLER

- Folding and fixed frames available
- Robust, rugged construction
- Overload safety valve

CFC100

Clarke HYDRAULIC LIFTING TABLES

- Ideal for lifting & moving models
- Foot pedal operated

HTL500

FROM ONLY £299.00 EXC.VAT £358.80 INC.VAT

MODEL	MAX. LOAD	TABLE HEIGHT MIN-MAX	EXC. VAT	INC. VAT
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HTL500	500kg	340-900mm	£319.00	£382.80

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CBG6RZ	PRO	150mm	£42.99	£51.59
CBG6RSC	HD	150mm	£54.99	£65.99
CBG6SB#	PRO	150mm	£56.99	£68.39
CBG6RWC	HD	150mm	£59.98	£71.98
CBG8W* (wet)	HD	150/200mm	£58.99	£70.79

Clarke ROTARY TOOL KIT

FROM ONLY £29.98 EXC.VAT £35.98 INC.VAT

Kit includes: • Height adjustable stand with clamp • Rotary tool • 1m flexible drive • 40x accessories/consumables

CRT40

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IN THIS ISSUE

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ON THE COVER...

One of the boilers for Martin Ranson's pair of 32mm 'pepperpot' locomotives (photograph Martin Ranson).

THE MOST VERSATILE TOOL FOR TURNING & FACING

It's easy to see why our best selling turning tool is the SCLCR. It can turn and face a bar without altering the toolpost, and the 80° nose angle gives much more strength than a 60° (triangular) insert. The NJ17 insert cuts steel, stainless, cast iron, phosphor bronze, aluminium, copper, brass etc. Please state shank size required - 8, 10 or 12mm square. Spare inserts £6.94 each for 8-10mm tools, £8.11 for 12mm.

SPECIAL OFFER PRICE £20.00

USE THE OTHER 2 CORNERS FOR ECONOMY!

Our SCRCR rough turning tool uses the same inserts as the SCLCR tools above. The good news is that it uses the other two corners! These very strong 100° corners are rigid enough for rough or intermittent turning. The insert is mounted at 75° to the lathe axis. 10mm sq section (for CCMT06 insert) and 12mm section (for CCMT09 insert).

SPECIAL OFFER PRICE £31.90

PROFILING WHEELS or SHAPING AXLES & PILLARS?

If you need to create complex shapes, our SRDCN button tool is invaluable. The 10mm square shank holds a 5mm dia cutting insert, and gives great versatility, superb strength and excellent tool life. The late Mr D Hudson of Bromsgrove SME used these tools for many years to profile the special form of tyre treads for his self-steering wheel sets with great consistency. Spare inserts just £5.87 each.

SPECIAL OFFER PRICE £34.00

TURN SMALL DIAMETERS with LIVE CENTRE IN PLACE!

The SDJCR tool uses a 55° insert, allowing access to small diameter components when using a tailstock centre. It can also profile back-angles. The NJ17 insert cuts steel, stainless, cast iron, phosphor bronze, brass, copper, aluminium etc. Shank size 8mm or 10mm square section. Spare inserts just £6.94 each.

SPECIAL OFFER PRICE £20.00

A TOP QUALITY BORING BAR FOR YOUR LATHE

Bar Dia.	Min Bore
8 mm	10 mm
10 mm	12 mm
12 mm	16 mm

Here's your chance to own a top quality boring bar which uses our standard CCMT06 insert. Steel shank bars can generally bore to a length of approx 5 times their diameter. Please state bar dia required - 8, 10 or 12mm. Spare inserts just £6.94 each.

SPECIAL OFFER PRICE £20.00 ea or buy all 3 sizes for just £55.00!

INTRODUCING THE GROUNDBREAKING NEW KIT-QD PARTING TOOL!

The new and innovative KIT-QD parting tool has a more secure insert location, stronger body and improved insert design compared to the original KIT-Q-CUT. It has an increased maximum reach of 23mm, giving over 1.3/4" parting capacity in solid bar. As previously, the tool fits the vast majority of ME lathes, including ML7 & ML10 machines, regardless of toolpost type. It comes complete with the key to locate and eject the tough, wear resistant insert. Cuts virtually all materials. Spare inserts just £11.07 each.

SPECIAL OFFER PRICE £69.50

EXTERNAL THREADCUTTING TOOL

These tools use the industry standard 16mm 'laydown' 3-edge inserts. With tough, tungsten carbide inserts, coated with TiAlN for wear resistance and smooth cutting, threads can be cut at very slow speeds if required. Tools are right hand as shown. 55° or 60° insert not included - order separately at £5.65. See our website for more info.

SPECIAL OFFER PRICE £36.50

INTERNAL THREADCUTTING TOOL

These tools use the industry standard 11mm 'laydown' 3-edge inserts. With tough, TiAlN coated tungsten carbide inserts, quality threads can be cut with ease. Tools are right hand as in picture. 10, 12 and 16mm dia's available. 55° or 60° insert not included - order separately at £5.65. See our website for more info.

SPECIAL OFFER PRICE £36.50

DORMER DRILL SETS AT 60% OFF LIST PRICE!

All our Dormer drill sets are on offer at 60% off list price. The Dormer A002 self-centring TiN coated drills are also available to order individually in Metric and Imperial sizes. Please see our web site for details and to place your order.

TURNING, BORING & PARTING TOOLS COMPLETE WITH ONE INSERT.

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DONCASTER EXHIBITION 8-10 MAY '20

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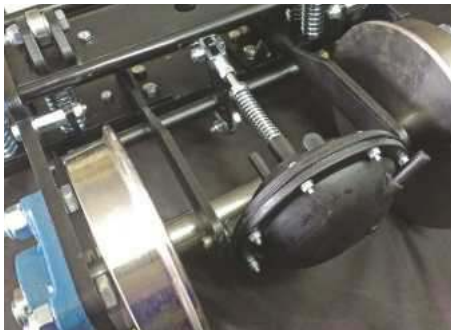









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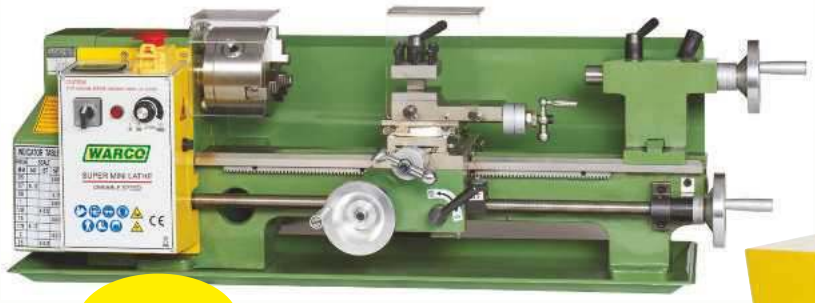

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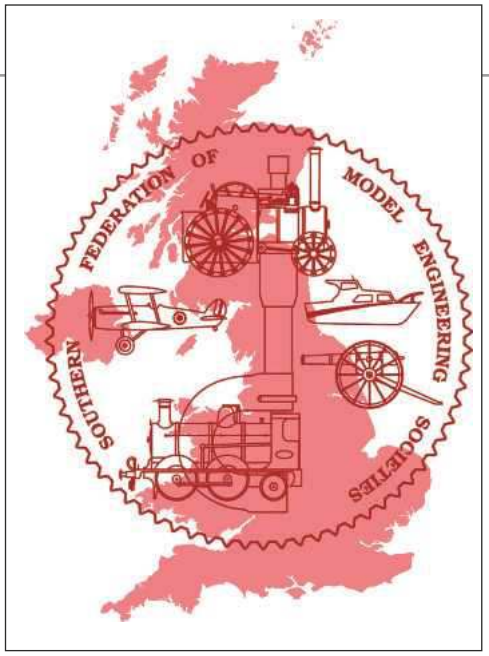
Happy Valentines!

I should like to wish all our readers a very jolly St. Valentine's Day! I hope you all receive lots of cards (but only one of course if you are married!) as I know very well that even the most dedicated and focussed model engineer is not immune to romance. I am sure you have also sent a card to your (one and only!) beloved. If you have not yet done so perhaps your editor can come up with a few suggestions for an endearing message – all, after all, part of the excellent service you should have come to expect. How about 'You quarter my wheels'? Or perhaps 'You hone my cylinder'. Other possibilities include: 'You pack my stuffing box', 'You trim my wick' or even 'you light my fire'. As you can imagine, other possibilities did occur to your editor but he hesitates to publish them, for the sake of propriety, a key consideration for a publication of this quality. I'm sure you can think of some of your own. If so, please feel free to send them in (before 29th February) and I will list the best of them in the Friday 13th March issue.
Good luck!

Flying Scotsman

The *Scotsman* goes on tour! In the spring it can be seen on the Watercress Line (the Mid Hants Railway) where it will stay until the 8th March. On the 7th and 8th March it will be hauling passenger trains on the Mid Hants (but I am afraid these are all sold out). It will then spend three weeks (1st – 21st April) at the National Railway Museum, York, before going on to the East Lancashire Railway from the 2nd to the 10th of May. Passenger hauling on the East Lancashire on the 8th to 10th of May was not yet sold out at the time of writing. More information can be found at www.flyingscotsman.org.uk

Southern Federation



Bob Polley, Chairman of the Southern Federation of Model Engineering Societies (SFMES), notes how this volunteer organisation provides services to more than 200 affiliated clubs. These services have traditionally been concerned with boiler testing, club insurance and health and safety matters. SFMES has recently been conducting a review of the longer term prospects for the organisation, and necessarily of the hobby it supports.

Everyone is aware of changes in the hobby, from negatives including reduced numbers of home workshops and training classes and increased legislation affecting both club and individual members' management and conduct, to positives such as the increased use of and interest in modern processes and products and improved communications through the use of computers and the internet.

No organisation can afford to be static, especially in the face of such change as our hobby has experienced and which will doubtless continue. SFMES therefore recognises the need to take stock of its own activities, the way it carries out its business and the need to reflect the interests of modern clubs and their membership as well as those of more traditional societies.

A volunteer organisation striving to meet the needs of its member societies, SFMES is setting out to get input from affiliates at the next **AGM** to be held **14th March 2020** at **STEAM Museum** in **Swindon** to guide its future direction and ambitions. For this to be effective, as many affiliated clubs as possible need to be individually represented at the AGM so, if your club is affiliated, please respond to the distributed invitation and try to attend.

If your society is not currently affiliated but you believe your club's views could assist SFMES in their considerations, or would like any further information, please contact Bob at **BobPolley@SFMES.co.uk**.

Cock-Up Corner

Those of you with sharper than average eyes will have noticed the spelling error which occurred on both the front cover and the contents page of the last issue (ME4631). I'm afraid I managed to confuse one of our most celebrated engineers (Maudslay) with a London hospital (Maudsley). My apologies. I'm glad to say though that Geoff Theasby's article has the correct spelling. It's a relief to know, isn't it, that at least one person at *Model Engineer* HQ has his eye on the ball?

Also on the contents page, I suggested that LittleLEC would be held at Maidstone. It is actually to be held at Birmingham and Maidstone will be hosting IMLEC.

PART 3

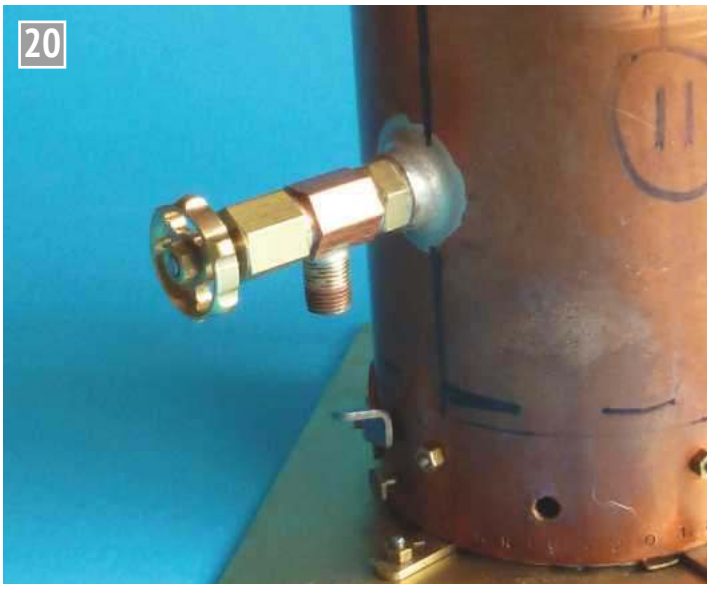
Vertical Boiler Locomotives

Martin Ranson presents a pair of 32mm vertical boilered locomotives.

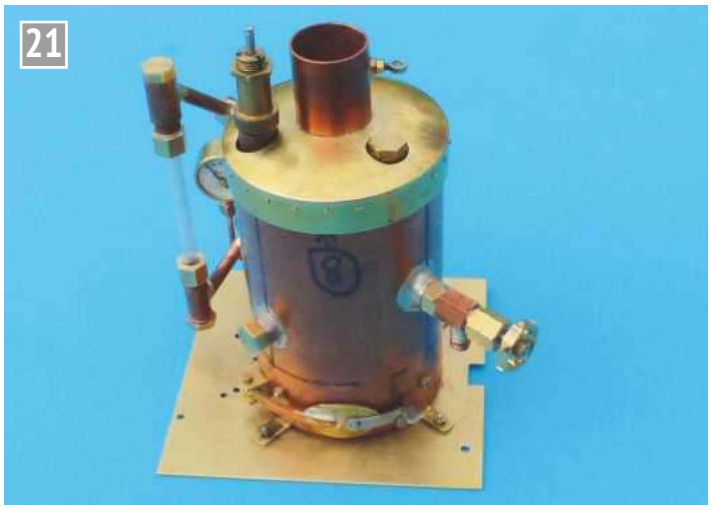
Continued from p. 235
M.E. 4631 31 January 2020

Steam valve and safety valve

Various combinations are possible (**photos 20, 21** and **22**); they can be made as separate items or as one combined unit. They can also be home-made or suitable commercial items can be bought. If they are separate items the safety valve could be fitted into the bush on the boiler top and used for the water filling. The thread size can be altered to match the valve threads, e.g. a common size for Roundhouse is 5/16 x 32. Note that to use a 5/16 thread the diameter of the bronze bar for the top bush should be increased to 7/16 inch diameter.



Steam valve.



Safety valve.

With a separate safety valve the steam stop valve would be mounted on its own and could be changed for a commercial screw-down stop valve.

If a home-made combined unit is to be made and a safety valve with a 5/16 thread is used then this bar diameter would again be raised to 7/16 inch.

The bush which supplies the steam feed has a copper pipe on its inside which goes up to the very top of the boiler and is shown in photo 12; some of its dimensions are critical, the two parts of this pipe assembly must be fastened with high temperature silver solder such as Silver Flo 24 before the bush is waggled into place. Make doubly or even triply certain that this hole is clear of any swarf, also ensure both ends of the copper pipe have been de-burred with a small round file. This completed bush is then attached to the boiler shell with Silver Flo 55.

Lagging and boiler bands

The lagging material is timber 5/16 or 3/8 inch wide and 1/4 thick (**photos 23** and **24**). I used some off-cuts from a rapidly dwindling supply of mahogany. The two long vertical edges are tapered inwards in width to

Safety valve bush.

Boiler lagging – in four pieces.

≫

Boiler bands.

make the strips fit in a circle. Make each strip about ½ inch too long at each end. This makes the work of planing and sanding the strips very much easier. It is far too easy to end up with the strips tapered inwards as in the shape of a wooden barrel. The extra ½ inch at each end is where the taper will usually occur. This extra length will ultimately be cut off. There are approximately 30 strips glued round the boiler shell and each strip is glued down onto a layer of Kaowool insulation.

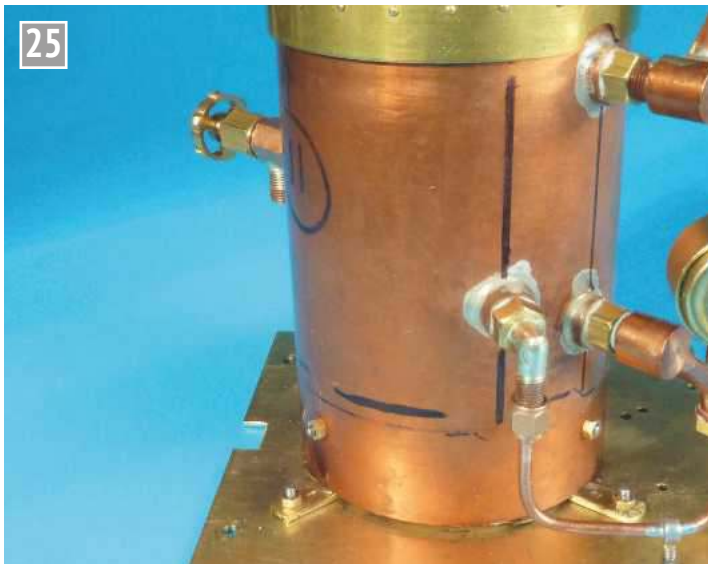
The strips for the oscillator engine are separated into four sections, one with eight or nine planks, two with eight planks and one with six. The other locomotive is very similar, with the width of each section being tailored to match the spaces between boiler bushes. This does make the strips possible to remove for varnishing and any future maintenance. Each of the four sections is then easy to remove from around the various bushes set into the boiler. To help the lagging sections hold together whilst being glued with slow-setting epoxy they are laid onto Kaowool sheet 2 or 3mm thick; the glue needs to be applied fairly liberally. I try to use a spare length of copper tube to wrap the lagging strips round. Quite a messy job, so please wear disposable gloves. To stop the Kaowool from sticking to the boiler barrel, the barrel can be wiped over with candle wax. Also to help the lagging sections stay put while the glue dries they are wrapped with lots of string. Using a spare length of copper tubing has another benefit; once the glue on each section has thoroughly dried the string can then be unwrapped. You are now looking at a rather messy surface - ridges of glue, odd bits of string and uneven bits of timber. Leave the strips on the copper tube for use as a support whilst planing. If you use a small woodworking plane it is only the work of a few minutes to generate a decent surface ready for sanding and eventually varnishing.

Yes, I am well aware this will blunt the plane blade, but the blade does not need a razor edge. It will be quite happy with a decent knife-edge sharpness. When it is blunt the edge can easily be restored by using 400 grade emery paper laid on a flat surface to re-sharpen it.

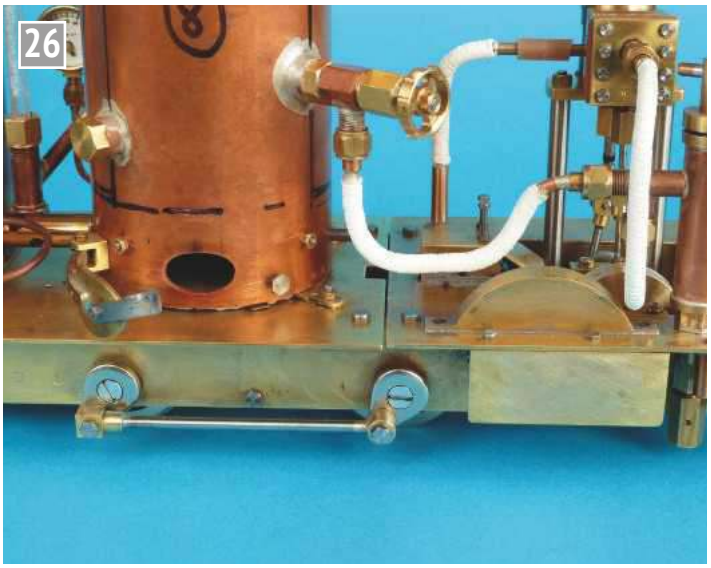
When the four sections are smooth to your satisfaction the excess timber length can be cut off. I use a fretsaw with a fine blade. If you have a small circular saw with a fine blade, that is much faster but be careful of fingers.

There are two brass boiler bands ¼ x 1/32 inch, each clamped up tight by a 10BA bolt. The lower band is very near the firehole door, so just above the door there is an extra brass strip silver soldered into place. All the gas matches I have used to light the flame inside the firebox have a yellow sooty flame so, eventually, there would be a large soot mark on the outside of the lagging. The brass strip deflects the soot away from the lagging.

There are four mounting feet under the boiler (**photo 25**).



Boiler feet.



Boiler fittings – steam valve.

These lift most of the boiler surface away from the main brass mounting plate.

Boiler fittings

Both boilers are of a similar size and design (**photos 26, 27** and **28**). Both of them use the same idea to get the steam supply from the boiler top and take it down to a bush on the side of the boiler. This is accomplished by using a pipe run inside the boiler down to the side bush where it is fastened with Silver Flo 24 before the bush is inserted into the boiler and fastened with Silver Flo 55. On the second boiler this pipe has a bush over its top end; this bush is closed with a threaded plug. The idea is to allow for cleaning the pipe in the extremely unlikely event that it gets clogged. The other bush fitted at the top is for the safety valve, it can be home-made or commercially bought from a supplier such as Roundhouse. Note the bush has a long thread which enables it to stand clear of the inside of the smokebox. For a ¼ inch thread the long bush needs to be ⅜ inch diameter; for a 5/16 inch thread the bush should be 7/16 inch diameter. There are four other bushes on the boiler, two for the water gauge, one for the water check valve, if it is needed, and one small bush for the pressure gauge. Down at the boiler base there are two holes drilled for the burner tube (one is ⅜ inch diameter and the other is 9/64 inch diameter) and also mounting holes for the firebox door and the four mounting feet.

More boiler fittings – gauges from behind.

More boiler fittings – gauges from the front.

Pressure testing

Both the boiler and the gas tank need pressure testing, even if an engine is only ever run in the back garden. Boilers are tested to twice working pressure and gas tanks are tested to a much higher figure. According to some people this should be 370 PSI and according to others it only needs to be 200 PSI. If you plan to run the locomotive in any public place then it should be checked according to the rules of your local model engineering society. This may mean a long drive if the nearest society is some distance away. The society nearest my house requires that the locomotive is stripped down, put through various checks as it is re-assembled and finally given a steam test on their track. For any home-made locomotive this may take quite a few hours.

●To be continued.

NEXT TIME
We'll look at frames, wheels and quartering.

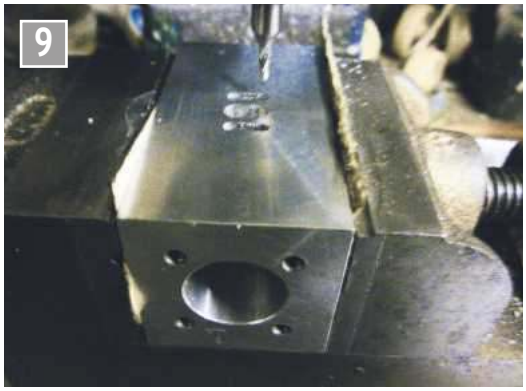
The Middleton Double Sided Beam Engine PART 3

Rodney Oldfield constructs another of Bob Middleton's stationary engines.

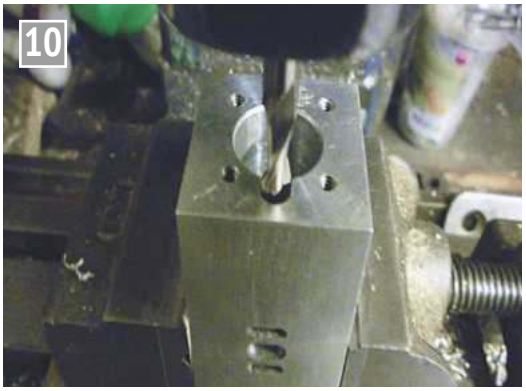
Continued from p. 187
M.E. 4630, 17 January 2020

Cylinder block porting

Refer again to fig 5 (part 2, M.E. 4630, 17th January). Mark out the centres and outer perimeters for the porting slots making sure you have the correct face. Fasten the work in the vice on the miller, level with the end of the jaws, mill out with a 3⁄16 inch slot drill, ⅜ inch long and ¼ inch deep on centre (**photo 9**). Place the 2nd cylinder in the vice level with the jaws and repeat. Next, using a 3⁄32 inch slot drill move over .030 inch and with great care slot ⅜ inch long and ¼ inch deep, turn around in the vice and repeat again, checking centres. Repeat with the other cylinder. Then mark out the steam inlet passage and then place it upright in the miller level with the front of the jaw. Line up and drill ⅛ inch diameter down into the first port. Turn it over and repeat. With a ¼ inch slot drill, mill down ⅜ inch deep *not on centre, but on the ⅛ inch hole, as this gives more area for the gasket*. Mill out into the bore (**photo 10**).



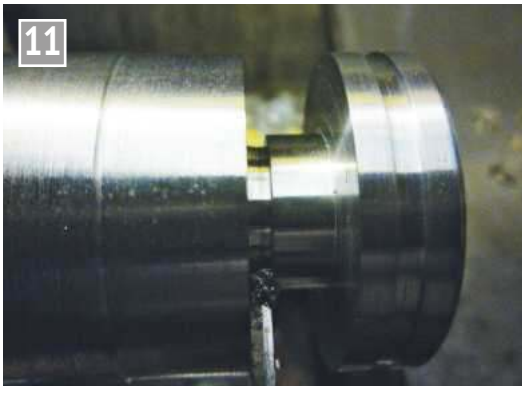
Drilling the port slots.



Milling out the steam inlet passage.

Cylinder top cover

Refer again to fig 6 (part 2). This is machined out of aluminium but instead of making a stuffer box for the rod gland I decided to drill and tap it out ⅜ inch BSP because I have both taps and dies. I machined as the drawing but tapped out ⅜ inch BSP x 5⁄16 inch deep, then drilled and reamed out 3⁄16 inch deep leaving a ⅜ inch wide collar (**photo 11**). Plunge down to ¾ inch diameter making sure of a good fit in the bore. Just for appearance I put a grove in the diameter before parting off.



Turning the cylinder top cover.

A pair of cylinder top covers and drilling jig.

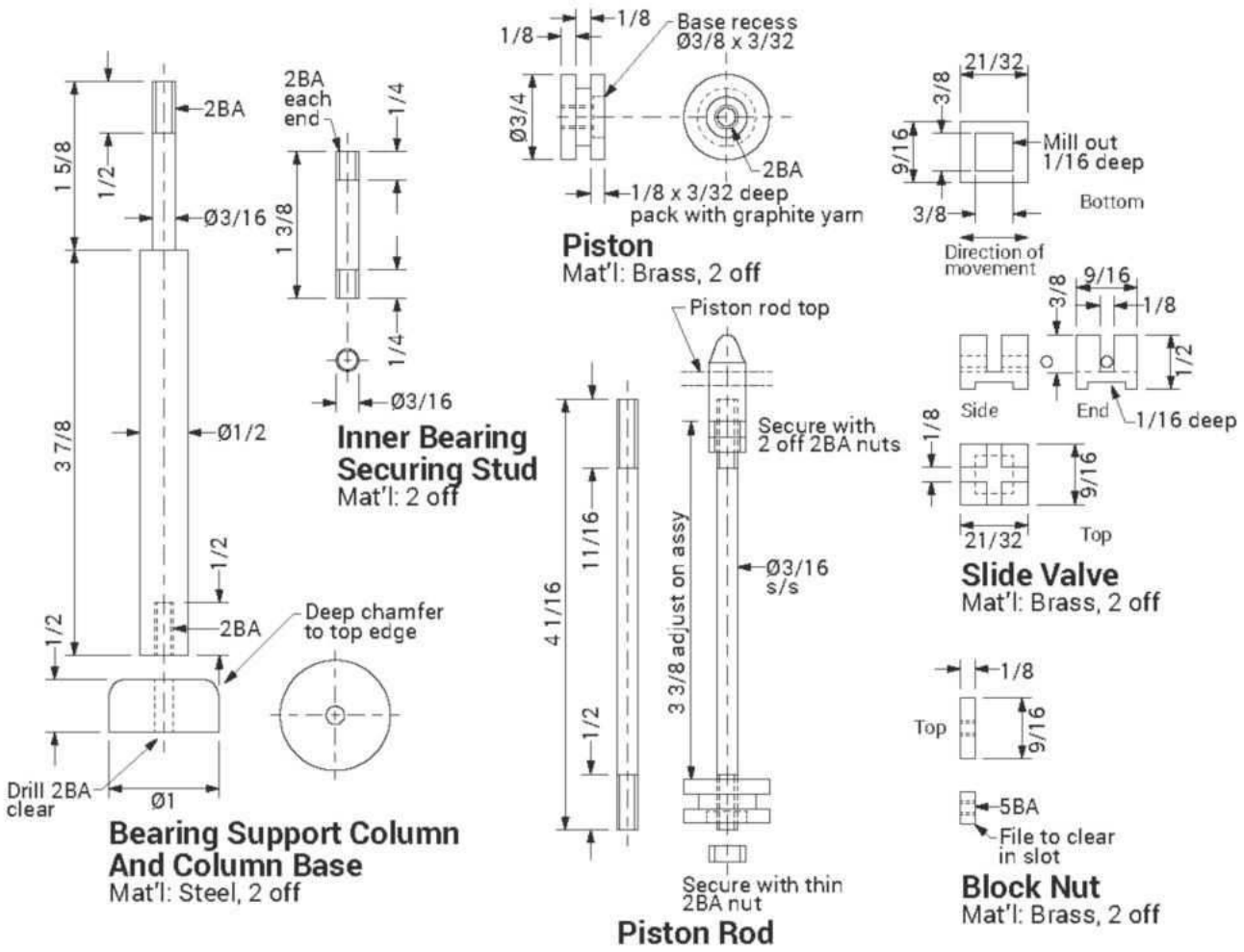


Fig 8

Over the years I have made several jigs for drilling covers and I have one just the right size and number of holes, so using this I drilled out 5BA clearance holes. Placing the cap onto the cylinder, spot through one hole in the cylinder, then drill and tap 5BA and stamp the cap and cylinder, right or left by the hole, bolt on, spot through, drill and tap the remaining five holes (**photo 12**).

Turning a packing slot in a piston.

Putting a thread onto the end of the piston rod.

Piston and piston rod (fig 8)

I prefer to screw and Loctite the piston onto the rod. Turn some brass down to .010 inch above ¾ inch then plunge in for the ⅛ inch packing slot to just down on ½ inch diameter, then drill and tap to 2BA. Part off a strong ⅜ inch length (**photo 13**). Then to keep everything running true I placed a piece of ¼ inch diameter bar approximately long in the chuck, centred, drilled and reamed to 3/16 inch diameter. Place the piston rod in the hole and tighten the chuck up onto the rod and die up to 2BA (**photo 14**).

The best way I have found of getting a true thread is to put the chuck in the tail stock, wound back, so as to give a flat face, and push it up to the stock then pull the chuck round by hand keeping a steady pressure on the tail stock as in photo 14. Whilst it is still in the chuck put a spot of Loctite on and screw the piston onto the piston rod tightly. Turn the piston down to a good fit in the cylinder and face off. Taking great care not to disturb the bush, slacken the chuck off and remove the piston and rod. Put in the other piston rod and repeat.

DO NOT REMOVE THE PISTON FROM THE ROD AFTER THIS.

Piston rod glands (fig 9)

These can be the 'traditional' stuffing boxes compressing graphite string or you could make 'O' ring glands. Figure 9 ≫

shows the traditional way and if you use these you will of course need to drill two holes for the 7BA studs into the cylinder end covers.

If you opt for 'O' rings you can make the glands from some ⅝ inch diameter stainless steel or whatever you have. Turn it down to ⅜ inch BSP diameter threading size 5/16 inch long and then cut the thread. Place in no. 1 jaw to the top and file a flat onto the ⅝ inch diameter. Turn no. 1 jaw to the bottom and file another flat onto it to fit a spanner (**photo 15**). Part off at ¼ inch. Over the years I have collected several pieces of brass bar tapped out to different sizes, so placing one with a ⅜ inch BSP size into the chuck, screw the gland into this, nipping up using the flats then dome and polish. Screw the gland into the top cover (which of course will require the corresponding hole tapped ⅜ inch BSP) and screw the top cover onto the cylinder. Push the piston rod with the piston on up from the bottom and make sure that it slides in easily.

Do not move on until you are happy with it (**photo 16**).

Next drill the hole in the cylinder block through to the exhaust port which is in the centre of the block, 1 5/16 inches and ¼ inch in from the face. Drill as in the drawing (fig 5).

CHECK and DOUBLE CHECK that you have the right face **and** the right way round.

●To be continued.

'O' ring gland.

Completed cylinders and pistons.

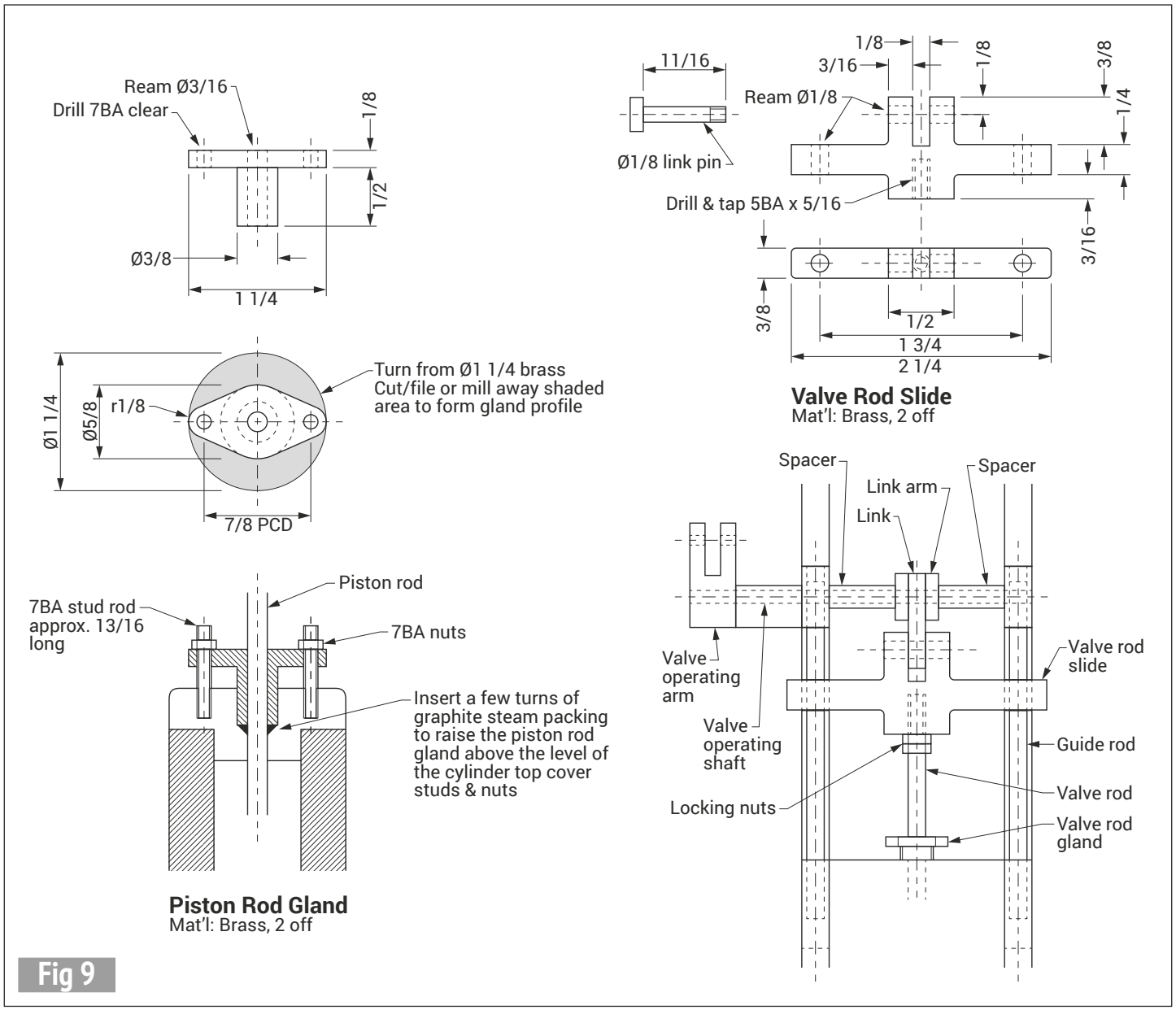


Fig 9

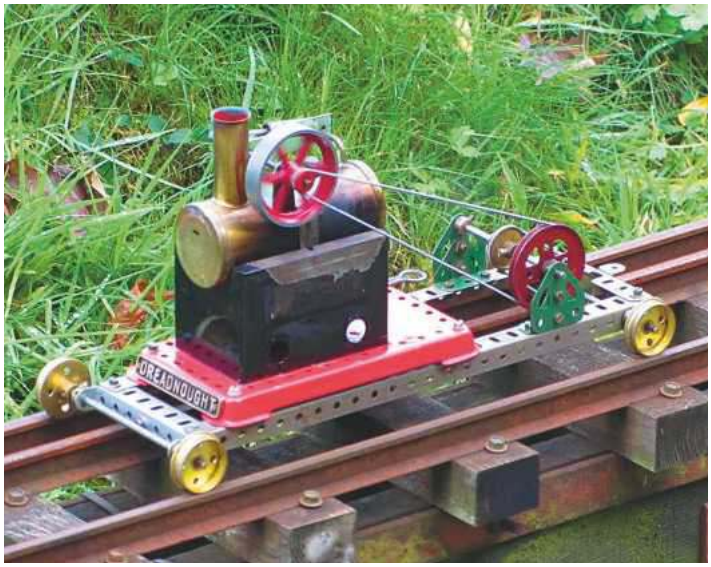
Building a Working Steam Loco After Dinner

David Hatherill and son John break all records for locomotive manufacture.

My mother was a little surprised when my son John (aged 10) and I announced we were going to build a working steam locomotive after dinner that evening. She was even more surprised when we said that we hadn't started yet and it was 5 pm already… and yet the objective was achieved.

It is true that we had probably bent the rules a bit as to what constituted a locomotive but if you take a 'working steam locomotive' to be a rail mounted vehicle which can propel itself under its own power through the sole use of a fired steam boiler and piston type engine then we had without doubt met the terms of our own challenge. Furthermore, the said locomotive was dual gauge and could be used on 5 inch or 7¼ inch gauge track merely by fixing an extension on the axles.

At this point I would have liked to have said it was all our own idea but, as they say in business, 'steal shamelessly' so I have to confess I vaguely recall seeing a similar engine produced by the Rev. Bob Jackson's son Andrew in the mid 1970's when I was around six or seven years old and that that was our inspiration, although I have no recollection of the exact design.



Whilst it was a fact that construction was completed in an evening, planning had taken somewhat longer whilst we amassed the parts we needed from a well-known internet auction site. The main item we required was a Mamod Minor 2 engine (the larger of the two familiar stationary Mamods with the engine on top of the boiler). We also used some long Meccano angles and trunnions, Meccano flanged wheels, pulleys and a couple of Mamod spring belts. Axles were made from steel bar of the same size as Meccano axles. Drive-wise the locomotive has a large reduction from the small Mamod flywheel pulley to a medium sized Meccano pulley on a layshaft with a further 1:1 ratio to the final drive. An extra pulley was added to allow two speeds on the final drive but the lower speed was never needed. So far, Meccano flanged wheels have proved satisfactory with stub points but I suspect proper crossing frogs may be their undoing. Who'd have guessed but Meccano flanged wheels do not conform to GL5 wheel standards.

Having completed the locomotive two final actions were required. Firstly, it needed to be named, and secondly it needed to be tested. In naming the locomotive I had a rummage in the 'come in handy' box, and found a small cast brass nameplate which came from the workshop of the late Laurie Lawrence, one time editor of *Model Engineer* and long term family friend. The nameplate read *Dreadnought*. I have no idea from whence it originated, since I can find no reference to a published design of that name, but either way it seemed a suitable, if improbable, name in much the same spirit as *Sans Pareil* (Without Parallel), *Novelty* etc., none of which lived up to their builders' expectations.

Clearly the locomotive did not understand the irony of its own name and on its first outing on my mother and late father's track completed seven complete circuits on a single firing of meths. Given the track is 164 feet round this equates to 1148 feet or 383 yards, or a little over one fifth of a mile, so a pretty impressive effort. The only modification required after this first test was to make the front axle equalised so that the long stiff wheelbase combined with very shallow flanges didn't lead to derailments due to changes in cross levels.

The locomotive has now run for several groups of visitors and also round the Guildford MES track and never ceases to raise a smile. We built it for a bit of fun but on a more serious note it has really connected with youngsters, who seem to love the improbable nature of it, will it to go on, and of course they can poke it and see all the bits working first hand. So, if you have some old Meccano, or an old Mamod engine sitting on the shelf, and a couple of hours spare why not make one for yourself? It's given much enjoyment and amusement far in excess of the effort required to make it.

ME

A Boiler Feed Pump PART 3

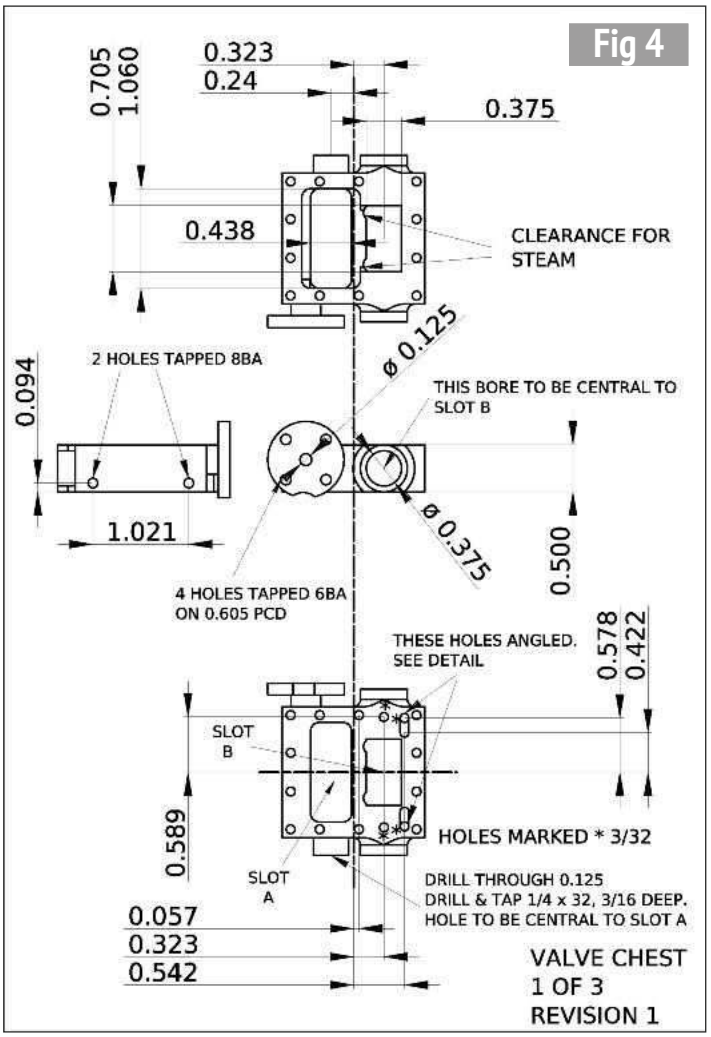
Ian Couchman redesigns the boiler feed pump for his Ruston Proctor traction engine.

Continued from p. 243
M.E. 4631 31 January 2020

Valve chest

Figures 4 to **6** show the details of this item. The casting didn't have the steam connection flange (it was easier to cast without it) so one was turned up and silver soldered in place (**photo 24**). The two faces were fly-cut (**photo 25**) and the casting then moved in the vice for drilling and tapping for the shuttle and the pilot valve rod (**photo 26**). The DTI is there to make sure the casting doesn't move. The hole for the shuttle (furthest from the camera) is reamed. The pump operation relies on the shuttle being a close but free moving fit in the valve chest. In case you don't have a 13/32 inch x 32 tap to hand, the threads at the ends of the shuttle hole can be cut on the lathe. I made a tap but still had to cut the threads on the plugs.

The slots which the slide valves run in were milled with end mills (**photo 27**) and then slots and holes for steam passages were added (**photo 28**), followed by the mounting holes around the sides. The final operation on this item is to drill the two angled holes from the bottom face to the shuttle hole. This was fairly easy with the three way vice (**photo 29**) and the hole came out exactly as planned, just breaking through into the shuttle hole (**photo 30**). This just needs cleaning up with the reamer.

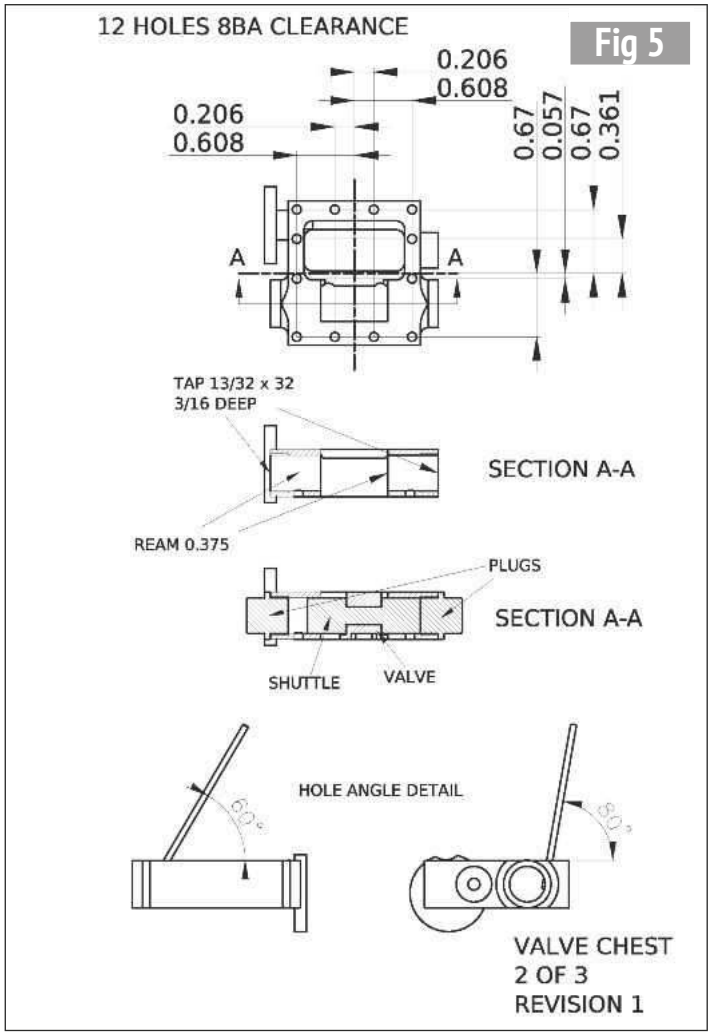


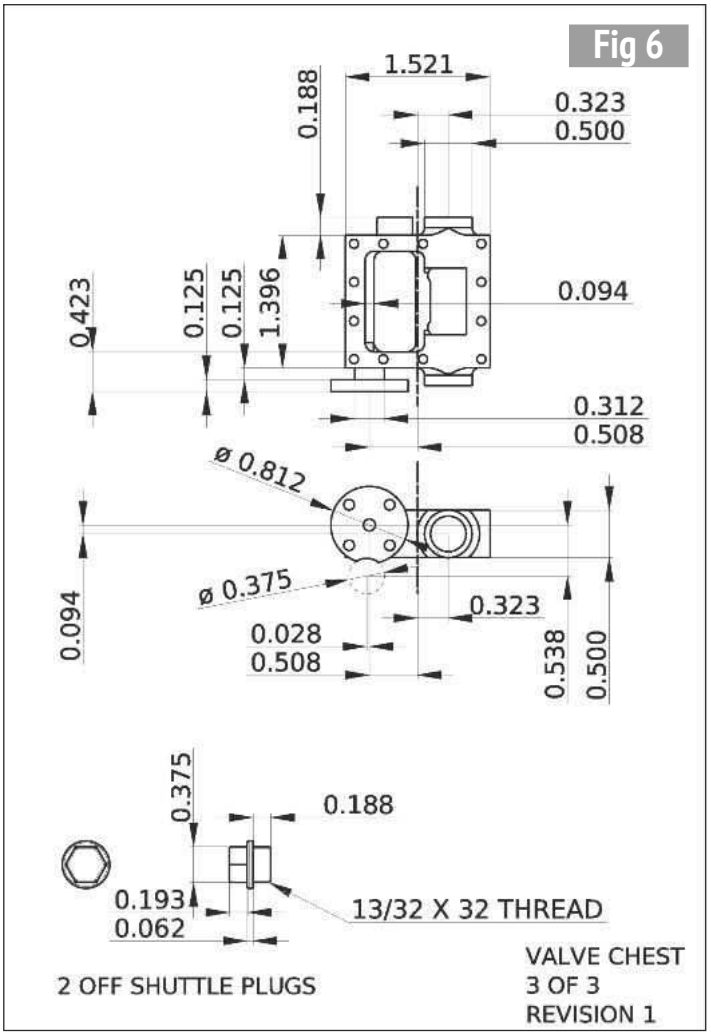
It's worth explaining the two ports into the shuttle hole. The one just drilled is the steam port, pushing the shuttle away. There is also steam on the other port, which will open as the shuttle clears it. Now for the clever bit (well, I like to think it's clever!). When the shuttle is pushed back from the other end, only the port furthest in the picture is opened to exhaust. If you look at fig 1 (previous part), you will see that there's only one hole in the centre of the pilot valve

Valve chest casting with flange added.

Fly cutting the valve chest faces.

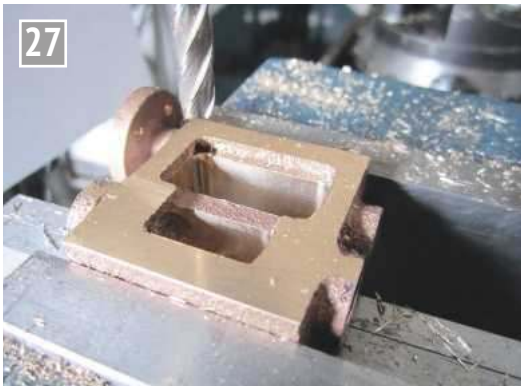
Drilling and tapping into the valve chest.



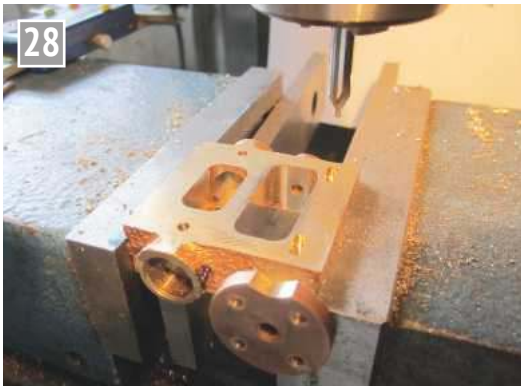


ports. This is the one which exhausts the inner shuttle port. As the shuttle passes this port and closes it, any steam left is compressed by the moving shuttle and acts as a buffer, avoiding the shuttle hitting the end cap too hard. Told you it was clever!

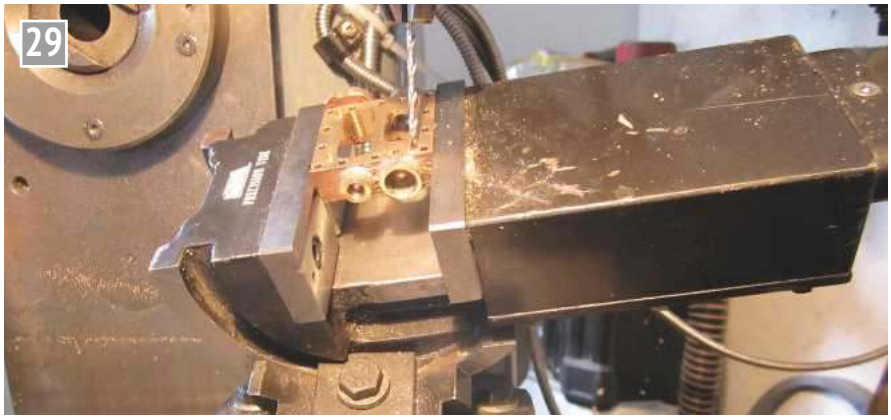
The cylinder end cover overlaps the end of the valve chest, so it may be necessary to add a little clearance (**photo 31**). Just the caps to make



Milling slide valve slots.



Creating the steam passages.



Drilling through into the shuttle hole.

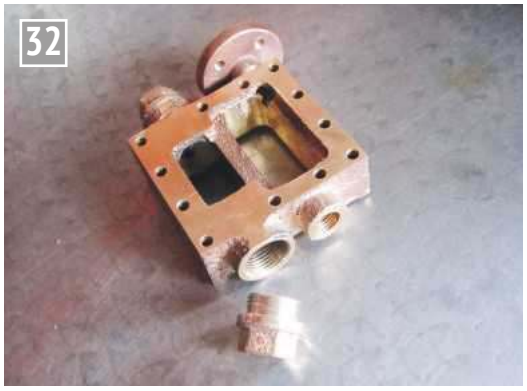
Successful shuttle hole drilling.

and that's another bit finished (**photo 32**).

As you can see, there's a number of areas on the mating surfaces of cylinder and valve chest which must be sealed. As the gaps involved are rather small, I used thin gaskets between these and also between valve chest and cover. These are fiddly little beasts to make. I came across a small, second hand vinyl cutter on eBay which turns out to be very good at cutting out gaskets (**photos 33** and **34**)! In case anyone wants to do the same, the machine is a Graphtec Craft Robo CC200-20. The same company makes a number of different models which should also work.

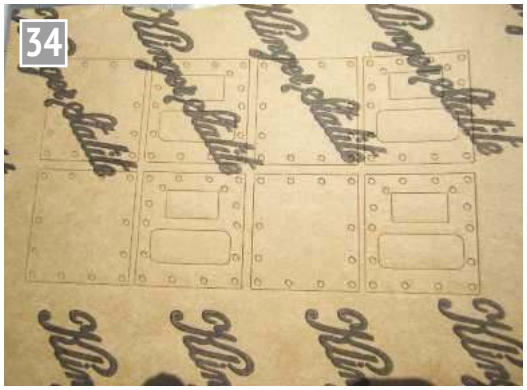
Software-wise, the outline of the gaskets was exported from the CAD software as a DXF file. The cutter needs SVG files, so I used a program called 'Inkscape' (open-source software, available for Mac, Linux and Windows) to import the DXF file and export an SVG file (a small correction was needed as the cutter, or possibly the software, cuts slightly over size). I use the Linux operating system so the drivers supplied with the cutter were no use. However, there is a program called 'robocut' available which works fine.

Adding clearance for the cylinder end covers.



Shuttle end cap.

Vinyl cutter.



A set of gaskets.

●To be continued.

- **Blowers**
  Peter Kenington exposes the humble steam raising blower to the winds of change.
- **Magdalen Road**
  Jeremy Buck tackles the complexities of valve setting on a 5 inch gauge A4 locomotive with piston valves and conjugated valve gear.
- **Tram Truck**
  Ashley Best completes the brake gear to finish off his Brill tram truck.
- **London Exhibition**
  John Arrowsmith reports from the London Model Engineering Exhibition at Alexandra Palace last month.
- **Beam Engine**
  David Haythornthwaite machines the cylinder port face, bore and end covers for his 1 inch scale Model Engineer beam engine.

Content may be subject to change.

ON SALE 28 FEBRUARY 2020

Obituary Ron Dawe

Ron Dawe was born on the 4th December 1930 in Devonport in a dockyard house owned by his grandfather, who was a store keeper in Devonport Dockyard. His first recollection of road steam was seeing steam wagons hauling coke from Keyham Gas Works. By the mid 1930's steam was disappearing from our roads but the fairground proprietors were still very much in evidence. Anderton & Rowlands and Whiteleggs were most remembered, stimulating a lifelong interest in showman's engines.

He went to school locally but was later enrolled for Devonport Technical School where he was to discover the appeal of the engineering world. He decided that machine work was his future and his parents looked around for an apprenticeship but discovered that a premium of £100 was required and doubted they could afford it. Another chance of an apprenticeship was by passing the two-day Civil Defence exam for entry into the Ministry of Defence apprenticeship scheme. The exam was taken in 1946 and he did sufficiently well enough to obtain a Fitter and Turner apprenticeship with the Royal Dockyard at Devonport.

During Ron's apprenticeship he was introduced to the periodical *Model Engineer* and he also joined the Plymouth and District Society of Model Engineers - the start of a lifelong passion. He ordered a Myford ML7 with a waiting list of 4 years but it arrived after 2 years in 1948 at a cost of £35. He kept this lathe all his life and produced his Gold Medal and Championship winning models on it.

Ron completed his apprenticeship on the 8th November 1951 and was immediately called up for National Service, joining REME on 15th November. He spent all his 2 years National Service stationed in Bicester refitting Bofors 40mm guns. He also purchased a set of second-hand 2" scale drawings of *Thetford Town* by Ronald Clark and commenced his first model. He soon discovered there were lots of errors so purchased works drawings from Garrett's who at the time held the drawings.

After National Service Ron returned to Devonport Dockyard, married Joan and, in 1957, son Bob appeared. He was offered a promotion and moved to Chatham Dockyard in 1961, purchasing the house he remained in for the rest of his life. Daughter Susan came along in 1962 and another son Andrew in 1966. Ron managed to retain £100 from the house move to set up his new workshop at the bottom of the garden and recommenced work on the Burrell. He soon realised that the bits he had made would not assemble into a specific engine so selected the fictitious No. 3915 and the name *EXCALIBUR*. The engine was built over a 26 year period with around 21 years on its actual construction. He completed it in 1980 and exhibited it at the 1981 *Model Engineer* exhibition where he was awarded a Gold Medal.

Ron became a member of the Road Locomotive Society (RLS), taking over as Information Officer in 2003, looking after the Burrell build records, and became President in 2005. Ron was an RLS man through and through and attended as many Society meetings and events as he could as well as displaying his models at shows and rallies around the country. Ron went on to build two more stunning models with his Fowler B6 Super Lion showman's engine *THE LION* which won him another Gold Medal in 1998 and the Duke of Edinburgh trophy the following year. Next came the Foster 65BHP showman's *JAMES WALTER* built from works drawings supplied by Michael Lane. Like all of his models this was built to the same exacting high Championship winning standards.

Ron and Joan were dealt a major blow when his model Burrell showman's *EXCALIBUR* was stolen from his home in May 2005, never to be seen again. Not to be beaten, he embarked on another 2 inch Burrell Scenic, this time modelling his favourite engine *EARL BEATTY.*

Ron had an eye for detail and everything had to be just right. He was held in the highest regard by the steam fraternity and his fellow model engineers and was part of the team who set up and judged at the *Model Engineer* exhibitions.

Ron passed away on Sunday 1st December 2019 only a few days before his 89th birthday, a gentle and kind man, a true gentleman and a lovely family man who was so proud of his family. For those who knew him we shall never see his like again. It was a privilege to have known a man like Ron and to have had him as a friend.

Andrew Smith – RLS Chairman

Moseley Railway Trust's Golden Jubilee

PART 2

Mark Smithers spends the weekend at Apedale to celebrate an anniversary.

Continued from p.231
M.E. 4631, 31 January 2020

In addition to the steam stock, mention must be made of the MRT's extensive collection of non-steam motive power. Continuing with the World War One theme, there are examples of 20HP and 40HP 'Protected' Motor Rail 'Simplex' petrol locomotives (respectively W/Ns 1111 and 1369 of 1918) and their Diesel-powered descendants (**photo 10**). There is also a distinctive Deutz rod-coupled 0-4-0 Diesel (W/N 10050 of 1931) whose horizontal single cylinder engine arrangement clearly harks back to the makers' early oil-engined locomotives of pre-World War One vintage (**photo 11**). Battery electric locomotives are not forgotten and the collection even includes *Lady Anne,* an 0-4-0 Clayton specimen (W/N BO922A of 1975) whose wheels can be set on the axles to either 18 inch or 24 inch gauge.

The Apedale Railway is also home to a large collection of historic non-steam motive power and one of the more distinctive items is this Deutz rod-coupled 0-4-0 Diesel W/N 10050 of 1931. Its horizontal single cylinder layout betrays its evolution from the early oil-engined locomotives constructed by this maker for the German Feldbahn systems during World War One, and which inspired a Ruston Proctor design built during that period.

The Moseley Railway trust has had a long association with the Motor Rail 'Simplex' locomotive, both petrol and Diesel and examples of the former onsite include specimens of both 20HP and 40HP W.D.L.R. types. This two-cylinder Diesel example, W/N 8878 of 1944, was supplied to an unknown site for the War Department during the Second World War, being shortly afterwards returned to the makers and re-sold to Fylde Water Board, Lancashire prior to passing into M.R.T. hands in 1978.

The MRT's rolling stock collection is extensive (**photos 12** and **13**) and the passenger items include a Robert Hudson semi-open bogie carriage and a reconstructed Penrhyn Quarry four-wheel workman's car. Amongst the freight stock there is once again a strong Great War flavour and the Trust possesses examples of the W.D.L.R. 'A', 'B', 'D', 'F', 'H' and 'K' class wagons, along with a French standard Pechot pattern bogie well wagon (believed to date from 1888) (**photo 14**) and an American 'Pershing' bogie flatcar (**photo 15**). In 2018 a gun carriage wagon (**photo 16**)

The MRT has a representative collection of narrow gauge rolling stock including suitable examples from the WW1 field railways. This is one of the ubiquitous 'D' class bogie wagons of the War Department Light Railways.

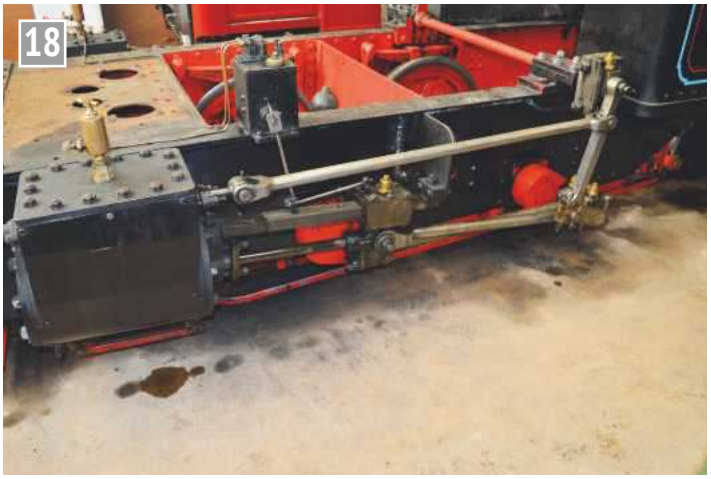
The W.D.L.R. 'E' and 'F' class bogie wagons were distinguished by a central platform well. The latter design was equipped with stanchions and a 'flat' configuration fore-and-aft. The MRT's 'F' class is seen in this view.

The oldest item of military rolling stock in the MRT collection is this Pechot bogie wagon believed to date from 1888. When new, these wagons were designed primarily for operation with the Pechot-Bourdon 0-4-4-0T, a variant of the 'Double Fairlie', of which only two examples survive, both on the Continent.

The re-created gun carriage bogie wagon was also on display at the gala and is seen on display here.

The contribution made by the other allied powers to narrow gauge WW1 rolling stock development has not been overlooked by the MRT and one of the items in the collection is this U.S. bogie 'Pershing' flat wagon dating from November 1917.

Generally regarded as the MRT's flagship locomotive, Kerr Stuart 'Tattoo' class 0-4-2ST Stanhope *(W/N 2395 of 1917) celebrated its centenary two years ago with a gala of its own, but it is currently out of service awaiting an overhaul. The boiler has already been removed for this purpose.*



Detail useful for prospective modellers of Stanhope *can be seen in this view, namely the cylinders, Hackworth valve gear and the displacement and mechanical lubricators. It is difficult to believe from this view that the frames had once been cut in half and were welded back together during the 1990's.*

was re-created with the help of National Lottery funding.

During the Gala there was even a role for two of the trust's wagon collection in the display of components from locomotives currently undergoing repair or restoration. These comprised the boiler from the Trust's flagship Kerr Stuart 'New Type Tattoo' class 0-4-2ST *Stanhope* (W/N 2395 of 1917) (**photos 17** to **20**) and the mainframes and gearbox from a representative of Baldwin's 4-50-1-C 0-4-0 petrol-mechanical design (**photos 21** and **22**) of which 189 were delivered to the U.S. military (108 of which went to France) and others to the French Artillery systems.

The design used 50HP 4-stroke engines supplied by Pittsburgh Model Engine Co. and Minneapolis Steel and Machinery Co. with 2-speed gearboxes (rated at 4 and 8 m.p.h.) and final jackshaft drive. These locomotives were generally used for shunting at transit points and rolling stock movements close to the front line and were generally popular with crews although prone to derailments (caused

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Stanhope's *replacement coupled wheels came from a Hudswell Clarke Diesel locomotive and they are shown here in close-up. An original pattern feedpump has been fitted to the motion stretcher although this is not connected up as the engine now relies totally on injectors for water feed.*

Stanhope's *boiler fulfilled the role of a heavy wagon load during the gala. It currently awaits a trip to the repair contractor but, at the time of writing, it is not anticipated that extensive work will be required.*

A challenging restoration project for the MRT team is a Baldwin 50 HP 7½ ton 4-50-1-C tractor locomotive imported from Switzerland in the spring of 2016 as a standard gauge Diesel conversion. The stripped-down mainframe, carrying the gearbox, was on display as a wagon load at the gala, but much work is still required, not least in sourcing and fitting a suitable engine unit.

by suspension shortcomings) and problems with engine reliability. Their basic design is thought to have inspired some early narrow-gauge petrol locomotives produced by John Fowler & Co. of Leeds, although these were plate rather than bar framed.

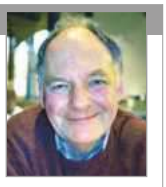
The MRT's Baldwin was obtained from a Swiss scrapyard, having been re-gauged to standard in its lifetime and fitted with a Diesel engine. Its restoration has already presented some interesting challenges, such as the removal of cast iron spacers fastened to the mainframes to adapt the brake rigging for standard gauge. The greatest difficulty is probably going to be the choice of engine for the restored locomotive – one surviving class member (W/N49581 of 1918) in the Frankfurt Feldbahn Museum still possesses its original engine but the French-based survivors and the Festiniog Railway's *Moelwyn* have all received more modern Diesel engines. Sourcing an original pattern petrol engine for the Baldwin would not be an easy proposition and at the time of writing no final decision appears to have been taken on a final course of action to be taken in this department with the MRT's locomotive.

Overall, the achievements of the Moseley Railway Trust at Apedale have been impressive and with the prospect of a new museum building and extension of the running line in the future, there would appear to be much to look forward to during the next fifty years. ME

This specimen on display at Froissy in France is how the restored Baldwin tractor should appear once restoration is completed. The Festiniog Railway possesses a similar Baldwin tractor, Moelwyn, *which, as with most of the class survivors, has been re-engined with a Diesel unit and fitted with a leading pony truck.*

Steam Turbines Large and Miniature

PART 23



Mike Tilby explores the technology, history and modelling of steam turbines.

Continued from p.158
M.E. 4630, 17 January 2020

The Stumpf-type turbine

A number of model turbines described in past issues of this magazine have been of the so-called Stumpf type. As discussed in previous articles in this series, my preference is to use a bladed rotor since I suspect Stumpf-type rotors will be inherently less efficient. However, this is only my guess and is just based on simplified theory. Too few actual performance measurements of model turbines have been made to allow a reliable comparison between efficiencies of the various types. In fact Mr Bamford (**ref 80**) performed tests with a Stumpf-type and a De Laval rotor and found his Stumpf rotor was about 10% more efficient. Therefore, it is apparent that the variations in design that are discussed below could, in reality, make little difference to the performance of model Stumpf-type turbines and this article only aims to point out the ***potential*** implications of design details.

In all turbines of the type in question, the steam jet enters and exits pockets or buckets at the cylindrical surface of the rotor (**fig 87**(A)). This contrasts with the more widely used axial-flow bladed rotor where steam enters via an end face (fig 87(B)). This seemingly small difference has major implications for the functioning, efficiency and design of the rotors. (It may be worthwhile pointing out that Stumpf-type rotors also differ from inward radial-flow rotors. In these, although steam enters the rotor via its peripheral surface, it exits at a smaller radius.)

Riedler Stumpf turbines

The first commercially successful design of turbine in which steam entered pockets or buckets in the periphery of a rotor seems to have been

Fig 87

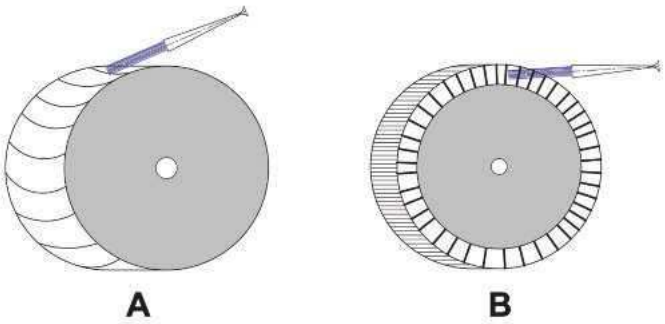
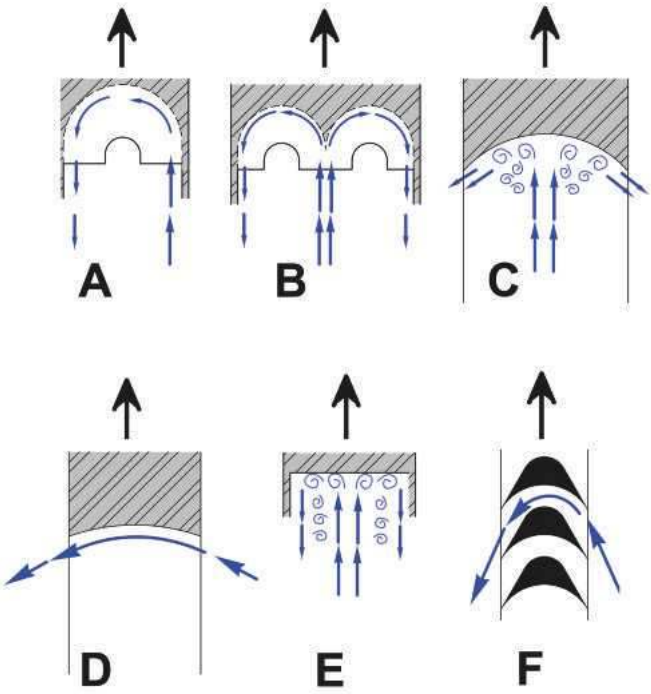


Diagram to illustrate alternative directions for steam to enter a turbine rotor. A: at the cylindrical surface. B. At the end surface.

Fig 88



Flow through various designs of turbine rotors. A and B: Original Riedler-Stumpf-type pockets; C: Pockets of Sperry flight instrument rotors; D: pockets of the rotor designed by Mr. Westbury; E: Flat bottomed pocket as found in certain model turbines; F: typical bladed rotor.

invented about 1900 by Allois Riedler and Johannes Stumpf (i.e. over a decade after successful bladed turbines had been invented by Charles Parsons and Gustaf De Laval).

Riedler was Professor of Mechanical Engineering at Berlin University and Stumpf was his student, who later also became a professor in Berlin. In its simplest form, their design was for a single stage impulse turbine that differed from a De Laval turbine in having a very large diameter rotor which was relatively wide and where peripheral pockets replaced the blades (see part 10, photo 38 and part 18, photo 48). Steam from one or more nozzles was directed tangentially towards the periphery of the rotor either on the mid-line (**fig 88**(B)) or on one side of the pockets (fig 88(A)). In these designs the steam enters the pocket, flows around the semi-circular bottom of the recess and exits the rotor in the opposite direction. This change of direction (and hence change in momentum) results in a tangential force being exerted on the rotor.

Riedler-Stumpf turbines were made in Germany by Krupps for AEG. Similar machines were made by other companies, notably the Terry Turbine Co., USA. Hence, turbines of this type are often referred to as Terry turbines.

Advantages of this design

For the model engineer, the Stumpf-type design has the significant advantages over conventional bladed turbines of being robust and much easier to make in the average hobbyist workshop.

Aircraft navigation instruments

The American engineer Elmer Ambrose Sperry may have considered these advantages when he adopted a similar design for the rotors of the gyroscopic navigation instruments for aircraft that he invented in the early decades of the last century. By WW2 essentially all allied military and civilian aircraft each carried at least two Sperry gyroscopic flight instruments, namely an artificial horizon (**photo 62**) and a gyro-compass. In each of these a heavy brass gyre or rotor (**photo 63**) was spun at about 10,000 rpm by a jet of air drawn through the instrument by vacuum.

An artificial horizon made by the Sperry Co. Ltd, UK.

Rotor from the Sperry artificial horizon shown in photo 62. (The rotor diameter is 2.065 inches.)

Design variations

Although the Sperry turbine is superficially similar to the Riedler-Stumpf design, it shows some significant differences in detail. Similar variations in detail are found in various model turbines of this type and they warrant discussion because of their potential implications for turbine efficiency.

As in other single stage impulse turbines, for maximum transfer of kinetic energy from the steam to the rotor, the peripheral speed of the rotor should be half the steam speed, i.e. very fast indeed. The large diameter of the original Riedler-Stumpf rotors gave a high peripheral velocity at modest rpm but, even so, the ideal pocket speeds were not attainable. (NB: To improve efficiency at attainable rpm some forms of these turbines employed velocity or pressure compounding.) In addition to low pocket speed, the following four factors would also seem to limit the efficiency of turbines of this general design.

1 Pocket shape and frictional losses in the rotor

In any impulse turbine, in order to exert maximum torque on the rotor and thereby extract as much energy as possible from the high velocity jet of steam, the direction of the steam should be reversed without reducing its absolute velocity. This ensures that it leaves the rotor flowing as fast as possible in the opposite direction to the movement of the pocket or blade. To achieve this, the steam must be smoothly re-directed around a curved surface with a minimum of turbulence and of friction with the rotor. That means keeping the steam path in the rotor as short as possible.

In the Riedler-Stumpf turbine the bottom of the pocket is smoothly rounded so the steam flows around the curve(s) and back out (fig 88(A)). However, the steam path is relatively long. In a bladed turbine the blade width was generally designed to be in a certain ratio to the blade pitch (as was discussed in part 22). For example, in a model turbine the blade width can be as small as 0.06 inch and the steam path in such a rotor is about 0.08 inch. In contrast, in Riedler-Stumpf type rotors the buckets have generally been much wider and the steam has to flow around a relatively long semi-circular path, e.g. if the buckets were 0.25 inch wide the path length would be 0.39 inch around the semi-circular bottom of the bucket plus the length of the straight sides.

The rotor from my Sperry artificial horizon is about 2 inches in diameter and has pockets which are 0.5 inch wide. They are crescent-shaped rather than semi-circular (photo 63) and seem to have been machined using a 45° dovetail-type cutter. The air jet from the nozzle in this instrument is directed at the centre of the pockets and this must result in loss due to much turbulence as the air jet impacts abruptly on the pocket wall (fig 88(C)). Any air that does flow around the curved surface will leave the rotor in a partly reversed direction, which is advantageous. This design appears to be less efficient than the true Rielder-Stumpf design but that was of no consequence for Mr Sperry since his aim was not to create high shaft power but merely to keep the rotor spinning at about 10,000 rpm on a relatively small flow of air. Also, since the inside of the instrument was under partial vacuum, there was little friction between the gyre and the surrounding air.

2 Pocket pitch

As discussed in part 18, for maximum efficiency the pocket should be aligned with the steam jet but this ideal state is transitory since each pocket soon disappears '*over the horizon*' (See part 18, fig 65) and there is a time interval before the next pocket becomes aligned. In a rotor with few pockets this effect becomes more pronounced and it seems that for best efficiency there should as many small pockets as possible so as to minimise the fraction of time spent between successive alignments of pockets with the jet. The large diameter of the original Riedler-Stumpf turbines combined with the very large number of pockets gave a pocket pitch of less than 3°. However, larger rotors experience higher frictional losses. This is especially so because of the drag that presumably results from a large disc and a large number of fast-moving pockets and the fact that, in a single nozzle turbine, at most only a few of those pockets are acted upon by the steam at any one time. However, it is noteworthy that Mr Bamford (ref 80) found that windage loss for his Stumpf-type rotor was very low. (This may have been due partly to the small clearance between the rotor and the casing.)

The number of pockets that can be fitted into a rotor will be affected by their length and the angle at which they are cut. More pockets can be accommodated if they over-lap each other, as in the original Riedler-Stumpf rotors or if a crescent shape is adopted as in the Sperry rotor (photo 63) which has 28 pockets giving a pitch of about 12.8°.

3 Counter-flow of steam

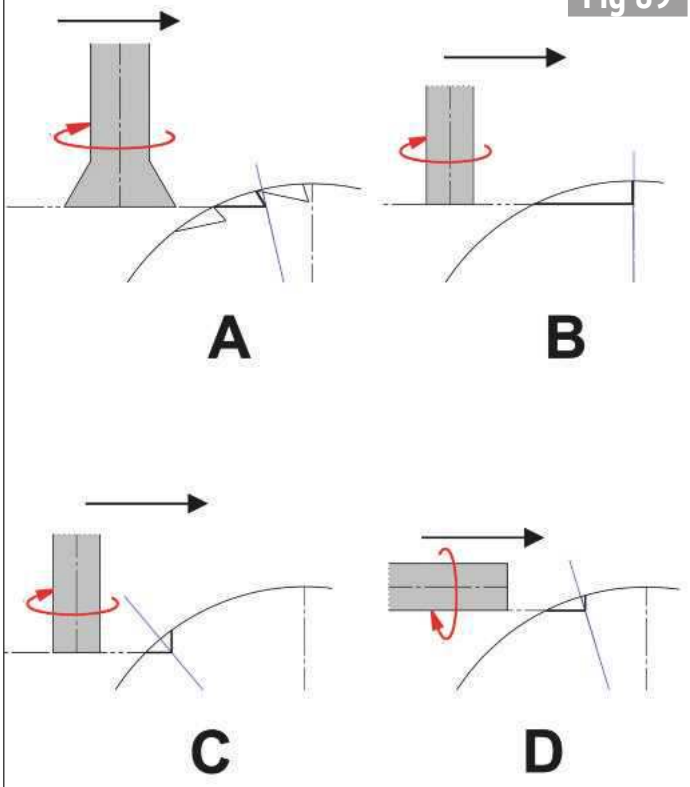
Steam flowing into the pocket of a true Riedler-Stumpf rotor flows out either on the opposite side or on both sides, depending on the type of pocket (fig 88(A) and 88(B)). This means there will be a significant degree of turbulence and entrainment at the boundary between steam flowing in opposite directions. The resulting loss of kinetic energy will be minimised by making the pocket wide relative to the width of the steam jet but that means increased frictional loss with the pocket wall, as discussed above. In a bladed rotor counter-flow loss does not arise since flow between the blades is unidirectional (fig 88(F)).

4 Outward escape of steam from the pockets

Steam tends to escape radially outwards from any rotor due to the centrifugal force effect and also because of pressure build up adjacent to the bottom of the pocket. The original Riedler-Stumpf turbine had deep pockets in the rotor so the steam was bounded by a wall on the outer side. Some simplified rotors (e.g. the Sperry gyro rotor) lack a proper outer wall and then outward migration of steam is bound to occur. The extent to which it occurs must depend on the length of time the steam spends flowing around the pocket and on the direction in which the steam enters the pocket. Clearly, the time spent moving around the pocket will depend on the pocket width.

If the steam jet is directed to the middle of the single pockets, as in fig 88(C), it will be more likely to flow outwards, especially if the pockets are quite shallow. However, if the edge of the pocket is angled backwards relative to the direction of travel of the pocket, as in the Sperry rotor and as shown in **fig 89**(A), then the steam will be encouraged to remain in the pocket and flow around its curve. Also, steam that does escape radially will tend to leave partly in the reverse direction to the movement of the pocket and that will favour transfer of power to the rotor. If the edge is aligned with a radius of the rotor (see fig 89(B)) then it will be easier for steam to escape radially and such steam will leave with the same tangential velocity as the rotor, which is less favourable. The worst case would be if the edge is angled forwards as in figs 89(C) and 89(D), since that would increase the tendency for steam to leave the pocket radially and, when it does so, it will have a tangential velocity in the same direction as and faster than the rotor movement. However, by ensuring there is a very small radial clearance between a rotor and its housing, escape of steam from the pockets might be reduced, as discussed below.

Fig 89



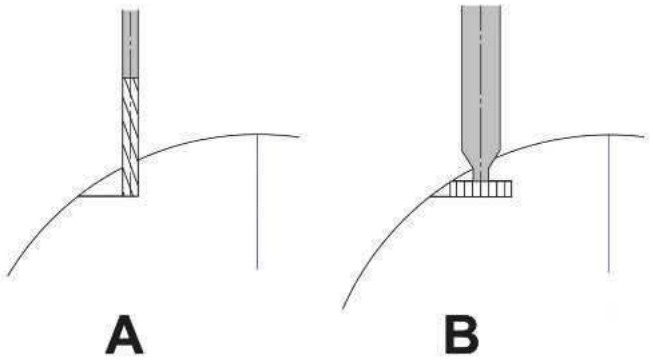
Geometry and methods used to machine simple pockets in turbine wheels. Blue lines are radii from centre of the rotor through the inner corner of the pocket. The grey shapes represent milling cutters. Red arrows indicate axis of cutter rotation and black arrows denote direction of feed. A: Dove-tail type cutter as used in ref 82; B: Plain end mill with pocket edge aligned to a radius; C: Plain end mill as used in ref 86; D: Plain end mill as used as in refs 84 and 85.

Design and manufacture of model turbine rotors

Amongst the published model Riedler-Stumpf type rotors of which I am aware, the ones which most closely resemble the original Riedler-Stumpf design are the impressive rotors made by Mr. Southworth for his 5 inch gauge locomotive *Turbo* (**photo 64**, **ref 81**). I assume the nozzles in Mr Southworth's turbines were directed down one side of the pockets, but this was not clear to me from reading his articles. He cut each pocket in three stages. Firstly, a slot was cut with a narrow end mill (**fig 90**(A)) to form the clearance for the shank of the cutter to be used in the next step. In this next step, it appears he used a small Woodruff cutter to machine out the pockets (fig 90(B)). Finally, the edge of each

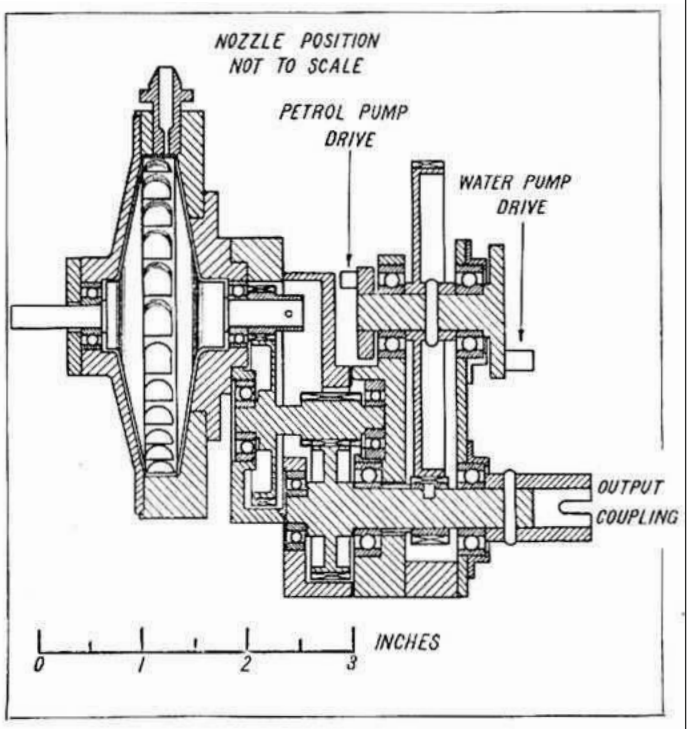
≫

Fig 90

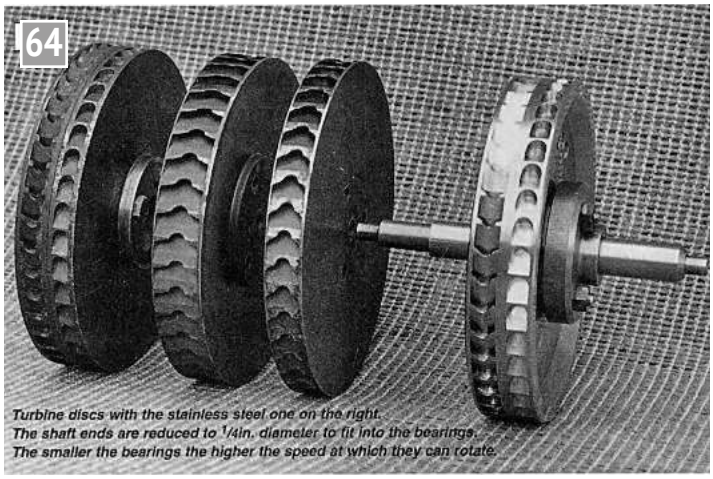


First two stages in machining the pockets of the rotors shown in photo 64.

Fig 91



Turbine designed and built by Mr Bamford (copied from ref 80).



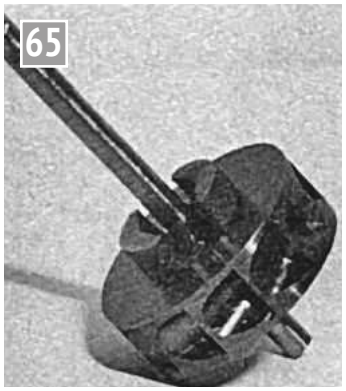
Rotors made by Mr. Southworth for his locomotive called Turbo (copied from ref 81).

pocket was chamfered to give smoother steam flow. Mr Southworth's rotors were relatively large in diameter (4.5 inches) and that made it easier to cut a large number of pockets. His rotor contained 40 pockets which equates to a pitch of 9°.

Mr. Bamford's Stumpf-type rotor (ref 80 and **fig 91**) was machined using a flat-ended 5/16 inch diameter end mill, but the information in his articles does not specify the geometry of the machining process used. This gave pockets with semi-circular bottoms, as in the original Riedler-Stumpf design. However, they lacked any outside wall. It seems clear that the steam jet was directed down one side of the pockets (see fig 91**)**. This was another fairly large rotor with a diameter of 3 inches. It contained just 25 pockets giving a pitch of 14.4°. The pockets were machined slightly to one side of the rotor. I suspect they were made like this to provide gaps through which exhaust steam could escape. Without these gaps the pockets would have been effectively sealed because of the small clearance between the rotor disc and its housing.

The rotor described in detail by Mr. Westbury (**ref 82**) resembled that of the Sperry gyro rotor in that it had crescent-shaped pockets cut with a dove-tail cutter (fig 89(A) and **fig 92**). It had 30 pockets giving a pitch of 12°. However, a seemingly important difference was that the nozzle was directed at an angle towards one side of the pockets with the intention that steam would flow smoothly around the curved surface (fig 88(D)). This also eliminated the counter-flow loss since the steam flow was unidirectional. As in the Sperry rotor, the bottom surfaces of Mr Westbury's pockets were angled backwards relative to a radial line and that encouraged the steam to remain in the pockets and steam that left radially did so in a slightly backwards direction relative to the movement of the pockets. However, Mr Westbury's turbine seems like a hybrid between a Stumpf-type design and a true bladed design since the pockets extended to both sides of the rotor.

Mr Bender (**ref 83)** initially used a plain end mill to cut pockets for his turbine, similarly to Mr Bamford. But in this case it was explained how the cutter was oriented relative to the disc and it can be seen that each pocket had an edge that was angled forwards, as shown in fig 89(C) and **fig 93**(A) and 93(B). Later he used an end mill with a groove ground around its circumference near the end. This resulted in a ridge being left around the edge of each pocket (fig 93(C)). The ridge presumably helped retain steam in the pocket and directed steam that did escape in a more favourable direction. He reported a definite improvement in performance using this version of his turbine. His pockets were off-centre on the edge of the wheel (fig 93(A)), as in Mr Bamford's turbine, but it is not clear to me whether he also directed the steam down one side of the pockets or into their centre.



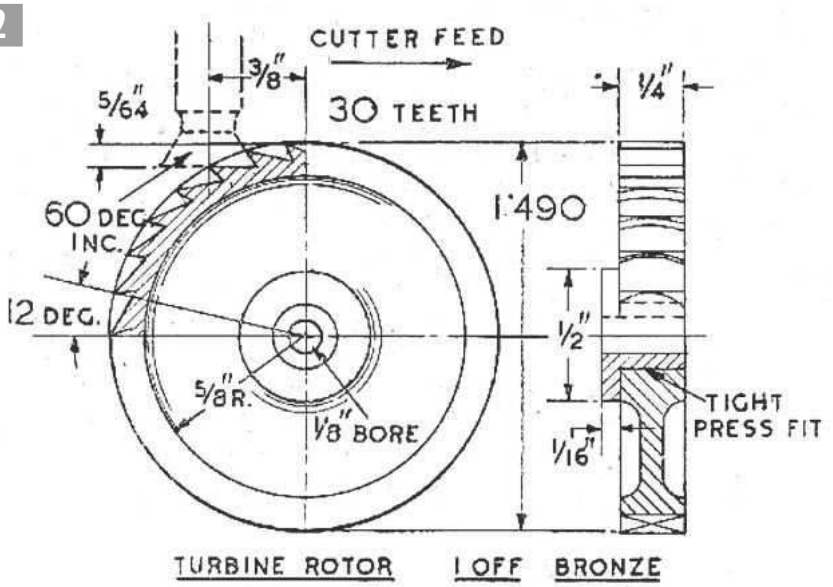
Rotor from a small turbogenerator made by Mr. Timms (copied from ref 84).

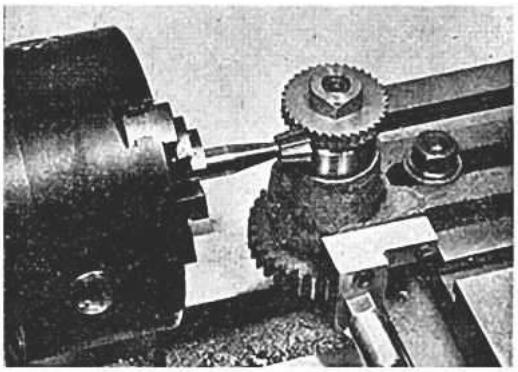
Miniature turbogenerators

A few past articles have described small turbogenerators for attachment to a larger model railway locomotive. These were based on Stumpf-type rotors with pockets machined using plain square-ended milling cutters. Mr Timms and Mr Rowbottom (**refs 84** and **85**) both oriented their cutters at 90° to the orientation used by Mr Bender, as illustrated by fig 89(D). This resulted in their pockets not only lacking any outer walls but also in being flat bottomed (see **photo 65**). Consequently, the steam jet would have impacted against the flat surface (fig 88(E)) without any curve to re-direct its flow. These rotors contained only 12 pockets (i.e. pocket pitch was 30°).

Use of plain end mills to cut the pockets places restrictions on the number of pockets and on their geometry. As explained above, for best efficiency the edge of the pocket should be angled backwards relative to the direction of rotation. However, using a plain end mill in a manner that gives a backwardly directed pocket edge, or even one aligned with a radius, means that few pockets can be fitted in around the circumference of the rotor (see fig 89(B)). Mr MacMahon (**ref 86**) was able to fit in 30 pockets by angling his cutter at 45° to a radius (fig 89(C)). However, that resulted in the edge of the pockets being angled forwards by 45°, which would encourage escape of steam from the pocket and steam that did leave radially would do so at an unfavourable angle. However, as discussed at the outset, it seems impossible to predict if the gain in efficiency from having more pockets is greater than the loss in efficiency due to their forwardly directed edges. The radial clearance between rotor and casing was fairly small at 0.005 inch and that may have helped retain steam in the pockets. It would be interesting to know if reducing the clearance further could improve performance.

Fig 92





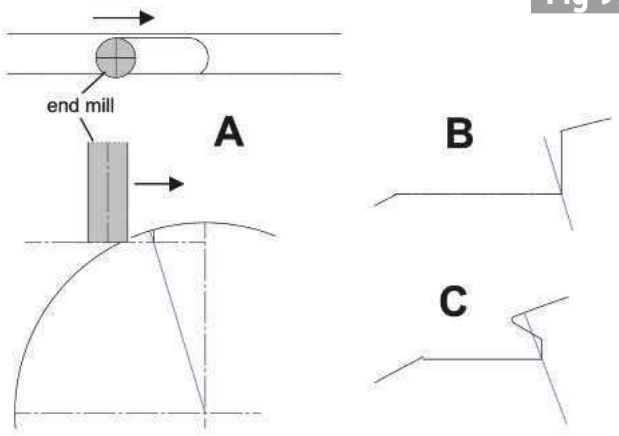
Turbine rotor designed by Mr Westbury and his set-up for machining the pockets (copied from ref 82).

Optimising efficiency

It seems that one way to improve efficiency of a Stumpf-type turbine could be to increase the number of pockets (i.e. decrease the pitch). This is the approach described in a very interesting series of posts on the *Model Engineer* forum by Byron Hanchett who is also undertaking the important task of measuring power output of his turbine in relation to changes in design (**ref 87**). He has compared the efficiency of Stumpf-type wheels with 24 and 48 open pockets. The wheels were 0.875 and 0.892 inches in diameter respectively and had equal sized nozzles which were directed down one side of the pockets i.e. smaller versions of Mr Bamford's rotor.

The increase in pocket number decreased the pitch from 15° to 7.5° and was associated with a marked increase in efficiency. Byron has told me that, for his standard test condition with compressed air, he estimated the power output to have increased from 0.9 to 1.2 Watts. He has also made a slightly larger rotor (1.226 inches diameter) with 60 pockets so the pitch was decreased further to 6°. Under the same test conditions ≫

Fig 93



Methods used by Mr Bender to cut his rotor pockets (ref 83).

as before, the output of this turbine was higher still, at 1.9 Watts. It is possible that these improvements in efficiency could have been partly due to other small differences in the designs of the turbines but the results are the best indication we have of how design of a Stumpf-type turbine affects performance. The last turbine wheel had 2 rows of pockets so as to facilitate experiments with velocity compounding. Under certain conditions this gave a further small increase in output.

True Riedler-Stumpf type pockets could be cut in small sized turbine wheels but that would require the use of very small Woodruff (keyseat) type cutters. Apparently, cutters just 3⁄16 inch diameter and 0.02 inch thick are commercially available. The outer wall of such pockets would prevent radial escape of steam and that should improve efficiency. However, the presence of the outer wall would also mean the steam had to flow into a very narrow crevice in the wheel and that could increase frictional loss. In this context it is very interesting that, in his forum posts, Byron Hanchett (ref 87) wrote that, based on his results, he believes open pockets can be as efficient as pockets with an outer wall, especially when the clearance between the rotor and the casing is very small. As discussed above, a small radial clearance should help retain steam in open pockets, regardless of the angle at which they were cut.

Reverse turbine pockets and blades

To run backwards, Mr Southworth's *Turbo* locomotive initially had a reverse turbine wheel mounted on the same shaft as the forward wheel. In other versions of his rotors, he cut two rows of pockets facing in opposite directions in one rotor disc (photo 64). In both cases, steam was directed at the pockets from nozzles pointing in opposite directions and so forward or reverse was determined by which nozzle was supplied with steam. A similar strategy was adopted by Werner Jeggli (**ref 88**) in his gauge 1 model of LMS 6202 (Turbomotive). He drilled a ring of simple angled holes through the rotor disc of the main turbine. These could be acted upon by a jet of steam from a second nozzle to provide low-power reverse.

This type of reversing arrangement is very convenient but it probably comes with a loss of efficiency when running forwards. As was discussed in part 17, in model turbines, at most only a few blades (or pockets) contribute to power output at any one moment and the others cause drag on the rotor (fannage). It seems likely that blades or pockets facing in the reverse direction will be even more effective at causing drag since they can act as scoops which cause turbulence. Therefore, when reverse pockets or blades are attached to the main forward turbine rotor, every one of them will act as an additional brake all the time the turbine is spinning in the forward direction.

The practice of having the reverse turbine mounted on the same shaft as one of the forward turbines was first introduced by Sir Charles Parsons and it became standard practice for full-size marine turbines. However, such reverse turbines were always located at the exhaust end of the low pressure forward turbine. These low pressure turbines always exhausted into a high efficiency condenser. Therefore, when a ship was moving forwards the reverse blades rotated in a high vacuum and so experienced very little drag.

In the full-size locomotive LMS 6202 there was no condenser and reversing was achieved using a separate small turbine which was normally disconnected from the wheels. When reverse was required, this turbine had to be mechanically engaged whilst the locomotive was stationary. In ships, the much higher powers that were generally involved, together with the need to frequently change direction while manoeuvring, made it impractical to use a drive that was engaged/disengaged mechanically.

Acknowledgement

I thank Byron Hanchett for making valuable comments on a draft version of this article and for allowing me to describe some of his results.

●To be continued.

NEXT TIME

My final article in this series will discuss safety concerns when operating high speed turbines and also will look at methods used to make turbine blades.

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A New GWR Pannier PART 15

Doug Hewson decides that LBSC's well-known GWR pannier tank design needs a make-over.

Continued from p. 173
M.E.4630, 17 January 2020

Drain cock lever (just peeping out from behind the springs).

Better view of the drain cock lever.

Now, this locomotive has not been designed with any proper cylinder drain cocks so I thought that I would include some in my design. This took quite a lot of thinking about with having the steam chests below the cylinders and not having a lot of room to play with. Anyway, for what it is worth here they are.

I have kept the operating mechanism the same as on the full-size engine so it should not look any different from the outside and it does mean that you will be able to see the steam issuing from the cylinder drain pipes in the correct place. I have also designed the cylinder drains with their proper kick down lever to release them. I have to admit that it was a bit difficult designing this arrangement when it would have been much easier if the cylinders had not been upside down but there we go.

I think that I have designed the best arrangement possible and at least everything has ended up in the right place. I have included **photos 115** and **116** to give you an idea of what the arrangement should look like. However, I have seen some pannier tanks with the cylinder drain cock lever at the opposite side of the reverser but the less said about that the better really. The photographs which I have shown are of 9681 on the Dean Forest Railway so you can go and have a look at those if you like. Photograph 115 shows the kick down lever in relation to the reverser and photo 116 is a better photo of the little lever itself which I didn't think you would see very well in the first photograph.

Now we come to the linkage, which I have copied as far as possible so that at least it will look right from outside and the lever will enhance the cab a little if nothing else. The original *Pansy* just has a single drain cock in the underside of the of the bottom cover plate but I just like to see the drain cocks open properly when a train sets off. Just one of my little quirks - it is all part of the scene, the same as going to a water column! (We have six water columns on our little railway so plenty to choose from.)

Photograph 117 shows the connection of the link to the rear of the locomotive to the cross bar which engages with the drain cock operating gear and **photo 118** shows the crank which takes the rod up to just above the side platform level. All of this information is shown on the drawings but I just thought I would give a run down on all the linkage. **Photograph 119** shows the little crank mounted on the middle right hand splasher which takes the drain cock operating rod to the lever in the cab.

Photograph 120 is a front on view of the cylinder drain cocks with the view towards the front of the engine. **Photograph 121** is the opposite view looking towards the rear of the locomotive. This view shows the arms which operate the cylinder drains by pressing the sprung loaded plungers on the cocks, which are a standard GWR fitting. Also shown on the photograph is the main

Front of the linkage.

The linkage is taken up to platform level.

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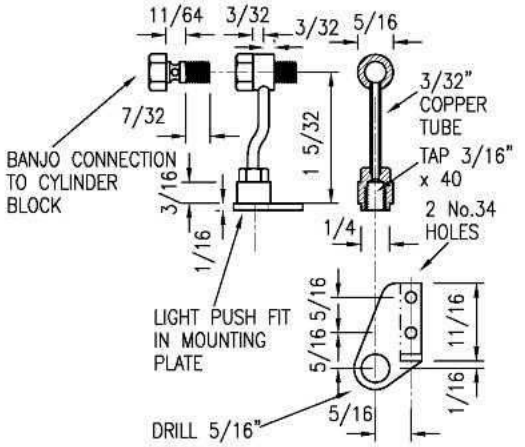
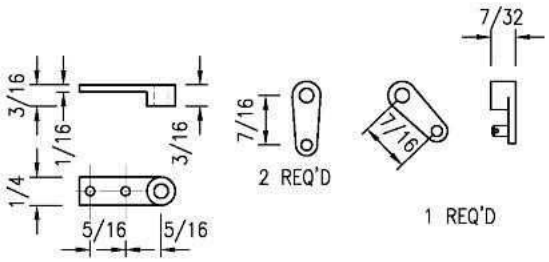
Fig 24

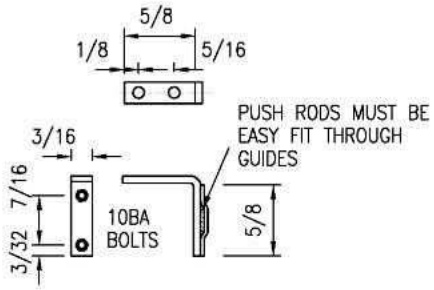


4 SETS REQUIRED

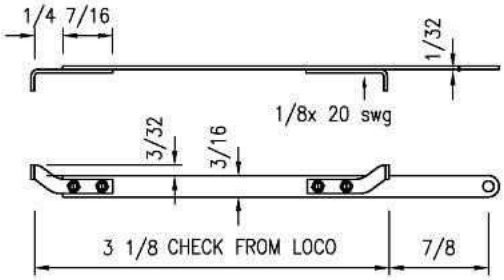
3/32" CRANK IN ARMS



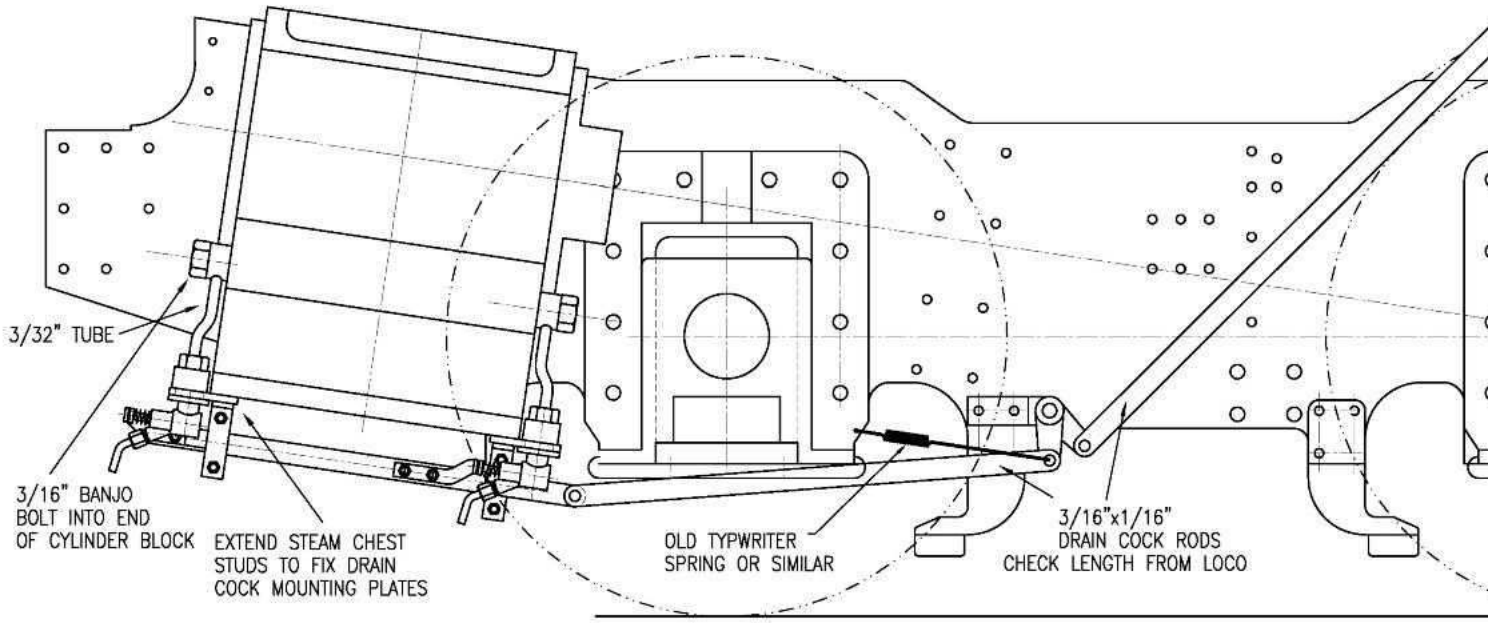
DRAIN COCK ROD BEARING AND CROSS SHAFT ARMS



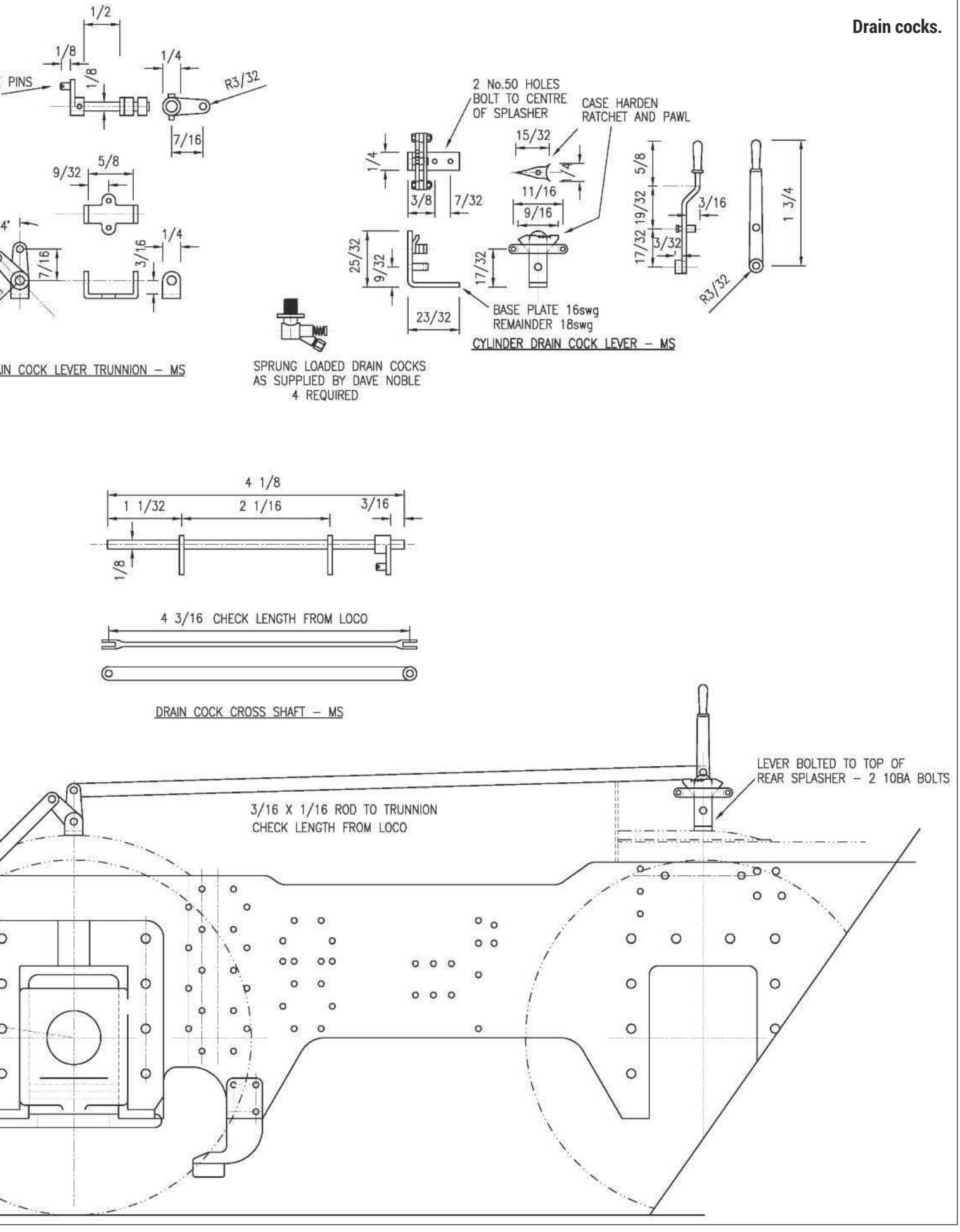
PUSH ROD GUIDES – 4 REQ'D GUIDES BOLTED TO UNDERSIDE OF MOUNTING PLATES



DRAIN COCK PUSH RODS – ONE PAIR REQUIRED – MS



Drain cocks.


1/2
1/8
1/4
PINS
1/8
R3/32
7/16
5/8
9/32
7/16
3/16
1/4
IN COCK LEVER TRUNNION – MS
2 No.50 HOLES
BOLT TO CENTRE
OF SPLASHER
CASE HARDEN
RATCHET AND PAWL
15/32
1/4
1/4
3/8
7/32
11/16
9/16
25/32
9/32
17/32
23/32
BASE PLATE 16swg
REMAINDER 18swg
CYLINDER DRAIN COCK LEVER – MS
5/8
19/32
17/32
3/16
3/32
1 3/4
R3/32
SPRUNG LOADED DRAIN COCKS
AS SUPPLIED BY DAVE NOBLE
4 REQUIRED
4 1/8
1 1/32
2 1/16
3/16
1/8
4 3/16 CHECK LENGTH FROM LOCO
DRAIN COCK CROSS SHAFT – MS
LEVER BOLTED TO TOP OF
REAR SPLASHER – 2 10BA BOLTS
3/16 X 1/16 ROD TO TRUNNION
CHECK LENGTH FROM LOCO

cross shaft which connects everything together.

I made all the parts for the lever some time ago as I thought that it was such a nice little job. However, this was before my little 'hiccough' and, unfortunately, I have not been able to do much about it since so I thought I would write about it instead. P**hotograph 122** shows all the bits laid out and is my attempt to produce something which looks as near as possible as I could get to the fittings on the full size locomotive. **Photograph 123** is another view of the lever shown back to front so that you can see the kick down catch which releases the spring loaded cocks. **Photograph 124** is the view from the other side showing the lever ready for bolting down to the centre of the right hand rear splasher in the cab which should be positioned to line up with the rod from the last crank on the middle splasher.

Now you will have the make up four short lengths of ⅛ inch pipe with a little banjo connection on one end and a fitting on the bottom end into which you can screw the cylinder drain cocks. The reason I said that the bottom end just needs to be a light push fit into the lower bracket is that it will not require any other securing once you have got the banjo joint screwed into the bracket under the cylinder block.

You will now have to make a pair of push rods from 3/16 inch x 20swg strip. Now, I always keep a stock of such strip in all sorts of sizes from ⅛ inch x 20swg up to ⅝ inch x 16swg and it comes in very useful for all sorts of jobs such as this. If you see your friendly sheet metal worker he will cut it up for you for a very reasonable sum - otherwise you can buy it ready cut from The Steam Workshop. Anyway, all I can say is that you will need lots of it and also for the next job which will be all the sanding gear rods!

The two guides on each rod will need to be a good running fit for the 3/16 inch rod so make sure that these have all the burrs removed from the edges. You will then need a couple of right angled brackets to fit each of these guides to the underside of the cylinder block. There are now three little shafts to make, as on the drawings. The collars can be retained with 1/16 inch taper pins. There is also a small tension spring to incorporate into the system somewhere and as long as you get it pulling in the right direction it does not matter too much where it goes. I have suggested a suitable place for it, as you will see, so that completes the cylinder drains.

Crank in the operating linkage.

Drain cocks under the cylinder block.

Another view of the drain cocks, looking backwards.

Component parts of the operating lever.

Showing the kick down catch.

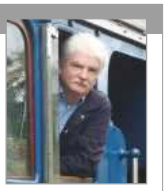
The complete operating lever.

●To be continued.

NEXT TIME
We move on to the brake gear.

PART 5

Magdalen Road Revisited



Jeremy Buck invites us back for a further tour of the Magdalen Road garden railway.

Continued from p.246
M.E. 4631, 31 January 2020

Work gets underway on the chassis

On completion of the refurbishment of the A3, I turned my attention to the chassis of the A4. I was presented with even more problems than I had expected.

On stripping down, the frames were revealed to be pretty good except that they were profiled for the A3, not the A4, but I could live with that. A mixture of brass and aluminium stretchers would not be my preference but my early fears that blind tapped holes in the aluminium would easily strip were not realised. However, a number of tapped holes in the brass did strip requiring M3 studding to be Loctited in. The inner frames under the firebox and cab did not allow any side play for the Cartazzi trailing axle so I had to mill ⅛ inch off each side of the drag box, bend the inner frames in to suit and provide corresponding ⅛ inch thick packs to the spacers between inner and out frames. I was surprised by the difference that that apparently small modification made.

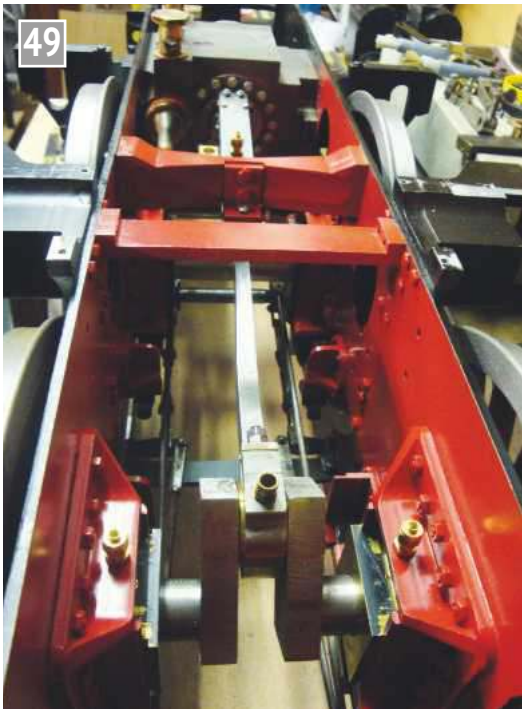
Incidentally, as work proceeded it became evident that Winson must have made extensive use of Don Young's Doncaster design, for which he provided comprehensive drawings and build notes in his magazine *Locomotives Large and Small* (LLAS), as a basis for the model.

With the frames re-assembled and painted (**photo 48**), things started to go seriously wrong. I had known from the start that the tyre profile on all the wheels was incorrect and the rims of the bogie wheels were incorrectly of the LMS/BR 'V' profile. The latter defect was remedied by machining replacement castings of the correct profile, but the driving and coupled wheels presented a bigger challenge because the diameter over the flanges was about ⅛ inch too large to enable the wheelsets to be mounted between centres on the ML7-R. After much thought I packed up the tailstock by ⅛ inch, mounted the wheelsets between centres and machined off the minimum amount from each wheel necessary to enable the wheel set to be mounted between centres with the tailstock in its normal position. Unfortunately, when I set up the wheelsets to reprofile the tyres it transpired that the centres were not concentric with the axles. The only remedy was to remove the wheels from the original axles, make new axles, fit the axleboxes, bond the wheels to the new axles and *then* profile the tyres.

The original crank axle had been machined from the solid and, after some heart searching over the incorrect shape of the crank webs, I retained the webs and crank pin and bonded in extensions to form the journals and wheel seats (**photo 49**). This did, at least, enable me to remove the feed pump eccentric which fitted poorly and was held by a grub screw that was impossible to tighten. I had in any case decided to dispense with the feed pump which was of very crude design and construction.

It was only when I removed the driving and coupled wheel axleboxes that I discovered that they contained sealed needle roller bearings, which explained why no provision had been made for lubrication of the journals. Unlike, I believe, the later Modelworks offerings, the bogie and trailing wheel axles do not run in roller bearings and as no provision had been made ≫

Frames after painting. The horizontal stretcher that is prominent in the photo is a late addition that I provided to provide a robust support for the vacuum brake cylinder.



Another view of the frames, at a later stage of assembly, showing the crank axle and the inside cylinder connecting rod with the Gresley pattern big end prominent.

One of the coupled wheelsets in the assembly jig.

for lubrication I provided oil reservoirs (machined in the top of the bogie axleboxes, mounted externally on the Cartazzi boxes) and drilled oil ways to the horn cheeks and journals. To achieve sensible running fits for the Cartazzi boxes, I had to screw liners to the hornblocks. I also had to silver solder in plugs, then re-bore the Cartazzi boxes to get the correct alignment of the trailing axle.

I made and fitted new crankpins, including those for the driving wheels with the correct square seating for the return crank. These were bonded with Loctite using the very simple jig to achieve the correct angularity as described by Don Young in his construction articles for *Doncaster* in LLAS.

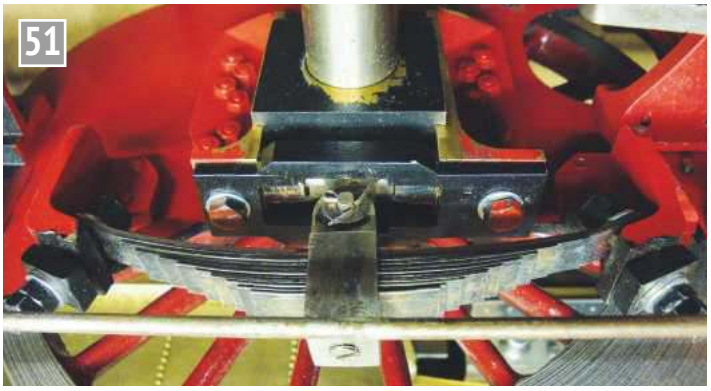
I have to say that my jig for 'quartering' the wheels (**photo 50**) on the axle was a bit cumbersome, especially when offering up the long crankpins on the driving wheels and ensuring that the middle cylinder crank was in the correct place. Although I did several dry run practices in positioning the wheels on the axle and tightening up the side plate of the jig, the process was a bit nerve wracking when it all had to be completed before the Loctite set while, at the same time, making sure that the adhesive did not get to the axleboxes. If I was doing it again, I would use a much simpler jig. Also the use of plain, split axleboxes would allow them to be separated from the axle while the wheels are being bonded.

The trailing wheels were about ¼ inch over scale diameter, but fortunately there was sufficient material in the rim to allow them to be machined down to the correct diameter.

The leaf springs to the driving and coupled axles were, in principle, a reasonable approximation to the full size detail. However, the spring leaves were made of some sort of composite material which snapped when flexed. I made and fitted new buckles and leaf springs (**photo 51**). I used unhardened and tempered spring steel for all of the leaves. I also replaced the spring leaves for the Cartazzi axleboxes but retained the original buckles (**photo 52**). Oil boxes were provided to feed the axle and the Cartazzi slides.

The cylinders had been machined from cast iron billets and in that respect they were generally satisfactory. However:

- One of the piston valve liners was loose.
- The ports in the liners comprised drilled circular holes.
- The cylinder covers registered poorly with the bores so proper alignment of the piston rods and slide bars was impossible.
- There were insufficient and poorly fitted bolts to attach the covers to the cylinder block. (Some threads were stripped and there were various oversize holes in both the blocks and covers).
- The piston rod and valve spindle end connections (to piston, main crosshead and valve spindle crossheads) were not fit for purpose due to the use of coarse threads that were impossible to align and no means of locking was provided.
- Piston rod and valve spindle glands were not fit for purpose, also due to the use of coarse threads, and were only possible to align because of oversize bores in the gland nuts.
- The piston valve bobbins were all of different lengths.
- The piston valve rings were not fit for purpose and jammed in the liners.
- Valve spindle guide supports were out of alignment.
- Every fastener was an M3 setscrew, irrespective of whether that size was suitable for its purpose.

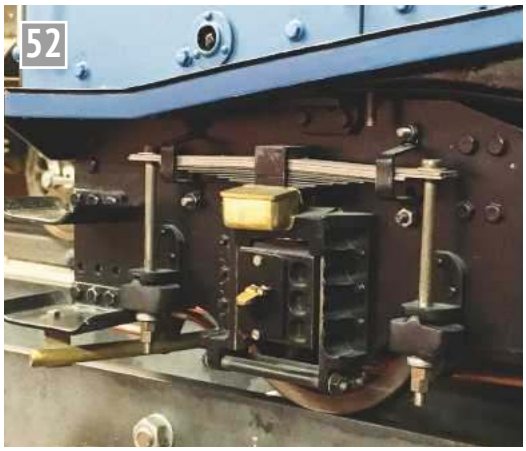


Coupled wheel spring assembly. The original longitudinal pin, which is hidden behind the hornstay, allows the axle to tilt. The new transverse pin, with split pin retainer prominent in the photo, ensures that the load on the spring is equally shared by each of the two spring hangers.

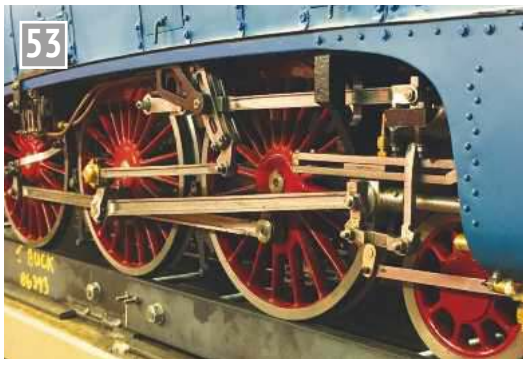
The detailing of the steam chests did not match the Don Young layout with resulting reduced longitudinal clearances for the piston valve bobbins, the various lengths of which I corrected to match Don's drawing - of which more later.

I regret not machining away some of the surplus metal on the outside and underside of each outside cylinder block. This would have allowed the insertion of some insulation between the block and the cylinder cladding.

The rebuilding comprised major surgery to - or replacement of - nearly all of the components listed above plus complete replacement of



Trailing axle showing Cartazzi axlebox and leaf springing. The upper oil box feeds the Cartazzi inclined slides and the horncheeks. The lower oil box feeds the axle to the underside, as it should, of the journal. The offside injector overflow pipe is visible below the footstep. The pipes behind the trailing wheel are the vacuum brake train pipe (lower) and connecting pipe between the vacuum reservoirs on engine and tender (upper).



Motion details 1.

Motion details 2. Compare this with photo 31.

piston rods, crossheads and slide bars (**photos 53** and **54**). M3 fasteners were retained where appropriate, although changed to stainless steel for cylinder covers, but traditional BA fasteners were introduced where I deemed the original fasteners to be unsuitable. For example the cylinders are now bolted to the frames with 4BA fasteners which approximate to a close tolerance fit in the original holes.

The valve rings and gland packing were replaced with PTFE (**photo 55**); the first time I have done this (although as earlier described I had successfully used this material for the regulator valve in the Stirling Single) and it will be interesting to see how they perform under steam. It would have been preferable to have squared up the ports in the liners, but this would have required all six liners to be removed and I baulked at that. It is sometimes difficult to know where to draw the line on a project such as this.

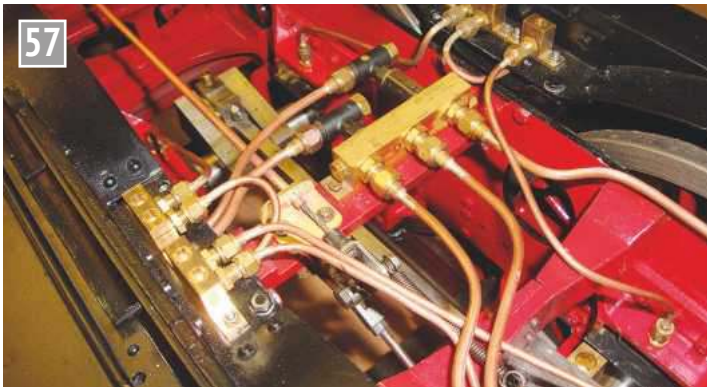
I also used PTFE in the drain cocks, the original bodies of which I retained (**photo 56**) but with modified operation from the cab via levers and Bowden cable (**photos 57** and **58**). I made a mistake in not lubricating the cable with graphite powder before assembly with the result that movement is very stiff; replacement with steam operated cocks may be worthwhile in the future.

In Don Young's Doncaster design, the exhaust pipework is integral in the very complex, inside cylinder casting. Given that these components were machined from the solid, Winson had to come up with something different and I think they came up with quite an elegant solution. Unfortunately I had to replace it all - including providing a blower cap and connection to the rear blast pipe (**photos 59** and **60**) - because it had been badly executed. Similarly, the simple arrangement of the live steam passages to the outside cylinders through the smokebox saddle, which had been machined from aluminium, was let down by poor details and the execution was unsatisfactory. I enlarged the diameter of the steam passages by as much as was practicably possible and provided new connections, both for the superheater in and the cylinders out, as shown in **photo 60**. As originally arranged, both had flanged connections to be secured with two M3 setscrews and I considered that the chances of achieving steam tight joints were remote; especially as the superheater connections required the insertion and tightening of setscrews that were impossible to access in the smokebox.

I also introduced a passage through the saddle

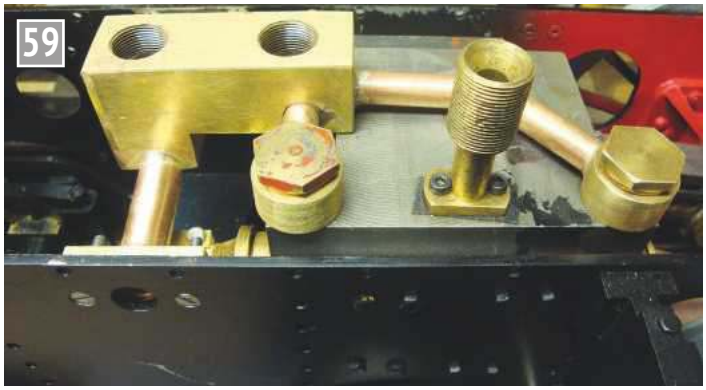
Piston valve bobbin, after lengthening to match the near side cylinder ports, with PTFE 'rings' which control steam entry and exit. The original rings can be seen in the background. The jig that I used to determine the actual port positions is in the foreground.

Underside of cylinders showing the drain cocks and operating linkage. The pistons are in the 'closed' position. The PTFE insert in the piston has an annular groove which, when in the 'open' position, lines up with the passage in the body.



No 4497: In the middle of the photo can be seen the crank where the mechanical drain cock linkage changes to a Bowden cable. The springs return the drain cocks to the 'closed' position. Also in the picture can be seen the manifold where the single feeds from the two mechanical lubricators split into three feeds, one for each cylinder. Oil feeds to hornblocks, inside cylinder slide bars, and weighshaft bearings are accessed through the hatches in the streamlined casing.

Cab view showing the drain cock operating level bracketed off the cab side sheet. Also prominent are the vacuum gauges for train pipe and reservoir. The lever projecting above the cab floor controls the ashpan damper.



Exhaust steam passages.

View on smokebox saddle showing live steam connections from superheater to saddle. ≫

for lubrication of the inside cylinder. Provision was made for lubrication of the outside cylinders by tapping into the connectors between saddle and each cylinder (**photo 61**). The three oil lines are as near equal length as possible and a check valve was provided in each line, complemented by two further check valves at the manifold where the feed from the two lubricators branched into separate feeds for each cylinder, as can be seen in photo 57.

Close examination of the original motion revealed that although, with the exception of the return cranks, the radius rods and inside connecting rod, parts closely approximated to the Don Young dimensions, it had been very poorly executed and at one stage I considered replacing the lot. I did make a new inside connecting rod, the big end of which bore no resemblance to the Gresley design. I also replaced the expansion links which were originally of brass construction, with new steel components.

I had hoped to modify the motion brackets so that the outer expansion link trunnion supports could be removed; thereby allowing the whole expansion link assembly (with radius rod attached) to be removed as a unit (as is possible for the A3). Unfortunately, the work required to do this would have had an unacceptable effect on the strength and stiffness of the outer support, and clearances were inadequate to allow the necessary stiffening to be added. The expansion links therefore need to be dismantled *in situ* in order to release the radius rods, if any attention is required.

I made new return cranks to match the square seating on the crank pins (**photo 62**). For all of the other components the end milled fluting was corrected using a Woodruff cutter. Brass bushes, if provided, fell out during stripping (they were, in almost all cases, ineffectively bonded in) and were replaced by new bushes with appropriate press fit. Oil holes were plugged, silver soldered and re-drilled and, in the case of the coupling and connecting rods, provided with screwed in oil cups also shown in photo 62.

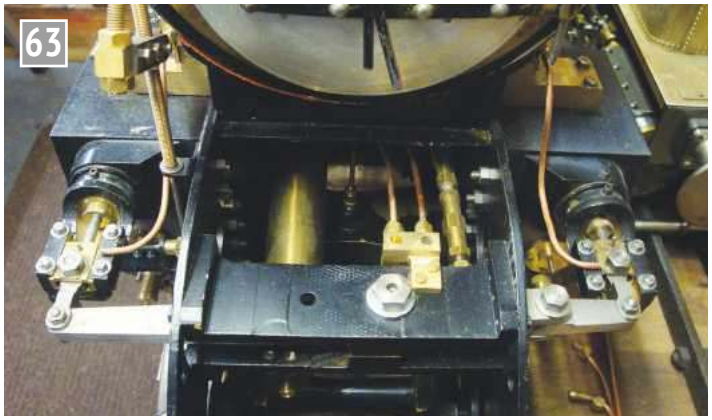
I thought the motion pins were an abomination. Floating pins, each retained solely by a split pin, are not only non prototypical but also unnecessarily double the amount of lost motion due to the initial clearance and subsequent wear in service. Where such pins were provided, as on the radius rods, the eccentric rods, the combination levers and the union links, not to mention the two to one gear, I silver soldered plugs into the original fork ends, re-drilled them and tapped one leg of the fork to receive a shouldered threaded pin. Arguably, this has made lubrication more problematical for some of the pins in the 2:1 gear (**photos 63** and **64**).

The two mechanical lubricators use the conventional ratchet and pawl type of drive and are driven by a return crank on the rear coupled wheel on the fireman's side. The drive arm of each lubricator is connected via a single shaft to a single drive arm that is connected via a cranked rod to the return crank. The swing of this arm is constrained by the

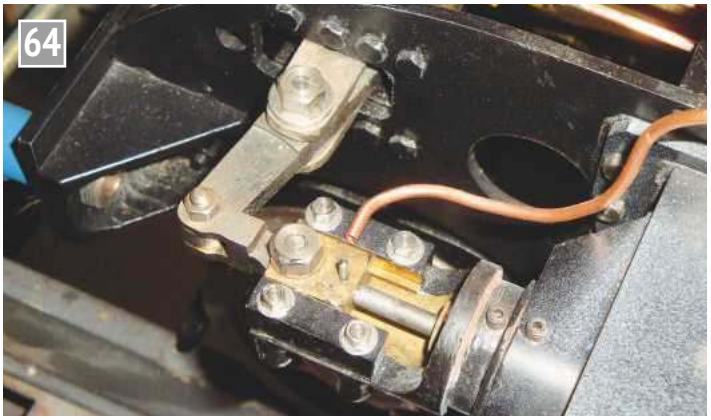
Live steam connection from saddle to outside cylinder showing also oil feed and check valve.

Return crank and more motion details.

Winson must have made extensive use of Don Young's Doncaster design, for which he provided comprehensive drawings and build notes in his magazine *Locomotives Large and Small*, as a basis for the model.

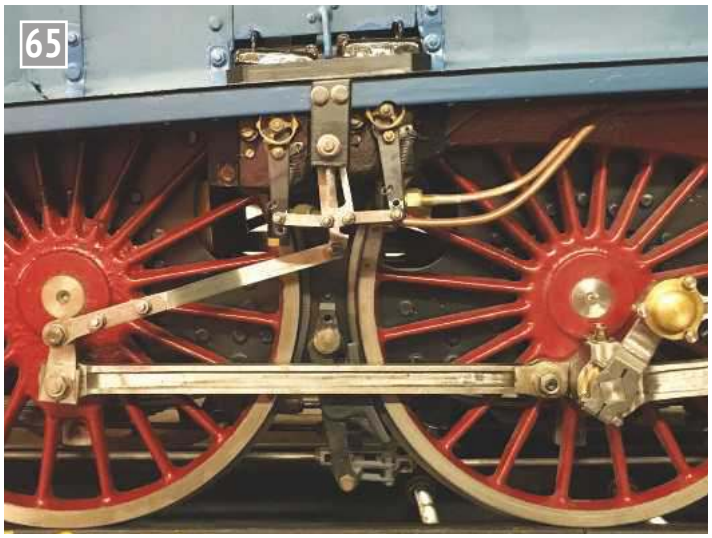


Two to one gear to drive middle cylinder valve, showing also gravity oil feeds to inside cylinder valve crosshead and bogie pivot pin.



Enlarged detail of valve crosshead.

spacing between the lubricator tanks and is scarcely enough for the pawls to click over the ratchets. To ensure that the maximum achievable swing was achieved, the throw of the return crank is arranged to cause the possible swing to be slightly exceeded. The cranked drive rod incorporates a simple lost motion device via two bolts in slotted holes to ensure that the actual swing of the drive arm is the maximum that can be accommodated without causing damage (**photo 65**). I may replace the ratchet and pawl mechanisms with roller clutches.



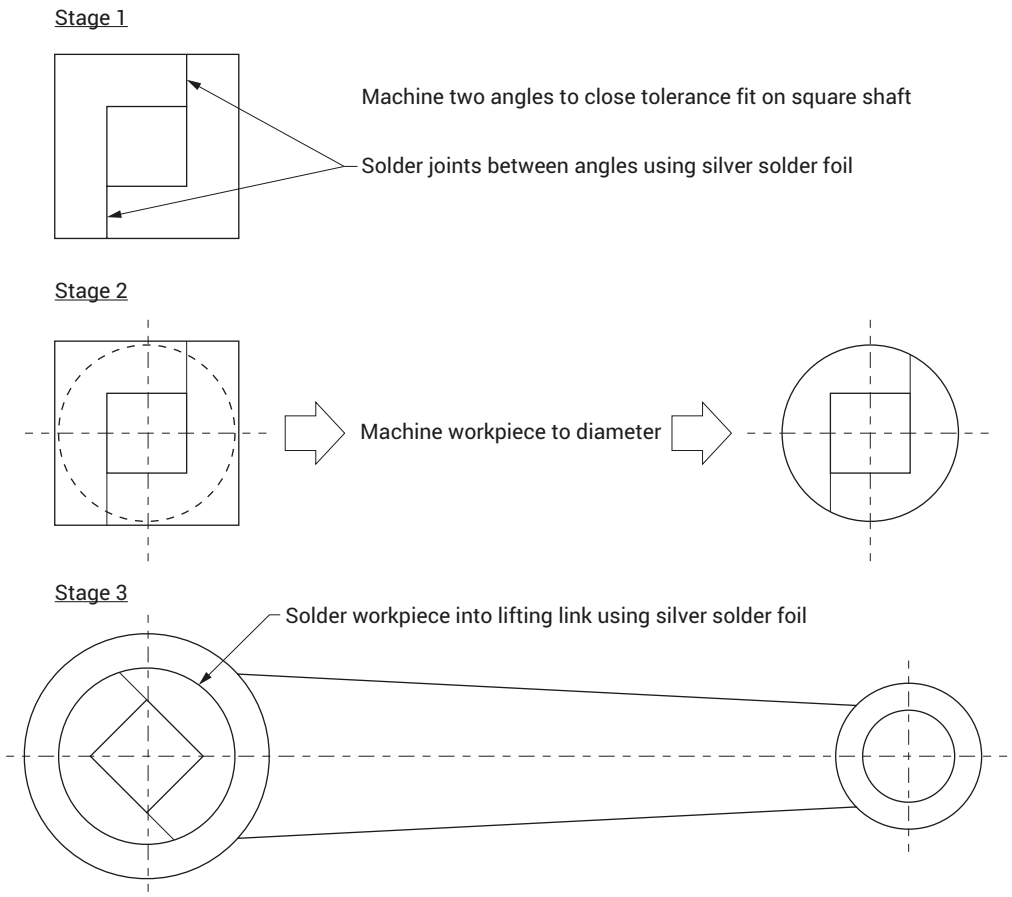
Mechanical lubricator drive.

I made and fitted new steel lifting arms for the weigh shaft because the originals, of brass, had a sloppy fit on the squared ends of the shaft, and I replaced the reversing rod, which was obviously proportioned for an A3, not an A4. My method of making the square holes was to machine, on the mill, a pair of BMS angles to form, when offered up to each other, the required close tolerance fit (and it must permit absolutely no movement) on the weigh shaft. The angles were then silver soldered together. The resulting thick walled square box section was then machined to an outside diameter that matched a corresponding hole in each of the lifting arms (**fig 3**). The square hole was then soldered into the pair of lifting links in a simple jig to ensure common alignment, before splitting and machining of each link to finished width. I used silver solder foil inserted into the joint during assembly; a technique that I use frequently for soldered joints. The reverser stand required little modification, the main tasks being to make a new main bearing and cross shaft - see later - and off-set crank, and to enlarge the base and arrange adequately robust fixings to the main framing (**photo 66**).

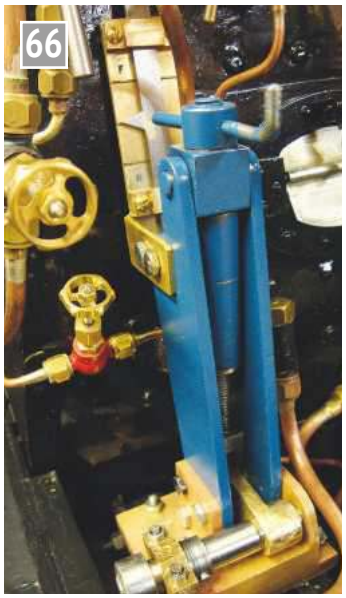
On completion of the valve gear, but with the valve bobbins only approximately positioned on the spindles, I connected up the air compressor. To my relief, it turned over at about 60psi, albeit very 'lumpily', in both forward and reverse gear. It was only a few revolutions and required assistance to get it started, but this was very encouraging and gave me additional incentive to get on with setting the valves.

●To be continued.

Fig 3



Method Of Forming Square Hole In Lifting Link



Reverser. Not visible are the stops that determine full forward and reverse gears. The fit up between the cranks and the cross shaft had to be perfect to prevent unacceptable 'waggling' of the lifting links.

Book Review

Bassett-Lowke Art: The Making of an Identity

Christine Sanderson

Published by The Charles Rennie Mackintosh House, 78 Derngate, Northampton NN1 1UH (www.78derngate.org.uk), £7.50 +£3 P&P. 8.25 x 5.75 in, 83pp full colour throughout, softback glossy colour cover.

I confess to coming to this with a slight bias; in the late 70s and early 80s I worked for the late lamented Beatties of London Ltd at 112 High Holborn, London WC1 and we frequently had visitors asking if we were anything to do with Bassett-Lowke because that very building had been their London HQ. Ever since then I have been delighted to know that the name lives on and that the company's products, loved and admired in their time by a faithful clientele, are now highly prized collectors' items appreciated for the quality they represent.

The first impression on opening this profusely illustrated volume is that Christine Sanderson really knows her stuff! As a guide at the 78 Derngate museum and charity in Northampton she has compiled a mass of information on the company, a taste of which is contained between its covers.

Wenman Joseph Bassett Lowke knew what style was and added a new layer of sophistication to our pastime. Such was his influence in life that his house *New Ways* was designed by the influential architect Peter Behrens in 1926 and is now a Grade II* listed building.

His legacy also lives on through a charity that has restored and now maintains the company's original HQ at 78 Derngate, Northampton, designed by Charles Rennie Mackintosh, an architect and designer of world renown at the time and still much revered a century later. This charity has published the title reviewed here, by Christine Sanderson, a guide for 15 years at Derngate and evidently an expert in her field. Having read it and looked at the artworks she writes about and illustrates, it surprises me that this subject has not been covered before and I am glad that she has put this to rights.

At first appearing a somewhat arcane subject for a book, this publication tells a fascinating and unique story about the business through its artwork used in catalogues and other publications and is far more than a dry listing of catalogues for the hardened collector. Much in the vein of the great man himself, the cover gives the secret away; just like those classy catalogues, there is much more to this than at first meets the eye and this is a book that will interest a far wider audience than hobbyists alone.

Christine Sanderson takes a chronological look at the catalogues and books produced for Bassett-Lowke from their first decade all the way into the 1950s, providing interesting background information on many aspects of the business.

W.J. Bassett-Lowke started his company when the world was poised to enter the 20th century and at that time, apart from custom-built commissions for the very wealthy, model railways aimed at the wider public were toys sold by retailers through set selections of items supplied by warehouses, listed in generic catalogues whose front page was designed to be overprinted with the retailer's name – something that happens still today in the stationery business for instance.

While Bassett-Lowke's first catalogue was one of these generic issues, his visit to the Paris Exhibition of 1900 would change the future of the model railway and model engineering field and that is where the subject of this book steps into the company's story. At the exhibition, Bassett-Lowke was struck by the quality of models mainly from German makers based in Nuremberg, made from soldered tinplate rather than the lacquered brass of British makers.

Astute as always, he realised that this was something very new and he thought that better off British customers could go for these, especially if they were painted in British liveries; there could be a business here but he would have to think up a way to get his products noticed and accepted by his target audience, many of whom would not otherwise give the idea of models a second glance. He took the plunge and immediately ordered some stock from suppliers at the exhibition.

Innovative products need an innovative marketing strategy and he knew that he could present his miniatures not as children's toys but as models and aim them at adults and mature youngsters. In order to succeed at this, marketing these high quality products would require something more sophisticated than the established norm of overprinted generic catalogues; his classy clients would only respond to a classy catalogue - something stylish basically. 'Chocolate box' type illustrations were not for him. 'Less is more' could be the answer and there was a new trend in art that was inexpensive to produce but stylish at the same time. It could be basic but that didn't mean that it had to look cheap - no sir. This was the luxury goods end of the market.

The serious side of model railways and modelmaking as hobby had just been born.

While Mao's attitude that 'quantity has a quality all of its own' may have appealed to the mass makers of British toys towards the end of the 19th century, Bassett-Lowke's new 20th century approach was

more like that of his aimed for clientele – 'quality doesn't have to shout to be noticed' - and no doubt he was well aware that first impressions count. This meant that the covers of his catalogues would have to express such a viewpoint, which is where the subject of this lovely little volume comes into the company's life story. The style of the covers continued within each catalogue's pages and, as printing developed, he kept up with the latest ideas and styles, including photographs from various sources within each publication.

Cladding the catalogues in 'art' covers conveyed the notion to his clientele that his products were high quality luxury goods and frequent reissues of the catalogues, with new covers and referring back to previous editions, helped keep his products in the minds and eyes of his customers. A wide range of these covers is shown in the book.

Quality has and always will be important to the discerning customer and Bassett-Lowke's products lived up to the reputation he was striving to build. Indeed, our very own founder Percival Marshall positively reviewed Bassett-Lowke's legendary Bing-manufactured LNWR *Black Prince* locomotive model in these pages in February 1901. His review led to a number of orders from readers that helped to grow the fledgling company.

Wenman Bassett-Lowke was as well versed in the world of design as of engineering and, as his sales and company grew, he entered and added respectability to other branches of the hobby and promoted the professional modelmaking side of his business, using his beautifully produced publications. He also cleverly saw that model railway enthusiasts don't always buy model boats, cars, electrical items or aircraft, so he listed these in different catalogues, each with its own stylish cover and examples of all of these are shown in this book.

The company was nothing if not prolific; there are at least 200 known catalogues and hundreds more adverts in magazines of the time, with illustrations not only by W B-L himself but by some of the most famous artists of the day, some of whom were famous for their artwork on full sized transport posters for firms such as the LNER and Imperial Airways. Within a few years he had befriended many of the movers and shakers of the day in the art world and the names who designed for Bassett-Lowke included Cecil J. Allen, Kenneth H. Cullen, Henry Greenly, Ernest W. Twining and Charles Rennie Mackintosh. Bassett-Lowke's catalogues were consistently stylish and were kept there by these names and many others, staying in touch with the evolving trends of the day.

They did amazingly innovative things with simple two or three colour printing, blocks of colour and silhouettes and you can see it all here, an inspiration to today's graphic artists.

Unsurprisingly, given the range of influential artists of the day employed by Bassett-Lowke, there is a fine selection of rather attractive artwork to be seen in this book and, adding to this, the author puts them all in context and gives us a short chapter each on several of these artists along with examples of their work.

This book will definitely appeal to those within the collecting field, be it art and design, advertising and marketing, Art Deco decorative art, model engineering or model railways and even social historians too. It will of course also appeal to the professional graphic artist, marketing and branding expert as a useful reference.

It says a lot that, a hundred years on, we still look at the prolific artwork from this innovative man and his team, admire his abilities and associate him with high quality he persistently strove for, and for which he is still justly famous. This handy little volume does him justice.

Highly recommended; your bookshelf deserves a copy and you should read it too.

Mitch Barnes

Write to us

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Stirling Engines

Dear Martin,
The Stirling engine rally article in issue ME4628 (20th December 2019) opened my eyes. I have been modeling for over 80 years and never realised that Stirling engines were full-size working engines, as most at shows look like delicate machines. Would it be possible to have an article on the full-size Stirling engines? A visit to the Hereford waterworks museum is a must for me this year.
Thanking you, Eric Sanders

Locomotive Oddity

Dear Martin,
In ME4627 (6th December 2019) Duncan Bell asked why some ex GER J65 0-6-0 tank locomotives ran as 2-4-0's with the front coupling rod sections removed. This was to improve their ability to traverse sharp track curvatures in shunting yards such as found in various docks systems which Duncan mentions. The only reference I have that refers to this change is in 'The Great Eastern Railway' by Cecil J. Allen, published by Ian Allan 1955, which notes that some of these modified locomotives (ex GER class E22; LNER class J65) worked for some years between Fenchurch Street and Blackwall where they would have worked in several small and cramped goods yards and private sidings.
Mike Johns (Taunton)

Dear Martin,
I refer to the letter from Duncan Bell in ME4627. According to Part 8A of the RCTS publication *Locomotives of the LNER*, the reason for the removal of the front side rods on some J67 and J69 0-6-0T locomotives allocated to work on the Kelvedon and Tollesbury Light Railway was to reduce wear and tear due to the sharp curves on that line. The same publication notes that the similar but smaller J65 0-6-0T's employed on the Fenchurch Street to Blackwall line frequently had their front side rods removed; no reason is given but it would not be unreasonable to assume that sharp curves were the reason. J65's with front rods removed also worked a number of other rural branches including the Stoke Ferry, Eye and Mid Suffolk Light Railway lines, and in the docks at Ipswich, Yarmouth and Lowestoft where curves would have been of even tighter radius. The Y4 class 0-4-0T locomotives designed explicitly for operating on tight curves, although they never ventured outside East London, had a 6 feet fixed wheelbase compared with the 13 feet 4 inches of the J65's in 0-6-0T format and 7 feet in 2-4-0T format. In the latter configuration the frames ahead of the driving axle would have been able to flex unconstrained by binding of the coupling rods and consequent wear of the bearings.
Best regards, Jeremy Buck

The Barclay Well Tanks of the Great War

PART 58

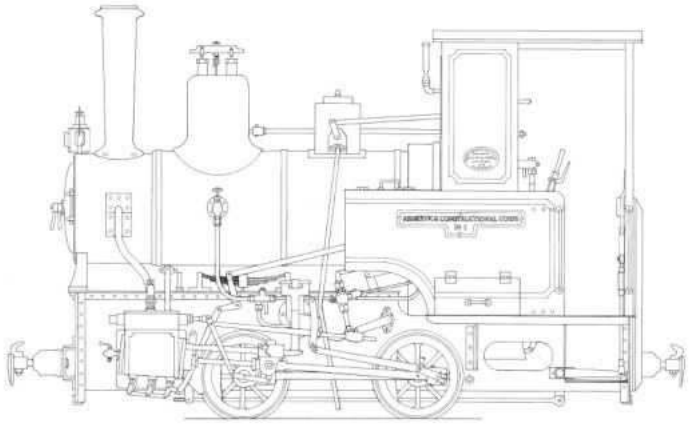
Terence Holland describes and constructs two appealing, century old locomotives.

Continued from p.183
M.E. 4630, 17 January 2020

This constructional series addresses Andrew Barclay 0-4-0 and 0-6-0 narrow gauge locomotives supplied for use in the First World War. Built without the use of castings, the 0-4-0 design is described as two versions; as-built for the British Admiralty in 1918 and as rebuilt and currently running on the Talyllyn Railway as their locomotive No.6, *Douglas*. The 0-6-0 engines described were built in 1917 and operated on 60 centimetre gauge track at the Western Front in France. These were small, spartan machines of which only 25 were supplied and none have survived into preservation.

ACC No.1 *exposed motion and gear.*

Side View of Original Engine Fig 183



Modifications required for *ACC No.1*

Figure 183 is my general arrangement drawing of *ACC No.1*; i.e. *Douglas* 'as built' by Barclay's in 1918 and before restoration by the Talyllyn Railway. The obvious differences are the lack of the extended cab, the absence of running irons and the single buffer/couplers. Surprisingly, the 0-4-0 and 0-6-0 engines were built with three drain cocks each side, i.e. with a central steam chest drain – an unusual feature for narrow gauge engines of such a small and Spartan design. But Barclay's went one step further when designing and building the three engines for *Bord na Mona* in Eire by fitting them with piston valves!

To give some idea of the diminutive size of the Barclay 0-4-0s, *Douglas* on the TR weighs in at 8 tons, whereas Alco's 4-8-8-4 *Big Boy* locomotives, built for Union Pacific in the States and the biggest ever built, weighed some 600!

I have not drawn a front or rear view of *ACC No.1*, as these drawings would not be dissimilar to those of *Douglas* - see figures 158 and 159 (M.E.4616, 5th July 2019).

As mentioned above, the most obvious difference is that there is no cab extension and only one set of window frames. Another significant change is the lack of angle iron guardrails protecting the cylinders and valve gear. It is not that apparent on the drawings but 'in the flesh' these make a big difference to the 'look ' of the locomotive – see **photo 272**, which shows another view of my locomotive before rebuilding.

Note that the nameplate in fig 183 is drawn slightly short; there should be equal spacing each side of the bunker. The completed plate should be 8 inches long and 1½ inches deep – see figure 153 (M.E. 4612, 10th May 2019). The maker's plates (see figure 151, same issue) are slightly oversize and this was done deliberately to make them more obvious – artistic licence one could say!

Photographs 273 and **274** show my locomotive as *ACC No.1* before rebuilding as *Douglas* - note the plethora of

Front View of ACC No.1.

whistles – they could definitely hear me coming! There were, however, a few other items which were a bit 'tongue in cheek', such as an incorrect firehole door, two drain cocks each side instead of three, mechanical lubricator etc. etc. It's a fairly long list…

Nameplates and maker's plates

Making these etched plates was dealt with recently, so there's not much more to say. **Photograph 275** shows the engine plates on my unrebuilt engine. The maker's plates, of course, will be the same as those on *Douglas*, although the rebuilt locomotive sports new maker's plates, which are a bit closer to the original. The lining operation and the provision of a garter crest were also dealt with recently.

Photograph 276 is another view of *Douglas* on the TR posing as *ACC No.1*; 100 years after construction. Note the pale colour used by Barclay's as their 'standard green' and the relatively complex yellow, olive green and black lining. The lack of the air pump next to the smokebox means that, to comply with regulations, a Diesel has to 'bring up the rear' and supply compressed air for the train brakes (**ref 57**). However, apart from the nameplates, colour scheme and lack of running irons the locomotive is still pretty much our old friend *Douglas*!

Injector Position

Barclay Tracing number 37355 of 1917 specifies a 'No.3 lifting injector' and the arrangement on the drawing is as shown in **fig 184** and not as shown

Rear View of ACC No.1.

Plates on the unrebuilt locomotive.

ACC No.1 *at Wharf Station (Talyllyn Archive).*

in the general arrangement fig 183. The arrangement in fig 183, however, is ideal for the model as it supplies the maximum head of water from the driver's bunker and the delivery pipes are quite short.

It would be difficult to exactly reproduce the original injector/feedpump/water valve arrangement, mainly because larger diameter pipes are required on the model.

When the six engines were built, they were fitted with injectors only, so the drawing detail regarding the crosshead pump does not apply. **Photograph 277** is an enhanced view of the final set up when Nos. 1 and 2 were photographed at Kilmarnock.

Note that, as with the water arrangement on the 0-6-0s (figures 180 and 181, M.E. 4630, 17th January 2020), there is a lengthy flanged pipe between the water valve and the well tank. This could be fitted with a tee and supplied with water from the bunker, with a cross pipe feeding the opposite side through the well tank, as suggested in figure 182 (same issue). The injector could be mounted level with the base of the bunker and close to the bunker front and not as shown in fig 183.

Schematic showing LHS Injector Layout on ACC No.1

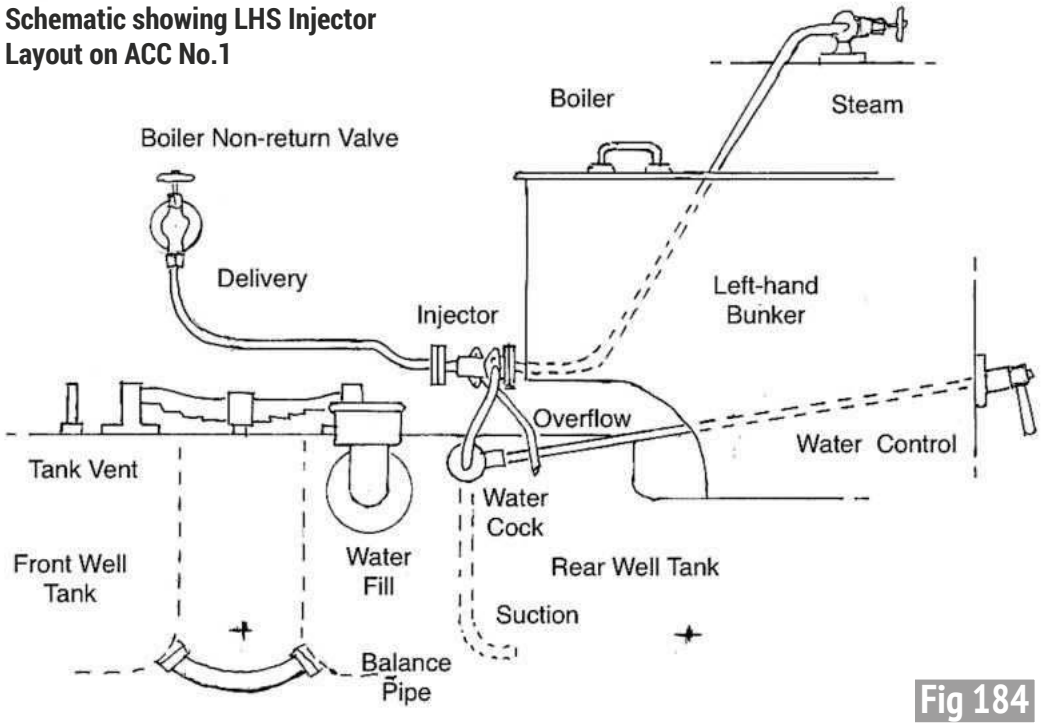
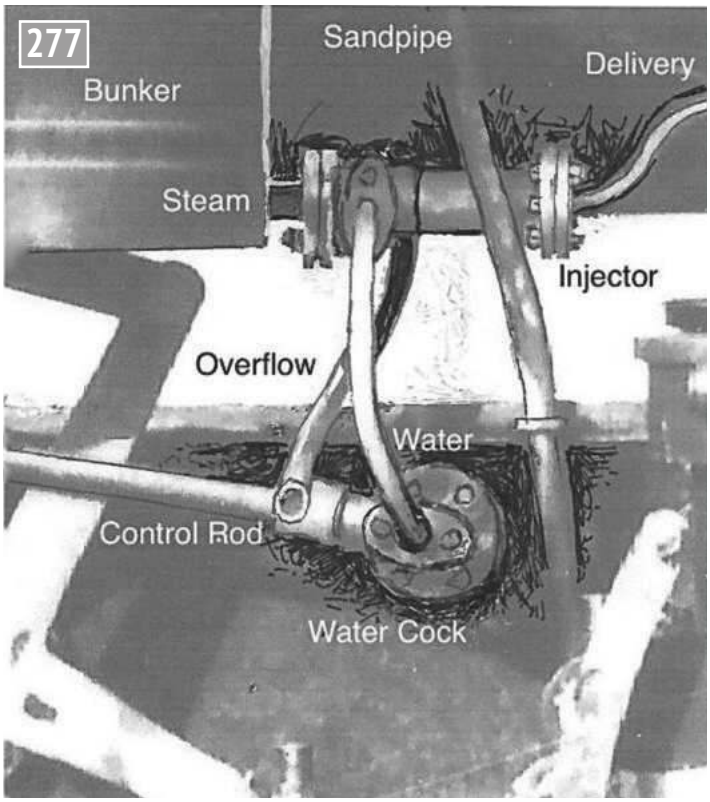


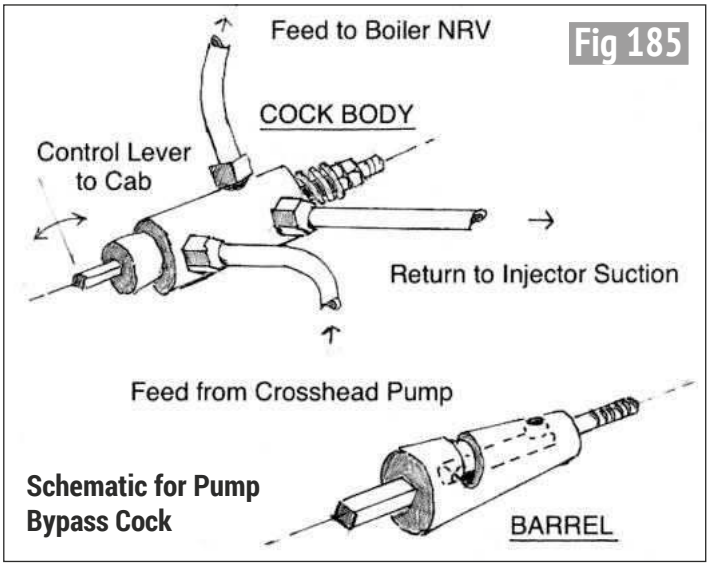
Fig 184

Figure 184 shows the injector layout as deciphered from the original Barclay drawing (Tracing 37355), which shows just about everything in layers! However, working out that the Barclay injectors were fitted up this way is helped by a perusal of the only available photograph (as far as I know), taken at the Barclay works. As can be seen in photo 272 my original position for the injectors was not far from that shown in fig 183. Using the water supply arrangement discussed above (fig 184), it should be possible to get a good representation of the original system (water supplied from the bunker, with a cross pipe feeding the opposite side through the well tank).

Things are a bit more difficult with the layout for the crosshead pump pipework because, as far as I know, no photographs exist of the proposed installation. It is difficult to understand the system from the Barclay drawing only (and believe me I've tried!) so I have made no attempt to provide a schematic. The main problem is that the general arrangement drawings are incomplete with respect to the pump system, and the pipework shown is a bit complex and layered with the injector pipework from the other side of the engine. 'Twas all a bit hypothetical anyway, 'cus they weren't actually fitted – so as Cole Porter once said 'anything goes'!



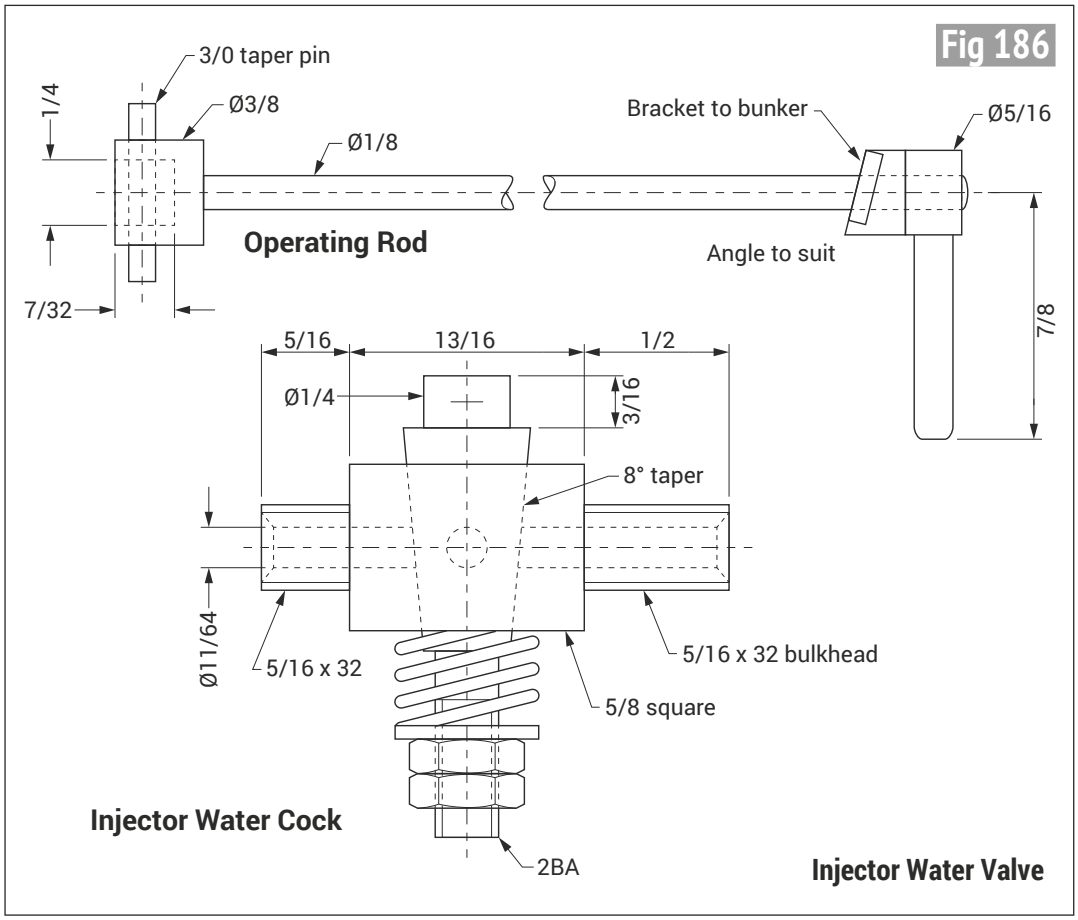
Right-hand injector arrangement at Kilmarnock (author's collection).



Schematic for Pump Bypass Cock

Fig 185

The sketch in **fig 185** is my interpretation of what the Barclay pump bypass valve may have been like. The valve shown is a plug cock and is similar to that indicated on the GA drawing. The back of the barrel is partially slotted so that the outlet from the pump is connected to the central passage, regardless of the position of the operating lever. This slot connects via the internal passage to the front of the barrel, which links to either the boiler non-return valve or to the bypass return (the injector suction from the well tank or, in our case, from the bunker), depending on the position of the control lever. The passageway could be drilled and partially tapped, say 2BA, and plugged with a suitably sealed, threaded stud, which would form part of the spring/stud assembly holding the plug into the body of the cock. The other end of the barrel is squared to take the push/pull cab control lever.



Injector water valve

The design of any injector water valve should ensure that air cannot get in during operation. **Figure 186** illustrates a suitable valve based on a typical cock design, which, in service, should be kept well greased. However, a better option (with a larger passageway) would be to use a modified commercial ball valve as advocated by D.A.G. Brown but finding one small enough could be a problem.

One limb of the threaded portion is longer than the other to allow it to be used as a bulkhead fitting or for the attachment of a mounting bracket.

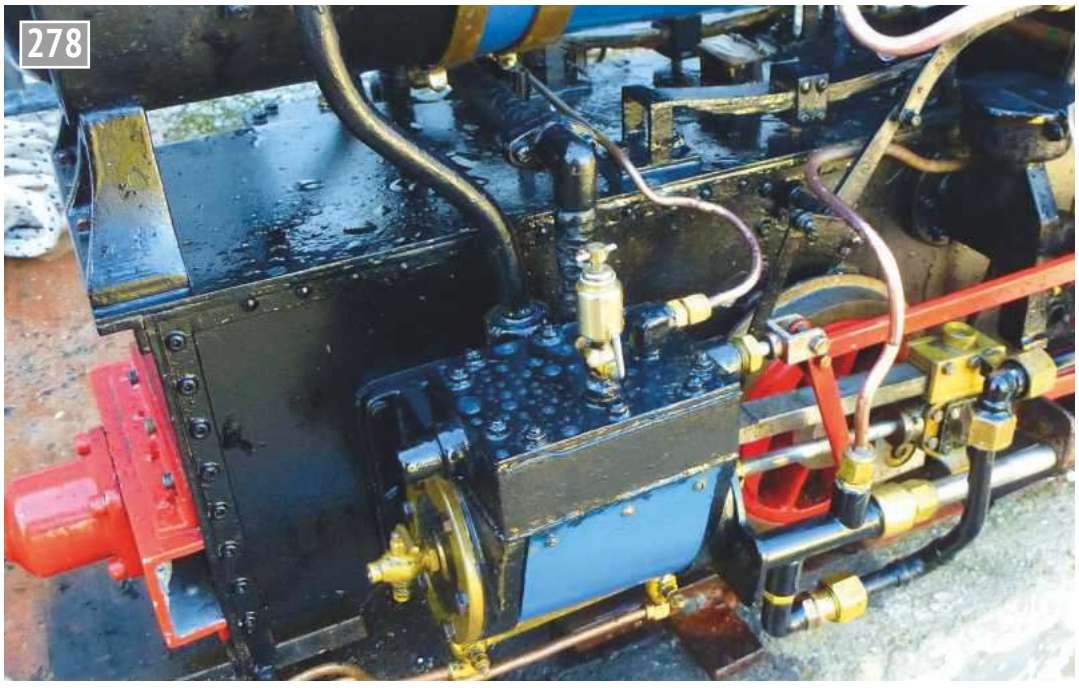
The angled bracket for fitting the control to the bunker inside the cab should be aligned to suit and will depend on the mounting position of the injector.

Cylinder backplate

Another simple job. Simply remove the front extension – as LBSC would have said - "'nuff said"!

Running irons

Again an easy task this - just don't make 'em and fit 'em – job done! As mentioned above there is a certain bonus, which can be ascribed to not having these irons and the twin buffers fitted to *Douglas*, in that the cylinders, motion and valve gear are much more exposed and visible and, in fact, the whole assembly looks very powerful and business like - see **photo 278**.



Motion work on ACC No.1.

●To be continued.

NEXT TIME

More modifications for *Airservice Constructional Corps No. 1*.

REFERENCES

57. John S. Robinson, Talyllyn Railway. Private communication, June 2019.

Building Dancer

Dancer *on the Mahurangi River.*

John Olsen constructs a 1:1 scale steam launch.

The story of *Dancer*, shown under way in the heading photograph (**photo 1**) really began back in the 1950s when my father had subscriptions to both *Light Steam Power* and *Model Engineer*. As a child, I was fascinated by the steam launches often featured in LSP. My father was always a bit sceptical about the idea, but thoughts of constructing a steam launch stuck in my mind. Then during the 1990s, with a small workshop of my own, I made a minor start on patterns for the A. A. Leak compound engine (ref 1) which was featured in the *Model Engineer* during the 1980s. Life intervened for a bit then, with two years spent working in Germany, I had a very small workshop in the 'Keller' of our apartment, with my Unimat 3, a small drill press and a belt sander for sharpening tools. Crammed into a space about 8 feet by 4 feet, along with a spare washing machine and the family bicycles, this was obviously not going to be the place for any large projects. However our time in Europe did give us plenty of exposure to canals including a very pleasant week cruising on the Rhine-Marne canal, again featured in an article in the *Model Engineer* (**ref 2**).

When we got back to New Zealand, the idea of a boat capable of the canal style of cruising, especially with some sort of heating system, was firmly entrenched. We had been sailing small dinghies with our three sons for many years by then, so I had learned a lot about building and maintaining small boats. I pulled out the Leak patterns and showed them to a potential foundry. With the help of their advice, I completed the set of patterns and had them cast. Around this time I also received my late father's Myford ML7 so now had a lathe a bit more capable of tackling some of the parts of the Leak. I also had a 10 inch Alba shaper. Anyone who knows the Leak engine will realise that the Myford plus the Alba is not really a large enough set of equipment to tackle that engine. I realised, however, that this was going to be a project that would take some time and hoped that opportunities to use larger machines would come along when needed. In fact I was able to enroll in a polytechnic course which enabled me to begin the machining of the bedplate. A fellow club member was kind enough to allow me access to a larger lathe and mill to machine and bore the low pressure cylinder, so the engine at least was well started. We had room in a drive-in basement garage under the house to build a boat up to about 23 feet in length, although getting it around a sharp bend and up a very steep drive was not something I was looking forward to.

Around this time, a new job opportunity beckoned, the down side being that it was in Auckland, 400 or so miles from where we were then living. So everything had to be packed away and moved to Auckland. Among other mishaps, some best glossed over, the moving company managed to lose the partly machined set of castings for some months. Fortunately they did show up eventually. The up side was that we found a house on a much flatter section, again built with a basement garage workshop underneath. The house was about 1500 square feet and the basement area was the same, with just a small amount taken up by a laundry and a small office. So over 1000 square feet was available for my toys. This enabled the plans for a boat to become much more ambitious (and, indeed, the Leak engine would have been a little large for a boat 23 feet long). The only real problem with that workshop was the lack of headroom; the beams that supported the floor of the house being only about 7 feet from the floor. **Photograph 2** shows the hull under construction there.

Speaking of size brings us to the question - how much space do you need? A rule of thumb that I would suggest bearing in mind is that you probably want to take the length and beam of the proposed boat, and multiply by at least three, preferably four, for the floor area you need. The actual shape of the space is not all that important, so long as you can get around the hull at each end. You may also need to be able to accommodate full size sheets of plywood in order to cut them up. Some of the space could be in a separate room, for instance you could have some of the woodworking machinery in another small shed if that is how it has to be. Much less convenient, but needs must. Small boats have been built in all sorts of strange places, including upstairs bedrooms. You do need to think about how you will get the finished article out, especially if bedrooms or basements are under consideration. My own workshop in Auckland was, I suppose, technically a basement, but had drive-in access with a fairly level drive out to the street, so access for removing the boat was quite good.

Another question will be what sort of hull you want to build. Unless you are a very skilled woodworker or boat builder, I would suggest that there are perhaps four main choices to consider:

1. Restoring an old hull. If the hull is in good condition then obviously quite a lot of the work is already done. However it is hard to find an old hull that is ideal for conversion to a steam launch and, unless you know a lot about boats, you may find that restoration can actually take more work and a longer time than building from scratch. **Photograph 3** shows *Galilee II*, restored from an old customs launch hull found under a hedge by Chris Cooper.
2. Fitting out a Fibreglass hull. This means that a lot of the more difficult work is already done, but does depend on finding someone with a suitable mould. Locally there was a batch of 14 foot hulls moulded in Christchurch (NZ) some years back, but I am not sure whether that mould is still about. *Janice Helen* was built in Nelson, New Zealand using that hull and is shown in **photo 4** with her current owner. The Elliot Bay Steam Boat Company in the USA offers a lovely Fibreglass hull and you can find details of that on the Internet (**ref 1**). Shipping might be a problem if you are in the UK.
3. Plywood construction. This is probably the simplest way, but does tend to produce a rather boxy looking hull. Designs with multiple chines look nicer but are more difficult to build, although still within the reach of a first time builder. Even the simplest, boxy designs tend to look pretty good when they are in the water with the chines out of sight.
4. Strip plank construction. This is the simplest way to get a nice looking hull with a classic shape, at least for a one-off construction. It is the way that *Dancer* was built. Although I had completed a partly-built plywood dinghy before, this was the first boat building project that I had attempted from scratch. While in this size it was pretty ambitious, I think any reasonably competent model engineer could do this. In the UK, Selway Fisher publishes a wide range of plans for steam launches in different sizes. *Kotare*, almost as long as my own boat, was built in Auckland to the Selway Fisher Golden Bay plans by an orthopedic surgeon with no previous experience - so it can be done (**ref 2**).

The hull for Dancer *under construction in a confined space.*

A restored Customs launch, Galilee II *with the owner and restorer, Chris Cooper.*

Janice Helen, *built from a Fibreglass moulded hull with her current owner.*

>>

Three boats together, Galilee II, Kotare*, and* Dancer.

Photograph 5 shows three boats, *Galilee II* being the clinker built example. She took longer to restore than did building either of the other two boats. That might also be due, in part, to the relative amount of free time each builder had, but it is probably not true that restoring an old hull will save time. For *Kotare*, Paul Eaton had a full set of Selway Fisher plans, while *Dancer* was built from a table of offsets and sketches. All of the interior detail and cabin construction was made up as I went along. The cabin is removable and was not finished at the time of the above photo. Another boat is shown in **photo 6**; this is *Clansman*, built by Tim Brown, and fitted with an engine built from castings by the Reliable Steam Engine Company in the USA.

Another advantage of the move to Auckland was that I came into contact with the Auckland Steam Engine Society. Among the members were those who had already built or were building steam launches of various sizes. One of the members, Peter Sewell, is a naval architect with considerable experience in designing small craft. I discussed my ideas with him, and with other members, and he designed a hull for me, using computer aids to determine stability, displacement and so on. So after a few years in Auckland, the engine was running on steam from a boiler on a trailer at club events (**photo 7**), and I was ready to begin on the hull.

Most amateur steam launches, at least here in NZ, are fairly small, typically in the range 12 to 20 feet or so. Many are repurposed older hulls, although some have been built with Fibreglass using a mould that a group in Christchurch came up with some years back. Boats in this size range are reasonably convenient to store and transport on a trailer. One serious disadvantage of some of the older hulls is that they tend to dry out and shrink when stored. They then leak when first put back into the water. It can take some time before the planks take up and you can stop pumping.

The Leak engine for Dancer *under trial.*

Clansman *being launched.*

The concept for *Dancer*, then unnamed, was a little more ambitious. Although it was still desired to have a boat that was trailable, I wanted a boat large enough to sleep two people in good comfort for reasonably extended cruises in sheltered waters. It was also to be narrow enough to be accommodated in an English canal lock, in case the opportunity to ship her to the UK for a cruise should arise. That limited the maximum draught, the beam and the height above water level. Trailer regulations limit the length behind the vehicle drawbar. At the time I started, the figure I found was a maximum of 10 metres behind the tow ball. For this figure it seemed reasonable to aim at 30 feet (9.25 metres) between perpendiculars for the hull, leaving a small amount at the front for a winch and for clearance between the bow and tow vehicle, especially when the combination is traversing a dip in the road. Another limitation from the trailer regulations is that the total weight of boat and trailer should not exceed 3500kg. So the design weight of the hull was to be 2400kg, leaving plenty of weight available for the trailer. I have since seen a figure stating that 12.5 metres is allowed behind the drawbar, but I am rather glad that I did not attempt to build a boat that long. The length is as much as I would care to tow. One advantage over, say, a caravan is that the boat is not as wide, and tapers towards the stern, which gives much better visibility of what is happening back there. It does turn out that long trailers are easier to back than short ones and the addition of a drawbar to the front of the tow vehicle makes it much easier to maneuver the trailer into tight spaces. *Dancer* is shown on her trailer in **photo 8**, covered with tarpaulins while she awaits the building of her new shed.

Peter duly came through with a design. This was quite an interesting challenge for him. The easy way to get sufficient stability while keeping the maximum weight down would have been a flat bottom. However this would not work too well with a steam engine driving a propeller, since this tends to require a large, slow revving propeller. The solution he adopted is a quite strongly V shaped

Dancer *on her trailer showing her length.*

bottom to the hull, with quite fine lines in the bow and stern. The maximum beam is 6 feet and the maximum draught is 2 feet 6 inches. However the latter can potentially be reduced to 2 feet by removing the skeg that supports the rudder and replacing it with a flat plate. This would come close to the propeller, reducing efficiency, but might be desirable should we get as far as the English canals.

The design was supplied to me as a table of off-sets and three sketches. These showed the bow and stern deadwood and a section of how the planking would meet up with the keelson. There was also a carved wooden half model. The design was for the hull to be built using the strip planking method and then glassed inside and out. Some years of work followed and this will be detailed more in later articles.

Earlier I mentioned *Galilee II*, restored by Chris Cooper. He had fitted it with a modified Simpson Strickland engine and with a boiler designed by André Pointon. André and his father, Ken Pointon run a small company called Colonial Ironworks supplying castings, engines, and boilers to those who need them. The boiler designed for *Galilee II* seemed ideal for *Dancer*, so I was able to obtain the set of drawings and embark on the next phase of the project. The boiler is a three drum design, like the Yarrow, but with the down comer tubes bent to reduce the distance between the two lower drums. **Photograph 9** shows the boiler for *Galilee II* before it was installed. This boiler was fitted with a grate for coal firing but I planned to set my own one up for oil firing. The design is approved to American Society of Mechanical Engineers standards. At this size it is beyond what the model engineering societies can approve so all materials had to be sourced with material certificates and all welding had to be done by an approved welder. I was able to do all the preparation and, since

A three drum boiler for Galilee II, *the design chosen for* Dancer.

all the small water tubes are expanded into place, I was able to bend and fit these at home.

My initial thought, when I started, was that this would be a ten year (or so) project and I had mentally thought of it as three phases, each of about three years, with a year or so to finish things off. This has, of course, actually turned out to be wildly optimistic. The boat is now in use, but cannot really be said to be completed. There is still plenty of work to do, particularly on the accommodation side of things. Total time elapsed since I got seriously started is now about 17 years. Oh well … it is a hobby. Two moves of house during the project have not exactly helped, especially since after the last move I had to build a shed to accommodate the project and, naturally, the longest delay with that was obtaining planning permission. Still, the result is that now I have an ideal shed, 12 meters long by 7 meters wide, and with more than enough headroom. Along with another shed that was already on the new property, I now have more workshop area than we have house area. If your space is more limited, you can still have a lot of fun with a smaller boat - and probably see results a lot faster too!

It turns out that my imagined three phases, or stages, are really more like four, the extra one being plumbing everything up and finishing off. *Dancer* is of course much more ambitious than most model engineers would aspire to, but will, I hope, give some idea of what is possible. I have not kept detailed records of expenditure; I felt that the total might be too frightening. I can confidently say, though, that the cost of the four wheel drive (now needed to tow the boat), the actual trailer and the shed certainly come to a lot more than has been spent on the boat. Most of the costs for the boat and steam plant come along in stages so are easier to manage than if the total had to be found all at once. The major cost for the engine was the castings. Having them cast locally was cheaper than buying from the UK would have been. The shipping costs from the UK would have been comparable to the cost of the castings themselves. For the hull, the timber was one of the larger costs, being about NZ$3000. This would convert to about £1,500 or so, depending on when you did the conversion. Epoxy was the other major expense for the hull. West system epoxy was bought in bulk containers at around NZ$500 for twenty litres and at least six of those have been used through the project.

The boiler required something around NZ$1000 for steel, about NZ$1300 for welding and a comparable amount for inspections. Probably approaching NZ$4000 or so all up. Putting things together has added ongoing costs for plumbing, paint and all those other expensive little pieces that boats seem to need. Although *Dancer* cannot really be said to be complete, she is able to be used at present, while work continues on the accommodation and on fixing minor problems. We have slept and cooked on board on several occasions. Preliminary indications are that the performance will be very good. *Dancer* can achieve a speed of around 7 knots or so with very little wake being made. So far problems with getting enough heat from the burner have prevented us from maintaining a cruising speed anything like that, but this is being worked on. The heading photo shows *Dancer* cruising on the Mahurangi river near Warkworth at a steam launch gathering in February 2019.

●To be continued.

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1. A Compound Marine Engine: Author, A. A.Leak: Model Engineer 1982-1983 beginning Vol 149, issue 3691, conclusion vol 151, issue 3709 (generally alternate issues).

2. European Canals, Shiplifts and Locks: Author, John Olsen. Model Engineer 2003 Volumes 190, 191. Issues 4190 to 4200 even numbered issues only.

PART 66

Garrett 4CD Tractor in 6 inch scale

Chris Gunn fits the belly tank and gets stuck into some piping.

Continued from p.177
M.E. 4630, 17 January 2020

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.

Now it was time for a major step forward, namely the fitting of the belly tank. There are a number of items that are connected to it or which are influenced by its position, so it was time to deal with it.

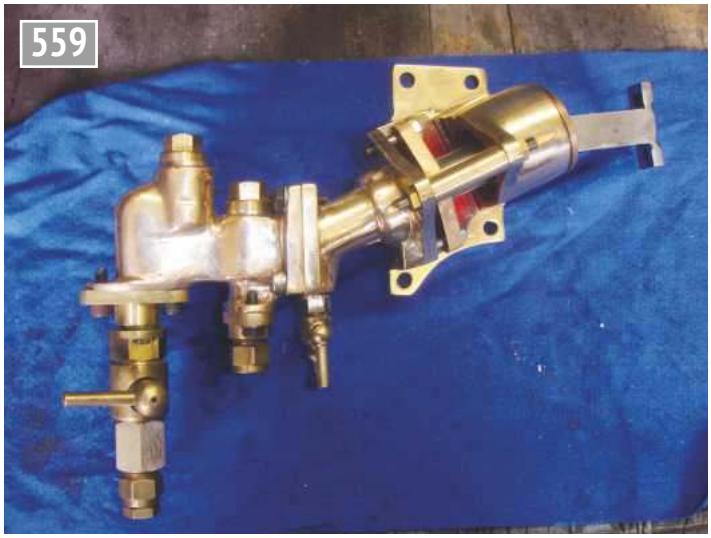
I did think long and hard about fitting the belly tank at this stage. First I had the prospect of good weather for a couple of weeks and second, I had a self-imposed deadline to get the engine ready to try and rally it at my local rally in the middle of September 2015. Once the belly tank was on I could get an awful lot done. I also had hydraulic tests and steam tests to think about and fit in with other people. My reservation was that it might be easier to make and fit the lagging and cladding at this stage with the belly tank off, however I did believe the cladding could be done after the tank and everything else was done. In the end I think I did the right thing, as I could have run the engine naked (the engine, not me) had I run out of time. I did manage to get the cladding done too, as will be revealed.

Just to set the scene again, the belly tank was completely assembled and

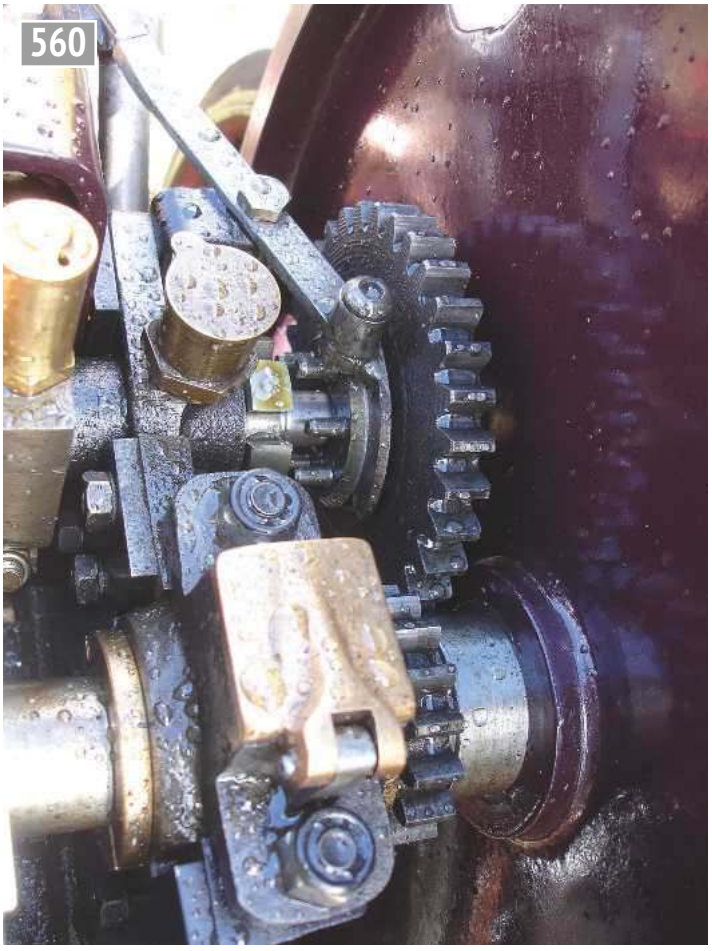
Drawings, castings and machining services are available from A. N. Engineering: Email: **a.nutting@hotmail.co.uk**

Belly tank assembly.

Steering wheel.



Pump assembly.



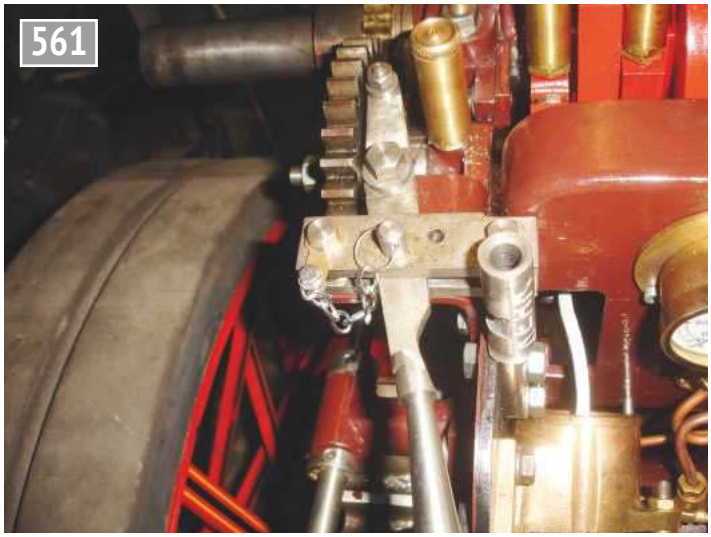
Bernie's gear change.

finish painted and lined. The two hand hole covers were not fitted however, but the three mounting brackets were, one each side and one at the front. The bolts were not fully tight in case I needed to wriggle them a little to get everything to line up. I moved the belly tank into position under the engine and supported it roughly in position on a couple of upturned steel bins, at about the right height. Then I used a light ratchet strap to lift the belly tank up into position and added a couple of screws as soon as I could. It did not take long to get the tank in position; **photo 557** shows work in progress.

Once the tank was in position, all seemed well and the most important thing connected to the tank, that has to line up perfectly, is the steering shaft and worm. They were the next items to go on and I am pleased to say that went well and I did fit the shaft with roller thrust races between the two mounting faces for ease of movement. The worm was fed on and the steering shaft supports fitted to the frames. I did take the flywheel off for this job, which also entails taking the L/H wheel off. Once the steering shaft was in place, I could add the steering wheel. I had taken some pictures of some full size engines and noted there was a plate in the centre of the steering wheel telling the steersman which way to turn the wheel and I managed to get someone to engrave one for me for a bit of added detail (**photo 558**).

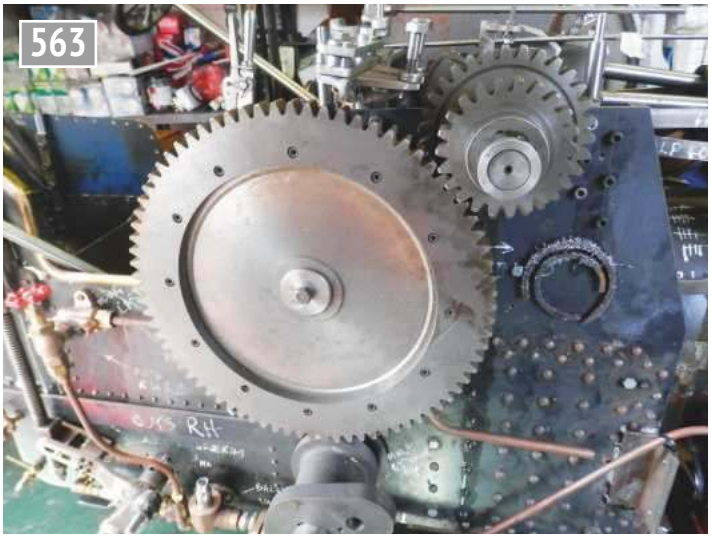
Work then continued and I recall that the water pump was a major assembly that went on next. I had the pump castings professionally polished after I had painstakingly cleaned them up with my power file, Dremel burrs and so on, only for the polisher to tell me I need not have bothered as he could have taken the castings from 'as cast' down to the finish you see in **photo 559** without any intervention by me.

Installing the pump was a bit fiddly but it had been on before. The drive shaft is assembly is fitted first, then the pump body on the inside of the horn-plates and the pump con rod is connected last. I mentioned that I was going to fit a pump clutch so I could disengage the pump from the gear drive and I covered the construction of the drive parts ≫



Pump gear change.

Pump piping.



Some piping.

Balance valve.

and gear shifting lever then.

I would sooner use a pump than an injector, but that could be because I have never had a really 100% reliable injector that worked without a lot of fiddling about. That could change as the injector fitted to the 4CD seems to work well so far.

When the engine was partly rough assembled I did test fit the pump and then had a look at the available space and the pictures I had taken of Bernie Fairbanks' engine (which has occasionally featured in the past in this series) and virtually copied that (**photo 560**).

My version is very similar and all was well - or so I thought - but after I had removed this for cleaning up, I subsequently made some supports for the canopy, fitted them and made the canopy complete. Then, when it came to final assembly, I found that one of the canopy supports and the pump drive lever fouled each other so I milled a slot in the support and a groove in the lever which allows me full movement of the lever (**photo 561**).

Once the pump was on, I fitted the pump clack and piped up the pump to that, using standard ⅜ inch copper pipe and, again, Enots compression fittings. The pipe has to be wriggled around the various lumps and bumps and I used a couple of commercial pipe clips to hold it in position around the moving parts.

I dropped another piece of tube down into the bottom of the tender tank, for the water supply to the pump and another from the pump bypass back into the tender. I split this into two sections joined by a short piece of clear soft tubing so I could check the flow of water back into the tender and also that the pump was working.

I also made a couple of brass ferrules to fit over these two pipes, with an O-ring let into the base in an attempt to close the holes in the tender floor (when fitted) and stop coal dust getting into the tank. **Photograph 562** shows the pump pipes to the left of my sugar scoop style shovel.

Next, I tackled the piping on the injector side of the engine, where there is a lot going on. I took the wheel off for better access whilst working on this side .

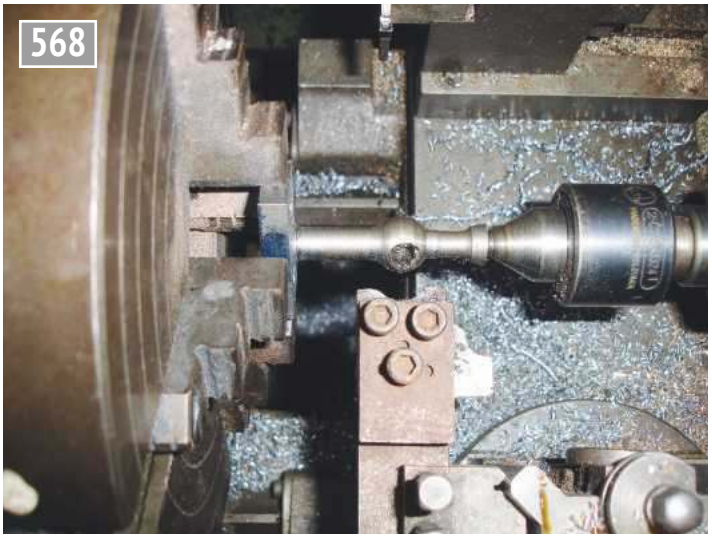
I worked from the bottom up and first to attend to was the belly tank to tender balance pipe. I had drilled the tender for the balance valve and had previously fitted it on the tender. I like to use a brass plate for this, with the two mounting holes tapped in the plate and a central hole for the water to pass by in the middle. This way there are no nuts inside the tank and no need to get a spanner in to hold anything. This also gives a good big area to apply any sealant. However, as work progressed I wished I had left drilling the holes for the bypass to this stage, as it seemed I could have had a little more clearance to fit everything in this cluttered area, had I been able to move the bypass. **Photograph 563**, which was taken during the trial assembly stage, shows some of the fitments on the R/H side.

The balance valve was refitted and the belly tank already had a brass plate with a boss tapped for ¾ inch

Belly tank connection.

Balance valve joint.

Belly tank joint.



Forming the ball on the standard.

BSP fitted to the underside. I intended to use ¾ inch bore standard galvanised pipe, which is little over 1 inch outside diameter to make the connection. However, I wanted to make the connection look something like the real thing rather than just use today's standard fittings. I had taken a few pictures of the full size article as shown in **photos 564** and **565**. These show the balance valve and the belly tank connection; I guess this shows some rather rudimentary gland packing.

I had already obtained a piece of tube which my friendly pneumatics engineer had threaded one end and bent for me using his big pipe bender. I made a pair of oval flanges for the valve end and used some galvanised fittings to get from the valve to the flange and then the other one was screwed on to the end of the pipe. This end of the assembly is shown in **photo 566**.

The other end was made from 2 x ¾ inch BSP commercial nipples and elbow to get from my plate on the tank to the horizontal and to connect into my expansion joint. This incorporates a gland which is packed and pulled up by the two studs to seal the joint. I used graphited cord to make the joint as I had run out of sisal string. In fact, this method of installing the balance pipe is the only way it can be done to allow the balance pipe to be lifted into position. This is shown in **photo 567**.

Once the pipe was connected I checked the rod which would allow the valve to be opened and closed from the footplate and found that this was too close to the drive gear when vertical, so I would need to make this lean back a bit to clear the gear and the gear guard. This is another reason for leaving the position of the balancing valve until assembly, rather than working from the tender drawing. I had made the top of the valve itself ½ inch square and I used an old socket, seated upside down, on that, and pinned a short piece of hexagon to fit the socket on the end of the operating rod so the valve could be opened and closed. I cut the hexagon end off the rod leaving about ½ inch of round section which was 8mm diameter.

I searched high and low for some universal joints that I knew I had put somewhere safe … until they 'came in handy'. I could not find them and in the end I found some very expensive ones and some very cheap ones on a well-known auction site. For hand operation like this the cheap one would do the job so this was ordered and was to be dispatched direct from China. It duly arrived and whilst a little rough around the edges was all as expected. In the meantime I made a support for the end of the rod, turning a ball end on the outer end of it (**photo 568**) using some form tools I had made for something else. I then put it in the vice on the Bridgeport and milled a flat, then drilled the hole for the rod to go through. The other end was drilled for two mounting holes – but, having been caught once, I did not drill the mounting holes in the tender until everything was in position.

●To be continued.

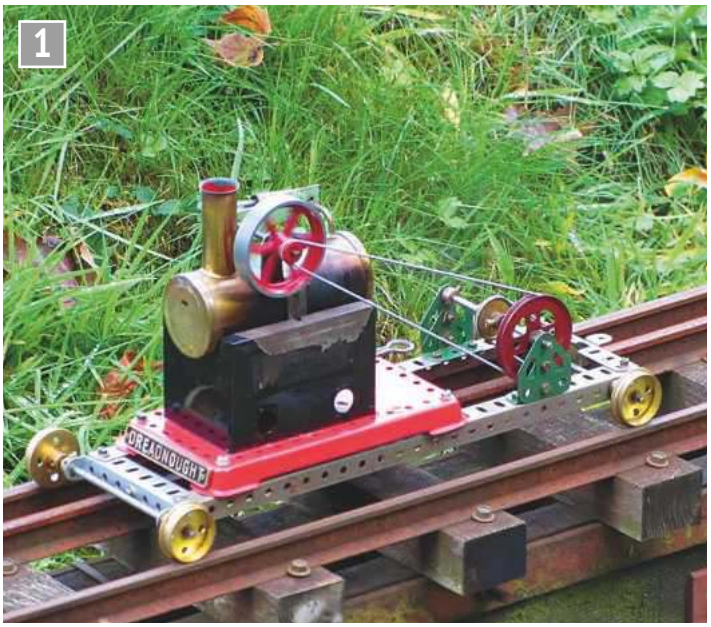
CLUB NEWS

Geoff Theasby reports on the latest news from the Clubs.

A very useful set of tiny tools may be obtained by buying a small spectacles repair kit and a similarly priced watch repair kit (about £4 each from the usual suspects). These will be handy for replacing not only the 18BA screws and nose pads in your spectacles but also quartz watch batteries, coin cells in digital calipers and angle gauges, and replacing and adjusting the length of metal watch straps. Many more uses will spring to mind as readers find opportunities in their own workshops.

In this issue: job qualifications, a 'fifth' bridge, a youngster's railway, couplings, the slush pile, monorails and being shot at.

Here is John's Meccano/Mamod steam locomotive from **Guildford Model Engineering Society**'s SMEE day (**photo 1**) which I mentioned last time. It was built in an evening. You can find out more about it on page 291.



John's Meccano engine at Guildford MES (photo courtesy of Secretary, Bryan Finch).

'Trains & Boats & Planes' - in December the Sheffield Auctions had several engineered live steam models of ships, aircraft and trains to 3½ and 5 inch gauges, plus internal combustion and Stirling hot air engines, steam plant, etc., including a PLM 'Bourbonnaise' type 0-6-0, No. 1424 (1423 is preserved), which went for £1800 (**photo 2**). See www.youtube.com/watch?v=0v19a_9kWtY Several of the models were in poor visual condition and none had boiler certificates. Your scribe spotted a 5 inch gauge IoM Railway *Crellin*, possibly to Ashdown Models 'Peveril' design (£1350), a 5 inch gauge Decauville, a quarry Hunslet 'Alice' type, in need of restoration (£1050), a 3½ inch gauge Stirling Single, a 5 inch gauge Super Simplex (£1800), two Royal Chester traction engines, one attractively finished, one not so (£1550), two Clayton 1½ inch scale steam wagons, an undertype (**photo 3 -** £900) and an overtype (undertype, overtype, Claytonning free... - Geoff), several Mamod, including one boxed, 'O' gauge railway, a 1 inch scale Fowler showman's engine in need of TLC, a very good *Model Engineer* beam engine (currently being serialised again in *Model Engineer* - £850) and a Stuart Turner version (£270). More photographs next time.

PLM 'Bourbonnais' locomotive at Sheffield Auctions.

Clayton undertype at Sheffield Auctions.

Worthing & District Society of Model Engineers, *Newsletter,* winter, has Mike Wheelwright discussing wheel loading and the advantages of incorporating a heavy drag box. This effectively transfers the adhesive weight rearwards from the leading coupled

axle, which is very effective. John Stoton details his life in boilers ("Luxury! We had to live in a hole in't' road") beginning at the CEGB. A later position was in Scotland and he was once called upon to help with sorting out many job applications. On rejecting one candidate, his decision was queried. He answered that despite two references being the norm, the applicant had given only one industrial reference, the other being a Clerk in Holy Orders. Later, he found that this was a coded way of claiming that the candidate was 'of the correct religious persuasion' for such a job in Glasgow.

W. www.worthingmodelengineers.co.uk

TSMEE News, November, from **Tyneside Society of Model Engineers**, held a Creosote Day, when all present were issued with pots and brushes and told to preserve anything made of wood (quiet at the back there!). Gordon Bullard has made some automatic cylinder drain cocks, beginning with a safety valve design, which works really well, suitably modified to look more authentic. A photograph shows them fitted to a 3½ inch gauge *Maisie*.

W. www.tsmee.co.uk

Robert McLuckie of **Edinburgh Society of Model Engineers** sends many photographs of their new 'Fifth' Bridge being erected at Almondell. I am sorry I have insufficient space to print more on this huge project, which is worth an article on its own.

W. www.edinbiurgh-sme.org.uk

B&DSME News, November, from **Bournemouth & District Society of Model Engineers**, tells us that Chris Bracey visited Eastleigh Lakeside Miniature Railway, owned by an engineering company and run by volunteers. It is a 10¼ inch gauge line and there is another line in Eastleigh of 7¼ inch gauge. Most unusually, most of the volunteers were young and they did a really good job.

W. www.littledownrailway.co.uk

A club new to me is **Tiverton & District Model Engineering Society,** which sends its schedule for 2020, duly forwarded to Editor Martin (now in the 'Master Diary' and appearing on a page near here – *Ed.*). Reader, your homework, should you choose to accept it: 'what is the name of their club newsletter?'

W. www.tivertonmodelengineering.org.uk

Stamford Model Engineering Society November *Newsletter* had a talk on the use of sugar in industry, with particular attention to the brewing industry. The rest of the newsletter is devoted to the horrendous vandalism (with photographs) at Market Deeping Model Railway Club and its staggeringly quick recovery, aided by donations from around the world, including £10,000 from Sir Rod Stewart, who has been made an Honorary Member. Total donations topped £100,000. One locomotive worth £8K was smashed and three vandals were fined a token £500.

The Link, December, from **Ottawa Valley Live Steamers & Model Engineers**, observes that progress is being made on all fronts - track, the site, building maintenance, etc. - without anything remarkable or catastrophic occurring. Editor Graham Copley has been appointed Most 'Esteamed' Member for the year, firing up his locomotive on 10 running days in 2019. Passenger traffic was up 17% on last year. President Len Winn has completed his 3½ inch gauge 'LBSC' *Virginia*. 'She' is expected to be introduced to the club track in the New Year.

W. www.ovlsme.x10host.com

Ryedale Society of Model Engineers November *Newsletter* has a good photograph of late evening at Gilling. The predominantly blue cast, due to the nature of twilight, adds to the ethereal quality of the picture, set off by the signal lamps and a distant view of the illuminated signal box. The last meeting in November was very cold and when John Cook was asked how many layers he was wearing, he replied that he was covering up his nightie!

W. www.rsme.org.uk

A marathon read hoved onto my doormat - the **Gauge 1 Model Railway Association** *Newsletter and Journal*, which was so large it comprised two magazines, called, surprisingly enough, Part 1 and Part 2, with a combined 136 pages. These will keep me in awe over the next few weeks. I write about Pt 1 here, and Pt 2 next time. The saga of Keith Bucklitch's coach couplings continues.

3D printed LNWR brake carriage (photo courtesy of Peter Davis and Peter Cunningham).

Reading the comments on his original item, he is pleased at the interest and has now designed and produced a 3D coupling mounted exactly as the originals, at a staggering financial outlay of 8 pence! On the same theme, Peters Davis and Cunningham have 3D printed an LNWR 45 foot full brake carriage to diagram 80 of 1902 (**photo 4**). I'm sure that we all know what a 'Pacific' or 'Atlantic' locomotive is but what about an 'Adriatic'? I certainly didn't. It refers to a locomotive known under the Whyte notation as a 2-6-4, mostly tank locomotives. They were widely used but only Japan and Britain made large quantities. Martin Ford improves and 'dirties up' a commercial 16 ton mineral wagon kit, which is time-consuming but not expensive (Shades of Tennessee Ernie Ford - Geoff). Martin Barker discusses wheel quartering. A third Martin, Martin Sheridan, built a working Franco-Crosti-boilered 9F. I found it interesting to see the 'entrails' laid bare.

W. www.g1mra.com

Next, the **Gauge 3 Society** *Newsletter,* winter edition. Robert Miller found that Vectis Auctions had a number of SR electric vehicles of 2½ inch gauge on offer. ≫

SR 6-PUL of 1930s? (Photo courtesy of Robert Miller.)

They may have been made contemporaneously by SR apprentices and Robert bought them. The dated control circuitry runs well on an 18 volt drill battery but a return to third rail is contemplated. I like the CC2 locomotive but this 6-PUL driving car shows more detail (**photo 5**).
W. www.gauge3.org.uk

Stockholes Farm Miniature Railway *Newssheet,* November, starts with a dramatic photograph of the railway underwater, so deep that Ivan's wellies were overtopped. Given that his location is only 10 metres above sea level, this is ominous. Did you know that there are 36 washout plugs on a 'Duchess' boiler? Ivan does, he made 37...
W. www.sfmr.co.uk

West Riding Small Locomotive Society's winter *Branchlines* has an item by Gordon Bullard on automatic drain cocks. *Deja vu*! See TSMEE above. Otherwise routine activities kept members busy.

I noted, as I was finalising this masterpiece, that I had missed a few newsletters. Nevertheless, my rigorous editorial procedures ensured that they would not inadvertently land on the editorial spike or that great slush pile in the sky. I would have you know that what appears to be a smooth relaxed operation from the other side of my keyboard is, in fact, a complete flummery, a blind, activity designed to mislead onlookers as to my real purpose. In the great publishing traditions of freelance journalism, sleep and gin testing, I am writing this at 2pm on Christmas Day.

Richmond Hill Live Steamers' *On Track*, December, mentions several monorail videos, Lartigue, Erwins and Road Machines versions, and a Quirks & Curiosities II from the Festiniog and Welsh Highland Railway, including a grav(it)y train. 'No Loco!' Naomi Klein should investigate... Another shows the building of a **complete** full scale railway on virgin land, just for the 2013 'Lone Ranger' film.
W. www.richmond-hill-live-steamers.tripod.com

The Link, December, from the **Model Engineers Society (NI)** continues the unhappy state of affairs, in that the decision to evict the Society from Cultra has been upheld and they must prepare to leave after nearly 50 years. Philip Lockett writes on designing and making points for his garden railway. A worms-eye view shows his handiwork (**photo 6**).
W. www.mesni.co.uk

Centurion Society of Model Engineers, *The Centurian Smokebox,* December, contains a request for details of model railway coaches of Rhodesia, 1940-1970. The Editor, Jon Shaw, sends Christmas Greetings from New Zealand!
W. www.centuriontrains.com

City of Oxford Society of Model Engineers *CoSME Link* arrives with 40 pages to review, so I will take a break now and gird my loins for the onslought... (Later) I'm back, did you miss me? Suitably girt, the winter newsletter carries a Health & Safety note, in that the fumes from welding mild steel using any process are now regarded as carcinogenic. For intermittent, non-industrial use, suitable passive face masks are acceptable. Ron Head writes on the 'how and why' of studs and the making of same. Dave Thorpe concludes his short series on making a mill engine, notable (for me) because the flywheel is attached using a tapered bush, common enough in industry but not for models. David Price visited Wentworth Woodhouse near Rotherham, the largest house in Europe, in his case because he lived locally in his youth and was once shot at by a gamekeeper. The nature of his transgression is not revealed. The story of the house's survival after being vindictively targeted for political reasons in the late 1940s is instructive as well as telling. Once, the family were the 5th richest in the country and widely known as a benevolent employer. A tour of the roof, currently under restoration, revealed that it was built with pitch pine and is still in good condition after 250 years. A tailpiece concerning John Winn's holiday in the US of A shows an elegant steam launch, wearing a rather large Stars & Stripes, more like a battle flag than an Ensign. A vexillologist writes - by convention, the size of an ensign is related to the size of the vessel, being an inch long for every foot of length. (A flight of fancy - as it would be unarmed, it would have to rely on its powers of lofty disdain if it met with an adverse situation, very like Marvin the Paranoid Android meeting the Frogstar Scout Robot Class D – Geoff)
W. www.cosme.org.uk

And finally... A wind turbine was asked for its musical preferences. "I'm a big metal fan" it replied.

Contact:
geofftheasby@gmail.com

Philip Lockett's points at MES(NI) (photo courtesy of Philip Lockett).

FEBRUARY

13 **Sutton MEC.** Video evening – 'Yours or Ours'. Contact Paul Harding 0208 2544749.

14 **Tiverton & District MES.** Club meeting at Old Heathcoat Community Centre. Contact Chris Catley: 01884 798370.

15 **Brandon DSME.** Running day. Contact Mick Wickens: 01842 813707.

16 **North Wiltshire MES.** Public running, Coate Water Country Park, Swindon, 11am-5pm. Contact Ken Parker: 07710 515507.

18 **Nottingham SMEE.** Talk – 'Boiler Making – Challenges and Outcomes', Norman Smedley, 7.30pm. Contact Tony Knowles: 01623 795242.

18 **Romney Marsh MES.** Talk: 'Narrow Gauge Railway Visits' – Mike Jackson, 7.30pm. Contact Adrian Parker: 01303 894187.

19 **Bristol SMEE.** Talk: 'Robot Bodies and How to Evolve Them' – Alan Winfield. Contact Dave Gray: 01275 857746.

19 **Leeds SMEE.** Meeting night – 'Three Short Model Engineering Topics' – Members. Contact Geoff Shackleton: 01977 798138.

21 **Rochdale SMEE.** Talk: 'Local Steam' – Bob Hayter, 7.30-9pm, Castleton Community Centre. Contact Rod Hartley 07801 705193.

23 **North Wiltshire MES.** Public running, Coate Water Country Park, Swindon, 11am-5pm. Contact Ken Parker: 07710 515507.

23 **Tiverton & District MES.** Running day at Rackenford track. Contact Chris Catley: 01884 798370.

25 **Romney Marsh MES.** Members' social afternoon, 2pm. Contact Adrian Parker: 01303 894187.

25 **Wigan DMES.** Presentation by Mr Dean Patterson on 'What We Can Learn from the Nuclear Industry'. Contact: wigan_mes@aol.com

27 **Sutton MEC.** Club night – cotton reel racing – make your own. Contact Paul Harding 0208 2544749.

MARCH

1 **North Wiltshire MES.** Public running, Coate Water Country Park, Swindon, 11am-5pm. Contact Ken Parker: 07710 515507.

3 **Romney Marsh MES.** Talk: 'Update on Clan Line' – Colin Clark, 7.30pm. Contact Adrian Parker: 01303 894187.

4 **Bradford MES.** AGM, 7.45pm, Saltaire Methodist Church. Contact: Russ Coppin, 07815 048999.

4 **Brandon DSME.** Meeting at The Ram Hotel, Brandon, 7.45pm. Contact Mick Wickens: 01842 813707.

4 **Bristol SMEE.** Themed topic evening on model turbine building with John Beddis. Contact Dave Gray: 01275 857746.

4 **Leeds SMEE.** Meeting night – jumble sale. Contact Geoff Shackleton: 01977 798138.

5 **Sutton MEC.** Bits and pieces. Contact Paul Harding 0208 2544749.

6 **Portsmouth MES.** Club night – 'Fuel for the Navy', 7.30pm, Tesco Fratton Community Centre. Contact Roger Doyle: doyle.roger@sky.com

6 **Rochdale SMEE.** Sale of items from Richard's workshop, 7.30-9pm, Castleton Community Centre. Contact Rod Hartley 07801 705193.

7 **Tiverton & District MES.** Running day at Rackenford track. Contact Chris Catley: 01884 798370.

8 **North Wiltshire MES.** Public running, Coate Water Country Park, Swindon, 11am-5pm. Contact Ken Parker: 07710 515507.

8 **Sutton MEC.** Sunday track day from noon. Contact Paul Harding 0208 2544749.

10 **Romney Marsh MES.** Members' social afternoon, 2pm. Contact Adrian Parker: 01303 894187.

13 **Tiverton & District MES.** Club meeting at Old Heathcoat Community Centre. Contact Chris Catley: 01884 798370.

14/15 **The Midlands Garden Rail Show,** Warwickshire Exhibition Centre. See www.meridienne exhibitions.co.uk

15 **North Wiltshire MES.** Public running, Coate Water Country Park, Swindon, 11am-5pm. Contact Ken Parker: 07710 515507.

15 **Guildford MES.** Public Open Afternoon 2-5pm. Contact Mike Sleigh: pr@gmes.org.uk

17 **Nottingham SMEE.** AGM. Contact Tony Knowles: 01623 795242.

17 **Romney Marsh MES.** Products of the winter workshop, 7.30pm. Contact Adrian Parker: 01303 894187.

18 **Bristol SMEE.** Spring auction (presumably an auction in the spring, not an auction for springs – Ed.). Contact Dave Gray: 01275 857746.

18 **Leeds SMEE.** Meeting night – 'Some Unusual Locomotives' – John Charlesworth. Contact Geoff Shackleton: 01977 798138.

20 **Rochdale SMEE.** Members' projects and problems, 7.30-9pm, Castleton Community Centre. Contact Rod Hartley 07801 705193.

22 **North Wiltshire MES.** Public running, Coate Water Country Park, Swindon, 11am-5pm. Contact Ken Parker: 07710 515507.

22 **Tiverton & District MES.** Running day at Rackenford track. Contact Chris Catley: 01884 798370.

24 **Romney Marsh MES.** Members' social afternoon, 2pm. Contact Adrian Parker: 01303 894187.

26 **Sutton MEC.** Club night – new and interesting items. Contact Paul Harding 0208 2544749.

28 **Romney Marsh MES.** Track meeting, noon onwards. Contact Adrian Parker: 01303 894187.

29 **North Wiltshire MES.** Public running, Coate Water Country Park, Swindon, 11am-5pm. Contact Ken Parker: 07710 515507.

29 **Portsmouth MES.** Public running, 2-5pm, Bransbury Park. Contact Roger Doyle: doyle.roger@sky.com

31 **Romney Marsh MES.** Track meeting, 11am onwards. Contact Adrian Parker: 01303 894187.

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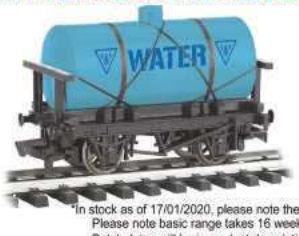

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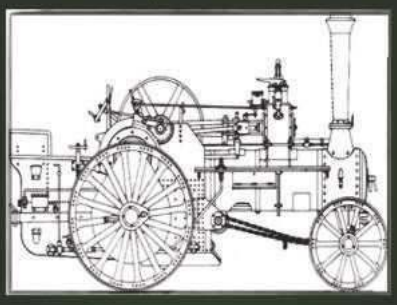

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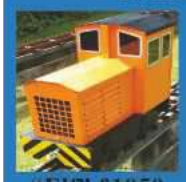

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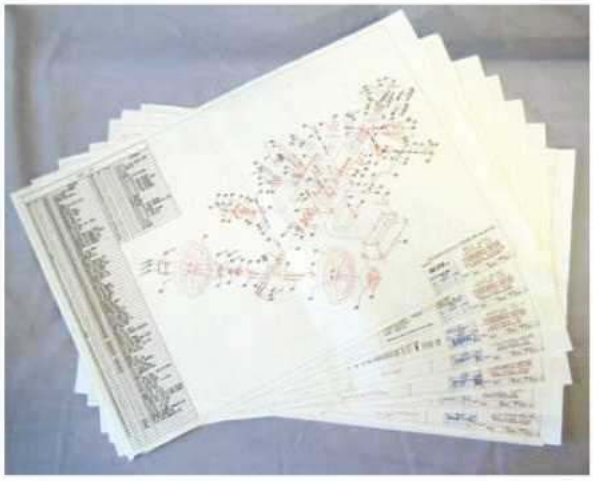

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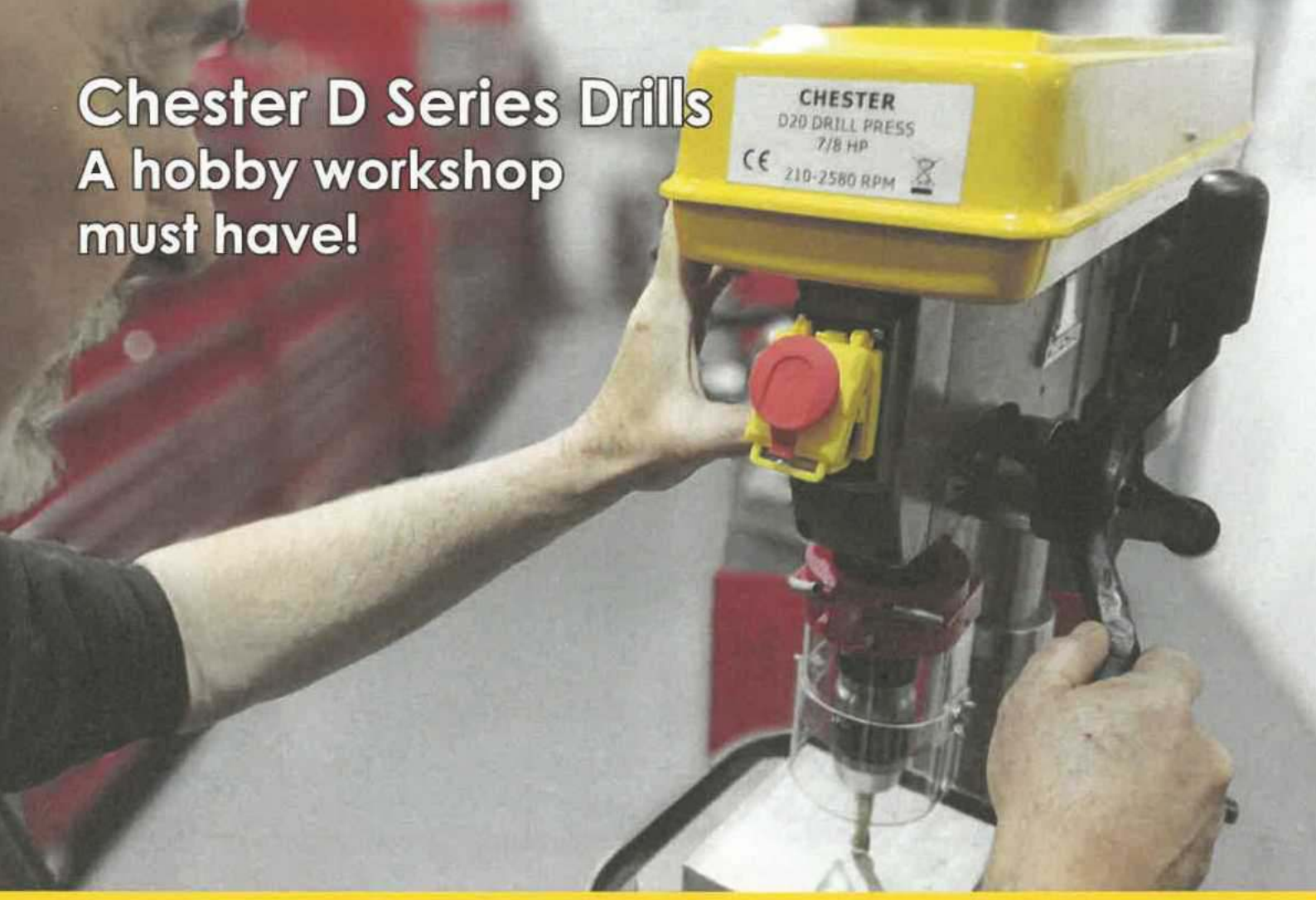

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